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International Symposium on Green  
Management and Local Government's  
Responsibility**

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## Preface

To achieve green development and build a beautiful China is an important part of the great rejuvenation of the Chinese dream. Radically, Green Development depends on the planning and execution of enterprises, non-profit organizations and the public sections in many areas. Their development strategies play a very critical role to achieve Green Development. This raises questions about how can these aforementioned organizations can effectively realize Green Development? How to implement the Green Development concept throughout organization management and strategy execution to plan production, guide development and sustain a long-term business operation? Given these gaps, from an academic standpoint, there are a good number of topics that absolutely deserve in-depth research.

Thus, Zhejiang University of Finance & Economics launched the “International Symposium on Green Management and Local Government’s Responsibility, 2017 ICGMGR” during November 4<sup>th</sup>, 2017 to November 5<sup>th</sup>, 2017 in Hangzhou, Zhejiang, China. This symposium provided a platform for sharing ideas and insights among scholars in terms of current and future research on these issues. During this two-day symposium, there were various sessions including paper presentations, keynote speeches, and academic and industry panel discussions were organized as well. Scholars, business executives, entrepreneurs, and policy-makers were invited to join us in the discussion.

We gratefully appreciate all the support and help from our respectful partners: Centre for Asian Business & Economics, University of Melbourne, Australia; Institute of Green Development, University of Jinan, China; Centre for Ecological Civilization, Zhejiang Province, China; Department of Psychology & Behavioral Science, Zhejiang University, China; Institute of Green Development, University of Hubei, China and so on.

In addition, I would like to express our sincere thanks to the joint efforts of various journals: Journal of Cleaner Production (SCI); Asia Pacific Journal of Management (SSCI); Public Personnel Management (SSCI); Journal of China University of Geosciences (Social Sciences Edition) (CSSCI); Collected Essays on Finance and Economics (CSSCI); and American Scholars Press (ASP), USA.

At this event, several American and domestic experts addressed keynote speeches. Professor Doug Goodman from Public & Nonprofit Management, The University of Texas at Dallas; Professor Donald H. Schepers from the Zicklin School of Business, Baruch College, City of University of New York; Associate Professor Xiaoling Zhang from City University of Hong Kong; and Prof. Jane Lu from University of Melbourne, etc. In the panel sections, a wide range of topics were addressed such as Green Strategy, Green Finance, Green Marketing, Cleaner Production and much more. In the Q & A session, experts and scholars made in-depth and active academic exchanges and discussions on a series of issues.

Forty-one academic papers have been selected after the committee’s rigorous review. All of these papers attempt to make contributions to green development and local government’s responsibility in different research areas. All of the selected papers represent only the authors’ viewpoints, not those of the editors.

### **Professor Wang Jianming**

*Deputy Dean of School of Business Administration  
Zhejiang University of Finance & Economics  
Hangzhou, China*

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## *Keynote Speech I*

### **Local Governments and Green Management: An Opportunity to Make a Difference**

**Professor Doug Goodman, Ph.D.**

*School of Economic, Political, and Policy Sciences ,  
The University of Texas at Dallas, Dallas Texas, USA*

This article builds on a recent editorial that my colleagues and I published as part of Public Administration Review's "Climate Change and Public Administration: A Blog Commentary Symposium" series. While a large majority of survey respondents from local governments in the United States view the environment as at least "somewhat a priority," nearly half do not see climate change as a priority for their cities or counties. Though local governments may not view climate change as a high priority, they do, however, engage in a long list of environmental and sustainable practices. This article discusses some of those initiatives and especially how local governments in the United States adopt Green Management techniques, including human resource policies, in an often-hostile political environment.

The purpose of this article is to provide a brief overview of Green Management techniques including human resource policies that are utilized by local governments in the United States in a sometimes-hostile political environment. Most Americans believe in global warming and climate change, and about half believe human activities are a major cause of the changing environment. However, a large majority of Americans readily admit that they are not well informed about global warming and its causes (Leiserowitz, Smith, & Marlon 2010). There are differences between Americans who identify as Republicans (50%) and Democrats (82%) and their beliefs about whether global warming is happening (Mildenberger, et. al., 2015). Recent polling has found wide support in the United States for policies to combat global warming. As expected, Democrats are more supportive than Republicans (Leiserowitz, et. al., 2017). The difficulty is finding support among conservative elected officials at the national level who are willing to address global warming.

Many of the policies implemented and proposed increase sustainability. Sustainability is defined as the ability to "meet the needs of the present without compromising the ability of future generations to meet their needs" (WCED, 1987, p. 41). In today's terms, sustainability is often discussed in context with the triple bottom-line: economic, social, and environmental benefits or costs (Elkington, 1997; Savitz, & Weber, 2006). What are the efforts made by local governments in the United States to implement sustainability practices? How does that relate to Green Management?

The United States has a federal system which is made up of a centralized government, 50 states, and 5 territories. In addition, at the sub-state level, there are counties, municipalities, townships, special districts, and school districts totaling over 90,000 governmental units (Table 1). As such, there are numerous jurisdictions, laws, and regulations covering the environment, sustainability, and green management. The 22,000+ local governments and their efforts at practicing sustainability is the focus of this essay.

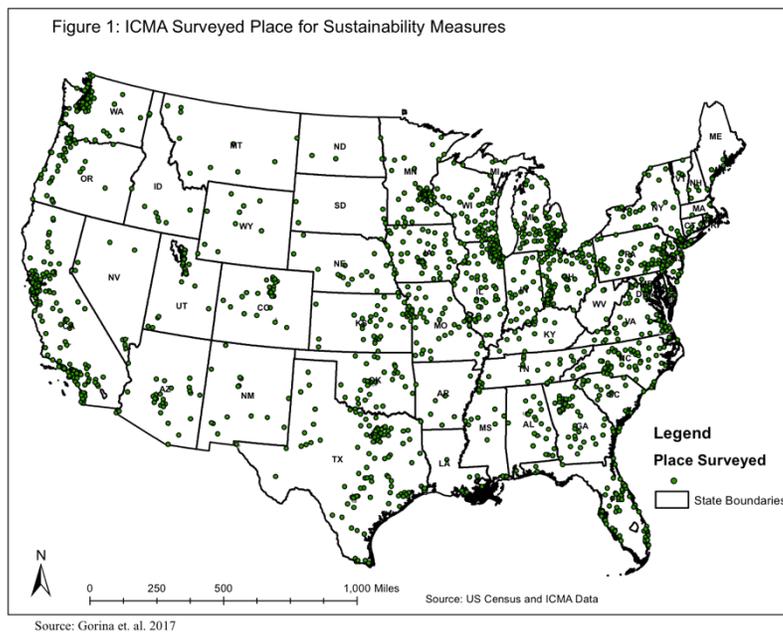
**Table 1. Number of Governmental Units in the United States**

Type	Number
Federal	1
States	50
Territories	5
Counties	3031
Municipalities	19,519
Townships	16,360
Special Districts	38,266
School Districts	12,880
Total	90,112

Source: US Census Bureau 2013

The United States Constitution sets up a federal system by granting limited enumerated powers to the national (federal) government. The Constitution also recognizes states and their roles in the federal system. The Constitution reserves to the states all powers not delegated to the federal government or prohibited to the states. Local governments receive their authority from the states in which they operate. Local governments must adhere to laws passed by both the federal and state governments. Local governments also have limited authority to make their own laws. In the context of this paper, they can also adopt sustainable policies and priorities.

In 2010, local governments were surveyed about sustainability policies and programs (ICMA 2010). The survey was sent to 8,569 local governments in the United States; 2,176 surveys were returned representing a response rate of 25%. Figure 1 illustrates the location of the local governments that responded to the survey (Svara, 2011).



The survey measured 109 sustainability activities including items measuring policies or practices in place to address sustainable activities. Overall, about 60% of the cities surveyed practice sustainability in at least one area. Recycling is the most popular, followed by transportation improvements and energy

conservation. Table 2 reports the levels of activity, ranging from 23% of the cities utilizing some alternative energy practice to 90% participating in recycling activities (Svara, 2011; ICMA 2010).

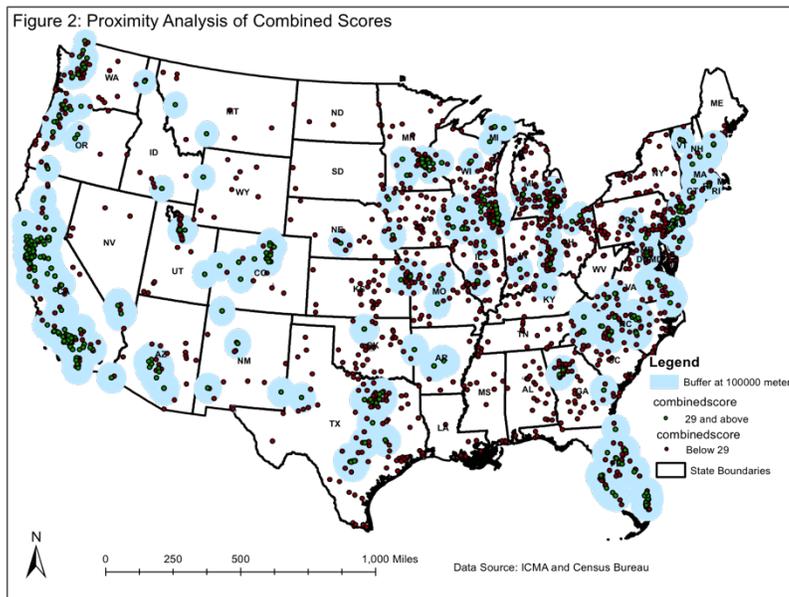
The survey also asked respondents to indicate the priority they place on various policy actions in their jurisdictions (see Table 2). When it comes to prioritization, local governments place high priorities on the local economy and policies that help the economy, followed by energy conservation, and the environment. They are less likely to enact policies that lessen the impact of climate change (Svara, 2011; ICMA, 2010). Though not reported here, local governments that place a very high priority on sustainability are less likely to emphasize policy priorities stressing the economy and are more likely to prioritize policies related to public transportation, green jobs, and climate change (Svara, 2011).

**Table 2. Activities and Policy Priorities**

<b>Activities adopted by local government</b>	<b>Policy Priorities</b>
<ul style="list-style-type: none"> <li>• Overall adoption rating across all activities (60%)</li> <li>• Greenhouse gas (52%)</li> <li>• Water (62%)</li> <li>• Recycling (90%)</li> <li>• Transportation and lighting (72%)</li> <li>• Energy buildings (19%)</li> <li>• Reducing building energy use (81%)</li> <li>• Alternative energy (23%)</li> <li>• Workplace transportation alternatives to reduce commuting (36%)</li> <li>• Transportation improvements (82%)</li> <li>• Building and land use (58%)</li> <li>• Land conservation and development rights (44%)</li> <li>• Social inclusion (58%)</li> <li>• Local Purchase (68%)</li> </ul>	<ul style="list-style-type: none"> <li>• Economy (94%--high to very high priority)</li> <li>• Energy conservation (70%)</li> <li>• Environment (62%)</li> <li>• Housing for all (48%)</li> <li>• Social justice (38%)</li> <li>• Public transportation (34%)</li> <li>• Green jobs (30%)</li> <li>• Climate change (19%)</li> </ul>

*Source: Svara 2011; ICMA 2010.*

Elsewhere, my colleagues and I looked at predicting local government sustainability based on spacial analysis (Gorina, et. al. 2017). We found that cities are more likely to adopt sustainability policies than when their neighbors adopt them (See Figure 2 and Table 3). Highly populated core cities in metropolitan areas are more likely to emphasize sustainability compared to the suburbs. Cities with professional city managers and dedicated staff for sustainability strongly predict adoption.



**Table 3. Predicted Sustainability Adoption Score, OLS**

Variables	(1)	(2)
Suburban		-2.423 (1.152)**
Independent		-1.579 (1.148)
Total Revenue 2007		0.888 (0.220)***
Population 2007		3.627 (0.470)***
City manager		2.351 (0.470)***
Staff for sustainability		8.496 (0.624)***
Median income		0.007 (0.011)
Occupancy rate		0.0525 (0.034)
Density		0.000 (0.000)
First nearest neighbor score	0.172 (0.026)***	0.084 (0.0197)***
Second nearest neighbor score	0.180 (0.025)***	0.084 (0.0195)***
Constant	11.11 (0.592)***	-28.48 (4.060)***
Observations	1,583	1,583
R-squared	0.0091	0.460
Degrees of freedom	2	11
<i>Robust standard errors in parentheses</i>		*** $p < 0.01$ , ** $p < 0.05$ , * $p < 0.10$

Source: Gorina, et. al. 2017.

As illustrated in Figure 3, the next step of sustainability is to move toward sustainable management and “green management”. Green management is defined as managing an organization to ensure a balance between organizational growth while safeguarding environment for future generations (Sudin, 2011; Lee, 2009). The literature on green management, especially in the public sector is lacking. It is virtually unheard of in public human resource management in the United States. Much of the literature focuses on Europe or Asia. The literature is even more lacking in Green Human Resource Management (GHRM), especially in the public and nonprofit sector literature.

## **Sustainability → Sustainable Management → → Green Management**

*Figure 3.*

The rest of this essay focuses on Green HRM. Ahmad (2015) suggests that GHRM is where HRM is engaged in managing the environment as part of managing the organization. The Society of Human Resource Management (SHRM) defines sustainable HRM as:

*The utilization of HR tools to help embed a sustainability strategy in the organization and the creation of an HRM system that contributes to the sustainable performance of the firm. Sustainable HRM creates the skills, motivation, values and trust to achieve a triple bottom line and at the same time ensures the long-term health and sustainability of both the organization's internal and external stakeholders, with policies that reflect equity, development and well-being and help support environmentally friendly practices. (2014, p. 3)*

Similarly, Mandip (2012, p. 244) suggests that GHRM uses “every employee touch point/interface to promote sustainable practices and increase employee awareness and commitments on the issues of sustainability.” The Society for Human Resource Management Foundation (2014, p. 25) argues that, “HRM must stay abreast of sustainable business needs and of the sustainability recruitment and career landscape.”

Drawing from the literature on GHRM, the following discussion highlights HR management areas that can be adapted by local governments with sustainability and green management practices as a guide. Engaging employees in sustainability initiatives and role modeling desired behaviors are essential to foster learning and create a work environment that is conducive to green management (Haddock-Millar, et. al. 2016). Green HRM suggestions include traditional transactional duties such as recruitment, performance, training and development, employee involvement, grievance, green jobs, and compensation and pay systems (Mandip, 2012). Cherian and Jacob (2012, p. 26) argue that “it becomes ideal to have effective human resource management practices including presentation of strict recruitment strategies . . . appraisal and reward systems which include environmental awareness and implementation in their evaluation process . . . and training and empowerment programs . . . which will enable the development of new set of skills and competencies amongst the employees of ‘pro green’ firms.”

Recruitment is a major area of focus for GHRM. Mandip (2012) argues that during the recruiting and application phase, potential employees need to be made aware of sustainability and diversity practices and policies. Having staff dedicated to sustainability and green management is key. The ICMA data set finds that 27% of local governments have dedicated staff focused on sustainability. The mean full-time equivalent employee (FTE) is 1.8. Besides dedicated staff, organizations can make sustainability and green management a part of employees’ job duties and a focus when recruiting. Following Mandip’s suggested GHRM framework, public sector employers need to use their websites to highlight greening endeavors and the organization’s expectations on green management and sustainability. Job descriptions can include local governments’ green and sustainability goals. Job interviews can highlight and stress the sustainability aspects of the mission. Hiring managers should pay attention to résumé details that provide evidence of the “triple bottom line.”

Diversity is a major part of social capital. It’s not only expected, but it is imperative that today’s local governments have a diversity plan that includes equitable representation and inclusion of applicants and

recruits. If organizations are missing key elements of their communities they need to customize recruiting to increase the likelihood of hiring missing elements (Slack, 1997).

Once hired, training and development become integral for successful local governments. Onboarding should include training modules on social and environmental issues, including green management, in the community and tied to the agency's mission. Local governments HRM administrators should begin by auditing existing training resources and assess their value to the organization. Goals, learning objectives, and training competencies related to sustainability need to be developed. Assessment mechanisms should be developed to properly measure success of tying training and development to sustainability and green management aspects of the organization's mission. Green HR managers should intervene to manage waste in organizations and with training and development. Webinars, Skype, Facetime, and other video conferencing mechanisms can be substituted for travel saving, time and money, as well as reducing the carbon foot print (Mandip, 2012).

Performance management should tie employees' job performance to green goals found on job descriptions (Mandip, 2012). Additionally, recognition and awards should be implemented for green and sustainability practices such as waste reduction and community service. Rewards can include items that show commitment to sustainability such as bus or other public transit passes, gift cards to healthy food establishments, gym passes, and fitness trackers, etc. Cherian and Jacob (2012) say that companies offered incentives in terms of green awards employees were more inclined to follow green management principles.

Local Governments can be more accommodating and adaptive to green policies that enhance employee involvement and participation. Mandip (2012) argues that organizations can encourage employees to become "Eco-intrapreneurs" to help employees develop environmentally friendly practices for local governments. Involve employees in ways to enhance the local government's triple-bottom line. Employees are most familiar with their jobs and work processes. Who better than them to look for ways to reduce waste and the carbon footprint?

Mandip (2012) argues that organizations need to encourage environmental whistle blowing. Whistle blowing alerts management to unsustainable, unethical, and illegal activities and practices in organizations. Local governments should encourage and reward whistle blowing rather than ostracize employees who alert organizations to questionable behavior.

GHRM compensation systems should reward employees for their "green" ideas. Local governments should let the employees share in the cost savings they generate through their ideas. Governments can encourage other actions such as flexible work weeks (Facer, & Wadsworth 2008), car pools, transit passes, car sharing, telecommuting, and e-work, paperless office, waste disposal (Shaikh, 2015). Environmentally-friendly HRM initiatives lead to greater efficiencies, lower costs, better employee engagement and retention (SHRM, 2014). Other activities such as "electronic filing, car-sharing, job-sharing, teleconferencing and virtual interviews, recycling, tele commuting, online training, energy-efficient office spaces, etc." are all policies that make organizations more sustainable and help organizations reduce carbon footprint (Mandip, 2012, p. 244; SHRM, 2014).

The ICMA (2010) survey includes items that are directly related to GHRM. The survey documents that some local governments provide a host of incentives for their employees. These incentives include encouraging employees to take mass transit to work (7%), carpool to work (6%), walk (4%) and bike (6%) to work, a few cities charge employees market rates for parking (4%) to encourage alternative forms of transportation. Nearly a fourth (24%) of local governments in the United States permit telework. Less than 1% of local governments have targets for telework. Those with goals on the average set targets of 9% of

their employees telecommuting. About 9% of local governments also offer compressed work weeks to their employees. Compressed workweeks cut down on travel, commuting, utilities, and office space, as well as increase morale (Facer, & Wadsworth 2008).

In conclusion, local governments should take more of a leadership role in GHRM. Sustainable human capital is one of the pillars of sustainability. Incorporating “green” into the employment process for local governments can lead to greater efficiencies and ultimately lead to a lower carbon footprint. Finally, more research is needed into GHRM in government and especially with local government.

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## **Biography**

Dr. Doug Goodman (Ph.D. The University of Utah, 2002) is a Professor and Program Head of Public and Nonprofit Management in the School of Economic, Political, and Policy Sciences at The University of Texas at Dallas. He teaches public human resource management, negotiation, and public management courses in the Master of Public Affairs (MPA) and the Ph.D. in Public Affairs programs. His current research interests include state and local government with an emphasis in sustainability, organization behavior, human resource management, and public budgeting. Dr. Goodman's research appears in journals such as the *American Review of Public Administration*, *Public Administration*, *Review of Public Personnel Administration*, *Political Research Quarterly*, *Human Resource Development Quarterly*, *Public Personnel Management*, *Politics & Policy*, *Public Administration Review*, and *American Review of Politics*.

Dr. Goodman is the Associate Editor for Practitioner Outreach for the *Review of Public Personnel Administration*. He is also on the editorial board for *Public Personnel Management* and the *Journal of Public and Nonprofit Affairs*. Dr. Goodman is an inaugural John C. Stennis Fellow at the John C. Stennis Institute of Government and Community Development at Mississippi State University. He is the section chair for the Personnel Administration and Labor Relations for the American Society for Public Administration.

## ***Keynote Speech II***

### **Governing Sustainability: The Issues with Multiple Codes and Standards**

**Donald H. Schepers, PhD**

*Professor of Management, Zicklin School of Business, Baruch College  
City University of New York, USA*

*[Abstract] Efforts toward sustainability face governance issues at a variety of levels. On the one hand, regulation of sustainability is incompletely determined by state actors. Non-state actors have emerged to fill some of the voids created by this incomplete regulatory regime. Those efforts attempt to incentivize sustainability primarily by shaping consumer demand. These non-state actors face a number of difficulties, such as competing non-state actors, incomplete supply chain control, and so on. The governance systems of both state and non-state actors will be examined, and issues for future action will be discussed.*

#### **Introduction**

The discussion of sustainability is often cast as a personal or corporate initiative issue. For instance, Jackson, Ones, and Dilchert (2012) portray managing human resources for sustainability as an issue of corporate initiative. Corporate self-published reports (e.g., Coca-Cola's 2016 Sustainability Report<sup>1</sup>) often tout corporate activities regarding sustainability in terms of voluntary corporate initiatives to enhance an image of the firm as socially responsible. Such initiatives, be they personal or corporate, are helpful but have some fundamental flaws. One such flaw is the selection of the issue. A corporation might select water as its sustainability issue, but disregard air or waste components of its operation. A second flaw is the size of the ultimate goal. Is the individual or corporation altering behavior sufficiently to achieve sustainability? Who is measuring, and how are the results being measured and reported? These and other flaws can be addressed through the imposition of an external governance system.

In this paper, I examine public policy initiatives, in the form of governance systems, either state-sponsored regulatory regimes or non-state sponsored voluntary regimes. I focus also on a variety of "commons" issues: water, fisheries, and wood products. In doing so, I examine the impact of these governance systems on the "tragedy of the commons" (Hardin, 1968).

#### **The Impact of State Regulatory Systems on Water Usage**

State regulatory systems control water usage in urban settings through the imposition of a variety of tax and other charges (connection fees, etc.). Clean water is provided from a utility company approved by the state. The water is sent from treatment plants to consumers by means of a piping system, and at the entrance to the user unit (house, industrial, or commercial setting), the amount of water usage is metered. That meter reading is then translated into a bill sent to the user at regular intervals. The consumer then monitors the use of water by the cost imposed by the state or its licensed utility.

A short example illustrates the power of this costing system. I studied for my PhD at the University of Arizona, in Tucson Arizona. The city is located in the Sonoran Desert area of the southwest United States.

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<sup>1</sup> This report can be found at <http://www.coca-colacompany.com/2016-sustainability-report>. Accessed February 20, 2018.

Summer temperatures typically exceeded 100° F, often trending over 110° F. In the apartment complex where my wife and I lived, children could often be seen playing in water in the open spaces. At that time, the water bill was paid by management. Shortly after our arrival, management decided to shift the billing arrangement and installed individual meters at each unit. Each unit was then responsible for their own bill. In no time at all, residents stopped allowing children to play outside in water. The cost had a very clear impact on usage.

However, there is another perspective on water that sees water as a human right, given its necessity for life. This is evidenced in the recent water crisis in Cape Town, South Africa (Poplak, 2018)<sup>2</sup>. The situation in Cape Town is that water usage has vastly outstripped water replenishment in the reservoirs, with the end result that reservoirs are now in the 10-15% of capacity range. This is due to a deadly trifecta: a multi-year drought, unlimited population growth, and disregard by many of the continuing crisis. The attitude of many residents is that, if they can afford to pay for water, it is their right to use as much as they wish. This indicates that true protection of the commons will need to be a multi-pronged effort, with cost as one element, and attitude management, another.

The situation in rural areas is dramatically different from a governance perspective. Essentially, there is no governance system on water usage in rural areas. Farmers and small rural communities rely on wells to access groundwater from aquifers or other underground water sources. The costs are marginal: a well is drilled, a pump installed, and the recurring costs are due solely to pump maintenance and power to run the pump.

Lacking any governance system or cost disincentive, there is little rationale for any concern regarding water usage save that of growing the crops. Illustrative of the inevitable outcomes in this type of situation is the Ogallala aquifer in the United States (Braxton, 2009). The aquifer runs from near the Canadian border down through the Plains States to Texas. This is the major grain-growing area for the United States, supporting not only domestic consumption, but also consumption worldwide, as much of the grain is exported.

Industrial-scale accession of the aquifer began in the 1950's. Farmers were told to pump all they wanted, and they did. By the 1980's, there were over 7,000 wells into the aquifer. Some places were pumping four to six feet per year, while the aquifer was being replenished at one-half inch per year. Studies have shown aquifer levels down 100 to 150 feet in some places (Braxton, 2009).

Recently, farmers have shifted farming practices. They are implementing farming techniques that preserve as much groundwater as possible, such as leaving stubble in fields to lessen erosion and enhance water retention (Braxton, 2009). The aquifer will not be there forever, but its life is being extended as more adopt sustainable farming practices.

The sustainability situation in rural areas echoes that of the urban areas, in that where cost is not a deterrent (as in the case of Cape Town), attitude must change if the tragedy of the commons is to be avoided.

### **The Impact of Non-State Regulatory Systems on Fisheries and Wood Product**

In the globalized marketplace, state regulatory systems are often inadequate to govern extended supply chains. This has resulted in threats to biodiversity, the sustainability issue. In the case of fisheries, for example, states govern the waters up to 200 miles from their shoreline. Beyond that, fishing fleets are in

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<sup>2</sup> See the article, "In less than three months, a major international city will likely run out of water" at <https://www.cnn.com/2018/01/24/africa/cape-town-water-crisis-trnd/index.html>. Paul P. Murphy. Accessed on February 20, 2018.

international waters and not subject to any governance system. Likewise, wood product is harvested around the world, some of it in very sensitive ecological areas such as rainforests. The eventual use of that product, however, is often not in the country of origin, but in developed countries with large cities. Lacking any governance over the international supply chain has resulted in devastation of major portions of rainforest and other sensitive habitat, thereby reducing biodiversity (Schepers, 2011). This results in a situation where no one state has the ability to govern the use of the commons. This has led to the emergence of a variety of non-state voluntary governance initiatives (Mele & Schepers, 2013; Pattberg, 2005).

These non-state (non-governmental or quasi-governmental) actors arise from public concern over a perceived under-protected public good (Meyer, 1999), in this case, biodiversity. These actors are predominantly registered non-governmental organizations (NGOs). Their survival depends on either donations or fees, or a mix of both. One such NGO, [waterfootprint.org](http://waterfootprint.org), was established to make consumers aware of water usage throughout the life cycle of a product. A pair of Levi jeans, for example, was estimated to use some 3,481 liters of water throughout its life, with only 10% of that used in the actual product production. Of the remaining 90%, half went into cotton farming, and the other half into washing the jeans. [Waterfootprint.org](http://Waterfootprint.org) did this analysis for a variety of foods and products, in the hope that awareness would lead to conservation. Unfortunately, donors did not see the urgency, and [waterfootprint.org](http://waterfootprint.org) filed for bankruptcy in September 2017.

Two NGOs that rely on fees to promote sustainable business practice are the Forest Stewardship Council ([ic.fsc.org](http://ic.fsc.org)) and the Marine Stewardship Council ([www.msc.org](http://www.msc.org)). Each of these supplies governance and certification in extended supply chains and receives payment from those in the supply chain in return for the certification. The demand for the certification has arisen from a variety of sources. Some buyer groups in the lumber or seafood retail business use the “responsibly sourced” certificate as a competitive advantage in developed country markets and are willing to pay the premium for the certificate. A second point of demand are other certification groups such as LEED builders or Seafood Watch, which provide “sustainable” certificates, again for competitive advantage. Banks and investment groups are a third point of demand. These require certificates in return for access to capital. For them, the lack of a certificate of sustainable sourcing is a risk, and this requirement on their part is one element of their risk management procedure. The fourth and final point of demand comes from social investors and social investment funds. Access to capital available from these individuals and funds is dependent on the social commitment of the business, and that is evidenced through the provision of sustainable certificates provided by the appropriate NGO.

There are a number of issues that arise in this method of governance, however (Schepers, 2010). The first is that the number of alternative governance schemes is bounded only by what the market will accept. For instance, in the wood product market, there are over 50 governance schemes (Domask, 2003). Such multiplicity reduces the legitimacy of any one governance scheme in two ways. First, industry participants have the opportunity to hand-pick the scheme that suits their operation best – i.e., provides the least need for the firm to alter its operations. Second, the variety creates confusion in the mind of the consumer. Consumers do not wish to research 50 governance schemes to determine which is the best for this product. There is an expectation that the industry will do that due diligence on their behalf. When the industry allows schemes to proliferate, the consumer sees white noise where clarity is expected. The end result is little to no governance, as there is no market support for any one scheme over other schemes of lesser quality.

The second issue is lack of throughput and market access. Should there be insufficient supply of the certified product, retailers will respond by also supplying non-certified product alongside the certified

product or choose not to provide the certified product at all, and simply sell the non-certified product. Therefore, any governance scheme for international supply chains must be able to ramp up to meet a significant segment of market demand in order to survive through the retailer to the consumer. Further, the market must support the premium required to support the certification process. These certification schemes are fee-based, i.e., the supply chain participants pay the certifier at various points in the chain to ensure the integrity of the chain and the products in the chain. These fees become extra costs passed on to the consumer, making the certified product costlier than the non-certified product. If demand does not support the premium, or if there is not enough certified product available to the retailer, the governance system fails.

Third is the issue of cost of certification. As noted, fees are due throughout the supply chain to maintain certification. For those in developing nations with poor economies, these costs are not insignificant, particularly as these costs are front-loaded. Such costs can be a roadblock preventing the producer from entering the certification process.

Illegal activity is the fourth issue. Such activity increases supply in the market, thereby reducing the price of the good in the marketplace. In addition, illegal harvesting reduces the biodiversity, as it is completely unregulated. The price reduction further disincentivizes participation in the governance scheme by reducing not only the price, but also any hope the producer had for recouping certification costs. Illegal activity also threatens the legitimacy of the certification process. Should illegally-obtained goods be inserted into the supply chain of certified goods, the reputation of the certification process itself comes under criticism.

A fifth issue takes the form of an unintended consequence. Both rainforests and seas are prized for their biodiversity. When one wood is prized by the market, a harvested forest will be replanted, but only in the desired wood. These monoculture forests defy the preservation of biodiversity, as many of the plants and animals that require biodiversity to survive will either die off or move on. In the seas, there are two issues. First is the issue of bycatch. Open sea fishing will catch not only the intended species, but a number of other species as well. This bycatch is returned to the sea, often in badly damaged condition. In the early 2000's, the issue of dolphin-free tuna emerged and entered the consumer consciousness<sup>3</sup>. In the eastern Atlantic, it was noted that tuna often swam below dolphins. As schools of dolphins are readily visible, trawlers using seine nets would scoop up both species. The tuna were kept, and the dolphins were either thrown back or harvested as well, with their meat commingled with the tuna. Thus, began the consumer cry for dolphin-free tuna, and small images certifying dolphin-free tuna now adorn cans of tuna. A second issue in the marine area is analogous to the monoculture plantation. Fish farms have emerged to supply certain fish for market consumption. Whereas this is in many ways a desired outcome, it also brings with it issues such as the rapid spread of disease in aquaculture environments. Both bycatch and aquaculture have the potential of limiting biodiversity, but through differing mechanisms.

### **Conclusion**

Market forces cannot protect the commons. This is clear from the few examples offered here. Other commons goods (e.g., clean air, clean earth, etc.) suffer from the same market imperfections as those used in illustrations here. Corporate initiatives are fine as far as they go, but the issues of selection of area of

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<sup>3</sup> See <https://www.fisheries.noaa.gov/national/marine-mammal-protection/dolphin-safe> as one account of this issue and the response of government agencies to deal with the problem.

concern and strength of initiative limit the potential of corporate initiatives to attain true sustainability. Therefore, regulation of some sort is necessary if environmental sustainability is to be achieved.

State or governmental governance systems have effect in those cases where the commons good under consideration can be bounded within the domain of the state. Such systems are limited in form, coming either as tax or regulatory systems. There is a second issue in that cost only moderates decision and action in limited degree. In those instances where cost is only a marginal factor, attitudes toward the commons must also be addressed to achieve sustainability.

Where the commons goods exist beyond the bounds of the state, non-governmental governance systems must be established to achieve sustainability. As these are market-based systems relying on fees to monitor the certification process, they fundamentally rely on the consumer to accept and pay the premium for the certified good. Certificate proliferation/confusion, lack of sufficient certified product availability, excessive certification cost, illegal harvesting, and unintended damage to the sustainability goal all threaten the legitimacy of the non-governmental governance scheme, and hence threaten to damage consumer faith in the scheme.

The achievement of a sustainable environment is vital, and each of these efforts (corporate and personal initiative, state governance, non-state governance) is part of the ultimate solution. The final solution may well require more “arrows in the quiver” than we have to date. We must continue to pursue successful implementation of what we now have, and also pursue new elements that arise as we continue seeking sustainability.

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### Biography

Dr. Donald H. Schepers, PhD, is a professor of Management. He is very proud to as Senior Associate Dean at the Zicklin School of Business, Baruch College, City of University of New York (CUNY), a leader in providing urban-based undergraduate and graduate business and executive education for the twenty-first

century. The Zicklin School of Business, a school within Baruch College is consistently rated by rankings experts among the top performers in areas relevant to academic excellence, diversity, and values.

Prior to becoming Senior Associate Dean, he served four years as Academic Director at the Robert Zicklin Center for Corporate Integrity, where he organized a number of conferences on financial practices, topics in sustainability, and corporate social responsibility. His teaching has included courses in business ethics and corporate social responsibility. His research spans corporate codes of conduct, corporate governance, socially responsible investing, and non-governmental organizations. He has authored or co-authored chapters in books, and his work has appeared in journals such as *Journal of Business Ethics*, *Business & Society*, *Business & Society Review*, *Corporate Governance: The International Journal of Business and Society*, and *Organizational Behavior and Human Decision Processes*.

Baruch College is a senior college in the CUNY with a total enrollment of more than 18,000 students, who represent 164 countries and speak more than 129 languages. Ranked among the top 15% of U.S. colleges and the No. 4 public regional university, Baruch College is regularly recognized as among the most ethnically diverse colleges in the country. As a public institution with a tradition of academic excellence, Baruch College offers accessibility and opportunity for students from every corner of New York City and from around the world. For more about Baruch College, go to <http://www.baruch.cuny.edu/>.

# **Analysis on the Influencing Factors of the Consumption Levels of Rural Residents in China**

**Feng Zhaojun**

*Chongqing College of Electronic Engineering, Chongqing, China*

Email: fengzhaojuntg@163.com

**[Abstract]** *In recent years, China's investment and external net exports for the contribution of economic growth gradually weakened and expand domestic demand. Stimulate consumption has gradually become a catalyst for China's economic growth. To improve the consumption ability for the majority of farmers, which accounts for 60% of the total population in China, is an important practical significance to stimulate the healthy and sustainable development of China's economy in the current "new normal" economic background. In order to further clarify the main factors affecting farmers' consumption level in China, in this paper, the per capita consumption expenditure of rural households as a measure of rural consumption level, the multiple regression analysis method was used to establish the quantitative model. Through the selection of relevant economic indicators and the collection of data, as well as the simulation and description of the peasants' consumption levels, the main factors influencing them are identified, which can provide reference for policy-making and industrial support of the relevant departments.*

**[Keywords]** *rural residents; consumption level; multiple regression; influencing factors*

## **Introduction**

Investment, consumption and exports are the "troika" of economic growth in a country. According to statistics in relevant departments, the consumption of developed countries accounts for more than 70 percent of the GDP growth, while in China, this figure is only about 46.89 percent (Wu, 2015). In recent years, China's investment and external net exports for the contribution of economic growth have gradually weakened and expanded domestic demand. Stimulated consumption has gradually become a catalyst for China's economic growth. Improving consumption ability for the majority of farmers, which accounts for 60% of the total population in China, is an important practical significance to stimulate the healthy and sustainable development of China's economy in the current "new normal" economic background. According to relevant data, our country's rural consumption growth per 1 yuan; 2 yuan will boost the economy as a whole and increase of the level of consumption, and a one percent increase in the rural area of home appliance demand could drive a 2.38 million national home appliance consumption demand (Li, X., & Guo, L., 2008); the growth of the rural population consumption level of the country's economic development is outstanding. However, in recent years, China's domestic market economy is weak; an insufficient effective demand has become an important factor restricting economic growth in China, and one of the important reasons is the lack of effective demand in rural areas. According to statistics, currently, the national total population of farmers' (60%) consumption accounts for about 46% of the total consumption across the country, and rural per capita consumption level is only 35% of urban per capita consumption levels (Lin, J., et al., 2007). On this issue, since the 18th National Congress of the Communist Party of China, the state has continued to increase its support in the vast rural areas. The relevant departments have also promulgated and implemented a series of policies such as expanding domestic demand and precision poverty alleviation. A full range of support and guidance for the development of the rural areas has allowed the rural areas to take on an altogether new aspect of the

peasants' income. There was a significant increase in the consumption concept that has also undergone a significant change; the scale of consumption in rural areas has further expanded economic growth and steady progress, pushing the overall situation towards a stable and healthy direction.

Due to historical and practical reasons, the vast majority of the rural consumption level in China is restricted by various factors such as the commodity price level, farmers' own income, agricultural production material price levels and consumption concept. There are also strong non-linear and time-invariant characteristics of each influence factor or variable. In order to further clarify the main factors affecting the consumption levels of China farmers, in this paper, the per capita consumption expenditure of rural households as a measure of rural consumption level, the multiple regression analysis method was used to establish the quantitative model. Through the selection of relevant economic indicators and the collection of data, as well as the simulation and description of the peasants' consumption levels, the main factors influencing them are identified, which can provide reference for the policy making and industrial support of the relevant departments.

### **Literature Review**

The level of residents' consumption mainly refers to the quantity and quality of the material and cultural aspects gained by residents in a given area for a period of time. It is calculated by calculating the amount of consumption per capita of the rural population in a given area (Li, S., & Zhao, R., 1999). In the empirical study, it is often used in terms of per capita consumption expenditure in rural households. A great deal of research has been done on the factors affecting the consumption levels of rural residents. Wang Shanshan and Wang Deyong (2005) proposed the Engel coefficient, farmers' families and the prices of consumer goods and living areas and other conditions as the main factors influencing the level of consumption of rural residents. Hu Yanjing and Dong Yingying (2006) further verified the main factors affecting farmers' consumption levels in China as the standard of peasants' incomes, the prices of the means of production and consumer goods prices through empirical study. This view got a response from Lu Fangyuan and Lu Min (2009); they argued that income per head was a major factor affecting individual consumption levels for farmers with low incomes. Liu Boya (2007) expounded the consumption environment of China's rural areas from many angles, which is an important factor affecting the level of consumption. Jiao Huining (2010) put forward the main factors that affected the consumption levels of rural residents in China, including the consumption concept, consumption environment, social security and the gap between urban and rural areas.

From the above scholars' research results, it can be concluded that in the rural residents in each historical period in China, the family income was the most important factor influencing the residents' consumption level. In addition, consumer prices, the Engel coefficient of rural households, the prices of the means of production and living conditions, as well as the consumer key and consumer environment, were also important influences on the rural residents' consumption level indicators. This paper analyzed the above literature, the index system of multiple linear regression model is established, and by regression model parameter estimation and model test of structure, the main factors of affecting our country rural residents are empirically analyzed.

## Establishment of Index System

### *Selection of Indexes*

Through literature research and expert interview, this paper regards the per capita consumption expenditure of rural households as a measure of the consumption level of rural residents in China, and the selection of the indicators is very extensive and representative. At the same time, there are also many economic indicators and related rural residents' consumption levels; the author compares the retail price index of our country, the Engel coefficient of the rural family, the number of rural employment, the price index of agricultural production, the per capita net income of rural households, the consumption price index of rural residents and the added value of primary industry as the relevant index through careful screening, and through the linear regression and index detection, determines that the level of consumption of rural residents plays an impact on the economic variables.

### *Data Collection*

This paper refers to the annual statistical yearbook of China National Bureau of Statistics, and has collected the economic indicators from 2001 to 2015, compared the per capita consumption expenditure of rural households  $Y$  as the dependent variable, the retail price index  $X_1$ , the Engel coefficient of rural families  $X_2$ , rural employment  $X_3$ , price indices of means of agricultural production  $X_4$ , rural per capita annual net income  $X_5$ , consumer price the index of rural residents  $X_6$  and the first industrial added value  $X_7$  as independent variables, and further studied the quantitative relationship between the indicators through the model. In order to facilitate the regression analysis and comparative study, the collected data have been fixed processing, the indicators were based on the 2000 indicator value as the base 100 conversion. The results are shown in Table 1.

**Table 1. Economic Indicators of Consumption Levels of Rural Residents in China from 2001 to 2015**

Annually	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	$X_7$	$Y$
2001	99.21	97.15	99.47	99.10	105.01	100.80	105.33	104.25
2002	97.91	94.09	98.34	100.50	109.86	100.38	110.01	109.83
2003	97.83	92.87	97.08	101.40	116.37	101.97	115.31	116.36
2004	100.56	96.13	95.99	110.60	130.31	106.88	142.04	130.81
2005	101.38	92.67	94.53	108.30	144.44	109.24	148.17	153.01
2006	102.40	87.58	92.67	101.50	159.18	110.86	158.43	169.39
2007	106.29	87.78	90.67	107.70	183.74	116.85	188.81	193.04
2008	112.56	89.00	88.82	120.30	211.26	124.43	222.55	219.19
2009	111.20	83.50	86.86	97.50	228.69	124.04	232.12	239.12
2010	114.64	83.71	84.64	102.90	262.67	128.50	267.46	262.37
2011	120.26	82.28	82.78	111.30	309.63	135.96	313.66	312.62
2012	122.66	80.04	80.93	105.60	351.32	139.36	345.86	353.75
2013	124.38	76.78	79.16	101.40	394.78	143.28	375.94	396.74
2014	125.62	76.99	77.54	99.10	438.98	145.86	396.43	501.95
2015	125.73	75.56	75.70	100.40	478.03	147.77	413.54	552.24

*Data source: Statistical Yearbook of the National Bureau of statistics over the years*

## Empirical Analysis

### Model Construction

According to the above analysis, this paper collected all the economic index data of China from 2001 to 2015, and established a multiple linear regression model according to the quantitative relationship of each index (Yu, X., & Ren, L., 2006):

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \alpha_6 X_6 + \alpha_7 X_7 + \mu \quad (1)$$

Which  $\mu \sim N(0, \sigma^2)$  represents random error.

### Parameter Estimation

In this paper, eviews 8.0 software was used as an analytical tool to input the index parameters of regression analysis model (1). The regression analysis results are shown in Table 2.

**Table 2. Results of Preliminary Regression Calculation**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-113.6248	727.3471	-0.156218	0.8803
X <sub>1</sub>	-2.496700	4.104505	-0.608283	0.5622
X <sub>2</sub>	3.539855	2.166544	1.633872	0.1463
X <sub>3</sub>	-4.427272	6.691413	-0.661635	0.5294
X <sub>4</sub>	-0.240417	0.733846	-0.327612	0.7528
X <sub>5</sub>	2.413816	0.250890	9.621003	0.0000
X <sub>6</sub>	5.638893	4.933436	1.142995	0.2906
X <sub>7</sub>	-2.199452	0.554082	-3.969539	0.0054
R-squared	0.998446	Mean dependent var		254.3113
Adjusted R-squared	0.996892	S.D. dependent var		142.4514
S.E. of regression	7.941221	Akaike info criterion		7.286538
Sum squared resid	441.4409	Schwarz criterion		7.664165
Log likelihood	-46.64903	Hannan-Quinn criter.		7.282515
F-statistic	642.5599	Durbin-Watson stat		3.262401
Prob (F-statistic)	0.000000			

Based on the regression results in Table 2, a preliminary parametric regression equation can be obtained:

$$Y = -113.6248 - 2.496700 X_1 + 3.539855 X_2 - 4.427272 X_3 - 0.240417 X_4 + 2.413816 X_5 + 5.638893 X_6 - 2.199452 X_7$$

$$s = (727.3471)(4.104505)(2.166544)(6.691413)(0.733846)(0.250890)(4.933436)(0.554082)$$

$$t = (-0.156218)(-0.608283)(1.633872)(-0.661635)(-0.327612)(9.621003)(1.142995)(-3.969539)$$

$$R^2 = 0.998446, \quad \bar{R}^2 = 0.996892, \quad F = 642.5599.$$

### Model Test

**Goodness of fit test.** The output data in Table 2 shows that  $R^2 = 0.998446$ , the modified determinant coefficient is  $\bar{R}^2 = 0.996892$ , which shows that the model fits the sample very well.

**F test.** To make an F test, the hypothesis is first proposed  $H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = 0$ . At a given level of significance  $\alpha = 0.05$ , in the test table, the degree of freedom can be found. The critical value of  $k - 1 = 6$  and  $n - k = 15$  is  $F_\alpha(6, 15) = 2.707$ . Table 2 can be obtained by  $F = 642.5599$ , because  $F = 642.5599 > 2.707$ , so the original hypothesis of  $H_0$ :

$\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = 0$  should be rejected. So, the regression equation is obvious, the retail price index  $X_1$ , the Engel coefficient of rural families  $X_2$ , rural employment  $X_3$ , the price index of agricultural means of production  $X_4$ , per capita income of rural households  $X_5$ , and the rural consumer price  $X_6$ , the first industrial added value index  $X_7$  and other economic indicators as united have a significant influence on our country's rural residents' consumption levels.

**Multiple collinearity test.** Normally, in the multivariate linear regression model, independent variables may also exist linear relationship to a certain degree, if the linear relationship between variables over them for a linear relationship between variables, the stability of the linear regression model may be a problem, can not get the optimal regression equation, regression coefficient is not accurate enough to solve this problem. Aiming at this problem, the paper based on the consideration of all the independent variables according to their degree of significant size, from big to small regression equation, introduced one by one, and for those who had no significant effect on the dependent variable of variables will be removed, thus it can be less obvious independent variables affecting the filtering and eliminating the influence of line to reduce their total (Zhuang, C., & He, H., 2006). In this paper, stepwise linear regression is carried out by eviews 8.0 software, and the results of stepwise linear regression are shown in Table 3:

**Table 3. Results of Stepwise Regression Calculation**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
$X_5$	2.513518	0.169436	14.83460	0.0000
$X_7$	-2.396282	0.369168	-6.491041	0.0001
$X_2$	3.236544	1.286526	2.515724	0.0306
$X_3$	-5.988644	1.537751	-3.894416	0.0030
$X_6$	3.767854	0.993332	3.793148	0.0035
R-squared	0.998347	Mean dependent var		254.3113
Adjusted R-squared	0.997686	S.D. dependent var		142.4514
S.E. of regression	6.853102	Akaike info criterion		6.948481
Sum squared resid	469.6501	Schwarz criterion		7.184498
Log likelihood	-47.11361	Hannan-Quinn criter.		6.945967
Durbin-Watson stat	3.165194			

As can be seen from Table 3, in the case of other variables remain unchanged, by  $F$  test, the explanatory variable the per capita income of rural households variable  $X_5$ , the first industrial added value index  $X_7$ , the Engel coefficient of rural families  $X_2$ , rural employment  $X_3$ , and the rural consumer price  $X_6$  of five economic indicators has a significant effect on consumption level, and the  $t$  value of each variable is also very reasonable. While the other explanatory variables, the retail price index  $X_1$  and price indices of means of agricultural production  $X_4$ , have certain contingency effects on the explanatory variable the per capita consumption expenditure of rural households  $Y$ , and should be eliminated from the regression model, thus a new linear regression model can be obtained:

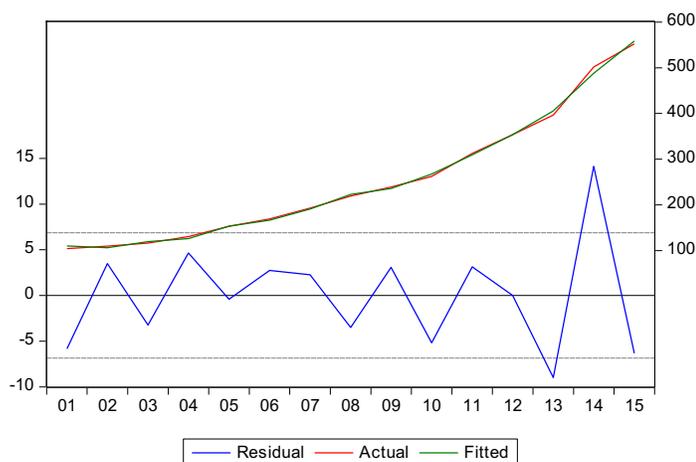
$$Y = 2.513518 X_5 - 2.396282 X_7 + 3.236544 X_2 - 5.988644 X_3 + 3.767854 X_6 \quad (2)$$

**Analysis of prediction results of regression model.** According to the multivariate linear regression model, this paper takes the per capita net income of rural households in China, the first industrial added value, rural family, rural employment and the Engel coefficient of rural residents' consumer price index as independent variables to predict the years from 2001-2015 of rural residents' per capita consumption

spending (consumption level) of the predictive value. The comparison between the true value, such as Table 4, and Figure 1 shows the comparison of prediction:

**Table 4. Comparison of Forecasting Model Results**

Annually	Predicted Value	Actual Value	Absolute Error	Error Rate
2001	110.07	104.25	5.82	0.05585
2002	106.38	109.83	3.45	0.03145
2003	119.60	116.36	3.24	0.02787
2004	126.17	130.81	4.65	0.03552
2005	153.40	153.01	0.39	0.00256
2006	166.63	169.39	2.76	0.01630
2007	190.77	193.04	2.26	0.01172
2008	222.72	219.19	3.53	0.01612
2009	236.03	239.12	3.09	0.01291
2010	267.54	262.37	5.18	0.01973
2011	309.49	312.62	3.13	0.01002
2012	353.75	353.75	0.00	0.00000
2013	405.72	396.74	8.98	0.02263
2014	487.83	501.95	14.11	0.02812
2015	558.61	552.24	6.36	0.01152



**Figure 1. Comparison of Actual and Predictive Value of Rural Residents' Consumption Levels**

It can be seen from Table 4, the regression equation (2) prediction of each year by the worth and the error between the true value of the rate is less than 0.1, and Figure 1 shows the fitting curve and the actual curve is also very fit. This shows that although the regression model of prediction accuracy is higher, the error is very small, they are within the acceptable range, so the model and the resulting regression equation in reality have certain operability, model the conclusion and the actual match very much, too. This means that the main factors influencing the rural residents' consumption levels in China are embodied in rural households' per capita annual net income, the added value of primary industry, Engel coefficient of rural households, rural employment and rural consumer price index. The results for relevant

departments to carry out the specific economic forecasts and analysis and policy has a certain reference value.

### **Conclusion and Recommendations**

For a long time, the main factor affecting the consumption levels of rural residents in China was the income of peasants; in addition, in the early stage of the reform and opening up, social commodity retail price was an important factor restricting the consumption of farmers in China. But with the state's kulak agriculture policy, the whole rural face received a new look, the majority of farmers in the reform practice to share more dividends, living standards have been improved, the income level is also rising, and consumption patterns have undergone great changes. From this conclusion, the social retail price is no longer the main factor restricting Chinese farmers' consumption, however, the per capita net income of rural households, the Engel coefficient, the first industrial added value and rural employment and other factors affect their consumption levels. At present, China's social and economic development is in a new transition period, the majority of farmers' consumption structure and consumption habits see a certain degree of unreasonable phenomenon. In order to further expand the domestic demand, optimize the industrial structure and promote sustained and stable economic growth, China's relevant departments should adopt a variety of effective measures according to the characteristics of agricultural production and farmers' consumption habits, increase the investment of agriculture through the government, adjust and optimize the agricultural industry structure to effectively reduce the burden on farmers, increase their incomes and improve the consumption capacity of the majority of rural residents. At the same time, optimizing the rural consumption environment, rationally adjusting the market structure of agricultural products, improving the rural social security system and speeding up urbanization and other initiatives will guide and improve the consumption behavior of farmers, stimulate their potential consumption needs, effectively play our vast rural market economic development support and pull the role of the new era of China's supply side of the structural reform of the smooth implementation of the promotion of China's socio-economic healthy and orderly development.

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# **Establishing and Analyzing Commercial Banks' Carbon Finance Business Revenue Model**

**Xu Dawei**

*Faculty of Management and Economics, Dalian University of Technology, Dalian, China*

Email: xudawei@dlut.edu.cn

**Zhao Peng**

*Faculty of Management and Economics, Dalian University of Technology, Dalian, China*

Email: baihualin5160@mail.dlut.edu.cn

***[Abstract]** Based on a summary of current studies on commercial banks' development of the carbon finance business, this article first analyzes the introduction of emission reduction equipment and the purchase of carbon emission rights by emission reduction enterprises to determine the amount of their carbon emissions and product cost; then, from the perspective of emission reduction enterprise financing, through establishing a revenue model for commercial banks' carbon finance business, this article analyzes and compares the revenue of that business and the factors that influence it and identifies theoretical conditions for commercial banks' development of the carbon finance business.*

***[Keywords]** commercial banks; carbon finance; carbon emission; revenue model*

## **Introduction**

Global warming has become one of the key issues of interest in countries around the world. Based on the pressure to reduce carbon emissions and characteristics of its development, the use of financial market tools to achieve the goal of reducing carbon emission has both theoretical implications and practical value. Internationally, carbon emission resources, carbon trading, and carbon derivatives trading have great development potential and create commercial opportunities. The “carbon finance” derived from the above situation is an important method not only for realizing energy savings and emission reduction, but also for achieving low-carbon development in the environmental finance area, which is a “hot” research topic. As primary financial institutions, commercial banks actively participating in carbon emission innovation should have two objectives: realizing carbon emission reduction and increasing enterprises' operating revenue.

“Carbon finance” remains at the theoretical forefront and exploration stage of international finance. Scholars and research institutions in various countries are actively involved in relevant research and practices. The only global environmental finance magazine defines carbon finance as follows: “finance problems related to global climate change.” Carbon finance primarily includes renewable energy sources certification, “green” investment, weather risk management, and the carbon emissions market. Carbon finance, including elements such as markets, institutions, products, and services, should be the solution to climate change. Carbon finance establishes an important segment to manage climate change and a low-cost method to achieve sustainable development, to reduce and adapt to climate change, and to manage disaster. It is also the core economic method of low-carbon development. The international carbon finance system includes three primary parts: the carbon finance market system, the carbon finance organization service system, and the carbon finance policy support system (Wang, Y., 2010). The

function of carbon finance is to shift environmental risks, to realize the objective of improving the environment, to reduce finance risks, and to increase social benefits by taking advantage of various financial institutional arrangements and trading activities aimed at greenhouse gas emission reduction, including finance market tools and finance services such as carbon emission rights and derivatives trading, investment in and capital raising for low-carbon project development, carbon insurance, carbon funds, and relevant financial consulting services (Du & Li, 2012).

This article defines “carbon finance” as all finance activities that benefit carbon dioxide reduction, including capital-raising activities for low-carbon projects, carbon derivatives trading, and relevant consulting and guarantee activities. Thus, combining the business characteristics of commercial banks and based on the reduction of enterprise actual production and operations, this article proposes a revenue model for commercial banks to develop their carbon finance businesses and comparatively analyzes the revenue conditions and primary elements of commercial banks’ carbon finance businesses.

### **Literature Review**

With the expansion of the carbon trading market, carbon emission rights have become financial assets with investment value and liquidity, which has generated a carbon trading currency and a carbon finance system supported by a series of financial derivatives, including direct investment, capital raising, bank loans, carbon index trading, and carbon options and futures (Ge, 2012; Wang & Wang, 2015). The international carbon trading market has great potential: carbon finance has become a new area of competition for global financial institutions, and the development of the carbon finance business by domestic commercial banks is an inevitable trend. One of the hot and difficult problems in the future research on carbon finance theory is that the financial institutions should study the operation mode and innovation of the carbon finance business on the one hand. On the other hand, the carbon financial institutions need to actively study the carbon finance business Its risk management in the carbon business (Xu & Li, 2015).

In the field of theoretical research, international studies on carbon finance have primarily focused on the carbon finance concept, choosing the carbon finance development approach, the trading price of carbon emission rights, product innovation in the area of carbon derivatives, and risk management and policy arrangements related to the carbon market. Studies on the carbon finance businesses of Chinese commercial banks remain rare, and future carbon finance systems and operational arrangements of commercial banks are the primary manifestation of financial institutions’ participation in carbon finance. In recent years, scholars have begun to pay attention to the role of commercial banks in carbon finance, and the number of studies on such topic have begun to increase dramatically. The effective development of carbon finance has become a topic that needs extensive discussions and is scholars’ current focus (Liu & Liu, 2016). Current studies show that domestic and international research in the area of “carbon finance” primarily focuses on macro policy, the carbon finance model, and the establishment of a carbon market institutional system. Most studies merely focus on the macro aspect, whereas specific model research and empirical and case studies remain rare. In particular, China’s carbon finance policy is relatively scattered and lies behind the development of carbon finance; in addition, a policy support system for such area has yet to be established. In terms of practice, China’s carbon finance business is at the gradual-development stage, and the environment for developing carbon finance has essentially been created.

Studies show that commercial banks are monetary operation enterprises with the primary business of making deposits in and loaning money to industrial and commercial businesses with the objective of profit. These commercial banks' operating revenue and risk control have become key issues. The theoretical research on the carbon business of domestic commercial banks remains at the explorative stage, and most of the data are from international statistical materials. Thus, domestic empirical studies are rare. Research on empirical models can be divided into two categories: the first is the carbon finance business model, and the second is the commercial bank revenue model. In research on the carbon finance business model, Blyth, et al. (2009) conducted a stochastic model analysis of carbon credit price dynamics, expanded the often-used analytical framework of static marginal emission reduction costs, included policy effects and technology cost dynamics, and analyzed carbon market dynamics and risk factors. By establishing the game model of local government and commercial banks, Zhang & Li (2009) analyzed not only government behavior according to different development views and institutional arrangements when the utility function changes, but also the external conditions for green lending affected by such behavior. Using the closing price of carbon finance spot contracts published daily by the BlueNext Exchange as research subjects and based on analyzing the statistic characteristics of the temporal order of the contract price return rate, Chun & Wang (2012) applied the extreme value theory (EVT) to establish models and analyzed the left and right 10% tails of revenue rates. Most studies on commercial bank revenue models have adopted the concept of "residual income"<sup>①</sup> to evaluate enterprise value and apply the complete residual income theory as the basic theoretical model for evaluating enterprise value. Zhang, Yang, & Zhang (2015) studied the copula function method of dealing with the nonlinear correlation between risk factors, constructed the Copula-ARMA-GARCH model and calculated Monte Carlo simulation of the integrated VAR of carbon market multi-source risk. Gao & Yu (2007) propose the asset volatility method and the income volatility method. They apply the income volatility method and use the stock acquisition of Shenzhen Development Bank by Newbridge Capital as a case study to conduct a Monte-Carlo simulation by applying the matrix laboratory (MATLAB) procedure. Xu., Deng & Thomas (2016) have developed a stylized model to investigate the impact of financial options on reducing carbon permit price volatility under a cap-and-trade system. Rogers, et al. (2015) have taken an integrated analysis approach to explore the options available for a UK homeowner to reduce their domestic emissions to the level advised by the UK governments Committee on Climate Change of 20% of those associated with a typical house in 1990.

At present, there is a lack of empirical model construction and analysis in the research of commercial banks' carbon finance business, especially the core and foundation of theoretical research. Therefore, this paper creatively constructs the carbon emission benefit model of commercial banks and reveals the income of China's commercial banks to carry out carbon finance business through hypothesis analysis.

### **The Revenue Model of Commercial Banks' Carbon Finance Businesses**

This part first analyzes the introduction of emission-reduction equipment and the purchase of carbon emission rights by emission-reduction enterprises to determine their carbon emission amount and to further determine product cost. Next, based on enterprise financing, we will establish a carbon finance

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<sup>①</sup>The concept of "residual income" is proposed by Feltham et al. In their view, the internal value of stock equals the sum of the discounted value of the book value (BV) of equities and the estimated net return on equity (ROE) after deducting the cost of capital.

revenue model by comparing the revenue of commercial banks that have carbon finance businesses. Last, we will discuss the theoretical conditions for commercial banks to develop carbon finance businesses.

### ***The Amount of Carbon Emissions Reduced by Emission Reduction Enterprises***

First, we determine the amount of enterprises' carbon emission. We consider a representative enterprise and assume that without any emission reduction measure, the enterprise's normal carbon emission is  $x$  ton, and the enterprise's restriction of its carbon emission is  $x_0$  ton. Because  $x_0 < x$ , the enterprises must reduce their carbon emission to the  $x_0$  ton standard. Here, we assume that the enterprise can reach the reduction standard by only two methods, with one method being the introduction of reduction equipment. Assuming the enterprise introduced  $n$  emission reduction equipment, the carbon reduction amount of each equipment is  $x_1$  ton, but such equipment requires a huge amount of fixed assets investment. The other method is to purchase carbon emission trading rights from the carbon-trading market. Assuming the price of carbon emission rights is  $p$  yuan per unit and the carbon emission amount purchased by the enterprise is  $x_2$  unit, the functional relation can be derived:

$$x = x_0 + nx_1 + x_2 \quad (1)$$

In the formula,  $x$  represents the amount of carbon emission of the enterprise without any reduction measure,  $x_0$  is the enterprise's carbon emission standard,  $n$  is the number of pieces of reduction equipment,  $x_1$  is the emission amount that each piece of equipment can reduce, and  $x_2$  is the amount of carbon emission purchased from the carbon trading market.

### ***The Production Costs of Emission Reduction Enterprises***

Assume that the costs being considered here include only carbon-emission-related costs and the effects of output. In other words, if the output of the enterprise is constant, then:

$$c(x) = c(x_0 + nx_1 + x_2) \quad (2)$$

In the formula,  $c(x)$  is the enterprise's production cost. Because  $c(x)$  only represents carbon-emission-related costs, the more carbon emissions, the more cost savings. Thus, production cost is negatively correlated to the carbon emission amount, and then:

$$\frac{dc(x)}{dx} < 0 \quad (3)$$

In the formula,  $x$  represents the carbon emission amount without any reduction measure by the enterprise, and  $c(x)$  is the production cost of the enterprise.

The actual amount of carbon emission after the enterprise's emission reduction is the sum of its carbon emission rights and the rights that the enterprise has already purchased from the market. Accordingly,

$$x' = x_0 + x_2 \quad (4)$$

In the formula,  $x'$  is the actual amount of the enterprise's carbon emission,  $x_0$  is the enterprise's carbon emission standard, and  $x_2$  is the amount of carbon emissions purchased from the carbon trading market. Thus, the revenue obtained by the enterprise due to social and government recognition of its carbon emissions can be illustrated as:

$$R(x') = R(x_0 + x_2) \quad (5)$$

In the formula,  $R(x)$  is the revenue obtained by the enterprise due to social and government recognition of its carbon emission. The more carbon emissions the enterprise has, the less revenue it can obtain from

social and government recognition. Accordingly, revenue is negatively correlated to the actual amount of carbon emission. Therefore,

$$\frac{dR(x')}{dx'} < 0 \quad (6)$$

In the formula,  $x'$  is the actual amount of the enterprise's carbon emission, and  $R(x')$  is revenue from the social and government recognition obtained by the enterprise.

### ***Revenue Analysis of Commercial Banks' Carbon Finance Businesses***

Enterprises' financing activities: Assuming the capital of the representative enterprise is all from bank loans, financing activities can be divided into two phases: the first phase is borrowing from commercial banks, and the second phase is repayment. The amount of money that the enterprise needs to borrow in the first phase is as follows. First is the production cost  $c(x)$ , which is borrowed based on the market interest rate  $r_0$ . Second is the carbon emission rights purchased from the carbon trading market; the fee is  $px_2$ , which is also borrowed at the market interest rate  $r_0$ . Finally, the cost of purchasing  $n$  emission reduction equipment is  $nF$ , which is borrowed at the interest rate  $r_1$ . Because the government and banks encourage enterprises to actively conduct emission reductions, interest rate  $r_1 < r_0$ . In the second phase, an enterprise's repayment amount can be illustrated as:

$$L = (1 + r_0)[c(x_0 + nx_1 + x_2) + px_2] + (1 + r_1)nF \quad (7)$$

In the formula,  $L$  is the enterprise's total repayment amount,  $r_0$  is the market interest, and  $r_1$  is the favorable interest rate. Because the enterprise reducing carbon emission can obtain social and government recognition and obtain revenue, the enterprise net repayment amount is as follows:

$$NL = (1 + r_0)[c(x_0 + nx_1 + x_2) + px_2] + (1 + r_1)nF - R(x_0 + x_2) \quad (8)$$

In the formula,  $NL$  is the enterprise net repayment amount, and  $R(x_0 + x_2)$  is the revenue obtained by the enterprise from carbon emission reduction. The problem then becomes to seek the minimum of  $NL$  under independent variables  $n$  and  $x_2$ . The first-order conditions are as follows:

$$\frac{dNL}{dn} = (1 + r_0)c'(x_0 + nx_1 + x_2)x_1 + (1 + r_1)F = 0 \quad (9)$$

$$\frac{dNL}{dx_2} = (1 + r_0)c'(x_0 + nx_1 + x_2)n - R'(x_0 + x_2) = 0 \quad (10)$$

Once the minimum net repayment amount has been determined, commercial banks' revenue from providing financing for enterprises that reduce their carbon emission can be determined. Because commercial banks provide loans at favorable rates to assist enterprises in reducing carbon emission and environmental pollution caused by production, enterprises will obtain social benefits (such as government rewards, social honors, good will, and image improvement), which can be illustrated by the following formula:

$$W_1 = r_1nF + r_0[c(x_0 + nx_1 + x_2) + px_2] + R(r_1) \quad (11)$$

In the formula,  $W_1$  is the revenue of commercial banks that provide financing for carbon finance projects, and  $R(r_1)$  is the social benefit commercial banks will obtain.

Commercial banks' revenue from regular loans is as follows:

$$W_2 = r_0nF + r_0[c(x_0 + nx_1 + x_2) + px_2] \quad (12)$$

In the formula,  $W_2$  is commercial banks' revenue from regular loans.

The revenue difference under these two conditions is as follows:

$$W' = r_1 nF + R(r_1) - r_0 nF \quad (13)$$

In the formula,  $W'$  is the difference between commercial banks' revenue from carbon finance projects and regular loans, which is  $W_1 - W_2$ .

Based on the foregoing, realistically speaking, to encourage commercial banks to participate in carbon finance projects, it is necessary to ensure that they can obtain more revenue and higher profits from carbon finance projects. According to Formula (13),  $r_1 < r_0$  and thus,  $(r_1 - r_0)nF < 0$ .  $R(r_1)$  represents the social benefit obtained by commercial banks from carbon finance project financing;  $R(r_1) > 0$ . Thus, the condition for  $W' > 0$  is  $R(r_1) > (r_0 - r_1)nF$ . In other words, the social benefits obtained by commercial banks from carbon finance project financing outweigh the revenue decrease resulting from the favorable rate.

Therefore, based on the foregoing analysis and comparison, it can be concluded that commercial banks' carbon finance businesses are affected by various factors such as financing revenue, social benefit, reduction in enterprise's financing activities, and government interest rates. In addition, it is worth noting that the risks of commercial banks' carbon finance businesses are unavoidable. Therefore, the measurement of operational risks is the core and foundation of commercial bank risk management. The EVT and the Loss Distribution Approach (LDA) can be used to measure commercial banks' operational risks. Feng, et al. (2011) analysis of Chinese commercial banks' operational risks and loss data indicates that the results of the two measurement methods have a relatively high degree of consistency, whereas the difference in the results from two types of distributions using the LDA is larger than the difference in the two methods. From a policy perspective, the risks of EVT and LDA arise out of the application process rather than the model selection. Thus, what is important is how banks apply the selected models.

## Conclusion

By analyzing the production and operation of representative emission reduction enterprises, this article creatively established the theoretical model for commercial banks' development of carbon finance businesses and subsequently studied their revenue. The study finds that commercial banks' carbon finance businesses are affected by various factors such as financing revenue, social benefit, and reduction in enterprise's financing activities, and the government interest rate. When the social benefits obtained by commercial banks from carbon finance project financing outweigh the revenue decrease resulting from the favorable rate, the revenue of commercial banks from carbon finance projects outweighs that from regular loans. This article theoretically confirmed that commercial banks' carbon finance businesses can increase their operational revenue and can facilitate the achievement of the win-win objective of emission reduction enterprises and commercial banks.

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# **Construction of a Performance Evaluation System for Public Projects Based on Public Satisfaction**

**Liu Man**

*International Business School, Yunnan University of Finance and Economics, Kunming, China*  
Email: 778023305@qq.com

**Jiang Qifa\***

*International Business School, Yunnan University of Finance and Economics, Kunming, China*  
Email: fagenjiang3@163.com

***[Abstract]** Being founded on public satisfaction, this paper analyzes the necessity of the construction of a performance evaluation index for public projects. After discussing the principles and priorities of an index construction, the initial indicators are proposed, and the feasible and reasonable methods to establish the evaluation system are penetrated as well. As a conceptual and theoretical study, it is concluded that public satisfaction should be integrated into the performance evaluation of public projects, not only because of the dominated goals, but also the requirements of continuous improvement for public projects.*

***[Keywords]** public projects; public satisfaction; performance; evaluation system*

## **Introduction**

With the developing economy, the Chinese governments\ increasingly pours many funds into public works. From 2006 to 2015, annual fixed assets in municipal public utility construction increased from 576.51 billion yuan to 16204.4 billion yuan (MOHURD, 2016). Due to large scale of investment in public works, there are inevitably accumulated problems, such as projects of low quality, and then casualties damaged by these defective public works, high pollution, waste of resources, and even corruption, etc. Therefore, the performance evaluation of public works, which refers to using scientific and normative evaluation methods, comparison of the unified evaluation criterion, based on the anticipated target, process and results of the economy of public investment behavior, efficiency, effectiveness and fairness of scientific, objective, fair and comprehensive measure of comparison and comprehensive evaluation (Zhu, et al. 2009), now goes into the public view and is taken seriously. However, the performance evaluation system of public projects in China is still in its infancy and needs to be perfected. Moreover, the goal of public projects is to maximize public interest, so public satisfaction will be an important indicator of public project performance evaluation. After consideration of the above issues, this article quotes the public satisfaction measure of public satisfaction with the degree of public projects, based on a public satisfaction index system of performance evaluation of public project construction, improve public satisfaction of public projects and for the government to improve the performance evaluation of public project provides a certain guiding role.

## **Literature Review**

### ***Reviews on the Performance Evaluation of Public Projects***

The United States was the world's earliest country taking into account the examination and assessment of public projects. In the 1960s, an American accounting agency first established a set of rules, e.g.

Economy, Efficiency and Effectiveness, recognized as the “3E” government performance of a typical structure paradigm, and later joined with Equity, building the structure factors of “4E”. In addition, in January 1993, the United States Congress passed the Act of Government Performance & Results, as an important legal basis for performance evaluation of public projects, which is used by science and technology departments. Project output should not only contain economic profits, but also include social benefits. This definition provides a measure of social benefits and a foundation for the national economic evaluation (Deput, 1884). After social benefits are presented, the performance evaluation gradually goes into the public view, organizations can gain citizen trust through performance evaluation, and the public will think the corresponding is reasonable after the tax return (Ammons, 1995). Advocated by the public, the emphases should be laid on statements such as effective administration, accountability fulfilling, meeting stakeholders’ expectations, and results-oriented (Flynn, 1997).

Since the 21st century, in terms of public project performance evaluation in China, great progress has been made. In 2006, the Methods and Parameters of Economic Evaluation for Construction Projects was authoritatively issued by departments of central governments. Owing to lack of precise indicators in the book, it is necessary to build a reasonable and feasible index to scientifically evaluate public projects (Jia, et al., 2003), and improve management and performance as well (Zhang, 2006). With a comprehensive and effective evaluation index, performance evaluation can be exactly implemented, in-depth analysis can be reached, and finally, performance improvement can be targeted (Du, et al. 2008). Some penetrations in this area have been made by Chinese scholars. Evaluation methods, indicators, standards, and procedures have been analyzed for different types of public projects, for example, science and technology projects (Li, et al. 2004), fiscal expenditure projects (Zhang, et al. 2007), and environmental protection projects (Zhai, et al., 2009).

### ***Reviews on Public Satisfaction***

As a result of increasing focus on performance evaluation by governments, public satisfaction, which centers around the public and set public perception as the criterion, has moved into the public view. The OECD proposed the idea of an analogy between the public and the client, which indicates that public administration is a kind of service, and the public is the same as the client, hence the client’s role among public and private sectors converge (Hughes 2001). The public satisfaction index (PSI) evolves from the Customer Satisfaction Index (CSI) and stands for a perspective of the beneficiaries’ satisfaction evaluation (Chen, et al., 2006). When using PSI to evaluate the governments’ performance, it shows the urgency and necessity of the application of administration philosophy in public satisfaction (You, et al., 2004), for instance, to analyze the key factors of satisfaction for public rural service (Li, et al. 2010).

Due to the awareness of the importance of public satisfaction on Chinese project performance evaluation, the study of the public satisfaction index system for public service, the discussion of factors influencing public satisfaction among the government service, and the ways to improve the public satisfaction have already become important fields of study for current research scholars.

### ***Reviews on Project Performance Evaluation based upon Public Satisfaction***

Along with the advancement of democracy in our country, public satisfaction will be the fundamental orientation of government reengineering and the ultimate goal. Government performance is no longer a simple set of synthetic statistical indicators, such as economic indicators; it must reflect the people’s satisfaction (Zheng, et al., 2007) and establish a scientific performance evaluation mechanism to meet the

inherent requirement of high performance in the definition of public satisfaction government (Zhu, et al., 2009), which is the foundation of satisfaction orientation for government projects performance evaluation (Zhu, et al., 2008). Here, citizens' satisfaction is a primary measure of public service and government performance (Hu, et al., 2014). The measure indicators should be proved as holding the nature of operability (Liu, et al., 2006), as well as effectiveness and scientificity (Hu, et al., 2009).

In summary, in China, there has been some exploratory research on operable attributes, scientific analysis and rational nature for an evaluation system of public service, yet there has been little study on the index construction for performance evaluation of public projects based on public satisfaction. Public satisfaction should be one key factor of public project evaluation criteria to improve performance. Under this recognition, this article attempts to construct a performance evaluation system to effectively evaluate the performance of public projects and finally improve projects' management.

## **Build the Initial Index System**

### ***The Principles of Index System Building***

Based on public satisfaction of performance evaluation for public projects, the performance evaluation index should be effective, applicable and rational. Therefore, the selection of an evaluation index should follow certain principles and start from the overall welfare to meet the needs of stakeholders. These principles are:

**Macro nature.** Selecting the public project performance evaluation index should proceed from the overall situation of national development to promote the social and economic benefits and welfare, rather than being confined to the project evaluation of their own interests.

**Comprehensive nature.** Public projects have the characteristics of large investment, long construction period, and affect a wide range. Besides the projecting area, it will exert negative or positive impacts on a much wider region. Therefore, it should care about all factors and stakeholders.

**Orientation of public value.** The public are beneficiaries, as well as evaluators of public projects; a public project is closely related to the interests of the public. Therefore, when conducting performance evaluation, we need to start from the public interests and value, then fit maximizing public interests in with optimal social welfare well.

**Response to the public real demand.** Since public projects serve the public, then before making the public project performance evaluation index, it should start from the actual demand of the public and consider the opinions of the citizens, ensuring full compliance with the interests of the citizens as well as democracy.

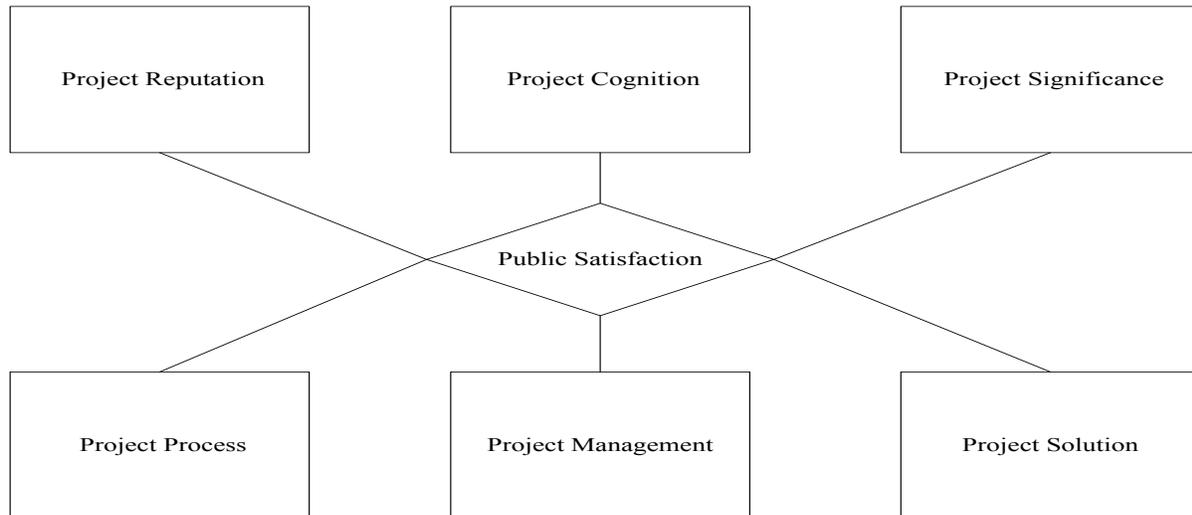
**Convenience of operation.** The selected index should be operable, representative, logical and independent of variables; it also should consider the design of index data which can be collected easily.

**Public equity.** Unlike private projects, public projects are funded by the public whose values and preferences are diversified, so in the selection of public project performance evaluation index, we should take into account the fairness of interest distribution between different stakeholders.

**Dynamics.** Indicator selection for performance evaluation of public projects will vary over time because of the nature of changes on environment, time and other external conditions. So, at a time we should improve our decision according to the actual project performance and the changing external conditions and internal factors.

### *The Construction of Initial Indicators*

Considering the above principles, we propose a model as an initial index from six aspects, e.g. evaluation of project reputation, project cognition, project significance, project process, project management, and project solution. The model will emphasize the importance of performance evaluation and originate from the Public Satisfaction Model (Zhu, et al., 2009), as shown in Figure 1.



**Figure 1. The Framework of Initial Indicators for Public-Satisfaction-Based Project Performance Evaluation**

**Project reputation.** Project reputation refers to the formation of recognition and the degree of satisfaction by the public, according to their value judgment after comprehensive evaluation for a public project and its related factors. Hypothetically, the project reputation is positively related with public satisfaction.

**Project cognition.** Project cognition refers to the extent to which the public project is known by the public, including the depth of understanding and span of recognition, which will respectively be defined the details of relevant information and levels above certain area known by the public (Zhang, et al., 2006). The higher project cognition, the easier and more accurate the project performance evaluation.

**Project significance.** This means that the project significance to the society will be assessed via a post evaluation which will be examined from economic, social, environmental, and sustainable factors. The public will push up their satisfaction when public projects show the importance to enhance the above factors.

**Project process.** A project will process some stages, e.g. conceptual design, early development, detailed design, production, closure, and operation (Shtub, et al., 2007). Process evaluation includes the indicators of project completion and its quality.

**Project management.** Project management is divided into areas as time management, cost management, quality management, risk management, contract management and so on. Public evaluation for each project management area emphasize on management capability and goal achievability (Jiang, 2013). Excellent management will promote public satisfaction.

**Project solution.** During any stage of a project there will be some unexpected problems. How to resolve these problems, including methods, results and consequences, will be appraised by the public, which will inversely interfere with public satisfaction.

## **Construction Methods of Evaluation Index for Public Project Performance**

The construction of the comprehensive evaluation index can be used via the expert survey method, the minimum mean variance method and the minimax difference method (Hu, et al., 2000). The above-proposed methods are based on the initial indicators of public satisfaction index for public project performance evaluation, namely the first-level indicators. Yet, from the entire index system building, these indicators need to adopt further scientific and reasonable refined subsystems according to the specific situation of the public project, such as secondary and tertiary indicators, and in nature, they can be divided into a quantitative index and a qualitative index, some of which can index for direct quantitative indicators. Jiang (2013) discovered that for other indicators which cannot be quantified directly, required methods should first be characterized by fuzzy language, and then ways used via consulting expert opinion and questionnaire to obtain data, which specifically set up the evaluation system. After the completion of the evaluation system, we can compare and select appropriate methods of performance evaluation. The main methods include the Analytic Hierarchy Process (AHP), fuzzy comprehensive evaluation method, artificial neural network method, and the grey cluster evaluation method, etc. For example, when adopting AHP, we need to experience five steps: clearly identify the goals of the evaluation; establish the hierarchical model structure; set up comparison matrix; conduct single level sequencing; test consistency; classify the sort of level (Meng, 2008). In selecting the performance evaluation methods, according to the nature of public projects we can flexibly choose various evaluation methods proposed above and combine a variety of evaluation methods when necessary. When index weights are determined, by using a linear weighted model, combined with weights of the index and the values of parameters, we can calculate composite scores of the whole model (Chen, et al., 2008). Then, according to the above scores, we can finally evaluate the performance of public projects.

## **Conclusion**

Public projects are critical to the development of a country and society. Since they set the goal to serve the public, then real needs of the public should be taken into account. Thus, the performance evaluation of public projects must start from the vital interests of the masses and be on account of public satisfaction. With fair certainty, it is time to establish a scientific and reasonable performance evaluation system for public projects in China. This conceptual and theoretical paper presents the principles of construction based upon public satisfaction with a public project performance evaluation system; and after examining basic principles, the performance evaluation system of public satisfaction and public projects are combined to determine the initial indicators of performance evaluation for public projects. Thereby, we also put forward the evaluation method and procedure, and construct the initial performance evaluation index. Due to dynamics of the establishment of performance evaluation system for public projects, the established index in this paper should be changed according to shifts of external and internal factors among different projects. Continuous improvements should be founded on public satisfaction to increase the effectiveness of performance evaluation.

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\* Corresponding author: Jiang Qifa; E-mail: fagenjiang3@163.com

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# FDI, Environmental Regulation and China's Forestry Ecological Environment: A U-shaped Curve<sup>1</sup>

Liu Kai, Hao Yating and He Rongjing

*School of Business Administration, Zhongnan University of Economics and Law,  
Wuhan, China*

Email: 15871826213@163.com

*[Abstract] FDI contributes to China's capital, but it also affects the forestry ecological environment through resource consumption. Based on this, this paper takes environmental regulation factors into the model and makes empirical analysis with panel data of China from 1998-2015. The study shows that there is a U-shaped relationship between FDI and China's forestry ecological environment. FDI reduces the quality of the forestry ecological environment first and then improves it. Moreover, environmental regulation has a positive moderating effect on FDI and can appropriately optimize the quality of it. Finally, this paper puts forward policy recommendations.*

*[Keywords] FDI; environmental regulation; ecological environment; U-shaped curve; forestry resources*

## Introduction

At present, China's overall economic scale and growth rate ranks high among the world and China has become a developing country with the largest inflow of foreign capital. FDI has brought drastic impacts on China's ecological environment while promoting industrial productivity and technological advances. Forest resources are the main part of the forestry ecological environment, and the abundance and structure conditions not only directly affect the quality of the forestry ecological environment, but also indirectly affect the industrial structure, economic advantages and ecological security. However, current forest reserves can't meet the need of the growing population in China. At the same time, the Chinese government has put the construction of the ecological civilization as an important content of the "13<sup>th</sup> Five-Year Plan"<sup>2</sup>. Therefore, this paper further explores the relationship between FDI, environmental regulations and forestry ecological environment in theory, and formulates a scientific and rational development plan. This will help achieve the development concept of "both gold and silver, but also green mountains and rivers" and gets into the international trend of environmental protection.

## Theoretical Background

There are two different opinions about the environmental effects of FDI. One is "pollution haven effect". It was first proposed by Walter and Ugelow (1979) and demonstrated by Copeland and Taylor (1994). Under the conditions of open economy, developing countries take the ecological environment as the cost of economic development, transferring "dirty industry" to areas which become "pollution havens" for transnational corporations. The other one is the "pollution halo effect". The view is that FDI brings advanced production technology, clean technology and management experience, which can reduce

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<sup>2</sup>Source from the Xinhua News Agency was authorized to issue "13th Five-Year Plan" (full text).  
[http://www.sh.xinhuanet.com/2016-03/18/c\\_135200400\\_2.htm](http://www.sh.xinhuanet.com/2016-03/18/c_135200400_2.htm)

domestic environmental pollution. Wheeler's (1995), and Daniel and Andrés' (1999) research have confirmed this view. In addition, FDI improves the degree of specialization, resulting in increasing returns to scale of input-output activities and reduces environmental pollution under established output conditions (Frankel, 2003).

The effect of FDI on forestry ecological environment has received increasing attention from scholars. When FDI enters the host country, the direct impact on forest resources is the destruction of the carbon cycle by the increase of carbon emissions (Hu, H., et al., 2012). Through their study, Liu and Long (2015) found that the export structure of forestry products has a significant negative impact on forest area and reserves, and a country or region can change their export structure so as to improve the status of their forest resources.

## Empirical Specification

### *Model*

The first step is to build the basic model,

$$\text{LnPFR}_{it} = \alpha_0 + \alpha_1 \text{LnFDI}_{it} + \alpha_2 (\text{LnFDI}_{it})^2 + \sum_{k=0}^n \lambda_k X_{it} + \varepsilon_{it} \quad (1)$$

$\text{LnPFR}_{it}$  represents the quality of forestry ecological environment (expressed in the unit area reserve) in Equation (1),  $I$  is provinces, and  $t$  stands for years.  $\text{LnFDI}_{it}$  indicates the actual amount of FDI utilized by the provinces. As relevant control variables,  $X_{it}$  includes economic scale (LN $GDP$ ), industrial structure (LN $STRU$ ), human capital endowment (LN $HUMAN$ ), trade openness (LN $OPEN$ ), wages (LN $WAGE$ ) and the level of urbanization (LN $TOWN$ ).  $\xi_{it}$  is random error.

The second step is to expand the model by adding environmental regulatory factors,

$$\text{LnPFR} = \chi_0 + \chi_1 \text{LnFDI} + \chi_2 (\text{LnFDI})^2 + \chi_3 \text{LnERS} * \text{LnFDI} + \sum_{k=0}^n \mu_k X_{it} + \xi_{it} \quad (2)$$

LNERS indicates the level of environmental regulation in Equation (2).  $\text{LnFDI} * \text{LNERS}$  is added to the model because environmental regulation has a moderating effect on FDI, and then affects the quality of the forestry ecological environment. Note that, if the first-order coefficient  $x_1$  and the second-order coefficient  $x_2$  are significant, and  $x_3$  is also significant, and  $x_2$  decreases as compared with Equation (1), it shows that environmental regulation has partial moderating effect on FDI. If  $x_1$  and  $x_2$  are not significant, but  $x_3$  is significant, it shows that environmental regulation plays a full regulatory role. If  $x_1$  and  $x_2$  are significant, but  $x_3$  is not significant, then the environmental regulation does not play a regulatory role.

### *Data Description*

**Explained variable.** Forestry ecological environment (PFR) is the measurement of forestry ecological environment that should include forestry productivity and forestry ecological attributes. One reason is the evaluation of the forest ecological environment is to make more rational exploitation and utilization of forestry resources and avoid the decline of productivity caused by the destruction of the ecological environment. Another reason is that the forest ecosystem mainly supports the production and operation of forestry. This paper chooses the reserve of unit area in each province to measure the ecological environment.

It is calculated as follows:

$$PFR_{it} = FR_{it} / FA_{it} \quad (3)$$

Where PFR represents the quality of forestry ecological environment, I means province, and T stands for year.  $FR_{it}$  represents the forest reserve of provinces I in year T, and  $FA_{it}$  indicates the forest area of provinces I in year T.

**Core explanatory variables.**

- 1) Foreign direct investment (LNFDI): This paper chooses flow data of FDI to reflect the actual impact of foreign investment on forestry ecological environment.
- 2) Environmental regulation (LNERS): Environmental regulation refers to the protection on environment by legal, regulatory or intangible constraints (Zhao, Y., 2009). This paper used the non-expected output estimation method. Considering industrial non-expected output, and the value of forest pest area was added.

**Control variables.**

- 1) Economic scale (LNGDP): Economic development is often accompanied by environmental damage. This paper used the provincial GDP. The expected sign is negative.
- 2) Industrial structure (LNSTRU): FDI into different industries, resulting in different natural resource consumption. The industrial structure is represented by the ratio of total industrial output to GDP. The expected sign is negative.
- 3) Human capital endowment (LNHUMAN): Consciousness of environmental protection are high when human capital stock is abundant. This paper used the ratio of educational population and total population in each region. The expected sign is positive.
- 4) Trade Openness (LNOPEN): Higher trade openness may introduce a lot of FDI by blindly, thus accelerating the deterioration of the environment. This paper used the ratio of the total import and export to GDP. The expected sign is negative.
- 5) Wage level (LNWAGE): Foreign investment will bear high cost of labor if average wage is high and it will be easier to screen quality of FDI. The index is expressed by the average wage level of the workers in each province. The expected sign is positive.
- 6) Urbanization level (LNTOWN): This paper uses the ratio of the urban population to total population in each province. Expected sign is uncertain.

## **Empirical Results**

***Full Sample Analysis***

The data of 29 provinces in China from 1998 to 2015 were analyzed by regression model. Then, the fixed effect model and stochastic effect model were used to test the regression equation. Finally, the fixed effect model was selected. In Table 1, (1) and (2) represent the estimated results of the basic model and the extended model, respectively.

It can be seen from Table 1 that the first-order coefficient of LNFDI in Equation (1) is significantly negative at the 1% level, while the second-order coefficient is significantly positive, showing “U” relationship between FDI and the forestry ecological environment. The U-shaped curve is opening up; that is, FDI reduces the quality of forestry ecological environment first and then promotes it. The inflection point of the U curve is calculated to be 3 billion 838 million yuan. Before the threshold, FDI consumes a lot of energy and produces harmful pollutants that destroy the forestry ecological environment. After the

threshold, FDI has a positive impact on forestry ecological environment. On the one hand, China strengthens the management of foreign capital, and adjusts the structure of foreign capital. On the other hand, technology is improved; the positive spillover effect and demonstration effect of FDI plays a role.

In Equation (2), the second-order coefficient of LNFDI decreases, and the opening of the U curve becomes larger, and the inflection point can be calculated to be 4 billion 106 million yuan. At the level of 1%, first-order coefficient and the second-order coefficient are both significant, and the coefficient of LNFDI\*LNERS is significant. It shows that environmental regulation has partial moderating effect on FDI. Before the inflection point, environmental regulation can reduce FDI to seek a pollution haven, and alleviate pollution. After the inflection point, environmental regulation may alleviate the positive spillover effect of FDI.

**Table 1. The Impact of FDI on Forestry Eco-Environmental Quality**

Explanatory Variables	(1)	(2)
lnfdi	-0.480*** (0.0461)	-0.477*** (0.0612)
(lnfdi) <sup>2</sup>	0.0673*** (0.00518)	0.0642*** (0.00686)
lnfdi*lners		0.0195*** (0.00619)

Note: The Z statistic in brackets \*, \*\*, \*\*\* representing 10%, 5%, and 1% significant levels, respectively.

As expected, the coefficients of economic scale (LNGDP) and industrial structure (LNSTRU) were significantly negative in (1) and (2), and the sign of wage level (LNWAGE) was positive. The coefficient of human capital endowment (LNHUMAN) is significantly negative, contrary to the expected. This is due to the human capital stock is increasing, but the proportion of forestry environmental protection technical personnel has not been improved. The coefficient of urbanization (LNTOWN) is positive, which may be due to the enhancement of urban greening level has improved the quality of forestry ecological environment. The coefficient of Trade openness (LNOPEN) from negative to positive but failed to test the significance. It shows that environmental regulation has a positive impact on forestry ecological environment, but it is not so effective.

### Sub-Sample Analysis

**Regional analysis.** In this paper, 29 provinces (municipalities and autonomous regions) of China were divided into three parts: East, Midland and West. In Table 2, (1) to (3) and (4) to (6) show sub-regional regression results of basic model and extended model, respectively. It was found that the first-order and second-order coefficient of LNFDI are identical in full sample and sub-sample.

**Table 2. Regional Regression Testing**

Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
	Eastern	Midland	West	Eastern	Midland	West
lnfdi	-0.462*** (0.0998)	-0.293*** (0.0496)	-0.382*** (0.0832)	-1.116*** (0.246)	-0.489*** (0.0788)	-0.266** (0.112)
(lnfdi) <sup>2</sup>	0.0360*** (0.00952)	0.0349*** (0.00612)	0.0616*** (0.0117)	0.0904*** (0.0206)	0.0673*** (0.00977)	0.0509*** (0.0151)
lnfdi*lners				0.00547 (0.00565)	-0.00354 (0.00652)	0.0456* (0.0259)

Note: The Z statistic in brackets \*, \*\*, \*\*\* representing 10%, 5%, and 1% significant levels, respectively.

Specifically, the coefficient of economic scale (LNGDP) and human capital endowment (LNHUMAN) in the East are opposite to those in the Central and Western regions. This is because the Eastern region has now crossed the inflection point of the U curve, and FDI plays a “pollution halo” effect. The Central and Western regions haven’t crossed over the inflection point and are still in the “pollution haven” stage.

**Impact of accession to international agreements.** China voluntarily contributed to the Copenhagen Agreement in 2009, in addition to furthering development and use of clean energy, as well as the implementing different environmental protection decisions. For the sake of robustness, (1) and (2) in Table 3 respectively represent the regression results of China before joining the Copenhagen Agreement and after joining. The results show that the variables are almost the same, which further proves that the model of this paper is robust. It shows that although member countries have made emission reduction commitments, there is a lack of financial and technical support, and there is no significant impact on China’s forestry ecological environment.

**Table 3. Impact of Accession to International Agreements**

<b>Explanatory variable</b>	<b>(1) Before</b>	<b>(2) After</b>
lnfdi	-0.598***	-0.0970**
	(0.0698)	(0.0473)
(lnfdi) <sup>2</sup>	0.0746***	0.0154**
	(0.00836)	(0.00617)

Note: The Z statistic in brackets \*, \*\*, \*\*\* representing 10%, 5%, and 1% significant levels, respectively.

### **Robustness and Endogeneity Test**

This paper carried out the robustness and endogeneity test to the model. The fixed effect analysis was carried out to select the per-capita forest reserve and FDI stock. At the same time, the GMM estimation was performed for the tool variable with lagged explanatory variables. The result was the same as the OLS estimates. It shows that the model set in this paper is robust and can eliminate endogenous problems to some extent.

## **Concluding Remarks**

### **Conclusion**

Based on the panel data of 29 provinces and regions in China from 1998 to 2015, the influence of FDI on forestry ecological environment was investigated in two parts. The results showed that: (1) From the national sample, FDI and China’s forestry ecological environment show a “U” relationship. That is to say, FDI reduces forest ecological environment quality first and then promotes it. After adding the environmental regulation factor, the U curve opening becomes larger. It shows that environmental regulation weakens the damage of FDI to forestry ecological environment before the inflection point. And it slows down the purification speed of forest ecological environment after the inflection point. (2) From the sub-sample analysis, the second-order coefficients of LNFDI in the East, West and Midland decrease in turn, and the coefficient of economic scale in the East is significantly positive. It shows that East has crossed over the inflection point, while the rest of the regions haven’t crossed it yet.

### **Policy Inspirations**

First, optimize the distribution of foreign investment. Most of China’s current foreign investment is concentrated in the eastern coastal areas. The eastern regions need to promote the technology spillover

effect, while the central and western regions should not only pursue the economic benefits of FDI, but they should also be concerned about the social and environmental benefits.

Second, strengthen regional environmental supervision. The government should encourage enterprises to improve pollution control technology in the eastern region and formulate and perfect environmental standards. For the central and western regions, we should pay attention to the foreign investment and environmental protection funds and raise the overall urban level, while reducing the consumption of resources and energy.

Third, increase forestry reserves. Both the government and enterprises should change the concept from “first pollution, post-governance” to “Beautiful scenery is the gold and silver”. Speed up the adjustment of forestry development model, making the transformation of traditional forestry to modern forestry, promoting the development of the forestry cycle.

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# Social Norms, Environmental Responsibility and Pro-Environmental Behaviors

Xiao Zhang and Nan Ye\*

*School of Business, Jiangsu Normal University, Xuzhou, China*

Email: nye@jsnu.edu.cn

*[Abstract]* Based on the data of the Chinese General Social Survey (CGSS) in 2010, this paper analyzes the influence of social norms on pro-environmental behavior and explores the intermediary effect of environmental responsibility to explain the influence mechanism of social norms on pro-environmental behavior. This study found that social norms significantly affect the green food purchase behavior, garbage classification recovery, emission reduction behavior and energy-saving and water-saving behavior. Also, the effect of social norms on garbage classification recovery behavior, energy-saving and water-saving is more obvious, the influence coefficient is larger. Meanwhile, environmental responsibility plays a part in the mediating effect. Social norms have little direct effect on green food purchase behavior and emission reduction behavior and make impact through the full mediated path of the environmental responsibility.

*[Keywords]* social norms; environmental responsibility; pro-environmental behavior

## Introduction

With the ecological civilization society is building in our country, environmental protection has received more public attention. Many scholars have also joined the study of pro-environmental behavior. Previous studies have examined the impact of pro-environmental behavior from different perspectives, such as from the perspective of demographic variables (such as gender, age, ethnicity, religion, income, and education, etc.) research. Hunter, et al. (2004) found that women have more environmental concern than men. Gong and Lei (2007) also confirmed that male urban residents engaged in environmental behavior less than women, based on Chinese General Social Survey (CGSS) 2003 data. Mu and Zhao (2015) showed that there is a significant negative correlation between age and green consumption behavior in their CGSS 2010-based studies. There are also studies showing that income, education and religious beliefs can significantly affect environmental protection behavior. Another study perspective is from the individual level on the impact of pro-environmental behavior. Nie (2016), based on the data of CGSS 2010, found that environmental cognition and environmental responsibility can significantly increase emission reduction behavior in public. Cui (2015) also found that on the causes of climate change awareness and the degree of harm awareness will significantly affect the public's emission reduction behavior. Peng (2015) found that the more knowledge of environmental protection of urban residents would increase more environmental behavior in his study.

The root of environmental problems lay in human activities, therefore, how to correctly guide individuals to carry out pro-environmental behavior becomes an important basis question for environmental governance. Environmental management measures tend to take more economic and legal methods, and in recent years, a non-economic intervention way – social norms, whose impact on pro-environmental behavior have gradually aroused the concern of scholars. In foreign countries, the study of social norms in environmental governance has been paid enough attention. But in our country, social norms in environmental protection research is still in the early stages. Therefore, we should fully grasp the

advantages of social norms in environmental protection after realizing their impact to study the path of environmental problems.

Based on CGSS 2010 data, this paper studies the influence of social norms on pro-environmental behavior (green food purchase, waste separation and recycling, emission reduction behavior, energy-saving and water-saving behavior), and the introduction of environmental responsibility to verify the social norms of pro-environmental behavior influence mechanism.

## **Theoretical Basis and Research Hypothesis**

### ***Social Norms and Pro-Environmental Behavior***

Social norms can be the rules of conduct that must be observed by social forces and supervised by laws and regulations, which dictate what people can or cannot do. They work with the help of external rewards or punishments, such as the observance of traffic rules. Also, they can be internalized into individual consciousness. They are not supervised by the social rules, but some of the rules established. They do not reward or punish anyone whether the rules are obeyed or not. Also, social norms are derived from a kind of personal value, such as not littering.

Allcott (2011) found that social norms can significantly reduce the consumption of electricity, which is equivalent to an 11-20 percent increase in electricity prices in the short term according to a study of 600,000 energy conservation experiments in the United States. Nolan, et al. (2008) conducted a research on 810 residents of California, and the survey found that social norms can better predict energy-saving behavior than other related beliefs, though respondents did not think social norms played an important role. Handgraaf, et al. (2013) believed that social rewards could encourage people to observe social norms and then conduct more pro-environmental behaviors. The conclusion was confirmed through an investigation about electricity use by a Dutch company. Andersson and von Borgstede (2010) conducted research on 418 participants and found that significant social norms influenced recycling behavior, and the influence of the high cost recovery is greater than the effect on the low-cost recovery; it namely explained more differences in the high cost recovery. Viscusi, et al. (2014) found that recycling behavior was related to the legal regulatory environment and external norms, and the social norms significantly enhanced the individual recovery rate. Bator, et al. (2011) found that people with weaker social norms were more likely to discard their cigarette butts and other rubbish, according to a study of 102 participants.

To sum up, the more social norms and social rules there are, the more pro-environmental behaviors will be made. Therefore, this paper puts forward the research hypothesis:

H1: Social norms influence the purchase of green food positively.

H2: Social norms affect garbage classification behavior positively.

H3: Social norms affect emission reduction behavior positively.

H4: Social norms affect energy-saving and water-saving behavior.

### ***Environmental Responsibility and Pro-Environmental Behavior***

Environmental responsibility is more of an internalized value, and individuals consider themselves to be responsible for protecting the environment. This environmental responsibility is not based on the rewards or punishments of the external environment, but instead built on the individual's obligation to environmental protection. Environmental responsibility is the behavior criterion of individual self-adherence, and individual environmental behaviors are driven by their own environmental responsibility. Stern (1999) argued that the ecological values of an individual, their cognition of the adverse consequences

of environmental pollution for doing things that were more beneficial to the environment and their thinking of the adverse consequences could be avoided; these three factors could make individuals have a sense of responsibility for environmental protection. Finally, the responsibility makes individuals engage in more climate-friendly behavior.

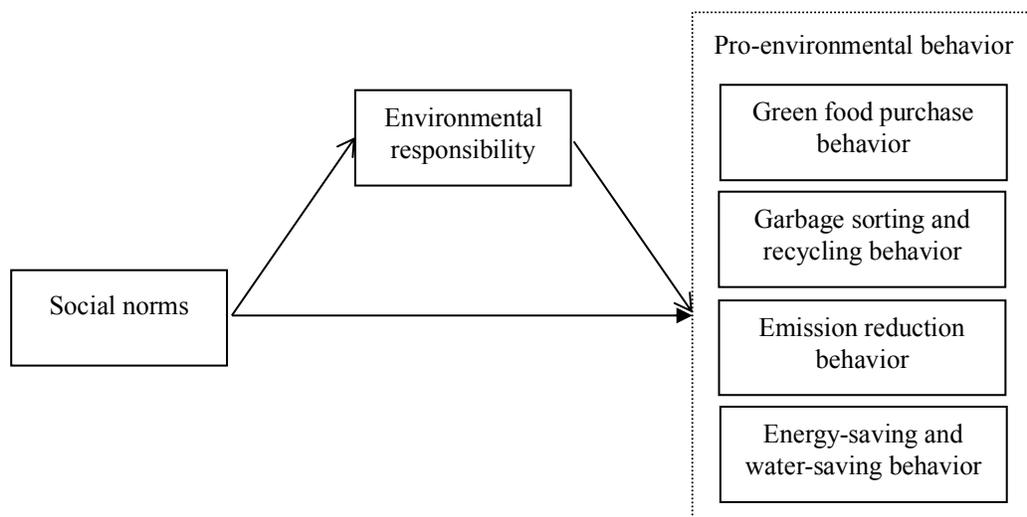
The individual has a strong sense of social norms, correct standards of values and behaviors. They generally believe that environmental protection is of vital interest. They have a duty to do more to protect the environment, so they have a stronger sense of environmental responsibility and more pro-environmental behavior. Based on this, we propose that:

H5: Environmental responsibility plays an intermediary role between social norms and green food purchases.

H6: Environmental responsibility plays an intermediary role between social norms and garbage classification and recycling.

H7: Environmental responsibility plays an intermediary role between social norms and emission reduction behaviors.

H8: Environmental responsibility plays an intermediary role between social norms and energy-saving and water-saving behaviors.



**Figure 1. Theoretical model**

### Data and Variables

The empirical data of this study came from the environmental protection module of Chinese General Social Survey in 2010, which deleted missing and unselected data and obtained the data that was ultimately used for analysis.

#### Explained Variables

**Pro-environment behavior.** This study divided the pro-environmental behavior into green food purchase, garbage classification behavior, emission reduction behavior, energy conservation and water-saving behavior. Green food purchases are designated by the item “do you often purchase fruits and vegetables that have not been treated with fertilizers and pesticides?”. The garbage classification recycling

activity is measured by, “do you often classify glass, aluminum cans, plastic or newspaper to facilitate recycling?” Emission reduction is measured by the item, “do you often reduce your car usage for environmental protection?” Energy saving water-saving behavior was classified by the topic, “do you save water in order to protect the environment and to reduce home energy usage such as oil, gas, electricity or fuel consumption?” and “often, for the sake of environmental protection do you save water or for water reuse?” measurement. All items are made up of cet-4 scale, 1= “always”, 2= “often”, 3= “occasionally”, and 4= “never”. This study classifies “occasional” and “regular” options into a category, namely, non-frequent pro-environmental behaviors and this code is 0; the “always” and “often” are classified as frequent pro-environment behaviors and coded as 1.

**Social norms.** Social norms and social norms of this research are designated by item “excuse me, can you tell me what’s your degree of the occurrence of the following ACTS – follow the traffic rules” and “excuse me, can you tell me what’s your degree of the occurrence of the following ACTS – to comply with the requirements of the work related articles of association?”, “excuse me, can you tell me what you degree of the occurrence of the following actions to comply with the requirements of the government department or a policy?”, “excuse me, can you tell me what you degree of the occurrence of the following ACTS and abide by the laws and regulations?”, “excuse me, can you tell me what you degree of the occurrence of the following ACTS – observe organization discipline” and so on, for a five item measurement, and each item score aggregation averaged.

**Environmental responsibility.** This study drew on the practice of Nie (2016), and divided environmental responsibility into three parts: environmental concern, environmental awareness and environmental contribution. Among them, the environmental concern is “generally speaking, you are concerned about environmental issues”; Environmental consciousness by the topic “it is very difficult to protect the environment for people like us”, “even if it takes more time and money, I also want to do something for the environment”, “life has more important things to do than to protect the environment”, “unless everyone do my efforts to protect the environment is meaningless” measurement, and will be the score aggregation average.

**Environment contribution.** This was measured by the item “in order to protect the environment, the extent to which you are willing to pay higher prices”, “in order to protect the environment, to the extent that you are willing to pay higher taxes”, and “in order to protect the environment, on how much you are willing to lower the level of life” measurement; the score aggregation averaged.

### ***Control Variables***

This study selected variables such as gender, age, nationality, religion, education, income, political status and health degree.

## **Empirical Analysis**

### ***The Main Effect***

In this study, OLS regression was used, and the correlation variables were controlled to verify the mediation effect of social norms and environmental responsibility, as shown in Tables 1 and 2. Table 1 and Table 2 show that social norms significantly positive influence green food purchase behavior (M1, beta = 0.051,  $p < 0.05$ ), garbage classification behavior (M4, beta = 0.118,  $p < 0.001$ ), the reduction behavior (M7, beta = 0.078,  $p < 0.05$ ), and energy saving water-saving behavior (M10, beta = 0.120,  $p < 0.001$ ), assuming the H1, H2, H3, and H4. Among them, the social norm has a more significant effect on garbage classification

behavior and energy saving behavior ( $p < 0.001$ ), and the influence coefficient is greater. This is because of the low cost of garbage classification and the implementation of energy-saving and water-saving behaviors, and the more people who comply with social norms are more likely to engage in such pro-environmental behaviors. However, there are many factors influencing the purchase and emission reduction of green food, such as disposable income, and living habits, etc. Therefore, the effect of social norms on this kind of pro-environment line is small.

**Table 1. Multiple Hierarchical Regression Analysis (1)**

Variable	M1	M2	M3	M4	M5	M6
	Green food purchase	Environmental responsibility	Green food purchase	Garbage classification behavior	Environmental responsibility	Garbage classification behavior
Gender	-.078***	.006	-.079**	-.066**	.042	-.072**
Age	.002*	.001	.002*	.003***	.001	.003***
Nation	.000	-.124*	.017	.003	-.150*	.024
Religious	.051	.181***	.025	.051	.202***	.024
Religious	.070***	.049**	.063***	.051***	.049**	.044***
Education	.008*	.027***	.005	.006	.027***	.002
Political status	.082*	.143**	.062	.008	.133**	-.010
Social norms	.051*	.162***	.028	.118***	.171***	.095***
Environmental responsibility			.142***			.136***
R <sup>2</sup>	0.059***	0.089***	0.096***	0.041***	0.091***	0.072***
Adjusted R <sup>2</sup>	0.054***	0.085***	0.091***	0.037***	0.086***	0.067***
F	12.716***	19.935***	19.114***	8.677***	20.091***	13.854***

\*\*\*:  $p < 0.001$ ; \*\*:  $p < 0.01$ ; \*:  $p < 0.05$ .

**Table 2. Multiple Hierarchical Regression Analysis (2)**

Variable	M1	M2	M3	M4	M5	M6
	Green food purchase	Environmental responsibility	Green food purchase	Garbage classification behavior	Environmental responsibility	Garbage classification behavior
Gender	.020	.025	.016	-.030	.041	-.039*
Age	.005**	-.002	.005**	.004***	.001	.004***
Nation	-.037	-.181	-.015	.016	-.138*	.046
Religious	.059	.257**	.029	.063*	.182***	.024
Religious	-.023	.009	-.024	.033***	.048**	.023*
Education	.016*	.031**	.012	.014***	.030***	.007**
Political status	-.044	.130	-.060	.005	.140***	-.025
Social norms	.078*	.157**	.059	.120***	.174***	.082***
Environmental responsibility			.121***			.215***
R <sup>2</sup>	0.031*	0.093***	0.060***	0.067***	0.104***	0.174***
Adjusted R <sup>2</sup>	0.016*	0.079***	0.043***	0.064***	0.101***	0.170***
F	2.035*	6.547***	3.580***	19.093***	30.788***	49.344***

\*\*\*:  $p < 0.001$ ; \*\*:  $p < 0.01$ ; \*:  $p < 0.05$ .

### ***The Mediation Effect of Environmental Responsibility***

In this paper, the mediating effect of environmental responsibility is tested by using the test mediation effect procedure (Wen, et al., 2004). First, the social norms and environmental responsibility independently return to the interpreted variables, and then the social norms and environmental responsibility are returned to the explanatory variables. By M1, M2, the social norms had a great effect on purchase of green food (M1,  $\beta = 0.051$ ,  $p < 0.05$ ), the sense of responsibility to the environment of social norms influence significantly (M2,  $\beta = 0.163$ ,  $p < 0.001$ ), and M3 shows that social norms and environmental responsibility in return. At the same time, the influence of social norms to buy green food become not significant (M3,  $\beta = 0.028$ ,  $p > 0.05$ ), and can therefore, be concluded that environmental responsibility in social norms on the influence of green food purchase plays a mediating role completely. By M4, M5, the influence of social norms on garbage classification behavior is significant (M4,  $\beta = 0.118$ ,  $p < 0.001$ ), the influence of social norms on environmental responsibility is significant (M5,  $\beta = 0.171$ ,  $p < 0.001$ ), the M6 shows that social norms and environmental responsibility in return at the same time, the influence of social norms on garbage sorting behavior is still significant (M6,  $\beta = 0.082$ ,  $p < 0.001$ ), and can therefore be concluded that environmental responsibility in the influence of social norms on garbage sorting behavior has a partial intermediary effect. It can be verified with the same method that the environment responsibility in social norms influence on emission reduction behavior, which a has completely intermediary role in the social norms of energy-saving water saving behavior of partial intermediary effect. Suppose H5, H6, H7, H8 are established.

According to the analysis, the social norms are engaged in more pro-environmental behaviors by stimulating residents' sense of responsibility for environmental protection. Specifically, social norms influence green food purchase behavior and mitigation actions completely through the path of the environment responsibility. And for garbage classification behavior and energy saving water-saving behavior, environmental responsibility has only a partial mediation effect. Individuals with strong social norms are also more environmentally responsible, so these individuals are more likely to engage in more pro-environmental behaviors.

### **Conclusion and Implications**

This paper studies the relationship between social norms, environmental responsibility and pro-environmental behaviors based on the 2010 Chinese general social survey data and draws the following conclusion: First, the social norms are positively affecting environmental behaviors such as green food purchase, garbage classification behavior, emission reduction behavior and energy saving behavior. Among them, social norms influence the behavior of garbage classification behavior, energy conservation and water saving significantly higher than that of green food purchase behavior and emission reduction behavior. Second, the environment responsibility has a full mediation role in the influence of social norms on garbage sorting recycling behavior and the reduction behavior and play a partial intermediary role in energy saving and water saving behavior. So, social norms can engage in more pro-environmental behaviors by activating individual environmental responsibility. It can be seen that social norms play a certain predictive role in pro-environmental behavior. By means of social norms, individuals can be guided to engage in more environmental behavior, and the implementation cost is lower and the results are more effective.

As a government, it is necessary to form good social norms, especially by creating a favorable climate for environmental protection, to activate the individual's environmental responsibility and thus, promote more pro-environmental behaviors. While the external environment constraints and criteria is good for regulating the behavior of the individual, the government departments should promote the effect of social

norms for pro-environmental behavior and reduce the cost of social norms for compliance. Specifically, relevant government departments can provide convenient implementation conditions for regulating behaviors, such as the provision of different classification rubbish bins, which can be beneficial to the recycling of residents' garbage classification. In addition, the government departments can provide relevant energy-saving and water-saving technologies to make it more convenient for residents to engage in energy-saving and water-saving behaviors.

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\* Corresponding author: Nan Ye, Ph.D., associate professor.

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# Wait or Act? Moderate Effect of Stakeholder Cooperation Expectancy on the Relationship between Corporate Environmental Awareness and Green Behavior in China

Xie Xiong-biao, Zhou Min and Wu Yue

*School of Economics and Management, China University of Geosciences, Wuhan, China*

Email: zhoumin0509@163.com

*[Abstract] With the help of ABC behavior theory, this paper analyses the influence of corporate environmental awareness on green behavior, and the moderating effects of stakeholder cooperation expectancy on the relationship between corporate environmental awareness and green behavior, then carries on the empirical analysis based on the survey data of 219 resource-based enterprises. The study also shows that corporate environmental awareness positively affects green behavior, the effect of corporate environmental awareness on environmental technological innovation is better than that on conventional environmental management; the moderating effects of stakeholder cooperation expectation on them are significant. Therefore, it is thus concluded that, the government should improve the positive incentive mechanism and actively cooperate with associations, consumers, and other enterprises in supply chain to enable enterprises to implement the initiative green strategy.*

*[Keywords] environmental awareness; corporate green behavior; stakeholder cooperation expectancy; joint action*

## Introduction

Since the 1980s, with the rapid growth of China's economy, serious resource consumption and environmental damage have affected China's socio-economic sustainable development. Therefore, the Chinese government has proposed to build a resource-saving and environment-friendly society in a prominent position in the industrialization and modernization development strategy and make the protection of the environment into a basic national policy. In this context, the green transformation of enterprises are inevitable. Corporate green behavior (CGB), known as the corporate pro-environmental behavior, refers to the conservation of resources and environmental protection ideas into the business activities carried out by a series of initiatives in order to improve their competitiveness under resources and environment constraints (Sarkar, 2008). The Chinese government has continuously strengthened publicity and education, improved relevant laws or regulations and supporting technical and economic policies to promote the green transformation and development of enterprises for long periods, while in reality, enterprise environment awareness is strong and the green behavior is insufficient (Xie, Wu, Feng, & Hao, 2015). Why is corporate environmental awareness and behavior inconsistent? This study holds the idea that there is a moderator variable between the environmental awareness and the green behavior of the firm. Those existing literature also have shown that although stakeholder behavior is fraught with uncertainty, stakeholder behavior collaboration or cooperation contributes to control costs and risks, increase expected economic benefits and encourage corporate green behavior (Yang & Chai, 2015). For the purpose of making clear these questions, this study raises the concept of stakeholder collaboration expectations and attempts to explore the moderate role of stakeholder collaboration between corporate environmental awareness and green behavior.

## **A Review of Related Theories**

At present, the studies of corporate green behavior are mainly concentrated in two fields. On the one hand, a large number of research results focus on the influencing factors and mechanism of corporate green behavior. Some of them have found their own factors affecting their green behavior. They think that the financial status (Blanco, Rey-Maqueira, & Lozano, 2009), non-precipitation redundant resources (Yang, Liu, & Shi, 2015), technical abilities (Teixeira, Jabbour, & de Sousa Jabbour, 2012), competitive advantages (Chen, Liu, & Yu, 2014) and other factors have significantly affected the green behavior of enterprises, at the same time, put forward the senior management support, environmental awareness and outlook on values have positive impacts on corporate environmental behavior (Papagiannakis & Lioukas, 2012; Teixeira, Jabbour, & de Sousa Jabbour, 2012; Li, & Ye, 2013; Leenders, & Chandra, 2013). Some scholars have studied the impact of external pressure on corporate green behavior. Fairchild analyzed the impact of customer and government regulations and competitive pressure on the green innovation of enterprises (Yalabik & Fairchild, 2011). Yi (2014) explained the driving factors of green development in American enterprises, including clean energy policy, tax preferential policies and labor market conditions. And scholars such as Williams (2012); Liu, & Zeng, (2014); Zhao, Zhao, Zeng, & Zhang, (2015) believe that government regulation is the main driving force for enterprises to carry out green behavior; there have also been other special studies emphasizing environmental regulation on the role of corporate green behavior mechanism.

Other papers have examined the impact of internal and external factors from different aspects on corporate green behavior. Li, Y. B. (2012) discussed the green formation mechanism of the company, based on environmental regulation, green consumption, market structure, internal drive and institutional impact and other aspects. Fan, Y. D. (2014) constructed the theoretical model of enterprise green management self-organization motive, where the internal driving force includes culture, system innovation, technological innovation and environmental factors and the external driving factors include government regulation, community pressure and consumer pressure; competition and synergy are its initial impetus. When Zhang, and Zhang, (2014) applied the in-depth interviews and grounded theory to understand the deep-seated factors that the enterprises green innovation strategy is influenced to implement, they found that the expected economic benefits, redundant resources and the pressure of stakeholders to work together to drive the formation of green enterprise innovation strategy. Yan, Li, and Xie, (2014) revealed the driving force of the green strategy of enterprises across case studies and there are non-active and active green strategic process under the internal and external environment pressure.

On the other hand, in addition to the impact of corporate green behavior factors and the mechanism of action, how to make decisions under the influence of various factors and put into practice has become another research hotspot. Zhang, and Guo (2011) proposed that the access to earn economic benefits, enhance the market competitive advantages and bear social responsibility, shaping the image and reputation of enterprises are the main incentives to make environment decisions voluntarily. Zhang, and Zhang (2013) believe that economic benefits are an important driving force for enterprises to carry out environmental innovation strategy, taking into account the different types of redundant resources and the driving effect of the pressure from different stakeholders on corporate environmental innovation strategy. Du and Zhu, (2010) suggested a corporate environmental technology innovation adoption behavior decision-making framework through the integration of rational variables and behavior variables. While these studies emphasized the importance of expected economic and situational factors in business decision-making, the analysis of corporate environmental decision-making process is not deep enough.

In the process of enterprise green behavior decision-making, the cooperation of relevant parties plays a very important role. Simpson, Power, and Samson (2007) considered that the network and cooperation between enterprises and suppliers to build a strong partnership is an important driving factor to promote environmental technology innovation. Lee (2011) explored the mechanism by which suppliers influence the ability of manufacturers to develop green products by a single case study. Xie, Yan, and Cheng (2008) pointed out that an industry's first practice of green development concept of corporate behavior evolution by the impact of competitive enterprise environmental strategy, peer cooperation and positive response is an important condition for continued green behavior. However, the specific mechanism of cooperation in the process of enterprise environmental decision-making is not clear enough.

According to the above literature, we can find that the existing research contents mainly focus on the analysis of the impact effect of the internal or external single factor and the analysis of the driving mechanism of the green behavior of the enterprise under the combined action of internal and external factors; the research on the green decision process is insufficient. The previous research has always focused on the importance of stakeholder cooperation in the corporate green behavior, but the mechanism of cooperation in the green decision-making process is not adequately clear. Therefore, aiming at bridging the gap of existing research, survey research of the resource-based enterprises are used in this paper to explore the role of stakeholder cooperation in the relationship between environmental awareness and green behavior, which is of great significance and expected to make a contribution to the corporate environmental behavior theory and the development of relevant policies.

## **Theoretical Basis and Research Hypothesis**

### ***Theoretical Basis***

In the field of social psychology, the concept of attitudes is more mature in the study of the relationship between "attitude and behavior". In general, most scholars suggest that cognition is the basis of attitudes. It refers to the psychological tendencies of what people like or dislike about certain things or phenomena and affects the behavior in a certain way. However, the "attitude-behavior" relationship is not completely consistent, and there are other factors that have a direct or indirect effect on the "attitude-behavior" conjunction, such as self-efficacy, and social norms. In addition, the intention as a moderate variable, and the importance of other people's attitudes will also act together with the behavior.

Currently, it is common that the planning behavior theory relates to the other variables mentioned above. Fishbein and Ajzen (1975) put forward rational behavior theory, which states that behavioral intentions act directly on behavior and that behavioral intentions are influenced by both behavioral and subjective norms. In view of this theory, Ajzen (1991) introduced the control variables of perceived behavior and presented the planned behavior theory. This states that behavioral intentions, except those being influenced by attitudes and subjective normative factors, are also affected by perceived behavioral control factors. Perceived behavioral control is the degree to which that individual is expected to be able to control the act itself when implementing a particular action, which is influenced by the factors that the subject perceives to promote or impede the execution of the act.

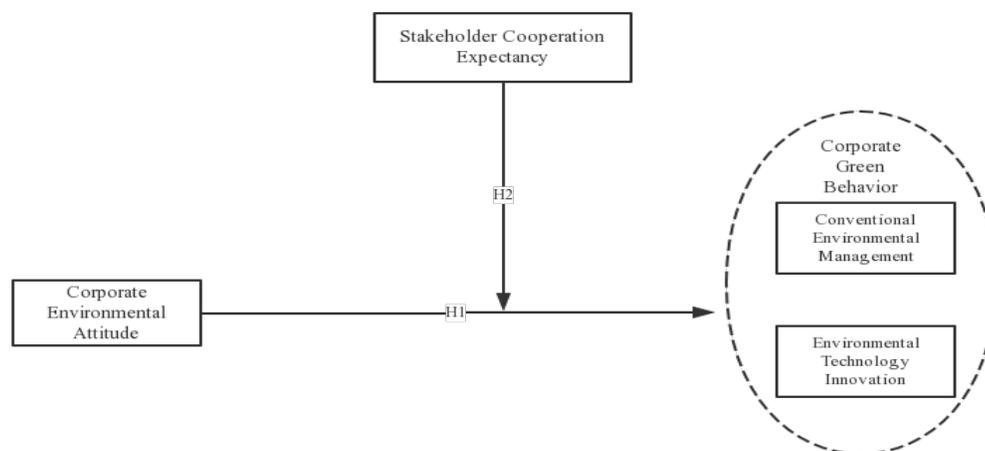
Except for the planned behavior theory, there are other models that explain individual behavior such as the theory of "Attitude-Context-Behavior (ABC)" proposed by Guagnano, Stern, and Dietz (1995). The model suggests that environmental behavior is the result of the interaction between environmental attitudes and situational factors (Guagnano, Stern, & Dietz, 1995). Ignacio Pisano and Mark Lubell (2015) explain

the differences in environmental behavior in different countries and have found that environmental behavior depends on mutual trust and situational factors among individuals. Prabhu, et al. (2013) observed Indian farm energy-saving behavior and believe that environmental awareness and situational factors act together on their behavior.

Our study is based on the ABC behavior model to explore the internal relationship between corporate environmental awareness, stakeholder cooperation, and green behavior. Both the planning behavior theory and the ABC behavior theory emphasize the importance of situational factors in attitudinal-behavioral processes (Wang, J. M., 2013). As attitude is the most basic part of awareness (Zhou, Z. J., 2008), the planning behavior theory and ABC behavior theory provide a good theoretical perspective for further analysis of the relationship between environmental awareness and green behavior. But the difference between the planned behavior theory and the ABC behavior theory is that the former regards the situational factors as parallel independent variables, while the context factors are treated as the moderate variables in the latter.

**Research Hypothesis**

As individual behavior theory is gradually applied to the study of organizational behavior, corporate behavior also has a subjective initiative. The enterprise green behavior exists from the process of consciousness to the behavior (Li, Xu, & Su, 2014), and is also influenced by the situational factors (Wang, & Wang, 2012). This paper refers to the ABC theory to construct the “Attitude -Context-Behavior” model of corporate green behavior, and mainly discusses the mechanism of stakeholder cooperation expectancy to the green behavior of enterprises. Based on what we have mentioned above, the model is designed in Figure 1, where corporate environmental awareness is the independent variable, corporate green behavior is the dependent variable and stakeholder cooperation expectancy is the moderate variable. Below, we specifically analyze the impact path in the hypothetical model.



**Figure 1. The Theoretical Model of “Corporate Environmental Awareness – Stakeholder Cooperation Expectancy – Green Behavior”**

**The impact of corporate environmental awareness on green behavior.** Environmental awareness originated from the environmental literacy proposed by American scholar Roth in 1968. Over the next 40 years, scholars have defined and studied environmental awareness from different perspectives and have not

yet defined it so far. Compared with many environmental awareness scales, there is a consensus on the connotation of environmental awareness that is environmental factors, especially emotional factors and cognitive factors in environmental attitudes, are the most basic components of environmental awareness. Other factors such as environmental knowledge and environmental behavior need to be in line with research questions and purposes to choose (Zhou, Z. J., 2008). Corporate Environmental Awareness (CEA) generally refers to business philosophy that in the production and management activities enterprises pay attention to protect the environment and resources. At present, there are few researches on the measurement of environmental awareness of enterprises. Liu and Lv (2008) drew lessons from the public environmental awareness measurement tools to divide the environmental awareness of tourism enterprises into environmental knowledge, environmental attitudes, environmental assessment and environmental behavior, respectively. Due to discussing the link with environmental awareness and green behavior, this paper considers the composition of public environmental consciousness and the hierarchy difference and combines corporate social consciousness with environmental problems aesthesia, environmental awareness and environmental attitudes.

The composition of corporate green behavior is not yet unified. Klassen and McLaughlin (1996) believed that generalized corporate green behavior includes green product development, clean production, establishing an ISO14001 management system, taking the initiative to participate in community activities, and so on; the narrow definition of corporate green behavior refers to the production process in all aspects of the use of environmental friendly measures and means. Jin, (2012) proposed that corporate green behavior mainly involves cultivating the green culture, using green technology, implementing green design and production, and developing green products. Wang, Ma, and Chen (2014) believed that green business enterprises, consisting of environmental responsibility, green product design, and green production process transformation, cultivate a green atmosphere, and the development of industry standards and other measures. We divide enterprise green behavior into two dimensions: Conventional Environmental Management (CEM), which corresponds to light green development including environmental management organization, personnel arrangement, related system, and effective implementation; and Environmental Technology Innovation (ETI), which includes green products, green process innovation and related R & D activities (Wang, & Guo, 2015).

Some firms carry out routine environmental management and environmental technology innovation behavior depending on whether the enterprise has a certain environmental awareness. The higher the environmental awareness of the enterprise, the greater the possibility of implementing green behavior, and the more obvious the depth and breadth of green behavior, so the following assumptions are made:

H<sub>1</sub>: The environmental awareness has a significant positive impact on the corporate green behavior.

H<sub>1a</sub>: The environmental awareness also has a significant positive impact on the conventional environmental management behavior.

H<sub>1b</sub>: There is a significant positive impact on the environmental awareness to the environmental technology innovation.

**Stakeholder cooperation expectancy's moderate effect on "Corporate environmental awareness – Green behavior"**. Awareness and behavior are not entirely consistent, especially in environmental performance. Corporate behavior is affected by situational factors (Lei, Wang, & Zhang, 2014). Stakeholders are important in situational factors. However, several researches that emphasize the role of stakeholder stress and synergies have been ignored. Therefore, this study puts forward the Stakeholder Cooperation Expectancy (SCE) by a salutary lesson from the expected theory, which refers to the judgment

of enterprises in the process of green behavior decision-making, such as government, industry association, consumers, supply chain enterprise, competitors and other related parties. Expected economic benefits are an important driving force for companies to perform environmental innovation strategy. The different behaviors of government and industry associations, supply chain partners, consumers and competitive enterprises directly communicate with the benefits, costs and risks of green behavior (Yang, Yang, Lou, & Yao, 2012). This paper makes these assumptions:

H<sub>2</sub>: Stakeholder cooperation expectancy plays a positive role in corporate environmental awareness and green behavior

H<sub>2a</sub>: Stakeholder cooperation expectancy plays a positive effect on the relationship between corporate environmental awareness and routine environmental management

H<sub>2b</sub>: Stakeholder cooperation expectancy has positive impact on corporate environmental awareness and environmental technology innovation

## **Scale Design and Data Collection**

### ***Scale Design***

The induction method is applied to the scale design. The specific steps are: Firstly, we clearly defined the three variables which are: corporate environmental awareness, corporate green behavior, and stakeholder cooperation expectancy. Secondly, according to literature and the research objectives of this paper, we divided the dimension and the preliminary design of the scale. Then, using four companies to conduct interviews and consultation, we made the scale design better. Furthermore, we conducted a pre-survey of 20 resource-based enterprises in the Hubei Province and tested the overall reliability and validity of the scale according to their feedback. After adjusting and improving the indicators, we finally finished the scale that is presented in our research. The scale is represented by a 5-level Likert scale, where 1 stands for “totally disagree”, 2 stands for “disagree”, 3 stands for “neutral”, 4 stands for “consent”, and 5 stands for “absolutely consent”.

### ***Data Collection***

The scope of the questionnaire covered 15 provinces in the eastern, central and western regions of China, mainly concentrating on resource-based enterprises in the Hubei, Henan, Zhejiang, Ningxia, and Gansu provinces and other areas. These were filled out by the administrators of environmental protection, energy conservation and emission reduction, and comprehensive utilization of resources. We delivered 2000 questionnaires in total and each company only received one questionnaire by e-mail and telephone communication. After recycling 230 questionnaires, removing the invalid 11 questionnaires, we finally arrived at an effective 219 questionnaires, whose effective recovery rate was 10.95 %.

## **Empirical Results and Analysis**

### ***Reliability and Validity Analysis***

Both are the prerequisites for model analysis. The confirmatory factor test was performed on the model by means of AMOS17.0. Our results showed that corporate environmental awareness, conventional environmental management, environmental technology innovation, and corporate stakeholder cooperation are expected to have a good significance for the standardized factor load (see Table 1). It is shown that

AVE is greater than 0.5, indicating that all latent variables have good convergence validity. Cronbach  $\alpha$  is greater than 0.81, C.R. is greater than 0.90, manifesting that the survey results have good reliability.

**Table 1. Variables Load and Significance Test**

Variables	Indicators	Items	Variables load	P	C.R.	AVE
CEA	CEA 1	The current environmental pollution is very serious	0.79	***	0.95	0.76
	CEA 2	Environmental pollution affect people's health and human survival	0.87	***		
	CEA 3	Corporation must accept and consciously abide by government environmental regulations	0.90	***		
	CEA 4	Corporation must bear the social responsibility of resources and environmental protection	0.83	***		
	CEA 5	Corporation must incorporate environmental protection into their business goals	0.88	***		
	CEA 6	Corporation must pay attention to the shaping of green image	0.96	***		
EGB	EGB 1	Corporation should regularly train employees' environmental awareness and environmental management skills	0.82	***	0.92	0.71
	EGB 2	There is a department or organization that specializes in environmental work in the corporation	0.81	***		
	EGB 3	Corporate environmental management department has environmental protection expert positions (such as environmentalists)	0.86	***		
	EGB 4	At present, the environmental system of enterprises is perfect	0.83	***		
	EGB 5	The corporate environmental protection system is well executed	0.88	***		
ETI	ETI 1	When products are designed, corporation consider the energy saving and recycling	0.89	***	0.95	0.78
	ETI 2	Choosing production materials, the corporation prioritizes the recycling and renewable materials	0.85	***		
	ETI 3	In the production process corporation have established materials, waste recycling system	0.88	***		
	ETI 4	corporation adopt a low consumption, light pollution, preventive environment-friendly production way	0.91	***		
	ETI 5	Green technology development accounted for a larger proportion of corporate R&D funds	0.88	***		
SCE	SCE1	Government and industry associations organize environmental training activities	0.81	***	0.92	0.69
	SCE2	Partners have a preference for green companies	0.83	***		
	SCE3	consumers prefer to buy green products	0.78	***		
	SCE4	Most companies in the industry are also engaged in green production management activities	0.88	***		
	SCE5	Corporation in the same industry will strengthen green technology innovation communication	0.86	***		

Note: \*\*\* represents  $p < 0.001$

**Table 2. Descriptive Statistics, Correlation Matrices and Reliability Analysis**

	Mean	S.D.	The reliability of $\alpha$	1	2	3	4
CEA	4.47	0.58	0.81	<b>0.87</b>			
CEM	3.81	1.02	0.91	0.64	<b>0.84</b>		
ETI	4.12	0.84	0.88	0.72	0.76	<b>0.88</b>	
SCE	3.93	0.94	0.92	0.70	0.64	0.70	<b>0.83</b>

Note: The blackened bevel is the square root of AVE

**Model Hypothesis Test**

**The impact of CEA on CGB.** The multiple regression model is applied to examine the effect of corporate environmental awareness on green behavior and we establish the following regression model:

$$Y = a + bX + e_1, \tag{1}$$

$$Y_i = a_i + b_i X + e_2, \quad i = 1, 2 \tag{2}$$

Formula (1) examines the impact of corporate environmental awareness on the corporate green behavior (path H1), where X represents the corporate environmental awareness, Y denotes the firm’s green behavior. In Formula (2), X is the same as above, Y<sub>i</sub> contains two corporate green behaviors, namely conventional environmental management and environmental technology innovation. When i = 1, Y<sub>1</sub> is the conventional environmental management behavior, and the model is concerned with CEA how to impact on conventional environmental management (path H<sub>1a</sub>). When i = 2, Y<sub>2</sub> is the environmental technology innovation, and the model focuses on CEA having effect on environmental technology innovation behavior (path H<sub>1b</sub>). a, a<sub>i</sub> and b, b<sub>i</sub> are regression constants and regression coefficients, respectively; e<sub>1</sub> or e<sub>2</sub> is a random error term in Formula (1). We calculate the mean of the two variables (CEA, CGB), and take the central transformation to get the new variable score, in order to estimate the regression equation. In Equation (2), we calculate the mean of the three variables (CEM, ETI, CEA), and construct the regression equation in the same way. The results of the test show (see Table 3) that the R<sup>2</sup> and the significance level of the three path models reach the ideal level, and the overall level of the regression model was reasonable.

**Table 3. The Test Result of the Effect of CEA on CGB**

	H <sub>1</sub>			H <sub>1a</sub>			H <sub>1b</sub>		
	Std Coefficient	t-value	Sig Level	Std Coefficient	t-value	Sig Level	Std Coefficient	t-value	Sig Level
Constant term		0.055	0.956		0.020	0.984		0.088	0.930
CEA	0.720	15.185	0.000	0.641	12.208	0.000	0.719	15.132	0.000
Correlation coefficient	0.720			0.641			0.719		
R <sup>2</sup>	0.519			0.411			0.517		
Adjusted R <sup>2</sup>	0.516			0.408			0.515		
Significance level	0.000			0.000			0.000		

**Moderate effect: SCE on “CEA-CGB” Mechanism.** Since explanatory variables and regulatory variables are continuous variables, we chose hierarchical regression to test the moderate effect (Wen, Hou, & Zhang, 2005). Construct the theoretical model as follows:

$$Y = a + bX + cM + dMX + e \tag{3}$$

In Formula (3), the meaning of X and Y are the same as that of Equations (1) and (2). M represents SCE. The interaction item X\*M is expected to the SCE's moderate role on "CEA-CGB" (path H2). In the first step, we only verify the main effect of CEA on CGB (Model 1). Then, we put the cooperative expectation M into the equation and analyze its main effect (Model 2). Finally, the interaction term X\*M is added to the equation to analyze the expected moderate effect of the SCE (Model 3). The results indicate that this moderate effect is valid. Because the overall significance level of model is 0.000, R<sup>2</sup> that reaches significantly is increased from 0.519 in model 1 to 0.602 in Model 3 (See Table 4).

**Table 4. The Test Result of the SCE's Moderate Role in "CEA-CGB"**

	Path H <sub>2</sub>		
	Model 1	Model 2	Model 3
Constant term	0.000	0.000	0.000
X	0.720	0.441	0.394
M		0.401	0.306
X*M			0.133
Correlation coefficient	0.720	0.763	0.776
R <sup>2</sup>	0.519	0.582	0.602
Adjusted R <sup>2</sup>	0.516	0.576	0.598
significance level	0.000	0.000	0.000

We divide the CGB into two dimensions, namely CEM and ETI, and test hypotheses H<sub>2a</sub> and H<sub>2b</sub>, respectively. Build the theoretical model as follows:

$$Y_1 = a_1 + b_1X + c_1M + d_1MX + e_1, \quad (4)$$

$$Y_2 = a_2 + b_2X + c_2M + d_2MX + e_2, \quad (5)$$

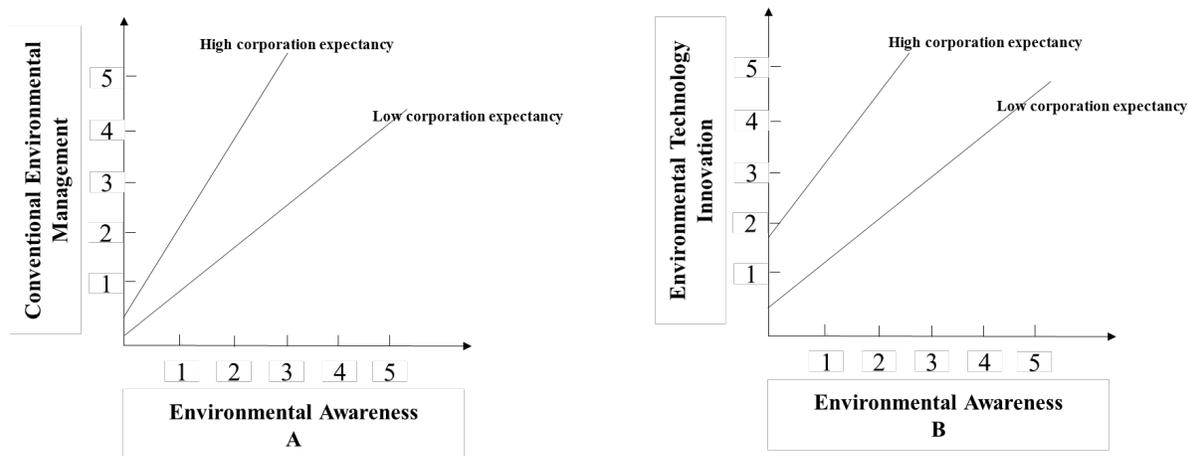
In Formulas (4) and (5), which also focus on the SCE's moderate impact on CEM (H<sub>2a</sub>) and ETI (H<sub>2b</sub>), the meanings of X, M and Y are the same as that of Equation (3), and Y<sub>1</sub>, Y<sub>2</sub> denotes CEM and ETI, respectively. The research method and analysis process are the same as Equation (3). The final outcomes prove that the moderate effect of these two paths is effective. Specifically speaking, in the path H<sub>2a</sub>, R<sup>2</sup> is raised from 0.411 in Model 1 to 0.484 in Model 3, and that in the route H<sub>2b</sub> is improved from 0.517 in Model 1 to 0.593 in Model 3. Their significance levels are reached.

**Table 5. The Test Result of the SCE's Moderate Impact on CEM and ETI**

	Path H <sub>2a</sub>			Path H <sub>2b</sub>		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Constant term	0.000	0.000	0.000	0.000	0.000	0.000
X	0.641	0.382	0.243	0.719	0.452	0.320
M		0.371	0.091		0.383	0.327
X*M			0.393			0.202
Correlation coefficient	0.641	0.694	0.695	0.719	0.766	0.770
R <sup>2</sup>	0.411	0.482	0.484	0.517	0.587	0.593
Adjusted R <sup>2</sup>	0.408	0.476	0.477	0.515	0.585	0.589
Significance level	0.000	0.000	0.000	0.000	0.000	0.000

We use linear regression to verify the CES's main effect on CGB and the moderate influence of SCE on "CEA - CGB". It is convinced that the regression coefficient of CEA to CEM is 0.243, and the coefficient of CEA to ETI is 0.320. SCE is expected to play a positive moderate role in "CEA - CEM", and its

interaction coefficient is 0.393. SCE has positive effect on “CEA - ETI”, whose interaction coefficient is 0.202. The model and these coefficients are significant.



**Figure 2. The SCE’s Moderate Effect on the Relationship between “CEA-CGB”**

In order to thoroughly observe the moderating impact of SCE on “CEA - CGB”, we use the mean plus twice standard deviation as the high expected cooperation and the mean reduce twice standard deviation as low cooperation expectancy to measure the expected moderate effect. As shown in Figure 2A, it is obvious that the slope of high cooperation is significantly greater than the low cooperation in the CEA’s effect on CEM, indicating that if we take into account certain environmental awareness, the higher the expected cooperation, the more likely to green awareness turning into environmental management behavior. According to Figure 2B, in the CEA’s influence on ETI, the slope of high cooperation is clearly greater than that of low cooperation, proving that under certain environmental awareness, the higher the expected cooperation, the more likely to translate environmental awareness into environmental technology innovation behavior, which shows that SCE has a positive moderate impact on the relation which CEA affects CEM and ETI.

### **Discussions**

Our research results prove that there is a significant positive relationship between corporate environmental awareness and green behavior. The effect of CEA on ETI is stronger than that of CEA on CEM, which indicates the importance of CEA to corporate green development. Moreover, the correlation coefficient, which is 0.72 in our estimations between CEA and CGB, is still relatively high, while that in foreign scholars is generally between 0.14 and 0.45 (Wen, Hou, & Zhang, 2005). We believe that the reasons for this difference may be that the environmental awareness of Chinese companies is mainly affected by the seniors – they directly affect the implementation of environmental protection. Of course, we do not rule out some reasons for the sample data may be that the questionnaire itself has a certain subjectivity; under the background that everybody is generally concerned about environmental protection, the survey may have modified their environmental behavior.

Our research also demonstrates that SCE is expected to have a significant positive moderate role in the relationship between “CEA - CGB”, which is consistent with several findings of Shrivastava (1995) and Zhang and Zhang (2013), since they believe that the green behavior of enterprises is affected by the pressure of stakeholders. In fact, stakeholders have a supporting role in corporate green behavior in addition to stress

(Shi, Zhang, Yang, & Meng, 2012). A lot of previous research illustrates that firms are often under stakeholders' pressure to deal with environmental behavior passively (Henriques, & Sadosky, 1999). Stakeholder collaboration conduces to improve regional environmental governance performance to a degree (Li, Ma, & Zou, 2016). On the basis of these analyses, we propose that government, consumers, competitors, upstream and downstream enterprises in the supply chain, and other stakeholders form joint actions together in order to enable corporation to reinforce active green strategy.

### **Conclusion and Suggestions**

Based on behavioral process theory, we used 219 resource-based enterprise survey data to conduct empirical research on the relationship between corporate stakeholders' expectancy, environmental awareness and green behavior. The results showed that corporate environmental awareness has a significant positive impact on green behavior, and stakeholders' cooperation is expected to have a significant effect on the relationship between these two former factors. The theoretical model of this study reflects the importance of corporate environmental awareness and the social network characteristics of enterprise green behavior and has certain contribution to theory and practice.

There are two main theoretical innovations in our insights. Firstly, we conducted an empirical study on the relevance and its level of environmental awareness and green behavior in China's resource-based enterprises. Secondly, this paper puts forward the concept of stakeholder cooperation from the perspective of decision-making subject and demonstrates the mechanism of stakeholder cooperation expectation to corporate green behavior. Compared with past research emphasizing the stakeholder pressure perspective, this study put eyes on the stakeholders' cooperation and the importance of their behavioral collaboration, reflecting the social characteristics of corporate green behavior. Our research enriches the theory of corporate environmental behavior to a certain extent. This paper provides corresponding suggestions for further promoting the green transformation of enterprises.

#### ***More Scientific Government Supervision and Improve the Regulatory Restraint Mechanism***

To drive enterprise green transformation and development, in addition to incentive and restraint mechanisms, the mandatory role of regulation is also essential. China's environmental laws and regulations are increasingly perfect, but have poor implementation. The government should establish a supervision system containing corporate self-examination, government inspection and public supervision, such as the establishment of enterprise green development report registration system, improve the Internet monitoring corporate environmental behavior system, the functional departments' inspection system and the public reporting system to reduce the information asymmetry caused by market failure. To enhance the business environment responsibility system, establish a corporate environmental credit file system.

#### ***Strengthen the Corporate Green Development Support System***

Coordinating the relevant departments through a variety of ways to recognize constraints of corporate green behaviors, the government should pay enough attention to the role of industry associations in green technology, information exchange and cooperation. Encourage the use of third-party professional green management company to promote green management. Build a green technology innovation system that is composed of government, business and scientific institution as the government plays a leading effect in the promotion and promotion of major green technologies. Accurately utilizing the system which contains resources and environmental protection technology innovation and demonstration base constructions rewards and promotes the advanced enterprises that have better green behavior performance to provide a

learning and spillover effect. Reinforce the financial policies for the corporate green development, set up special support funds to solve other problems that lack capital and have high cost, and speed up the construction of the adoption of environmental credit assessment of the loan rating mechanism.

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# The Strategies of Integrating Green Management and Business Model Innovation

**Wei Yu-Chen**

*Shandong University of Finance and Economics, Jinan, China*

**Zhang Cai-Xia**

*University of Jinan, Jinan, China*

Email: se\_zhangcx@ujn.edu.cn

**[Abstract]** *Environment management strategies are more important in the new environmental era. Many environmental programs are introduced by corporations to gain or maintain competitive advantages. The objective of this paper is to extend the environmental management framework of the green value chain model by business model innovation. Besides presenting the fundamental elements of the traditional business model. It redesigns a three-layer business model and adapts the business model canvas as a useful tool towards achieving and maintaining the sustainable business model.*

**[Keywords]** *sustainable business model; three-layer business model; green value chain; environmental performance*

## Introduction

Climate change is top mind for both governments and executives. Moving to a low carbon development model is now a common economic topic of discussion especially in the carbon-intensive manufacturing, energy, transportation, and real estate industries of China. This trend is drawn mainly from the authority pressure of the government, from the competitive forces in the market, and from the growing financial constrains for the businesses. The new environmental era represents a new challenge to businesses worldwide. The challenge is to introduce effective methods of which economic development and environmental protection symbiotically coexist. To meet the challenge, the numbers of corporations who integrate environmental practices into their strategic plans and daily operations is continuously increasing. The establishing of a new business model for sustainable development in China is needed urgently, and this should be a joint effort with the Chinese government (Birkin, Cashman, Koh, & Liu, 2009). Both researchers and practitioners have paid an increasing attention on integrating environmentally-sound alternatives into the managerial plans and production processes, but a broad frame of reference for a sustainable business model has not yet been adequately developed. The aim of this paper is to establish holistic thinking on sustainable technological solutions and how they are integrated into the value chain model as a strategy for supporting low carbon design and improvement via the powerful business model innovation.

This paper explores a few relevant models in the second section. Qualitative analysis is applied to the components and elements of sustainable value chain management and how they serve as a basis for sustainable business models. The third section portrays how the corporations should innovate their business models in capturing value and developing sustainable strategies. Finally, this paper draws certain conclusions and identifies potential issues and opportunities in the realm of sustainable business model.

## Models for Low Carbon Management

Increasing numbers of corporations in the manufacturing industries have identified market potential for implementing environment management (EM). The current philosophy of EM is moving towards industrial ecology; the chosen methods and their characteristics are shown below in Table 1. The existing models provide a background for the sustainable value chain management.

**Table 1. Stage and Models of Environmental Management**

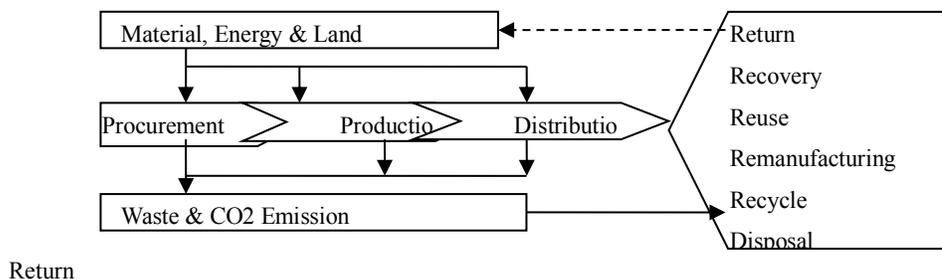
Time Period	Models	Primary Characteristic(s)
Late 1960's – mid 1980's	End-of-Pipe Pollution Control	Pollution problem solving Manage to compliance with the law provisions
Mid 1980's – mid 1990's	Pollution prevention	Manage to reduce sources and minimize the waste Product stewardship “Eco-efficiency”
Mid 1990's – mid 2000's	Green Supply Chain	Manage to deliver the right product at the right time, with the right cost Concerning the entire product life cycle from cradle to cradle
Mid 2000's – mid 2010's	Green Value Chain	Manage to get continuous value stream from the value chain Concerning the welfare of key stakeholders

Source: Adapted from Kolk, A., & Mauser, A. (2002).

## Green Value Chain Strategies: Framework and Indicators

### *From Green Supply Chain to Green Value Chain*

When managers make decisions, they have to take into account the internal and external environmental implications and linkages between the economic activities and the environmental performance. Since the 1990's, increasing public attention has been given to the product life cycle, which typically includes procurement, production, distribution, logistics and packaging. That is, manufacturing and production process are viewed as the most harmful to the environment, in the forms of material consumption, energy depletion, waste generation, and ecosystem disruption. Therefore, the supply chains have to respond to these environmental pressures such as regulations, consumer demands, and limited resource availability, and become greener (see Figure 1). The attributes of the green supply chain management (GrSCM) involve a paradigm shift from end-of-pipe environmental control to meet regulations and pressures to the situation to not only lead to overall economic profit, but also to minimize ecological damage.



**Figure 1. Green Supply Chain with Environmentally Influential Practice – A Closed Loop**

However, the dynamic international competitiveness paradigm reveals that the relationship between environmental goals and industrial competitiveness should not be thought of as involving a tradeoff between social benefits and private costs, and not resting on static efficiency or on optimizing within fixed constraints, but on the capacity for innovation and improvement that shift constrains. The ultimate

objective of a sustainable value chain is to consider all environmental effects of both value-added and non-value-added activities from internal to external logistics, to firm infrastructure, to the goods and services provided, and to the recovery operation of the energy, material and waste. Products pass through all activities of the chain in order, and at each activity the product gains some value. The chain of activities gives the products not only more added value than the sum of the independent activities' values, but also lower net cost of meeting environmental regulations because reducing pollution is often coincident with improving the productivity with which resources are used. Therefore, the green supply chain management can be viewed as an example of the sustainable value chain management.

The sustainable value chain framework (see Figure 2) outlines manufacturing-related activities and responsibilities of partners, manufacturers, customers, and other stakeholders. These activities may occur before, while, and after a specific product is delivered to a specific customer. The framework is based on the following assumptions: the business can lower costs and risks by eliminating waste at the source or by using it as useful input, there is potential to realize major improvements through new disruptive technology, reputation and legitimacy can be built by engaging a broader range of stakeholders, the corporations' vision focus on serving the unmet needs and direct them toward the solution of social and environmental problems.

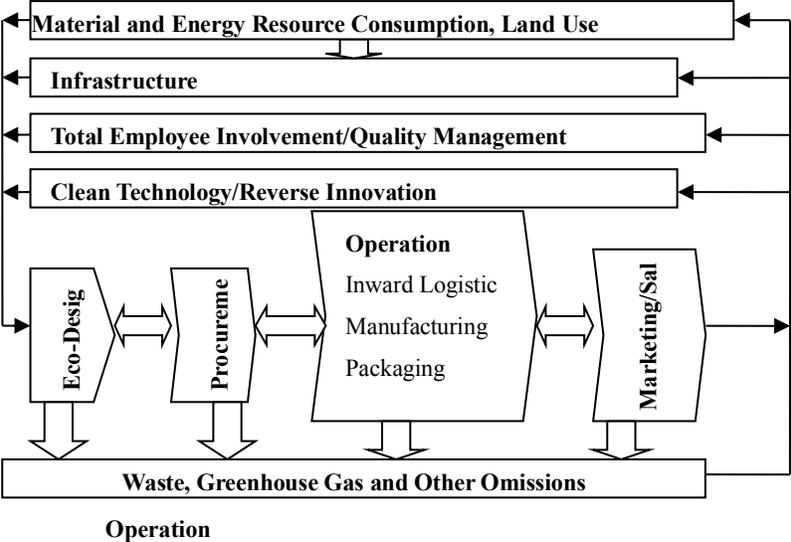


Figure 2. Green Value Chain Management Framework

**Performance Evaluation**

The evaluation of sustainability in value chain is an enabler to quantitatively measure performance in sustainability in specific processes, usually involves four phrases structure of plan, action, check, and do (PDCA cycle). The components of sustainable value chain evaluation system should include sustainable indicators and metrics repository, measurement methods, guidelines, and sustainability performance analysis and report. The main purpose has to be for internal decision-making and external accountability reporting.

There are many within-corporation or international attempts to measure and analyze the performance of the environment, society, and economy sustainability by developing quantitative and/or qualitative indicators, for example, GM 46 Metrics for sustainable manufacturing, Environmental 60 indicators for

European Union, and so on. They provide a tool for decision-making in multi-levels of management, operation, and internal or external stakeholders. According to the fifth level of Veleva, et al.'s (2001) Sustainable Production Indicator, the measurement of sustainable value chain involves not only addressing environmental and ethical or social problems of production, but also related ecological product design, marketing and the state of support activities such as infrastructure, human resources management and technology. Typical metrics for measuring value chain performance include scrap or non-product output, materials use, hazardous materials use, energy use, water use, air emissions, hazardous waste, and water pollution, to name some: Carbon emissions (tons CO<sub>2</sub> Equivalent), air pollution emissions (tons or kg), liquid waste generate (tons or kg), solid waste generate (tons or kg), and percent recycled waste (percent). Differentiated from the green supply chain, green value chain indicators tend to be more inclusive than the previous set of performance measures and focus more directly on showing trends concerning crucial processes before and after the product manufacturing. The measurement operation sequence has to be logical and traceable so that it can be repeatable and comparable in the time dependent product value chain. Therefore, designers can track the sustainability performance with indicators via standard based repeatable measurement methods, and access measured metrics via various design analysis tools and use the results in their decision-making processes for ecological technology innovation.

### **Sustainable Business Model Innovation**

#### ***Re-Purpose and Redesign the Business Model for Sustainability***

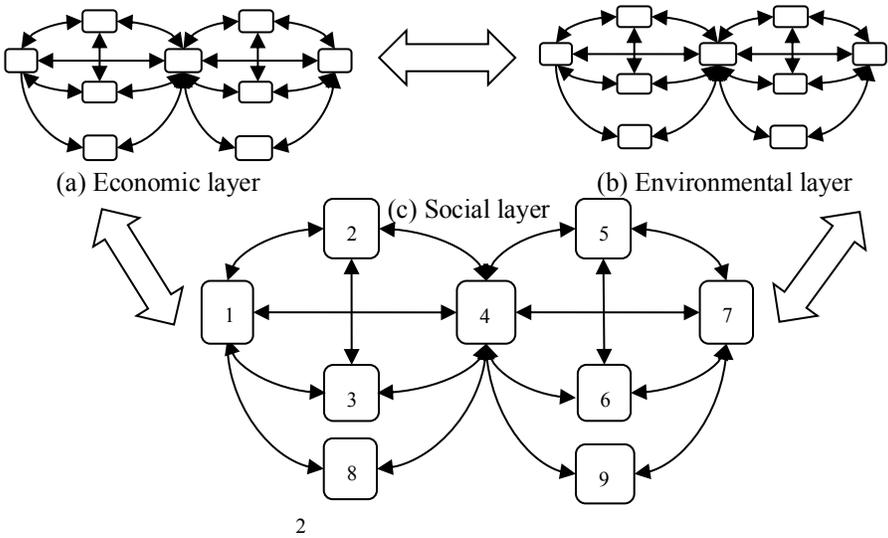
Whenever the low carbon management is integrated, it either explicitly or implicitly employs a particular business model. The concept of the business model first appeared in the 1950s, but only became prevalent in the 1990s with the advent of the internet; it describes the rationale of how an enterprise creates, delivers, and captures value in economic, social, cultural or other environments. In essence, a business model is a conceptual model that articulates the logic and provides data and other evidence that demonstrates how a business creates and delivers value to customers, and makes a profit (Teece, 2010). The different elements that need to be determined in business model design are:

- Select technologies and features to be embedded in the product/service
- Determine benefit to the customer from consuming/using the product/service
- Identify market segments to be targeted
- Confirm available revenue streams
- Design mechanisms to deliver value
- Design mechanisms to capture value

However, business models are necessary features of market economies where profit seeking firms endeavor to meet consumer wants within changing markets, technologies and legal structures. Shareholder value (economic profit) maximization is not the only benefit that an enterprise creates, delivers, and captures. The value should be for all stakeholders, including society and nature, within the value network and the new business models should both facilitate and represent prioritizing delivery of social and environmental benefits through close integration between the firm and all other stakeholders group with low carbon management strategies. Furthermore, the creation and delivery of social value in addition to economic value is seen as a main driver of social entrepreneurship, such as footprint reduction, poverty alleviation, fair distribution, waste reduction and transparency, and their associated business

strategies – understood as clean technology, sustainability vision, pollution prevention and product stewardship – can take forward the capture of sustainable value for the business. Long run enterprise success is a consequence of balancing both the competing and complementary merits of multiple stakeholders, including social and natural environment, to increase the opportunities of superior and sustainable competitive positioning.

The redesign of business models enables the reconfiguration of business capabilities to adapt the firm to the changing business environment, so that the business models can be seen as a voluntary vehicle of innovation for sustainability purpose which requires more integrated thinking and the reconfiguration of several business aspects such as capabilities, stakeholder relationships, knowledge management, leadership and culture. Thereof, the traditional business model canvas is extended into three layers (Joyce & Paquin, 2016): economic profit layer, environmental life cycle layer, and social stakeholder layer of sustainable business model as shown in Figure 3. The numbers 1 through 9 in the first economic layer represent: 1 – Partners; 2 – Activities; 3 – Resources; 4 - Value Proposition; 5 - Customer Relationship; 6 – Channels; 7 - Customer Segments; 8 – Costs; and 9 - Revenues. In the second environmental layer. the numbers represent: 1 - Supplies and Outsourcing; 2 – Production; 3 – Materials; 4 - Functional Value; 5 - End-of-life; 6 – Distribution; 7 - Use Phase; 8 - Environmental Impacts; and 9 - Environmental Benefits. And the numbers represent: 1 - Local Communities; 2 – Governance; 3 – Employees; 4 - Social Value; 5 - Social Culture; 6 - Scale of Outreach; 7 - End-Users; 8 - Social Impacts; and 9 - Social Benefits in the third layer of social stakeholders. The three-layer business model is actively managed in order to create customer and social value by integrating social, environmental, and business activities which can be measured or at least argued for.



Source: Based on ideas in Evans et al. (2017).

Figure 3. Sustainable Business Model

**Sustainable Business Model Innovation**

As proactive strategies feature radical changes to the core business logic of a company, a major number of business model elements will be affected, and business model innovations may be required to support a systematic, ongoing creation of business cases for sustainability. It is not only achieved through

innovation in technologies, products or services, but also through business model innovation. The business model innovation concentrates on new ways to create competitive advantage through superior customer value and contributes to the sustainable development of the company and society. For example, sales and profits are improved by environmentally and socially outstanding products and services, leading to not yet available value propositions. Cost and efficiency-oriented measures are applied to support the new products and services and to gain competitive advantage through sustainability performance, which in turn pays in terms of risk management, reputation and corporate brand value. As innovative drivers unfold their full potential the company becomes increasingly attractive to high-skilled employees. Business model innovation has certain advantages for improving sustainability compared to technology innovation alone. Technology innovation is constrained to a specific industry, while business model innovation can be applied across a wide range of industries. Therefore, a company can make use of new business models from other companies, industries, and/or even competitors.

### **Conclusion and Implication**

In the past 40 years, China has followed the industrializing footsteps of the Western World. The environmental problems have become critical and urgent in the process of modernization and industrialization. However, changes in the state of the environment and globalization have led to subsequent public pressure and environmental legislation and called for a shift in research and practice in business strategies from a green value chain to a sustainable business model. It has evolved from defensive strategic management to protect the current business model, to accommodative strategic management to experiment within the given business model, and to proactive strategic management leading to business model redesign in the focused sense. Business model innovations as a result of business model management can be broad or focused. Therefore, it is suggested that competitive advantage grows out of the way corporations organize and perform discrete activities in sustainable business model which should be measured by the environmental indicators. Accommodative and proactive sustainability strategies may help creating and adopting new business models which support the continuous and systematic creation of values for sustainability.

### **Acknowledgement**

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# Study on the Development Path of Ecological Agriculture in the Western Suburbs under the Background of Eco-City Construction

**Ma Yunchao and Zhang Dan**

*School of Economic and Management, XI'AN University, Xi'an, China*

Email: 724709941@qq.com

*[Abstract] Suburban ecological agriculture has to promote an ecological balance, improve the ecological environment; promote suburban economic development, improve farmers' income, and enhance the ecological civilization awareness of urban and rural residents. Under the background of eco-city construction, the western region should promote the construction of urban ecological civilization by vigorously developing suburban ecological agriculture, improving the quality of the urban ecological environment, absorbing the surplus labor force in the suburbs, cultivating ecological culture, and raising the ecological protection consciousness of urban residents and suburban residents.*

*[Keywords] urban ecological agriculture; ecological city construction; western region*

## Introduction

Ecological agriculture is a new type of modern agricultural development model, which focuses on the ecological system of ecological self-maintenance, low input, recycling, and high efficiency to achieve economic and ecological benefits of unity. Eco-city construction is inseparable from the development of ecological agriculture, and for the western region, the development of ecological agriculture is particularly important. Li, & Yuan (2007) elaborated the realization mechanism of eco-agriculture industrialization from the agricultural ecological production process. Tu Jun (2009) introduced the advantages and disadvantages of industrialization of ecological agriculture in western China. Cheng Xinjie (2014) used the Sujiatun District of Shenyang City as a research object, and this paper elaborates on the connotation of eco-agriculture tourism and makes an empirical study on the development of eco-agricultural tourism in this district as well. Based on the analysis of the status quo, conditions and resource evaluation of tourism development, and Development Strategy of Agricultural Tourism, Luo Shiming (2017) analyzed the advantages and challenges of China's agroecological transition, and this article puts forward a strategy of agro-ecological transition in our country for the future. It is not uncommon for academia to study eco-agriculture. However, with the background of eco-city construction in the west, it is still a lack of discussions on eco-agriculture construction, which is also the significance of this article.

The western region is the birthplace of important rivers such as the Yellow River and the Lancang River. It is also the birthplace of the Northwest monsoon. Therefore, the ecological environment in the western region will be directly related to the environmental quality of the central and eastern regions, and the western region itself is a gully, has serious soil erosion, the desertification phenomenon is frequent, and it is a fragile ecological environment, so it is only through the vigorous development of an ecological agriculture, especially the development of suburban ecological agriculture, can this region improve the quality of ecological environment, so as to promote the construction of eco-city.

## **Analysis on the Relationship between the Construction of a Western Ecological City and a Suburban Ecological Agriculture**

Suburban ecological agriculture is an ecological agriculture developed in the suburbs of neighboring cities. As the suburban agriculture approaches the city, its development is influenced by urban activities and will also have a corresponding influence on the city. Suburban ecological agriculture is characterized as follows: First, as the public transport system is developed, it is easy to develop eco-agricultural tourism. Modern urban people place more emphasis on physical and mental relaxation, and on the weekends they are willing to be close to nature and breathe fresh air, in order to achieve the purpose of health – both physical and mental. The urban public system is close to the city, so it is convenient to develop ecological agriculture tourism. Small, it will have year-round tourists come to the area. Second, the transport infrastructure is good, allowing for easy transport of fresh agricultural products. Suburban transport infrastructure is better, and the city has a greater demand for fresh produce, so suburban eco-agricultural products have a greater market and advantages. Third, the suburban ecological agriculture and the city between the greater impact. As the geographical position and the city adjacent to the development of the suburbs of the larger efforts, and it is easy to be devoured by the pressure of the city, the development of suburban ecological agriculture on the one hand will serve the supply of urban agricultural products to maintain green landscape, and protect the ecological environment. On the other hand, it will also take initiative to integrate with the city, develop the ecological agriculture park, leisure farm and other new business models.

Suburban ecological agriculture has many important roles. First, it should promote an ecological balance, and improve the ecological environment. Suburban ecological agriculture is good for the theory of ecology to guide agricultural production, combined with the essence of organic agriculture and agricultural modernization in the scientific and technological achievements, to avoid environmental pollution and resource consumption, to adjust the physical and chemical properties of the soil, purify the city water quality, reduce the air Dust and other particulate matter, through the green plant purification of air, improve air quality. Ecological agriculture, in the construction of eco-agricultural parks, artificial green landscape and so-formed tourism and leisure industry, an important support, has become a city beautification environment, the green part of the city, in promoting a harmonious urban environment, and sustainable development plays an irreducible lack of role.

Second, to promote suburban economic development, we need to improve farmers' income. Urban and rural areas in the suburbs reflect the most obvious areas, close to the suburbs of the city usually there will be a large gap between rich and poor; one side are high-rise buildings. While there are small houses, this phenomenon is not only common in the western suburbs. In the vicinity, it is mainly because in the outskirts of the urban areas there is less rural arable land, so the per capita land area is far less than the outskirts of rural areas, and land, human resources and other elements come at a higher cost. So the outskirts of the rural areas are generally underdeveloped. There is also a greater gap in per capita income than the city. If we can develop ecological agriculture, we can improve the land use efficiency, so as to improve the economic benefits of agriculture (Zhang Feng, 2016). On the other hand, the related industries such as tourism, leisure and entertainment, which are based on ecological agriculture, can also absorb the employment of rural laborers. Achieving a diversified income of farmers, will thereby increase their income levels.

Third, enhance the ecological awareness of urban and rural residents. Ecological agriculture and its associated leisure and cultural industries have the effect of propagating ecological civilization knowledge and improving the awareness of ecological civilization of urban and rural residents. On the one hand, by

participating in the activities of ecological agriculture construction and related industries, the suburban farmers realize the economic benefits and the ecological benefits brought by ecological agriculture. Through the development of ecological agriculture and the living environment, the per capita income is increased, and the infrastructure construction is developed, which will promote them to pay more attention to the construction of ecological civilization, so as to support the relevant ecological civilization construction activities. On the other hand, the public will travel to the suburbs for sightseeing, tourism, to experience the pastoral life, harvest physical and mental health, and also learn the knowledge of agriculture and environment, and understand the importance of ecological agriculture, thus deepening the understanding of ecological civilization.

Since the implementation of the western development policy in 2000, the state has increased capital investment and policy support to the western region. After 17 years of development, the western region strengthened its infrastructure construction, and the three industrial structures have been optimized and upgraded. At the same time, with the Sanjiang for protection, returning farmland to forest and grass, natural forest protection projects and other ecological protection projects, the western region of the ecological environment has been protected, and so ecological and environmental awareness has been improved. First, the local government attaches importance to the construction of an ecological civilization. According to the “China Green GDP Performance Assessment Report” released in 2017, the top ten indicators of China’s green development performance in 2015 ranked fifth and seventh, respectively, in Chongqing and Tibet. Sichuan also entered the top ten green GDP, ranking seventh (China Green GDP Performance Assessment Report, 2017). For example, in 2014 Urumqi City created an ecological civilization model city, titled, Shaanxi Province, and founded the “Shaanxi Province, the construction of ecological civilization.” Xi’an proposed the construction of the “quality of Xi’an” slogan. Second, industrial pollution emissions have declined. With the application of new technologies and new methods, the emission of sulfur dioxide in western China has been declining yearly. The total amount of industrial waste water discharge has been lower than that of the eastern part of China, and the overall stability has been maintained. The total output of industrial solid waste has increased yearly, but industrial solid waste emissions are decreasing yearly. Third, energy efficiency continues to increase. With the technology, capital, talent and other inputs continue to invest in the field of ecological environment, the western region of water, land and other resources to improve the efficiency of GDP energy consumption decreased yearly. GDP energy consumption is a major indicator of energy consumption and energy saving, indicating the extent of energy use in a region’s economic activities, reflecting changes in economic structure and energy efficiency. The western region GDP energy consumption decreased yearly, with individual provinces such as Gansu’s million-yuan GDP energy consumption being lower than the national average.

But the problems in the construction of an eco-city in the western region are as follows: First, the contradiction between industrial development and ecological resource protection is still outstanding. Because of the lack of funds and talents in the western region, its development has long relied on abundant natural resources and is an extensive economic development model. Resource development and raw material processing occupy industry dominance, especially heavy industry with some pollution in most western provinces. The consumption of natural resources is also expanding, including the pollution of water resources and consumption, emissions, and occupation of arable land; and natural resources are limited and non-renewable. The ecological resources of the protection and economic development between the contradictions of the reconciliation are in trouble (Yu, & Ning, 2014). Second, poverty leads to individual regions at the expense of the environment for economic growth. Although the construction of urban

ecological civilization has been the attention of the western provinces, and they have implemented the relevant policy measures, but due to the western region between the provinces and cities between the economic development, resources and environment there is a large gap between the individual areas due to particularly backward economic, local government officials based on the pursuit of economic growth and performance, resulting in “short-sighted” behavior, and they continue to take a “first pollution, post-governance”; in the old way, the city’s environmental pollution enterprises would take any of the phenomenon of pollution. There have been ecological supervision departments in name only, leading to a vicious cycle of economic and ecological environment. Third, the residents of ecological construction participation is low. The western region itself is in underdeveloped areas, and the per capita income and income of GDP rank in the lowest of the national rankings. And an underdeveloped economy is accompanied by an inadequate investment in education, residents generally do not have a high education level, lack ecological protection awareness, take the initiative to participate in ecological construction will be lower. Even if many people in urban areas are busy with their livelihoods and have no time to take into account the pollution of environmental pollution, even if they worry about and pay attention to environmental pollution problems, many people think that environmental pollution is mainly from industrial sewage, and that ecological environmental protection and the construction of the responsibility should also be mainly the government’s commitment; they feel individuals cannot have too great of effect on the construction of the environment, and the willingness to pay for the construction of the ecological environment is not high.

### **Suburban Ecological Agriculture Path Selection & Ecological Construction**

Strengthening the protection of resources and environment and enhancing the quality of the ecological environment are the future developments of an important strength aspect of the city. The main goal of an eco-city construction is to improve the efficiency of resource utilization, to strengthen the level of ecological protection, and build the city into a complex system of artificial environment which is harmonious with nature. This will improve the quality of cities and realize the coordinated development of ecology, economy and society. The goal of ecological agriculture construction is to improve the efficiency of land resources utilization, to maintain the efficient, sustained and stable development of agriculture, to realize green pollution of agricultural products and to promote the unity of ecological, economic and social benefits. It can be seen that the goal of eco-agriculture and eco-city construction is unified. By developing the ecological agriculture in the suburbs, the ecological quality of the city can be improved, and the ecological quality of the city can be promoted by providing the ecological quality of the city.

First, vigorously develop suburban ecological agriculture, enhance the quality of urban ecological environment. Vigorously support the development of suburban ecological agriculture, in the urban suburbs to establish eco-agricultural park, through the provision of start-up capital, tax incentives, and farmland circulation, etc., to promote the formation of eco-agriculture industry, through industrial agglomeration effect, and promote suburban leisure and tourism development, so as to enhance the level of local economic development, through the development of ecological agriculture to promote suburban eco-environmental quality improvement, thereby enhancing the city’s environmental quality.

Second, through the development of ecological agriculture to absorb suburban surplus labor, improve the income level. Urban local governments can plan ecological construction projects according to local resources and environment characteristics, and earnestly pay attention to and protect the vital interests of suburban residents. In the process of developing ecological agriculture and building ecological projects, we

can provide more employment opportunities for local residents to participate in which to raise their income levels. In short, allow residents to share the development of ecological agriculture and ecological construction of the results, so as to stimulate the autonomy of resources to participate in the ecological environment construction initiative.

Third, through ecological agriculture development of ecological agriculture tourism, cultivating ecological culture, and improving urban residents and suburban residents of ecological protection awareness, is conducive to promoting the construction of urban ecological civilization (Jin, & Yang, 2012). In the process of developing an ecological agriculture, on the one hand, we need to attract local residents' employment, and on the other hand, we need to attract urban residents' travel, an eco-agriculture park for employees and tourists to carry out ecological education and ecological science activities, and the popularization of ecological civilization construction knowledge. At the same time, encourage the public to participate in the ecological environment construction, cultivate the public ecological and environmental protection consciousness and enthusiasm, so as to help establish its ecological responsibility.

### Conclusion

In short, the process of building an ecological city in the west is a very good way to vigorously develop the agriculture in the suburbs so that it will be able to provide more employment opportunities, raise the income of residents, cultivate the ecological culture and enhance the residents' ecological protection awareness through the development of suburb ecological agriculture, and promote the process of building ecological civilization city.

### Acknowledgement

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# Research on the Influencing Factors of the Development of Green Finance in P2P Lending Platforms\*

Jialin Fu and Yantian Fan

Zhengzhou University of Light Industry, Zhengzhou, China

Email: 891908604@qq.com

*[Abstract] Within China's new normal economy, the idea of green finance has been accepted and practiced in the financial industry. In recent years, the peer to peer (P2P) lending industry develops rapidly, and it is an important force to promote the development of green finance. In this paper, factor analysis is used to study the influencing factors of the development of green finance in P2P lending platforms. The research shows that the main factors include risk management, external supervision, and products or services. The countermeasures and suggestions are put forward based on this conclusion.*

*[Keywords] P2P lending platforms; green finance; factor analysis; China*

## Introduction

Green finance is also known as low carbon finance, environmental finance and sustainable finance. Guo and Chenzi (2012) considered that it originated from the financial action of the United Nations Environment Program. It means that financial institutions and organizations use relevant financial products and services to support environmental protection, energy use and other series of financial activities aimed at using diversified financial instruments to protect the ecological environment and biodiversity. By guiding the distribution of socio-economic resources, economic and social sustainable development will be promoted.

China is also actively advocating and practicing green finance, striving to build a sound financial policy. In September 2015, the "Overall Plan for the Reform of Ecological Civilization System" was issued, and China was the first to establish the top design of a green financial system for the first time. In March 2016, the "13th Five-Year Plan" saw the construction of a green financial system at the national strategic level (Wang, & He, 2016). Soon after, Premier Li Keqiang highlighted the need to vigorously develop a green finance and inclusive financial system in his government work report (Wang, X., 2017). Undoubtedly, the development of green finance cannot be separated from the P2P lending industry. As a typical representative of China's Internet finance, the P2P lending industry will respond to the government's call to develop green finance.

## Literature Review

Domestic and foreign development of green finance process and content is so different that domestic and foreign scholars' focus on green finance is also different. The research direction of foreign scholars has focused on the connotation of green finance, the pricing of green financial instruments, and the influence on the development of financial enterprises. Salazar (1998) pointed out that green finance is a financial innovation that seeks environmental protection path and a bridge between the financial industry and the environment. Brennan and Schwartz (1985) considered the cost of natural resources and put forward the calculation method of closed and open first-order enterprise option price. On this basis, Cortazar and

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Schwartz (1993) expanded the calculation method of first-order enterprise option price. Scholtens and Dam (2007) analyzed and compared 51 financial firms implementing the “Equator Principles” and 56 unfinished financial firms. The findings found that financial firms implementing the “Equator Principles” had a stronger sense of social responsibility and were able to win higher social reputation.

In contrast to foreign scholars, domestic scholars started late on green finance. On one hand, they learned from foreign related research; on the other hand, they also took into account the basic situation of our country. In China, scholars who think the development of green finance is beneficial to the economy, have reached a consensus on the necessity of implementing green finance in society and environment. Internet finance, as China’s forward position of financial industry innovation, whose relationship with the green finance is very close, will be the better carrier to promote China’s green finance. Lou Feipeng (2015) and Chara, et al., (2017) feel that P2P lending industry is an important force to boost the development of green finance with its advantages of lower transaction costs, wider area range, and more flexible lending ways. Mai Junhong and Xu Feng (2015) used the joint analysis method and found that the main factors influencing the development of green finance in financial institutions include the credit risk, the industry characteristics and the external supervision.

In summary, with the rapid development of green finance and its increasing influence on social and economic life, it is very important to understand and study the connotation of green finance. At present, the P2P lending industry developing green financial is still in the transition from concept to practice. Although some progress has been made in terms of cognition and experience, the research results on practice, such as the platform construction of green finance, the direction of choice and analysis of actual problems, etc., are relatively small and not mature. These problems to a certain extent may affect P2P lending industry’s development of green finance at a deeper level.

### **Building Indicators of Influencing Factors of P2P Lending Platforms Developing Green Finance**

The development of green finance of P2P lending platforms is a multi-win-win situation. From the platform point of view, it can obtain high-quality project resources, and from the perspective of environmental protection enterprises, they get enough financial support. From the perspective of investors, they also contribute to environmental protection while obtaining the fixed income, and from the society point of view, the solution of the series environmental problems also provides strong support for China’s green economy. In addition, Ma Jun (2015) considered that China’s green finance needs at least \$2 trillion a year for the next five years, with the government budget being only 10% to 15%, so the remaining 90% to 85% will require private investment. This provides chances for the introduction of green finance to China’s P2P lending platforms.

#### ***Selection of Indicators***

P2P lending platforms developing green finance mainly cover 3 parts: green environmental protection enterprises, government and investors. So, the corresponding influencing factors are roughly from these stakeholders. On this basis, this text takes the social responsibility, the endogenous power of the platform, the platform strength, the compliance, the risk control, the platform information disclosure, the bad debt rate, the supporting mechanism of government, the external supervision, the executive team, and the products or the services as the main research variable respectively, with X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11 to represent.

### ***Sample Selection and Data Acquisition***

Questionnaires were used in the text to test the rationality of the above indicators. In the selection of the sample, as much as possible choosing the employees who have a certain background with the relevant professional knowledge and investors of P2P lending industry. The questionnaires were sent by WeChat, Tencent QQ, E-mail and other methods. A total of 198 questionnaires were collected and 190 valid questionnaires were obtained after removal of the invalid questionnaires. The effective rate of questionnaires was 95%.

## **Data Analysis**

### ***Applicability Test***

In this paper, through testing, the KMO value is 0.686, which is an acceptable level, indicating that the 11 indicators are more suitable for factor analysis. At the same time, the Sig value of the Bartlett Sphericity Test is 0, which is less than 0.01, indicating that there is a significant correlation between the variables.

### ***Factor Extraction and Rotation***

The closer the communality of the variable is to 1, the higher the degree of interpretation of the variable by the common factor is, the better the factor analysis will be. Table 1 shows the results of each variable covariance extraction. The results show that the commonality of other variables is very high, except for the product or service indicator variable, indicating that the results of the factor analysis are valid.

**Table 1. Communalities**

<b>Component</b>	<b>Initial</b>	<b>Extraction</b>
X1	1.000	0.762
X2	1.000	0.847
X3	1.000	0.713
X4	1.000	0.769
X5	1.000	0.928
X6	1.000	0.931
X7	1.000	0.894
X8	1.000	0.589
X9	1.000	0.870
X10	1.000	0.731
X11	1.000	0.856

In order to simplify the data, we have selected fewer public factors from eleven factors to reflect the information of the original variables as soon as possible. In this paper, the factor analysis method was used to reduce the dimensionality. When the number of factors is three, the cumulative variance of the explanation is 80.09, which indicates the information of more than 80% can be explained by these three factors. After the extraction and rotation, the variance contribution value of each factor has changed, and each value is closer, but the cumulative variance contribution rate is not changed. In this way, the indicators are concentrated, while retaining the original information of the indicators. The specific results are shown in Table 2:

**Table 2. Total Variance Explained**

	Initial Eigenvalues			Extraction sums of squared Loadings			Rotation sums of squared Loadings		
	Total	% of Variance	Accumulated %	Total	% of Variance	Accumulated %	Total	% of Variance	Accumulated %
1	5.008	45.528	45.528	5.008	45.528	45.528	4.229	38.443	38.443
2	2.370	21.549	67.007	21.549	21.549	67.077	2.790	25.366	63.808
3	1.511	13.732	80.809	13.732	13.732	80.809	1.870	17.000	80.09
4	0.992	9.021	89.830						
5	0.388	3.523	93.353						
...	...	...	...						
1									
1	0.020	0.183	100.000						

**Factor Score and Evaluation**

**Table 3. Component Score Coefficient Matrix**

	Component		
	1	2	3
X1	-0.015	0.093	0.358
X2	-0.074	0.247	0.274
X3	0.176	0.056	-0.021
X4	0.235	-0.010	-0.121
X5	0.256	-0.150	-0.019
X6	0.238	0.029	-0.103
X7	0.230	-0.048	-0.007
X8	-0.012	0.236	0.090
X9	-0.069	0.354	-0.226
X10	-0.003	0.312	-0.085
X11	-0.106	-0.102	0.564

As we can see, in Table 3, the score coefficient matrix shows that the main factors affecting the development of green finance include risk control, external supervision, and products or services. Their characteristic values are 0.256, 0.354, and 0.564 respectively. Therefore, the scores of the common factors are obtained as follows:

$$F1 = -0.015X1 - 0.074X2 + 0.176X3 + 0.235X4 + 0.256X5 + 0.238X6 - 0.230X7 - 0.012X8 - 0.069X9 - 0.003X10 - 0.106X11$$

$$F2 = 0.093X1 + 0.247X2 + 0.056X3 - 0.010X4 - 0.150X5 + 0.029X6 - 0.048X7 + 0.236X8 + 0.354X9 + 0.312X10 - 0.102X11$$

$$F3 = 0.358X1 + 0.274X2 - 0.021X3 - 0.121X4 - 0.019X5 - 0.103X6 - 0.007X7 + 0.090X8 - 0.226X9 - 0.085X10 + 0.564X11$$

**Conclusion and Suggestions**

From what has been discussed above, we can predict that in the process of P2P lending industry developing green finance, it is important to pay special attention to the risk control, the requirements of regulation, and the magnitude of the green product innovation. The development of Internet finance and green finance is not only an important direction of China’s future financial reform, but also an important breakthrough in the financial “supply-side reform”. Tian Guoli (2017) and Du Li & Zhang Xin (2012) believe that Internet

finance itself has green attributes, while green finance needs the support of digital Internet technology to further practice democratization and universalization. The P2P lending industry, as the representative and important force of Internet finance, developing green finance is a good attempt. For P2P lending platforms “hand” green finance, it is recommended from the following aspects:

### ***Strict Risk Management to Protect the Healthy Development of Green Finance***

Firstly, it needs to give full play to their own advantages, make better use of large data and other means to do a good job of customer credit and professional technical means to do the customer’s risk management. Secondly, it is necessary to strengthen the research on the guiding policy of government to ensure that the business development is in line with the government’s policy. As for P2P lending platforms, they should actively learn from the experience of traditional financial risk management, enhance the professional ability of risk management, and actively identify and manage customers’ risks. Finally, analyze the characteristics of green economic development and credit risk which green finance may face, and take the appropriate risk management measures.

### ***Strengthen Supervision and Create a Sound Policy Environment***

From the perspective of regulatory policies, P2P lending platforms should seek the opportunity to actively participate in the formulation of regulatory policies and improve the feasibility and effectiveness of the supervision policies. From the perspective of policy support, as an effective way of developing green finance, P2P lending platforms should be actively involved in the green financial development to get government’s support. From the perspective of social responsibility, P2P lending platforms should also actively call on the government to fully promote the establishment of a sound green financial development mechanism and optimize the allocation of green financial resources.

### ***Accelerate Product Innovation and Improve Customers’ Service Satisfaction***

In the development of green finance, P2P lending platforms need to develop innovative financial products actively according to the characteristics of the green finance and targeted consumers. At the same time, the P2P lending platforms can also make good use of the accumulated data advantages of mobile Internet, to tap into customers’ spending habits.

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# **Study on the Relationship among Institutional Environment for Sustainable Development, Entrepreneurship and Economic Growth**

**Huajing Li**

*School of Economics and Management, Beijing Forestry University, Beijing, China*  
Email: lihuajing@bjfu.edu.cn

**Yonghui Li\***

*School of Business, Renmin University of China, Beijing, China*  
Email: liyonghuilx@163.com

**Ziang Zhang**

*School of Economics and Management, Beijing Forestry University, Beijing, China*  
Email: ziang@bjfu.edu.cn

**[Abstract]** *As a representative of developing countries and transitioning economies, Chinas entrepreneurial activities are undergoing double trials, which are the realization of economic growth transition, as well as the minimization of environment damage. Therefore, the concept of sustainable development is introduced to this paper, which focuses on the relationship among institution, entrepreneurial activities and economic growth. By reviewing existing researches, propositions of relationship among sustainable developing institutions, entrepreneurial activities and economic growth are brought up.*

**[Keywords]** *sustainable development; institutional environment; entrepreneurial activities; economic growth*

## **Introduction**

Entrepreneurship, as the engine of growth and springboard of economics, academics and policymakers have universally recognized its role in stimulating economic growth and accelerating economic change. Many scholars have discussed the intrinsic characteristics and influencing factors of entrepreneurial activities. However, the social embeddedness of entrepreneurial activities hasnt received sufficient attention, which refers to the effect of existing institutional arrangements and specific institutionalized values, norms, and cognitive on entrepreneurial activities as well as the value creation (Zhang, & Du, 2007). Furthermore, there are few theoretical frameworks which have linked entrepreneurial activities with both its antecedents and its economic outcomes together (Bjørnskov & Foss, 2016). Therefore, given the prominent role of entrepreneurial activities in economic development and transformation, it is important to understand the antecedents of entrepreneurial activities and the outcome of entrepreneurial activities (Shepherd, 2011), pursue a deeper understanding of institutional factors of entrepreneurial activities, and stimulate new ventures playing a role for the economic development (Simón-Moya, et al., 2014).

With the transformation of economic and the global tendency of sustainable development, it's very necessary to take social benefits, ecological benefits and economic benefits, the triple bottom line, simultaneously into consideration in entrepreneurial activities. Although severe challenges have been presented in many countries, relevant studies are still insufficient, the role of public policies and innovations, the value creation of entrepreneurial activities, and the operationalization of sustainable development require further attention of scholars (Silajdžić, et al., 2015).

In our study, notions of sustainable development will be introduced into the relationship among institutional environment, entrepreneurial activities and economic growth. In view of the impact of

institutional environment on entrepreneurial activity may be direct or indirect and may be contingent on one country's economic development level, unemployment rate, or measurement indicators of entrepreneurial activities (Simón- Moya et al., 2014), relevant studies can focus more on emerging economies because of the higher impact of entrepreneurial activities on resolving those internal dilemma (Stenholm. et al., 2013). So, we use the data in China to explore the chain of institutional environment of sustainable development, entrepreneurial activities and economic growth.

## **Literature Review**

### ***Institutional Environment and Sustainable Development***

Institution theory research began in the 19th century, and the definitions of institution are different from school to school. In *Strategic Management*, institution means “the rules of game”, according to the definition made by Scott (1995), and institution is a form of social structure composed of cultural cognition, norms and regulation (Zhang, 2013). Based on Scott's research, Kostova (1997) proposed a national institutional framework model, which includes three dimensions: regulatory, cognition and norm. Among them, regulatory comes from the state, government and other legal authority of the organization issued by the various laws and regulations (Kostova & Roth, 2002; Yang, 2011). Cognition comes from public awareness and understanding of the outside world, which can be measured through entrepreneurial education and entrepreneurs skill (Busenitz, 2000; Li, 2011). The normative institution encompasses values and norms. In the institutional environment and business research, the national institutional framework model has been widely recognized and applied (Wang, 2009).

In the late 1970s, the concept of sustainable development came into being as people continued to worry about the sustainability of economic development and the growing environmental damage. The United Nations Environment Program (UNEP) believes that sustainable development including 17 key objectives, which is related with regulatory elements such as emergency action to address climate change, normative elements such as guaranteeing sustainable consumption patterns and cognitive elements such as education.

In this paper, we define institutional environment of sustainable development as a series of regulatory, normative and cognitive elements that promote the overall improvement and stable development of the “economy-society-environment”. In the study of the relationship between business and environment, some scholars regard entrepreneurial activity as a panacea for promoting a more sustainable development of society. Hall (2010) argued that sustainability has become a mainstream business strategy, and entrepreneurial activities are the effective ways to achieve a more sustainable society. Zu (2014) has pointed out that in recent years, under the influence of global action to encourage enterprises to focus on social and environmental performance, the momentum of entrepreneurship activities in line with the demands of sustainable development has increased. As for the contribution of entrepreneurial activities to the sustainable development of economy, society and environment, it depends on the support of market environment to sustainable development practices (Pacheco, et al., 2010). Silajdžić, et al. (2015) analyzed entrepreneurial activities in transition economies that meet the demands of sustainable development, found that entrepreneurs in transition economies are reluctant to bear the risks of investing in green business opportunities, and the main reason for this phenomenon is that governments and educational institutions are unaware of their roles in supporting green development and green entrepreneurship. Therefore, the sustainable-oriented enterprises that trying to create a triple value of economy, environment and society, can't receive any support from government. Apergis and Eleftheriou (2015) studied the relationship

between renewable energy consumption and institutional factors in Europe, Asia and Latin America, found that political and institutional factors are significantly related to renewable energy consumption.

### ***Institutional Environment and Entrepreneurial Activities***

In recent years, institutional theory and entrepreneurial researches are emerging. Audretsch and Acs (1994) first conducted an empirical research on institutional environment and entrepreneurial activities, found that entrepreneurial activities were positively influenced by macro-economic environment. Then Kreft and Sobel (2005) analyzed how economic policies in different states of the United States affected the occurrence rate of entrepreneurial activities. Iakovleva, et al. (2012) extended the study of regulatory, cognitive and normative dimensions of institutional environment into the sustainable development of natural tourism industry in northern Norway and northwest Russia, found that environmental regulation, legislation, and government programs played an important role in the sustainability of the natural tourism industry; in addition, cognitive and normative institutions also play a vital role, especially in relation to entrepreneurial competencies and the development of business and nature conservation awareness.

Existing findings also suggested that institutional environment can be targeted to promote or limit the development of certain sectors or businesses. For example, Audretsch, et al. (2007) demonstrated that government incentives (e.g. tax breaks) can directly influence developing directions of industrial sectors and encourage new ventures creation. Hiatt, et al. (2009) found that the regulation to consumption of alcoholic beverages, can not only lead to the decline of the brewery, but also contribute to the development and production of non-alcoholic beverages. Therefore, if institutional environment does not limit illegal or highly polluting entrepreneurial activities, entrepreneurs may be more likely to choose to engage in damaging entrepreneurial activities in order to gain more resources and achieve their goals (Barendsen & Gardner, 2004). Conversely, if institutional environment can motivate and support entrepreneurial activities which take the triple bottom line into consideration, it will contribute to the sustainable development of economy and society.

### **Theoretical Model**

Through the brief review of the relationship between institutional environment and entrepreneurial activities, as well as institutional environment and sustainable development, it can be found that scholars have paid more and more attention to the impact of institutional environment on entrepreneurial activities and sustainable development. However, the mechanisms of institutional environment to entrepreneurial activities and value creation have not been clarified. So, in our study, we combine sustainable development, institutional theory and entrepreneurial theory to explore Chinese institutional environment of sustainable development and entrepreneurial activities, hope can provide directions for further studies.

### ***Regulatory Environment of Sustainable Development and Entrepreneurial Activities***

Government can improve institutional environment by reducing the creating and operating costs of the new business, simplifying entrepreneurial procedures, and encouraging entrepreneurial activities (Van Stel, et al., 2007). Simón-Moya, et al. (2014) clustered countries with similar economic development and institutional environment, compared entrepreneurial activities and innovation outputs of these countries, and then found that a preferable regulatory environment is usually conducive to exploit entrepreneurial opportunities. Chan (2010) studied the effect of environment-oriented corporate strategies in Chinese context and found that government would directly influence the external environment of the enterprises. Li (2013) found that a regulatory environment could directly affect and promote green business activities.

Zhou and Huang (2015) found that a more comprehensive regulatory environment plays a positive role in the international business model choice through property rights protection, financial support and other means. Zhang and Lu (2015) found that government could significantly promote entrepreneurial activities in the process of forging innovative cities through providing supportive policies.

Proposition 1: A regulatory environment of sustainable development can directly impact entrepreneurial activities.

### ***Cognitive Environment of Sustainable Development and Entrepreneurial Activities***

A country's human capital plays an important role in process of discovering and taking advantage of business opportunities (Simón-Moya, et al., 2014). Shen, et al. (2015) conducted a case study of Israel and found that due to the geopolitical environment in Israel, it adopted a system of compulsory military service, which cultivated a large number of talents that are equipped with both high-technology capability and team spirit as well as adaptable capacity. It is these talents who take part in business activities with professional and high-technology skills leading to the rapid development of Israel and becoming the highest entrepreneurial density country in the world. It has been argued that education, especially entrepreneurship education, can help individuals to recognize market opportunities, and is positively associated with entrepreneurial activities (Levie & Autio, 2011). Lans, et al. (2014) argue that higher education for entrepreneurial activities and sustainable development can promote each other and lay the knowledge base for sustainable entrepreneurs. Li, et al. (2015) argue that the government's role in encouraging entrepreneurial activities is not clear enough for the new ventures created. It ignores the knowledge-based entrepreneurial opportunities, and the cognitive environment of sustainable development can play an important role in the effectiveness of regulatory environment.

Proposition 2: A cognitive environment of sustainable development can mediate the relationship between regulatory environment and entrepreneurial activities.

### ***Entrepreneurial Activities and Economic Growth***

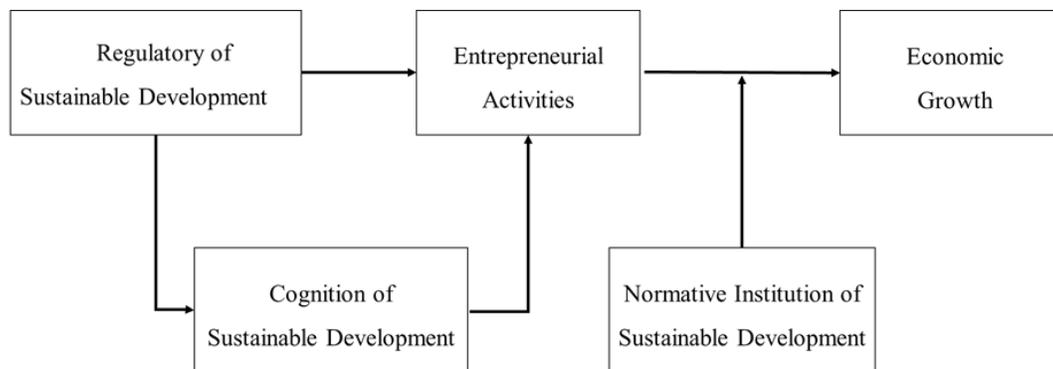
Over the past few decades, governments and academics have growing interest in entrepreneurial activities, particularly new entrepreneurs and new ventures generation, but such interest has based on the assumption that entrepreneurial activities can promote productivity and economic growth (Silajdžić, et al, 2015). According to GEMs reports of the past few years, entrepreneurial activities are beneficial to economic growth, and opportunity-pulled entrepreneurial activities contribute more on economic growth than survival-pushed entrepreneurial activities. Researchers have conducted empirical studies on the role of entrepreneurial activities in economic growth (Bjørnskov, & Foss, 2013). Aparicio, et al. (2016) argue that entrepreneurial activities are bridges between institutional factors and economic growth, which aim to achieve higher economic growth rates. Using the panel data of 43 countries from 2004 to 2012 and the three-stage least squares method, they analyzed the relationship between institutional factors and opportunity-pulled entrepreneurial activities, the results pointed out that both formal and informal regulations can positively impact opportunity-pulled entrepreneurial activities and thus promoting national economic growth. Therefore, it is feasible to construct a suitable institutional environment to increase the opportunities for entrepreneurial activities and ultimately achieve the goal of economic growth.

Proposition 3: Entrepreneurial activities can contribute to national economic growth.

### ***Normative Environment of Sustainable Development and Entrepreneurial Activities***

Informal institutions as an essential component of society, its effect on entrepreneurial activities are rooted in shaping behaviors (El Harbi, & Anderson, 2010). According to a research of Kaufman Entrepreneurial Leadership Center in U.S., formal institutions in the United States and Japan are both sound and regulated, but there are significant differences in the entrepreneurial attitudes of local residents. 91% of Americans show acceptance and respect to those starting up one's own business, yet only 8% Japanese held the same opinions, so entrepreneurial activities in the United States are significantly more active than those in Japan. It can be seen that the informal institutions in cognition and norms, such as culture, values, ways of thinking, will have an impact on entrepreneurial activities. Li (2013) argues that the normative institution promotes the sustainability of green entrepreneurship into development. Therefore, this study suggests that the governments cultivation of green and entrepreneurial innovation atmosphere will affect and change the behavior of the public, so that the public will be the product of environmental friendliness, innovation and other factors as decision-making factors, and then sustainable developing regulatory is conducive to the value creation and economic contribution of entrepreneurial enterprises that meet the demands of sustainable development.

Proposition 4: A normative environment of sustainable development regulates the relationship between entrepreneurial activity and economic growth.



**Figure 1. Theoretical Model**

### **Discussion and Conclusion**

As discussed above, we suppose a theoretical framework for future research in the direction of institutional environment, sustainable development and entrepreneurship, and the possible relationships among institutional environment of sustainable development, entrepreneurial activities and economic growth can be shown in our framework, also including corresponding propositions about these relationships. The following questions can be further explored, such as the relationship between opportunity-pull entrepreneurship, necessity-push entrepreneurship and institutional environment, how different dimensions of institutional environment affect different kinds of entrepreneurial activities in different ways, under what conditions can policies be expected to reach the prospective outcome, and so on. We expect more future works to enrich the study of sustainable development and entrepreneurship.

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\*Correspondent author: Yonghui Li (liyonghuilx@163.com)

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# **The Impact of Sustainable Supply Chain Management on Business Performance: A Sustainability System Perspective**

**Wenbin Ni**

*Zhejiang University of Finance & Economics, Hangzhou, China*  
Email: neesebin@163.com

**Hongyi Sun**

*City University of Hong Kong, China*  
Email: sun.3333@cityu.edu.hk

***[Abstract]** This paper explores the linkage between sustainable supply chain (SSC) and business performance by considering the effect of the entire supply chain. The paper proposes that SSC comprises three dimensions, that is, inbound sustainability, internal sustainability, and outbound sustainability. By integrating the three dimensions of sustainable supply chain, the entire supply chain is expected to contribute to business performance, and integration with both the supplier and customer is expected to enhance such contribution.*

***[Keywords]** sustainable supply chain, supply chain integration, business performance*

## **Introduction**

The evolving practices of sustainable supply chain management (SSCM) assumes that working closely with supply chain partners simultaneously leads to sustainable development and business advantage (Seuring & Gold, 2013). However, firms typically require their suppliers or internal functions to comply with external sustainable pressures without considering the possible negative effects on other parts of the supply chain (Lee, 2010). How collaboration along the supply chain ultimately leads to simultaneous achievements of sustainable development and business performance thus is not clear due to the lack of rethinking the entire supply chain end to end.

Against this gap, this paper explores the linkage between SSCM and business performance by considering the effect of the entire supply chain. Following the concept that supply chain is a value system including inbound, internal and outbound value flow, sustainable supply chain comprises three dimensions, that is, inbound sustainability, internal sustainability, and outbound sustainability (Lavie, 2006; Priem & Swink, 2012). We theorize the distinct effect of each dimension. The theoretical model aims to explore how the end-to-end sustainable practices along entire supply chain leads to business performance.

## **Theoretical Background**

### ***Extended Resource-Based View***

Differing from the resource-based view (RBV) which emphasizes that firms owning, or controlling, heterogeneous resources within their boundaries are capable of achieving competitive advantage, the extended resource-based view (ERBV) advocates that critical idiosyncratic resources extends beyond firm boundaries (Lavie, 2006). ERBV suggests that interfirm collaborative advantage enhances firm performance.

Four types of interfirm rents are applicable to elucidate the dimensions of SSCM in the present research (Lavie, 2006). Internal rent derives from the focal firm's own resources, which to some extent connects to interfirm resources. Appropriated relational rent refers to a common benefit derived from jointly possessed

resources in the interfirm partnership. Inbound spillover rent extracts from internalization of partners' shared resources by the focal company. Outbound spillover rent is the outflowed benefit of the resource of the focal company to its partners. The ERBV thus, suggests that a focal company's performance is the combinative effects of its internal resources and external partners' resources.

### ***The Demand-Side Approach***

The demand-side approach (DSA) considers value creation as the primary basis of firm competitive advantage (Priem, et al., 2012). Value is the customers' perceived utility from, or their willingness to pay for, an offering. The value is supplied through a value system, which usually consists of a series of firms conducting value-added activities along the supply chain. The DSA implies that the collaborative advantage is valuable only if it produces output which customers are willing to pay for (Schmidt & Keil, 2013). Value capture from resources in the supply side thus should be connected with value creation in the demand side. The effect of the entire supply chain should be considered in exploring the performance contribution of SSCM (Pagell, & Shevchenko, 2014). The DSA brightens the role of customers in SSCM, which gives new perspective in linking SSCM and business performance.

### **Dimensions of SSCM**

Basically, the primary activities of a supply chain include an inbound function, internal operations, and an outbound function. Accordingly, this paper proposes three dimensions of SSCM. Inbound sustainability (InS) refers to fostering sustainability in the supplier side to ensure inbound materials and services meet sustainable requirements (Hollos, Blome & Foerstl, 2012). Two typical strategies of InS are supplier assessment and collaboration (Gimenez, & Tachizawa, 2012). Internal sustainability (IS) refers to internal operational practices for sustainable objectives (Liu, Kasturiratne, & Moizer, 2012; Wong, Lai, Shang, Lu & Leung, 2012). These initiatives result in sustainable products or processes. Environmental or social certification, waste or energy consumption reduction, internal training or involvement programs, eco-design, or environmental management systems are often mentioned in IS practices (Gimenez, Sierra & Rodon, 2012; Zhu, Sarkis, & Lai, 2012). Outbound sustainability (OuS) refers to the offering of sustainable products or services to customers (Carter, & Rogers, 2008). Customers are identified as a driving force for sustainable initiatives. Customer orientation is the necessity that supply-side activities can contribute to demand side value creation. OuS hence emphasizes the role of value creation in linking SSCM and competitive advantage.

Altogether, the three dimensions of SSCM form a sustainability system to provide sustainable offerings. As a result, they should not be viewed as discrete components only playing alone. Rather, they play together as a system.

### **Hypotheses Development**

#### ***Relationships between the Dimensions of SSCM (H1, H2)***

The sustainable input from suppliers facilitates the internal operations to meet sustainable standards. Some sustainable outcomes also require collaborative solutions between the supplier and the focal company. Suppliers' investment in sustainability is the necessary condition for collaborative solutions. Investment in IS is attractive when the behaviors and outcomes of the supplier are predictable, and the risk of opportunism is preventable. The focal company thus is willing to invest in internal sustainability to appropriate relational

advantage. Altogether, the sustainability of suppliers' operations will directly affect the sustainable operations of the focal company.

H1: Inbound sustainability (InS) has a positive impact on internal sustainability (IS).

Supply chain is a system to create customer value. IS is the production process of OuS. Or put differently, OuS is the output of IS. The proposition of a positive impact of IS on OuS is thus reasonable due to their relationship along the supply chain. The internal investment in sustainability provides the company sufficient resources, both tangible and intangible to have capabilities to meet customer's requirements and needs of sustainability. The focal company is thus capable to provide outbound spillover rent to increase customer value. Therefore, IS, the internal resource or capability, and provides external relational rent, specifically to customers in this regard. Accordingly, we put forth the following hypothesis.

H2: Internal sustainability (IS) has a positive impact on outbound sustainability (OuS).

### ***The Impact of SSCM on Business Performance (H3, H4, H5)***

Though heterogeneous resource and capability can generate economic rent, the DSA insists that the rent from external collaboration and internal operation should create value for customers (Priem, et al., 2012). That is, offerings that customers are not willing to pay for are invaluable and will not lead to superior business performance. The DSA thus implies that the sustainability that flows through the entire supply chain should eventually serve the purpose to create value for the customers.

Remembering that OuS is defined as the sustainable offerings to the customer, OuS is theorized to directly impact business performance. Therefore, we propose the following hypothesis:

H3: Outbound sustainability (OuS) has a positive and direct impact on business performance (BP).

We theorize that IS and InS impact business performance through the sustainability system. The collaborative advantage among the supply chain partners, though necessary for value creation, is not sufficient by itself to generate business performance. Specifically, IS is the production process of OuS, and is necessary stage to offer sustainable offerings to customer. Nevertheless, its contribution to business performance is achieved when customers are willing to pay for the offerings. Consequently, IS relates to business performance through the mediating effect of OuS.

H4: Internal sustainability (IS) has no direct impact on business performance (BP). The impact of IS on business performance is mediated by OuS.

This rationale is applicable to InS' impact on business performance. A slight difference is that the mediating effect not only refers to OuS, but should likewise consider the role of IS. Just as Hollos, et al. (2012) propose that for SSCM to lead to superior performance, the combination of the supplier's efforts with the focal company's own efforts is the requisite.

H5: Inbound sustainability (InS) has no direct impact on business performance (BP). The impact of InS on business performance is mediated by InS and OuS.

### ***The Impact of Supplier Chain Integration (H6, H7)***

The long-term integration between the supplier and the focal company helps foster partner-specific absorptive capacity, such that the focal company develops the ability to identify, assimilate and apply valuable knowledge from a specific supplier. SI is beneficial to develop mutual trust, mutual information exchange, and long-term collaboration. In such circumstance, internal investment in sustainability is an attractive strategy to internalize all the relational specific benefits. Therefore, the following hypothesis is proposed:

H6: Supplier integration positively moderates the relationship between InS and IS.

Integrating with customers is another source of relational rent. Customers' suggestions or ideas are major stimulators of company innovation. Firms must work closely with customers to understand their requirements. As the DSA suggests, better understanding of the customer improve the company's capability of value creation for the customer. Specifically, increased in customer integration (CI) evokes a company's willingness to invest in internal sustainability, both reactively and proactively. Thus, we provide the following hypothesis:

H7: Customer integration positively moderates the relationship between IS and OuS.

## **Methodology**

### ***Questionnaire and Sampling***

The conceptual model was tested in Chinese context. China's rapid economic growth over the last three decades has ensured that the whole country suffers from serious sustainability problems, such as air pollution, water pollution, and resource shortages (Zhu, Sarkis, & Lai, 2007). Sustainability issues are particularly challenging for Chinese manufacturing firms.

Two hundred questionnaires were sent out by mail and 133 were returned. Twenty-three cases were excluded because of missing data. These were regarded as non-response cases, resulting in a sample size of 118 and a response rate of 59%. A t-test showed no significant difference in company size (no. of employees) ( $t=-1.509$ ), sales ( $t=-0.901$ ), and return on sales ( $t=-0.076$ ) between response and non-response (or excluded) cases and removed the concern about non-response bias.

### ***Measurement Instruments***

SI and CI was measured from logistical integration, which refers to the extent of cooperation in information and material flows along the supply chain, and technological integration, which refers to the extent of cooperation in product and process design or knowledge sharing (Wong, Boon-Itt & Wong, 2011).

Inbound sustainability is operationalized as the focal company's monitoring of and collaboration with suppliers to achieve inbound environmental sustainability (Vachon, & Klassen, 2006). Outbound sustainability is the sustainable output of a company to its customers and to society in terms of products and processes. Internal sustainability is operationalized as environmental management practices or programs, such as environmental certification or training programs, energy consumption or pollution emission reduction programs, and water conservation or recycling programs.

Business performance was measured by asking the respondents to indicate the degree of performance variation by comparing current sales and return on sales to those of three years ago.

### ***Common Methods Bias***

Harman's single-factor test was conducted following the traditional procedure of loading all the items into an exploratory factor analysis (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003). The total variance explained by factors with eigenvalues larger than 1 was 73.1%, while the largest eigenvalue factor accounted for 28.9%. As no single factor accounted for the majority of the covariance among the measures, concerns about common methods bias could be removed.

## **Analysis and Results**

The data analysis used SmartPLS 2.0 M3 software by conducting partial least squares (PLS) structural equation modeling (SEM).

### Reliability

Cronbach's alpha was used as the lower boundary of internal consistency reliability, and composite reliability (CR) as the upper boundary for true reliability (Hair, Ringle, & Sarstedt, 2013). For a two-item scale, the alternative of the Spearman-Brown coefficient was reported (Eisinga, Grotenhuis, & Pelzer, 2013). The reliability coefficients were all above 0.80, except for the alpha value of business performance, which was 0.769, but above the cutoff value of 0.7. The measurements therefore showed adequate reliability.

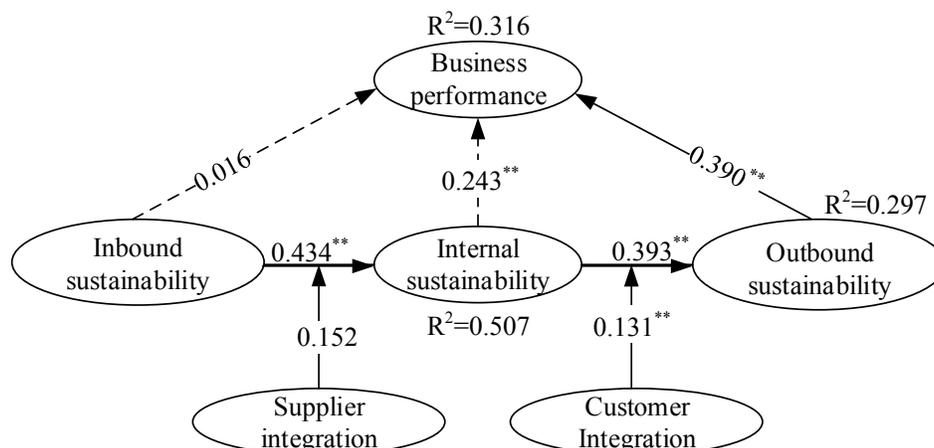
### Validity

The convergent validity was shown by the values of the average variance extracted (AVE), which were all above the recommended cutoff of 0.5 (Hair, et al., 2013). Indicator reliability was also examined. The loadings of indicators in their corresponding constructs were all greater than 0.8, above the commonly recommended value of 0.708, and the t value (between 16.23 to 83.81) shows that all of the loadings are significant at 0.01 (Hair, Hult, Ringle, & Sarstedt, 2013). The discriminant validity was assessed by two criteria. First, the square root of AVE of each construct was greater than the correlation coefficients with the remaining constructs. Second, the loadings of the indicators in their corresponding constructs were all greater than their loadings on other constructs (i.e., the loadings were greater than the cross-loadings).

### Structural Model Results

First, the collinearity between the exogenous variables was tested using latent variables scores from the SmartPLS results by running regression (Hair, et al., 2013). The value of the variance inflation factor (VIF) indicating that the collinearity problem was not severe between the exogenous variables.

$R^2$  indicates the percentage variance of the endogenous variable that is explained by the model. As shown in Figure 1, 31.6% of the business performance, 50.7% of the internal sustainability, and 29.7% of the outbound sustainability variance is explained by their predictors. Chin (1998) recommends  $R^2$  values of 0.67, 0.33, or 0.19 as signifying substantial, moderate, and weak values, respectively. Thus, our  $R^2$  values are weak to moderate, or moderate to substantial. The  $R^2$  values are adequate to demonstrate the good effect of the predictors on the predicted variables.



--> Indicating the relations that are hypothesized to have no direct effect  
\*\* :  $p < 0.01$

Figure 1. Testing Results of the Conceptual Model and Hypotheses

We then assessed the path weights. Inbound sustainability (path=0.434, t=3.742, p<0.01) had a positive impact on internal sustainability, and internal sustainability (path=0.393, t=6.663, p<0.01) had a positive impact on outbound sustainability, so hypotheses H1 and H2 are supported. Outbound sustainability (path=0.390, t=7.120, p<0.01) had positive impacts on business performance, so hypotheses H3 is supported. Inbound sustainability had no significant impact on business performance (path=0.016, t=0.194, p>0.1), so the direct effect linking inbound sustainability and business performance is not found. But internal sustainability had a positive effect on business performance (path=0.243, t=3.141, p<0.01). Finally, supplier integration had no significant moderating effect on the linkage between inbound sustainability and internal sustainability, while customer integration (path=0.131, t=2.185, p<0.05) had a significant moderating direct effect on the linkage between internal sustainability and outbound sustainability. Therefore, H6 is not supported, but H7 is supported.

### ***Testing of the Mediating Effects***

The bootstrap method (resample n=1000) was applied and the results are presented in Table 1. Both indirect effects are significant at p<0.01 level. Specifically, OuS partially mediates the effect of IS on BP, since the direct effect are as well statistically significant. IS and OuS completely mediates the effect of InS on BP. Examination of percentile 95% confidence intervals further support the significant of mediating effects. The lower level values are above zero. The results thus support that the supply side integration and cooperation on sustainability related activities impact business performance through a value system.

**Table 1. Results of Testing the Mediating Effects**

Hypothesis	Predictor variable	Mediating variable	Dependent variable	Direct effect	Indirect effect	Total effect	Percentile 95% CI for indirect effect	Support for mediating effect
H4	IS	OuS	BP	0.191*	0.157**	0.348	0.067, 0.270	Partial supported
H5	InS	IS OuS	BP	0.007	0.165**	0.172	0.067, 0.288	Supported

\*\*p<0.01; \*p<0.05. CI: confidence interval.

### **Implications and Conclusion**

The results prove the distinctive effects of each dimension in exploring sustainability and business performance linkage. Supplier collaboration is necessary but not sufficient for SSCM; IS serves as the absorptive capability needed to internalize the inbound sustainability; and customer collaboration is critical for value creation in the demand side. In this way, the three dimensions of SSCM compose a sustainability system to supply sustainable offerings to end customers.

A sustainability system approach explores the effect of the entire supply chain, and simultaneously highlights the distinctive effect of each component. Though supply side is necessary in offering sustainability, supply side collaborative advantage is mediated by the system to create customer value. The linkage between SSCM and business performance is significant when sustainability with customers is achieved. Therefore, this paper suggests that SSCM can be profitable, but only until sustainability goes to satisfy the customers. When exploring the SSCM and business performance linkage, the effect of the entire supply chain should be considered.

This research may have the following contributions to the field of SSCM study. First, the separation of SSCM into inbound, outbound, and internal sustainability is a new contribution to this field. Second, this

study concludes that business performance is achieved via a sustainability system. “Sustainability is profitable” if customers’ needs are met and they are willing to pay for sustainable issues. Third, this study shows that both supply side collaborative advantage and demand side value creation are important to explain how SSCM leads to business performance.

### Acknowledgement

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**A Study of Corporate Green Human Resource Management through  
Analyzing Corporate Social Responsibility Reports  
– Quoting Listed Companies in Zhejiang Province as Samples**

**Xiaode Hu**

*The School of Business Administration, Zhejiang University of Finance & Economics,  
Hangzhou, China*  
Email: hxdnx@zufe.edu.cn

**Wei Wu**

*The School of Business Administration, Zhejiang University of Finance & Economics,  
Hangzhou, China*  
Email: 471614802@qq.com

**Muke Hu**

*The School of Business Administration, Zhejiang University of Finance & Economics,  
Hangzhou China*  
Email: 1282088718@qq.com

***[Abstract]** This thesis aims to analyze the status quo of corporate practices on green human resource management through the study of the 2016 corporate social responsibility reports of listed companies in Zhejiang province. It screens the practices on GHRM disclosed in the corporate social responsibility (CSR) reports, categorizes such practices and builds management models hereon. It vividly and objectively showcases the achievements and inadequacies in such practices and provides suggestions on future endeavors in GHRM. Listed companies should promote the GHRM concept to achieve psychological, interpersonal and environmental harmony among employees; listed companies should establish a more rational, healthier and future-oriented management model so as to integrate economic, social and environmental benefits and to achieve sustainability; listed companies should pay more attention to employee HRM, which is the core part of GHRM.*

***[Keywords]** CSR; green HRM; listed company*

### **Introduction**

The concept of green human resource management (hereinafter “GHRM”) originates from sustainable development (Yang, 2003). Under the backdrop of a low-carbon economy, the ideas of being environment-friendly and going green remains at a high momentum and is reflected in every aspect of our daily life and regular production. To practice green management, a company should go beyond green production and reduction of three wastes (waste gas, waste water, industrial residues) and continue to study and transform as in green consumption and GHRM. The study of GHRM, from its concept, theoretical basis, and influence factors to its effects, will contribute greatly to guide the corporate practice. At present, very little study has been conducted on the status quo of corporate GHRM and specific practices, i.e. to which level and stage has corporate GHRM been developed, what aspects still requires our attention, and what improvements and enhancements we shall make in the future. The practices of

GHRM are difficult to observe. Specific practices are recorded in corporate social responsibility reports. This thesis aims to observe such practices through the study of corporate social responsibility reports, analyze the status quo and provide suggestions therefore.

### **Theoretical Basis**

Green practice is a broadly-defined concept. A lot of non-green practices have been witnessed in corporate HRM, such as a lack of legitimate employment contracts, insufficient safety protection during production, waste of paper, water and electricity, or a negligence of talent development and employee care, etc. A more comprehensive and equitable management model needs to be developed in order for HRM to become green and sustainable and to better meet the requirements of corporate and employees (Yuan, 2016; Wang, 2017). GHRM is in demand.

The definitions of GHRM vary in China and abroad. In China, the definition goes beyond the environment management in an organization to include the living and working status of its employees and their sustainable development, i.e. a combination of the employees' situations and mentalities (Wei, & Li, 2006). Abroad, the definition mainly emphasizes the inclusion of environmental consciousness in human resource management (Gill, 2012).

In research contents, the study of GHRM is based on such as the theory of sustainable development (Chen, 2017). Some researchers have focused on how to match human resource to a firm (Liu, Zhang, & Liu, 2014). Antecedent variables and outcome variables of GHRM have different results (Tang, Sun, Jia, & Chen, 2015). Also, different corporate performance is due to corporate strategy (Harrison, & Freeman, 1999). If there are green-oriented strategies, corporations can absorb more employees which can lead to better management results to protect the environment (Fernández, Junquera, & Ordiz., 2010). There are positive associations of the benefit levels for both variables with environmental management system implementation on a large scale (Wagner, 2013).

Unlike the studies of other researchers, this thesis studies GHRM from the perspective of corporate social responsibility. It will put more attention on the management of the employees' situations and mentalities, in addition to environmental consciousness. It is more inclined to the definition of GHRM in China.

### **Status Quo of Corporate GHRM**

This study was conducted by the corporate social responsibility reports of 50 listed companies in Zhejiang Province. Over 20,000 words were gleaned from these reports with relevance to GHRM practices, which are further categorized as follows:

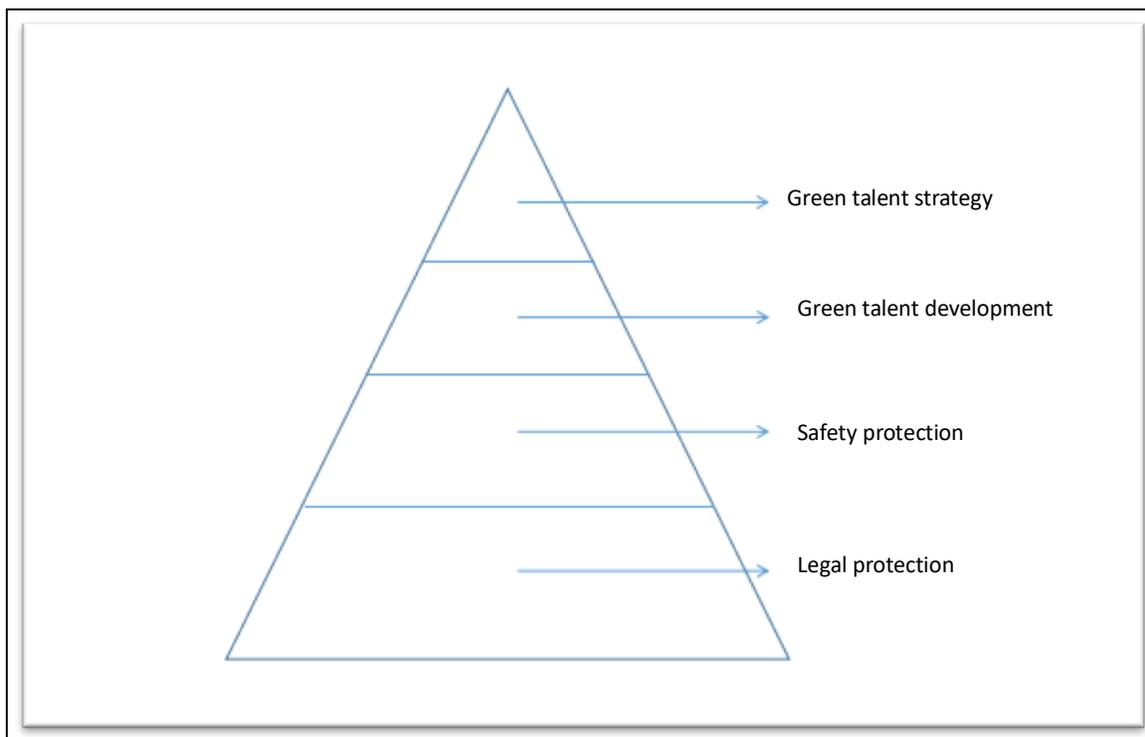
**Table 1. GHRM Practices of 50 Listed Companies in Zhejiang Province**

	<b>Specific Practices</b>	<b>Ratio</b>
Legal and compliant employment relationship	<ol style="list-style-type: none"> <li>1. Dahua Technology signs employment contracts with its employees as required by law, pays for employees' five social insurances (endowment insurance, medical insurance, unemployment insurance, industrial injury insurance, and maternity insurance) and housing funds, provides medical check-up, provides paid vacation, and organizes employee union as required by law.</li> <li>2. Gu Yue Long Shan operates and keeps improving a democratic management system via its employee representative assembly. All the matters with relevance to employee remuneration and benefits will be reviewed and approved by its employee representative assembly. A remuneration negotiation system is in place; to ensure its employees receive remuneration and benefits no less than legal and regulatory requirements.</li> <li>3. Ensure its employees receive remuneration and benefits no less than legal and regulatory requirements.</li> <li>4. Promises paying composition to staffing not lower than the requirements of the law .....</li> </ol>	100%
Multi-channel high quality recruitment system	<ol style="list-style-type: none"> <li>1. Haizheng Pharmaceutical has established recruitment relationship with over 60 universities, 20 colleges and 8 technical secondary schools in China.</li> <li>2. Huashu Media has introduced the school-enterprise cooperation channel in addition to campus recruitment and professional recruitment. It will also publicly recruit senior executives from time to time. ....</li> </ol>	25%
Diversified training system	<ol style="list-style-type: none"> <li>1. Bai Long Dong Fang has established a three-level training system to cater to different needs. A multi-channel training system is in place to offer different training content.</li> <li>2. Feida Environment has established Feida School since 2006 to provide various trainings in management, general skills, specialized skills, operation skills, cultures, etc. ....</li> </ol>	100%
Diversified, human-centric, fair & equitable compensation & benefits (C&B) system and performance review system	<ol style="list-style-type: none"> <li>1. Hua Feng has established a C&amp;B system with 5 series, 20 grades and 8 categories to cover employees at various levels. Policies on professional employee promotion, employment by internal competition for management positions, piecework salary for production line workers are all in place.</li> <li>2. Binjiang Group provides a more humane maternity leave and above-standard breastfeeding leave system to female works on production line.</li> <li>3. A review system on water consumption is in place. Standards on water consumption has been established to manage daily water usage and to reward water savings and punish overuse .....</li> </ol>	60%
Clear-cut green career development path	<ol style="list-style-type: none"> <li>1. Hengdian Dong Ci has established a development system for management positions. An internal promotion system is in place. A mentoring system is in place for nurturing future leaders.</li> <li>2. Hangmin Stock has established a platform for employees to develop together with the company. A scientific evaluation and selection system is in place to develop its talent team.</li> <li>3. Gu Yue Long Shan provides three career development paths for technical positions, management positions and regular positions respectively. ....</li> </ol>	60%
Corporate culture	<ol style="list-style-type: none"> <li>1. Hangzhou Bank promotes a home culture with respect as its core. It strives to build a harmonious culture where employees and the company treat each other as family.</li> <li>2. Hongrun Construction promotes the concept of work with efficiency and live in a healthy style. ....</li> </ol>	40%
Employee relationship and employee events	<ol style="list-style-type: none"> <li>1. Huamei Holdings regularly provides allowances and stipends to financially challenged employees. It also organized summer camp activities for the children of its employees.</li> <li>2. Hold regular recreational activities and charity events .....</li> </ol>	100%
Green working environment	<ol style="list-style-type: none"> <li>1. JACK promotes paperless working and trains employees to save electricity, water and fuel. It has also introduced EPR and OA office system.</li> <li>2. Huashu Media promotes green working and strives to improve the greenery on its premises and the surrounding areas.</li> <li>3. Da Hua promotes coffee culture and fabric shoe culture. It provides leisure spots and regularly invites health experts to speak. ....</li> </ol>	55%
HSE	<ol style="list-style-type: none"> <li>1. Hai Zheng has introduced OHSAS8001 vocational health managing system since 2008 and has received DNV accreditation.</li> <li>2. Safety measures: use non-toxic and low-toxic materials, provide clinics and emergency kits .....</li> </ol>	75%
Talent strategy	<ol style="list-style-type: none"> <li>1. Jiahua Energy has adopted the talent strategy of 'six can and six must' .....</li> </ol>	4%
Others	<ol style="list-style-type: none"> <li>1. Provision of help to migrant workers in their children's schooling, provision of help in housing for married couples.</li> <li>2. Localization of human resource management, e.g. employment policy, religious belief, habits and customs of Vietnamese employees. ....</li> </ol>	

(SOURCES: The papers listed).

From this form, we can see that green HRM mainly involves the employment relationship, recruitment, training, remuneration, performance, career development, employee relationship, corporate culture, health and safety, working environment, and talent strategy, etc. The companies are doing well in the employment relationship, training and employee relationship. All of the 50 listed companies have been paying attention to these three aspects. The companies are doing inadequately in recruitment, corporate culture, green working environment and talent strategy. Less than 60% of the 50 listed companies have been paying attention to these aspects and only 4% have a talent strategy.

From the ratios, we can also see that HRM shall be implemented from the easiest level to the more advanced level. We are inspired by Maslow’s hierarchy of needs, which consists of biological need, safety need, love and belonging need, respect and self-realization need in an escalation order. The order of these needs is not fixed and can be adjusted from time to time. The higher level of need emerges when the lower level of need is met. Likewise, GHRM may be regarded as one need in green management. A company shall realize green management level by level. Based on our study of the GHRM practices, we hereby put forward the pyramid model in GHRM.



**Figure 1. The Pyramid Model in Green HRM** (SOURCES: The papers listed above)

So, we divided GHRM into four levels. The ground level is legal protection. The minimum requirement in GHRM is legal employment. Employment contracts in line with relevant laws and regulations should be signed. Child labor should be avoided. Working hours shall be in line with relevant laws and regulations. Compensation and benefits paid to employees shall not be lower than legal requirements. Discrimination, harassment and physical punishment shall be prohibited. Employees’ right to organize and join in trade union shall be respected.

Above the legal protection level is the level of green management in safety protection. Safety protection refers to not only occupational health and safety but also psychological health and safety. To realize green management in environment and psychology, safety protection shall cover employee relationships, a green working environment, health and safety, and corporate culture. Major measures shall include green and environmental protection in the work area, health protection of working employees, prevention of occupational diseases, safeguards in the work area, green and healthy employee relationships, activities to promote employee engagement, and humane care in corporate culture.

The third level above safety protection is to enhance green management in talent development, which includes multi-channel high quality recruitment, a diversified training system, a diversified human-centric, fair and equitable C&B system and a performance review system, as well as a clear-cut green career development path. During recruitment, the efficient and green concept shall be followed through. Multi-channel high quality recruitment shall be adopted to attract talents. A diversified training system shall be established to develop employees at various positions and various levels. An Internet-based training channel shall be greatly promoted due to its environmental feature. A fair and equitable C&B system and performance review system shall be established. In addition to the benefits required by law, the companies shall provide additional green benefits in line with their respective situations, e.g. female employee protection during special occasions, a clear career development path, and enhanced motivation measures.

At the top, when all the underlying levels are in place, green HRM shall be escalated to the strategy level. This also indicates the importance of green HRM in a company. Directions and objectives of green HRM shall be defined at the strategy level as a safeguard of the company's grand strategy.

### **Conclusion and Suggestion**

This thesis analyzed the corporate social responsibility reports of 50 listed companies in Zhejiang province. Over 20,000 words were gleaned from these reports with relevance to green HRM practices, which were further categorized into 11 aspects such as employment relationship, recruitment, training, C&B, performance review, career development, employee relationship, corporate culture, HSE, working environment, and talent strategy. The 50 companies were paying various amounts of attention to these 11 aspects. They were doing well in employment relationships, training and employee relationships, but were inadequate in talent strategy. Based on our study and with the inspiration from Maslow's hierarchy of needs, we put forward the pyramid model of GHRM. A company may use this model to develop its green HRM to ensure: firstly, legal protection; secondly, safety protection of employees' psychological and physical health; thirdly, green talent development including recruitment, training, performance review, C&B and career planning to cater to the higher need of employees; and at the top, a green talent strategy. A company can follow this simple model to cover all aspects of GHRM in its development.

To conclude, at present, the listed companies are doing well in employment relationships, training and employee relationships, but are inadequate at the higher levels, especially at the strategy management level, which also indicates a lack of sufficient attention in GHRM. To develop corporate HRM in the green and sustainable direction, not only the listed companies need to enhance their GHRM strategy, but also the non-listed companies need to learn from the best practices of GHRM.

We provide the following suggestions: (1) listed companies shall promote the GHRM concept to achieve psychological, interpersonal and environmental harmony among employees; (2) listed companies shall establish a more rational, healthier and future-oriented management model so as to integrate

economic, social and environmental benefits and to achieve sustainability; (3) listed companies shall pay more attention to employee's HRM, which is the core part of GHRM.

### **Inadequacy and Outlook of Future Study**

#### ***Inadequacy***

1. This thesis analyzes the status quo of corporate green HRM through the study of corporate social responsibility reports. The scope is limited and cannot cover all aspects of corporate human resource management.
2. This thesis quotes 50 listed companies in Zhejiang province as samples. The sample size is not large.
3. The model put forward in this thesis is quite primary and has not been validated in actual circumstances.

#### ***Outlook for Future Study***

1. The sample size can be increased. In addition to corporate social responsibility reports of listed companies just in Zhejiang province, we can select several other economically-advanced provinces or make a comparison study between economically-advanced provinces and less developed provinces.
2. The scope of future study can be diversified. In addition to corporate social responsibility reports, surveys and interviews and other text materials can be included to expand the study scope.
3. The theoretical model is to be validated.

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# Research on Strategies of Green Transformation and Upgrading for Enterprises – Take Chia Tai Group as an Example

**Ting Cui**

*School of Accountancy, Guangdong University of Finance & Economics, Guangzhou, China*  
Email: 584333040@qq.com

**Ze-xian Yang**

*School of Law and Intellectual Property, Jinan University, Guangzhou, China*  
Email: 13631296599@163.com

**[Abstract]** *Green transformation of enterprises is the inevitable practice of the new economy, and also an important project of the sustainable development of enterprises. Green transformation includes external green operation and internal green management, and through the combination of the two to achieve ecological, social and economic benefits of unity. Through the case of Chia Tai Group, we see that the success of the transformation of enterprises is not only to consider their own strength, but also to rely on government support. Finally, this article gives specific policy recommendations.*

**[Keywords]** *green transformation; Chia Tai Group; system theory*

## Introduction

Modern industry has made enormous achievements, and at the same time, has placed the green economy and green development concept, with increasingly serious ecological problems and social contradictions, into people's vision. In recent years, the CPC Central Committee has put forward the "ecological civilization construction", "five development concept", General Secretary Xi Jinping's "two mountain theory" and other instructions, all highlighting the harmony between man and nature, social relations, and emphasizing sustainable development. Green transformation is not only applicable to various industries and regions, but is also a reality and urgent need for enterprises.

There is no specific explanation in English literature about the concept of "Enterprise transformation and upgrading". Chinese literature is quite rich in this research. On the basis of summing up the literature about transformation and upgrading, Yun-shi Mao (2015) considered that transformation and upgrading is the activity of enterprises to implement new business directions to improve their sustainable competitiveness and the added-value of their products and services. Wen-chang Zhao (2013) wrote that the transformation and upgrading of enterprises is a process of evolution; in this process, through organizational restructuring, management change and development model change, enterprises achieve high value-added status. Xue-min Liu and Sheng-ling Zhang (2015) wrote that this includes three aspects: the impact of corporate activities on the external environment; internal management, emphasizing labor and capital issues; the enterprise products meeting the green concept.

Green transformation of enterprises is a dynamic evolution, and the realization of the process must be affected by many internal and external conditions. Ye Li (2016) focused on the factors that affect the green transformation of resource-based enterprises and put forward the influencing factors of three dimensions: external conditions, scenario factors (scale, location, capital, etc.) and internal conditions (technology, market, etc.). In addition, Chang-jian Du (2016) researched the importance of ecological civilization education for green transformation and upgrading.

In the specific transformation methods and the choice of countermeasures has also full of research results. Yan-ling An (2016) emphasizes in her book, *Green Enterprise*, to fulfill the green responsibility, green design, green production, green procurement and other initiatives as a green transformation of the enterprise path. From the formation or participation in a green alliance, enterprises also can achieve risk and sustainable development (Song, 2016). Tao Wang (2014) studied Chinese steel enterprises, from the aspect of service-oriented manufacturing, value chain integration, environmental management and other aspects of the green transformation strategy business model.

Based on this, the research theme of this paper lies in China's New Normal, how enterprises, through green transformation, achieve transformation and upgrading. The first part elaborates the concrete connotation and necessity of the enterprise for green transformation and analyzes the path and countermeasures of the green transformation with the view of the system theory. The second part adopts a single case study method, The Chia Tai Group in China to carry out the management and business activities of a real green transformation case; finally, we come to the conclusion and give corresponding policy recommendations.

### **Green Transformation and Upgrading of the Enterprise: The Specific Meaning, Purpose and Necessity**

Green economy is a sustainable development model of an ecological economy (Gao, 2015), because "Green" should not be limited to the ecological environment in the narrow sense of concern. Similarly, the green transformation of enterprises also has a rich connotation. First, corporate activities should be consistent with green principles, that is, business purposes and business behavior need to meet the "protection of the environment, saving resources" principle to prohibit the cost of the environment in exchange for profits.

Second, enterprises in the internal scientific and green management refers to the enterprise should actively carry out a management model, organizational model, and production methods such as green innovation change. Coordinate and improve the internal labor relations to provide healthy working conditions.

Both the external business and the internal management emphasize the harmony of social relations. This harmony achieves the fate of coexistence. Green transformation and upgrading need huge costs and resources, however profit is the fundamental purpose of enterprises. But the two are not contradictory. For enterprises to achieve sustainable development, achieve ecological benefits, and social and economic benefits of unity, we must have a forward-looking vision. This is also the purpose of corporate green transformation.

The green transformation of enterprises for the country, society, and the development of the enterprise itself have far-reaching significance. First, achieving the national green policy an important step. In order to ensure the successful construction of a "beautiful China", the government has proposed and implemented many "green policies". The implementation of these policies needs to rely on all levels of government, organizations, enterprises and individuals to promote them. Enterprises are an important part of the ecosystem, and green transformation is conducive to the implementation of the country's macroeconomic policies for social development and this lays a solid green foundation.

The second step is to achieve an important measure of economic reform. The green transformation of enterprises is conducive to solving structural imbalances, overcapacity and other issues, and promote the modernization of economic development.

The third step is to achieve sustainable development of enterprises, which is an important change. For enterprises to maintain long-term vitality in the fierce competitive environment, we must take the initiative to adapt to the economic situation and major national decision-making and conform to the wave of green consumption. Green transformation promotes the sustainable development of enterprises in a healthy economic system environment and maximizes business value. So, this is the way of self-change, but is also an inevitable task of the times.

### **The Path and Countermeasure of Green Transformation and Upgrading Under the View of System Theory**

An enterprise is a complex ecosystem and organic whole – internally, by a variety of elements combined. Macroscopically, the enterprise is an element and other related elements can form a system. Therefore, in a complex economic environment, business managers should fully consider the characteristics of each element, combined with the actual situation, and personalize and specific operation. Green transformation is also a process of ecological evolution, each element of mutual influence, plays a synergistic effect. Therefore, the transformation and upgrading of enterprises has a systematic thinking; at the same time, this study should also take a systematic theoretical point of view.

#### ***The System of Strategic Planning***

Enterprises, in accordance with the existing internal and external conditions, developed in the next period of time to achieve a certain goal of the practice process, used to guide the process of the line and program, that is, the strategic planning. As a whole system, green transformation also needs to establish a scientific plan to control the overall situation, a unified action, for enterprises to determine the direction of the road.

First, the whole can affect and control the various subsystems. Only according to the external environment and the specific reality of their own enterprises, does the top design, in order to maximize the overall performance. Clear the direction of transformation and reduce the probability of failure of business transformation.

Second, the green transformation of enterprises should be clear in each primary and secondary strategy. Transformation and upgrading is carried out by the internal and external planning to complete the layers; they need to obey the system from the law. The strategic plan indicates that the various stages of the various stages of the primary and secondary strategies, each planning implementation step-by-step, (Fan, 2008). This requires managers to understand the essence of each element within the system, targeted to promote the overall system optimization.

#### ***The Implementation of Corporate Green Responsibility***

Enterprises integrate eco-environmental protection into the whole process of operation and management, integrate the protection of ecological environment and the development of enterprises (Li, M., 2014), The implementation of green responsibility requires a certain economic base; ecological, social and economic benefits of the three unified, mutual influence and constraints, and we must take into account the three, coordination of the three. If we only pursue the economic benefits or are blindly concerned about the ecological construction, we have unrealistic or unscientific system thinking.

#### ***Innovative Thinking***

Everything in the world has an evolutionary process, and the transformation and upgrading of enterprises is also with the changes in the environment to change its specific meaning. Entrepreneurs should not focus on the current interests, but should grasp the evolution of things to innovate. Rely on innovation

drive, play up innovative thinking to achieve market value creation, and promote sustainable development.

**Green innovation of the management model.** First, the organizational structure decides on the green transformation. Enterprises should rationally set the managerial hierarchy, improve the efficiency of implementation, and the green values spread to the various organizational structure. In addition to the establishment of green research departments or groups to increase support for green projects, they must also take environmental protection into the decision-making elements. At the same time, using a flexible management model, going from linear management to non-linear management transformation, in order to improve the flexibility of green transformation. Through the use of excellent management experience, enterprises will achieve green management and modernization.

**Innovation of the governance structure of the green transformation.** Modernization of the governance structure requires to overcome the “family business” rigidity and close the drawbacks. Specifically, we should fully mobilize the contribution capacity of each element of the system, and actively absorb the new forces and talent into management, so that enterprises rationalize the talent structure, reducing the arbitrariness of decision-making.

**Innovation of labor relations.** Enterprise labor relations is a complex giant system, important to business and social stability is essential. Enterprises should be green, humanize staff management, improve employee job satisfaction and happiness index, and reduce labor costs. Change the relationship between the interests of employees exploiting employees. This is also green transformation and upgrading of the real needs and core elements.

**Innovation of the business model.** First, take a green diversification strategy. In the product services, markets, capital and other aspects of green diversified development, thus forming a benign ecological closed-loop. Green diversification strategy will be enterprise ecosystem within the relevant elements closely linked to play a synergistic effect. The advantage lies in the enterprise that can fully mobilize and integrate green resources in the closed loop to achieve the recycling of resources, reduce waste and costs, greatly enhancing the efficiency of business. Second, promote the greening of products and services. The significance of the existence of enterprises lies in their valuable products and services to the community.

**Innovation in design.** In order to comply with the green wave, companies must adhere to the concept of environmental protection. Greening covers the whole process of commodities from design, R&D, production, marketing and consumption, and is bound to involve changes in key technologies. Through the use of green technology or advanced equipment to reduce pollution emissions and promote the enterprise’s competitive advantage to meet the needs of social green consumption, will be of highly ecological significance.

### ***Green Cooperation and Green Alliance***

The openness of the system determines that the development process must be associated with the external environment. Continued transformation and upgrading of enterprises, external stable relations within cooperation or alliance relations is essential. Inter-firm, cross-industry, cross-regional, strategic cooperations, or the formation of green alliances are conducive to the formation of a green culture between enterprises, promoting each other. A Green Alliance is like a system, each individual situation is different; they need to play their specific role, learn from each other, and complement each other.

## **Chia Tai Group's Green Transformation of the Road: A Case Study**

Chia Tai Group was founded in 1921. It is a typical representative of overseas Chinese businessmen, but it is also a world-renowned multinational group of companies. From the Reform and Opening up to Open the Door to foreign investment, the Chia Tai Group quickly developed into the Chinese market, then continue to increase its investment in China and has contributed to China's agricultural modernization, and subsequently finance, retail, pharmaceutical and other industries. In addition to the pursuit of profit maximization, the Chia Tai Group also, through a series of initiatives, has promotes their own green transformation.

### ***Green Agriculture Development Model***

Chia Tai Groups first initiative was the use of the "Four statuses and one system" model, which refers to their implementation of agricultural development, with "Government + business + financial + farmers" system. The model was based on the "Company + farmers" model, and in according to the new situation of growing with the times, grew to a collection of government, business, finance, farmers with four advantages. With the support of government policy, the use of land, farm labor, banks and other financial institutions, this standardized agricultural production management model achieved a win-win situation (Long, 2015).

The green meaning of the model is to promote the rational allocation of resources, the effective integration of policies, technology, capital and land and other resources, thus saving cost and playing the overall effectiveness of resources; secondly, it helps improve the whole industry chain of agricultural products. This model promotes the transformation and upgrading of modern agriculture, and achieves good ecological, social and economic benefits. It is a benchmark for green enterprises. It is worth mentioning that the participation of government forces is important for implementation of the model, indicating that business innovation should be consistent with the purpose of green policy, and with the government to promote the development process.

The Chia Tai Group's second initiative was the development of a circular economy. Recycling economy is essentially a category of the green economy, emphasizing resource reduction input, recycling and waste recycling. In the Chia Tai Group, some agricultural projects have adopted a circular economy model. For example, in the crocodile breeding base, eliminating chicken as a crocodile food not only reduces breeding and processing costs, but also enriches the industrial chain, to create a new cycle of aquaculture ecology. Similar practices are also found in other farming and pastoral projects. Manure and sewage generated in agricultural activities are reused after being treated with modern environmental technologies to support other organic processes. Agricultural product breeding achieves the whole process of green production, and the farming and animal husbandry cycle achieves the purpose of low-carbon zero pollution.

### ***Green Agriculture and Animal Husbandry Products***

The improvement of the economic environment stimulated the green market demand, and in recent years, the Chia Tai Group has increased the production of green investment. In order to ensure the quality of green products, the Group actively uses modern advanced green technology, automation, unmanned farming and production, full quality control, and fine process management in the promotion of production efficiency to effectively protect the food safety.

For example, the Chia Tai Group, from the aspect of the introduction of high-quality pig breeds, with reference to the world's advanced standardized system around the modern farms. created a series of

supporting system construction, such as feed system construction, an epidemic prevention system, and all kinds of measures to improve the pig industry's ecological cycle. The Group, regardless of the industrial chain system, product safety standards and quality standards, technical level and technical efficiency, has reached a world-class level, conforming to the green production and green consumption needs (Zhou, 2016) .

### ***Green Business Operations Management***

First, the Chia Tai Group, although they are a typical family business, they actively overcame the drawbacks of this model. On the successor problem, they solved the family hereditary system drawback, stipulating that the younger generation should not be the only hereditary practice brought into internal management. In order to firmly grasp talent, the group implemented a “small boss” personnel training program, introduced a talent evaluation system, from the staff to the top excellent management personnel to improve the talent structure in order to reserve a strong talent pool.

Second, the Chia Tai Group is a multi-seek cooperation to pursue win-win situations. For example, the Group, with the Hainan Airlines Group, created the Hainan Farm Reclamation Group agreement, a joint development in agriculture and animal husbandry products cultivation, processing and marketing; and with Anncore and Dow Chemical Company, to jointly build a food safety strategy platform, which uses tripartite resource advantages to solve food chain safety and health risks, moving a green concept into the full range of food production. In addition, the investment area of government docking is also an extremely important part of the group, which can gain government policy support for the transformation and create a harmonious political and business environment. This is also a successful factor in the transformation of enterprises. In the industrial layout, the Chia Tai Group, in farming and animal husbandry, has changed throughout the times and created a diversified business model with the formation of agricultural products, retail, pharmaceutical, industrial, real estate, finance, media and other industries. In modern enterprise transformation and upgrading, a single business strategy or a single industry chain risk is too high and will restrict the pace of business expansion. The improvement of infrastructure, rural e-commerce as a capital of the fertile land, is a strategic emerging industry. The Chia Tai Group, Alibaba, and Ants Financial have based their strategies on Rural Taobao “3.0 strategy” to carry out “Internet + agriculture” green investment, and their products and services will be extended to the rural market. Tripartite cooperation has achieved a strong combination, and played a good integration effect. The Chia Tai Group has used the electricity business platform to broaden their channels of agricultural products and extended financial services to rural consumers, attracting a large number of “long tail” customers. The integration of an online and offline industrial chain so that the Group's business can promote each other as well as docking in the ecological closed-loop has improved the green transformation of their breadth and depth.

### **Conclusion**

The Chia Tai Group, through its own green transformation, with good business ethics and green integrity, has enjoyed huge intangible wealth. The Group has adapted to the green trend, firmly grasping the needs of the government's green policy. However, the Group's green process does need the supports from the government. According to the view of New Structural Economics, the improvement of the productivity level depends on the combination of the “effective market” and a “positive government” (Lin, 2017). The enterprise has difficulty in the absence of internal and external pressure in the case of automatic transformation. Therefore, the government should play the corresponding constraint function and

incentive function in the market management, and correctly help the transformation and upgrading of enterprises.

### ***Improve the Environmental Protection of Relevant Legal Norms and the Development of an Enterprise System***

Although China's current green economy construction has made great achievements, it needs to recognize the relevant laws and regulations have not been updated in time; the lag of the law cannot adapt to social development environment. Therefore, the government should improve the environmental laws and regulations to make up for the system's loopholes and deficiencies. Control the brutal growth of polluting enterprises and increase the illegal costs of enterprises so that pollution of the environment and destructive ecological behavior is managed by strict regulation, rather than just moral condemnation.

### ***Provide Preferential Policies***

Although environment-related laws can reduce the extensive development of enterprises in the system, the pace of green transition will also need to rely on policy encouragement and welfare stimulus. The first is to give tax incentives to green enterprises, such as green technology development or environmental protection projects, which can be deducted before tax. The rewards such as material rewards or honorary titles for corporate charitable contributions and employee benefits can also be given. Second, we should attach importance to the construction of an intellectual property rights system to effectively guarantee and stimulate the economic benefit and technological innovation of enterprises. Support enterprises to securitize green technologies to expand financing channels. Third, we need to support the development of green financial services, a scientific and rational assessment of the green financial policy system, through loans, bonds, private investment, as well as other multiple tools for the enterprise to realize the green reconstruction to provide financial support, and strengthen the supervision of enterprises green fund use (Rouf, 2012). Fourth, set up a green research fund platform, and encourage and finance R&D cooperation of local large-scale enterprises and universities and other research departments to reduce the green cost of enterprises' transformation and upgrading.

### ***Rational Allocation of Resources and Optimize the Industrial Structure***

The 18th Party Congress put forward that the market plays a decisive role in the allocation of resources from the original role of the basic role, but it is undeniable that the market cannot be in economic operation of smooth adjustment of all drawbacks; reliance on the government will be limited resources use. The government should provide more resources for the development of a green economy, play a macro-control role, optimize the industrial structure, support new energy, landscape construction, pollutant handling and other green industries, transform the traditional industries of resource consumption, and protect the efficient use of resources.

From the point of view of the rational economic man, ecological elements and green ideas will be externalized to the enterprise's objective function (Chen, et al., 2011). The green transformation of modern enterprises must rely on internal and external forces of the enterprises themselves. In particular, the enterprises should take the initiative. The green ecological civilization is embodied in corporate activities, which can lead the whole economic circle of overall high-quality green transformation. Green is no longer a means of social and economic development, but a development of endogenous elements, and is the pursuit of value with the economic benefits.

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# **A Study on the Sustainable Development of Leisure Agriculture and the Ecological Environment**

**Zhang Wei, Li Xin and Zhang Xiaofan**

*School of Business, Tianjin University of Finance and Economics, Tianjin, China.*

Email: mikechangwei @163.com.

*[Abstract] As one of the leisure industries, leisure agriculture is the combination of a first industry and a tertiary industry. It is also an important part of ecological civilization construction and green economy development. Based on the theory of geography and tourism, this paper analyzes the ecological and environmental problems caused by leisure agriculture, modifies the framework of the traditional agroecosystem, describes a compound agroecosystem including nature, agriculture and tourism subsystem, and puts forward strategies to promote the sustainable development of leisure agriculture.*

*[Keywords] leisure agriculture; ecosystem; sustainable development*

## **Introduction**

Leisure agriculture, as one of the leisure industries, is a hybrid of a primary industry and a tertiary industry (Yu, 2001). It is also an important part of the construction of ecological civilization and the development of green economy. The increasing pressure of urban population has resulted in the need to escape urban pollution and a fast-paced lifestyle, return to nature and enjoy the rural pastoral life, thus leisure agriculture came into being (Greffé, 1994; Tosun, 1998). Leisure agriculture, as a newly-form agriculture, also contributes to the promotion of the rural revitalization strategies. However, leisure agriculture started relatively late in China and the theory and practice are not perfect, resulting in a series of problems in the ecology and environment, adversely affecting sustainable development. How to combine agriculture, rural resources and tourism is a common task for the development of agriculture and tourism in the process of revitalizing the agriculture and ecological civilization in China.

## **Eco-Environmental Problems**

The rural leisure agriculture economy of China is in its infancy. Although leisure agriculture has achieved considerable economic benefits, its sustainable development is still faced with major challenges because of a series of problems. At present, the ecological and environmental problems are mainly reflected in the following three aspects: (1) Land transfer has led to land abandonment. Some villages have adopted the “village collective + business” model to attract some external funds, but it has also brought long-term development problems, such as land abandonment caused by land transfer and fruit forest damage. Lucid waters and lush mountains are invaluable assets. Rural tourism construction must be based on resources, environmental conditions and the wishes of farmers, and any “performance project” and profiteering projects are short-sighted (Fang, X., 2015). (2) Over exploitation has caused environmental deterioration. Leisure agriculture is based on the rural natural environment and the agricultural environment. However, in the development of leisure agriculture, some operators ignore this point. A large number of artificial facilities have seriously destroyed natural environment. (3) Disordered development has wasted resources. Some investors and developers blindly follow the trend, launching leisure agriculture programs without early investigation and research or they release the land by exploiting preferential policies from the government, causing waste of resources and affecting the development of leisure agriculture.

To sum up, the key of developing leisure agriculture is to convey a feeling of a “return to nature” with a beautiful pastoral scenery and a clean and comfortable living environment. Developers need to be aware that leisure agriculture relies on the resource advantages in rural areas and that they are supported by the whole rural ecosystem.

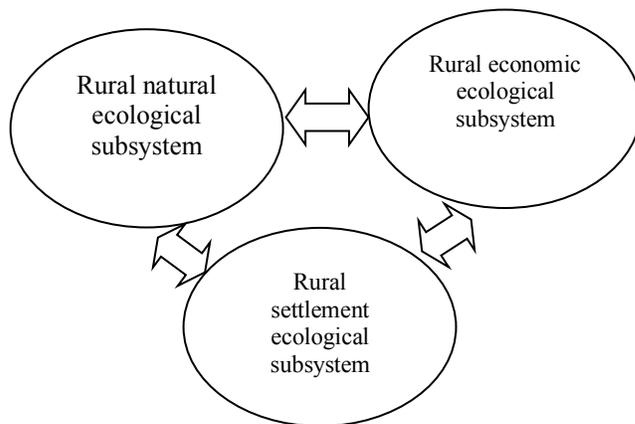
## A Comprehensive Rural Ecosystem

### *Traditional Rural Ecosystem*

A rural ecosystem is both a semi-natural and semi-artificial ecosystem. Chen Youqi argued that “rural ecosystems refer to living and non-living common organisms with mutual restraint and interaction connected by certain forms of material and energy exchange in rural areas” (2000, p. 24).

The basic characteristics of a traditional rural ecosystem is human intervention, self-recovery function and material circulation. The rural ecosystem is a semi-artificial and semi-natural ecosystem with natural elements and intangible culture made by residents. Although there are advanced technologies, rural agricultural production still relies on the land. Besides, the development of rural ecosystems is still influenced by human intervention. A large proportion of the rural ecosystems is the natural ecological subsystem. This system, with obvious natural force, has a strong self-recovery and self-regulating function. Rural ecology provides the necessary materials and products for human survival, ensuring the existence and development of the urban ecosystem. It’s a complex ecology-economy framework. The rural ecosystem must absorb energy from the urban ecosystem besides nature and produce agricultural products for the urban ecosystem.

According to the different components and functions of the rural ecosystem, the composition of the rural ecosystem can be divided into three components: the rural natural ecological subsystem, the rural economic ecological subsystem and the rural settlement ecological subsystem (Chen, 2000, p. 24). We can see the framework of the traditional rural ecosystem in Figure 1.



**Figure 1. The Traditional Rural Ecosystem**

The rural natural ecological subsystem is the foundation of rural ecosystems. The complex interaction between biological species enables the system to withstand external changes and have a higher integrated productivity. The rural economic ecological subsystem is a combination of rural natural interaction and human interaction, including rural farming, animal husbandry, forestry and rural industrial ecological subsystem, etc. It is governed by natural laws and dominated by economic laws. The rural

settlement ecological subsystem results from the interaction between human and nature. Human intervention is the most obvious element in this subsystem, and the artificial landscape occupies a large part of the subsystem. The evolution and development of the system is mainly dominated by the economic laws of human society.

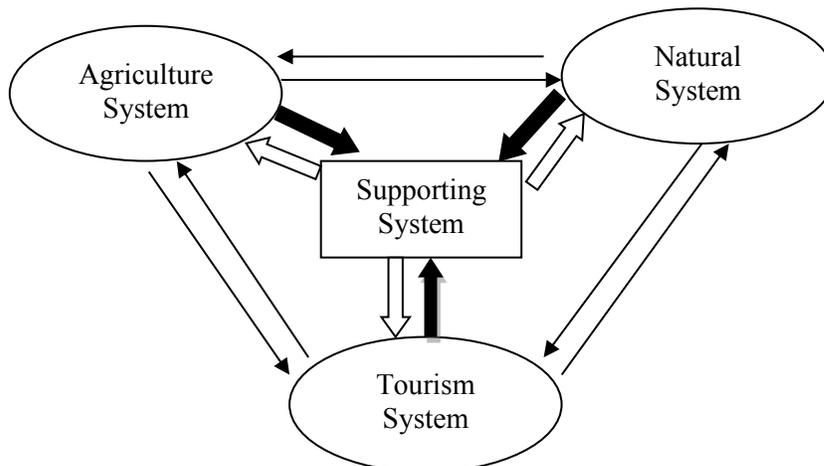
All of these subsystems interconnect, penetrate and interact with each other to be an indivisible whole, playing the overall function and promoting the progress and sustainable development of the country.

***A Comprehensive Rural Ecosystem Embedded with Leisure Agriculture***

Leisure agriculture originated from Italy, Austria and other places in the 1930-1940s and then quickly spread throughout Europe and the United States. Developing leisure agriculture can extend the industry chain both in agriculture and tourism, thus forming a more diversified industry. And leisure agriculture brought a new income source for the local citizens (Oppermann, 1996). With the characteristics of low investment, low risk, low threshold and flexible operation, leisure agriculture can be a platform for farmers to run their own businesses or get employed (Ma, Y., 2007; Noel, 1990).

Agriculture, the first industry in China, should become a multi-functional agriculture. In addition to performing the traditional functions of agriculture, it is necessary to fully discover its diversification, such as tourism function, cultural and ecological functions, and leisure functions, etc. Tourism, a tertiary industry, is an industry group, and includes catering, hospitality, traveling, visiting, shopping and entertaining, which fully reflects social harmony and tranquility. Satisfying basic demands (enjoyment, leisure needs) can emerge as the higher pursuit. Leisure agriculture, as a manifestation of agricultural multifunction, pays more attention to the experience and participation of tourists.

Once leisure tourism is embedded into the rural ecosystem, the natural subsystem, agricultural subsystems and tourism subsystems are closely integrated to develop a new industry with leisure tourism, cultural tourism, and energy supply, as described in Figure 2.



**Figure 2. Comprehensive Rural Ecosystem Embedded with Leisure Agriculture**

The agricultural system embedded with leisure agriculture provides consumer demands for tourism and relies on tourism to increase income for local people and revenue for the local government. The natural system provides ecological demands for the tourism system, but human activities during the travel may also have a negative impact on the natural system by causing pollution, intentionally or unintentionally. As Maude and van Rest (1985) argued, leisure agriculture has brought a large number of

tourists, which will produce garbage pollution and even lead to the deterioration of the rural environment. The agriculture system is in need of getting and utilizing resources from natural systems. Without sunshine and water, plants cannot survive, and crops cannot grow. At the same time, the control of many diseases mainly depend on the chemical pesticide. Using too many chemical pesticides can result in pollution to environment.

There is a supporting system in the center of the comprehensive rural ecosystem, mainly consisting of government management policies and business supporting networks, maintaining the stability of the whole system. There are three systems of feedback to the supporting system, and in turn, the government in the supporting system can provide preferential policy for the agricultural systems and laws and regulations on environmental protection for the natural system, as well as business circles in the supporting system can provide a scientific controlling method for the tourism system. On the one hand, the government needs to establish a perfect construction system, set up specialized institutions and make sure the policies and regulations can be orderly managed. On the other hand, BCSEA (Business Community Supported Agriculture) and industry associations, providing consulting services and communicating with industry and government, support the orderly competition and sustainable development of leisure agriculture.

### **Sustainable Development of Leisure Agriculture**

The concept of sustainable development was proposed in 1980, “World Conservation Strategy”, includes the connotation of “persistence” and “development”. It aims to promote the balanced development of human economy, social development and natural ecological environment.

Some studies on the sustainable development of leisure agriculture advocate sustainable development and argue to protect the ecological environment while developing leisure agriculture. They propose that the development of leisure agriculture should rely on the advanced ecological concept and establish an ecological cycle concept with the principle of low carbon, and a leisure agriculture project should reasonably exploit tourism resources, based on ecological protection (Wang, Yan, & Feng, 2008). Inskeep (1991) argued that a healthy and sustainable development of leisure agriculture plays a role in maintaining the integrity of the rural culture and environmental system, promoting rural economic development and farmers’ employment, as well as fairly and reasonably allocating a variety of social and economic benefits brought by leisure agriculture in the various regions. During the development of leisure agriculture, we also need to focus on the protection of rural culture and value and oppose the action of remising farmland and changing the property of land (Lei, 2008). The blind pursuit of economic benefits will ignore the environmental carrying capacity and sustainable development.

At present, some local governments just care about whether leisure tourism can bring benefits for the local residents and effectively promote regional economy in China. However, other countries pay more attention to protecting the local cultural traditions and ecological environment during developing rural tourism. Therefore, governments should balance the ecological and social factors in the sustainable development of agricultural leisure tourism. There are some useful measures.

1. Perfect the policy system. Some countries take the development of leisure agriculture, urban residents’ leisure tourism, farmer employment and regional revitalization as basic national policy, which shows their full attention to the sustainable development of leisure agriculture. The government can give more support for leisure agriculture by simplifying the approval

- procedures of leisure agriculture projects, implementing tax incentives and ratings for leisure agricultural tourism projects, and coordinating financial institutions to provide agricultural loan.
2. Construct industry associations. Expand the financing channels and promote the common prosperity of the whole industry by associations such as the US Nonprofit National Rural Tourism Fund (NRTF), the Regional Agricultural Revitalization Council in Japan, Australia's Leisure Agriculture or Farm Sightseeing Company. Local government should strengthen its support for professionalization of research teams, encourage research and development department to carry out the study on leisure agriculture.
  3. Strengthen training and education. The key to developing the agricultural leisure industry is the concept of sustainable development. It is essential to develop natural resources under a scientific plan, cultivate the superiority and pride of the local residents for their rural culture, encourage the residents to learn ancestral techniques and promote the preservation and inheritance of rural tourism resources. Managers and employees of leisure agriculture should be trained together and organized to learn from the advanced experience in other places to improve their quality.

### **Implications and Conclusion**

Leisure agriculture is a new industry that combines with agriculture and tourism. It emphasizes the experience and participation of tourists and plays an important role in rural economy development, cultural transmission, ecological environment protection and agricultural modernization. It can be clearly reflected in a comprehensive rural ecosystem embedded with leisure agriculture that humans and an ecosystem are a community of common destiny and everyone needs to raise the awareness of protecting the ecological environment and follow a sustainable concept while developing leisure agriculture. Only in this way can we develop leisure agriculture in a healthy and scientific way.

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# Research on Value Co-Creation Among Customers, Manufactures and Platforms on the Theories of Refined Platforms

**Lu Qinyuan, and Chen Ying\***

*School of Business Administration, Zhejiang University of Finance and Economics,  
Hangzhou, China*

Email: qinyuan228@outlook.com; yc@zufe.edu.cn

**Zhu Zhenhua**

*Department of Economic and Trade Management, Xinjiang University of Science  
and Technology, Aksu, China*

Email: zhu972270656@163.com

**[Abstract]** *The appearance of refined platforms based on the theories of lean management satisfies the need of a shared economy. Green management is a new management mode in enterprises brought up with the background of sustainable development such as a green market and environmental protection. This paper focuses on refined platforms and studies methods of resource sharing and the value co-creation process. The value co-creation process among customers (C), platforms (P) and manufacturers (M) is discussed through the case study of the bargain platform (Mr. Ye Helps to Bargain) operating in the home furnishing decoration market.*

**[Keywords]** *refined platforms; green management; value co-creation; Mr. Ye Helps to Bargain*

## Introduction

Lean management is a management mode to reduce waste in the management process and an idea to improve value, as well as to achieve resource sharing. Lean management is mainly applied to modern manufacturing industries and has been performing well so far. This management mode aims at producing as much value as possible with the lowest input. During the past few years, the platforms that the Internet provides shed a light on the development of lean management. Enterprises break the traditional lean management mode by building “lean platforms”. With the help of big data, enterprises use Internet platforms to connect specific groups of individuals and eventually turn “partially refining” to “integrally refining”.

Lean platforms and green management supplement each other adding relevant input, and this brand-new way of management is going to stand firm in future business management (Huang, L., 2015).

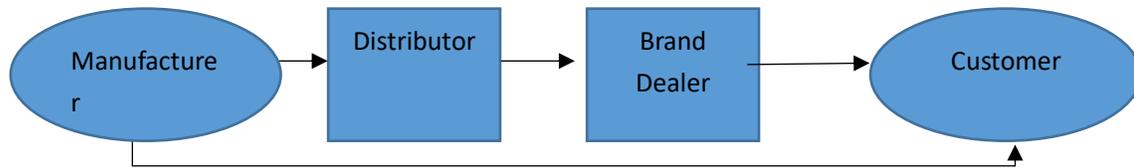
As the sharing economy and platform economy is rapidly developing, the appearance of lean platforms satisfies the needs of the present age and shows its forefront. Therefore, research on value co-creation based on the thought of lean platforms has significant referential meaning to resource sharing in the future.

## Literature Review

### ***Theory of “Customer to Manufacturer” Mode***

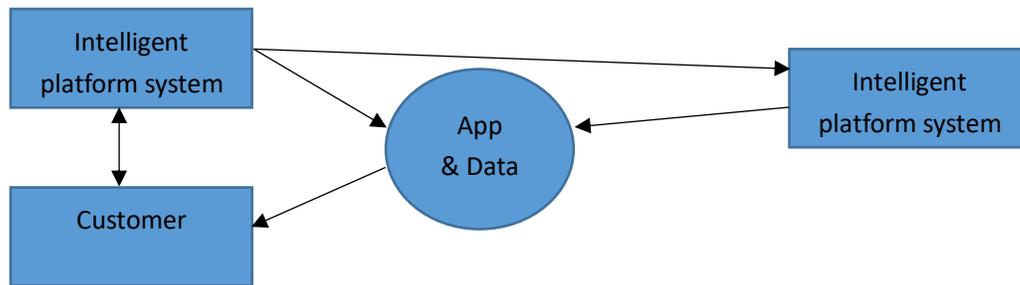
“Customer to Manufacturer” mode (C2M) is a customer demand-oriented international business model brought up in the background of the “industrial Internet” (Duan, & Pan, 2017). Enterprise C2M

e-commerce platforms provide the opportunity for customers to communicate with enterprises directly. Customers will only have to pay a little more than production cost. Other expenses like brand tax, cost of physical store management and production storage are saved, as shown in Figure 1.



**Figure 1. Enterprise C2M e-Commerce Platform**

Third party e-commerce platforms use an intelligent platform system to send real-time information between manufacturers and customers by the Internet as shown in Figure 2.



**Figure 2. Third-Party C2M e-Commerce Platform**

**Advantage of “Customer to Manufacturer” mode.** Price is lowered because the intermediate links of production selling are omitted. Manufacturers only need to produce as many items as demanded so the expenses of storage are decreased. Customers can get personalized production by making demands to the manufacturers.

**Disadvantage of “Customer to Manufacturer” mode.** The pleasure of the purchase decreases due to longer production time. It is believed that the purchase need of customers is often instant, which means it will certainly create more pleasure to gain possession of the items right after purchasing them. Pre-sale orders are scattered both in time and geography. This customer-oriented production behavior apparently will cause such scatter.

**Theories of Value Co-Creation**

Yi and Yuan (2009) came up with the concept of the consumer value system which focuses on the transinformation and evaluation of consumers’ demands. In this system, the two fundamental points are consumer-oriented value creation and value requirement. They argue that the value creation is not a one-way process. Apart from the traditional opinion that producers create spendable value for consumers, it is newly brought up that consumers can transform the usage value into perceived gains and then feed them back as exchange value to producers. Thus, consumers are not only “consumers” but also value creators in the process of value creation.

Scholars have studied the core of “value co-creation” from various perspectives and they hold two different opinions on it. Prahalad and Ramaswamy argued that value co-creation, which is based on the

heterogeneity in interactive experience of consumption, can appear in any phase of value creation (Du, & Qian, 2014).

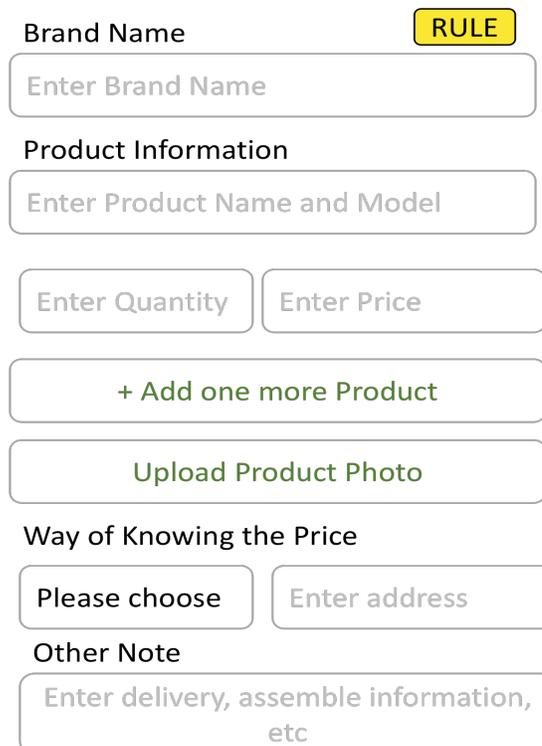
Most domestic researches have fixed their attentions to offline activities such as partaking of consumers in product development and innovations in consumption experience. They've also studied the principles, processes, effects, and influences, etc. of value co-creation combined with theories in other subjects. Wan Wen-hai and Wang Xin-xin (2013) have made close connections between value co-creation and consumer experience with related theories and built a innovation model of purchase experience in fast selling industries through empirical investigations.

In conclusion, the present researches of value co-creation have mostly stayed on theoretical analysis and offline activities, while the researches on value co-creation on the Internet are lacking. With the rapid development of the Internet, research on value co-creation on the Internet apparently has more practical significance (Dong, Evans, & Zou, 2008).

### Case Study of Mr. Ye Helps to Bargain

#### *Introduction of Mr. Ye Helps to Bargain*

Mr. Ye Helps to Bargain (hereinafter referred to as “the bargain platform”) is an Internet platform that started in April 2016 and provides free service of home furnishing decoration consulting, purchasing, bargaining, and rights safeguarding, etc. Homeowners only have to type the brand, model number, and sale channels of desired products into the online platform (as shown in Figure 3) and then the platform, AKA Mr. Ye Helps to Bargain, will help to bargain even if the sellers have already shown you the “lowest” price. The success rate is usually higher than 95%.



The image shows a screenshot of the application interface for 'Mr. Ye Helps to Bargain'. It features several input fields and buttons. At the top, there is a 'Brand Name' label and a yellow 'RULE' button. Below this is a text input field with the placeholder 'Enter Brand Name'. The next section is 'Product Information', followed by a text input field with the placeholder 'Enter Product Name and Model'. Below that are two side-by-side input fields: 'Enter Quantity' and 'Enter Price'. A green button with a plus sign and the text '+ Add one more Product' is positioned below these. Another green button with the text 'Upload Product Photo' is located below that. The 'Way of Knowing the Price' section includes a 'Please choose' button and an 'Enter address' input field. Finally, the 'Other Note' section has a text input field with the placeholder 'Enter delivery, assemble information, etc'.

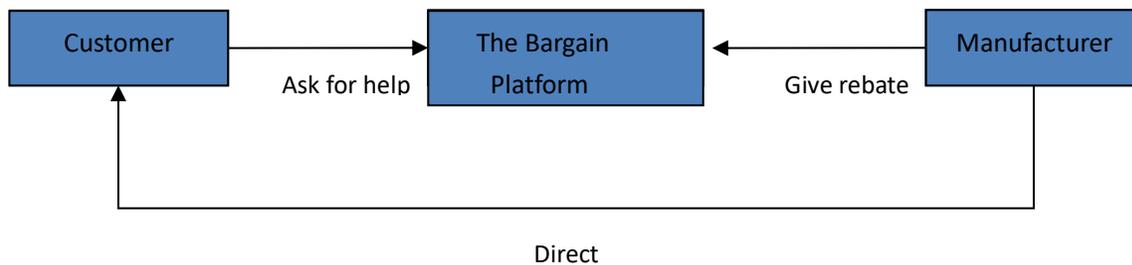
**Figure 3. Application Interface of the Bargain Platform**

***“Customer to Platform to Manufacturer” Mode of Mr. Ye Helps to Bargain***

The bargain platform still values the needs of customers the most and the add a “platform” link to the C2M mode (C2P2M). Unlike the C2M mode, the bargain platform serves as an intermediate platform to connect customers and manufacturers in the producing process of customization products (Maglio, & Spohrer, 2008).

The bargain platform can help homeowners purchase products among over 100 known brands of construction materials, furniture, and home appliance. Homeowners can go to the stores or various sale activity sites to acquire the lowest of the products on their own. Next, they can get an even lower price on the bargain platform. Then, they can receive the products and services if they accept the price to purchase the product or they can have their previous paid money returned if not satisfied.

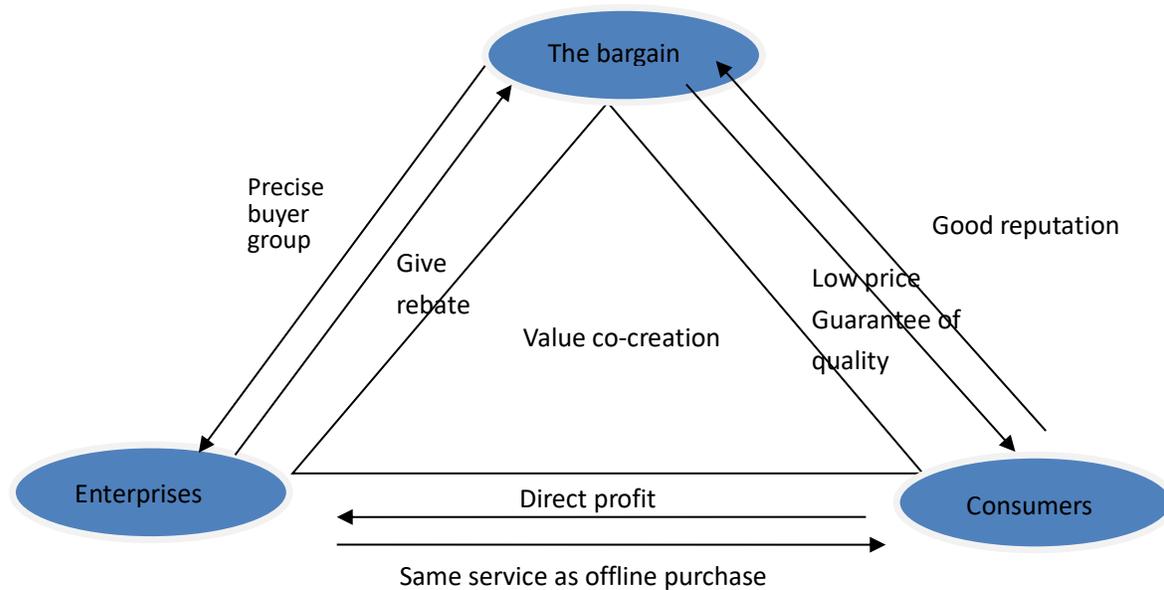
The bargain platform makes profits by taking rebates from enterprises for increasing the amount of sold products. So, the platform will be able to provide better services for homeowners. The bargain platform helps homeowners to save money and helps bring in frequent buyers and the cut-down on propagation cost at the same time. As a third-party platform, Mr. Ye Helps to Bargain is easy for consumers to operate online and does the bargain job offline efficiently. Therefore, the bargain platform stands firm in the huge home furnishing decoration market (Pralhad, & Ramaswamy, 2004).



**Figure 4. The C2P2M Mode of the Bargain Platform**

Free customized bargain service is one of the attractions of the platform, for this no-cost service helps build a friendly relationship between the platform and consumers. The two main features of the platform are shown as follows: (1) Lowest price: price is the most concerned point and the platform can get a lower price than previously provided to consumers. (2) Efficiency: concise operation interface of the platform enables consumers to make appointments in one minute. The accomplishment of the bargain job in one day uplifts the consumption experience (Wu, & Chen, 2012).

### *Practice of Mr. Ye Helps to Bargain in Value Co-Creation*



**Figure 5. Value Co-Creation Mode of the Bargain Platform**

The Mr. Ye Helps to Bargain platform connects consumers and manufacturers and actualizes the value co-creation of three participants. The bargain platform, serving as the core link in the value co-creation, offers assistance to consumers in purchasing high-quality products with a pretty low price, and brings in frequent buyers and cuts down on propagation cost for enterprises as well. The platform makes profits by taking rebates from enterprises. Yet, it is only a small part of the value creation process. The ultimate operation aim of the platform is to expand the consumer groups. In other words, Mr. Ye Helps to Bargain aims at becoming the well-trusted bargain platform by its users.

### **Conclusion**

It can be discovered that through the empirical investigation as shown above, in the Internet with massive information, precise understandings of customers' needs and the grasp of accurate customers with the lowest costs are crucial for enterprises in the cruel market competition. Apparently, some enterprises are now important users of the platform apart from individual consumers. The platform in the case above whose functions successfully transformed from information media into the intermediary in business operation, has actualized direct communications between customers and manufacturers. The cost of business operation is lowered, while the benefits for both are promoted through the bargain platform. Then, an integrated process of value co-creation is accomplished. The platform refining like the bargain platform can help to decrease the cost in the whole value chain as to make the maximum benefits for all participants. These kind of refined platforms make it possible that social resources are being used at the greatest extent with the purpose of producing maximum benefit. It can be predicted that this C2P2M mode is very likely to be the main operation mode of e-commerce platforms in the future judging from the developing trends of the Internet platforms.

The thought of refined platforms to make maximum usage of resources correspond to the concept of green management which is significant in constructing an ecologically sustainable society. Enterprises promote the sustainable development of nature, society and themselves by green management. Green management coordinates the development goals of enterprises and society, and eventually both can enter this brand new sustainable development phase

### Acknowledgement

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\*Corresponding Author: Chen Ying, Email: yc@zufe.edu.cn

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# The Study of Brand Communication and Social Marketing Strategies in Socialnomics

Lin Di, and Chen Ying\*

*School of Business Administration, Zhejiang University of Finance and Economics,  
Hangzhou, China*

Email: 17816850944@163.com; yc@zufe.edu.cn

*[Abstract] With the large-scale development and popularization of Internet and mobile terminal equipment, the era of mobile Internet is coming. The existence of the network has greatly reduced the cost of acquiring and disseminating information, changed the industrial structure of traditional industries, and promoted the new economic situation of Socialnomics. Based on the existence of communities, the marketing strategies utilized by Socialnomics have combined existing marketing theories, and further developed into a more effective strategy. In this article, the “THREE PAPAS” air purifier is taken as an example, showing how the enterprises, under Socialnomics, use new media tools, establish a variety of communities, and achieve a high degree of interaction and value co-creation with target customers.*

*[Keywords] the era of mobile Internet; socialnomics; “THREE PAPAS”; value co-creation*

## Introduction

In recent years, the number of mobile devices such as smart phones has surged, and these devices have gradually become the main medium for the public to acquire, share and disseminate information. It is obvious that the Internet and mobile terminal equipment have been widely popular among the masses, suggesting the advent of the era of mobile Internet. The arrival of the era of mobile Internet enables everyone to become the producers and disseminators of information and has greatly reduced the cost of value co-creation. This has brought new challenges and opportunities for the global world of industrial structures which has begun remodeling. The innovations and changes are due to the development of Internet technology and have given birth to a new economic model – Socialnomics.

Socialnomics is an economic form which carries out economic activities with various social organizations and social relations as productive forces (Kong, 2015). In the era of mobile Internet, Socialnomics is going to develop and spread rapidly. Products and services and the approaches of brand marketing are more likely to go through great changes. All kinds of new media tools including the micro-blog, WeChat and others are used frequently by a number of firms. How to take effective marketing modes in the social economic background, gain their imperious demands, strengthen brand communication, and reduce marketing costs will become major tests of marketing personnel. The following will take the social marketing model of “THREE PAPAS” air purifier as an example to demonstrate how to achieve successful social marketing in Socialnomics.

## Literature Review

### *Research Status of the Characteristics of Socialnomics in the Internet Age*

Socialnomics (Wang, 2017) is a new economic form breeding in the era of mobile Internet. It focuses on the community, followed by the economy. Compared with the traditional business models, the most important change in Socialnomics is that it is a decentralized business, which means that community

members, community management teams and consumers can expend cooperation in various forms according to their own needs and resources (Cai, 2015).

Socialnomics is a business thinking and model based on the community. Its foundation mainly depends on the community's identity and a sense of belonging. The owners make use of horizontal communication within the community to discover the demands of members. The key is to obtain the corresponding value by satisfying these demands, to further establish and perfect the ecological system within the community (Hu & Song, 2015).

Socialnomics (Feng, 2017) has five features in its systematic structure, personnel organization, operation process and marketing and other aspects: stable organization, distributed resources, flexible production, personalized marketing and dual products.

In conclusion, Socialnomics has developed on the basis of mobile Internet technology, and gradually expanded into a new economic ecology. Its key lies in the community, specifically the members in the community. Community building is the top priority. In terms of community maintenance and expansion, enterprises need to provide products and services aimed at the needs of community members. This internal ecological satisfaction enables the community itself to gain stronger external capital by optimizing the community's environment, condensing members' power, and enhancing the community's identity. Therefore, in the study of the characteristics and business logic of the community's economy, it is necessary to focus on the community's participants, and maintain and develop community strength through the study of their characteristics and needs.

#### ***Research Status of Brand Communication Strategies Associated with Socialnomics***

In Socialnomics and the fan economy, the brand directly relies on the users' word of mouth in the empirical study of the "THREE PAPAS". The establishment and dissemination of the brand must pay attention to consumers' sense of participation and their participating behavior (Li, Q., 2015). Socialnomics is the singular point of brand communication, instead of the starting point or end point. In the community, the brand owner needs to have an equal identity with other users and a timely release of information, so that users can obtain it the first time (Yang, & Li, 2016).

In the era of mobile communities, brands and users need to build a long-term emotional relationship. Consumers replace the product as the starting point of brand building through every link and become a new driving force. In the community, the trust accumulation and emotional input of users give the brand and consumers the shortest way to connect, and the long-term development of the brand depends on the followers of the community. Brand communication also changes from a traditional linear structure to a more rigorous and complex network structure (Wang, 2017).

To sum up, in Socialnomics, the most important method of brand communication is the user word of mouth. When enterprises set up a brand, they mainly first do word of mouth to establish consumer loyalty to products or services, and then rely on the reputation of users to build awareness. In order to build up word of mouth, brand owners need to increase the interaction with community members and publish more users' information in the community with an equal attitude, so as to increase the stickiness of the community.

#### ***Research Status of Marketing Strategies in Socialnomics***

Operations of the community must realize self-operation among community members and establish the social mechanism. This mechanism can be varied or even be members themselves, but it is important to

realize the internal members of the organization of the community (Yang, 2015). Social marketing needs to direct people as a channel to operate, different from micro business, mainly to use the users' word of mouth effect to introduce more users. In the social context, compared with the relatively isolated individual consumers, consumer groups have a greater impact on consumer psychology and behavior (Qiu, 2017).

The management of a brand community needs to create feelings to obtain emotional resonance with users, mining and improving user loyalty (Chen, 2017). Because of the nature of mobile Internet, social marketing depends heavily on new media tools, mainly from the media, such as WeChat, micro-blogs and other tools used for most network users. With the Internet as a platform, feelings serve as the emotional link to meet the needs of the core, and such a community will exist for a long time. However, the community contains a large number of users with a variety of needs; it is difficult for owners to create value for all users. Therefore, community marketing should aim at small customers' demands and achieve high sales with precise positioning.

### **Case Study of “THREE PAPAS”**

“THREE PAPAS” Household Intelligent Environmental Technology Co., Ltd. (Beijing) was founded in February 2014, focusing on manufacturing and selling intelligent hardware related with healthy domestic environment designed for specific groups of pregnant women, and children; they mainly sell air purifiers (Li, Y., 2014). The project was initiated by Saiying Dai, Haibin Chen and Yanan Song, all of whom are fathers. The company aims to develop products in an innovative mode and create the most suitable air purifier for children. Since the start of the project, it has expanded with astonishing speed and efficiency. In March, their sincerity and determination touched Mr. Zhen Zhang, the capital partner of Gao Rong, to get 10 million US dollars to start the fund. In August, “THREE PAPAS” and the entrepreneur media “I Endorsement” team held product launches in the Dark Horse Global Road Show Center. In September of the same year, the company launched crowd-funding in Jingdong, and created 11 million 220 thousand Yuan, which successfully beat China's public funding records. In the air purifier market where the competition is particularly fierce, as a new brand on the Internet, the “THREE PAPAS” venture horse can successfully survive and become a legendary and familiar brand in a year of period, because of ingenious social marketing carried out by its team.

### **Marketing Strategies of “THREE PAPAS”**

#### ***STP Strategy***

**Market segmentation.** The three founders of “THREE PAPAS” have the same identity – father. The original intention of the three partners to create the brand was to find the best air purifier for their children. In major household appliance stores, they had not found a special purifier designed for children. So they decided to work together to develop a product specifically for their children. This was the origin of the “THREE PAPAS” brand. “THREE PAPAS” divided the market into different groups in accordance with “serious vertical” thinking, consumer age and identity as the subdivision elements in many customer groups. But in today's purifier market, almost all brands are positioning in the general consumer population. Therefore, this unique subdivision strategy has laid a solid foundation for breaking the gap of air purifier market, and successfully entering and occupying a place.

**Target market selection.** Based on the original intention of brand, “THREE PAPAS” narrowed the target customers through reasonable market segmentation, paying attention to pregnant women and

children, aged 0 - 10 years. These two consumer groups are more special, for the sake of healthy pregnancy and growth. All need the purest air, so the quality of the air purifier is extremely demanding. Having seized this appeal, it focused on the target market of these two special groups and strived for innovative research and development to create a dedicated air purifier for the world's pregnant women and children. This market choice was unprecedented in the purifier market. This unique vision of "THREE PAPAS" is the key to the company's success.

**Market positioning.** In order to achieve its goal, "THREE PAPAS" used differentiation strategy, and researched and developed products that were different from the general user products according to the physical needs of pregnant women and children. To deeply understand and collect the needs of target customers, it had in-depth interviews and communication with more than 700 parents by WeChat and other new media tools and gained 65 needs to fully tap the pain points of air purifier users, and finally summed them up to the 12 focus points, to finish product positioning and focusing.

Through repeated attempts, "THREE PAPAS" finally produced a new intelligent air purifier that made users scream. There are many amazing and excellent features and functions. For example, the shape is designed with a rounded transition, and the air inlet is arranged at the bottom to form a 360-degree wind circulation; the top outlet is inclined and curved in an upward, circle, so as to avoid blowing straight at the child's body...All of the designs are based on the needs of the target consumer groups, and are the most attractive selling points of "THREE PAPAS" air purifiers. Furthermore, the materials used in the manufacturing process belong to environmental-friendly materials, which accords with people's concept of green life today and also matches with the image of this enterprise.

### ***Fan Marketing***

Nowadays' business models have changed to emotional capital as the core of fan economic ecology. Fans play a vital role in economies. In the community and fan economy, the brand directly depends on users' word of mouth. Contrary to the traditional business model, enterprises must do loyalty at first, and then popularity, to make users become strong brand fans, and then spread brands through them. Enterprises succeed in using the power of fans to create word of mouth and then build the brand with word of mouth. Then, the enterprises must define the user group correctly and turn the users into fans. "THREE PAPAS" is based on this methodology, starting from the original fans group, and successfully building user platform.

First of all, "THREE PAPAS" has spared no effort to build a fan group. It always adheres to the zero-distance communication with users and pays attention to the creation and dissemination to fans. All of the selling points of the product stems from the pain complaints from its fans. In the initial stage of product design, more than 100 parents from "paranoid parents" were narrowed down by more than 700 parents, and they became the most basic fan group. After the integration of the Dark Horse business resources, the company created Dream Angel fans group, and then launched the love testing activities accumulated star parents who are also an important media to spread fans. "THREE PAPAS" respects the fans' sense of participation and initiative, maintains good and effective interaction, and always carries out the idea of value co-creation. The huge group of fans has played a very active role in its crowd-funding and the entire brand building and dissemination process, stimulating a steady stream of creativity and purchasing behavior.

Secondly, "THREE PAPAS" uses the construction of organizational culture and value concept to achieve emotional communication with its fans. Since there is a common identity among the founders of the brand and fans, that is, the father, it is easy to achieve emotional resonance. It is their consensus to

create the best-quality air purifiers for children, so that they can grow in a healthy environment. They touched the investors with their “fatherly affection” and “father spirit”, infecting fans and users. Organizational feelings and culture have also been exercised throughout the whole ecological chain, product development, design and production links to follow the concept of the enterprise, which help them manage the whole enterprise with the flexible power of organizational culture.

Finally, the company makes full use of the scene and fragmentation of Internet life. It’s common for people to scan the circle of friends and micro-blogs on the subway and on the bus, which has become a habit for most people. The success of “THREE PAPAS” is definitely associated with WeChat’s circle of friends. At first, its brand, products and business stories were reprinted by only a minority of people via WeChat, and then spread by a growing number of their friends, gradually expanding their brand awareness. Thus, the brand marketing of the fans economic undoubtedly depends on new media tools, especially social marketing, to make users willing to share reprint information for enterprises.

### **Conclusion**

Born in the era of Internet, Socialnomics is the product of the development of the times and technological progress. The new economic ecology has given birth to a more perfect and innovative marketing model. Social marketing based on the community pays more attention to the emotional connection between users and service groups, constructing communities via the connection of feelings, promoting exchanges via positive interaction, adopting information via communication, building trust via demand satisfaction, establishing brand recognition via word-of-mouth spreading, and inculcating business sentiments and attitudes to life via interactivity. As a dark horse in the online air purifier industry, “THREE PAPAS” attempts Socialnomics bravely with its unique wisdom and feelings, makes full use of the customer resources brought by the Internet, mobilizes their subjectivity and participation, advocates value co-creation and the concept that does loyalty at first and then enhances brand recognition. It has created a high-quality brand with a sincere attitude and excellent technology.

### **Acknowledgement**

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\*Corresponding Author: Chen Ying, Email: yc@zufe.edu.cn

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# Food on the Tree: Green Catering and Poverty Alleviation Tourism

**Xie Fang, Liu Mengmeng and Peng Huihui**

*School of Business, Tianjin University of Finance and Economics, Tianjin, China*

Email: xiefang6105@163.com

*[Abstract] In modern tourism activities, “food” has become an important tourism resource. With the strengthening of the concept of green consumption, the original ecological green food has gradually returned to the table. This paper discusses how Shanxi Yonghe county uses flowers on the trees as green food raw materials to cooperate with XiBei catering enterprises in Beijing, boosting the local economy of Yonghe by pro-poor tourism and green catering industry. In addition, this paper analyzes the limitations of the locust flowers industry development and puts forward countermeasures and suggestions to build a green catering tourism brand.*

*[Keywords] locust flowers; green catering; poverty alleviation tourism*

## **Introduction**

With the deterioration of the ecological system, changes in human consumption demand and the emergence of food safety issues, people are increasingly concerned about healthy and organic food. A new concept of green consumption and a new lifestyle came into being (Guo, 2013). Recently, “Yonghe Locust Flowers Poverty Alleviation Activity & Locust Cultural Tourism Festival Conference” was held in Beijing. Flowers cakes, dumplings and other foods made by Yonghe wild locust flowers caught most people’s eye. Not only can it cater to the green consumption trend and demands, but also it can achieve poverty alleviation by developing the Locust industry and cooperating with Beijing Xibei catering enterprises.

In recent years, the tourism cluster consisting of red culture tourism, the Yellow River customs tourism, and green ecological tourism has gradually formed in Yonghe county, based on the unique geographical conditions and rich tourism resources.

## **Locust Flowers Industry in Yonghe County**

### ***Geographical Location and Growth Environment***

Yonghe county is located in the south of Luliang Mountains, in the east of the Yellow River canyon and the northwest of Linfen city, with a total area of 1212 square kilometers. It is one of the cradles of Chinese civilization with charming historical culture, folk culture and red culture. 1.8 km<sup>2</sup> locust trees on the territory of the Loess Plateau have been planted with an annual output of 25 million kilograms, which becomes a magical project of locust flowers industry.

Yonghe County Locust trees are grown along, require deep and well-drained soil, which can grow with calcareous soil, neutral soil and acidic soil, but have poor growth in arid and are barren low-lying areas. They are able to resist smoke and adapt to the urban environment. Deep-rooted, the budding force is not strong, a medium growth speed, the longevity is very long, and the pagoda flower of Yonghe county is drinking the Yellow River aquatic long.

### ***The value of locust flowers***

The large number of wild locust trees growing in Yonghe county have good ornamental value as well as natural ingredients for food and catering industries.

**Cuisine value.** Nowadays people's tastes have changed, and they want to seek some original ecological fresh food. Plenty of locust flowers can be made into rice, cakes, dumplings, honey and so on. Because of its remote location and lack of resources, there are few industries in Yonghe county, which makes it the perfect place, free of pollution.

**Medicinal value.** Traditional Chinese medicine believes that the flowers have the functions of cooling the blood and clearing the fire of the liver. In the countryside, people take locust flower as medicine with the effect of detoxification.

**Tourism value.** Locust flowers are of good ornamental and landscaping value. The blossoms in summer, with white petals and fragrance, are mentioned in ancient Chinese poetry. Nowadays, it is very rare to see locust flowers for citizens in big cities, root seeking culture of Chinese people can be satisfied with the desire for nostalgia and returning back to the nature.

### **Locust Flowers based the Path to Poverty Alleviation Tourism**

#### ***Cooperating with Well-known Catering Enterprises***

"Green food" refers to products which are good for the balance of ecosystem and maintaining the sustainable utilization of the resources in the process of the food production and consumption by applying the concept of safety, health, energy saving and environmental protection (Pu, 2009).

Beijing Xibei catering restaurant has had a history of 28 years and has been enormously popular with many customers. Aiming at providing authentic northwest countryside delicacies, the restaurant is dedicated to searching for the most natural and best northwest food materials and innovating local traditional cooking process. All the materials of Xibei come from the grasslands, mountains and countryside of the northwest, are easy to cook, and free of additives, ensuring the natural and ecological essence of the taste, as well as maintaining the characteristics of green, nutrition and health.

The cooperation of locust flowers industry in Yonghe County and Beijing Xibei catering is beneficial to each other. On the one side, it opens up a new promotion channel and promotes tourism poverty alleviation for the local industry. On the other side, it promotes the brand of Beijing Xibei catering restaurant.

#### ***Developing Eco-Tourism of Locust Flowers***

With abundant tourism resources, developing eco-tourism of locust flowers will promote cooperation between the locust flowers industry and catering enterprises, as well as realize poverty alleviation through ecotourism. It is necessary to strive to facilitate the overall development and fulfill the goal of poverty alleviation based on tourism resources and farmers' participation (Li, 2011). Locust trees in China are of unusual significance in the history of folk stories, which represent the "culture of ancestral roots", such as the Hongtong big locust tree. Yonghe is a "natural oxygen bar" with 1.8 km<sup>2</sup> wild locust trees. Therefore, develop the locust flowers into a tourism project. Experiencing the "root culture" or taking a leisure vacation are both attractive.

**Construct a special folk lodge.** A unique folk lodge with locust flowers will be built and every room decorated with locust flowers. Meals and dishes made by locust flowers for customers will be provided.

**Hold locust flowers exhibitions.** As the flowers last for a short time, sometimes the tour would be off-season. Thus, activities of locust flowers need to be developed to attract tourists. These exhibitions,

including prose, painting works, and samples about locust flowers, will be displayed to keep the style and atmosphere of the locust flowers all year round.

**Picking locust flowers.** Tourists can experience the planting and picking process in person, which will impress them with the original ecology and fun. In addition, residents can be invited to teach tourists how to make locust flowers food.

**Launching tourism cultural festivals.** A cultural festival can be held to symbolize the mother of the Yellow River On Mother's Day every year. "Hundreds people cycling" will be very attractive while many tourists ride under the locust trees. Besides, as the Chinese national female costume, Qipao can be embroidered with patterns of locust flowers. Launching a photography competition for shutterbugs will show the lasting and natural features and the cultural charm of Yonghe.

**Integrate tourism resources.** During the opening ceremony of the Shanxi Yonghe locust flowers cultural tourism festival, tourists will purchase tourism products and visit tourist attractions and historical sites around, such as Qiankun Bay, the Confucius Temple, and the Yellow River National Geological Park. By integrating all of these tourism resources, the locust flowers industry will be promoted to boost the local tourism.

## **Further Measures to Promote the Development of Locust Flowers Industry**

### ***Build Green Supply Chain of Locust Flowers Industry***

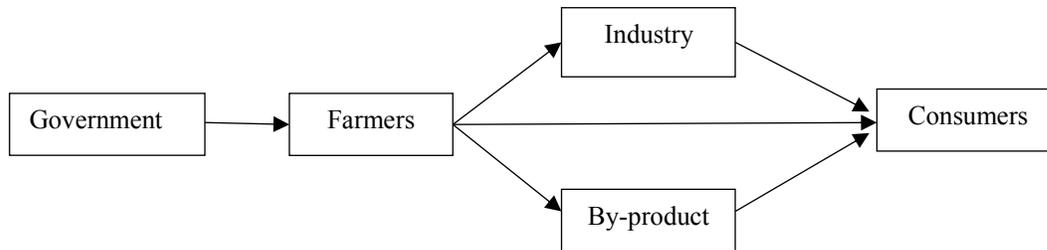
There is an urgent need to drive improvements in the efficiency and effectiveness of food chains (King, Cole, et al., 2017). The Locust flowers industry needs a complete supply chain with government domination, enterprise participation and direct selling from farmers to consumers. It needs to form an extended industrial chain for poverty alleviation. A complete closed loop is necessary, including scientific plantation, standardization and product diversification, safety control of the food, packaging, transportation, food research and innovation and evaluation feedback of consumers. Only in this way can poverty alleviation come true. A green supplier is particularly important. The green supply chain management design starts from the raw materials and runs through the whole production and marketing. Therefore, food suppliers should not only ensure pollution-free of raw materials, but also reduce the energy consumption in picking, storing and shipping.

Strengthen green supply chain management. It is not inadvisable to destroy the local environment and violate the laws of nature because of the need for large quantities of locust flowers. So we should adhere to the win-win principle. The win-win principle advocates protecting the environment, as well as promoting economic development on environmental and economic issues and catering to requirement of sustainable developments (Deng, Zeng, & Luo, 2013).

### ***Diversify Product Design and Sales Channels***

Because of the short lifecycle of the locust flowers in April and May, it limits the poverty alleviation income for the residents. Therefore, it is necessary to make full use of the edible value and medicinal value of locust flowers to design diversified products to meet the needs of market diversification. For instance, the advanced technologies of frozen and dehydration processing can be utilized to maintain the taste and make it possible to eat locust flowers food whenever and wherever possible. Cooperating with pharmaceutical companies to make full use of their medicinal value to produce pharmaceutical products is also a good choice.

Nowadays, with the boom of the Internet economy, we can make best use of the electricity sales platform and convenient and quick logistics. Online and outline combination broaden the sales market and bring a new breakthrough in promotion of a series of locust flowers features.



**Figure 1. Green Supply Chain Based on Locust Flowers Industry**

***Integrate Multiple Resources***

**Perfect the policy system.** The government should promulgate some laws and regulations to supervise green management, increase green consumption and protect ecological protection. These rules also need to be practical and affordable to enable and facilitate more cross-border trade and the integration of smallholder-based agricultural production that will be required for food security.

**Develop advanced technology.** Innovation is the source of human progress. Enterprises need to promote technological innovation, complete industrial transformation, and reduce energy consumption in the process of production. Private investments to address environmental issues are perceived as a powerful engine of sustainability (Rueda, Garrett, & Lambin, 2017). The food producers are tightening controls of their manufacturing operations, which will be useful for monitoring ingredient supplies and taking effectiveness of preventive and sanitary controls.

**Enhance environmental consciousness.** The concept of green consumption should be enhanced for the tourists, ensuring that they will cherish tourism resources, take good care of environmental sanitation, and be a civilized traveler. And local residents, as well need to protect the local culture or help its renaissance because the lucid waters and lush mountains are invaluable assets.

**Implications and Conclusion**

Green consumption promotes the sustainable development of tourism and it is the direction of the development of tourism in the future. Relying on the cultural characteristics and advantage of local natural resources, advocating “food on the tree” flower culture is the best choice for Yonghe county to strive to alleviate poverty. It is amazing that just a flower has the incredible power to change a poverty-stricken county into a scenic spot and bring great economy benefits for the local residents. Undoubtedly, the practice of Yonghe county is pioneering and setting a good example the rural countryside to follow. Rural local governments should optimize the integration of poverty alleviation resources, implement precise poverty alleviation projects and ensure the poverty alleviation to benefit the local people.

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# Research on the Model of a Closed-Loop Supply Chain with Collecting and Remanufacturing for WEEE, based on EPR with Government Guidance

Xinfeng Luan, Kai Kang, and Jing Zhang

*School of Economics and Management, Hebei University of Technology, Tianjin, China*

Email: luansmile@163.com

*[Abstract] WEEE products are recycled and remanufactured based on EPR with government guidance. Manufacturers manufacture and remanufacture EEE, and they are the leader of the Stackelberg game at the same time. This paper analyzes the changes of three parameters in manufacturers, retailers and third-party recyclers. It also analyzes the effect of processing funds and government awards on three parameters. Finally, it shows that processing funds will influence the enthusiasm of enterprises and needs to balance the government awards and processing funds.*

*[Keywords] EPR; processing funds; government awards; closed-loop supply chain*

## Introduction

The contradiction has been gradually increasing between economic growth, resources and the environment with the rapid development of society. It has been the focus of how to coordinate the development of economy, resources and environment. The government, as a public administration, has paid more attention to the collecting and remanufacturing of waste products. It guides the collecting and remanufacturing of waste products to achieve resource-saving and environment society through EPR. The enterprise is a market entity. It improves the market competitiveness of products and achieves resource and environment benefits by implementing resource and environmental responsibility and saving costs. Regulations for the collecting of waste electrical and electronic products are being implemented now. It's necessary to research the problem of the closed-loop supply chain of collecting and remanufacturing for WEEE based on EPR with the government guidance. In this paper, we first, review the related literature. Second, we establish mathematical models to analyze the changes of three parameters of manufacturers, retailers and the third-party recyclers. We also analyze the effect of funds and government awards on three parameters. It gets the optimal return rate, the optimal manufacturer's profit and the optimal profit of CLSC. Finally, the conclusions of the research are validated and illuminated by numerical analyzing.

Current research on the closed-loop supply chain has mainly focused on the selection of the recovery channel (Savaskan, Bhattacharya & Van Wassenhove, 2004; Savaskan & Van Wassenhove, 2006; Gu, Ji, & Gao, 2008; Han, X., 2010; Wang, & Da, 2010), the coordination of closed-loop supply chain (Wang, Da, & Sun, 2009; 2010), as well as awards, subsidies, penalties and pricing based on government guidance (Aksen, Aras, & Karaarslan, 2009; Xiong, Huang, & Xiong, 2011; Ma, Hu, & Da, 2016; Zhang, Yu, & Li, 2016; Li, & Wang, 2016). Research on the model of closed-loop supply chain with collecting and remanufacturing for WEEE based on EPR's practice with government guidance needs further investigation (Bai, & Liu, 2011; Liu, & Song, 2017). The Ministry of Industry and Information Technology and other four ministries of the PRC issued notice to carry out the EPR pilot project in order to deal with collecting WEEE from the point of producer in 2015. The state council issued China's extended producer responsibility presenting clear requirements that the producer needs to bear the responsibility of collecting and reusing WEEE in order to protect resources and the environment. It's

necessary to analyze the influence of the EPR and government guidance on CLSC. There will be more decision bases for the EPR'S implementation.

### Fundamental Assumption and Notation

The assumption is that there is only one manufacturer and one retailer in the closed-loop supply chain. There are three collecting channels including manufacturer collecting, retailer collecting and third-party collecting. The manufacturer makes new products from raw materials. They also make remanufactured products from recycled materials. All recycled WEEE can be remanufactured. There is no difference between new products and remanufactured products in the market. Consumers have no preference for either. The manufacturer is the leader of Stackelberg game. The manufacturer, retailer and third-party are all independent decision-makers who make decisions for their own maximum interests. A single period case is considered. The manufacturer and retailer share information. The manufacturer takes economic responsibility of EPR.

$c_m$  denotes the unit cost of making a new product from raw materials.  $c_r$  denotes the unit cost of making a remanufactured product from recycled materials,  $c_m > c_r$ .  $\Delta$  denotes the unit cost savings of using recycled materials,  $\Delta = c_m - c_r$ .  $\tau$  denotes the return rate,  $0 \leq \tau \leq 1$ .  $w$  is the wholesale price of the new product.  $p$  is the retail price of the new and remanufactured product.  $J$  is the unit government award for remanufactured products from the manufacturer.  $y$  is the unit processing fund from the manufacturer because of using raw materials to government.  $z$  denotes the transfer payment price to the retailer or third-party from the manufacturer,  $0 < z \leq \Delta + z - y$ .  $I$  denotes investment in collecting WEEE.  $B$  is size factor.  $\Pi_j^i$  denotes the profit function for channel member  $j$  in CLSC model  $i$ ,  $i=M, R, 3p, j=M, R, 3p, T$ .

### Models and Solutions

This paper studies the processing funds and government awards based on the research of Savaskan and builds a new model. It analyzes the effect of processing funds on the decisions of the manufacturer, retailer and third-party. It also discusses the changes of return rate, manufacturer profit and CLSC profit.

Product demand function is  $D(p) = \alpha - \beta p - \phi y$ , ( $\alpha > 0, \beta > 0, \alpha > \beta c_m + \phi y$ ). The average unit manufacturing cost is  $c = c_m(1 - \tau) + c_r\tau = c_m - \Delta\tau$ , known by  $\Delta = c_m - c_r$ . Let us assume that the return rate of WEEE  $\tau$  is a concave function of investment in collecting  $I$ ,  $\tau = \sqrt{I/B}$ . Processing funds will influence the remanufacturing decisions of manufacturer and influence the productivity. In order to simplify, it is assumed that the return rate will increase with the increase of the processing funds,  $\tau = \sqrt{I(1 + ky)/B}$ . And  $k$  is positive. The value of  $k$  always makes  $\tau \leq 1$ . So the total return cost  $C$  is  $C(\tau) = B\tau^2/(1 + ky)$ .

#### Model M – Manufacturer Collecting

The manufacturer collects WEEE from customers directly and makes remanufactured products in Model M. The retailer is responsible for selling. So the retailer's profit function is stated as

$$\Pi_R^M = (p - w)(\alpha - \beta p - \phi y).$$

The first-order derivative of  $p$  is obtained, and it is the retailer's optimal retail price.

$$p^{*M} = \frac{\alpha + w\beta - \phi y}{2\beta}$$

The market demand function is  $D(w) = \frac{\alpha - w\beta - y\phi}{2}$ .

Manufacturer's profit function is

$$\Pi_M^M = \frac{\alpha - w\beta - y\phi}{2} (w - c_m + \Delta\tau) - \frac{B\tau^2}{ky + 1} + J\tau \frac{\alpha - w\beta - y\phi}{2}$$

The first-order derivative of  $w$  and  $\tau$  are obtained separately and then simultaneous equations and solutions are found. The optimal wholesale price and the best product return rate are obtained.

$$w^{**M} = -\frac{4B(\alpha + C_m\beta - y\phi) + (1 + ky)\beta(J + \Delta)^2(-\alpha + y\phi)}{\beta(-8B + (1 + ky)\beta(J + \Delta)^2)}$$

$$\tau^{**M} = \frac{(1 + ky)(J + \Delta)(-\alpha + c_m\beta + y\phi)}{-8B + (1 + ky)\beta(J + \Delta)^2}$$

Then, the optimal retail price, retailer's profit, manufacturer's profit and the total profit of CLSC are found. The results are listed in Table 1.

### **Model R – Retailer Collecting**

The retailer is not only responsible for sales, but also undertakes collecting WEEE from consumers and transfers them to the manufacturer for remanufacturing. The retailer gets transfer prices of WEEE from the manufacturer.

The retailer's profit function is stated as

$$\Pi_R^R = (p - w)(\alpha - \beta p - y\phi) + z\tau(\alpha - \beta p - y\phi) - \frac{B\tau^2}{1 + ky}$$

The first-order derivative of  $p$  and  $\tau$  are obtained. The best responses are found.

$$p^{*R} = \frac{(1 + ky)z^2\beta(\alpha - y\phi) - 2B(\alpha + \beta w - y\phi)}{\beta(-4B + (1 + ky)z^2\beta)}$$

$$\tau^{*R} = \frac{(1 + ky)z(-\alpha + \beta w + y\phi)}{-4B + (1 + ky)z^2\beta}$$

The profit function of the manufacturer is stated as

$$\Pi_M^R = (\alpha - \beta p^{*R} - y\phi)(w - c_m + \Delta\tau^{*R}) - z\tau^{*R}(\alpha - \beta p^{*R} - y\phi) + J\tau^{*R}(\alpha - \beta p^{*R} - y\phi)$$

Given  $p^{*R}$  and  $\tau^{*R}$ , the optimal wholesale price and the optimal manufacturer's profit are found.

$$w^{*R} = \frac{-4B(\alpha + c_m\beta - y\phi) + (1 + ky)z\beta(2J(\alpha - y\phi) + 2\Delta(\alpha - y\phi) + z(-\alpha + c_m\beta + y\Delta))}{2\beta(-4B + (1 + ky)z\beta(J + \Delta))}$$

$$\Pi_M^{R*} = -\frac{B(-\alpha + C_m\beta + y\phi)^2}{2\beta(-4B + (1 + ky)z\beta(J + \Delta))}$$

Given  $\Pi_M^{R*}$ , it finds that the greater the value of  $z$ , the greater the manufacturer's profit is, when the values of  $y$  and  $J$  are constant.

The manufacturer has the optimal profit when  $z = \Delta + J$ . So the optimal transfer price the manufacturer is willing to the retailer is  $z^{*R} = \Delta + J$  in Model R.

Given  $z^{*R}$ , the optimal wholesale price in Model R, manufacturer's profit, return rate, retail price, retailer's profit and the total profit of CLSC are obtained. The results are listed in Table 1.

### Model 3p – Third-Party Collecting

The third-party is only responsibility for collecting WEEE and transferring it to the manufacturer for remanufacturing. And the third-party will get the transfer price. The retailer only engages in the sale. Its function is stated as  $\Pi_R^{3p} = (p - w)(\alpha - \beta p - y\phi)$ .

Similarly, the optimal retail price is found.

$$p^{*3p} = \frac{\alpha + w\beta - y\phi}{2\beta}$$

The third-party's profit function is stated as

$$\Pi_{3p}^{3p} = z\tau(\alpha - \beta p^{*3p} - y\phi) - \frac{B\tau^2}{1 + ky}$$

The first-order derivative of  $\tau$  is obtained. The optimal return rate is found.

$$\tau^{*3p} = -\frac{(1 + ky)z(-\alpha + w\beta + y\phi)}{4B}$$

Then the manufacturer's profit function is stated as

$$\Pi_M^{3p} = (\alpha - \beta p^{*3p} - y\phi)(w - c_m + \Delta\tau^{*3p}) - z\tau^{*3p}(\alpha - \beta p^{*3p} - y\phi) + J\tau(\alpha - \beta p^{*3p} - y\phi)$$

Similarly, the optimal wholesale price is obtained.

$$w^{*3p} = \frac{(2B - (1 + ky)z\beta(J - z + \Delta))(-\alpha + y\phi) - 2B\beta c_m}{\beta(-4B + (1 + ky)z\beta(J - z + \Delta))}$$

Given  $w^{*3p}$ , the manufacturer's profit is found.

$$\pi_M^{3p} = -\frac{B(-\alpha + y\phi + \beta c_m)^2}{2\beta(-4B + (1 + ky)z\beta(J - z + \Delta))}$$

Similarly, the optimal retail price, retailer's profit, wholesale price, manufacturer's profit, the optimal return rate, third-party's profit and the total profit of CLSC are obtained, respectively. The results are listed in Table 1.

**Table 1. Optimal Responses in Three CLSC Models of Collecting and Re-manufacturing**

Optimal Response	Model M	Model R	Model 3p
$p^{**}$	$\frac{2B(3\alpha + c_m\beta - 3y\phi) + (1 + ky)\beta(J + \Delta)^2(-\alpha + y\phi)}{\beta(8B - (1 + ky)\beta(J + \Delta)^2)}$	$\frac{-B(3\alpha + c_m\beta - 3y\phi) + (1 + ky)\beta(J + \Delta)^2(\alpha - y\phi)}{\beta(-4B + (1 + ky)\beta(J + \Delta)^2)}$	$\frac{12B - (1 + ky)\beta(J + \Delta)^2(-\alpha + y\phi) - 4B\beta c_m}{\beta(-16B + (1 + ky)\beta(J + \Delta)^2)}$
$\tau^{**}$	$\frac{(1 + ky)(J + \Delta)(-\alpha + c_m\beta + y\phi)}{-8B + (1 + ky)\beta(J + \Delta)^2}$	$-\frac{(1 + ky)(J + \Delta)(-\alpha + c_m\beta + y\phi)}{8B - 2(1 + ky)\beta(J + \Delta)^2}$	$\frac{(1 + ky)(J + \Delta)(-\alpha + y\phi + \beta c_m)}{-16B + (1 + ky)\beta(J + \Delta)^2}$
$w^{**}$	$\frac{4B(\alpha + c_m\beta - y\phi) + (1 + ky)\beta(J + \Delta)^2(-\alpha + y\phi)}{\beta(-8B + (1 + ky)\beta(J + \Delta)^2)}$	$\frac{\alpha + c_m\beta - y\phi}{2\beta}$	$\frac{(8B - (1 + ky)\beta(J + \Delta)^2)(-\alpha + y\phi) - 8B\beta c_m}{\beta(-16B + (1 + ky)\beta(J + \Delta)^2)}$
$\Pi_M^*$	$-\frac{B(-\alpha + c_m\beta + y\phi)^2}{\beta(-8B + (1 + ky)\beta(J + \Delta)^2)}$	$\frac{4B^2(-\alpha + c_m\beta + y\phi)^2}{\beta(8B - (1 + ky)\beta(J + \Delta)^2)^2}$	$-\frac{2B(-\alpha + y\phi + \beta c_m)^2}{\beta(-16B + (1 + ky)\beta(J + \Delta)^2)}$
$\Pi_R^*$	$\frac{4B^2(-\alpha + c_m\beta + y\phi)^2}{\beta(-8B + (1 + ky)\beta(J + \Delta)^2)^2}$	$-\frac{B(-\alpha + c_m\beta + y\phi)^2}{4\beta(-4B + (1 + ky)\beta(J + \Delta)^2)}$	$\frac{16B^2(-\alpha + y\phi + \beta c_m)^2}{\beta(-16B + (1 + ky)\beta(J + \Delta)^2)^2}$
$\Pi_{3p}^*$	/	/	$\frac{B(1 + ky)(J + \Delta)^2(-\alpha + y\phi + \beta c_m)^2}{(-16B + (1 + ky)\beta(J + \Delta)^2)^2}$
$\Pi_T^*$	$\frac{4B^2(c_m\beta + y\phi - \alpha)^2 - B(c_m\beta + y\phi - \alpha)^2\beta(-8B + (1 + ky)\beta(J + \Delta)^2)}{\beta(-8B + (1 + ky)\beta(J + \Delta)^2)^2}$	$-\frac{3B(-\alpha + c_m\beta + y\phi)^2}{4\beta(-4B + (1 + ky)\beta(J + \Delta)^2)}$	$\frac{(-\alpha + y\phi + \beta c_m)^2((J + \Delta)^2 B(1 + ky))}{(-16B + (1 + ky)\beta(J + \Delta)^2)^2} + 2B\left(\frac{8B}{\beta(-16B + (1 + ky)\beta(J + \Delta)^2)^2} - \frac{1}{\beta(-16B + (1 + ky)\beta(J + \Delta)^2)}\right)$

### Comparison of Three CLSC Models for Collecting and Remanufacturing

Given Table 1, three comparisons can be seen.

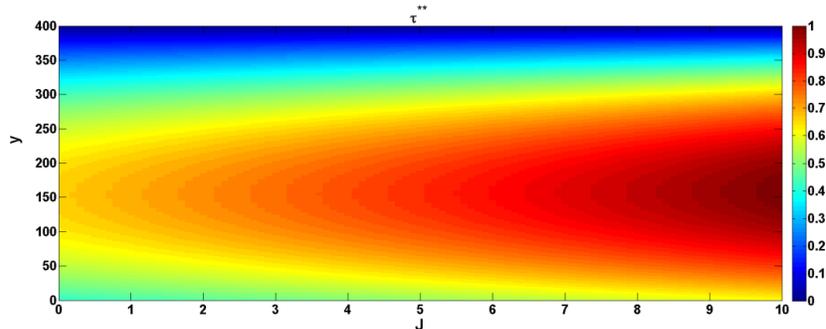
**Contrast 1.** The optimal return rate relationship under the three models is that  $\tau^{**R} > \tau^{**M} > \tau^{**3P}$  in Model R. The optimal transfer price that the manufacturer is willing to transfer is the sum of the government awards and the cost savings. That will attract more consumers to sell WEEE. So there will be the highest return rate.

**Contrast 2.** The optimal manufacturer's profit relationship under the three models is that  $\Pi_M^R > \Pi_M^M > \Pi_M^{3P}$ . In Model R, manufacturer collecting rate is high. And the remanufacturing rate will be relatively high. Then there will be more remanufactured products in the market.

**Contrast 3.** The maximum profit relationship of CLSC under the three models is that  $\Pi_T^R > \Pi_T^{3P} > \Pi_T^M$ . From the above, the return rate of WEEE, the manufacturer's optimal profit and the optimal total profit of CLSC are the optimal responses in Model R, when the manufacturer is the leader of Stackleberg game.

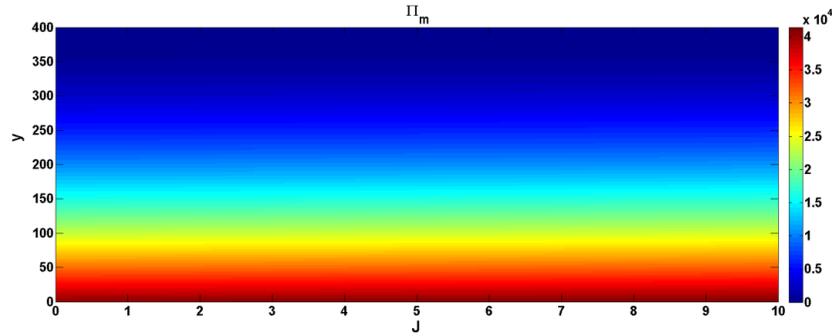
### Numerical Simulation Analysis

The numerical simulation analysis is carried out in order to clearly observe the changes of the optimal return rate, manufacturer's profit and the optimal total profit of CLSC in Model R. Let us suppose that the parameters of an electronic product are  $c_m=200$ ,  $\Delta=22.5$ ,  $B=3000$ ,  $\phi=1.1$ ,  $k=0.01$ ,  $\alpha=500$ . In Model R, the changes of the optimal return rate, manufacturer's profit and the total profit of CLSC are shown in the following figures.



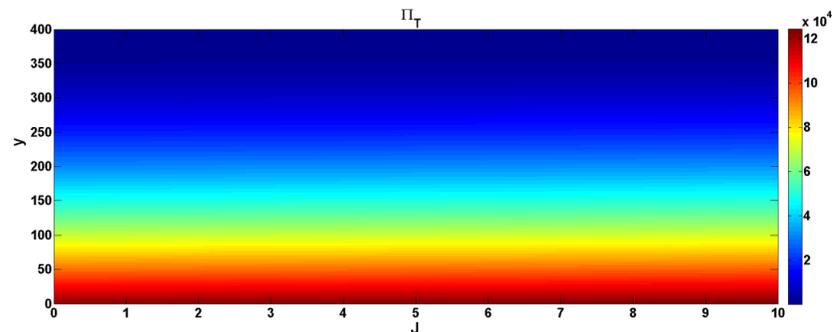
**Figure 1. The Optimal Return Rate in Model R**

From Figure 1, it can be observed that with the increase of processing funds and government awards, the return rate also increases. The minimum value when the return rate is the highest is that the processing fund is about 160 yuan and the government award is 7 yuan. It is interesting and of great significance for government and enterprises. In other words, there is a range of choice. The optimal return rate will be obtained when the government awards are from 7 yuan to 10 yuan and the processing funds are from 100 yuan to 320 yuan.



**Figure 2. The Manufacturer's Optimal Profit in Model R**

From Figure 2, it can be seen that government awards have almost no effect on manufacturer's profit. But with the increase of processing funds, the manufacturer's profit will decline. This shows that processing funds will influence the enthusiasm of enterprises. It needs to balance the government awards and processing funds.



**Figure 3. The Total Optimal Profit of CLSC in Model R**

From Figure 3, it can be seen that government awards also have almost no effect on the total profit of CLSC. Same as above, with the increase of processing funds, the total profit of CLSC will decline.

The paper's results are consistent with the reality and show that processing funds have important influence on manufacturer. How to encourage enterprise's enthusiasm and at the same time make it undertake responsibility of EPR is still needs to be deeply addressed.

### Acknowledgements

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# Effect of Risk Perception on Consumer Substitution: A Moderated Mediation Model

Ming Jin, Siye Qian, and Ying Yang

*School of Business Administration, Zhejiang University of Finance and Economics,  
Hangzhou, China*

Email: 791455728@qq.com

**[Abstract]** Frequent food safety crisis have seriously impacted the public food consumption confidence, promoting the occurrence of consuming category substitution behavior. Based on the category perspective, this paper constructs the conceptual model of consumption substitution in the background of crisis. The results show that the category attitude plays a mediating role between risk perception and substitution intention, and the risk attitude plays a moderating role in the mediation. This finding provides a new idea and suggestion from the view of “category” for the dairy industry and for enterprises and provides a new perspective for consumer behavior research.

**[Keywords]** consumption substitution; risk perception; risk attitude; category attitude

## Introduction

Food safety crises have the potential to remarkably illustrate consuming behavior. With a series of food safety events, ranging from poisonous milk powder to fipronil egg events, Chinese consumers’ confidence in food has been seriously affected. Even worse, the food safety environment, as well as the food industry, have been tremendously hard hit. Although the actual risk level of some events is not high, the public perception of food safety risk often has strong “subjective construction” and “amplification of risk”, which makes consumers panic, having disastrous and irreversible consequences (Pennings, Wansink, & Meulenberg, 2002; Jinrong, Yan, & Wenxia, 2013). Under a crisis situation, consumers would fall into a situation in which they are biased in judgment. In other words, their consuming behavior is not always consistent with the real risk level which they have perceived. Therefore, understanding the inherent mechanism of consumer risk response behavior and exploring the general law of consumer substitution are of great significance to promote the development of the food industry and optimize the governmental food safety regulations.

Continual dairy safety incidents have brought a huge negative spillover effect on the industry as a whole, and the dairy safety crisis have risen to an issue of industry level (Chen & He, 2015). Hence, taking the dairy industry as an example, this paper analyzes the impact of consumers’ risk perception on consumption substitution from the perspective of category, then introduces the risk attitude as the moderator variable to discuss the influence of individual differences on consumption behavior, and constructs a conceptual model on substitution behavior under a food safety crisis.

## Literature Review and Hypothesis

### ***Consumption Substitution***

Consumption substitution and category substitution are newly defined nouns put forward in our previous research. According to the definition of the Food Marketing Institute (FMI, 1993), categories are a set of products or services that can be easily distinguished and managed, which can be substituted for each other.

The distinction of categories requires that categories are divided based on the consumer's classification habits.

Broadly speaking, consumption substitution includes three aspects: brand switching, category substitution and the corresponding changes in consumption patterns (Ming, Min, & Bo, 2015). Previous researches focused mostly on the brand level and paid close attention to brand switching behavior. Brand switching, as a normal conversion behavior, refers to consumers' choices from one brand to another as a result of consumer psychology or other external factors. But continual dairy safety events have brought a huge negative spillover effect to the entire industry, which not only has urged consumers' brand switching willingness, but also promoted their category substitution intention. The category defined in this paper, emphasizes the division of products from the consumers' point of view. In this study, we focus on the category substitution behavior. Compared to brand switching, category substitution is an unconventional, long-term conversion. At the same time, the definition of product category is not static; it is updated all the time (Moreau, Markman, & Lehmann, 2001). So, in this article, replacing milk with soybean milk and replacing "domestic milk powder" with "foreign milk powder" all belong to the conception of category substitution after the Melamine Scandal in 2008.

### ***Risk Perception***

The definition of risk perception is cross-cutting. Risk, as a kind of objective existence, is the key factor to explain consumer behavior, while perception is the key link between human and external stimuli. The perception of risk is the cognitive process of individual psychology to external stimuli, and ultimately guides the individual's behavior decision (Cheng & Yin, 2012).

In order to explore the inherent mechanism of consumption substitution behavior better, this paper used the conception of "risk perception" instead of the conception of "perceived risk" to decouple risk perception and risk attitude from "Risk Behavioral Model". Perceived risk and risk perception are two different concepts. Perceived risk usually consists of two dimensions: the uncertainty of the results and the seriousness of the consequences (Bauer, 1967). Pennings, Wansink, & Meulenberg (2002) pointed out that academics often assume that consumers are risk-averse in the discussion of perceived risk; that is, the impact of risk attitude has been embedded in them. Xiaofei Xie and Liancang Xu (1995) pointed out that risk perception is the consumers' subjective feelings, experiences and cognition about the outside world objective risks, and these subjective feelings and cognition would inevitably affect their behavior decision. In this paper, risk perception refers to the customers' subjective perception that they are exposed to risks or some expected loss when they stay in their original category.

Chunmei Fan (2013) explored the dynamic changes in public risk perception in the milk powder events and revealed the impact of risk perception changes in public consumption behavior. The greater the perceived risk, the greater the likelihood of loss, and the less willingness to keep the status quo. Thus, the hypothesis is as follows.

Hypothesis 1: Risk perception has a positive impact on consumers' substitution intentions.

### ***The Mediating Role of Category Attitude***

The SOR model, the "Stimulus - Organism - Reaction" model, is a common research paradigm in the field of consumer behavior. The process of consumers' formation of substitution intention has also experienced a series of psychological reactions with crisis-stimulating, and they are generally expressed as that risk perception affects consumers' behavior decisions by influencing their evaluations or attitudes about the entire category (Xingdong, & Fenjie, 2012).

Therefore, this article introduces a concept of category attitude (Li, & Yue, 2006). The attitude of category in this study refers to the stable emotional tendencies of consumers for one particular category of products, which affects the subjective evaluation of the individual and their following consuming behavior. As we all know, good category attitude is the key to customers' loyalty. On the contrary, the higher the risk assessment of the product category, the worse the category attitude, and the stronger the substitution intention they have. Previous research found that consumers' perception of the crisis will affect their assessment of the entire category, and this subjective perception will inevitably further affect the consumer's behavior decision-making. Hence, the hypothesis is as follows.

Hypothesis 2: The category attitude plays a mediating role between risk perception and substitution intention.

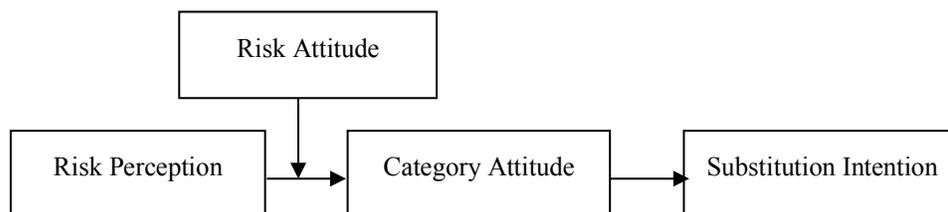
### ***The Moderating Role of Risk Attitude***

As Pratt (1992) put it, consumers' risk response behavior depends not only on risk perception, but also on risk attitude (risk preference). Risk perception and risk attitude are two different concepts. Risk perception is the consumer's assessment of the likelihood of being exposed to risk and risk attitude involves the consumer's understanding of risk and the degree of aversion to risk (Cheng & Yin, 2012). Arrow (1965) gave the definition of risk attitude and on the basis of the definition, he further classed consumers' attitudes of risk into 3 groups: risk aversion, risk neutrality, and risk seeking, according to the different shapes of the utility function curve. Thus, the characteristic of risk attitude that "vary from person to person" is consistent with the requirement as a moderator variable (Zhonglin, Hau, & Lei, 2006). Mazumdar (1993) argued that risk-seekers tend to maximize their "perceived gain" and are less sensitive to risk compared with the risk-aversers when making a purchasing decision. To be concrete, a high-risk preference will weaken the consumers' negative evaluation of the category, and based on this, the following assumption is presented:

Hypothesis 3: A high-risk attitude would weaken the negative impact of risk perception on category attitude.

Based on Hypotheses 2 and 3, risk perception affects the substitution intention through the category attitudes; that is, the risk attitude plays a moderating role through the mediating effect of the category attitude. In general, risk-seekers are often insensitive to risk and hold better attitudes towards the entire category, so they tend to retain their consumption of the original category. Therefore, the hypothesis is as follows.

Hypothesis 4: A high-risk attitude would weaken the positive impact of risk perception to the consumer substitution through mediating effect.



**Figure 1. Research Model**

## Research Design

### *Data Source and Sample Characteristics*

Our study took dairy consumers as the research object. Since May 2017, our group adopted a method that combined a field survey and an internet survey, within the scope of the 11 cities of Zhejiang Province. A total of 1,000 questionnaires were collected, of which 910 questionnaires were effective. Apropos of the survey sample, women accounted for 51% of the sample, and men accounted for 49%. In terms of family structure, unmarried, or married without children, accounted for 32%, and 68% were married with children. On the whole, the sample of the survey was mainly young and middle-aged consumers with high education levels and living in cities. All of the respondents have heard of the dairy safety incident, which indicates that the survey sample has a certain representativeness and pertinence.

### *Scale Selection and Reliability Test*

This questionnaire was based on a large number of domestic and foreign mature scale and has been modified and improved on the basis of pre-investigation. The measuring item adopted a seven-level Likert scale, and value one represents complete disagreement, and value seven represents complete agreement.

The risk attitude scale quoted from Pennings, Wansink, and Meulenberg (2002) included three measuring items. This paper selected three dimensions of risk perception from Wansik and Leuthold (2002). The category attitude scale referenced the study of Dahlen and Lange (2006). The substitution intention quoted the study of Zeithaml (1996). Combined with the characteristics of the dairy products category, this survey was designed into four items. The Cronbach's coefficient was used to test the reliability of the scale. The Cronbach's values of the variables were all greater than 0.7, which indicates that the questionnaire reliability was good.

### *Confirmatory Factor Analysis*

In this paper, the discriminant validity of risk perception, risk attitude, category attitude and substitution intention were tested by confirmatory factor analysis (Hui, Lee, & Rousseau, 2004). It can be seen from Table 1 that the fitting effect of the four-factor model is the most ideal compared with the other three models, which indicates that the four variables involved in this paper are clear and independent and have good discriminant validity (Hayduk, 1987).

## Empirical Analysis

### *Correlation Analysis*

The correlation coefficient results show that risk perception is positively correlated with substitution intention ( $\beta=0.468$ ,  $P<0.01$ ), and negatively correlated with category attitude ( $\beta=-0.456$ ,  $P<0.01$ ). At the same time, risk preference is positively correlated with category attitude ( $\beta=0.609$ ,  $P<0.01$ ), and negatively correlated with substitution intention ( $\beta=-0.612$ ,  $P<0.01$ ). The results of the correlation analysis are broadly consistent with the expectations of this paper and provide preliminary support for the relevant hypothesis.

### *Hypothesis Testing*

**Main Effect Test.** In this paper, multiple regression analysis was used to test the impact of risk perception on substitution intention. As shown in Table 1, under the premise of sex, age, education level, family income, family structure and permanent place as the control variables, risk perception has a significant positive impact on substitution intention ( $\beta=0.474$ ,  $P<0.001$ ) in Model 2, so Hypothesis 1 is established.

**Table 1. Regression Analysis Results**

Variable	Dependent Variable			Mediator Variable			Dependent Variable
	SI			CA			SI
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Gender	0.015	-0.013	-0.009	-0.021	0.007	0.023	-0.019
Age	0.014	-0.030	-0.004	-0.006	0.037	0.004	0.003
Education	-0.015	0.011	-0.005	0.002	-0.024	0.001	-0.010
Income	-0.029	0.004	0.011	0.042	0.011	-0.021	0.028
Structure	0.005	-0.021	-0.023	-0.028	-0.003	0.000	-0.021
Place	-0.074*	-0.044	-0.050*	0.021	-0.008	-0.045*	-0.026
RP		0.474***	0.153***		-0.463***	-0.822***	0.394***
RA						0.124*	-0.193**
CA			-0.694***				-0.421***
RP*RA						0.616***	-0.203*
R <sup>2</sup>	0.006	0.224	0.604	0.003	0.210	0.583	0.669
F	0.978	37.211***	171.961***	0.438	34.348***	142.938***	181.852***

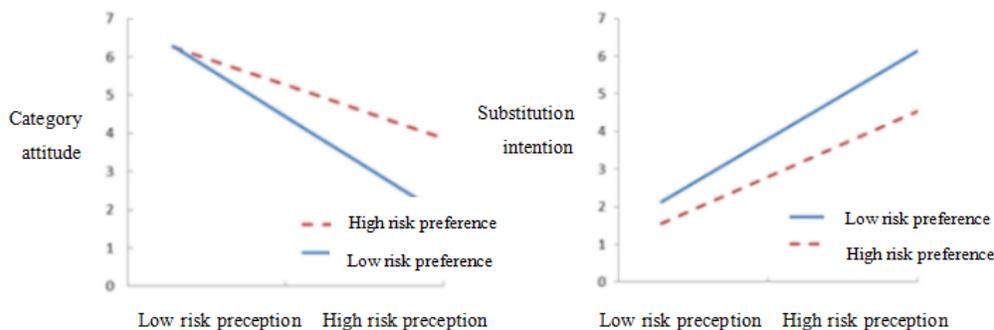
Significance level: \*\*\* means  $P < 0.001$ , \*\* means  $P < 0.01$ , \* means  $P < 0.05$ . RP= Risk Perception, RA=Risk Attitude, RP\*RA = Interaction between Risk Perception and Risk Attitude, CA= Category Attitude, & SI= Substitution Intention.

**Mediation Effect Test.** In this paper, three step mediation regression method (Zhonglin, Hau, & Lei, 2006) was used to test the mediating effect of the category attitude, and the results are shown in Table 1. As we can see in Model 3, both risk perception ( $\beta=0.153$ ,  $P < 0.001$ ) and category attitude ( $\beta= -0.694$ ,  $P < 0.001$ ) have significant impact on substitution intention, while the regression coefficient of risk perception to substitution intention decreased from 0.474 to 0.153, indicating that category attitude played a partial mediating role in the impact of risk perception on substitution intention, so Hypothesis 2 is supported.

**Moderating Effect Test.** In Model 6, both regression coefficient of risk perception ( $\beta=-0.822$ ,  $P < 0.001$ ), risk attitude ( $\beta= 0.124$ ,  $P < 0.05$ ), and the interaction between them ( $\beta=0.616$ ,  $P < 0.001$ ) have a significant impact on category attitude. The regression coefficients of interaction between risk perception and risk attitude on category attitude are positively significant, which is opposite to the main effect. That is, the risk attitude has a negative effect on the effect of risk perception to category attitude, so Hypothesis 3 has been explained.

**Test of Mediating Effect with Moderating Effect.** The theoretical model of this study is a moderated mediation model. The moderating effect of risk attitude in the mediating effect was tested by the methods of Zhonglin, Hau, & Lei (2006), and the results are shown in Table 1. In Model 7, the regression coefficients of risk perception ( $\beta= 0.394$ ,  $P < 0.001$ ), risk attitude ( $\beta= -0.193$ ,  $P < 0.01$ ), and category attitude ( $\beta= 0.421$ ,  $P < 0.001$ ), and the interaction of risk perception and risk attitude ( $\beta= -0.203$ ,  $P < 0.05$ ) on category attitude are significant, while the regression coefficients of interaction on category attitude is negatively significant, which is opposite to the main effect. That is, the risk attitude affects the substitution intention negatively through the mediating effect of category attitude, so Hypothesis 4 is supported.

In order to have a more vivid presentation of the moderating role of risk attitude, our paper drew the adjustment effect diagram according to the recommendations of West and Aike (1993). The result is shown in Figure 2.



**Figure 2. The Moderator Role of Risk Attitude**

## Conclusion and Implications

### Research Conclusion

The frequent dairy safety incidents, with huge negative spillover effect, has risen to an industry crisis After the Melamine Scandal in 2008, “foreign milk powder” has become a powerful alternative. Foreign dairy brands have seized a large share of the domestic market, and the domestic dairy industry has stagnated for a long time.

We proposed that consumers’ substitution under a crisis can be effectively modeled as a combination of risk perception and risk attitude, as well as the interaction between them. Firstly, risk perception, as the internal cognition of external stimuli, will promote consumers’ willingness of substitution. Secondly, under the frequent food safety crisis, consumer’s category substitution behavior originates from the evaluation and attitude of the specific category, in other words, category attitude plays a mediating role between risk perception and substitution intention. Last, but not least, the impact of risk perception on substitution intention varies from person to person. In general, a high-risk attitude weakens the positive impact of risk perception on substitution intention through mediating effect, while a risk-averter prefers to magnify the risk and substitutes the original category.

Our conclusion will be applied to the development of enterprises and industry. We propose that enterprises are supposed to strictly control food safety. At the same time, in order to deal with different consumers, enterprises have to develop different response strategies. For the risk-averter, enterprises should take positive measures such as product recalls and compensation to reduce consumers’ sense of insecurity. For the risk-seeker, enterprises can reduce consumers’ risk perception through continuous communication. Meanwhile, food enterprises should rethink the “category” from the perspective of the consumer and carry out product category innovation and structural adjustment to promote healthy development of the industry.

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# Accelerating the Ecological Transformation of the County – Based on the Investigation about Jingning City of Zhejiang Province

**Weihong Li**

*Lishui Vocational & Technical College, Lishui, China*

Email: 971668916@qq.com

*[Abstract] Party committees at all levels adhere to the realistic background of green environmental sustainability. Jingning has proposed that an autonomous county and other mountainous areas are focusing on the breakthrough of an industrial ecological transformation. It aims to deal with the relationship between gold and silver mines and beautiful scenery. With the scientific protection of environmental resources, efforts are made to promote economic development. However, the pace of progress has not met expectations. Therefore, we have screened the constraints of the industrial transformation, moreover, with the design for an ecological vision of the county industry, corresponding development measures are also put forward. It focuses on four aspects of modernization: implementing e-commerce, promoting capitalization, making differentiation and enhancing foresight. We will fully develop eco-agriculture, eco-industrial and eco-tourism, and we will have a distinctive mountain economic and social development path.*

*[Keywords] industrial ecological transformation; mountainous area; countermeasures*

## **Introduction**

Traditional theory is opposed between an industrial system and the ecosystem. Owing to this idea, we pay great environmental costs for rapid economic development. Essentially speaking, the resource environment and industrial development are in a large system of universal connection rather than a zero-sum game. Most of the mountainous areas have poor in economic development compared to the well-developed counties. Due to undeveloped industry, this mountain area of counties still has clear water and blue sky. In recent years, the mountainous area has gradually taken the road of industrialization. But in the way of promotion, extensive low-end characteristics appeared. As green development is rooted deeply in the hearts of people, how to improve the ecological transformation has become a necessary answer for this undeveloped county mountain.

## **Literature Review**

From current published literature, many domestic and foreign academic scholars have researched industry ecologicalization. Yifu Lin, a professor at Peking University, said that under the condition of weak economic growth, only industry is constantly upgrading, and the level of labor productivity will continue to increase (2015). Jinglian Wu, a professor of Tsinghua University, pointed out that many enterprises are doing simple processing, relying on cheap labor, natural resources and other factors of production and investment of RMB money; we should save resources and improve efficiency to achieve sustained and stable growth as the ultimate measure of choice (2006). Yining Li, a professor at Peking University, pointed out that adapting to the new normal is to adapt to the continuous adjustment of structure and the gradual transformation of the economic development mode. Both state-owned enterprises and private enterprises need reform and transformation (2015). Yinxing Hong, a professor at Nanjing University, said that facing the trend and pressure of global economic transformation, China must have corresponding countermeasures to actively promote the transformation and upgrading of the industrial structure (2013). Also, Xiaohu Bai

felt that the industrial foundation of ecological civilization construction is based on the transformation of traditional industries, which is based on nonlinear circular regeneration. The institutional obstacles are analyzed, and policy suggestions for the construction of an ecological industry are put forward (Bai, 2010). Zuo Mao, a Japanese philosopher, once pointed out that “a sustainable society can be achieved, only if it breaks through the logic of pursuing the highest profit capital” (1998). Ben Agger, a professor of Ecology in Canada, had a similar thought of “people seek the environment of happiness through personal high consumption, and further pressure the fragile ecosystem” (1991).

According to the research results published both at home and abroad, industrial ecology has a high level. However, the economic basis of the existing sample is relatively developed. For less-developed mountain counties, how to compensate for the weakness of an existing foundation under the rapid development of ecological transformation is still a problem.

This paper mentions two cores theses. One is the theory of the industry ecologicalization and another is the theory of the advantage of backwardness. The industry ecologicalization theory which was popularly accepted is K. E. Boulding’s opinion which was put forward in “The Economics of the Coming Spaceship Earth” in 1966. He proposed “spaceship economy” theory. It was a new, mainstream concept of ecological economy at the time. He said, “We can’t be able to do the job of knowledge or technology in the future. But one thing is clear, in the future of society, it will have to live on the earth which the resources are extremely limited, like a spaceship. So, we have to develop a cycle of material economy” (Boulding, 1970).

The theory “advantage of backwardness” was created by American economist Gerchenkron. He thought the advantages of backwardness was caused by the special status of those underdeveloped areas, and it is also associated with relative backwardness of economy (Hu, & Jiang, 2014). Many areas start the exploration of industry ecologicalization based on the premise of the local developed economy. Turning the advantages of backwardness into reality requires one condition which is upgrading technical innovation and industry according to the current advantages. This upgrading includes extending the industry chain, accelerating added value, reducing the consumption of original materials, innovating the rules and transforming processes.

This paper takes the backward-developed county Jingning as an example, analyzes the attempts on boosting the economy based on the scientific protection to the environment, explores the industry transforming on the mountain countries, as well as analyzes the restrained factors for the industry transforming, and then raises the active idea to promote the local economy.

### **General Overview of Jingning**

Jingning is located in the southwest of Zhejiang Province, which is the only county of the She minority autonomous county in China. It is an important ecological barrier in Zhejiang Province. Data from the Jingning environmental protection and the meteorological bureaus show that the quality of the air and water environment in Jingning has maintained an excellent level. The average concentration of PM2.5 in the county is maintained at 30 micro grams per cubic meter, and the quality of the rural mountain air environment reaches the national level.

In recent years, Jingning’s economic society has kept a rapid development momentum. In the 12th five-year plan period, the total GDP of the county increased from 2.67 billion yuan in 2010 to 4.45 billion yuan in 2015, an average annual growth of 8.5%. The three industrial structures were adjusted from 16.8:36.3:46.9 to 14.9:29:54.1. The basic competitiveness of the county economy rose from 13th to 9th place of 120 national autonomous counties (Report on the work of the government of the She Nationality

Autonomous County of Jingning, Lishui in 2016). However, in comparison to the rest of the province, the development of Jingning is still at a backward level. The country industry lacks competitiveness. The county has not highlighted the ecological advantages and national characteristic advantages, and stimulation as an ecological resort and tourism to the economy hasn't completely appeared, and good ecological factors have a great advantage to the economic benefits of migration.

Certainly, making the growth of late-development advantage into reality is conditional. It means adhering to the direction of industrial ecology, following the comparative advantage of technological innovation and industry upgrading, strengthening system innovation, and mechanism transformation, etc. It also includes extending the industrial chain, increasing extra value, reducing raw material consumption and other technical means in industrial ecology, and promoting the development of a circular economy. In theory, when an industry forms an industrial agglomerate, it is able to form a reasonable division of labor in the various details of the industry so as to further promote industrial transformation and upgrading.

### **Preliminary Practice in Ecologicalization to Jingning's Industry**

Since the 18th CPC National Congress has been convoked, the party central committee has put forward the five development concepts and implemented the five-integrated layout. Among those concepts, "green & ecotype" have become the key words and new trend in this period of development. The experience of ecological civilization construction discloses that implementation and advancement in an ecological industry is the central content of ecological civilization construction. In terms of the underdeveloped counties, the realization of overtaking also exists in the ecological transformation of the industry. After the 19th CPC National Congress, Jingning will seize their own advantages in ecotype, nation and policy resources and try to explore the path of ecological industry

First, the step was adjusting the structure to promote the transformation. In the counties, Jingning decided to shut down 29 pollution-related enterprises and realize zero industrial pollution. It also created a mountain eco-industry supporting point and population transfer load point according to the farmers' pioneer park and 110 industrial blocks. For example, Jingning's bamboo and wood processing industry converted a new producing idea in the propulsion process of "three changes a split" and "five water co-governance". It turned from extensive processing to a small handicraft production transformation. Supported by "Li-Jing National Industrial Park", Jingning actively explored different developments and introduced major ecological manufacturing in order to lead benchmarking enterprises for ecological transformation.

The second step was nurturing the leading industries. Jingning took the tourist trade as the first strategic pillar industry. So Jingning promoted the scenic area, increased capital investment, upgraded "the window of Shexiang" and "Dajun in the cloud", two national AAAA level scenic spots, and accelerated the development of the holiday resort and "thousands of lake" scenic area construction. Then, the brand of "Magic Shexiang" formed gradually. It strengthened tourism services which was led by national culture and invested according to the highest standard of Lishui. The differentiation and uniqueness of She Village was revealed.

The third step is to strengthen policy guidance. We should seize the unique advantages of ethnic autonomous counties and make full use of the series of policy documents specially supported by the provincial government to promote the development of Jingning and strengthen policy guidance and financial support. In recent years, Jingning has created an entire domain development planning of tourism development planning and national culture. It has introduced a series of policies and measures such as the "New ten" policies to support industrial economy and accelerate the national development and speed up

tourism development. Meanwhile, it also inclines funds to ecological industry, which vigorously promote Jingning's ecological transformation.

Although a lot of beneficial explorations in Jingning have obtained certain results, the mountainous area still has a long way to go. The extensive ecological development mode has no basic change, resources and environment constraints, and scientific and technological innovation ability is insufficient. Improving the quality of development and the requirement of the core competitiveness is becoming more and more urgent.

Firstly, economic growth faces two pressures: "weak microscopic subject and high demands in development". In Jingning's research, we found that due to a lack of land, technology and funds, it is difficult for the traditional enterprises to realize good and rapid transformation. Industries' ecological transformation faces two challenges: the intensity of development and high protection costs. Due to the innovative enterprises lacking the soil and the inadequate top-level design, government faces appraisal pressure while there are still some leaders adoring GDP. There is still a long way to go to achieve development and conservation and ecological transformation.

Secondly, the ecological industry has dual problems. One is the quality of resources is general and the problem is the industrial output is poor. The quality of the ecological environment resources is general, and the pressure of ecological environment continues to increase. For example, Jingning county's scale will be extended to 10 square kilometers, and a larger number of low hills will be used for urban land development and construction. Industrial land is more intense. A large number of ecological transformation projects which are suitable for development and construction in the plains area are difficult to implement in Jingning with the existing conditions. Or else we need to invest more supporting environmental funds. In the future, this trend will be strengthened, leading to more investment costs and poor output.

Thirdly, the weak technical force of industrial ecology is inconsistent with the quick transformation of the enterprises. The layout of Jingning industry is similar to the surrounding counties. What is more, the factors and supporting guarantees are not enough to attract high quality talents. At the same time, for the enterprises, the faster work process, and the ecological transformation of a small amount of partial use of successful introduction of talents, makes it difficult to retain talents. Talent introduction and industrial development has entered a non-virtuous circle. It has become an urgent problem in Jingning's ecological industry.

In general, the industrial ecological transformation of Jingning is mostly in the start-up phase, it is still in the exploring mode. However, the industrial transformation and upgrading of Jingning has great potential to be developed.

### **Design of the Industrial Ecological Vision of the Mountain Area County**

The era of big data and the Internet has brought new opportunities for the Jingning mountainous area such as the transformation of development. Compared with the developed areas, the location disadvantage has gradually weakened, and the unique advantages, such as the ecology and nationality are further amplified. The transformed environmental advantage products and green products are the comparative advantage. Jingning and other mountainous counties have to make full use of their comparative advantages, promote industrial ecology, strengthen their complementation advantages with the external region, and strive for win-win cooperation in order to make greater efforts in the process of transformation and development.

Currently, Jingning's industrial ecological transformation needs the following:

### ***Efforts Should be Made to Foster the Foundation of the Ecological Industry***

With the recent development of tea, the medium-term development of bamboo and the long-term development of Tormentil grand ideas, it has accelerated the leading agricultural industry cultivation and created characteristics and advantages of agricultural products. It has also expanded the regional industry advantages in mid-long term industrial planning as well as the efforts to construct the Shawan, the west of Jingning. The Bohai area is for modern agriculture; it builds green agricultural products which are based in Yangtze river delta. Developing the ecological industry focuses on the development of green food, bamboo, wood processing and utilities and other common equipment. It is important to develop a new material industry and biological medicine industry to encourage incoming processing industry's transformation.

Also, it is needs to strengthen the industry chain extension and cluster development, optimize the spatial layout of industrial development and promote the cluster development of characteristic industries. We should develop the modern service industry, build a national minority cultural industry headquarters as the goal, speed up the development of preserving one's healthy endowment leisure tourism economy, optimize the increasing trade, real estate and other traditional service industry, foster the development of financial information, e-commerce and emerging service industries such as industrial design which is a positive development of cultural creative industry to form a distribution center for a handful of ethnic craft products that have a certain influence in the country and build a service development highland in southwestern Zhejiang.

### ***Focus on Building "Four Industrial Clusters"***

We need to foster a cluster of modern industrial clusters with a high correlation degree, high technology content and comparative advantages resources. First, we will build a green ecological industrial cluster. Based on edible fungus, bamboo and wood processing, tea and alpine vegetables and fruits, we have to optimize the scope of the county's agricultural industry and processing industry layout. Meanwhile, we should also strengthen the leading enterprises, cultivate and develop small and medium-sized enterprises, expand production scale, improve the level of intensive management, and improve the ability of deep processing. Second, build a national headquarters economic cluster. By taking advantage of national policy and relying on the Lijing Industry Garden (the economics of the construction of the national economic headquarters of the new district and external buildings of the development zone), vigorously introduce a marketing, trading-type enterprise group or regional headquarters, and a headquarters in purchasing, e-commerce and other functions, and strengthen the construction of a modern service industry agglomeration demonstration area. Third, we should build hydroelectricity and manufacturing industrial clusters, speed up the key generic technology research and the development of its application, accelerating the reform of new technology and the improvement of new craftwork, eliminate small-scale private hydroelectric stations, accelerate the large hydroelectric project, actively make hydrophone industry joint-stock enterprises, and promote the development of hydroelectricity and manufacturing industry transformation. Fourth, build a cluster of ecological health industries. Then we should combine the minority customs tourist resort with farmers' pioneer park construction, vigorously foster health care food, traditional Chinese medicine manufacturing, health services and other industries, strengthen the industrial chain's investment and capital introduction, and strengthen the interactive development with cultural industry and leisure health tourism industry.

## **Promote the Ecological Development of the County Industry**

### ***Promote Industrial Agglomeration and Foster a Symbiotic System***

The existence and development of an industry usually corresponds with the development of other industries and forms the development of industrial agglomeration. From the perspective of scale economy, industrial agglomeration development is beneficial to reduce development cost and improve innovation ability and reach resource sharing. So, this is the transformation of Jingning's industrial ecology. Jingning's regional economy will accelerate once the industry ecology economy forms an industrial agglomeration. On the one hand, it will promote the whole social learning process and strengthen the economic level of science and technology innovation. On the other hand, it will also promote the regional economic development of all kinds of production factors and advantages of combination. It will also promote the timely change of the resources in the agglomeration area with the change of the external market environment, and then constantly improve the ability of dynamic competition. At the same time, along with the deepening of industrial agglomeration, in the gathered zone, an industrial symbiosis system will gradually form. Namely, by the industrial symbiosis unit in certain environment consists of a collection of industrial symbiosis. From the development trend of industrial agglomeration, the development of an industrial zoology agglomeration is the direction and path of Jingning's inevitable choice in the future.

To promote industrial agglomeration, the cultivation of a symbiosis system will not be formed naturally; it needs to be planned and fully committed to in advance. Most of Jingning's ecological transformation is in the start-up and development stage. But some have begun to enter advanced stages, so timely planning the construction of ecological symbiosis system and further deepening the top design will speed up Jingning's industry ecological processes.

### ***Deepen Institutional Arrangements and Build a Policy System***

We should highlight the top-level design of the county, adhere to issue orientation, deepen reform and innovation, and boldly go ahead and try to build the "four-beam and eight pillars" of the ecological civilization construction in the mountainous areas. We should implement the development strategy of "three counties and three counties" (eco county, industrial rich county and cultural name county), and constantly promote the integration of "three counties". Meanwhile, it is needed to cohesively force the ecological and do the big article, practically put the all-round "ecological" into all aspects of the industry's upgrading and economic transformation, leading the construction of "beauty" by the county extension to the countryside, from local to global, from the beauty of the partial county to the beauty of the whole county. Moreover, we have to improve the policy support for the development of beautiful landscapes, excavate human resources and make new and beautiful businesses, and guide capital investment in the "green hills and green mountains". All of these measures are taken in order to adhere to cultural guidance, put the national culture elements into the project implementation, support and other aspect as a rigid threshold, lay solid foundation marketing for the She minority cultural development and provide a richer and varied cultural support for folk customs tourism.

### ***Highlight the Concept of Guidance and Strengthen the Guarantee Support***

First, adhere to the green concept. We always have to adhere to the green ecological development idea of "green water castle peak is the gold mountain and silver mountain", improve the quality of development, and gradually realize the connotation of ecological improvement. Second, is to adjust the target. At present, under the background of raising pressure of ecological environment protection, we should combine the

project introduced with ecological environment protection, strictly screen ecological big enterprises and ecological projects to ensure that the introduction is of a family, drives a batch. Third, is to strengthen the innovation guarantee. The introduction of professional skills and talents aim to strengthen basic theory and applied theoretical research. At the same time, we will step up innovation efforts, establish mechanisms, improve policy support efficiency, and further unleash reform and development dividends.

### **Conclusion**

The county economy is the basic position in China. Therefore, it is of significance to develop the ecological economy of the county. After investigation and analysis, the full text is summarized as follows. This paper analyzed the economic foundation of Jingning. It explained the Jingning Ecological Industrialization Prospect in the necessary theoretical background. The analysis on ecological industry was under the premise of the model and theoretical analysis. It draws the conclusion that is the circular economy is an important manifestation of the essence of ecological and economic transformation. Ecological economy is a necessary condition to achieve sustainability.

The article also studied the industrial ecology of mountainous counties such as Jingning. It analyzed the comparative advantages and late development advantages of the mountainous areas. It defined the connotation of Jingning's echo-economic development. In the case of Jingning county, it summarized the practice and experience of mountain ecological industry. The paper put forward the industrial policy system and institutional arrangements and summed up the county industrial mountain ecological transformation planning and implementation of initiatives. It pointed out the disadvantage is the advantage and the characteristic way. We should seize the high ground based on the present.

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# The Way to Solve the Dilemma of Productive Small and Micro Enterprises in the New Era – The Success and Anxiety of “QQ” Drink

**Winxin Kong<sup>1</sup>**

*College of Economic and Management, Zaozhuang University, Zaozhuang, China*  
Email: kwx0906@163.com

**Ying Xu**

*College of Economic and Management, Zaozhuang University, Zaozhuang, China*  
Email: luna198208@hotmail.com

**[Abstract]** *This paper analyzes the success and failure of “QQ” beverage from multiple angles, summarizes the dilemma faced by general productive small and micro enterprises in the new era, and explores their solutions. The conclusion is that the difficulties of small and micro enterprises need internal and external support. Externally, they should use government support policy, realizing the joint huddle development between enterprises and applying niche marketing. Internally, they should carry out the enterprise internal mechanism innovation and improve the level of management.*

**[Keywords]** *“QQ” drink; small and micro enterprises; solution; the joint huddle development; niche marketing*

## **Introduction**

At present, a conservative estimate of China’s registered small and micro enterprises is in the tens of millions, and this number is increasing yearly. After Chinese social development entered a new era, environment of manufacturing and operation enterprises was changed. The survival space of small and micro production enterprise has been gradually compressed when facing fiercer market competition. And most of the small and micro production enterprises are generally located in the low-end links of the industrial and value chains, with low level technology, low additional value, small in scale, and weak in strength. Therefore, they are always in an inferior position in competition with large and medium-sized enterprises. Their product homogenization is very serious, which can make it difficult to space out price grade. In order to survive and develop in the fiercely competitive market, the enterprise resorts to all sorts of subterfuges to reduce production costs. These kinds of phenomenon are common, and include a lack of good reputation, cutting corners, counterfeit products and tax evasion. Some enterprises have been compelled to withdraw from the market, some have struggled to maintain survival, and of course, there are also a lot of small and micro enterprises that have gradually broken through their own bottleneck and are reviving. This article takes the “QQ” beverage enterprise as an example. The authors analyze the reasons for success through product positioning, the predicament the company faces in terms of difficulties in production, innovation, talent and financing. Eventually, the authors explore and analyze the general measures for solving difficulties in small and micro production enterprises.

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<sup>1</sup>Correspondence: Weinxin Kong, College of Economic and Management, Zaozhuang University, Zaozhuang, China.  
Email:kwx0906@163.com

## Success of “QQ” Drink

### ***First Success: Accurate Product Positioning***

“QQ” drink is the main product of Shandong Wofu Biological Engineering Co., Ltd. (hereinafter referred to as Wofu), and the company is a small enterprise of switching to other production from daily industry soon. As soon as “QQ” drink product moved towards the market, it attracted widespread attention, becoming another successful “QQ” drink trademark registration after Tencent “QQ” software and Chery “QQ” automobile. After the successful registration of the “QQ” drink trademark, Wofu, has been thinking about how to position its products. Wofu, found by survey, that Japanese Coca-Cola launched GABA functional drinks with the effect of relaxation and tension relief as early as 2007. GABA is a kind of natural non-protein amino acid with regulating effects on several functions of the body and is beneficial in improving people’s emotions and relieving stress. When there is a lack of GABA in the human body, people can feel anxiety, restlessness, fatigue, and other emotions. Groups at a high pressure for a long time are likely to lack GABA. GABA ingredients are listed as food additives in Japan and Taiwan, and GABA was also listed as a new resource food by the Ministry of Health on September 27, 2009. As a result of the quickening pace of social life, people’s work, study, and social pressures becoming greater, broad space requirements for compressive resistance drinks that can soothe mood and relieve pressure have increased significantly. So Wofu, eventually positioned the “QQ” product along the GABA compressive resistance drinks, introducing the first domestic enterprise manufacturing compressive resistance drink, and has brought people a new consumption concept.

### ***Second Success: Marketing Mode Transformation***

Wofu, formerly named Shandong JianBo Dairy Biological Engineering Co., Ltd., was founded in 1996, and located in the high-tech agricultural demonstration park in Zaozhuang, in the Shizhong district. It was the largest liquid milk products production and processing base south of Shandong Province. After the “melamine” event with Sanlu milk powder in September 2008, the entire country turned pale at the mention of milk, and China’s domestic dairy products were unsalable for a short time. Wofu was not spared due to serious dull sales from the market impact after the third quarter of 2008; the number of product sales fell sharply, and milk was returned. The company made a tough decision to give up the dairy industry and enter the beverage industry. But the lack of technology trapped the product research and development. The company decided to introduce technology in 2011, cooperating with Taiwan Dajia Ranch Co., Ltd., Japan Miura International Co., Ltd. and Institute of Life Sciences of Tsinghua University cooperation. After active development, compressive resistance drinks were finally launched in April 2011. “QQ” drink gradually formed five series of products mainly focusing on functional drinks, supplemented by tea drinks, milk drinks, coffee drinks and fruit juice drink.

Giving up the dairy industry to enter into the drinks industry, as well as readjustment of product development, the company’s marketing strategy changed. In a business interview, Meng Jianbo, chairman of the “QQ” company put forward the following point of view: Before 2008, products sales basically took a direct selling model. The factory directly distributed the daily product to the terminal with 72 offices, 172 customer service vehicles and more than 700 sales personnel throughout the country. Enterprise funds became increasingly tense, and it was difficult to maintain the direct sales model. So, the company first changed the sales model to sales agents, and gradually took back offices and service vehicles across the country in order to reduce cost of sales. The second change was to the marketing team. Sales

personnel were cut from more than 700 people to only dozens of people. Thirdly, it built the product image on the company's own websites, China's food websites and other websites. The fourth change was to actively organize and take part in the sugar reception, food and drink product exhibitions, and purchasing meetings held all over the country to expand the product's publicity and to actively promote the product orders and sales of the product. Fifth, according to the feedback from clients and consumers, the company actively improved the product design, and made the taste, fragrance and consistency of "QQ" product moderate so the products, after the adjustment, were able to meet the needs of consumers.

### ***Third Success: Simple and Efficient Management***

Wofu, is a small enterprise. The only investor, Meng Jianbo, is the chairman of the company and is also the company operator. The company's financing channel mainly includes its own funds and borrowing from relatives and friends. The other companies cooperating with the company do not participate in the company share, and only invest in technology. The company's development strategy and management decisions are basically judged by chairman, and others only play the role of advisers. The company is operated under limited fixed capital undemanding of the requirements on the technology, equipment, and the site's relatively simple production management, and high production personnel mobility. Low and peak seasons of the drink market are significantly obvious; hundreds of employees are needed in the market peak season, and only a dozen production personnel are enough in the low season. A large number of temporary workers ensures the market dynamic balance of the low and peak seasons employment, and the minimum of personnel cost. There are limited administrative personnel in the company, and the company basically has no formal compensation system. The compensation of the administrative personnel is basically a fixed salary plus performance bonus. The chairman is familiar with the administrative personnel, and he rewards depending on the individual's performance and subjective judgment. The sales personnel are paid a basic salary plus sales commission, and the production personnel are paid by production and working time. Simple and flexible management makes the company's decision-making and execution efficiency higher.

## **"QQ" Drink Anxiety**

### ***First Anxiety: Difficult Production***

The production cost of "QQ" drink is higher. In recent years, domestic and international commodity prices have continued to rise. Energy, such as coal and electricity, labor costs, land use fee, and shop rental prices have increased by nearly double-digit percentages. Such an increase in production cost has a relatively larger impact on small enterprises with small capital and little gain and it also affects the enterprise's profit space and living space. "QQ" drink products have many varieties, and complete categories. Despite many varieties of raw materials, the product demand is not high due to a relatively small market, and the amount of raw materials purchased is small. Because of the limited funds the company has, the company is not able to purchase in bulk even if the sales season is at its peak or if the raw materials prices decrease. The company has no pricing power on procurement, procurement can only be subject to the market, and the cost is much higher than that of large enterprises.

The production personnel of "QQ" drink are not stable with great mobility; there is a high turnover rate. Production personnel instability reduces labor proficiency and makes technology unstable. New employees need a certain amount of training before starting the new post, and then they leave after they achieve adequate skills. Immature technology not only influences the production efficiency, but it also

can bring certain hidden troubles to product quality. Two complaints of “QQ” drink products in 2012 were due to the inadequate proficiency of production personnel in the ingredients link of production. The company only pays the social insurance for a small number of production management personnel, and the remaining production personnel are temporary workers, who get paid by the yield. Once disputes between the labor and capital occur, it is difficult to handle in accordance with the law. They are able to reach an agreement only through coordinating with each other, increasing the risk of production management beyond doubt. But if the company handles the formal labor contract for all personnel, the labor costs of the enterprise will increase greatly, adding burden to the business in the condition of lower profits or none at all.

### ***Second Anxiety: Difficult Innovation***

The innovation of “QQ” drink is obviously insufficient, and the research and development costs invested by the enterprise are very low – less than 1.5% of annual sales income. This means the company can only choose simple following strategy for their products, even imitating other products in packaging design. “QQ” drink received an infringement complaint from enterprises such as “Wahaha” in 2012. Independent enterprise innovation ability is very low; it is difficult to develop new products and new services to adapt to the changes of the market and be able to reduce the production cost and improve production efficiency through improving production technology. The enterprise’s only way of innovation is currently technology import and cooperation. Some of these imported technologies are the same that are currently using by others or those that are facing elimination, and lack of advancement. Hence, using only technology import and cooperation is unable to solve the basic problem of the enterprise innovation.

### ***Third Anxiety: Talent Shortages***

“QQ” drink not only faces the problems of production labor shortages and difficult technical innovation, but also faces a talent shortages. Recruiting technical personnel is a challenge. Firstly, only a few candidates meet the requirements of the job; secondly, is hard for the enterprise to provide competitive compensation for technical personnel. Only relying on the so-called career advancement opportunities, it is hard to see the hope of the enterprise and product market; it is also not practical to rely on recognition because it is difficult to form the cultivation of the feelings again within a short time. So, the enterprise only can carry out technical cooperation with other enterprises, which limits the research and development of the products. The lack of marketing personnel and senior management personnel is also a weakness of the enterprise. The marketing personnel battle of the drink industry has been long-standing, and people with a slight achievement have been targeted by companies with stronger strengths. It is an obvious example that several sales elites of the “QQ” drink company were poached by other enterprises in 2013. For college students just stepping into society, although they are full of voluminous vitality, they lack work experience, and companies are reluctant to spend energy in developing them. The talent competition is fierce – it is difficult to attract, use and retain employees under the existing conditions of the enterprise. Hence, the talent shortage problem is likely to continue.

### ***Fourth Anxiety: Capital Shortages***

In the development process of “QQ” drink, various problems need to be solved, such as production, technology, and talent. Money, directly or indirectly, accounts for more than half of the problems, and other difficulties can be resolved only by using money. Sufficient funds can develop and store new products and paying high wages can also resolve unsteady employees and other recruitment problems, to

a certain extent. In the period of the enterprise start-up and product input, money can even pit one against one hundred and have a leverage effect that other factors don't. Due to an insufficient flow funds, "QQ" drink product sales are basically spot cash, without credit, which, to a certain extent, affects the orders of the products. There exists obvious the following phenomenon for beverage consumption: the brand plays a key role in drink consumption, and advertising becomes an important key factor of drink market expansion, and drink brand fame. According to statistics, the advertising expense of "JDB" drink was hundreds of millions yuan every month in 2013. It spent just 578 million yuan on the CCTV tender, becoming the third bid king in high price (Xing, 2016). In a business interview, Meng Jianbo, the chairman of the "QQ" company told us, "Lack of money made the market promotion of "QQ" drink products difficult. "QQ" drink intended to make lights advertising in an important local street of Zaozhuang in 2014. The advertising costs of the street were up to millions of yuan. The plan had to be aborted due to the high cost. Not to mention the advertise "QQ" drink across the country".

The external financing gate seems to be forever separated by a layer of glass, and can be seen, but cannot touched. Due to the relatively insufficient enterprise assets, development zone land cannot be mortgaged. The procedures to apply for loans are the same with large enterprises. Many commercial banks basically don't make an advance to small enterprises due to their own operational risk. Sometimes they can get loans, but the payment comes after and the best time and use efficiency of funds were affected. Today, the drink market competition is intense, so not solving the financing difficulty will inevitably restrict the promotion of "QQ" drink products and the development and expansion of the enterprise.

### **The Small and Micro Production Enterprises Solution**

The "QQ" drinks case shows us again that the dilemmas of small and micro enterprises are multi-faceted, and the solutions need internal and external support.

#### ***Government Policy Support***

Since the heavy burden of small and micro enterprises has become a well-recognized fact, our country has issued many policies to reduce the pressure and solve the difficulties of these enterprises. On October 12, 2011, the state council issued nine financial and fiscal policies, referred to as "nine suggestions", to support the development of small and micro enterprises (Wang & Du, 2011). On October 25, 2011, the China Banking Regulatory Commission issued supplementary notice of "ten suggestions" (Wang & Du, 2011). On November 17, 2011, the Ministry of Finance and the National Development and Reform Commission jointly issued a notice and decided to exempt small and micro enterprises from management, registration, certification and 22 administrative fees from January 1, 2012 to December 31, 2014 (Wang & Du, 2011). The state council issued Opinions about Further Support of the Healthy Development of Small and Micro Enterprises with GF [2012] No. 14 on April 19, 2012. The Ministry of Industry and Information Technology also issued the Implementation Plan of Supporting Special Action of the Small and Micro Enterprises on March 8, 2013. Since 2014, the Council of States held executive meetings, and repeatedly mentioned to intensifying assistance to small and micro enterprises and encouraging its healthy development; on April 11, the Ministry of Finance, jointly with the Ministry of Industry and Information Technology, Ministry of Science and Technology, and Ministry of Commerce issued the Interim Measures of Special Funds Management for Small and Medium-sized Enterprises Development (CQ [2014] No. 38), arranging special funds to support small and medium-sized enterprises to carry out

scientific and technological innovation activities in electronic information, optic-mechanical integration, resources and the environment, new energy and high efficiency and energy saving, new materials, biological medicine, modern agriculture and high technology services and other fields (except international scientific research cooperation projects). On April 8, the Ministry of Finance and State Administration of Taxation issued the Notice about the Issues Related to Income Tax Preferential Policy of Small Profit-Making Enterprises, from January 1, 2014 to December 31, 2016, allowing the small profit-making enterprises whose annual taxable income is less than 100000 RMB (containing 100000 yuan) to pay enterprise income tax at a reduced rate of 20%, before 50% income is included in its taxable income (Xing, 2014). So, to alleviate the burdens and solve the difficulties of small and micro enterprises, can not just stay on the policy and system, and can not just establish an artificially imposed visible glass door which can't be entered between policy and enterprises. The key is to turn the support of the government at all levels and relevant departments to small and micro enterprises into concrete action.

### ***Joint Native Development***

There are obviously “low, small and scattered” characteristics in small and micro enterprises. “Low” refers to low product technology content, low added value, and low-end of the industrial chain; “small” refers to the small enterprise scale, small strength, and small market; “scattered” means the enterprise fights the enemy separately, without the “unity” and “chain development”. Without effective organization, it is difficult to form an industrial advantage in the industry. The lighter industry in Wen Zhou used the cost advantage to defeat the enterprises of Japan and South Korea. More than 4000 lighter small and micro factories took 80% of the world's market share. However, when costs rose, these small and scattered enterprises can't form a scale effect and only dozens of enterprises continue to work at present. If some small lighter enterprises can reorganize resources, they will avoid unnecessary waste, avoid mutual consumption, and save strength to develop new products. So, similar small and micro enterprises can integrate each other's resources, and adopt to the weak joint, and huddle development. The Ministry of Industry and Information Technology in the “Twelfth Five-Year” Small and Medium-sized Enterprises Growth Plan clearly put forward that “the concentrated development is the key point in promoting the growth of small and middle-sized enterprises”, agglomeration development provides an effective guarantee in providing effective service outsourcing way, obtaining the public development resources, creating regional brand and technology innovation for small and micro enterprises specialization development (TFYSMSEGP, 2011).

Joining means development of small and micro enterprises could make “doggies” into “wolves”. The concept of “Doggies economy” was put forward by famous economist Zhong Pengrong during his investigation of Zhejiang economic development. For example, a joint enterprise meant development of the home textile enterprises of Haining Zhejiang popularized the regional brand. Thirty garment enterprises in Wenzhou jointly invested into the Wenzhou clothing e-commerce service center. Sixteen shirt backbone enterprises in Yiwu made an industrial alliance. Eleven small businesses within the same industry in Taizhou made an association and reorganization of their share-holding system. A group of enterprises became shareholders, and the original eleven businesses were all written off, converting equipment, personnel and market into shares of the new enterprise. The former owners have complementary advantages, as well as specific duties and responsibilities based on their respective specialties (Qiu, 2015).

There are also many small and micro businesses carrying out group loans. The so-called “group loan” means small and medium-sized enterprises which have difficulty getting loans join together and form a joint sponsor. They can get loans all at once and pay 5 to 10% group loan deposit. Banks or credit agencies respectively give credit to the enterprise of this joint insurance group. For example, one enterprise of this group needs loan, the other enterprises can help provide deposit for it. In fact, in the mode of “group loans”, the enterprises guarantee each other in terms of assets and credit and combines judiciously with self-discipline and autonomy of its members, the credit service of the third party and the bank credit business, which reduces the risk to the banks. Through the “group loan”, the member enterprises make a voluntary combination, sharing the risk and benefit, have complementary advantages and implement interactive development (Yang, 2007).

In addition to the weak joint, small and micro enterprises should also realize their joint strength. China’s small and micro enterprises should learn from the experience of a Japanese enterprise, which formed a supply industry chain together with the upstream and downstream enterprises to achieve mutual support. China’s small and micro enterprises can also do this with their supporting industries and services with the aid of large and medium-sized enterprises. Shandong Sanjiu Pharmaceutical Co., Ltd. and “QQ” drink enterprise are in the same city and provide a case for the weak and the strong joint of the enterprise. Shandong Sanjiu Pharmaceutical Co., Ltd. is formerly known as a small enterprise (the traditional Chinese medicine factory of Zaozhuang), and legally registered the “Sanjiu” trademark with Shenzhen Sanjiu group three years ago. The two companies consulted with each other once due to the trademark dispute, and finally both sides ganged up. While traditional Chinese medicine factory of Zaozhuang was integrated into Shenzhen Sanjiu, Shandong Sanjiu Pharmaceutical Co., Ltd. was founded, and they used the “999” trademark together. Now, Shandong Sanjiu Pharmaceutical Co., Ltd. has become an important northern production base of “999” Ganmaoling of the Shenzhen Sanjiu Group, and a strong and a weak joint has opened up a shortcut for rapid development for the small business traditional Chinese medicine factory of Zaozhuang.

### ***Internal Mechanism Innovation***

Low barriers to entry for small and micro enterprises, rapid expansion and management ability ascension are often disconnected. Therefore, the development of small and micro enterprises SHOULD not just depend on one burden-reduction policy, decompression policy and blood transfusion policy. The key is making their own blood, management change and innovation. First of all, small and micro enterprises should play the advantage of their own “small”-ness, make full use of their simple and effective management, optimize personnel composition and workflow, and pool resources to do a good job of specialization.

Secondly, small and micro enterprise should really pay attention to talent, establish a high-quality staff team as soon as possible, and turn the emphasis on talent into practice, invest in talent introduction and use, give participation and decision-making rights to the enterprise managers and relevant personnel, and increase market competitiveness rapidly under the condition of using the least resources.

Thirdly, small and micro enterprises should gradually improve the enterprise management system. Small and micro enterprises mostly have not set up a real modern enterprise system. Although they have the enterprise architecture in form, they are prone to a patriarchal mouthpiece in management decisions. Compared with the mature and perfect model of large enterprises, small and micro enterprises have a large gap in aspects such as management system, personnel allocation and capital operation, with

extensive and chaotic state. Extensive internal management, and a disordered financial system and employment system make them resign themselves to being inferior in market competition and they become easy to bankrupt in competition with large and medium-sized enterprises. Since the various resources of small and micro enterprise are limited, they are unable to implant the traditional large and medium-sized enterprises management model. However, the boss should not make all the decisions. The relevant system of enterprise management and decision-making needs to be established to give full play to the comprehensive efficiency of modern enterprise management.

Fourthly, increase enterprise credit consciousness, and establish the concept of “good faith”. Many dealers, agents and customers don’t want to associate with small and micro enterprises because of the low credibility of unstable product quality and weak market service consciousness. Banks are reluctant to give small and micro enterprises loans, due to high bank loan risk and other objective factors caused by non-standard financial management, rapid market change, and low anti-risk ability of small and micro enterprises. Financial opaqueness is also one of the more important reasons. Companies keep three sets of books, one for the superior, one for the bank, and one for their own use. It unavoidably makes people worry. It is an indisputable fact that it is difficult to make up for the gap on the strength between large and medium-sized enterprises and small and micro enterprises in a short time. But small and micro enterprises should not be lost to large and medium-sized enterprises on business integrity and should be even better and more perfect than them.

### ***Carry on Niche Marketing***

Direct competition in the market between small and micro enterprises and large and medium-sized enterprises would be tantamount to throw straws against the wind. The direct confrontation between “QQ” drink and “Wahaha” in the products lead to a definite failure. Numerous small businesses with fast growth all avoid direct competition with large enterprises. They focus on a certain market segment, choose the particular smaller niche market as the goal, and provide professional service, which is niche marketing. Philip Kotler said, in *Marketing Management (Eleventh Edition)*, “Small enterprises should focus on implementing niche strategy. There are three main assignments of market niche need to be done as follows: create a niche, extend the niche and defend the niche, etc. Because the strength of niche is weak, it is easier to be success and sustained through multiple niches than single niche” (Kotler, 2003). For this, small businesses should establish a reasonable base point, do many things and take more time in the niche creation, niche expansion and niche protection according to their own resources, ability and credibility.

Small and micro enterprises tend to make fatal mistakes in production design, such as taking the following strategy. They follow the product design and development of big business. Without sufficient capital and technical strength to quickly start into the market, the small businesses can only be dragged down by big businesses. Considering the small strength and limited resources, a strategic focus is the best choice. Small businesses should further subdivide the market and find the potential demand of some consumer groups for their products. This is not necessarily a big potential demand, which is not easy to attract the attention of big business, but it may very well be opportunities for small businesses. Enterprises can choose product professionalization, service professionalization, specific customer professionalization, scale professionalization, and geographical area professionalization to create niche according to specific circumstances. For example, regarding sock products, consumers often face the problem that a hole in the front of the socks will appear soon and the rest of the socks are still intact.

Consumers can't use them but feel wasteful when throwing them away. But a simple improvement such as making them thicker in the front, a simple improvement, may be able to win more customers. Many companies are not willing to do further improvement on their products, while a small hosiery manufacturing enterprise can produce such products to meet the potential demand of some consumers.

Multiple niches can increase insurance coefficient, spread the risk across rather than on one single niche, so companies want to select multiple niche products or markets, and further expand their niche in order to ensure their survival and development. One is after opening up special niche products, product mix is expanded according to the characteristics of the product, and more widely niche products meet the needs of different consumers. The second is that niche products are gradually penetrated into new market segments, the niche products market is expanded, and the product's market share is improved, to achieve the goal of expanding niche market.

The ideal niche should not be attractive to main competitors, but after the rapid expansion of niche products, it may also attract a lot of competitors to imitate and enter. If there are new competitors that enter, the enterprise should keep its leading position in the market to protect its niche market. Market protection is not a meaningless term; the enterprise needs to establish a good reputation with dealers, agents and customers, carry out good sales channel construction and attach great importance to the role of promotion. Niche marketers should focus on long-term interests to establish, maintain and strengthen the relationship of mutually beneficial exchange, deliver the goods with customers and dealers, and use the long-term relationship with customers as the core. In short, as long as the small enterprises are good at management, they can pay close attention to the small parts ignored by large enterprises on the market at any time. Through specialized operation and carefully serving customers, small businesses always have a chance to make profit and thrive.

### **Conclusion**

This article has investigated and researched the situation of "QQ" drinks. Many small and micro enterprises also have difficulties in different parts of the business as "QQ" drinks, such as production, innovation, talent and financing. But small and micro enterprises have their own advantages; for example, they're "small", "flexible" and "vivid". When our country enters a new era, the state pays more and more attention to the development of small and micro enterprises, and the development of small and micro enterprises will surely usher in another spring. Therefore, we should not only make use of all sorts of government preferential policies, but also realize joint means of development. When facing the market and competition, we should take supplemental marketing as the key point and highlight the flexibility of small and micro enterprises. We should innovate the mechanism internally and continuously improve self-management level. Due to the specific conditions of different small and micro enterprises, the methods used to solve the problems are not exactly the same. This paper does not take a horizontal comparison study on other small and micro enterprises, so the conclusion is not complete. It is pending further validation of more business research in the future.

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# Research on Innovation Ecosystem Based on Green Management

Ke Liu and Meng-Han Chen

*School of Economics and Management, Zhengzhou University of Light Industry,  
Zhengzhou, China*

Email: liuke\_liu@163.com and 114738673@qq.com

*[Abstract] Innovative ecosystem based on green management is the driving force of enterprise sustainable innovation. This paper first introduces the introduction of innovation ecosystem based on green management. Then, the paper analyzes the literature viewpoints and the main operational mechanism of the innovation ecosystem. Finally, with specific cases, the dissertation concludes that the construction of the innovation ecosystem based on green management which has become a new way to create competitive advantages for the enterprises.*

*[Keywords] green management; innovation ecosystem; operational mechanism; government responsibility*

## Introduction

In recent years, driven by the new technological revolution and a new industrial transformation, the government's innovation policy and the innovation model of enterprises are changing. Any single individual can not fully possess all the resources needed for innovation in the context of economic globalization, and the synergies between enterprises and other organizations are becoming a new trend of the innovative development. In fact, it is possible to conclude that an innovative ecosystem is a synergistic mechanism of the enterprises with its stakeholders, in which enterprises are no longer independent individuals, but instead rely on the synergies to connect with their suppliers, distributors, outsourcers, products manufacturers and technology providers, and then provide customer-oriented solutions and create value. An individual enterprise can not be completed independent to obtain innovative resources and make innovation, and it needs to carry out complementary cooperation with other enterprises so that there is a common purpose. To achieve sustainable and healthy development, attention should be paid to the green aspect regarding the implementation of management of the innovation ecosystem. Green management is a management style in that enterprises use innovative technology to achieve the goal of environmental protection, and ultimately access competitive advantage management through the full integration of environmental strategy and organizational purposes. In the process of innovation ecosystem operation, enterprises focus on reducing or eliminating the negative impact of the product on the ecological environment, and the system benefits and environmental protection are combined to realize the sustainable development of innovative ecosystems, which is the connotation of enterprises innovation ecosystem based on green management (Liu, Xu, & Qi, 2017).

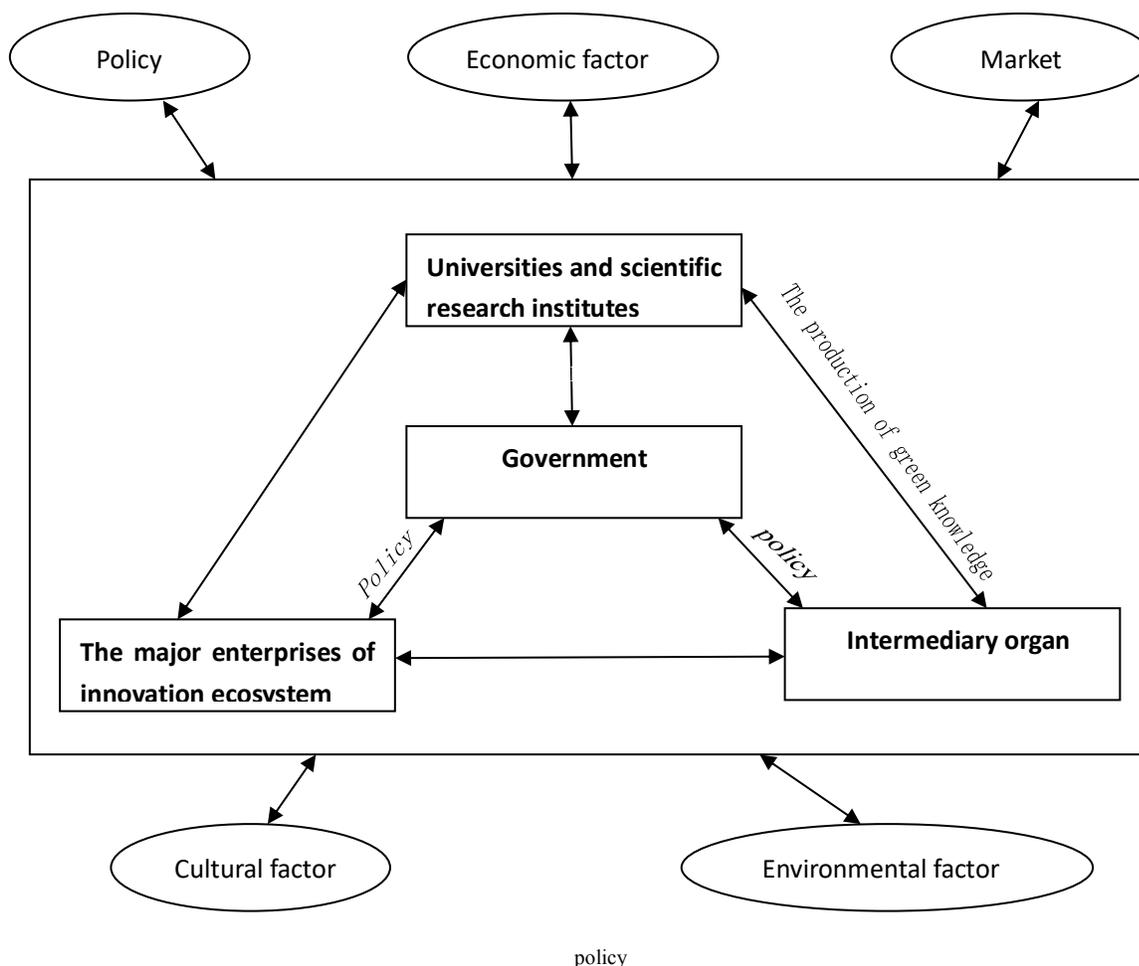
## Literature Review

With the deepening of research on innovative practice, people found that the innovation system is like a dynamic ecosystem. The innovation ecosystem first appeared in a research note "Maintaining the Country's Innovation Ecosystems, Information Technology Manufacturing and Competitiveness" published by the U.S. Presidential Technical Advisory Council in January 2004, which emphasized that a well-built innovation ecosystem is the foundation in which a national economy continues to prosper and maintain its leadership in the global economy (Wang, R., 2014). Foreign scholar Estrin (2010) pointed out

that the innovation ecosystem is a system composed of three communities of research, development and application and an external innovation environment. It is concluded that the healthy balance movement between the three communities is the key to sustainability of the national innovation ecosystem. Domestic scholars Bing Sun and Da-Ming Zhou (2011) put forward the structural model of an enterprise technological innovation ecosystem based on the core enterprise. According to Jin-Xi Wu (2014), the health level and healthy development capacity of an innovation ecosystem should be measured in terms of integration with the environment, value-added capabilities and health (Wang, R., 2014). To sum up, the domestic and foreign academic circles are constantly deepening their research on such issues as innovative ecosystems and green management, and they have made useful theoretical and practical achievements.

### Architecture of Innovation Ecosystem

Innovation ecosystems based on green management are symbiotic, open and complex network structures formed by the interrelationships, interactions and synergies between some different innovation subjects.



**Figure 1. The Essential Component Factor of Innovation Ecosystem Based on Green Management and External Environment Structure Diagram (Wang, R., 2014)**

The structure of the main body within innovation ecosystem is usually expressed as (see Figure 1):

1. In the innovation ecosystem based on green management, the core enterprise is the core of the innovative ecological network, and other innovation subjects provide support, service and guarantee for green innovation of the enterprises. As the founding companies of the innovation ecosystem, the main core enterprises must be at the heart of the innovation ecosystem, while the role of other subject enterprises can be seen as a reflection of the innovation ability.
2. The government has a great influence on the development of the enterprise regarding policy, law and taxation, and the government must be included as an innovation subject into the innovation ecosystem. Ecological responsibility is an important part of government responsibility, and the government is duty-bound to promote green management. The government is mainly engaged in system design and policy formulation and formulated laws and regulations and environmental protection policies based on green management to create a favorable external environment for green innovation activity (Chu, 2017).
3. A sustainable development of innovative ecosystems is surely attached to talent and technology, and the universities and research institutions, as the source of talent cultivation and green technological innovation, should be accepted into the innovation ecosystem to provide talent, green technology and knowledge. As the main force of innovation research, the universities and research institutes can promote the sustainable development of innovative ecosystem by participating in the research and development of new technologies and new knowledge. They should not only serve the innovative green chain of enterprises, but also create a new chain of innovation.
4. Intermediaries play an essential role in the system as an indispensable supportive institution for innovation ecosystems. The main role of Intermediary organizations is to provide green technology information, to carry out green technical advice, assessment and dissemination activities and to formulate the green technical norms and standards.
5. The ultimate goal of innovation ecosystem is to meet the needs of the market, so the end user must be included in the system to actively cultivate the user's green consumption concept, and the end user's consumer demand and consumer willingness should be seen as innovative power of innovation ecosystem (Wang, C., 2013).

### **Discussion on the Operational Mechanism of Innovative Ecosystem Based on Green Management**

#### ***Green Cultural Management Mechanism***

Enterprise culture embodies the core idea of business management. Innovative ecosystems should also have their systematic cultural consensus. To integrate the concept of green management into the innovative ecosystem, it is necessary to establish a green cultural management mechanism into the system. The implementation of green management of innovative ecosystems not only should not destroy the environment when the core enterprise of the system run their own business, but also promote the public understanding of environmental philosophy and the significance of environmental protection so that the green management of the cultural mechanism enjoys popular support.

### ***Resource Integration Mechanism***

Resource integration is one of most commonly used means of enterprise strategic adjustment. To maintain the healthy and stable operation, the innovation ecosystem must collect the effective resources by combining the innovative resources of subjects to optimize the integration. Although the innovation ecosystem based on green management itself has the function of optimizing the allocation of resources and promoting the upgrading of industrial structure, it is still necessary to establish a perfect resource integration mechanism within the innovation ecosystem. The promotion of green innovation is a value orientation based on the green management of innovative ecosystem innovation. This platform of the innovative ecosystem should play an intermediary role in the integration of resources for the supply and demand side of innovative resources to provide effective connection of green resources to form the innovative value chain of the green resource.

### ***Cooperation-Competition Mechanism***

There will be a variety of competing relationships within the enterprise due to the scarcity of resources or uncertainties in the environment, as well as within the innovation ecosystem. Competition within the system is divided into two cases: the competition between the main innovative subjects and the competition between the main innovative subjects and non-subject organizations. For fierce competition, the system needs to create an operating environment and development platform of fair competition to protect the smooth information communication between the main organizations. Although fierce market competition based on green management brings a lot of green innovation resources, making the green industry more intensely competitive, and innovation gets more energetic. Interest-driven is the driving force of the construction of cooperative mechanisms in innovative ecosystems. The innovative ecosystems insider must focus on the win-win concept of cooperation to achieve their interests while to realize the overall interests of the system (Mei, Chen, & Liu, 2014).

### ***Case Analysis***

The advantage of the innovative ecosystem is that the internal self-recycling resource supply and the external open unified as an organic whole. Once the green management concept is integrated into the system, it can allow it to have innovative resources beyond the boundaries of the company and organization where it is located. This advantage of Alibaba has the most concentrated expression: Alibaba focuses on e-commerce to hatch out the supply chain, payment, finance, logistics, large data, service providers and other subsystems for enterprises to create a dependable living environment. At the same time, these systems have to penetrate into further subdivision areas, and to affect the industry upstream and downstream, to complete the transformation of the entire industry, which makes Alibaba become a powerful innovation ecosystem. With the help of interconnection mechanism and competitive-cooperative mechanism in the ecosystem, Alibaba has formed its unique eco-field in the system, which, on the one hand, produces effective coordination among every object, and on the other hand, urges every object to compete, bringing vigor to all the objects within the system (Bao, & Yu, 2017).

With the core of Alibaba, the biggest highlight of the innovating ecosystem is that it integrates the management method--green innovation. Green management has gone through the whole developing processes of innovating the ecosystem, and the degree of green management has increased along with the development of the system. In March, 2016, Alibaba formally established green-consuming working group, which was led by group president, integrating the force of business lines such as category,

principle, standard, public welfare and research, with the help of government, businesses, certification body, and consumers, improving the standard, as well as the certification of green products, introducing green products to the market, creating the convenient purchasing platform for green products, gradually establishing excitation mechanism similar to “green integration” for the consumers purchasing green products, thus encouraging green consumption. Through green management, Alibaba means to improve its innovation ecosystem and promote green consumption, thus to help more consumers to get into the habit of green consuming, to release green consuming, to promote upgrade to the industry and revolution to the supply end. There is no doubt that the measure will bring Alibaba’s innovating ecosystem into a constant and stable development.

### Conclusion

The theory of the proposed innovation ecosystem provides a new way for innovation management, and building an innovative ecosystem based on green management will help to promote the emergence of green innovation and promote the sustainable development of the innovative ecosystem. At present, although China’s research on innovative ecosystems based on green management is still in its infancy, the discussion of the theory and practice of green management is deepening and the enthusiasm of all walks of life to build innovative ecosystems is also rising. The construction of innovative ecosystems based on green management requires the constituent bodies and their auxiliary enterprises to play their respective roles and clarify the roles of their constituent subjects. Creating innovative ecosystems based on green management and optimizing the internal and external environment of the system will add up to the continuous development advantages and innovation ability of enterprises. With the implementation of China’s innovation-driven strategy and green development strategy, China’s research and construction of innovative ecosystems based on green management will mature shortly.

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# Research on Brand Image Dimensions of Characteristic Towns: Based on Brand Concept Map

**Zhao Chang**

*School of Business Administration, Zhejiang University of Finance & Economics,  
Hangzhou, China*  
Email: zhaoc@zufe.edu.cn

**Shen Fei**

*Yuhang Local Taxation Bureau, Hangzhou, China*  
Email: shenfei7@126.com

***[Abstract]** The brand image of the characteristic town is one of the important components of branding the characteristic town, and there is still a lack of brand image dimensions. Based on the Keller brand image model, this paper explores the brand image dimensions of the characteristic town, combined with distinguishing its features, using the Brand Concept Map measurement method. The empirical results show it effectively maps out the brand image dimensions of the characteristic town. Therefore, according to the results, we can guide the research and practical countermeasures of the brand image of the characteristic town.*

***[Keywords]** brand image dimension; characteristic town; brand concept map*

## Introduction

Relatively independent from the urban areas, the characteristic town is a space platform, with a clear industrial positioning, cultural connotation, tourism and certain community functions. As a new type of industrial spatial organization, the characteristic town is playing an important role in the transformation and upgrading of regional industry (Sheng, & Zhang, 2016). How to effectively carry out regional branding has become a hot topic in academic circles (Hanna & Rowley, 2013). The research on brand image of the characteristic town has not yet been paid attention to, and its basic problems, such as definition and dimension, urgently need to be solved.

According to the Keller brand image model, this paper puts forward the brand image dimension model of the characteristic town. and uses the sample of Hangzhou Dream Town, which is the first provincial characteristic town in Zhejiang province. Moreover, it uses the newest Brand Concept Map method to measure the brand association structure.

## Literature Review

A regional brand is the unique attraction of regional function, emotion, relationship and strategy, which acts on the public mind to produce a series of unique associations of multi-dimensional combination (Kavaratzis, 2005). The corresponding regional brand image is based on consumer cognition and brand name attributes and associative associations (Fetscherin & Heilmann, 2012). Therefore, the concept of brand image of the characteristic town can be expressed as the overall impression and evaluation of the brand association or perception of the characteristic town in the mind of its stakeholders.

At present, a regional brand image lacks a recognized measurement. For example, Ceng (2010) discussed the characteristics of a regional brand image, which lies in regional characteristics, intangible

features, comprehensiveness and dynamics. Sun, Wang, & Lan. (2015) defined the regional brand image as the general impression formed by the association or perception of the brand of the cluster in the consumer mind. Fetscherin and Heilmann (2012) put forward nine dimensions of a regional brand image from the angle of individual metaphor. Therefore, this paper refers to the existing brand image connotation such as Aaker's brand personality theory (Aaker, 1997), brand image three-dimensional model (Biel, 1992), and Keller's brand image model (Keller, 2003). Keller's model is the most influential model, whose brand associations are divided into three types: character attributes, interests and attitudes. Attribute associations are further classified into the relevant attributes of the product and non-product related attribute associations. Moreover, the interest associations are divided into function experience, and a symbol of the three types. Yamen Koubaa, et al. (2015) and Long (2013) furthered the Keller brand image model by using the matrix dimension structure method.

### **The Model of Brand Image of Characteristic Town**

The model of brand image of the characteristic town is composed of two dimensions: brand association type and brand association perception degree. The latter includes three aspects: the intensity of association, the degree of love and uniqueness. Brand association type contains three sub-dimensions, reflecting the characteristic attributes of characteristic towns, and each sub-dimension is reflected by the degree of brand association perception. As shown in Table 1, the dimensions of the model and their internal relationships are as follows:

1. Brand association type. First, Attribute type mainly refers to the regional characteristics and characteristic industry attributes of characteristic town. The regional characteristic includes natural scenery, landscape architecture, cultural customs. Industry attributes mainly for the characteristics of industrial properties of the town's characteristics lay the foundation for the economic brand image, covering the associations of characteristic industry, famous enterprises and brands, industry technology level, feature of the town policy and institutional environment. Second, in addition to the interests of function, emotional and symbol, the interests of the association types also release information of regional value which was based on economic development, advanced technology or abound resource (Martinovic, 2002). Third, Keller believes that the brand association of the most abstract and the highest level is the type of attitude, which relates to the overall assessment of consumer brands. In addition to the individual sense of evaluation and emotion, it also has a unique collective emotional factor.
2. The degree of Association. First, Brand association intensity refers to the connection strength of brand nodes, which is the key factor for consumers to recall and further influence brand choice. Brand association strength is an important condition of the formation of brand association, and directly affects the brand association types. Second, In the concept map of the characteristic town, association 's favorite degree expresses the love degree of the interviewees. They are closely related to the associative attributes and interests. Third, Uniqueness of association is a unique proposition. Uniqueness can be identified individually or measured by the associative effect and the multiplicative effect of preference. The latter method is adopted in this paper.

**Table 1. Dimension Structure Model of Brand Image of Characteristic Town**

Brand Association Type		Degree of Association		
		Intensity	Favorite Degree	Uniqueness
Attribute	Regional characteristics	A, B	C, D	AC\BC
	Characteristic industry attribute			
Benefit	Direct interest embodiment: functional interest	A, B	C, D	AC\BC
	Source of interest creation: regional value			
Attitude	Evaluation of individual meaning	A, B	C, D	AC\BC
	Unique collective emotion			

*Note: A and B are respectively connected with a high intensity or moderate intensity brand types and characteristics of town brand connection; C and D denote the direct connection or indirect connection between the words you favorite and the brand type; AC\BC are the combination of strength and favorite degree, AC represents a very unique combination, and BC means a unique combination.*

### **Data Collection and Drawing**

#### **Measuring Method**

This paper chooses the Brand Concept Map method put forward by Joiner (1998) to draw the brand image of the characteristic town. Moreover, it mainly discusses the core first level association in the brand concept map. The measurement rules of the unique of brand image of characteristic town are as follows: the combination of high and medium association strength with connection of favorite association can be formed of two unique associations: very unique and unique. If there is a missing item in the intensity or favorite, the combination of them is not taken into account. Therefore, the association types are obtained through interviews and calculations, and the association intensity is obtained by direct inquiry. The association unique is determined by lexical attributes, and the association uniqueness logic inference is obtained.

#### **Interview Implementation**

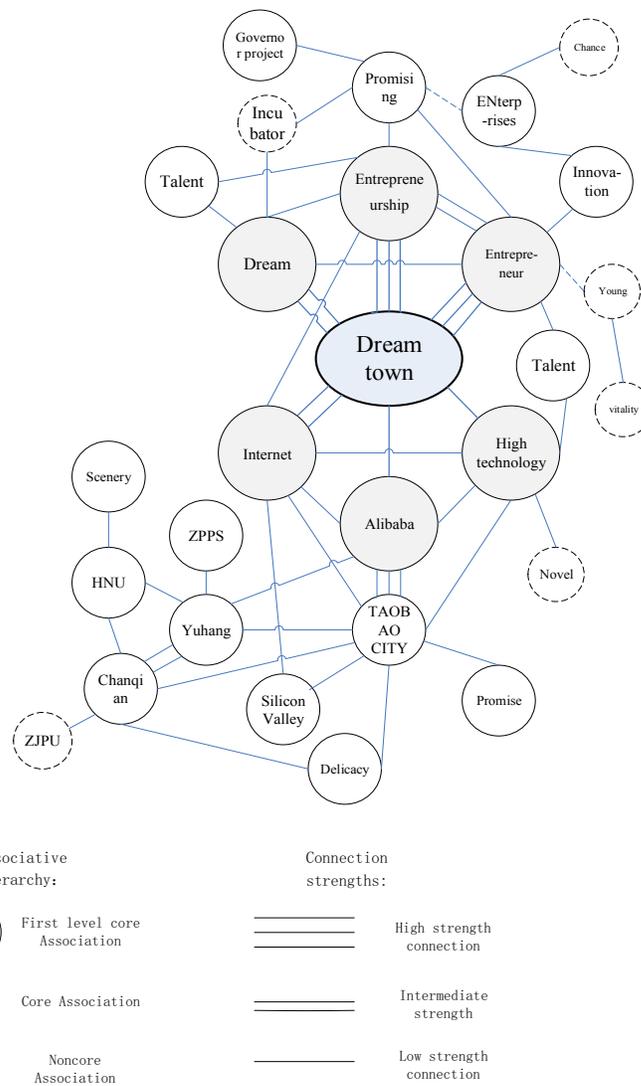
The first step was the initial interview. The main object is the relevant management of the dream town to understand the dream town development planning, regional brand construction, and brand publicity work, etc. The second step was pre-investigation. The survey objects are the management departments of the dream town, the enterprises in the characteristic towns and the surrounding enterprises, institutions, residents, and the public. The result aims to the vocabulary summary (Table 2). The third step, a formal questionnaire, was used to investigate the location of a dream town in Hangzhou. A total of 78 questionnaires were sent out, 70 were effectively recovered, and 50 valid questionnaires were confirmed. Rand association type determination and drawing.

The results of the survey are summarized below, and Table 2 is arranged according to the total mentioned frequency. Under the rules of surveying and mapping, the overall dreamtown brand image was drawn, with the help of UCINET software as shown in Figure 1.

**Table 2. Brand Association Types in Brand Image of Dream Town**

Brand association	Association type		Core brand association		First grade brand association			
	Core	First grade	Mention frequency	Connection number	First order frequency	First class ratio	Secondary Connections	Advanced connection
Entrepreneurship	Y	Y	50	117	50	100.0	0	117
Entrepreneur	Y	Y	44	97	44	100.0	0	97
Internet	Y	Y	36	72	35	97.2	6	66
Dream	Y	Y	36	69	36	100.0	0	69
Alibaba	Y	Y	35	62	24	68.6	1	61
High technology	Y	Y	34	59	30	88.2	7	52

Note: the brand association of number 7-25 is not closely related to the article, so it can be omitted.



**Figure 1. Using Brand Concept Map to Map Out the Dream Town Brand Image**

## Empirical Study

### *Empirical Study on Brand Association Types*

There are six core levels of association in Figure 1, which explain two basic questions. The first question is what the characteristic town is engaged in, while the second question is how to do the characteristic town. The “Entrepreneurial” association represents positioning of Hangzhou Dream Town, whose service object is for “entrepreneurs” association. As its “Internet” industry, Hangzhou Dream Town has a representative of the enterprise – “Alibaba” company, and its industrial technology level obviously belongs to “high technology”. The six core levels of the brand image of the dream town belong to three associative dimensions of the characteristic town, as shown in Table 3.

### *Brand Association Degree*

First, there are three intensity connections between the dream town and entrepreneurship, the dream town and entrepreneur, and Alibaba and Taobao City, as shown in Table 3. Moreover, there still four intermediate strength joints. The intensity connections between dream town and entrepreneurship means that the dream town is regarded as a place for entrepreneurship. Second, there are several favorite association words such as Promising, Innovation, Youth, and Vitality which are direct and indirect connections with Core and First Level Associations. Third, according to the rules established earlier, the Entrepreneurship can gain a Uniqueness of brand association of Young and promising innovative entrepreneurs. At the same time, “Internet” can access a unique association of the Internet version of “Hangzhou Silicon Valley”. Above all, the uniqueness of the dream town can be expressed as “Silicon Valley” of Hangzhou Internet, realizing the entrepreneurial dreams.

**Table 3. Dimension Structure Model of Brand Image of Dream Town**

Degree of Association Brand Association Type		Core Level Association	→		
			Intensity	Favorite Degree	Uniqueness
Attribute	Regional characteristics	Entrepreneurship	high	Promising (direct)	Promising entrepreneur
	Characteristic industry attribute	Internet	Medium	Silicon Valley (direct) Promising(indirect)	Hangzhou Silicon Valley on the Internet
Benefit	Direct interest embodiment: functional interest	Entrepreneur	high	Promising, innovative and young (direct) Vitality (indirect)	Young and promising innovative entrepreneur
		Alibaba		Promising, Silicon Valley (indirect)	
	Source of interest creation: regional value	High technology		Novelty (direct)	
Attitude	Collective emotion	Dream	Medium	Promising (indirect)	

## Conclusion

Based on the Keller brand image model, this essay proposed a model of the brand image of characteristic town. Using the brand concept map, features of the town brand image dimensions can be effectively mapped: brand association types (attributes, interests and attitudes), and the degree of association (intensity, favorite degree and uniqueness).

The limitation of this paper is that only a sample of a characteristic town was selected. Therefore, study on the brand image of characteristic towns needs to choose typical samples of characteristics towns, further refine the model of brand image dimension of characteristics of town, and then, through a large sample of empirical investigation, further develop the brand image dimension of the characteristic town.

### Acknowledgements

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# **Construction of Green Land Renovation Planning Mode Based on Regional Collaboration**

**Xuefei Huang**

*School of Public Administration, ZheJiang University, Hangzhou, China*  
Email: 11722062@zju.edu.cn

**Cifang Wu**

*School of Public Administration, ZheJiang University, Hangzhou, China*  
Email: wucifang@zju.edu.cn

**Xi Li**

*Beijing Institute of Control and Electronic Technology, Beijing, China*  
Email: htlx123@sina.com

**Xiaowei Hu**

*School of Public Administration, Zhejiang University of Finance and Economics,  
Hangzhou, China*  
Email: 1696673004@qq.com

**[Abstract]** *Land consolidation plays a key role in the promotion of China's social and economic development. In order to keep the vitality of land consolidation, the goal of land consolidation should be oriented to support urban and rural development and optimize space reconstruction. An important measure is that the governments should coordinate the large spatial development strategy and the goals and mode of land consolidation planning. In this study, land consolidation is emphasized to create a life community in planning area based on the perspective of integrated region land utilization. Specifically, the green land renovation planning mode based on the regional collaboration can be constructed from urban and rural restructuring, village landscape designing and creating an ecological distribution pattern on account of the regional land general use.*

**[Keywords]** *regional collaboration; land use; land consolidation; planning mode*

## **Introduction**

The goal of land consolidation in China has been changed from merely increasing the amount of cultivated land to gradually improving the quality of cultivated land. Now the goal of land consolidation has turned into striving for harmony of humans and nature, as well as the construction of the life community. In the previous land consolidation activities, which merely separated the fields, water, roads, forests, villages, and towns or implemented the projects one at a time, it has been unable to meet the new requirements of urban and rural development and land improvement. The essential feature of land consolidation is to coordinate the relationship among population growth, economic development, and social progress and the sustainable use of natural resources. Land consolidation shall connect the fields, water, roads, forests, villages, and towns with land consolidation projects. It shall scheme deeply and arrange comprehensively. It shall collect the funds and achieve convergence and coordination. What's more, land consolidation shall place urban and rural areas under a whole regional space to drive all kinds of land consolidation. It shall coordinate the production, living and ecological land allocation and harmonize the unity of opposites of urban, agriculture

and ecological space. The green and ecological land renovation planning mode constructed based on the guidance of regional collaboration changes the dispersed, isolated land consolidation projects into integrated consolidation projects. We shall adhere to regional collaboration and unify between city and countryside and implement the comprehensive consolidation of mountains, rivers, forest, fields and lakes.

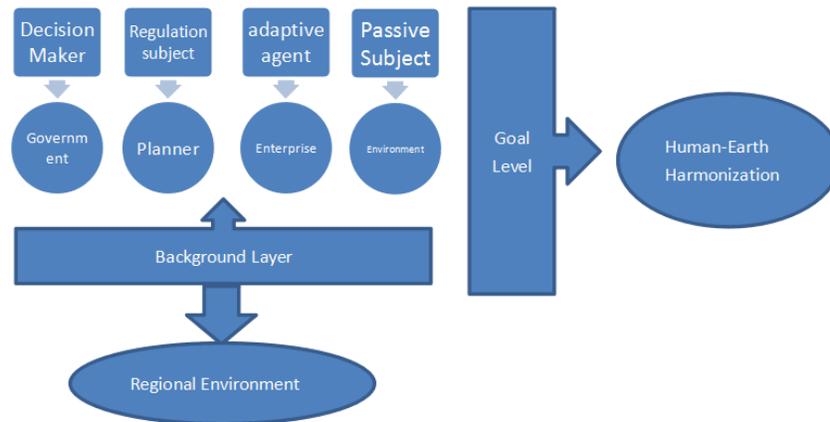
### **Research on Regional Theories and Land Consolidation**

Region symbiosis refers to the interactivity and win-win situation of the regional units and elements with mutual influences, mutual relations, mutual dependence, mutual promotion and nested relations and is a kind of phenomena of system organization, social organization and economic organization (Zhu, 2010). Collaborative development requires the unified development of goals and planning, as well as the high coordination and integration among the various elements within the system. They can be open to the outside jointly under the conditions of mutual equality and openness and realize overall development in mutual cooperation, mutual promotion and functional organic integration (Yingji Liu, 2012). Based on the systematic investigation of the natural resources, economic and social development and location conditions of the villages and towns in different areas (Hiironen, & Riekkinen, 2016), the land consolidation and town-village allocation plan are developed to guide the urban-rural space optimization and rural space reconstruction so as to form cities - town - central village (community) - basic-level village (the new urban and rural space system has become an important platform for the realization of communalization of rural residential, industrialization, large-scale operation of agriculture and infrastructure intensification (Yansui Liu, 2012; Wu, Fei, & Ye, 2011). There is research which used the theoretical framework of PSR (pressure state-response) as the theoretical basis of the spatial pattern of land consolidation constructed the assessment indicator system for the land consolidation space pattern and proposed, under the effect of pressure, to unleash the true potential of land consolidation and promote the improvement in quantity and quality of cultivated land and potential tapping of the construction land inventory for the different state features system through a series of measures such as response to the original land use system, planning of land consolidation, project implementation and technological innovation and so on, which can improve the structure and function of land use system and ease the system pressure (Qu, Zhu, Yun, Zhang, & Gao, 2017). Land consolidation may be described as the planned readjustment of the pattern of the ownership of land parcels with the aim of forming larger and more rational land holdings (Pašakarnis, & Maliene, 2010; Asiama, Bennett, & Zevenbergen, 2017).

### **Construction of Land Consolidation Planning Mode Using Regional Synergetic Theory**

Interacted, mutually restricted and mutually promoted, the land consolidation region is the multi-dimensional complex regional system which connects the urban and rural areas, transportation, rivers, mountains, trees, creatures and mankind together and integrates urban and rural space, traffic space, agricultural space and water space. The Chinese central government has devoted large sums of money to rural consolidation projects each year in an effort to help protect cultivated land, to improve agricultural production, to enhance the socio-economic development of rural communities, and to help build rural landscapes (Luo, & Dallen, 2017). The land consolidation planning mode should develop and evolve from plane to space and single to diverse: (1) simple land consolidation planning mode (cultivated land-based service mode: land reclamation, land leveling, country roads, irrigation facility, shelter forest for farmland. (2) complex and diversified land consolidation planning mode (people-centered regional consolidation mode: the reconstruction of urban and rural space - transport space-agricultural space-ecological space,

under the coordinated development of the region so as to realize the construction mode of coordination of human and land, and joint development of economic development and common development of human, biological and living space. land consolidation is one essential tool amongst other instruments in the land management tool-box and it is an integrated part of a broader rural development “package” (Hartvigsen, 2005; Boonchom, Piewthongngam, Polpinit, & Chatavithae, 2017).



**Figure 1. Regional Land Consolidation Planning Mode Mechanism**

### Empirical Analysis

In this paper, Danjiang Town, Leishan County in the mountain and hills area in southwest China’s Guizhou Province was chosen as the empirical analysis. Located in Leigong Mountain in Miaoling to the southeast of the Yunnan-Guizhou Plateau, the territory of the county is in the shape of an inverted triangle. With the north side higher than the south and the east side higher than the west, the terrain is dominated by the canyon landform of middle mountains and high mountains. The valley is cut strongly to form the high mountain and deep valley, as well as cliffs and steep walls. There were large amount of waterfalls, showing a typical tectonic erosion landscape. The lowest elevation is 848m and the highest elevation is the main peak of Leigong mountain, 2178.8m, resulting in a height difference of 1694.8m, which shows the depth of the cutting. Dominated by the main peak of Leigong mountain, it encircles outside to form the high mountains and middle mountains, accounting for 3.14% and 95.8% of the whole county, respectively. The social and economic development of Leishan County is relatively more backward, but the minority culture in the local area is effectively protected and inherited.

The total area of the region is 2678.05 hectares, which is 40170.75 mu in total. The area of the forest-grass land is 1349.81 hectares, accounting for 50.4%. The area of the organic town and village is 69.85 hectares, accounting for only 2.61%. The area of traffic land is 30.16 hectares, accounting for 1.13%. The agricultural land area is 1087.34 hectares, accounting for 40.6% and the area of other land mainly for the field and bare land is 109.72 hectares, accounting for 4.1%. Most land of this area is terrace. The paddy field is almost the terrace with the terracing area of 752.53 hectares, and the dry land parts have been terrace with the statistical area of 121.29 hectares. The terracing rate in the project area is about 81%.

There are good natural ecological environments in the local area. The original terraces were gradually formed by thousands of years. But the land production capacity is poor for two reasons: The first is due to the natural environment. High mountains and steep slopes easily cause soil erosion, fertility decline and

frequent disasters (Xin, Yang, Wei, & Chen, 2015); The second reason is due to socio-economic factors. There is a shortage of facilities, poor production conditions, single economic pillar products, backward industry, poor finance support and low farmers income which result in limitations of the investment on the agricultural production, which then exacerbate the vicious circle of the predatory production of extensive operation.

For a land consolidation region of such a special landform dominated by cultivated land and forest, the traditional land consolidation method may destroy the original ecological environment, resulting in its deterioration (Liu, Duan, & Hui, 2016). According to the existing cultivated land occupation balance policy and land use direction, it is hard to increase the cultivated land and improve the quality in this area. So we choose the complex land consolidation planning mode – people-centered regional reconstruction mode which plays a role in land consolidation. According to the aggregate analysis of the condition of all kinds of spaces in this area, the land consolidation planning mode in this area is constructed by the guidance of regional collaboration. As the center of the county located to the north of famous ancient folk ecotourism tourism region – the Miao ethnic village of Langde, south to the old family of Lusheng and Datang in habitation of short-skirt Miao, and east to the famous Xijiang Miao village and Leigongshan Nature Reserve, it is the center of the three scenic spots in Leishan County and is the pivotal position for the development of tourism and transportation. Therefore, the reconstruction of urban and rural space – transport space - agricultural space - ecological space is to realize the mode construction for coordination of man, land and the common development of economy, biological and living space.

### ***Urban and Rural Space Reconstruction***

We need to increase the construction land space according to the demand, adding scenic service facilities and improving the conditions of guest accommodations. For improving transport efficiency and forming the transport network, a certain proportion of traffic land area should be increased. To protect the native terraces and arable land, we should re-cultivate the destroyed cultivated land and develop the structure of plantation in a diverse way. This will enable the handicrafts, specialty food, Chinese herbal medicine, mountain spring water and other green industries to further develop.

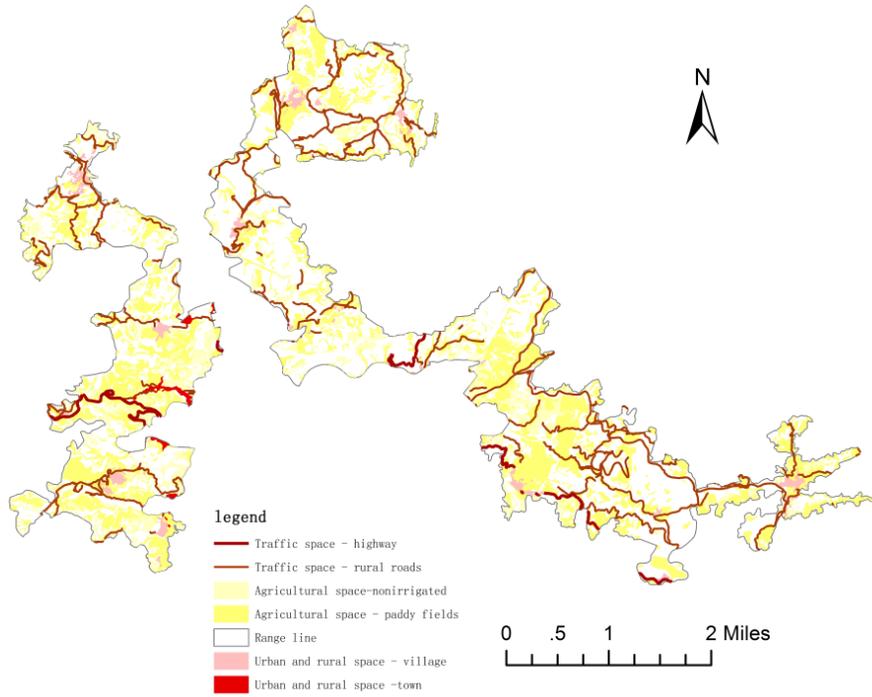
### ***Rural Landscape Remaking***

The rural style is strong and the ethnic minorities' unique characteristics are obvious in this region. We should keep the same with the original landscape style in the process of improving the urban and rural living environment and infrastructure and insist on protecting the original folk customs.

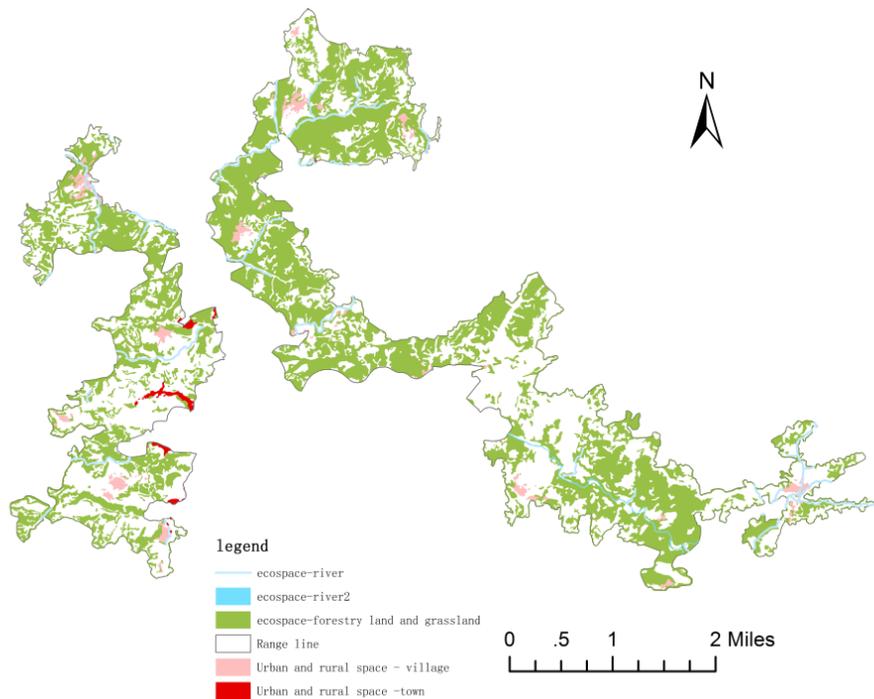
### ***Connection of the Ecological Space***

We shall ensure that the urban and rural space, transportation space and ecological space can be connected together through ecological nodes and ecological corridor and choose the ecological mode for the consolidation process and engineering technology.

We shall use the ecological design in engineering design as much as possible when we construct the land consolidation planning mode based on regional collaboration. The land consolidation mode can improve the urban and rural space quality of the consolidation region, enhance the quality of the tourism region, and promote economic and social development, as well as avoid predatory production so as to develop and protect the ecological space better.



**Figure 2. Background Layer – Regional Environment of Urban-Rural and Transportation**



**Figure 3. Background Layer – Urban-Rural and Ecological Environment**

## Conclusion

The green and ecological land consolidation guided by the regional collaboration needs integral planning. We shall analyze the status quo and problems of the economic and social development and remediation and analyze the urgent problems that need to be solved, as well as the opportunities and challenges. What's more, we also need to promote the implementation of planning and technical programs step-by-step and focus on location structure, urban and rural development stages, infrastructure layout, modern industrial system and cultural background. The green and ecological land renovation planning mode shall be constructed according to circumstances. Sticking to the natural, social, economic, ecological and cultural characteristics, it is necessary to closely understand and master the inherent laws of urban and rural development in the consolidation region on the basis of full investigation. We shall recognize the objectivity of the law when we give full scope to creativity and innovation. Under the premise of full respect to the law, we focus on these "question points" and take the study of the characteristics and rules of land consolidation planning in the whole region. We can offer the land consolidation planning program for the specific problem under the guidance of objectives. Meanwhile, under the balance coordination effect of value rationality and instrumental rationality, we integrate all the aspects together to realize the characteristic, innovative and green land consolidation planning mode based on the balance coordination among government, enterprise, social organization and citizen.

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# **Analysis of the Influence of Customer Misbehavior on their Own After-Effect Reaction – Based on the Green Consumption Environment**

**Xie Fenghua, Yuan Zhenlan, Dai Shuangya and Zhu Hong**

*Business Administration College, Zhejiang University of Finance & Economics,  
Hangzhou, China*

Email: 1678512614@qq.com

*[Abstract] With the continuous development of the economy, people's awareness of environmental protection is increasing, thus green consumption is becoming more and more important. Green consumption refers to the modern consumption pattern which is beneficial to human health, environment and resources protection. Based on the green consumption background, we have systematically reviewed the relevant literature on customer misbehavior, guilt feelings, behavior modification and self-examination, and we have built a model and proposed hypotheses. Our research results show that: (1) Customer misbehavior significantly influences guilt feelings and behavior modification. (2) Verbal injury, aggressive behavior and norm violations have significant positive impact on self-examination. Meanwhile, the three dimensions also significantly influence guilt feelings and behavior modification. (3) Self-examination has full mediating effects on the relationship between verbal injury and guilt feelings, on the relationship between aggressive behavior and behavior modification, on the relationship between norm violation and guilt feelings, and on the relationship between norm violation and behavior modification; self-examination has no mediating effect on the relationship between verbal injury and behavior modification, nor on the relationship between aggressive behavior and guilt feelings.*

*[Keywords] green consumption; customer misbehavior; self-examination; compunction emotion; behavior modification*

## **Introduction**

Nowadays, the service industry has been an important power in supporting Chinese economic growth. Despite the rapid development of the service industry, the frequent occurrence of customer misbehavior is a challenge. Customer misbehavior refers to the abnormal behavior of violating social norms and destroying regular consumption order, bringing harm to service staff and other customers in service interactions. The deterioration and spread of misbehavior have negative influences on various aspects. For example, Grove and Fisker (1997) indicated that customer misbehavior significantly influences the consumption order and destroys the good mood of other customers in the same consumption situation. In addition, Liu Ruping (2010) concluded in her study that customer misbehavior can directly destroy the consumption mood and increase dissatisfaction of other customers in the same consumption situation. The work pressure of the service staff is increased and work efficiency is reduced, which indirectly harms the enterprise's image in the mind of other customers and decreases the number of loyal customers, increasing the operation costs of the enterprise and may even destroy social harmony.

Though customer misbehavior is a frequent occurrence in consumption area, it has not attracted the attention of academic and scholars. There is hardly any literature exploring the misbehavior influence on the psychology and behavior from the angle of misbehavior perpetrators. By thorough research on customers' own emotion perceptions, this paper aims to explain how the customer misbehavior influences their moral emotions which will impact their after-effect reactions, providing a reference point for service

businesses and reminding marketers that customer misbehavior is not only confined to negative influences, but also has positive influences.

## **Research Plan**

### ***The Influence of Customer Misbehavior on Their Own After-Effect Reaction***

Tracy (2004) points out that guilt is an unpleasant emotional experience when individuals violate their inner moral criterion, namely the unpleasant and self-focus emotional reaction when individuals realize that their behavior has violated the ethics criterion, intentionally, or unintentionally, hurting others. The research of Zhao Xiaoming (2015) indicates that hurting others can easily arouse remorse and the sense of guilt in individuals. Customers' rude remarks or physical collision with employees or other customers can bring physical or psychological harm to others, which may produce guilt in the customer. Zhang Xiaoxian (2010) believes that guilt is a reflection of the individuals' conscience after their misbehavior which does harm to others. Thus, guilt will arise in customers when their destructive misbehavior harms employees and violates norms in consumption. On the basis of the above analysis, our hypotheses are proposed as follows:

H1a: Verbal injury has positive influences on guilt feelings.

H1b: Aggressive behavior has positive influences on guilt feelings.

H1c: Violation of norms has positive influences on guilt feelings.

The emotion and social image of individuals can be damaged and challenged by customers' misbehavior, producing a feeling of tension, which will arouse mental and emotional disorders. If the positive image is threatened, individuals will actively take action to repair the damaged image, such as acts promoted by moral criterion (Li, & Yu, 2013). Newman (2008) believed that individuals generally tend to hold that they are kind in their deep heart in spite of their immoral behavior and beliefs. On the basis of above analysis, our hypotheses are proposed as follows:

H1d: Verbal injury positively affects behavior modification.

H1e: Aggressive behavior positively affects behavior modification.

H1f: Violation of norms positively affects behavior modification.

### ***The Mediating Effect of Self-Examination on the Influence of Customers' Misbehavior on Their After-Effect Reactions***

The self-actualization theory by Maslow can be used to explain customer misbehavior, namely that unethical customers will increase moral behavior consciously to expect to restore their damaged self-image. The increased moral behavior is modified behavior. Schmidt (2004) believed that individuals will produce unpleasant feelings similar to guilt when they realize that they have acted improperly and are responsible for the consequences of their actions. Introspection will induce guilt because self-consciousness and responsibility assessment are the process of self-examination. Meanwhile, Cao Jina (2010) suggested in her research that individuals will produce negative emotions if they fail to control their own behavior and they will make deep introspection to eliminate their negative emotions. On the basis of above analysis, our hypotheses are proposed as follows:

H2a: Self-examination plays an intermediary role in the influence of verbal injury on guilt feelings.

H2b: Self-examination plays an intermediary role in the influence of verbal injury on behavior modification.

H2c: Self-examination plays an intermediary role in the influence of aggressive behavior on guilt feelings.

H2d: Self-examination plays an intermediary role in the influence of aggressive behavior on behavior modification.

H2e: Self-examination plays an intermediary role in the influence of norms violation on guilt feelings.

H2f: Self-examination plays an intermediary role in the influence of norms violation on behavior modification.

## **Research Methods**

The samples selected for this research were consumers with consumption experiences. Since the research aims to study the misbehavior of consumers and the after-effect perception and reaction to their own misbehavior, it is appropriate to study this from the perspective of consumers. A total of 350 paper questionnaires were distributed at the scene. The main targets were Hangzhou university students, including those from Zhejiang Commerce and Industry University and Zhejiang Finance and Economics University. In addition, 300 electronic questionnaires were distributed online to cities including Hangzhou, Shanghai, Chongqing and Chengdu. A total of 510 questionnaires were selected as being valid. SPSS20.0 was mainly used for data analysis in this study.

## **Empirical Study**

### ***Regression Analysis of Customer Misbehavior of Their Own After-Effect Reactions***

Monadic regressive analysis was made with guilt feelings (GF) serving as the dependent variable and the three dimensions of consumer misbehavior as the independent variables. The standard coefficients of consumers verbal injury (A), aggressive behavior (B) and norms violation (C) on guilt feelings (GF) were respectively 0.909, 0.727, 0.066 and the P values were all less than 0.05, respectively 0.03, 0.00, 0.044, showing that verbal injury (A), aggressive behavior (B) and norms violation (C) have significant positive effects on guilt feelings (GF). The assumption of H1a, H1b, H1c are supported.

In the same way, the regression analysis was made with three dimensions of consumer misbehavior regarded as the dependent variables of behavior modification (BM). It indicated that the three dimensions have significant positive influences on behavior modification (BM). The assumption that H1d, H1e, H1f are supported.

### ***Verification on the Mediating Effect of Self-Examination***

It can be read from Table 1 that the standard coefficients of consumers' verbal injury, aggressive behavior, norms violation are, respectively, 0.099 (P = 0.003), 0.727 (P = 0.000) and 0.000 (P = 0.044) in M1, reaching the significant level. M2 shows that the self-examination standard coefficient reaches a significant level (P = 0.000), while the effects of consumers' verbal injury (P value changes from 0.03 to 0.1) and norms violation (P value changes from 0.044 to 0.240) disappears, and the effect of aggressive behavior is the same as self-examination and is put in regression equation. Combined with the above analysis, it can be concluded that self-examination has a full mediating effect on the influence of verbal injury and norms violation on guilt feelings and no mediating effect on the influence of aggressive behavior on guilt feelings. The above analyses and results are all on the assumption of that H4a, H4e are supported and H4c is not supported.

In the same way, the modeling of the M3 & M4, it can be concluded that self-examination has a full mediating effect on the influence of aggressive behavior and norms violation on behavior modification and

no mediating effect on the influence of verbal injury on behavior modification. The above analyses and results are all on the assumption of that H4d, H4f are supported and H4b is not supported.

**Table 1. Verification on the Mediating Effect of Self-Examination**

Variables	Guilt Feeling		Behavior Modification	
	$M_1$	$M_2$	$M_3$	$M_4$
Verbal Injury	0.099	0.055	0.364	0.224
Aggressive Behavior	0.727	0.670	0.186	0.004
Norms Violation	0.066	0.038	0.113	0.025
Self-Examination		0.173		0.544
R <sup>2</sup>	0.591	0.609	0.226	0.443
F	193.119	158.251	39.128	79.381

## Conclusion and Enlightenment

### *Research Conclusion*

In this study, based on exploration of rich field data, we may safely draw the conclusions as follows:

1. Verbal injury, aggressive behavior and norms violation have significant positive effects on guilt feelings, self-examination and behavior modification.
2. In the analysis of the influence of self-examination on guilt feeling and behavior modification, it can be concluded that the higher the degree of self-examination is, the stronger the guilt feeling will be, the more likely behavior modification will be. By hierarchical regression analysis, the significant effects of verbal injury and norms violation regression coefficients disappear when self-examination is put in the regression equation of guilt feelings, indicating that self-examination has a full mediating effect on the influence of verbal injury, norms violation on guilt feelings.

### *Research Enlightenment*

Three strategies and approaches to manage customers' misbehavior for service business are put forward in this paper through the problems and results found in the research:

1. Transform traditional marketing concepts and serve customers appropriately. Service businesses should pay attention to the social behavior of customers. Service businesses are supposed to take appropriate measures to actively guide customers to comply with service specifications and improve service efficiency rather than wait and respond negatively. Not only should it be emphasized that service is customer-oriented, but service businesses should also realize that customers are not always right.
2. Convey enterprise values and strengthen moral beliefs of the customer. Service businesses can create a civilized and harmonious consumption environment by humanistic services, displaying the sincerity and determination to customers, thus enhancing the customers' moral beliefs and reduce the occurrence of unethical behavior from the source.
3. Plan service design reasonably and complete service processes. Enterprises can skillfully make use of service facilities to reduce opportunities for customers to commit misbehaviors. Communication facilities, such as customer notifications and norms, can be designed and arranged to publicize social rules and service speculations, and reinforce customer awareness of their actions.

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# Measurement and Decomposition Model of Carbon Emissions Embedded in Consumption: An Empirical Study Based On IOA

Wang Jianming, Pengwei, Shen Xiaohua and Baojing\*

Business Administration College, Zhejiang University of Finance & Economics,  
Hangzhou, China

Email: 466629563@qq.com

*[Abstract]* Based on statistical data at the national level, this article used an input-output model to measure the quantity of China's carbon emissions embedded in consumption. On that basis, SDA decomposition method has been used when analyzing the emission changes. It was found that the quantity of carbon emissions embedded in consumption has been growing quickly during the period from 1992 to 2007. But with the advantages of technology development and energy structure optimization, emission intensity has declined constantly. We found that the economic-structure effect, consumption-level effect and population-size effect have a positive influence on embedded consumption emissions. We also found that the emission intensity effect and consumption-structure effect have a negative influence.

*[Keywords]* carbon emissions embedded in consumption; input-output analysis (IOA); structural decomposition analysis (SDA); carbon intensity

## Introduction

Carbon emissions in consumption, as the term suggests, are the carbon emissions brought by consumption which can be classified into direct carbon emissions and indirect carbon emissions (also known as embedded carbon emission) according to the emission way. Direct carbon emissions in consumption refer to the carbon emissions in the domestic direct use of energy, such as the carbon emissions brought by the use of domestic appliances, collective heating and daily commutes. Its measurement is simple, and therefore, it has relatively more related literature. Indirect carbon emissions in consumption, which is also called "carbon emissions embedded in consumption", refer to the carbon emissions generated in the production procedures of the national economy industry which supports the residents' demands of different kinds of products and services (Wang, 2012). Since the measurement is complicated, and it is a new segment study field, the concerning literature of carbon emissions embedded in consumption is rare (Wu, Wang, Zhang, & Wang, 2013). This study mainly researches the carbon emissions embedded in consumption, including its measurement and influencing decomposition factors.

## Literature Review

### *Research on the Measurement of Carbon Emissions*

The measurement principle of the carbon emissions embedded in consumption is not complicated. It can be divided into two steps as follows. Step 1: Get the usage amount data  $Q_i$  ( $i$  represents the type of energy, for instance, coal, petroleum, or gas, etc.) related to consumption by direct or indirect methods. Step 2: Calculate the total amount of carbon emission through the carbon emission coefficient of the different types of energy.

$$CI = \sum(\rho_i \times Q_i) \quad CI = \sum(\rho_i \times Q_i) \quad (1)$$

In Step 1, measurement thoughts include two methods, due to the fact that carbon emissions embedded in consumption include all the carbon emissions generated in the entire production procedure of consumer goods: Method 1– bottom-up Life Cycle Analysis (LCA) & Method 2 – top-down Input-Output Analysis (IOA) (Wang, 2012). The IOA was put forward by Herendeen in 1975, and first applied to empirical research on residential energy consumption in the USA and EU. In this method, energy use of intermediate products is merged into the corresponding sector’s ultimate energy use, and it makes the accurate measurement of embedded (indirect) consumption carbon emission possible, and has been widely used afterwards. Since the input-output table reflects the complicated supply-demand relationship of interdependence and cooperation between different sectors in economical operation, the energy use of intermediate products can be summed up by calculating Leontief Inversed Matrix. Compared with LCA’s harsh demand on the data, the data for IOA is relatively accessible, and the calculation is not complicated. IOA has become the main method in the current research on the calculation of carbon emissions embedded in consumption (Wei, Liu, Fan, & Wu, 2008), as well as many other methods derived from IOA, including multi-region input-output model method studying on cross-regional carbon emission’s attribution and distribution.

In Step 2, in condition that the energy usage amount is known, the data of carbon emission of consumption theoretically can be calculated by using Formula 1. But in actual application, many factors of energy use such as fuel sector proportion, and combustion adequacy, etc. will influence the ultimate amount of carbon emission of consumption. In consideration of the data availability, “2006 IPCC National Greenhouse Gases Guidance” issued by IPCC (IPCC, 2006) explained the regular calculation formula in detail:

$$\text{carbon emissions of energy consumption} = \sum (\text{energy emission factors} \times \text{oxygenation efficiency} \times \text{amount of energy consumption}) \quad (2)$$

Compared with Formula 1, Formula 2 adds the item “oxidation rate” which is always taken as 1 to calculate for convenience in most empirical research (Liu, Geng, Xue, Xi, & Jia, 2011). When calculating the carbon emissions of residential consumption, the data of usage amount of direct carbon emission of fossil energy is comparatively accessible than indirect carbon emission, thus the research on direct carbon emission of consumption is more abundant covering the carbon emissions in macro field and micro segmented field.

### ***The Influencing Factor Decomposition Research on Carbon Emissions***

There are two types of widely-used factor decomposition models. One is the Index Decomposition Model, and the other is the Structure Decomposition Model (Xu, Liu, & Jiang, 2006). The Index Decomposition Model represents the target variable and undergoes the decomposition of influencing factors by successive multiplication with several indicators. The advantage of the decomposition method lies in that there are no residuals and it can quantize the contribution of every index on the target variable. However, the shortcoming is that we can only carry out fluctuant decomposition of target variable on the total level. In the Structure Decomposition Model, however, the target variable and every dimension effect all contain the structure data by sector owing to the application of matrix structure though it also takes the target variable as the form of successive multiplication with each structure dimension. Therefore, its advantage is obvious: except for being able to quantize the contribution of every dimension on target variable on the total level, it can analysis the reason of the target variable’s fluctuation by sector from the structural level. But, the shortcoming is that it’s complicated to calculate and likely to make mistakes.

Since the calculation of carbon emissions embedded in consumption mainly applies the IOA method, which is based on input-output tables, accordingly, the Structure Decomposition Model, which is based on input-output tables, is perfectly appropriate for the factor decomposition of the calculation results.

## **Model and Data**

### ***Model***

The basic formula to calculate residential carbon emission embedded in consumption by input-output method is as follow:

$$CF = CI(I - A)^{-1}Y \quad (3)$$

Here CF represents the amount of residential carbon emission embedded in consumption; CI represents energy intensity, and is  $1 \times n$  order matrix (n is number of sectors); A is the matrix of direct energy consumption coefficient on the basis of 14 sectors' treated input-output tables; Y is the diagonal matrix transferred from the ultimate consumption amount of each type of consumer goods in input-output tables;  $(I - A)^{-1}$  is Leontief's counter matrix to measure intermediate demand.

The classification calibers are different among the Input-Output tables of different sectors. In order to insure the accuracy of the results, the study applies the classification as 14 groups, such as farming, extractive industry and so on.

In this study, SDA decomposition method is applied to analyze the fluctuant total amount of residential carbon emission embedded in consumption in China. We assume that the change of total amount of residential carbon emission embedded in consumption is codetermined by 5 influencing factors including changes of carbon emission intensity, economy structure, consumption structure, residential consumption level and population Scale:

$$Q = FBSP \quad (4)$$

In Formula 4, Q represents the total amount of carbon emission brought by residential consumption; F represents carbon emission intensity, in other word, it is the carbon emission resulted in unit production and is  $1 \times n$  vector (n is the number of sectors); B represents economy structure factors, and is  $n \times n$  Leontief's counter matrix; S represents residential consumption structure factors, and is  $n \times 1$  matrix of residential consumption structure; L represents residential consumption level factor, and is the total per capita consumption level; P represents the population change factor, and is the total population.

### ***Data***

"Input Output Tables of China" developed in 1992, 1997, 2002 and 2007 are applied as the source of Input-Output tables in this study, the data transformation of price comparison is obtained by using Liu & Jiang's (2010)'s Equivalent Price Index flat subtraction. The data of ultimate energy consumption amount of residential carbon emissions embedded in consumption is from "China Energy Statistical Yearbook" of the corresponding year, and the carbon emission coefficient of fossil energy comes from "Guideline on Provincial Greenhouse Gas List Preparation (on Trial)" (National Development and Reform Commission of the People's Republic of China, 2011). All the data of each type of energy's carbon emission rate and oxidation rate come from "Guideline on Provincial Greenhouse Gas List Preparation (on Trial)", and other statistical data come from "China Statistical Yearbook" of the corresponding year.

## **Data Analysis and Result Explanation**

### ***Calculation of the Chinese Residential Carbon Emissions amount of Consumption***

According to Formula 3, we can calculate and obtain the statistics of Chinese residential carbon emissions of consumption by applying the living energy consumption data in “China Energy Statistical Yearbook” and the carbon emission coefficient data in “Guideline on Provincial Greenhouse Gas List Preparation (on Trial)”.

According to our survey: 1) The amount of residential carbon emissions embedded in consumption show an increasing trend year by year, and the amount of carbon emissions embedded in consumption almost doubled during 15 years. However, the growth fluctuates with the growth rate of 21%, 15% and 36% in the 4 periods; 2) The intensity of carbon emissions drop dramatically, and the intensity in 2007 drops 56% compared to that in the year 1992. It can be seen that technological progress, structure promotion etc. have significant effect on the reduction of carbon emissions in consumption; 3) The amount of carbon emissions increases most in the sector of culture, education and health, business and other services together. The amount of carbon emissions embedded in consumption increases greatly in the sector of transport, storage and information service too. In contrast, the carbon emissions decrease in sector of farming, forestry, animal husbandry, fishery and sector of manufacture of foods which are concerning to residential basic needs.

### ***Influencing Factor Decomposition of Chinese Residential Carbon Emissions of Consumption***

The structure decomposition expressions of 2.11 to 2.15 are used to conduct the structure decomposition on the calculation result of residential carbon emissions embedded in consumption during the sample period. The result shows that the general effects of structure decomposition coincide with the incremental extent of the amount of carbon emissions embedded in consumption during the sample period.

**Table 1. The Structure Decomposition of Chinese Residential Carbon Emission embedded in Consumption in 2007 (1992: base period; Unit: 10000 tons)**

<b>Effect Decomposition</b>	<b>Effect of Emission Intensity</b>	<b>Effect of Economy Structure</b>	<b>Effect of Consumption Structure</b>	<b>Effect of Consumption Level</b>	<b>Effect of Population Scale</b>	<b>Total Effect</b>
<b>Consumer Goods Sector</b>						
Farming, Forestry, Animal Husbandry and Fishery	-113	-152	249	371	341	1266
Extractive industry	-9	8	16	41	27	107
Manufacture of Foods and processing of tobacco	-170	-356	280	548	512	1925
Manufacture of Textile, Wearing Apparel and Leather	-363	-359	616	1021	1093	4063
Processing of Timber, Manufacture of Wood, Articles for Culture and Sport Activities	-12	25	-54	118	37	151
Processing of Petroleum, Coking, and Fuel	-57	65	51	360	174	747
Manufacture of Chemical Products and Medicines	-230	363	65	1411	699	2923
Manufacture of Non-metallic Mineral Products	-83	132	-82	678	254	1139
Processing and Manufacture of Metal Products	-297	481	628	954	894	3358
Manufacture of Machinery and Electrical Equipment and other products	-858	2889	-69	3775	2595	9460
Production and Supply of Electric Power, Gas and Water	-115	182	97	606	350	1417
Transport, Storage and Information service	-442	1076	-26	1558	1334	4554
Wholesale and Retail Trades, Hotels and Catering Services	-173	-384	-905	1610	531	1967
Culture, Education and Health, Business and Other Services Together	-364	2858	-1744	2746	1112	3635
<b>Total</b>	<b>-3288</b>	<b>6831</b>	<b>-878</b>	<b>15797</b>	<b>9954</b>	<b>28416</b>

As can be seen from the decomposition results of the above table, three factors including effect of economy structure, effect of consumption level and effect of population scale have positive effect on carbon emission embedded in consumption, and effect of emission intensity and effect of consumption structure however show negative effect in the total amount. Among the three positive factors, the effect of consumption level contributes most with half of the total contribution, i.e. 157970 thousand tons. In the two negative factors, the effect of emission intensity contributes most with almost 80% of the total negative effect.

Here we mainly analyzed the effects of the five factors on carbon emissions embedded in consumption.

1. Effect of emission intensity. Effects of emission intensity of all the 14 sectors show significant negative effects. Among the sectors, sector of manufacture of machinery and electrical

equipment and other products has the greatest negative effect with the contribution of almost 9000 thousand tons of carbon.

2. Effect of economy structure. This table of effects indicates the industry correlation change of national economy. From the statistical view, in the effect of economy structure, sector of manufacture of machinery and electrical equipment and other products and sector of culture, education and health, business and other services together have comparatively greater positive effects.
3. Effect of consumption structure. The effect of consumption structure is the one with least contribution among the 5 effects. This indicates that the consumption structure has little effect on carbon emissions embedded in consumption from the total perspective.
4. Effect of consumption level. During the sample period, the effect of consumption level appears significant positive effect with the contribution far outweigh the other 4 effects. From this point of view, we believe that the growth of Chinese residential carbon emissions embedded in consumption mainly comes from the improvement of residential consumption level.
5. Effect of population scale. The effect of population scale shows considerable positive during the sample period, and like the effect of consumption level, it has positive effect in all the sectors. However, in term of contribution, effect of population scale is far less than effect of consumption level.

### **Conclusions and Public Policies**

From the article, we can conclude: First, emission intensity, economy structure, consumption level and population scale are the most important effects that bring the rapid growth of carbon emissions embedded in consumption. Second, the change of economy structure increases the carbon emissions embedded in consumption and emission intensity is also the most important factor in the decrease of carbon emissions embedded in consumption, while consumption levels and population scale are important factors causing the increase of carbon emissions embedded in consumption. However, the impact of consumption structure is very small, which is almost consistent with Yao, Liu, & Wang's research conclusions (2011). The only difference between the results lies in that this study found small negative effect while theirs found a small positive effect.

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\*Corresponding author: Baojing – Email: 466629563@qq.com

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# Analysis of Policy Characteristics of China's Dairy Industry under the Crisis of Food Safety

Ming Jin, Wen Chen, Chen Deng, Xin Huang and Ying Yang

*School of Business and Management, Zhejiang University of Finance and Economic,  
Hangzhou, China*

Email: 2810166371@qq.com

*[Abstract] Based on the theory of supply side reform and consumption side stimulation and the theory of institutional change, through the construction of China's dairy industry system policy changes in the analysis of the framework of China's dairy industry, the process of institutional change is divided into four stages: Reduce the inefficient supply stage, increase the effective supply stage, regulate the distribution channels and lead consumer upgrade stage, and combined with consumer behavior, industrial structure and corporate behavior, policy-orientation and other aspects of the characteristics, this paper analyzes the process, mode and policy characteristics of the dairy industry in China after the Sanlu milk powder incident, and puts forward corresponding policy suggestions.*

*[Keywords] Sanlu milk powder incident; dairy products; institutional change; policy characteristics*

## Introduction

Compared with developed countries in Europe and America, the dairy products market in China is relatively late. With unbalanced development of each stage in the chain and regulatory system, there are many imperfections in policies, regulations and industry standards, and these issues have been fully exposed in a series of major food safety incidents. Among them, the strongest impact to consumers and the industry and the most representative food safety incident was the melamine-tainted milk powder outbreak in September 2008. This incident resulted in consumers feeling sensitive to domestic food safety issues. For the dairy industry, and even the entire food product industry, this incident had an immeasurable negative impact. It led to a great adjustment to the dairy industry structure (Zhang, L., 2010; Ming, 2015). After the melamine-tainted milk powder incident, the government accelerated the formulation process of dairy industry standards. A series of intensive policies and regulations have been issued to pay more attention to food safety than food sanitation.

After the melamine-tainted milk powder incident, consumer behaviors, industrial structure and enterprise behavior underwent significant changes. In this context, domestic scholars have launched relevant research on the supervision system of the dairy industry in China. However, there are few literatures that have systematically analyzed the institutional changes and policy characteristics of the dairy industry from the beginning of the major food safety incidents to the end. This paper preliminary constructs an analytical framework of the Chinese dairy industry policy, then systematically combines the Chinese institutional change process, mode with policy characteristics after the "melamine" toxic milk powder and other major food safety incidents, and it puts forward corresponding policy recommendations.

## Related Literature Review

### *Theory of Supply Side Reform and Demand Side Stimulation*

Generally, academic circles believe that “supply side reform” mainly solves the problem of overcapacity and insufficient effective supply (Xu, 2016); it is usually divided into two aspects: reducing invalid supply and increasing effective supply (Xu, 2016; Liu, 2016; Li, W., 2016). The demand side stimulus is directly related to supply side reform, and includes investment, consumption and export that drives economic growth. After the financial crisis in 2008, the dynamic role of investment and export to promote economic growth has gradually declined, and consumption has gradually become the main driving force for economic growth. Considering the consumption upgrade and the characteristics of the dairy industry, we will mainly consider the stimulation of consumer side in the study of demand side stimulation in the dairy industry.

Currently, the mainstream view emphasizes that economic growth can be driven by a two-way push between supply side reform and demand side stimulus (Liu, 2016; Li, Y., 2015; Ren, 2016). The dairy summit in 2016 also highlighted “The two-way push of supply side reform and demand side stimulation as policy orientation, it can promote the development of dairy industry” (Zhang, F., 2016). Therefore, this paper is based on the policy basis of the two-way push of supply side reform and demand side stimulation, with the supply side reforms mainly acting on middle and upper reaches of the dairy industry chain, and the demand side stimulation mainly acting on the downstream of dairy industry chain.

### *Theory of Institutional Change*

The theory of institutional change comes from the New Institutional Economics; they used the concept of transaction cost to apply to the new institutional economics method of cost benefit analysis to institutional analysis. It also explains the decisive role of the system in economic development (Ming, 2008). North regarded institutional change as a process from institutional equilibrium to disequilibrium and then to equilibrium, and he was the first person to give an analytical framework for institutional supply (Ming, 2008). He expected that the economic subject will promote the institutional supply from the perspective of altruism and self-interest compatibility. The classical theory of institutional supply belongs to induced institutional supply theory (Yao, 2005). Yifu Lin believes that under the state’s pursuit of maximum rent and output maximization, institutional change is the spontaneous change in the pursuit of potential profit opportunities when the system is unbalanced and the mandatory changes in the implementation of the policies and decrees (Ming, 2008). He believes that induced institutional change include the spontaneous advocacy, organization and implementation of changes in the current institutional arrangements when consumers respond to profit opportunities, that in order to emphasize the institutional supply of spontaneity. He put forward to the concept of mandatory institutional change for the first time on the basis of predecessors, that due to exist external effects and “free rides” and other problems. The supply of new institutional arrangements provided by induced innovation will be less than the supply of social optimal conditions, therefore, the state intervention must be made to make up for the lack of sustained institutional supply.

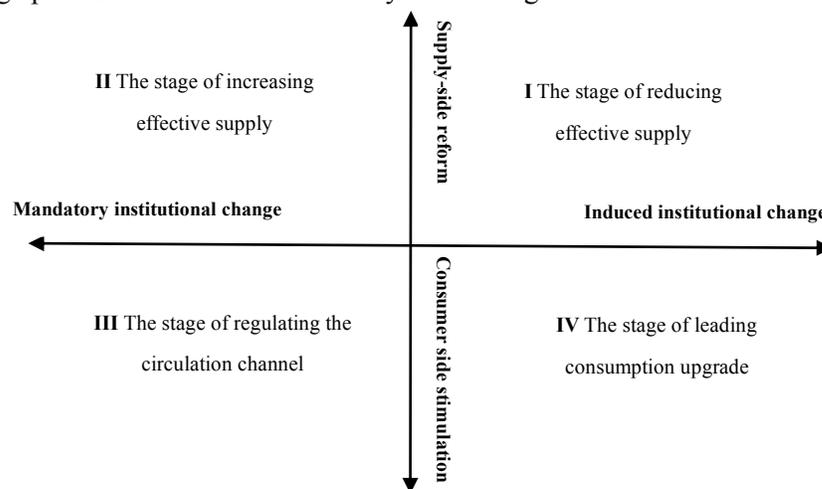
## Mode of Institutional Change and the Analysis of Policy Characteristics of the Dairy Industry after the Sanlu Milk Powder Incident

### *Institutional Change Analysis Framework of China's Dairy Industry after Sanlu Milk Powder Incident*

In this paper, an analysis framework of institutional change and policy characteristics of China's dairy industry after the Sanlu milk powder incident was initially constructed, in order to objectively evaluate the dairy industry system policy and put forward targeted suggestions. The analysis framework was based on the theory of supply side reform and demand side stimulation, and the theory of institutional change. First of all, this paper sorted out the relevant policies that promulgated after the melamine milk powder scandal in 2008, according to the focus of each type of policy; that is, whether the main direction of the policy was the supply side or the consumer side. A vertical axis was divided into two: supply side reform and consumption side stimulation. Secondly, the abscissa axis was the mode of institutional change, according to the policy, which was mainly dominated by subject of change; that is to say, it was mainly caused by market demand induction or government guidance and compulsory enforcement. The system change was divided into induced institutional change and compulsory institutional change. Thus, since the Sanlu milk powder incident in 2008, the institutional evolution process of China's dairy industry can be divided into the following four stages (as shown in Figure 1):

- I. The stage of reducing ineffective supply,
- II. The stage of increasing effective supply,
- III. The stage of regulating the circulation channel,
- IV. The stage of leading consumption upgrade.

What needs to be explained: the division of stages of China's dairy industry institutional change process is not absolute, and the boundaries of dairy industry system changes are not entirely different. There are two reasons for this. First, because the system changes in time with continuity, the division of the stage is not absolute in time; it can't avoid the occurrence of overlapping phenomenon. Second, due to the dairy industry's development of non-equilibrium, the definition of the role and status of different institutional change subjects in different stages is opposite. But this doesn't affect the overall grasp of dairy industry change process and the dominant analysis of change mode.

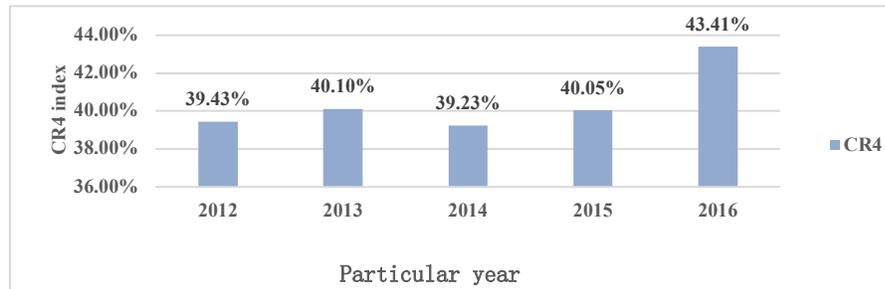


**Figure 1. Institutional Change Analysis Framework of China's Dairy Industry after Sanlu Milk Powder Incident**

### ***Analysis of Policy Characteristics at Each Stage***

The main line of policy objectives in each stage was to carry out the supply side reform and demand side stimulation through the continuous optimization of the food safety supervision system and industrial policy. On the premise of ensuring the quality and safety of dairy products, there was constant enhancement of the competitiveness of domestic brands to meet the growing demand for consumer upgrades. The following is the analysis and evaluation of the characteristics of each stage of the institutional change and policy characteristics.

1. The stage of reducing ineffective supply (2008-2013). Frequent crisis incidents of dairy products made consumers lack confidence in domestic dairy products, causing a serious phenomenon of consumption substitution. Under the grim situation of food safety, market demand forced the government to formulate policies and regulations to strengthen food safety supervision, regulate the development of the industry, reduce ineffective supply, and form inductive institutional change. At this stage, to reduce ineffective supply by supply side reform, the government should strengthen the food safety supervision system, formulate and improve the industry policies and regulations to regulate the industry order, especially the development order of the industry upstream, and eliminate backward production capacity, so as to protect the quality and safety of dairy products. After the first stage, effectively improving the industry development environment, market supply order and consumer confidence have been restored, remarkable achievements have been achieved in the scale, mechanization and standardization of milk sources, and by 2015, 100% of the milking is mechanized (Wang, Z., 2004). The policy goals of reducing the ineffective supply are basically realized.
2. The stage of increasing effective supply (2014 - up to now). On the basis of industry consolidation in the first stage, the initial conditions of the second stage have changed. The competition between domestic dairy products and international dairy products is possible. At the same time, industrial concentration is not high, which seriously restricts the sustainable development of the domestic dairy industry. It is difficult to solve the problem of industrial structure upgrade by the spontaneous change of the market at this time. Therefore, the government plays a leading role in this stage, and takes a “top-down” compulsory institutional change, and a series of policies and regulations have been promulgated, focusing on upgrading the domestic dairy industry structure, balancing the competition between domestic and foreign dairy products, and promoting the development of China’s dairy industry. The policies and regulations at this stage have prompted the dairy enterprises to accelerate the process of merger and reorganization. The industrial structure is optimized and the market competitiveness is improved, as shown in Figure 2. In 2016, the CR4 index rose significantly over the previous year. However, the implementation effect of the corresponding policy needs further observation.



**Figure 2. 2012-2016 China Dairy Industry Concentration Index CR4**

(Data sources: The data of dairy industry yearbook in 2012-2016 years were collected and calculated.)

3. The stage of regulating the circulation channel (2014-2016). With the improvement of the domestic food supervision system, consumers pay more attention to the selection of brand. This brings opportunities for the development of China's dairy industry which has just recovered from the crisis. At the same time, the differentiation and specialization of consumers' purchase behavior and the convenience of purchasing channels have promoted the development of diversified channels, such as mother and baby stores and e-commerce platforms. But the chaos caused by imported dairy products and diversified distribution channels have also brought new challenges to the market supervision and industry policy. Therefore, this stage mainly strengthens mandatory institutional change of the government in the import dairy market circulation order and quality supervision, regulating the circulation channel behavior. After the dairy industry supply side made great achievements, facing new demand trends and a new regulatory environment, policy from the supply side reform to consumption side stimulation began to change. The government adopts mandatory means to standardize the e-commerce platform. The effect of the follow-up policy measures remains to be observed.
4. The stage of leading consumption upgrade (2016-up to now). On the basis of the first three stages of development, the impact of the dairy crisis has gradually weakened. And the trend of consumption upgrade has begun to take shape (China Industrial Information Network, 2016). At this stage, under the consumption upgrade, new consumption demand will lead the government and enterprises to adapt and guide the market demand and form a "bottom up" induced institutional change at a higher level. In order to meet the upgrades of consumer demand, the domestic dairy market presents a new trend of product varieties, product quality upgrades and the rapid development of diversified shopping channels, such as the e-commerce platform, but it also brings new challenges to the safety supervision of dairy products, such as excessive formulation of infant formula and other issues. How to improve the quality of dairy products, improve the competitiveness of domestic brands and strengthen the emerging new channels of supervision will be the focus and difficulty of government regulation.

### **Conclusion and Suggestions**

Based on the theory of supply side reform and consumption side stimulation and the theory of institutional change, through the construction of China's dairy industry system policy changes in the analysis of the framework of China's dairy industry, the process of institutional change is divided into four stages: Reduce the inefficient supply stage, increase the effective supply stage, regulate the distribution channels, and lead

consumer upgrade stage. Combined with consumer behavior, industrial structure and corporate behavior, policy-orientation and other aspects of the characteristics, this paper analyzed the process, mode and policy characteristics of the dairy industry in China after the Sanlu milk powder incident. Through the analysis and evaluation of the policy, combined with the development and supervision experience of dairy industry in developed countries, this paper puts forward the main suggestions to improve the dairy industry system policy:

### ***Comprehensively Improve the Quality of Dairy Products, and Strengthen Total Quality Management***

The government can strengthen total quality management from the following aspects: First, formulating comprehensive supporting policies, while continuing to promote the docking of domestic food safety standards with international standards, we should take full account of the national conditions, consumer psychology, socio-economic development and consumption upgrade trends. At present, there are few policies to regulate the downstream chain of dairy products, especially the circulation channels and sales links, and the relevant supporting policies lack unity, professionalism and authority. At the same time, it is necessary to consider whether new categories can be compatible. Second, whole industry chain regulation is key. Government regulation requires not only quality supervision in the upstream and middle reaches of the industrial chain, but also the supervision over the downstream storage, transportation and distribution channels, as well as the quality and safety of sales links, including traceability management of food safety information from field to table. Under the new situation, the government should innovate the management mode and method appropriately, such as speeding up the construction of enterprise main responsibility system, promoting a dairy industry risk guarantee fund and other joint actions of dairy industry community initiatives. At the same time, it is necessary to improve consumer complaint channels, implement the responsibility of government, enterprise and society, giving full play to the role of a risk prevention mechanism, to shift the focus of supervision work to improve the overall efficiency of supervision work.

### ***Adapt and Lead the Consumption Upgrade Trend***

Consumption upgrade brings the trend of demand difference and demand convenience. It promotes the upgrading of consumption structure and the growth of new consumption demand, stimulating enterprises to increase product innovation, but at the same time, it also brings new challenges to government safety supervision (The State Council, 2017). In the era of big data, the government should encourage enterprises to strengthen the specialization analysis of consumer demand to find potential demand, so as to make better product innovation and achieve the goal of guiding the new consumption. With the development of diversified channels, how to promote diversified shopping channels such as the e-commerce shopping platform, mother and baby stores and so on, to effective integration has also become a new problem for the government. The government should give full play to the advantages of each sales channel, make the division of sales channels clear, encourage enterprises to provide professional services in the entity store, and effectively integrate online sales.

Although this paper's analysis constructed a "melamine event" in China's dairy industry policy framework, the framework is based on that proposed under the specific background, and its framework and policy analysis may be relatively rough, and may not necessarily have universal significance. However, the general idea should play a reference role in the analysis of the changes in the dairy industry and the characteristics of the policy.

## Acknowledgements

The authors would like to express their gratitude to all those who helped during the writing of this thesis. First of all, we would like to extend our sincere gratitude to our supervisor, Ming Jin, for his instructive advice and useful suggestions on this thesis. Secondly, thanks to the support of the Research Program for Humanities and Social Science of the Ministry of Education.

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# **A Study on the Intentional Behavior of Customers in Service Mistakes – Based on Attribution Theory**

**Fenghua Xie and Shuangya Dai**

*School of Business and Management, Zhejiang University of Finance and Economic,  
Hangzhou, China*

Email: 1123078245@qq.com

*[Abstract] With the in-depth development of the market economy, the buyer's market structure is more stable, and in business and customer exchanges, the customers have more right to speak. The customer's self-consciousness is growing, they are eager to express more of their own demands. However, not all claims are reasonable, and with the increase in the interaction between customers and the service industry, the frequency of improper behavior is on the rise. In the field of service management and marketing this has been of widespread concern. When there is a case of service failure, this will show the violation of social norms and produce conflict of words and other misconduct, and then in the context of proven service failure, the intention of the formation of improper behavior of the customer has a very important role.*

*[Keywords] service failure; attribution theory; misconduct; service failure type*

## **Introduction**

Service failure is an intangible product; providers cannot provide quality standards, nor can they describe the quality level. It has a series of characteristics like diversity, invisibility, simultaneous production, and consumption, etc. Enterprises try to provide the best service to customers, but they cannot satisfy all customers with the service provided. Even the best service provider also can make mistakes in the process of service delivery, which may cause customer complaints and dissatisfaction in the service level. With the increase of customer interaction, the frequency of customer misconduct in service industry is on the rise, and it has received wide attention in the field of service management and marketing.

For China's service enterprises and consumers, this will be a very special period. On the one hand, the development of the service industry is to enhance the quality of life of consumers and increase the service enterprise's profit. On the other hand, endless service failures encounters consumer distress. At the same time, to solve the problem of service failure and service recovery, service enterprises realize an obvious "lack of experience". The research on customer's improper behavior and intention based on the premise of enterprise's clear fault has already lost the corresponding interpretation effect, so it cannot play a guiding role in theoretical research. At this point, how to judge the responsibility attribution of service failure has become the focus of the research on the formation mechanism of customer misconduct intention. Based on this, this paper introduces attribution theory into the study of customer misconduct intention. From the perspective of attribution, the authors analyze the attribution of customer misconduct intention to customer misconduct in the context of service failure.

## **Research Hypothesis**

### ***Customer Emotional Response and Improper Intention***

Customer misconduct events have occurred in various parts of the world but their definition in academic circles is not a unified view. This situation will affect domestic and foreign scholars to reveal this

phenomenon (Harris, 2003). Fullerton (2004) gave a new definition of customer misconduct in that it violated social norms to accept and follow service consumption situations, and behavior disorder caused by definition of the service for the customer behavior. In most cases, it is difficult to define whether customer misconduct is harmful or not, and the judgment criteria adopted by service enterprises and customers who implement misconduct are different. From the point of view of violating social norms, it is emphasized that the universality of customer misbehavior is the overall response of customer behavior rather than individual or small group (Liu, & Ma, 2010).

Regarding the six emotions of a purchase (joy, excitement, anger, disgust, contempt, surprise) and the three post purchase behaviors (complain, reputation, satisfaction assessment), Westbrook's (1987) study found a positive correlation relationship between positive emotion and satisfaction evaluation, and reputation activities are negatively related to negative emotions and complaints; positive correlation with satisfaction evaluation, and reputation activity is negatively correlated. In the process of accepting the service, when the service fails, negative emotional reactions of customers will lead to improper behavior intention.

Jiangang Du, and Xiucheng Fan (2009), using the method of experiment, proved that the impact of customer service failure and negative emotions can have a relationship between the enterprise and customer service and can adjust the effect. Based on this, the following hypotheses are proposed:

In the context of H1: service failure and customer emotional response negatively influence customer misbehavior intention.

### ***Customer Emotional Response and Failure Attribution***

In the context of service failure, do customers facing service failure make judgments on the reasons for service failure? Which criteria help them make mistakes in the explanation of the reason? The answer to these questions is the main content of the service attribution. Weiner (1985) put forward three dimensions of attribution of service failure: responsibility, control and stability, and felt that only from these three dimensions can the interpretation of service failure be objective and comprehensive. Generally speaking, the errors caused by internal factors are generally considered to be easier to control, and factors outside the enterprise are identified as difficult to control. Stability refers to belonging to the stability dimension by chance or fixed event. Zeithaml, Berry, & Parasuraman (1988) stated that attribution is not the customer's exploration of the real cause of the event, but instead the subjective inference of the "cause of the event". In the actual service, there are many reasons for complaints, and customer attribution for service failure is "low involvement" and fuzzy; that is to say, customers will not have a clear attribution. Based on this, the following hypotheses are proposed:

In the context of H2a: Under the circumstance of service failure, customer emotional response positively influences the attribution of stability failure;

In the context of H2b: Under the circumstance of service failure, customer emotional response positively influences controllable failure attribution.

### ***Causal Attribution and Customer Misbehavior Intention***

The cognitive experience of customers on difficulties can be explained by different attributions. In the study of product failure, attribution has a direct impact on consumer behavior after purchase. Mattila (2004) studied from product failure to service failure and verified that the attribution of failure will affect the customer's negative word-of-mouth behavior. Yanjun Peng (2011) empirically found that in the context of

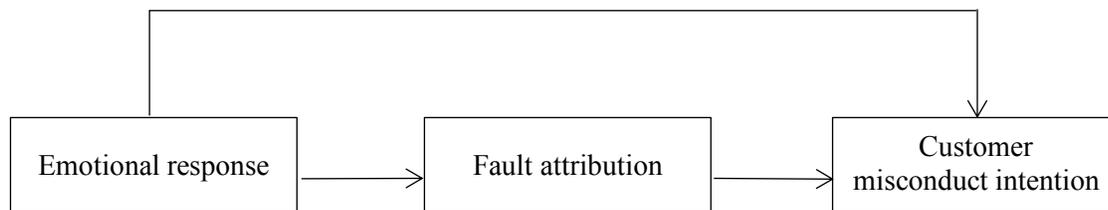
service failure, the more that mistakes are controllable and stable, the more likely they are to change their businesses. Harris & Daunt (2013) found that most customers have a strong retaliation tendency when they think that the enterprise can implement controls to avoid a mistake without controlling behavior, and the mistake is unacceptable in actual consumption, performance for the customers in the service places, fraud, shoplifting, noise and other bad behaviors such as staff abuse (i.e. customer misconduct). Therefore, in the service failure fuzzy situation, maneuverability and stability attribution may lead to customer behavior being more positive or negative. Compared to uncontrollable and unstable failures, maneuverability and stability failure produce more negative results, and customers' stronger misconduct intention is higher. Based on this, the following hypotheses are proposed:

In the context of H3a: Under the circumstance of service failure, the attribution of controllable positively influences customer's intention to act improperly.

In the context of H3b: Under the circumstance of service failure, the attribution of stability positively influences customer's intention to act improperly.

### ***Constructing Model***

Based on literature review, conceptual definition and theoretical assumptions, this paper intends to study the impact of customer emotional response, attribution of failure and customer misbehavior intention, and constructs a corresponding theoretical model, below in Figure 1.



**Figure 1. Conceptual Model of Research**

### **Research Design and Empirical Results**

The study sample data were acquired through simulation experiment and questionnaire consisting of two parts. The subjects filled out the questionnaires according to their own situations. In the first part, the situation of service failure was given. After reading, the subjects filled in the questionnaire according to the real situation, and the second part was the basic data of the subjects. The questionnaire was carried out in Hangzhou in 2017 and the questionnaire was distributed and withdrawn on the spot by random sampling and voluntary answering. The design of scale mature reference measured each dimension in this study.

We distributed 250 paper questionnaires and recovered 234 copies, of which 223 were valid questionnaires. The make up of the respondents was as follows: men accounted for 36% , women accounted for 64%; those 15-24 years old accounted for 72%, 25-34 years old accounted for 26%, and 35-44 years old accounted for 2%; those with graduate degrees and above accounted for 76%, 18% had degrees, 4% were in high school, junior high school and below accounted for 2%; the level of consumption of 800 yuan was 6%, 801-1000 yuan accounted for 16%, 1001-1200 yuan accounted for 26%, 1201-1500 yuan accounted for 18%, and more than 1500 yuan accounted for 34%.

**Table 1. Model Analysis Results**

<b>Hypothetical path</b>	<b>Standardized path coefficient</b>	<b>P value</b>
Emotional response – Customer misconduct intention	0.238	0.022
Emotional response – Controllable	0.33	0.019
Emotional response – Stability	0.297	0.024
Controllable – Customer misconduct intention	0.285	0.035
Stability – Customer misconduct intention	0.212	0.032

This study made use of SPSS20.0 to analyze the sample data, with emotional response as independent main effects on customer behavior intention was improper. From Table 1, we can see that emotional response as independent variables, regression analysis of customer affective response ( $P=0.022<0.05$ ), the main effect, which based on the assumption that the establishment of H1. As a mediator variable, the regression analysis of the two dimensions showed that ( $P=0.019$ ,  $P=0.024<0.05$ ) there was a significant relationship between them, so H2a and H2b were assumed to be valid. The regression analysis of error attribution has a significant effect on customer misbehavior intention, and the P value is less than 0.05, so it is assumed that H3a and H3b are established.

### **Conclusion**

This study found that customer emotions have a significant positive effect on failure attribution and improper customer behavior intention; maneuverability and stability due to customer service that improper behavior intention has a significant positive influence. It shows that the customer's emotional response and attribution of fault will lead to the formation of improper intention before the occurrence of customer misconduct, and the mechanism of customer's improper intention is verified. The research shows that the customer's control and stability attribution to service failure is an important factor leading to improper intention. When the customer service failure is due to the fact that the enterprises did not take effective measures of control, or certain types of service failures occur frequently and they are not an accidental phenomenon, the customer will have relatively strong intention of misconduct. Especially regarding the maneuverability attribution, the customer's judgment of fault maneuverability in the fuzzy context of service failure is more intense than the stability judgment in the judgment of customer's improper intention.

### **Management Implications**

#### ***Continue to Strengthen Process Control and Improve of Service Quality***

The occurrence of service failure and the spiritual or material loss caused by it is the fundamental cause of customer's improper behavior intention. Therefore, the service enterprises should continuously strengthen the awareness of their process control of their service to reduce the probability of service failure, and to reduce the loss and adverse effects of service failure to them and their customers. At the same time, when service failure occurs, the enterprise should respond in a timely manner with the most sincere attitude, make a reasonable mistake treatment plan, take positive and effective measures, and resolutely implement a serious investigation of the failure and take corrective action, so as to continuously improve the quality of service to avoid similar mistakes occurring in succession.

#### ***Improve the Service Quality of Communication to Close the Distance with Customers***

In reality, service enterprises should make full use of opportunities, through various channels, to interact and communicate with customers and peers deeply, enhance the emotional links between the customer and

the enterprise, and make customers aware that the enterprise is not only the transaction object. This will enable the manufacturing cooperation partner and win-win community of interests, thus eliminating customer-to-enterprise resentment, increase customer identification of the enterprise and bring the social distance closer between customers and the enterprise. Especially when a service failure occurs, service enterprises should be active immediately, should be timely in listening and responding to customer complaints, eliminating customer dissatisfaction, and fully expressing its sincerity to customers before the customers have a chance to gain a bad attitude. After a service failure that ends with a proper solution, establish a good interaction mechanism among customers.

### **Acknowledgement**

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# Study on Distribution of Interests in Cooperative Delivery of Rural E-Commerce Logistics Based on the Fourth Party Logistics

Guanghua Zhao and Xiang Xiao

*School of Business and Management, Zhejiang University of Finance and Economic,  
Hangzhou, China*

Email: xiaoxiang525@yeah.net

*[Abstract] In recent years, major e-commerce giants have grabbed the opportunity of the rural electricity supplier market. Making the rural electric business to the rapid development in the background of Internet plus economic development, but the rural electrician terminal distribution efficiency is the main factor restricting its development. This paper tries to set up a cooperative distribution mechanism based on the strong resource integration ability of fourth party logistics from the perspective of promoting the development of a green supply chain and establish the model of alliance distribution based on the Shapley value method. Mainly from contribution levels for the second correction and using the example of numerical simulation. The results show that the ultimate distribution of benefits of the union avoids egalitarianism, is more reasonable and fair, are conducive to the establishment of a cooperative distribution alliance and provide the theoretical basis for the distribution of a rural electrician alliance.*

*[Keywords] fourth party logistics; collaborative distribution; Shapley value method; profit distribution*

## Introduction

In recent years, under the background of the Internet, the economy has developed rapidly, online shopping is precisely because it is fast, convenient, has economic advantages, and has gradually gained the favor of consumers. With the development of urban electricity market close to saturation, the major electricity supplier giants quickly went to the countryside and tried to seize the rural markets, which are considered as the blue ocean area for the development of e-commerce. For the fourth consecutive year, the central document emphasizes the development of rural electricity suppliers. The state has laid out the development of rural electricity suppliers from a strategic level and has successively issued a series of documents for implementation. According to data released by the Ministry of Commerce, as of the end of 2016, China's rural retail network reached 885.54 billion yuan (quarter-on-quarter growth rate higher than the city), the number of rural express delivery outlets was nearly 95000, and the coverage of township outlets was over 70%. Taobao village reached 1311, forming a rural electricity supplier industry agglomeration, promoting the rural economy of electricity and information technology (Yantai Municipal Bureau of Commerce, 2017).

A good distribution service is the basis for the development of a rural electricity supplier, but the distribution system is not perfect. It brings great difficulty for the rural electricity supplier distribution service. At present, the third-party distribution service has high cost due to a lack of concentration and distribution distance. From the perspective of green supply chain, relying on the strong resource integration and planning ability of the fourth party logistics enterprises, it is proposed of the establishment of a rural e-commerce logistics collaborative distribution alliance to reduce the distribution cost and increase the efficiency of distribution, which will be a new way to solve the problem. Domestic and foreign scholars have had a lot of academic discussion on the present collaborative of distribution alliance, and the alliance

of joint distribution cost allocation problem also has some substantive suggestions, but in the distribution of profit distribution, how to establish a more fair and reasonable benefit distribution model has been a hot academic problem in the relevant literature.

## **Related Literature Review**

### ***Development of Fourth Party Logistics***

The fourth party logistics is an advanced supply chain management mode of operation, proposed and registered the earliest in 1998 by the famous American management consulting firm Accenture. Fourth party logistics (4PL) is a supply chain integrator, the integration of resources, capabilities and technology of its own and other organizations to build a solution for the implementation of an integrated supply chain (Zhao, 2006). Fourth party logistics is a supply chain integrator and is the leading force of supply and demand sides and three-party logistics. It is not the benefit of the logistics, but it provides a complete supply chain solution through information technology, integration ability and other resources, in order to obtain a certain profit.

Domestic scholar Zhitai Wang (2004) stated that 4PL provides intellectual support for the integration of all resources and business; its remarkable characteristic is not to provide specific logistics services. While the third party logistics (3PL) covers both warehousing enterprises, transport enterprises or other types, to provide customers with all operational services, 4PL is the management of 3PL and they should be integrated so they cooperative and complementary with customer service. Chunping Tan and Ye Wang (2009) proposed that 4PL attaches great importance to the construction of a unified and standardized logistics information standard platform, through the integration of different logistics resources and provides the most perfect service to customer requirements. Yuliang Cao, and Qingjun Wang (2010) thought that 4PL reduces logistics costs and transaction costs, provides enterprise-centered humanistic service, and helps to improve the core competitiveness of enterprises. Combined with the above scholars' research, fourth party logistics has great prospects in logistics distribution and supply chain optimization, and the existence of fourth party logistics provides support for the development of a collaborative distribution alliance.

### ***Overview of Collaborative Distribution of E-Commerce Logistics***

Joint distribution comes from Japan, also known as cooperative distribution, combined transportation or combined transportation. Yuasa Cardiff (1986) defined it as: under the premise of ensuring the reasonable distribution of individual enterprises, in order to improve vehicle utilization, multiple distribution less amount of the company's integration, centralized distribution, so that the entire alliance achieve optimal profits. According to its definition, it can be seen that joint distribution is essentially an effective distribution mode to improve logistics efficiency and obtain economies of scale. At present, domestic and foreign scholars have mainly focused on the significance of joint distribution, operation mode, profit distribution and other aspects of joint distribution.

Katsuhiko Hayashi and Yuji Yano (2003) sorted out a series of measures taken by logistics distribution enterprises in a certain region to improve the environment. After comparison, it was concluded that joint distribution is one of the key measures to reduce environmental pollution for logistics enterprises. Wenying Hou, & Xiaodong Yu (2010) defined joint distribution from the point of view of improving the efficiency of logistics distribution and realizing the rationalization of logistics distribution, that is the logistics distribution activities are jointly organized by multiple enterprises. Lin Zhang (2011) feels that the essence of joint distribution is to integrate the logistics elements of each distribution enterprise horizontally, so as

to realize the sharing of logistics facilities and the common distribution of goods. Xiaowei Wen (2012) thinks that joint distribution is the cooperation of many logistics companies. Under the unified dispatching of logistics and distribution, joint distribution is carried out to the users in a certain area, so as to realize the sharing of the transportation resources and the economies of scale.

### ***Research Status of Interest Distribution***

The enterprises which set up the dynamic alliance delivery are independent entities, and have their own interest demands. Fair and reasonable interest distribution mode affects the operation of the cooperative alliance to a large extent. With regard to the study of the distribution of joint distribution, the existing literature tends to use game theory and other related theories. Juping Shao and Jianhua Xu (2015) proposed the Swap Body technology which has the characteristics of intensive, modular, and standardized of city distribution mode based on PSI. Mengke Yang, & Xiaoguang Zhou (2015) proposed the collaborative delivery model of e-commerce and express logistics of UJI and the limited area joint delivery service mode of urban express terminal. Miaoqing Sun (2013) put forward the construction of the joint distribution of urban logistics by the professional H party logistics enterprises and the government. Zhenhua Jiang (2013) believes that the establishment of a city logistics distribution information platform can make a number of customers with third party logistics companies complete the common delivery service to reduce logistics costs and improve logistics efficiency, to achieve intensive scale and standard height. Therefore, in the traditional Shapley value method, the cooperative risk factor is introduced to solve the high transaction cost caused by the cooperation risk in the cooperation process, which provides a new perspective for the benefit allocation of the joint distribution alliance members.

## **Shapley Value Theorem and Example Verification**

### ***Shapley Value Theorem***

Lloyd Shapley introduced the Shapley Value Method in 1953. It is mainly used to solve a cooperative game problem in which many people use mathematical methods to gain more reasonable allocation. When n enterprises engage in an economic activity, for each form of cooperation among them, some enterprise combination will benefit. When business interests between the activities of non-confrontation, cooperation in the enterprise increase, caused by such benefits, the n enterprise cooperation will bring the greatest benefit, Shapley value method is a scheme to assign the maximum benefit.

The definition as follows:

Let set  $M = \{1, 2, 3, 4, \dots, n\}$ . If we select any one of subsets  $J$  (means any combination of  $M$ ),  $S \subset M$ , inevitably there will be a real-valued function,  $V(M)$ , meet the conditions as  $V = 0$ ,  $V(S_1 \cap S_2) \geq V(S_1) + V(S_2)$ , and  $S_1 \cap S_2 = \phi$ . Therefore,  $[M, V]$  is called n enterprises cooperative games.  $V$  is called characteristic function of the cooperative game, and  $V(S)$  is called the profit value of the cooperative union.

$X_i$  means the income earned of the No.  $i$  member among  $N$  from maximum benefit of the cooperation. And  $X = (X_1, X_2, \dots, X_n)$  is called the allocation strategy of cooperative game strategy.

Define as follows: Set  $M = \{1, 2, 3, 4, \dots, n\}$ ;

Overall rationality:  $\sum_{i=1}^n V(M)$ ;

Individual rationality:  $X_i \geq V(i)$ ,  $i=1, 2, 3, \dots, n$ , where  $V(i)$  is a member of  $I$  that does not benefit from other alliances:

In the cooperative game given by the Shapley value method, the revenue P of the enterprise I is called the Shapley value. The Shapley value creatively proves that P is unique, and the Shapley value method satisfies the validity, symmetry and additivity. The results are as follows:

$$P_i^c(V) = \sum_{S \subset S_i} W(|S|) [V(S) - V(S - \{i\})], \quad i=1, 2, 3, \dots, n;$$

$$W(|S|) = \frac{(n-|S|)! (|S|-1)!}{n!}$$

Where |S| is the number of elements in the subset S, W(|S|) is a weighting factor. It can be seen from the above that the distribution strategy of Shapley value method can better meet the benefit of the terminal joint distribution alliance, and the distribution meets the principle of “collective rationality and individual rationality”.

### Example Verification

As the rural electricity supplier has gradually developed consumer trends, this article assumes that there are three third-party express enterprises, respectively, given the number of enterprises. Enterprise A, Enterprise B, and Enterprise C join to a rural area of China H express delivery. From the perspective of fourth party logistics, the dynamic alliance integrates the advantages of each express enterprise, and three express enterprises are set up to coordinate the distribution of H in rural areas. Such as the distribution of service innovation of Enterprise A with strong storage capacity, distribution of technological capabilities, Enterprises B in the Internet data analysis, and the Enterprise C in transportation service ability and experience. We set three companies to build the dynamic distribution alliance, their investment is, respectively, 50 thousand, 30 thousand, 10 thousand. Enterprise A’s investment is mainly from the management personnel and intellectual property, Enterprise B’s investment is mainly from the distribution of vehicles, and Enterprise C’s investment is mainly from rental and office equipment. If there is no cooperation with the three companies, respectively in their separate operations, the annual profit would be 30 thousand, 20 thousand, and 10 thousand. With an A and B alliance, the annual profits will be 130 thousand; with an A and C alliance, the annual profits will be 70 thousand; with a B and C alliance, the annual profits will be 50 thousand, and with an ABC alliance, the annual profit will be 180 thousand.

**Table 1: Profit Calculation Form of A in Joint Distribution Enterprise Unit: Million Yuan**

S	{1}	{1, 2}	{1, 3}	{1, 2, 3}
V(S)	3	13	7	18
V(S- {1})	0	2	1	5
V(S)-V(S- {1})	3	11	6	13
S	1	2	2	3
W( S )	1/3	1/6	1/6	1/3
W( S )[v(s)-v(S-i)]	1	1.8	1	4.3

Data sources: The table comes from the authors’ calculations.

The profit distribution value of Enterprise A can be obtained by adding the last row value of Table 1, The calculations are as follows:

$$P_c^1(V) = 1 + 1.8 + 1 + 4.3 = 8.1 \text{ (million yuan)}$$

In order to save the length of the article, this article does not list the profit distribution table of Enterprise B and Enterprise C. Equally accessible:

$$P_c^2(V) = 0.7 + 1.7 + 0.7 + 3.7 = 6.8 \text{ (million yuan)}$$

$$P_c^3(V) = 0.3 + 0.7 + 0.5 + 1.7 = 3.2 \text{ (million yuan)}$$

Through case analysis, using the Shapley value method of alliance profit distribution is more reasonable, considering the contribution of the abandonment of traditional egalitarianism.

### Conclusion

In this paper, with rural e-commerce logistics distribution as the research object, the authors conducted an analysis of the rapid development of e-commerce, and rural electricity supplier logistics distribution problems in the last mile. Combined with the previous scholars' research basis, from the perspective of the fourth party logistics, this paper proposed to establish a dynamic alliance of rural electricity supplier logistics to implement collaborative distribution. Collaborative distribution is a complex problem. In order to effectively improve the stability of cooperation, it is necessary to make a thorough study of the benefit distribution structure of cooperation, so that members can support each other so as to realize the sharing and complementarity of resources and core competence. The Shapley value method was used to distribute the benefits of enterprises, and the profit of joint distribution was greater. Based on the degree of contribution, the correction scheme was proposed. From the example, it can be seen that the revised results were more realistic and practical. As a resource intensive logistics distribution mode, a collaborative distribution response to the concept of green logistics can effectively improve the level of logistics services, reduce logistics distribution costs, reduce waste of resources, and ultimately create a good alliance efficiency, and achieve win-win situation between alliance members.

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# **Application of Housing Industrialization in Green Building from the Perspective of SST**

**Weihua Huang and Yinzi Zhou**

*School of Business and Management, Zhejiang University of Finance and Economic,  
Hangzhou, China*

Email: 272649674@qq.com

***[Abstract]** Based on the theory of Social Shaping of Technology (SST), in the view of China's housing industry development in the field of green building and the function of society to the development of technology, this paper researches into social organization forms such as the consumer, enterprise, and governments shaping and acting on the technology of the housing industry. The authors explore the interaction between housing industrialization technology and green building and summarize the restricted factors of society on the development of the housing industry in the application of green building in the government, providing reference for countermeasure research of real estate enterprises.*

***[Keywords]** SST; housing industrialization; green building; the real estate*

## **Introduction**

In recent years, ecological civilization construction has been a very important function in the cause of Socialism in China. Green building is an important part of ecological civilization, and green architectural technique plays a special role in green building. The real estate product realization process is the production process of the construction of real estate, and this process consumes large quantities of materials and machining processes, leading to environment problems. The pressure of the housing industry environment comes from domestic production process and related industries of the housing industry. Green building refers to maximizing the conservation of resources, including energy, land, water and materials in the whole building lifecycle. That is to say, it is to protect the environment and reduce pollution, to provide people with a healthy, applicable and efficient use of space. The use of theory of social shaping of technology, the formation mechanism of the green building of housing industrialization technology on the development of green technology, green low-carbon industries, has an important guiding role in the construction of ecological civilization. The development of the housing industry, especially to speed up the application of green building technology research and development is to gradually promote housing construction embarking on a high technological content, low resource consumption, less environmental pollution, good economic benefit, energy-saving residential road of sustainable development. How to realize the organic combination of residential industrialization and green building, through green building goals and improve the overall level of housing industry has become a major task facing our country.

## **Related Literature Review**

### ***The Idea of Housing Industrialization and Green Building***

Research on housing industrialization abroad shows us that it mainly developed after WWII. The scholars believe that countries chose different roads and ways according to their own characteristics in the process of developing housing industrialization. New methods for improving the housing product and reducing construction costs may be taken up by house builders (Barlow, 1999). Housing industrialization is one of

the most promising methods to solve the problem of the population living in different countries (Davidson, 2001). The development of the housing industry and technology according to the actual conditions of the development of all countries to achieve the appropriate combination of enterprise organization, organization and technology is an effective way to realize the housing industry. Some studies proved that factory-based construction technology can produce superior buildings for the same, and in some cases less, cost with much faster construction times. The demonstration and prototype-industrialized housing projects have affectively proved that the new system-based technology can be transferred to housing (Howes, 2002).

Research on housing industrialization at home has mainly been concentrated on construction and construction technology, analysis of finance, and industrial organization optimization. Scholars' understanding of the advantages of the housing industrialization revealed comparative advantages, and they also agree that residential industrialization is the inevitable trend of development of real estate industry. Actually, the development of housing industrialization is the process of reshaping the traditional construction industry. Through the integration of a complete industrial chain, and the whole industry will rise (Lu, 2011). Zhengpeng Ji (2014) believes that the combination of housing industrialization and green building can save resources, protect the environment and reduce pollution. It also can improve the quality of housing construction and performance, and promote energy conservation, reducing the economic cost of housing construction. In addition to the study of the industrial chain, some scholars' research has been into housing industrialization of the main body and the industrial chain of the various elements. From the residential building virtual industrialization group's point of view, this includes economic efficiency, energy efficiency and social benefit, analyzing the advantages of the real estate industry in the construction of security based on the industry chain (Wang, Li, & Sun, 2007). Wang Min generally believes that green building is more demanding for technology and management than traditional architecture (2014). If we cannot clearly analyze the stakeholders' respective interest demands and corresponding responsibilities, and face up to the different challenges they face, then it is bound to cause some problems in the green construction industry chain and will affect the overall development of the green building industry in China. Therefore, this paper, through residential construction technology and green building, actively explores the integrated application of industrial products and the concept of the four conversations and one protection in green building.

### ***Theory of Social Shaping of Technology***

Social shaping of technology (SST) is an important theory put forward by Edinburgh school scholars through observation and analysis of the relationship between science technology and society since the 1980s (Bi, 2017). It emphasizes that social factors play a key role in technological development. By virtue of the orientation and method in SST research, the effect of either technological or non-technological factors on the green building process is studied in respect to the interactive relationship between technology of the housing industry and society, and then the social formation of selectivity, uncertainty and procedure in housing industrialization is further discussed.

## **Social Shaping of Housing Industrialization's Technology and its Application in Green Building in China**

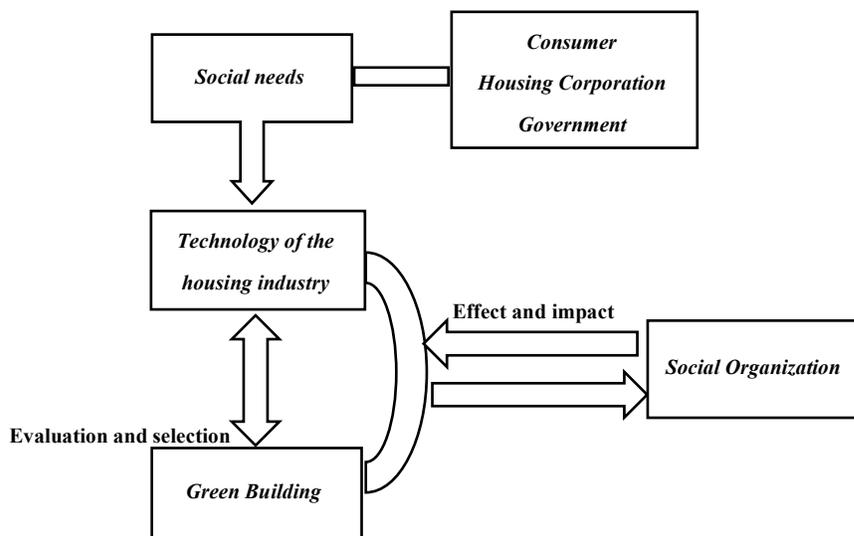
### ***With Selective Social Shaping of Housing Industrialization's Technology***

SST study claims that any technology does not follow according to internal logic of development, nor in a method as designed, but instead is created by choosing its own different path choice. And this choice is

produced by society in the creation and use of its conditions. That means, at first, the possibility of development of housing industrialization technology is essentially constructed according to the various needs of consumers, that is, according to the characteristics of user needs. During the process of determination, the effort is required in obtaining industrial technology in a desired way to achieve application effect through technical design, test and exploration, so as to find the various needs of consumers and the specific performance.

***With Uncertain Social Shaping of Housing Industrialization’s Technology***

The theory of social formation of technology has strongly criticized the theory of technological determinism. It states a specific technology should not be regarded as the only inevitable phenomenon, but instead should be regarded as an influence on society that all kinds of factors and conditions are shaping up for technology. It is the process of a new mode into the production system to obtain excess profit by the factors of production. Housing industrialization is a process about comprehensive process factors such as housing industrialization’s technology, economy, society and consumers. It is creative, not a simple mechanical process. However, it is the many variable factors, as well as the non-deterministic and multidirectional interaction between the factors that are difficult to estimate and to control, that make housing industrialization a process of uncertainty.



**Figure 1. SST Analysis Model of Housing Industrialization Technology** (Wang, C., 2009)

Technology for housing industrialization exists in the social system; it was formed due to social demand, and the interaction between green building. Technology in housing industrialization with green building, in turn, affects society (Wang, C., 2009). There are three levels of specific forms of social organization from the level of consumers, the level of housing corporation, and the level of government to discuss technology of the housing industry in green building to promote the social demand.

***Social Organization Shaping and Acting on Technology of Housing Industrialization***

Technology of housing industrialization of China is a joint effort of the government, enterprises and consumers; it came from the analysis of their interests, the relationship and the influence of technology potential and the focal point by using SST theory on analyzing the impact on technological development and the development process.

**Consumer.** China's current urban population is 771 million from the perspective of China Statistical Yearbook, and the population is expected to reach 822 million by 2020. According to the calculation of the current per capita housing construction area of 33.52 square meters, the new city's population demand for residential area will reach 1 billion 700 million square meters (China Statistical Yearbook, 2015). Therefore, the stimulation technology in the development of housing industry is greatly needed. Terminal consumer demand largely determines the final realization of each link of the value of the housing industry, and the demand level of the value-added benefits depends on the size of the consumers. To sum up, consumer groups for residential products have increasingly high demand, and consumer demand determines the degree of industrialization of residential technology development. Therefore, improvement is needed in housing industrialization in terms of hardware at the same time. We also want to pay attention to the concept of publicity to ensure that consumers can accept the potential of more space and added value.

**Housing corporation.** With the consumers paying more attention to comfort and the pursuit of personalization in their residences and customer relationship management for mass customization, developers must deal with this new situation and make the corresponding adjustments to production. Developers have gradually changed from independent developments in the past to owners of development transformations. Cai Min (2015) mentioned in an article about Broad Homes Industrial International Co., Ltd. having completed projects of almost 20,000,000 square meters with industrialized building technology in China that include residential buildings, commercial buildings, public facilities, industrial facilities and infrastructure. A typical example is Broad Homes' 5th generation of industrialized integrated building systems; it has adopted the world's most advanced precast concrete technology and BIM platform. By optimizing their R&D, design, manufacturing, construction, material and product systems, their quality is improved, and time, energy and cost can be saved. Through standardization and industrialization, they have adopted a flexible production line to produce PC, which can greatly reduce their labor costs and shorten production periods, while ensuring product quality and efficiency.

**Government.** With the development of economy, population urbanization is accelerating. As shown in Table 1, the level of urbanization in China has increased from 29.04% to 56.1% from 2000 to 2015. Cities at the prefecture level or above increased from 262 in 2000 to 295 in 2015. With the increased process of urbanization, it is an inevitable requirement for housing industrialization to adapt to it. Sustainable developing architecture is another of the most important elements of city function.

**Table 1. 2000-2015 China Cities at Prefecture-Level or Above Data (NBSC, 2015)**

Indicators	2015	2010	2005	2000
Cities at prefecture level or above (a)	295	287	286	262
Urban population of more than 4 million(a)	15	14	13	8
Urban population on 2 million to 4 million (a)	38	30	25	12
Urban population on 1 million to 2 million (a)	94	81	75	70
Urban population on 0.5 million to 1 million (a)	92	109	108	103
Urban population on 0.2 million to 0.5 million (a)	49	49	61	66
Urban population of 200,000 (a)	7	4	4	3

The role of the government in the entire industry chain is very important. It rose to command the overall situation, and create macro-control policies to promote new technologies, new materials, new standards, guide social consumption and so on. So, in order to further the housing industry and promote residential industrialization further, the government must first move and develop relevant industrial policies and measures for organizational socialization production, formulate standards including those for the

implementation of the role, and give maximum support so this emerging industry can thrive. According to the experience of developed countries, at this stage of China's development of the housing industrialization process, rapid development of the city will be very necessary. The house is one of the most important elements of a city's function, and with the development of the city's economy and urban population increase, housing demand and housing consumption will be expanded. Moreover, the demand for green residential housing will increase.

### ***Application of Housing Industrialization in Green Building***

**Table 2. 2000-2015 China's Construction Industry Standard Coal Consumption Data (NBSC, 2015)**

<b>Indicators</b>	<b>2015</b>	<b>2010</b>	<b>2005</b>	<b>2000</b>
The construction industry standard coal consumption (million ton)	76.96	53.093	34.0331	21.7853

At present, building energy consumption has been juxtaposed with industrial energy consumption and traffic energy consumption, and has become one of the three major energy users in China. Energy savings in the building industry is imminent. As shown in Table 2, China's standard coal consumption in the construction industry increased from 21.7853 million tons in 2000 to 76.96 million tons in 2015. According to the Report on China Building Energy Saving Data in 2015, it shows that in a Chinese residential construction area of 0.446 hundred billion square meters, the total building area of 0.545 hundred billion square meters by the end of 2013. According to the Ministry of Housing and Urban Rural Construction Data, by the end of 2013, there will be a total of urban new building energy-saving building area of 8 billion 800 million square meters, which accounts for the town civil construction area of 30%, a total of 80 million tons of standard coal and energy-saving ability. Green building is also called sustainable development building, and its standards include sustainable economic development, ecological sustainable development and the sustainable development of society. In China's Assessment Standard for Green Building, thus, green buildings have a healthy, safe and comfortable living function at the same time, and they also have to reduce the consumption of resources, reduce environmental load and other additional features. This is the inevitable direction of the future ahead of China's construction industry, and it has a very broad prospect. The housing industry is an important way to realize the goal of green construction industry.

### **Conclusion and Suggestion**

At present, the construction industry in China is still in the traditional construction methods, which is contrary to our concept of sustainable development and is not conducive to the development of green building. When green building has become an inevitable result of the construction industry, the construction of a fundamental change in the way of the building will reflect the building concept of the four conversations and one protection (Ji, Y. 2011). Promoting a faster and better housing industry development can fundamentally solve the construction situation of high energy consumption and heavy pollution.

Housing industrialization in China has developed for more than twenty years, but there are still many problems due to the fact that the implementation of the housing industry policy of our country is late in the development of residential industrialization. Generally, both green and conventional residents have had strong preferences and were willing to pay more for improving various aspects of environmental performance in green residential developments (Chau, Tse, & Chung, 2010). The entire society will take a long time to improve its technology. Rather than technology, it is more important to change the current social environment and reduce social factors on housing industrialization technology, based on the SST

analysis from the perspective of consumers, enterprises, government and other forms of social organization of housing industrialization technology in green building and shaping mechanism. To sum up, the relationship between industrial and residential green building performance is the process and the results, the mutual influence, and interaction. The housing industry is a powerful guarantee for realizing green building, and it is the ultimate result of the development of the housing industry. Therefore, housing corporations through displaying green technology's prospects should pay attention to the interests and problems of the relevant social groups, intake social factors such as management systems, ecological ideas, and promote the development of green technology. Finally, the government is responsible for the formulation of policies and standards. The housing design standards, the housing industry installation standards, standards, and certification systems are the premise of a healthy and rapid development of the housing industry. The government sets the residential standards, the evaluation and selection of the housing industry technology. However, China's current housing industry standards and the development of certification system are still behind the social demand and housing market.

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# Research on Social Responsibility Accounting Information Disclosure of Small and Medium-Sized Enterprises in China

**Zhong Shuai Fang**

*Zhejiang University of Finance & Economics, Hangzhou, China*

Email: 1217249499@qq.com

**[Abstract]** *With the continuous development of market economy, accounting information users are no longer satisfied with the financial accounting reports of traditional enterprise accounting information acquisition. The economic benefits of the enterprise and its social benefits need to be considered. As a result, corporate social responsibility accounting information disclosure has received more attention from all walks of life. The leading global enterprises have been in the leading position in the disclosure of corporate social responsibility accounting information and have their own information disclosure system. China's enterprises, in a constantly changing environment, are profoundly aware of the urgency and importance of the implementation of social responsibility accounting information disclosure. Therefore, the disclosure of corporate social responsibility accounting has become one of the hot topics in academic circles in recent years. In order to improve corporate social responsibility accounting information disclosure consciousness and the attention of the public, this paper analyzes the problems and causes of the information disclosure of social responsibility in small and medium enterprises in China through the domestic and international theory. The author discusses how to build an index system for accounting disclosure for small and medium social responsibility in China, and then describes the development trend and prospect of social responsibility accounting for small and medium-sized enterprises in China.*

**[Keywords]** *social responsibility accounting; information disclosure; index system; small and medium-sized enterprises*

## **Introduction**

With the rapid development of market economy and as various types of enterprises continue to grow, the simple financial accounting report has been unable to meet the demand of government and society from all walks of life. Economic profit is not the only standard; the importance of accounting information disclosure of corporate social responsibility to evaluate enterprise development situation and prospect is gradually revealed. Multi-national leading companies disclose corporate social responsibility accounting information as a common practice to enhance competitiveness. All walks of life in China have also realized the importance of disclosing social responsibility accounting information. Therefore, the disclosure of corporate social responsibility accounting in China has become one of the hot topics in academic circles in recent years. The discussion is becoming more and more intense. In such a background, more small and medium enterprises and the public understand and pay attention to social responsibility accounting. This paper will make a detailed analysis and research the information disclosure of small and medium enterprises through the research background. This paper will introduce the basic situation of the social responsibility accounting information disclosure through the index system and the development prospects. A comprehensive summary and conclusion follows at the end.

This research can call for more small and medium enterprises to undertake and fulfill their social responsibilities forwardly. In addition to the development of the enterprise itself, the public will pay more attention to environmental governance, production control, charity donation, after sales protection and

timely payment of taxes and other responsibilities. This will gradually form the social supervision of all the people, urging the enterprise to undertake the obligation, and promote the development of social responsibility accounting information disclosure system to mature and become standardized.

### **Literature Review of Social Responsibility Accounting**

American scholar Oliver Sheldon (1925) was the first to put forward the concept of “corporate social responsibility”, so this aspect has received wide attention and has become a common research topic in the field of many academic circles. Corporate social responsibility means that in addition to the business activities of the enterprises to create wealth and bear the legal liability of the shareholders, they also take on employees, consumers, the environment, and other stakeholders of the responsibility, with the social responsibility of the enterprise to promote that the enterprise abandon their profits as the only goal, and put forward a people-oriented aspect in their activities and contribute to social progress and development. David F. Lioness (1968) put forward “social responsibility accounting”. He pointed out that the social responsibility accounting and traditional financial accounting are very different; the traditional concept of accounting only shows the economy, and social responsibility accounting reflects the relationship between business and society. Gray (2001) first put forward the responsibility target of social responsibility accounting. Because of their use of social resources, enterprises should report the performance of social responsibility to all social parties. Western accounting scholars in developed countries have made great achievements in the theoretical study of corporate social responsibility accounting information disclosure.

In China, social responsibility accounting research started late. Tongxin Li (1985) implemented the idea of social responsibility accounting in the “special economic zone” and his was the first “social responsibility accounting” research in China; more Chinese scholars began to study social responsibility information disclosure from the normative point of view and combined with China’s national conditions, they began study its feasibility. The Ministry of Finance (2007) issued the revised “enterprise financial rules”, thirty-nine provisions: according to law, enterprises should implement the funds needed for safe production, cleaner production, pollution control, geological disaster prevention, ecological restoration and environmental protection, on the basis of the relevant provisions of national standards included in the cost of the relevant assets or expenses of the current period. Liangan Xie (2007), using the basis of the research literature of the social responsibility accounting theory in China as a reference, conducted extensive research on this topic. First, classify and summarize the research results in recent years. Second, discuss various arguments about social responsibility accounting in detail. Finally, put forward some suggestions on the future development of social responsibility accounting theory. Daoqiong Xu (2010) believed that enterprises are influenced by traditional ideas for a long time, which is usually considered as a simple economic entity as an accounting object, and the goal is simply to maximize the pursuit of economic interests. In the development of economic globalization, this limited thought restricts the further development of enterprises and involves many social problems. Danhong Wu (2010) believes that further efforts should be made to strengthen the awareness and behavior of corporate social responsibility disclosure. First of all, from the government point of view, the relevant departments have not issued the corresponding laws and regulations, making the enterprise social responsibility information disclosure of information difficult to quantify and standardize. Secondly, from the point of view of accounting research in China, this disclosure should be based on existing foreign research results, to strengthen our country enterprise understanding, combined with rigorous academic research to provide Chinese enterprises with

a theoretical basis for guidance and advice. Hongqi Liu (2010), through research on the current situation and development trend of corporate social responsibility report released in the world, analyzed the corporate social responsibility accounting information disclosure problem. Jian Li (2012) considered the analysis index system of corporate social responsibility accounting information disclosure as the social responsibility accounting factor that confirms and measures special and highly targeted enterprises. It is an information system that can comprehensively reflect the contribution and income of corporate social responsibility. Qi Zhou (2016) studied the disclosure of corporate social responsibility accounting information under XBRL. The practical application needs the cooperation of the stakeholders, including the government, the enterprise, the software developer and the investor. In addition, this paper theoretically puts forward the idea of constructing a classification standard of corporate social responsibility accounting information expansion, and in practice, it is necessary for the relevant government departments to complete the development of classification standard and issue authoritative documents to ensure the final executability.

### **The Index System of Social Responsibility Accounting Information Disclosure**

To guide the establishment of a perfect responsibility accounting data disclosure system which is in line with the basic conditions of the primary stage of socialism is the voice of the times and the common demand of our people. At the same time, the enterprise wants to achieve the goal of accounting as a steady development process, and establish a rational, scientific market economy system; both need to establish and perfect the disclosure index system. So, accelerating the establishment of this system is the need of the times, and also the need of society. As for how to build this system, this author feels that there are 6 indicators that are needed. Among them, these three items are related to green accounting.

#### ***The Index Reflects Cleaner Production***

The enterprises improve their utilization rate of resource recycling; reduce the generation and discharge of pollutants and flue gases; reduce, or even eliminate, the hazards of pollutants to human health and the threats of the natural environment through using clean energy; continuously improve design, using advanced technology and equipment; recycle; and strengthen management measures. This is what we call the concept of clean production. Clean production indicators of enterprises are generally divided into six categories that include: the requirements of production process and equipment; resources and energy utilization index; product index; indicators of pollutants (before the end of treatment); waste recycling targets; and requirements of environmental management. But different enterprises are in different sectors, and the clean production index will have some minor differences because of the natural difference, but China's small and medium enterprises should strictly abide by these six indicators in order to fulfill their social responsibility, and promote the transformation and upgrade of their enterprises, contributing to the development of our community by their own strength.

#### ***The Index Reflects Pollution***

Pollution control, as the name suggests, is that people will improve, or eliminate, environmental pollution by using the specific technology and means in the process. According to common sense, pollution can be divided into two categories: natural pollution and man-made pollution. So, the small and medium enterprises' social responsibility accounting information disclosure in our country reflects both on the pollution governance index, but the main point is man-made pollution.

### ***The Index Reflects Environmental Protection***

All along, the protection of the environment is an important topic in our country – one that cannot be ignored on the road to development. With the development of market economy and the improvement of people's living standards, people have gradually realized that our country cannot retake the way like western countries with "pollution first, treatment later", so therefore, the attention of environmental protection level is rising.

## **The Development Trend and Prospect of the Accounting Information Disclosure of Small and Medium-Sized Enterprises Social Responsibility**

### ***Aspects of Enterprise Development***

With the rapid development of the world economy, the concept of the enterprise has been redefined. The enterprise is no longer just for the enterprise itself and the shareholders to create wealth, but also has the role of promoting social development and increasing wealth for the entire society. Therefore, enterprises must meet the requirements of their owners, but also bear the social responsibility of stakeholders. It is obvious that the regional environment and the international environment of the enterprises are closely related, and they must bear part of the responsibility for social development. The traditional definition of the enterprise is no longer applicable in our modern society. The enterprise is a part of the society, and it is a cell in the society. The enterprise is closely linked with the society and is defined as an "enterprise citizen". So, the relationship between enterprises and society will only become more close, and the survival and development of the enterprises depends on the stability of the whole society. Social progress and development also need to give enterprises a force; the two complement each other, mutually beneficial, a win-win situation.

### ***Aspects of the Overall Social Market***

First, the contents and patterns of the responsibility accounting disclosure will become more standardized. In different industries, content and focus is always more or less different among corporate social responsibility disclosures. This is inconvenient in comparing enterprise accounting information, but if specific to a particular industry, it may have similar content. Therefore, it is not realistic to establish disclosure standards that various industries can use in the future. If the Chinese enterprises are classified and put in a corresponding industry, according to the analysis of a situation within an industry, modify the content and mode of the disclosure, make it correspond with the particular industry, and it is completely feasible. So, this author believes that the standardization and institutionalization of disclosure contents and mode will be an inevitable trend of development and prospects.

Second, the means of the responsibility accounting disclosure will combine with information technology more closely, and the means and time of the responsibility accounting disclosure gradually adapting to the features of the times is an important characteristic. The methods of the traditional disclosure have the characteristics of high cost, long time, and slow propagation. The present disclosure method changed the disadvantages of traditional methods, becoming more informal and timely. This not only saves money and time for enterprises to disclose the required information and greatly improve the efficiency of the information disclosure, but it also vividly displays a variety of business activities for the public. In displaying information to the public, today's technology provides a feedback channel to the enterprises. If a person needs to, he can copy and download the contents of the disclosure, so that we can carry on processing and analyzing this kind of information by means of accounting and make the

corresponding evaluation. According to this process, a platform for social supervision enterprises of various types of activities can be provided. The informal and timely accounting information disclosure, whether or not it is representing a general trend, is the inevitable direction of the development of the times.

Third, the development of disclosure mode and channel will have more choices. This is mainly caused by the network and electronic products application in the field of accounting in our country. In fact, this is not difficult to understand. For example, in the process of information disclosure, enterprises can handle this through operating corresponding controls; the disclosure of the information content not only includes the various types of accounting statements in the traditional sense, but it can also include images or text. Although the responsibility accounting disclosure needs scientific rigor, institutional constraints and norms, it also has to adapt to the needs of the public, flexible and diverse, reflecting the basis of the system and norms. This is the trend of the times.

### **Implications and Conclusion**

Based on the research on the problems of the social responsibility accounting information disclosure in small and medium-sized enterprises, it was found that there are serious problems. This is the bottleneck that restricts the development of small and medium enterprises in China, and also affects the healthy and sustainable development of our country's economy. With the continuous deepening of the market economy, the market is becoming more and more standard. Many problems of accounting information disclosure are the stage performance that our country is experiencing in the process of rapid economic development. Today's social environment, in fact, provides a good environment for the development of the social responsibility accounting information disclosure for the small and medium enterprises in China: the globalization of the economy develops the ethical value of the enterprise, the model of international leading enterprises has a good guiding role in developing small and medium-sized enterprises, and the laws and regulations are constantly improving. Small and medium-sized enterprises are an important part of our market economy, and it is essential to standardize the development mode. With the improvement of our own governance structure and the construction of the entire social supervision system, the problems of small and medium-sized enterprises social responsibility accounting information disclosure will eventually be solved.

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# The Dual Task of the Construction of an Ecological Civilization

Liu Hongyan, Zhan Liuyang and Liqi

Tianjin University of Finance & Economics, Tianjin, China

Email: lhy80.35@163.com

**[Abstract]** *An ecological civilization is human survival, and was proposed by Rachel Carson's book, Silent Spring and a number of ecological futurists based on long-term observation and research. There has been a consensus in many countries, between the United Nations and the general public from the 1970s or 80s. The construction of an ecological civilization includes not only the earth's natural ecosystem and social ecosystem, but also two departments and two major tasks. Only the coordination of two long-term tasks are unremittingly carried out in the end in order to achieve the great goal. In this dissertation, the task and aim are launching the elaboration in order to encourage all citizens to share with the earth.*

**[Keywords]** *ecological civilization; construction; dual task*

## Introduction

The United Nations announced on October 31, 2011 that there are 7 billion people in the world. This shocking number is the first signal that there has been an increase of 1 billion people in the last twelve years from 1999 to 2011 (Ban, 2011). If this number increases, there will be 9 billion during this century, and 10 billion by the end of the century. A huge consumption of resources will correspondingly increase 10 to 20 times, and the earth's limited resources will dry up. How will humans continue to live? After Carson's book, *Silent Spring*, was published, a group of future learners and ecologists published many writings which gave warnings that the ecological civilization is the parent of human existence. Restoring and maintaining the ecological balance is the first task, or we will be unable to survive on this earth. Among these ecologists, the Rice Group pointed out in 1972 in the book *The Limits of Growth* (1972) that if we reach a population of 7 billion in the new century (even as America has a high GDP per head by statistical and scientific hypothesis), the total burden of sewage will be 10 times as much as it is now (Rice Group, 1984). From the numbers recently released by the Environmental Protection Agency (EPA), this is basically accurate. Global carbon dioxide emissions have increased by ten billion tons, a hole has appeared in the ozone layer, and the Greenhouse Effect has caused the sea levels to rise about two meters. Thousands of small islands have been overwhelmed. If we reference the issue of "Entropy: A New World View", published in 1981 by Rifkin and Howard, we see the Second Law of Thermodynamics Entropy Principle which points out that the third world is walking the path of industrial countries, accelerating the consumption of resource depletion, and widening the gap between rich and poor. The dual economy will improve the high entropy value of the earth. If we do not take effective measures to organize their low entropy society to adapt to the natural order, the earth will soon collapse in this closed system, leaving the last heat death not so far away. Then authors suggest that we should give up the high energy economy and high entropy culture for a low entropy of economic and cultural development in order to save the rare earth from being snatched into the jaws of death (Rifkin & Howard, 1987). Whatever people have said about the entropy principle and the heat death, although there are many different opinions, the second law of thermodynamics irreversibility is objective existence; we cannot treat it carelessly. In short, twenty or thirty years ago, a group of future learners and ecologists pointed out that a population of 7 billion is a vigilant number, and just equals the population of today. So, there is no reason not to meet the challenges, just answer the warning.

## **Ecological Civilization is the Foundation of Human Existence**

Answering the first point of the 7 billion vigilant number, we should understand the scientific world outlook completely and thoroughly in that the ecological civilization is the foundation of human existence. From the primitive society, agricultural civilization, industrial civilization to the electronic information society, human beings have gone through four waves of historical process (Toffler, 2001). The last two waves have led to the destruction of the ecological civilization era. Economic production activities take place on the limited resources of the earth; its growth is not unlimited but limited. The limit line is the earth's resource storage volume depletion, which not only refers to non-renewable resources. Energy and renewable energy, once exhausted can become non-renewable energy; even inexhaustible solar energy arrives at a rate at which the earth and the form is very limited, and because the earth's lower entropy affect to combine with solar (Rifkin & Howard, 1987).

These extrapolations are based on scientific mathematical calculations, so they tell humans that the GDP growth rate of countries must be kept at a low level. We must put conservation and restoration of the earth's ecosystem at the top, so that the formed environment and resources are called the normal nature of ecological civilization. We should not forget that the increasing population increase the consumption of energy. If it reaches 8, 9 or 10 billion, we can expect a consumption growth of 15%, corresponding to a population increase of 1 billion or 15% calculated every 12 years (Liwen, 2011). According to the calculations set by the information, the ratio of the earth's resources and energy consumption of the population during the century shows that energy has had difficulty meeting demand. This picture is not purely imaginary; and it tells us that what we do now can avoid or prolong the advent of these tragedies. It is necessary to take urgent and forceful measures as soon as possible.

First of all, it is the first view of the world that ecological civilization is the basis of human existence which is the most scientific, reasonable and correct view that can guide the future of mankind. Because since the industrial revolution and industrialization, pragmatism, materialism, idealism, revolution, ideology and so on have competed for the most important position of the most of scientific world's outlook. However, these worldviews consider only the local and national interests of human life and social development, and the corresponding social, political and economic construction and institutional issues are also solved. Practice shows that they are not considered part of the ecological environment for human survival and their development is a fundamental decision and control function. So, they all have their own reasons, but they must obey or surrender to ecological civilization if survival is highest world outlook.

The second issue is under the guidance of the highest world outlook. From governments to the United Nations Development Programme in the formulation of GDP or development plan, the construction of an ecological civilization must be given priority status. A portion of investment funds for the construction and development of a properly balanced economy and people's livelihood must be set aside – a specific amount that is no less than 15% the proportion of the difference of the national situation, (only 12 years in the population growth in 1 billion, consume 15% of the total amount of information and energy for the original work). For the GDP growth index, the current situation is that countries didn't put it in a separate independent unit, most dispersed the maintenance ecological cost to the economic construction of each project. If it's in the first place, then the so-called GDP worship problems can occur. So, the real difficulty is not in control of growth, which should be around 3%. Many people think that a growth rate of 3% is to balance economic development and the best portion of energy consumption. If there is no single line of ecological civilization construction projects, this 3% is not much practical significance; once listed, 5% is

not very high. In short, the key to all the problems is that the growth rate must have an ecological civilization project (Pettis, 2012).

The third problem is the quality of the urban construction and expansion. Cities, especially the metropolis areas, are increasing with modern industrialization. The current global ten to thirty million metropolitan population (including the peripheral region) has reached nearly two hundred. Their energy consumption accounts for nearly 70% of the global consumption and is the culprit for environmental pollution. A group of mayors and scholars put forward the concept of a “green city” and thought that by using solar energy, low carbon economy, electric vehicles, more open parks, street parks, and by limiting heavy pollution by various logistics methods in urban areas, etc., they could achieve this desire. It is a redeeming suggestion of course. However, the fact is, the larger the scale of the city, the amount of land area is more populous, so the larger the absolute quantity and per capita energy consumption is greater of waste garbage and exhale carbide particles. In the broad rural areas, the average life expectancy is far lower than the agricultural population.

Another problem associated with urbanization is the construction of nuclear power plants. With the development of urbanization, more power supplies will be required and more coal and water resources will be consumed. Therefore, many countries will adopt the method of building nuclear stations to alleviate this contradiction. But nuclear power has duality; its negative effect is extremely obvious, which is the inevitable radiation pollution damage to surrounding people and land. The Chernobyl disaster 20 years ago and the recent disaster in the Fukushima region demonstrate that we have been unable to completely eliminate nuclear disaster. These disasters not only hit the Ukrainian agriculture and Japan’s economy, but also endangered personal safety and affected the surrounding countries. The air and ocean are without boundaries, so nuclear particles drift into the atmosphere and the sea; no one is able to build a protective barrier in this context. Germany, the Nordic countries, and Italy know that a nuclear radiation hazard cannot be avoided, so they have resolutely declared denuclearization. Under this act, the Japanese are learning from this profound lesson and have shut down the nuclear station and decided not to build new one (UN008, 2011).

Unfortunately, this is the decision of individual countries; the EPA is neither universal, nor will they make unified rules. Many countries are still wading through a variety of reasons and excuses in nuclear station construction. One of their excuses is that secure technology can achieve a level of zero nuclear radiation pollution. This excuse is simply untenable. There is no absolute zero for nuclear radiation pollution. The reason this is untenable is that the most of the nuclear pollution released by nuclear stations has weights of different sizes. The most safe nuclear station has also been unable to completely prevent pollution of nuclear emission particles.

### **The Construction of Ecological Civilization is the Instinct of Human Beings**

The construction of an ecological civilization is a rich connotation of the concept of reference plane, as a product of nature, he is also a small ecological structure of the structure of the universe, and he is the center of the construction of ecological civilization, also is the goal and object. Without maintaining and promoting the level of ecological civilization, it is neither conscious nor competent for the construction of ecological civilization in the external environment. The ecological civilization construction will not have the ability to both lack self-consciousness.

What is the ecological civilization construction of human beings? It includes two parts: body and mind, and body and spirit. The human being’s body includes the five sense organs and blood vessels of the

intestines or stomach, etc. and are both entrusted by nature, which belong to the tissues in the physiological mechanism. We call it abandon in our ancient learning; Western learning call it “body”. So, we should maintain the ecological balance of the development. Food and activities to supplement nutrition and improve limb physique was two points. But do not speak of health. Disease enters by the mouth, damages the balance, affecting growth. Desire is an important factor in this, whether diet or sexual life; excessive desire will damage health. The ancients advocated the desire for Tao, or the desire for reason; that is to focus on the balanced development of the body movement. The difficulty is that it is difficult for people to grasp the degree of truth or reason in real life. So, disease is often born. From the perspective of ecological equilibrium development of physiology, the best way is to return to nature, eat more fruits and vegetables and whole grains, beans, eat less spicy food, oil dishes, and basically do not eat genetically modified food. Table delicacies from land and sea, like the Leopard Shark’s fin bird’s nest bear bile. Dress in cotton fabric; chemical fiber-blended fabric cannot make underwear. Refuse to wear airtight wrapping fabric (except only when swimming, gymnastics and other sportswear for training). It seems to be the common sense of health, but it contains the connotation of the ecological balance of the form, so it should be repeated.

As to the inner spirit of the ecological system, it includes five senses desire and from outside into the flow of information within the collision and integration of complex phenomenon. From the perspective of mental health, neither desire nor forced repression are caused by excessive or nervous disease, and there should be no activity in a blank or long-term rest state. The nature of heaven and earth is expensive. The thinking of the mind is that people should think constantly and think deeply about the activities of the outside personnel and their inner activities.

The activity of thinking can be absorbed and promoted by school education and cultural tradition. Generally speaking, the higher the level of education, the more abundant the essence of traditional culture and the higher the ability of understanding and thinking. So, scholars, thinkers, scientists and artists are always in pursuit of higher education and wide absorption, so that they can create a good science and cultural products after reflection and reconstruction work. These are carried out in different educational systems and cultural systems. History shows that the more open, and more relaxed the education system and the freer the culture system, then people’s education knowledge, composing spirit and absorb cultural nutrition activities are more free and diversified, and there is a greater possibility of success. Therefore, the educational system and the cultural system should be in constant reform, and the goal of reform will be the liberal and lively openness. If we do these things, the degree of ecological civilization education of ecological civilization and culture will be improved.

Spiritual ecological civilization is different from material and technology civilization; it lies in its development is not balanced, which is not in a straight line like the latter, but according to the freedom to imagine the bold exploration and the spirit of not being afraid of failure in a creative activity. Sometimes the lower stage of social and economic development can create great doctrines and fine arts. Marx made a deep and penetrating analysis of this and proposed the famous theory of disequilibrium (political economy and critical introduction) (Marx, 1955). Engels summarized the history of science and art during the Renaissance which poured out of a batch of giants, and also pointed out that their thinking ability was versatile. They had both highly-developed and outstanding knowledge, and adventurous spirits which push them forward with creative activity (Engels, 1970). In China, there was the Spring and Autumn Period and the Warring States period, the Zhou Dynasty decline and collapse, and the violent social dispute, but there were various situations and a hundred schools of thought. The first sage proposed still known and accepted

the great breadth of thought and theory. The great unification and economic prosperity of the Han Dynasty did not appear as an ideological giant.

These historical facts as people are well known, and make it clear that the spirit of ecological civilization has its own unique personality; it is both an imbalance and free and lively. In the new era, the construction of an ecological civilization and the development of spirit, is to promote a cultural development boom. The primary task is to implement the law of an open ecological civilization open, with no mandatory limits to freedom of imagination. All flowers bloom together and contention of thought. Someone worry that they won't cross cultural confusion, others require increasing investment, consider the more the greater the output, it is not alarmist is kill the spirit of ecological civilization and culture the individual character of thought, and with the generation of cultural creation. Although economy is the foundation of culture creation, material life without at least a guarantee to create science and art activities, but history shows that ancient and modern, Chinese and foreigners anger out the music of Beethoven as the poet of poverty is born a Patent Office clerk. Einstein didn't understand the condition of enterprises and government spending, with his free spirit of creation, through ideal experiment found that Newton's absolute space-time theory and put forward the breakthroughs of the space-time relativity of the special theory of relativity, and later in the same situation, put forward the general theory of relativity, the greatness of a correlation between the mass and deduces the formula,  $E = MC$ , which opened up human knowledge and the material energy of the universe to convert a new road, to the benefit of mankind. All this tells us a truth: freedom of imagination is not afraid of the failure of the spirit of adventure and a bold hypothesis is the premise of scientific discoveries to create activity. It is also the cultural and artistic innovation's first music, caution beg a certificate, artistic creation and other closely reasoned and scientific practice is secondary. And today we advocate the reform of a cultural system, planning and scientific development, still did not take off mold caused by decades of planned economy, the centralized control with a deep color.

Generalized relative to the natural substance of culture, is a knowledge system, is a kind of soft power. There is no boundary or fixed boundaries. This liquidity to history of comprehensive sex is not distinguished by anyone, and at the same time, there is nothing good or bad, or relative to the brutal civilization. It is progress and developed degree of different cultures and civilizations both phase is completed and the difference between each other. The performance of the traditional culture is an ancient civilization. Modern civilization is the result of the transformation of the former; it's adaptation to the modern culture is not equal to the latter. So it rejects any form of particle scale and rubbish, only hold fine ideological and ethical progress and scientific theory. So, the construction and development of modern ecological civilization, the inclusive and allow free debate and competition between homogeneous and heterogeneous thinking, do it and the different is its progress, otherwise will be back. That is the essence of life. Identify the relationship between culture and civilization. We went to the new culture of development and prosperity, create first-class theories, have the world's top art, as well as the corresponding top scientists, thinkers, artists, and cultural powers as the basis of universal standards and spiritual civilization.

### **Conclusion**

Essentially, the dual task of the construction of ecological civilization is not only the need of the development of history, but also it is an extremely difficult creative work. In terms of the world, it requires a long and arduous struggle among people of all nationalities. As far as our country is concerned, it is necessary to mobilize all the officials and citizens from the south to the north to make unremitting efforts

so as to gradually climb to the summit of their brilliant brilliance. The author is willing to work with all the people for their common struggle.

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# The Second Child Fertility Intention and its Antecedents of Childbearing Age Couples in Zhejiang Province

Zeng Chuikai, and Wang Yuanyuan

Zhejiang University of Finance and Economics, Hangzhou, China

Email: ckzeng@163.com

*[Abstract]* In this study, we examine the relationship between family demands-resources and the second child fertility intention and the influencing factors with the universal two-child policy. Sampling the population of the right age from four cities in Zhejiang Province – Hangzhou, Ningbo, Quzhou and Lishui – a total of 587 effective cases were received. Based on cognitive-affect-action theory to determine the affect factors as intervening variable, we developed a family demands-resources model. Analyzed by SPSS22 and Amos22, this article found: Physical, work and psychological factors will prevent those couples who are appropriate to have a second child; work and psychological factors will lead to negative affect; material, psychological, family and fertility attitude factors will promote a couple to have a second child. positive and negative affect play the mediator role between family demands-resources and the second child fertility intention.

*[Keywords]* family demands-resources; fertility intention; positive affect; negative affect

## Introduction

China adheres to the basic state policy of family planning, perfecting the population development strategy on the basis of the full implementation of the couple can only have two children policy, actively dealing with an aging population. The universal two-child policy, which is beneficial to optimize the population structure, increases the labor supply, and reduces pressure on an aging population. At the same time, the “two-child policy” can alleviate the payment pressure of the pension insurance fund (Zeng, 2017).

The universal two-child policy was implemented on January 1st, 2016, and the second child reproductive output has been lower than expected. Data statistics show that in 2016, the national new population was over 17.5 million, compared with the birth of a population of 16.55 million in 2015; the population only increased by 0.95 million. The birth of a population of 16.87 million, compared with 2014, an increase of 0.63 million only. Overall, the total fertility rate slowdown is a big trend year-by-year. We know the universal two-child policy is not successful (Mu, 2017). At the same time, the researchers have studied the second child fertility intentions in Guangdong Province and they found that the implementation of the universal two-child policy has significant positive effects, but the intention is not strong. Only 40.4% of the respondents have pronounced two, and 59.6% people said they don't want to have the second child (Zhong, 2016). To sum up, the couples wanting to have a second child is only 40.4%, there is no more than 50%, and those couple of childbearing age that are willing, as compared with other provinces in east China's Shandong province, is very strong, but it is only about 60%, so we know that the universal two-child policy is not effective.

This article will research this phenomenon. Based on cognitive-affect-action theory, this research developed a family demands-resources model and constructed two mediators: the positive effect and negative effect. Firstly, this paper describes the fertility intentions of the second child study status from the previous studies. Secondly, we examine and analyze second child birth will influence factors research

status. Finally, we apply critical theory and adopt the method of empirical analysis to analyze couples with school-age children with fertility intentions about the second child.

### **The Antecedents of a Second Child Fertility Intention**

From the perspective of economic analysis, including cost and social cost of family factors (Mu, 2017), family cost includes economic cost and opportunity cost. Zhang Dan (2015) specifically points out that the economic costs include: (1) the cost of children; (2) the children's education cost; (3) children will reduce more children's education quality; and (4) the price is too high for a lower quality of life. Opportunity costs include: (1) may lead to their children or spouse giving up their education opportunities; (2) the family-rearing children result in a loss of their, or their spouses, work opportunities for advancement; (3) raising a child is a lot of work and the delayed time reduce the family income. In addition to these costs, there are also psychological costs, which mainly include: (1) raising a child is too much trouble to make yourself or your spouse lose a lot of free time; you can't do what you like; (2) fertility raising children too tired, can't find the right person to help with the children; (3) worry about children's education quality; the fear of having their own children than other people's children, the psychological pressure is very big. Social security and a maternity insurance policy are also main influence factors (Wang Song, 2016).

To sum up, from different angles, different subjects have researched the influence factors of child birth. Thus, the second childbirth's influence factors are multi-dimensional, and the effect mechanism is also complicated.

### ***Theoretical Basis***

This project explores the influence on fertility intention of child-bearing age women from the perspective of organizational behavior. Family demands for women of child-bearing age to give birth to two children mainly are good physical condition for conception, worries and concerns for the second child birth, giving birth to two children for professional influence, and so on. And on the other hand, the family to have two children may need social and government assistance to provide supporting policies of birth allowance and extension of maternity leave, organizations for women of child-bearing age concern and care, and a series of resource support. So, from the perspective of organizational behavior, this article can explore willingness for second childbirth from two aspects of family demand and family resources. We build a family demands-resources model based on job demands-resources model. The job demands-resources model (Demerouti, & Bakker, 2011) is a theoretical framework. It integrated two relatively independent researches: stress research tradition and motivation research tradition. From two aspects of job requirements and resources, we can study the influencing factors of organizational outcomes. According to the model, job demands, and job resources are value-based job characteristics (Schaufeli, & Taris, 2013). Job demands are the processes of health damage, namely the job demands mainly from the aspects of mental, affectual, physical consideration for health and energy consumption, and the negative affects to the organization's output. Job resources are the originator of incentive process, namely resources mainly from the aspects of work support, autonomy and feedback to affect work motivation, which affects the output of the organization. Family resources are a comprehensive two child policy trigger family for urban women of child-bearing age material, psychological, society, organization, and resources, etc.

According to the process of cognition, effect, behavior, and reading the related articles on affected factors, it can be determined as the intermediary variable. In combination with the results in this paper, we study whether we can confirm at present if most of the couples of child-bearing age agree to have two children if there is the rational cognition, if they are thinking on the one hand, and on the other hand, the reality of how to make the individual aspiration a consistent and realistic demand, is the first breakthrough to realize two child policy development as soon as possible (Song, 2016).

In addition, countries also should give more financial support, and promote the equalization of public products about fertility, raising awareness and public service in order to reduce the burden of family and parental rearing of children. Only then, will the two-child policy be likely to achieve the desired effect (Chen, 2016).

### Research Model

This article explores the influence factors of childbirth wishes from the angle of the two family demands and family resources. Based on cognitive and affectual behavior theory (Schaufeli, & Bakker, 2004), constructs two intervening variables: the positive affect (active, alert, focused, etc.) and negative affect (fear, nervous, etc.). (Qin, 2008). See Figure 1.

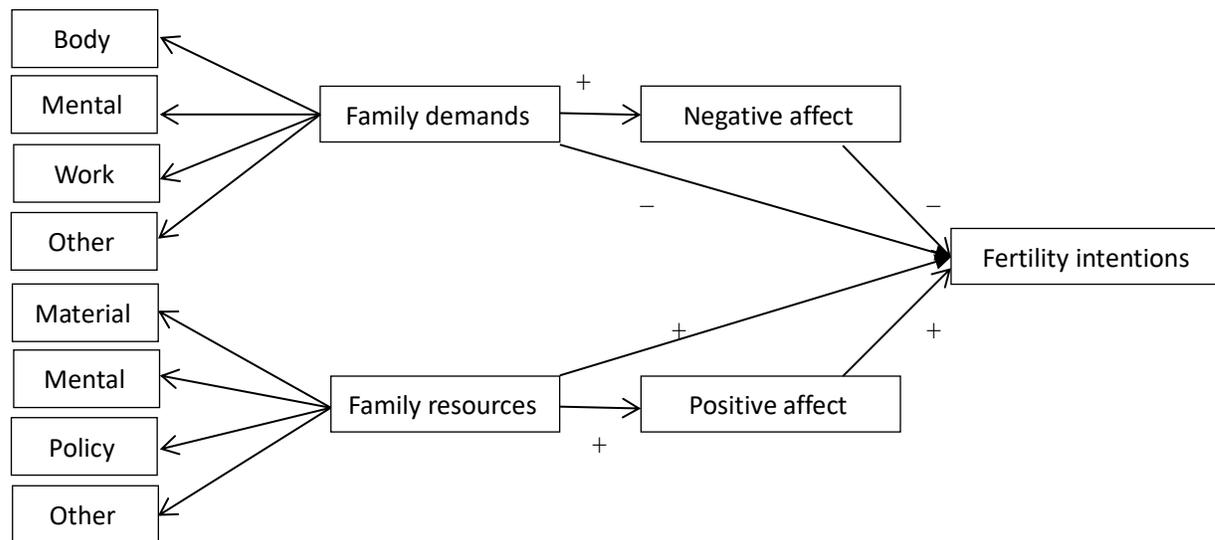


Figure 1. Research Model

Finally, on the basis of literature review, this article develops the scale: family demands-resources. Scale is divided into two aspects: family demands scale and family resources scale. Family demands are measured by physical, psychological, organization and social. Family resources are measured by physical, psychological, and social. Through preliminary investigation, the merger of inventory items, fine-tuning, split, excluding, form the final scale with good reliability and validity.

### Methods

This paper uses a questionnaire survey and survey of second childbirth couples of childbearing age in four cities - Hangzhou, Ningbo, Lishui, and Quzhou, in Zhejiang province. Finally, we collected 587 questionnaires. We use the family demands-resources scale.

We hypothesized the following:

Hypothesis 1: family demands were negatively correlated with fertility intention.

Hypothesis 2: family resources were positively correlated with fertility intention.

Hypothesis 3: family demands were positively correlated with negative affect.

Hypothesis 4: family resources were positively correlated with positive affect.

Hypothesis 5: positive affect was positively correlated with fertility intention and negative affect was negatively correlated with fertility intention.

Hypothesis 6: The relationship between family recourse and fertility intention is mediated by the positive affect and negative affect.

Family demands and family resources: We used the scale (see Figure 1). Positive affect and negative affect: We used the PSNAS scales (Watson, 1988; Egloff, et.al., 2003). Within the sample, 40.5% were female. Aged 20 to 25 years old accounted for 13.4%, 25 to 30 years was 43.4%, 30 to 35 years was 33.5%, and more than 35 years was 9.7%. Undergraduate course made up 57.9%, civil servants were 21.1%. Family structures both sides of husband and wife only one party is only children proportion reached 38%; household income, below 60 thousand China Yuan accounted for 4.8%, 60-100 thousand China Yuan accounted for 11.2%, 100-150 thousand China Yuan accounted for 32.9%, accounted for 36.3% of 150-200 thousand China Yuan, 200 thousand China Yuan more than 14.8%.

## Results

Through the survey, we know that two child policy has paid attention to and understood to the degree to which those couples did not achieve full coverage amounted to only a third respectively. Investigators didn't know that part of the other countries had implemented the "universal two-child" policy. One very attention, and attention not reached 6.3% and 6.3% respectively, know and don't know very well the proportion of 3.2% and 2.7%, respectively, Before the second child policy implementation, wanted to and prefer to have two children of respondents reached 30.8%, and after the policy implementation, very much wants to and compared to have two children of respondents reached 36.3%, Preliminary can be found that the implementation of the "universal two-child" policy did not, to a large extent, affect school-age couples for the decision whether or not to have two children. So, this article continues to explore what reason lead to this phenomenon.

Means, standard deviations, and correlations for study measures are reported in Table 1. From Table 1, in family demands dimension, the physical factors, psychological factors, work with the intention of the couples who have two children of school age have a significant negative correlation, ( $p < 0.05$ ). The work factors, physical factors and psychological factors will hinder the couples that have two children of school age. Hypothesis 1 was supported. Work factors, job factors, physical factors, psychological factors can cause personal negative effect, ( $p < 0.05$ ). Hypothesis 3 was supported.

In family resources dimension, material factors, psychological factors, family factors and fertility concept with the intention of the couples having two children of school age have a significant positive correlation, ( $p < 0.05$ ), which will promote the will of the couple having two children of school age. The risk control factor and policy factor and the will of the couple having two children of school age had no significant influence, ( $p < 0.05$ ). Hypothesis 2 was supported partly.

In addition, physical factors, risk control factors, psychological factors, policy factors, family factors, and Pearson correlation value of positive affect were 0.196, 0.104, 0.110, 0.171, 0.098, and significant value was less than 0.05. Fertility concept factors and positive affect Pearson correlation value was 0.005, significant value was greater than 0.05. And fertility idea factors, material factors and negative affection of Pearson correlation value of 0.158, 0.091, and significant value was less than 0.05. Visible, concept of

fertility factors and personal negative affect significant positive correlation, were not significantly associated with a personal positive affect. Hypothesis 4 was supported partly.

Significant negative correlation, negative affect and childbearing willingness significantly positively related to positive affect and childbearing willingness ( $p < 0.05$ ). Hypothesis 5 was supported.

**Table 1. Descriptive Statistics and Correlations Among Study Variables**

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1 Work	2.79	.94	<b>0.87</b>										
2 Body	2.24	1.00	.51**	<b>0.85</b>									
3 MD	3.27	1.06	.71**	.39**	<b>0.79</b>								
4 Material	1.98	.94	.11**	.19**	.04	<b>0.88</b>							
5 Risk control	2.43	1.04	.37**	.38**	.20**	.55**	<b>0.83</b>						
6 MR	2.42	.93	.06	.02	.04	.46**	.37**	<b>0.76</b>					
7 Policy	2.62	.89	.27**	.24**	.21**	.44**	.51**	.42**	<b>0.82</b>				
8 Family	2.48	.88	.06	.04	.11**	.46**	.41**	.59**	.50**	<b>0.80</b>			
9 Attitude	2.98	.89	.18**	.09*	.26**	.33**	.36**	.35**	.51**	.52**	<b>0.80</b>		
10 PA	3.10	.94	-.00	.03	-.06	.20**	.10*	.11**	.17**	.10*	-.01		
11 NA	4.47	.98	.26**	.17**	.24**	-.09*	.07	.05	.04	.02	.16**	-.40**	
12 FI	2.94	.84	-.31**	-.24**	-.15**	.19**	.02	.25**	.07	.34**	.14**	.13**	-.16**

Note: \* $p < .05$ ; \*\* $p < .01$ ; MD=Mental demands, MR =Mental resources, PA= Positive affect, NA= Negative affect, FI= Fertility intention

Table 2 represents the intermediary effect (control variable: area, unit of nature, gender, age, education status, income, family structure).

**Table 2. The Mediating Effect of Affect**

Variable	Negative affect		Positive affect		Fertility intention			Fertility intention		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Work		.16*				-.35***	-.33***			
Body		NS				-.10*	-.10*			
Mental demands		NS				.16**	.17**			
Material				.16**					.13*	.11*
Risk control				NS					-.16**	-.15**
Mental resources				NS					.10*	.10*
Policy				.18**					-.10*	-.12*
Family				NS					.34***	.34***
Fertility intention				-.15**					NS	NS
Negative affect								-.10*		
Positive affect										.11**
R <sup>2</sup>	.01	.08	.01	.02	.04	.14	.15	.04	.19	.20
Adjustment R <sup>2</sup>	.001	.07	-.00	.002	.03	.12	.13	.03	.17	.18
R <sup>2</sup> change	.01	.07	.01	.01	.04	.10	.01	.04	.15	.01
F change	1.07	15.18	.72	1.99	3.36	22.23	5.67	3.36	17.40	7.66

Note: \* $p < .05$ ; \*\* $p < .01$ .

From the mediation effect of fertility intention of the family, Model 6 as you can see, the work factors, and physical factors have a negative influence on fertility intention ( $\beta = 0.35$ ,  $P < 0.001$ ), the body factor has a negative influence on fertility intention ( $\beta = 0.10$ ,  $P < 0.05$ ), the positive impact of psychological factors on the fertility intention (beta = 0.16,  $P < 0.01$ ), the first step, the coefficient c effect

is remarkable. From Models 2 and 7, work factor has a positive influence on the negative affection ( $\beta=0.16$ ,  $P < 0.05$ ), In the presence of negative affect, work factor has an effect on the fertility intention significantly ( $\beta=0.33$ ,  $P < 0.001$ ), so there are intermediary effect partly.

Physical factors and psychological factors and negative affect have no significant role. From M9, the independent variable physical factors, psychological factors and family factors have a positive influence on fertility intention ( $\beta=0.13$ ,  $\beta=0.101$ ,  $\beta=0.34$ ,  $P < 0.05$ ,  $P < 0.05$ ,  $P < 0.001$ ), and independent risk control factor and policy factor have a negative influence on fertility intention ( $\beta=0.15$ ,  $P < 0.01$ ), the first step in the intermediary effect coefficient c effect is remarkable. And there is no significant impact on fertility intention. You can see by Models 4 and 10, independent variable material factor and policy factor have a positive influence on intermediary variable positive affect ( $\beta=0.16$ ,  $\beta=0.18$ ,  $P < 0.01$ ,  $P < 0.01$ ), the independent variable fertility factor has a negative influence on positive affect ( $\beta=0.16$ ,  $P < 0.05$ ), intermediary variable positive affect has a positive influence on fertility. ( $\beta=0.11$ ,  $P < 0.01$ ). In the presence of positive feelings, material factors, policy factors effect on fertility intention ( $\beta=0.11$ ,  $\beta=-0.12$ ,  $P < 0.05$ ,  $P < 0.05$ ), so material factors have partly intermediary effect on fertility intention. Policy factors have no intermediary effect.

The risk control factors, psychological factors and family factors have no significant effect on positive affect. Positive affect has a positive influence on fertility intention. ( $\beta=0.11$ ,  $P < 0.01$ ).

### **Conclusion**

Women's fertility intentions are stronger than men's. Men still undertake the main economic responsibilities in the family, so compared to women, the economic pressure can make their fertility intention lower than women's. Both sides of husband and wife in one spouse as the only child and both husband and wife as not the only children family structure have significant differences on fertility intention. Both sides are not only children age couples of childbearing willing than only one party as the only children in the family fertility intention. A couples' age in the second child of different income levels has significant difference on fertility intention. Civil servants, teachers, staff and other business unit personnel's second child birth will be generally lower, and the private enterprise and self-employed second child birth will be generally higher. In this interview, we learned that although the implementation of the universal two-child policy for civil servants, teachers, and staff within the system unit of the nature of school-age couple is more beneficial, the young couple needs to care for the elderly, has mortgage repayments and a series of economic pressures, and pays more attention to personal freedom and the influence of the more modern concept of fertility. In addition, these respondents generally had higher educational experience; for the purpose of elite education for their children, more couples choose not to have two children. In Zhejiang province, the intention to have two children in both developed and less developed economic areas is the same; this may be due to the fact that the intention to have two children is more an individual personal subjective matter.

In family demands, considering that the work factor, and physical factor will hinder the fertility intention, and psychological factor can promote the couple have two children. Job factors and psychological factor can promote personal negative effects. From family resources, control risk and policy factors hinder the fertility intention, and the physical factor, psychological factor and family factor can promote fertility intention. Material factor and policy factor promote positive affect.

Negative affect and positive affect have significant influence on childbearing willingness, namely a negative affect will hinder the couples of a childbearing age's willingness, and a positive affect can encourage couples of a childbearing age's willingness.

In the presence of negative effects, in the three dimensions of family demand, a negative affect factor has partial effect on fertility intention. In the presence of positive feelings, in the six dimensions of family resources, a positive affect factor has partial effect on childbearing.

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# Study on Green Production Method of Friction Material

**Maoqing Xie**

*Jiangsu University, Zhenjiang, China*

Email: xmq@chinaclutch.com

**Peng Peng**

*Hefei University of Technology, Hefei, China*

Email: rocpeng@chnnanmo.com

**[Abstract]** *It's always a difficult problem to deal with the organic material, solid waste and harmful metals produced in the process of friction material production. This paper introduces a new process for reducing organic emission, a new material to reduce the use of harmful metal, and a solution to recycle solid waste, which can help to improve the green production of friction material industry.*

**[Keywords]** *friction material; organic waste gas; heavy metal pollution; reuse of waste materials*

## Introduction

With the development of the automobile industry, the friction material industry has also entered into a rapid developing period since the 1980s. Meanwhile, semimetal friction material and non-asbestos friction material have also developed a lot. At present, the resin or rubber matrix composites, NAO, copper substrate, and iron substrate etc. are made by the friction materials, which replaced the traditional asbestos friction material. Along with the industrial development, the problem of environmental protection is becoming more and more serious. A product's environmental impact is directly influenced by the environmental properties of the materials used such as energy costs, emissions involved in production and manufacturing phases, and recyclability (Giudice, Rose, & Risitano, 2005). The main environmental problems both at home and abroad are as follows:

1. How to reduce the use of organic materials and reduce VOC?
2. How to reduce the use of heavy metal?
3. How to deal with the waste?

Several methods are introduced to solve the above three problems.

### How to Reduce the Use of Organic Materials and Reduce VOC?

The organic compounds in the friction material include: rubber, resin and organic solvents (solvent oil, toluene, aromatic solvents), acrylic fibers and other large molecular compounds. This kind of organic material will produce the organic waste gas VOC through the hot pressing and then secondary vulcanization of the heating box. Currently, in the domestic market, the following three methods are commonly used to deal with the VOC:

#### ***Spray Tower***

The advantage of this is the small amount of investment, and the disadvantage is that it produces secondary pollution waste water, which still needs to be treated in another way, and it costs a lot.

### ***Activated Carbon Adsorption Device***

Activated carbon is mostly used to deal with VOC. It can absorb most kind of benzene waste gas, but it has a bad performance in adsorbing hydrocarbon. Activated carbon is not suitable for a humid environment. And after a period of time, you will need to update the activated carbon. And meanwhile, the old activated carbon must be processed by professional recycling units, which brings great pressure to the running cost.

### ***Regenerative Thermal Oxidation Furnace***

The principle is to burn the waste gas at a high temperature to the corresponding oxides and water. The advantage is that it can handle all kinds of organic waste gas, however, the disadvantage is that it costs a lot.

Among the above-mentioned three ways, the third method is most optimal from the effect. But some manufacturers use both the spray tower and activated carbon. All of these are the purification measures that need to be done after the emission of waste gas. The viewpoint of this paper is to control the production of organic waste gas from the very beginning, which is to reduce the use of organic materials.

Here, we introduce a kind of production technology of non-organic solvent, which will only reduce 80% organic gases. Organic solvent can not only produce organic waste, but also threatens the safety of production and workers' health.

The traditional production of clutch friction is one-step process and two-step process. The one-step process requires the use of organic solvents (aromatic solvents or toluene), and the two-step process also needs a large amount of methanol excepting organic solvents. Clutch facing factories consume thousands of tons of organic solvents each year in China. If the use of organic solvents can be reduced, a great contribution will be made to reduce organic emissions.

A German company first raised the concept of free-solvent production of clutch friction, and the French came up with a production plan with water as the solvent. From 2014, with the stronger and stronger environmental protection consciousness, some domestic factories began to develop these two kinds of new technology and new equipment. The present achievement is the free-solvent manufacturing process.

The principle of the free-solvent extruding process is to use a specific shape of the screw to rotate in the heating cylinder, which will press the rubber forward in the hopper, so that the glue will be melt evenly. The yarn is passed in the middle of the glue layer and the glue is wrapped within the yarn. With different molds, the glue is transformed into a consecutive glue layer. The wrapped yarn is made into a required clutch facing by the next process, such as hot pressing and abrasive machining. The screw extruder is the main machine to transport viscosity rubber. And its core structures include an extrusion device, transmitting device, temperature control device, feeding device, the fuselage, and frame, etc. And the main parts of extruder include the screw, cylinder and head. This kind of technological process has a safety production, high efficiency and less artificial demand. What is most important is that it can completely replace the one-step method or the two-step of production process. And it can finally achieve rubber process as a real green pollution-free production.

At present, the majority of domestic clutch facing companies have started to implement this technology and launched products. Gear pump system equipment can significantly reduce production costs, making the rubber products more competitive (Zhang, & Tan, 2007). This technology will be another revolution in friction material.

## How to Reduce the Use of Heavy Metal?

In China, until now there hasn't been any law or regulation against the use of heavy metals in friction materials. However, the U.S. and European countries have set laws on this for a long time. The United States and Japanese joint industry guide "JIG101A", stipulates antimony as a B material to declare. Antimony sulfide, which is usually used as a lubricant for friction materials, can produce antimony oxide after the oxidation. Antimony oxide has been suspected to cause cancer (Lu, Suo, Wang, & Lu, 2008; Lu, & Wang, 2009). And it's also harmful to the heart and the liver function. Meanwhile, the antimony element was listed as a priority-controlled pollutant by the US Ministry of Environmental Protection as early as 1979. Generally, lead is not directly used in friction materials. However, due to the problem of the quality of raw materials, the lead element can be detected in most domestic products. And lead elements come mainly from the copper fiber and some minerals. Lead chemicals always stay in the human body, and they are harmful. Copper has been widely used in friction materials such as copper substrate. In recent years, European and American countries have found that friction material in use will produce several micrograms to several milligrams of dust. And therefore, automobile brake dust sums up to 300000 tons per year in China. The dust containing metals such as copper, enters into the soil and rivers through the rain. And finally, this dust enters into the food consumed by human beings. Less use or no use of the metal materials are the environmental protection tasks for all countries.

Antimony, lead and cooper contribute a lot to the performance of the friction materials. How can the friction material meet the application requirements if the use of the above-mentioned three heavy metals is reduced? Here, we introduce a new synthetic material – potassium titanate.

Potassium titanate products have strong chemical stability, high temperature wear resistance, high temperature heat insulation, sound-absorption, and excellent properties such as insulation. In the 20th century, potassium titanate has been completely used in military field abroad. Potassium titanate is non-toxic, harmless and free from contamination, with the intermediate use as chemical fertilizer. It exists in a variety of products. What we recommend being used in friction material is six potassium titanate whisker. It is a national key research project of "863". We verify by the following experiment that six potassium titanate whisker can replace antimony, lead and cooper.

Test 1: 12 copies of organic phenolic resin, 10 pieces of styrene butadiene rubber, 40 composite fiber (excluding copper fiber), 10 components of friction properties containing sulfide antimony, and 28 portions of filler.

Test 2: 12 copies of organic phenolic resin, 10 pieces of styrene butadiene rubber, 50 composite fiber, 10 pieces of six potassium titanate whisker and 18 portions of filler.

Test equipment: DMS fixed speed friction test machine.

Test standard: GB/T 5764-2011

Test results: From the results, we can see Test 2 can completely meet the requirements of friction material, and it has the superior performance at a temperature of 350°C. And more important is that it can reduce the use of harmful metals.

Six potassium titanate whisker is now seldom applied because it costs a lot. However, with more and more strict environmental requirements and strong demand for the new materials, six potassium titanate whisker will be used widely in the future.

## How to Deal with the Waste?

The threat to the environment of the abandoned friction materials has been reported before. There is hardly friction between the friction material and the counterpart in the process of vehicle transmission and braking; this violent friction will inevitably lead to brake pads and brake discs or brake drum wear, and produce the corresponding particles (Li, Zhang, & Ren, 2003). According to the statistics, the friction waste quantity generally accounts for 10-20% of friction material production. And we can make the conclusion that the waste from friction materials in China is about 150000 to 300000 tons every year. Domestic friction materials factories lack the technology for waste digestion and reuse. The only solution is the centralized treatment of waste incinerators, which costs a lot. However, many factories treat the waste in a private way, which threatens environmental pollution. Here, a kind of waste reuse method is introduced. And different manufacturers can adopt it by their own situations.

Friction waste can mainly be divided into grinding waste and drilling waste. Each friction materials company has its own unique formulations. Here, it is set that it's a one-formula material.

- **Step 1.** We need to put the drilling waste crushed into powder particle with the size greater than 150 microns. According to our test, the raw material with the granularity more than 150 microns is most suitable for the friction material.
- **Step 2.** We mix drilling waste and the grinding waste prepared in Step 1 mix via a high-speed mixer.
- **Step 3.** Sift the mixture by the sieving equipment of different granules. It can be usually divided into 100microns, 150microns, 200microns and 250microns.
- **Step 4.** Test the friction performance of different granules with the help of the basic formula – resin 12, rubber 10, fiber 50 and mixed materials 28.
- **Step 5.** We select from the formula design according to the different friction properties of the four groups of mixed materials. The only principle is that the total utilization ratio is not more than 15%.

This solution of the waste treatment is a little bit complicated. However, it can not only solve the problem of the solid waste treatment, but also has a great economic effect. With the strict environmental protection requirements, it is believed that it can be widely used. Natural fiber composites are also claimed to offer environmental advantages such as reduced dependence on non-renewable energy/material sources, lower pollutant emissions, lower greenhouse gas emissions, enhanced energy recover and end of life biodegradability of components (Joshi, Drzal, & Mohanty, Arora, 2004).

## Conclusion

Although there are many difficulties in environmental protection for the friction materials industry, there are still many solutions. The success of non-asbestos and environmentally-friendly friction material development, fast and slow, will have an impact on the future development and survival of enterprises (Wang, 2008). Following are the suggestions we give according to the present situation:

### *Accelerate Technological Innovation*

In combination with its own situation, learn foreign experience, look for new materials, and new processes. Research and develop the products that do not contain and produce harmful substances.

### ***Detect Value and Self-Examine***

On the one hand, we need to well manage the raw materials suppliers, and on the other hand, we should entrust a third company with national recognition to help us do the supervision work.

### ***Share Resources and Integrate Industry***

We will strengthen peer exchanges, while not do low-end, repetitive production. We should focus on channel integration and business model innovation. Meanwhile investment should be put on the advanced technologies and equipment.

### ***Strengthen Internal Management and Establish Effective Systems***

All the staff in the enterprise should have the spirit of environmental protection. It is necessary to set up the internal rewards and punishment system in order to improve the working environment of the traditional friction material workshop.

The Chinese friction material industry has developed rapidly, and it plays an important role in the world. With the reshuffle and upgrade of the Chinese manufacturing industry, the future of the friction material industry will be more and more competitive. However, the opportunities will appear along with the challenges. Green production, energy conservation and environmental protection are the eternal theme. All the friction material enterprises should try their best to make the achievements so that the industry can develop healthily and orderly.

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# **The Study of the Impact of Customer Misconduct on the Retaliation and Leave Tendency of Front-Line Staff in Service-Oriented Enterprises**

## **– Based on Green Consumption Environment**

**Xie Fenghua, Gu Zhanhao, Dai Shuangya, and Fan Xi**

*Business Administration College, Zhejiang University of Finance & Economics,  
Hangzhou, China*

Email: 1038638842@qq.com

***[Abstract]** With the continuous development of the economy, people's awareness of environmental protection is increasing, thus green consumption is becoming more important. Based on the green consumption background, we study the impact of customer misconduct on the retaliation and leave tendency of front-line staff in service-oriented enterprises. The majority of service practitioners and customers have been in close contact in the service industry. In the "oppression" of the highest standards of the service industry – "customer first", service practitioners were forced to smile at customers who did the wrong thing. This study will explore the effect of customer misbehavior on the retaliation tendency and turnover intention of front-line service staff.*

***[Keywords]** customer misconduct; retaliation tendency; leave tendency; emotional disorder; green consumption*

### **Introduction**

At the beginning of the 1960s, the economic center of the developed countries in the world began to turn to the service industry. At present, the added value of the global service industry accounts for more than 60% of the national product. The development of the service industry is one of the most important ways to transform the growth mode, promote industrial upgrading and improve people's livelihood (Liu, 2010).

This research will take the influence of customer misconduct on employees' retaliation tendency and turnover intention in service enterprises as the main line. This study will discuss the mediating mechanism of emotional disorder in it in order to do a little bit for the field of service management

### **Literature Review**

Western scholars first proposed the concept of customer misconduct. Many service products require face-to-face communication between service staff and customers, so customer misconduct can cause short-term emotional distress or long-term psychological impact on employees (Harris & Reynolds, 2003). Emotional disorder is the emotional state caused by the inconsistency of the inner and external expressions of the employee. And emotional disorders have a great impact on employees (Heuven, 2006). Harris and Ogbonna (2006) confirmed the impact of customer misbehavior on the emotional disorder of the service staff during the study of the British catering industry. The service staff generally say that they do not show their true feelings when they suffer from the verbal insults or mistreatment of their customers. Karatepe, Yorganci, & Haktanir (2009) took 204 front-line hotel service staff as the object of an investigation and found that oral verbal attacks on customers had a significant positive impact on service staff's emotional disorders.

## **Theoretical Analysis and Research Hypothesis**

### ***The Impact of Customer Misconduct on the Retaliation and Leave Tendency***

Customer misconduct refers to the violation of norms of the consumption situation generally recognized or destroyed the normal order of customer consumption behavior (Fullerton & Punj, 2004), namely the customer service personnel of verbal attacks, unreasonable demands or some irregularities. And the different emotions will cause people's different behavior (Lazarus, 1991), with positive emotions and negative emotions and service personnel will have a completely different behavior tendency. According to the study of Frijda (1994), retaliation can reduce the pain of the individual. The individual would alleviate the negative emotion by retaliating the offender. Fitness (2001) also pointed out that when an individual feels humiliated, retaliation allows individuals to rebuild their dignity again. Skarlicki, Folger, and Tesluk (2008) found that when a front-line service person is being treated wrongly, it may lead to retaliation. Therefore, it is possible to speculate that the improper behavior of a customer will have a positive impact on the retaliation tendency of the service staff.

H1a: Customer misbehavior – Speech infringement has a positive impact on the retaliation tendency of the employees in the service type enterprises.

H1b: Customer misbehavior – unreasonable demands are positively affecting the retaliation tendency of the frontline employees of the service enterprise.

H1c: Customer misbehavior – irregularities are affecting the retaliation tendency of the frontline employees of service enterprises.

H1d: Customer misbehavior – Speech infringement has a positive impact on the turnover intention of the front-line employees in service enterprises.

H1e: Customer misbehavior – unreasonable demands are positively affecting the turnover intention of the frontline employees of service enterprises.

H1f: Customer misbehavior – irregularities are affecting the turnover intention of the frontline employees of service enterprises.

### ***The Influence of Customer Misbehavior on Emotional Disorder***

It could lead to an aggravation of emotional disorders among front-line employees when the front-line service staff communicate with unfriendly customers (Wegge, Vogt, & Wecking, 2007). Harris and Reynolds (2003) investigated front-line waiters in the American catering industry and found that employees hid their true feelings when they were faced with customers' abusive and rude treatment.

H2b: Customer misbehavior – Unreasonable demands are positively affecting the emotional disorder of the employees in the service - oriented enterprise.

H2c: Customer misbehavior – Irregularities are affecting the emotional disorder of front-line employees in service enterprises.

### ***The Mediating Role of Emotional Disorder in the Influence of Customer Misbehavior on Retaliation and Turnover Intention***

Ramana Kumar Madupalli and Amit Poddar's study confirmed that emotional disorders could lead to a tendency to retaliate for front-line service workers (2014). Rupp, McCance & Grandey's study found that emotional disorders could lead to a decline in job performance and an increase in turnover intention (2007).

H3a: Emotional disorders are positively affecting the retaliation tendency of the employees in the service-oriented enterprise.

H3b: Emotional disorders are positively affecting the turnover intention of the front-line employees in service enterprises.

H4a: Emotional disorders mediate in the influence of customer misbehavior – Verbal abuse on retaliation.

H4b: Emotional disorders mediate in the impact of customer misbehavior – Unjustifiable demands on retaliation.

H4b: Emotional disorders mediate in the influence of customer misbehavior – Violation behavior on retaliation tendency.

H4d: emotional disorders mediate the influence of customer misbehavior, verbal abuse, on turnover intention.

H4e: emotional disorders mediate the influence of customer misbehavior – Unjustified demands on turnover intention.

H4f: emotional disorders mediate the impact of customer misbehavior – Violation behavior on turnover intention.

## Questionnaire Design and Data Collection

### *Questionnaire*

Combined with the background of this study and the characteristics of specific objects, a questionnaire was conducted from the perspective of front-line service enterprise employees. This research questionnaire consisted of a 7-point scale. Based on the frontline staff of service industry and the background requirements of face-to-face situation, this paper selected three dimensions – verbal insults, unreasonable demands and violation behavior – to study customer misconduct.

**Table 1. Summary of Questionnaire Survey**

Distribution Form	Number of Questionnaires Recovered	Effective Number of Questionnaires	Effective Recovery Rate (%)
Wenuan Xing	145	122	84.1
Paper questionnaire	177	143	80.8
Total	322	265	82.3

## Data Analysis and Hypothesis testing

### *Reliability and Validity Test*

This study used Cronbach's alpha coefficient to evaluate the internal consistency of the measurement items to achieve the purpose of testing the reliability of the scale. As shown in Table 2, the Cronbach's alpha coefficients of each scale were between 0.761~0.940, all higher than 0.7. So, the measurement reliability of all scales reached a high level.

**Table 2. Summary Table of Reliability Analysis of Variables and their Dimensions**

Variables	Dimension	Alpha coefficient of each dimension	No. of Questions	Overall alpha coefficient of each scale
Customer misconduct	Verbal abuse	0.873	4	0.940
	Unreasonable demands	0.895	4	
	Irregularities	0.935	6	
Mood disorders	/	/	6	0.834
Retaliation tendency	/	/	5	0.868
Turnover intention	/	/	6	0.877
Involvement degree	/	/	16	0.802
Internal and external locus of control personality trait	/	/	6	0.761

**Hypothesis Test**

Regression analysis was used to test the theoretical model and hypotheses. In the three dimensions of customer misbehavior, the standardized regression coefficients of verbal aggression and violation behavior were 0.343 and 0.274. The t test showed that the significant differences were 0.000 and 0.000, which were significant at a given level of 0.001. This indicated that speech violation and violation had significant positive influence on retaliation tendency. However, the standard regression coefficient of irrational demand for retaliation tendency was -0.013. By t test, its significance was 0.863, greater than 0.05, which did not reach a significant level of 0.05.

The three dimensions of customer behavior on turnover intention of the standardized regression coefficients were 0.245, 0.220, and 0.238. The significance of t test was 0.000, 0.003 and 0.000, which were all significant at the significant level of 0.01. This indicates that verbal abuse, irrational demands and irregularities have a significant positive impact on turnover intention.

The three dimensions of customer behavior in violation of unreasonable demands, dysregulation of the standardized regression coefficients were 0.252, 0.412. The significance of t test was 0.000 and 0.000, which were both significant at the significant level of 0.001. This indicates that irrational demands and irregularities have a significant positive impact on emotional disorders.

**Conclusion and Practical Significance**

**Research Conclusion**

Regarding the current situation of the development of the service industry and China’s vacancies existing on the basis of the research on employee service enterprise perspective, this paper discussed the influence of three dimensions of customer misconduct to its retaliation tendency and turnover intention, and testes the dysregulation of the mediating effect and moderating effect of involvement. The results of the study showed that:

1. Verbal abuse and irregularities have a significant positive impact on retaliation tendency;
2. Verbal abuse and irrational demands and irregularities have a significant positive impact on employee turnover intention;
3. Irrational demands and irregularities have a significant positive impact on the emotional disorder of the front-line employees;

4. Emotional disorder has a significant positive effect on the tendency of retaliation and the tendency of turnover;
5. Emotional disorder plays an intermediary role in the influence of verbal abuse and irregularities on retaliation tendency;
6. Emotional disorder plays a mediating role in the influence of verbal abuse, irrational demands and irregularities on turnover intention.

### ***Practical Significance***

In order to eliminate the adverse effects of customer misbehavior on service enterprises and their frontline service staff, the key is to prevent the occurrence of customer misconduct. First of all, service enterprises should do well with the records of customer complaints and complaints, and also record the process of the development of typical customer misconduct events. Secondly, the enterprise can, from the aspects of acquisition and customer misconduct-related information, and get information from various sources, according to the problems, develop an in-depth study that is suitable for the enterprise's scientific service, and finally, minimize the occurrence of improper behavior of the customer. Ultimately, the service enterprises should improve their scientific service system, and make the above scientific service methods explicit.

For customer misconduct, only with through the enterprise's and service personnel's unilateral efforts, will the effect be certainly very small. The most important thing is to start from the customer and guide their education.

First of all, other customers have a tendency to attribute customer misconduct, and they tend to attribute the responsibility of misconduct to service-oriented enterprises. Secondly, the enterprise can, through the typical customer misconduct harm of front-line service case, trigger public event marketing, new thinking and reflection on customer misconduct, and cultivate public customer misbehavior harmful theory. Finally, according to the different types of misconduct at customer service enterprises, posting signs at the place of service or education cartoons, playing public video, service personnel are reminded of these methods, expressed or implied, as well as inappropriate sexual behavior or some immoral customer, and they advocate the public to boycott this kind of improper behavior, and guide customers to express consumption.

Although customer misconduct can be reduced to a certain extent by scientific service, it cannot be completely eliminated. So, to a certain extent, employees of service enterprises will encounter improper customer behavior. Management should be aware of the customer misconduct, frontline service personnel management, and the tendency for revenge mood disorder and turnover intention management, and take practical coping mechanisms.

### **Acknowledgement**

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# Research on Green Supply Chain Management and Practice Performance: A Case Study of An Aluminum Corporation

Qiongwen Cheng and Lu Zhou

School of Economics, Central South University, Changsha, China

Email: chengqw@csu.edu.cn; 744624692@qq.com

*[Abstract]* A green supply chain management practice subsystem, a management performance subsystem and system dynamics model system dynamics model of the influence of management practice on management performance are constructed in this work. On this basis, the data from an aluminum corporation have been well simulated. This paper constructs a green supply chain management practice subsystem and a management performance subsystem respectively, and a system dynamics model of the influence of management practice on management performance is established. Along with an aluminum company data related to data simulation, the results show that: (1) Under the double pressure of economic and environment, corporate environmental performance is rising slowly; (2) In order to achieve the best overall performance, which is represented by the total assets, the most suitable enterprise R&D conversion rate is 0.6001, and the green degree of the supplier product is 0.5005; (3) Unit raw material cost is the most important factor affecting the performance of green supply chain management performance of the electrolytic aluminum enterprises factor. It is suggested that entrepreneurs should give full play to the innovative spirit of management practice and take the initiative to adjust the investment structure, focusing their attention on technological R&D and cooperation with suppliers in the green industry to achieve a win-win situation in both economic performance and environmental performance.

*[Keywords]* green supply chain; management performance; system dynamics

## Introduction

The development goal of an innovation-driven strategy is to promote economic development and raise the overall social welfare level. Starting from economic quality, the intensive economic development mode should be promoted to realize the sustainable development of ecological economy and green economy (Liu, Wang, Jin, & Liang, 2016). From the experience of foreign innovation-driven development, the United States, Germany, Japan and other countries have formed a complete and innovative industrial development system, accumulated a great deal of experience and become one of the important factors influencing their international competitiveness. However, China still lags behind developed countries in terms of cleaner production, high-end manufacturing and circular economy. At present, the environmental situation facing our country is still grim and requires a large amount of funds to govern. The central government allocated special funds for prevention and control of the atmosphere, water and soil, respectively of 11.2 billion yuan, 14.0 billion yuan and 9.1 billion yuan (MEP, 2017). With the continuous progress of environmental supervision in the whole country, if the industry wants to continue to develop, it must choose to upgrade their green production and fulfill their business social responsibility. Green supply chain support promotes green management practices from the supply side and optimizes them among the environmental, economic and social benefits of high pollution and high energy consumption industries. Green Supply Chain Management (GSCM) can ease the pressure between market value and environmental performance so that companies can balance social responsibility with business needs (Rondinelli, & Berry, 1998).

Taking the great dilemma facing China's aluminum industry as an example: on the one hand, the production process of the aluminum industry has the characteristics of negative environmental externality.

In the case of unclear property rights, the production activities of aluminum enterprises may cause the welfare of the entire society to be impaired. On the other hand, as a national pillar industry, the profits of aluminum enterprises may be continuously reduced due to overcapacity in the industry. Nevertheless, the situation is more difficult for electrolytic aluminum enterprises in the aluminum industry chain. Therefore, the traditional supply chain based on the development model has been difficult to sustain innovation-driven transformation and in order to upgrade the aluminum industry, to optimize the allocation of elements of the aluminum industry, to improve the supply chain management structure, and to achieve corporate green supply chain management practices and performance improvement, then micro-profit electrolytic aluminum is one of the ways. As the concept of green supply chain management further spread, several micro-profit electrolytic aluminum enterprises have begun to explore the green supply chain management and practice, yet the effect is not satisfactory. Hence, one of the ways to solve the current environmental and economic problems faced by electrolytic aluminum enterprises is by exploring ways to influence the path analysis of management practices to improve the performance of green supply chain management in micro-profit electrolytic aluminum enterprises.

At present, domestic and foreign scholars have mainly focused on the definition of green supply chain management, the analysis of drivers, the performance evaluation and the selection of suppliers, and so on. The impact of green supply chain management practices on performance and its interrelationship is relatively small. Therefore, this paper takes “the impact path of green supply chain management practices on performance” as the research object, and uses system dynamics theory to comprehensively and systematically analyze the mechanism of each element and the interaction between them, and build a system dynamics model of impact path to carry out empirical research and simulation, to explore the key factors that affect the performance of electrolytic aluminum green supply chain management, to provide recommendations for improving the economic efficiency and environmental performance of electrolytic aluminum enterprises, and to provide a theoretical basis for their green transformation.

### **System Boundary Analysis**

Scholars, both domestic and abroad, have defined the concept of green supply chain management practices from scratch. After nearly ten years of research, the connotation of green supply chain management has been very richly explored. It is considered that the specific context of green supply chain management practices under the premise of considering the business context is quite necessary and they have put forward the five elements of green supply chain management as the manufacturing industry including the five elements of environment-friendly design, green procurement, internal environmental management, investment regeneration, and green cooperation with consumers. Hsu, & Hu (2008) in Malaysia, through the ISO14001 certification of research, defined the practice of green supply chain management as environmental design, green procurement and the reverse logistics of the three. Each of these three practices corresponds to the three processes of practice: Green Procurement, as the first process, indicates the resources necessary for the organization in the initial stages of carrying out supply chain practices; Green Design points out how to ensure performance in the process of supply chain management implementation; Reverse Logistics, the third process, is the embodiment of the post-supply chain operation practice in the enterprise, promotes business concerns on how to reduce environmental hazards and increase value Meacham, Green, Jr, Zelbst, & Bhadauria, (2013). In the study of the status quo and driving force of green supply chain management in Taiwan’s garment and textile industry and their interaction mechanisms, it was pointed out that in the clothing and textile industry, green supply chain management practice elements

mainly refers to the cooperation with suppliers and customers to reduce environmental pollution from the source management of product green design, product life cycle management and waste recycling. Liu Chunxiang (2016) built a green science and technology supply chain dimension system model around the design links, resource links, production links and other aspects of the supply chain and analyzed the internal relations and interaction mechanisms of each of the supply chain links.

Combined with the above documents, it can be concluded that the elements and contents of green supply chain management practices include three aspects: Internal practices (internal environmental management, green design, investment recovery), external practices (green procurement, cooperation between upstream and downstream) and post supply chain management practices (reverse logistics). Taking the actual situation of the energy-intensive electrolytic aluminum industry into account, this paper summarizes the management practices of the green supply chain into four aspects: Green Procurement, Internal Environmental Management, Green Design and Reverse Recycling Logistics.

For the construction of green supply chain management performance subsystem, taking into account the relevance and operability of evaluation indicators, in this paper, the green supply chain balance scorecard is used to evaluate the performance of green supply chain management. Enterprise green supply chain management is in the enterprise's overall production and service activities are fully integrated into environmental awareness. These production and services include design, procurement, manufacturing, packaging, shipping and more (Zsidisin & Siferd, 2001). The Green Supply Chain Balanced Scorecard combines the characteristics of the green supply chain itself from the perspective of the stakeholders, puts environmental factors into the traditional balance scorecard evaluation system and integrates green ideas that include environmental factors into the entire product life cycle of the supply chain (Yang, J., 2010). Using the green supply chain balance scorecard, this paper evaluates the performance of green supply chain management by selecting five indicators of finance, internal processes, customer service, innovation and development and green environmental protection. Throughout the green supply chain management system, a series of internal and external drivers exert a pulling or pushing force on the green supply chain management practices of enterprises, resulting in the corresponding performance, which in turn, will play a feedback role in driving and practicing green supply chain management (Zhu, Q., 2010). Therefore, this article will drive - practice - feedback into the same system for analysis. At the same time, in order to attain the basic green supply chain management practice investment, this article is under the assumption that the government regulation is effective, and the initial operating state of the enterprise is micro-profit.

## **Construction of SD Model**

### ***Construction of Green Supply Chain Management Practice System***

Green purchasing practices refer to the activities of electrolytic aluminum companies in purchasing green raw materials. In this process, we should consider the level of green cooperation with suppliers of alumina, and this level is mainly reflected by the greenness of products provided by suppliers. The green purchasing quantity of the enterprise is determined by the required output of the current period and the green degree of the supplier's product. The production capacity of the current period is determined by the capacity and the utilization rate of the current stage. The production capacity is the stock, and the new capacity is jointly determined by the new investment in the current period and the investment rate of production capacity. Profits affect the new investment in the current period, while raw material costs and inventory costs affect the current profit by influencing the total cost of the current period.

The elements of internal environmental management include the environmental management system, executive environmental commitment and cross-departmental collaboration. The environmental management system belongs to the system construction, which has long term stability, and the degree of perfection is set to constant in the model. Executive environmental commitment is affected by environmental performance and economic performance. The current profit impacts the current investment in staff training, and staff training affects employee skills and technical skills, including explicit and implicit cognition and psychology of environmental management, which are two common effects of the green degree of cooperation between departments, The internal environment management ability affects energy efficiency, the resource utilization rate and the waste emission index, and the three indexes jointly affect the environmental performance of the electrolytic aluminum enterprise.

The research on the driving factors of green design is mainly from the perspective of stakeholders. Hall (2000) believed that green design pressures includes legal pressures and non-legal pressures on consumers, customers, shareholders and environmental groups, etc. Zhu (2013) pointed out that the driving factors affecting the green supply chain management practice of enterprises are regulations, the market and internal factors. According to the analysis of the literature and taking this into account, management of internal dynamic factors in the role will affect the driving factors of green design and is defined as the top management green preferences, consumer preferences and green-to-green trade barriers as the representatives of the regulations. Green design will directly affect the design of energy and resource utilization rate, design of waste discharge design and the recovery of products.

Reverse recycling logistics can be measured directly by the amount of the green recycling of the electrolytic aluminum enterprises. In the current period, the new amount of recycling is the inflow variable of the amount of green recycling, and the current recovery processing quantity is the outflow variable of the amount of green recycling. The recycling amount is determined by the green recycling rate and the regeneration rate. The new amount of recycling is jointly determined by the amount of green waste products and the recovery rate. Current sales orders will affect the stock of aluminum consumption, and together with the product scrap rate will influence subsequent green waste product quantity and will affect green recycling.

### **Construction of Green Supply Chain Management Performance System**

Financial indexes are traditional indexes, with a focus on both profits and total assets (Chen, J. 2009). The task of the financial subsystem is to improve financial efficiency; the key issue is to obtain maximum profit based on existing resources; the key factor index is the profit rate, the degree of matching between the total assets and the scale of development.

The internal process subsystem reflects the process by which an organization creates overall value by organizing its production activities, starting with accepting customer orders, assembling enterprise resources for production, and ultimately delivering goods to consumers or completing service delivery. The essence of internal process management is to gather and coordinate various functions of the enterprise, reduce the cost of raw materials and finished product inventory, and improve the overall performance (Sun, 2009). The goal of the internal process subsystem is to achieve the highest operational efficiency and lowest production costs; the key issue is to control the inventory of raw materials and finished products; the key factor indicators are inventory, capacity utilization and costs.

The construction of the customer subsystem mainly considers that enterprises can provide stable products to their clients long-term. The selected evaluation indexes should focus on customer needs and

intentions. The main measurement indexes are customer satisfaction. The second-level indexes mainly include product qualification rate, on-time delivery rate and product greenness (Zhou, J. 2006). The Customer subsystem's mission is to improve customer satisfaction; the key issue is to make the supply of products to customer satisfaction standards; the key indicators are average order response time, product quality and product greenness.

The innovation and development subsystem is an "enhancer" for the three subsystems described above and is the cornerstone for improving processes, meeting customer expectations, and ultimately, reaping financial returns. Electrolytic aluminum technology innovation and staff development are directly related to the quality of its competitive advantage, which requires that electrolytic aluminum companies must improve their ability to develop new products and overall quality of staff (Yang, 2010). The goal of the innovation and development subsystem is to achieve financial performance through technological innovation and personnel development of the enterprise. The key issue is how to effectively utilize the internal resources of the organization. The key factors are R&D conversion rate, R&D investment and training investment rate.

The overall performance evaluation of the green supply chain needs to build a green subsystem in addition to the traditional supply chain to consider the factors, but also to pay attention to the degree of environmental protection and resource conservation (Gu, 2009). In this paper, based on the peculiarities of the green supply chain, we set out the index of environmental performance evaluation from the perspectives of energy conservation, resource utilization and waste discharge compliance. The mission of the green subsystem is to improve environmental performance. The key issue is to reduce the amount of waste discharged through resource and energy conservation through management practices. The key indicators are resource utilization, energy efficiency and waste emission compliance.

### **System Construction of the Impact of Green Supply Chain Management Practice on Performance**

Based on the above analysis, green supply chain management practice system mainly includes the four subsystems of green purchasing, internal environmental management, green design and reverse recovery logistics. The green supply chain management performance can be divided into financial, customer, internal processes, innovation and development and green five subsystems, and on this basis, according to the relationship between subsystems, we can build a systematic dynamic flow chart of the path of performance impact on green supply chain management practices.

There are 11 stated variables in the model, including internal environmental management capabilities, green design capabilities, patents, total assets, finished goods inventory, capacity, green recovery, raw material inventory, rate of change including internal environmental management capacity growth, green design capacity increase speed, new patent, new investment, product output, order quantity, new capacity, new recovery, recycling capacity, green procurement, green production, and other variables such as auxiliary variables and constants, for a total of 53.

In this paper, Vensim DSS software was used to simulate the model. The model contents were taken from the average of the same type of enterprises in the electrolysis industry that met the research conditions estimated by experts. The research period of the model was one year, and the whole research span was from 2005 to 2025.

## Empirical Research

This paper takes a certain electrolytic aluminum enterprise in Yunnan as an example, using the interviews of department managers and the audit reports of the company from 2005 to 2015. The aluminum smelting company is mainly used in electrolytic aluminum smelting and is the first national environment-friendly enterprise in the non-ferrous metal industry. The company has conducted a preliminary exploration of green supply chain management, and in recent years, the profit has been low, which satisfies the demand for case selection.

### *Establishment of the Equation of Variables*

Based on the theory of system dynamics and the current situation of the enterprise supply chain, this paper constructs the equation of SD model variable of green supply chain management practice based on the following methods:

1. The empirical formula was adopted for the relationship of general cognition, such as sales revenue = order quantity \* price.
2. Regression analysis was used to determine the equation of variables with high correlation, such as the determination of product qualification rate.
3. Experts were consulted to determine the relationship between variables such as market share and product greenness.
4. Research results were referenced to determine parameters such as the relationship between R&D investment and new patents.
5. Some parameters were difficult to estimate, and the trial and error method was used to test the possible values before the model was stable.
6. On the basis of these methods, this paper made a reasonable valuation of the parameters in the equation by referring to the relevant literature and analyzing the actual situation of the enterprises.

### *Model Inspection*

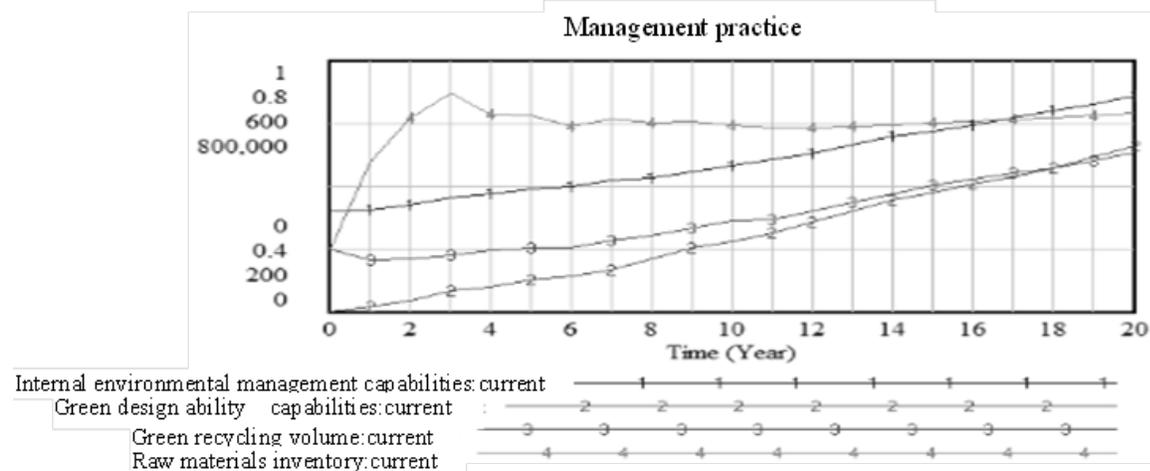
In the rationality of the structure, behavior model and consistency check, the authors found that the present construction of the green supply chain management practices on the performance of the influence of the path model structure was reasonable, the behavior was consistent with the actual system, and the model was relatively correct, truly reflecting the actual system structure and function. Because there was a certain degree of subjectivity in modeling the dynamic model and system dynamics, the need to test model was stable, so this article inspected key variables in the model by the stability of the state variables to represent the whole stability of the model. To reduce the time step from 1 (current) to 0.5 (current 2), and then to 1.5 (current 3), the change trend of the time step can be seen from 1 (current) to 1.5 (current 3). When the time step was reduced from 1 to 0.5, the change of the six state variables was not obvious. When the time step increased from 1 to 1.5, the green design ability, internal environment management ability and green recovery amount were basically unchanged. Raw material stocks have risen slightly from the first to the fifth year, with little change in the following 15 years. Although the number of patents and the total amount of assets decreased slightly before the adjustment, the change trend of the whole research span was basically consistent. The model was not sensitive to parameter changes and indicates that the model can be applied in practice.

The degree of generalization of the model in reality was determined by the fitting degree of the system dynamics model. The simulation data of the first 10 years of the model were compared with historical data, and the fitting degree of the model was measured by profit index. The average relative error of the average

value of the previous 10 years' profit and the actual data of the enterprise was 5.69%. Errors can control category, shows that the model has good fitting and high applicability, conforms to the enterprise actual situation, and this can, to some extent, provide directional guidance advice to enterprise in the green supply chain management practices in the process of decision-making.

### **Simulation and Results Analysis**

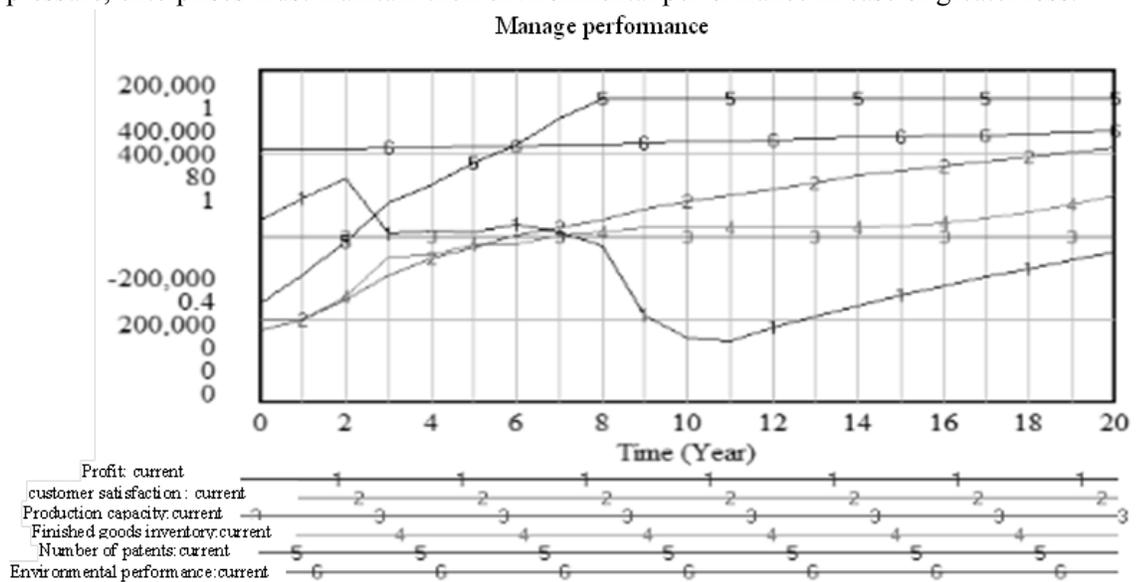
Green supply chain management practices accord to the development of green economy as a part of the development of green economy. Green economy transformation is a long-term behavior that takes a period of time to see the effects of inputs (Tong, Wang, & Yang, 2015). Combined with the above analysis, this study draws the trend of practice and performance of electrolytic aluminum enterprises' green supply chain management and provides data support for further analysis of green supply chain management system of electrolytic aluminum enterprises and follow-up policy simulation. Green supply chain management practices are measured by four indicators, which are raw material inventory, internal environmental management capabilities, green design capabilities and green recycling volume. The operation result of green supply chain management system main performance indicators is shown in Figure 1. The raw material inventories indicator of electrolytic aluminum enterprises peaked in 2008 and then declined slightly but remained at a high level due to overcapacity and insufficient capacity utilization resulting in a backlog of raw materials. The recycling volume in electrolytic aluminum companies increased yearly, which was due to enhanced green design capabilities that made the product recovery rate increased yearly. When the recycling rate remained unchanged, the stocks of recycling showed an upward trend. The green design capability shows an increasing trend under the dual motivation of green trade barrier becoming stricter and consumer green preference gradually emerging. In the context of a sound environmental management system, the capacity of internal environmental management has been growing yearly due to the linkage between senior management's environmental commitment and cross-sectoral green cooperation.



**Figure 1. Green Supply Chain Management Trends**

The performance of green supply chain management is measured by the six indicators, which are profit, customer satisfaction, finished goods inventory, capacity, number of patents and environmental performance. It is worth mentioning that, among all the indicators, finished goods inventory and capacity belong to the internal process subsystem. Due to the fact that the long-term nature of electrolytic aluminum production capacity was relatively stable over the time span of the study, it was not included in the trend chart. The operation result of green supply chain management system main performance indicators is shown

in Figure 2. Electrolytic aluminum companies' profits peaked in 2007, then began to decline. After a period of fluctuations and even profit loss, they increased slowly in the later stage. Customer satisfaction was influenced by the product yield and on-time delivery rate, showing an upward trend. Production capacity remained unchanged. Finished goods inventories, same as raw material inventories, were overshadowed by the large environmental impact of overcapacity. The number of patents in the first eight years maintained a steady growth trend and remain unchanged in the follow-up time. This is because in the first eight years the whole industry was in a profitable state, which could maintain a certain amount of R&D investment. When enterprises are at a loss state, the cost of research and development cannot be guaranteed. The environmental performance increase trend slowed down during the study period as a result of the decrease in profits, leading to low investment in corporate environmental protection. However, under external pressure, enterprises must maintain their environmental performance in case of greater loss.

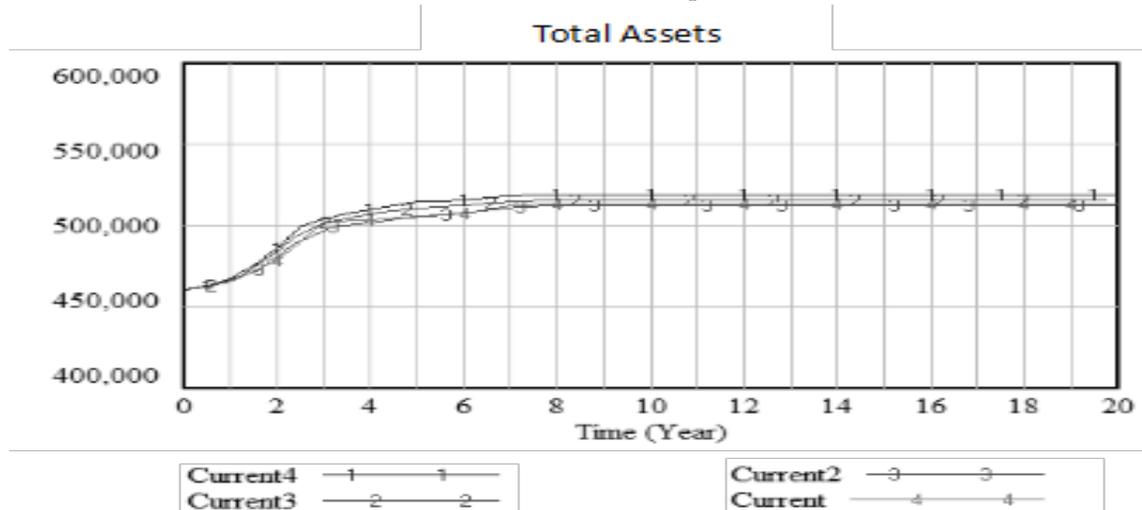


**Figure 2. The Performance of Green Supply Chain Management**

The system dynamics simulation was used to provide a basis for enterprise decision-making. The stability analysis shows that, when time step dropped from 1 to 0.5, most of the current performance was improved. And when time step improved from 1 to 1.5, approximately all the current performance deteriorated. In the paper, the simulation results of time step from 1 to 0.5 are discussed step-by-step and shown in Figure 3. The Current is time step=1, the Current 2 is time step=0.8, the Current 3 is time step=0.6, and the Current 4 is time step=0.5. When time step is maintained at about 0.5, the whole performance represented by the total assets is steadily improved to the optimal state, and at this time, R&D conversion rate is 0.6001 and supplier product green degree is 0.5005.

R&D conversion rate is not a definite formula. In this paper, R&D conversion is expressed as a ratio of how many patents accounted for the total profit of the enterprise, and it is used to measure the amount of money invested by an enterprise in developing a new product and patents. On one hand, the R&D conversion rate will affect the number of new patents, and as customer preference changes, it will ultimately affect the attractiveness of the product. On the other hand, R&D investment will occupy the resources of the enterprise, and on the premise of a certain profit of an enterprise, the entrepreneurial spirit is necessary to improve the R&D conversion rate. Therefore, enterprises need to give full play to the ability of entrepreneurs to meet the stable development of the enterprises and downstream consumer demand

preferences. In the process of green supply chain management and practice, the enterprises should not only consider the order response time, production plan and other factors, but also take the electrolytic aluminum enterprise and supplier alumina enterprise green cooperate level into account when choosing upstream suppliers, which mainly depended on the green degree of the suppliers' products. The green production enterprise's raw materials and product costs will affect the profit allocation of the enterprises and the subsequent investment decisions. Choosing a suitable green supplier will be a key part of the green supply chain management and practice. Based on the above factors, the optimal R&D conversion rate and product green degree means, upstream of the green supply chain management and practice in the process of production and downstream products of suppliers to meet the reasonable decision preference of consumer demand, can maximize both economic and environmental performance.



**Figure 3. Sensitivity of Total Asset to Time Step**

In order to further explore the impact of green supply chain management practices on performance, sensitivity analysis of the constants in the model was conducted, and the following results were obtained:

(1) Of the 12 controllable constants (R&D investment rate, investment rate, training and training effect, the average response time of order, demand fluctuation, scrap rate, regeneration rate, unit investment cost of raw materials, labor cost, inventory cost, production rate, and production rate), the 8 constants of green supply chain management performance (R&D investment rate, investment rate, training and training effect, the average reaction time, product orders scrap rate, regeneration rate, unit labor cost, and inventory cost) are insensitive, so the 8 key variables are not in constant promotion of green supply chain management performance improvement.

(2) R&D investment rate, training investment rate and training effect reflect the enterprise's R&D efforts and employee development levels. Only when the financial benefit of the enterprises reaches a certain extent and there is effective integration of all aspects of resources, R&D investment and training investment can they promote the performance of the enterprise.

(3) For the 4 sensitive factors, namely demand fluctuation, unit raw material cost, production rate and capacity investment rate, the simulation results showed that: the rise of demand fluctuation makes the overall performance rise, while the unit raw material cost increase leads to overall performance decrease. When the production rate speeds up, the overall performance increases, and when the productivity investment rate increases, the overall performance declines. Among them, the performance change of unit

cost of raw materials and production rate index are the normal phenomenon; the capacity investment rate increase performance decline is in the specific context of electrolytic aluminum industry overcapacity. However, fluctuations in demand led to the rise of overall performance increase is a point worthy of concern. With the increase in demand volatility, profits and patents also increased accordingly. but inventories of finished goods decreased. This is due to the fact that demand volatility affects the number of orders, which affects sales revenue and profits, and further affects R&D investments and patents. The result shows that the market shocks are not necessarily unfavorable conditions, and to some extent, they can promote enterprises to adjust production scale, and finally achieve better financial results.

After conducting sensitivity analysis of demand fluctuation, unit raw material cost and production rate by adjusting the values of three variables and forming different practice models, the results are shown in Table 1.

**Table 1. Sensitivity Analysis Variable Settings in Practice Modes**

<b>Practice mode</b>	<b>Fluctuation in Demand</b>	<b>Unit Raw Material Costs</b>	<b>Production Rate</b>
Practice mode one	0.15	0.5	0.7
Practice mode two	0.165	0.5	0.7
Practice mode three	0.15	0.45	0.7
Practice mode four	0.15	0.5	0.77

The first practice mode is the original mode, which was used to maintain demand fluctuations, the unit cost of raw materials and the production rate were unchanged in accordance with the existing green supply chain management model for simulation to predict future performance.

The second practical mode was to increase the volatility of demand by 10%, while the unit raw material costs and production rates remained unchanged. This mode was used to examine the impact of fluctuations in demand on the overall performance of electrolytic green supply chain management. The practical significance is that the market continues to fluctuate and the instability of product demand increases, forcing enterprises to make adjustments, coordinate their scale and adapt to the environment.

The third practical mode was to reduce the unit raw material cost by 10%, while the demand fluctuation and the production rate remained the same. It was used to examine the impact of unit raw material cost on the overall performance of electrolytic aluminum supply chain management. The practical significance includes two aspects. First, enterprises reduce their purchasing cost of raw materials by strengthening their cooperation with upstream alumina enterprises or scrap aluminum recycling enterprises. Second, enterprises should strengthen their environmental management of upstream alumina enterprises or scrap aluminum recycling enterprises, promote their green production, improve product greenness and reduce hidden costs of raw materials.

The fourth mode of practice was to increase the production rate by 10%; the fluctuation of demand and the unit cost of raw materials remained unchanged. We examined the impact of production rate on the overall performance of electrolytic aluminum green supply chain management. The practical significance is that enterprises should strengthen production management, improve production efficiency and speed up production progress. The simulation results of the four practical models are shown in Figures 4, 5 and 6.

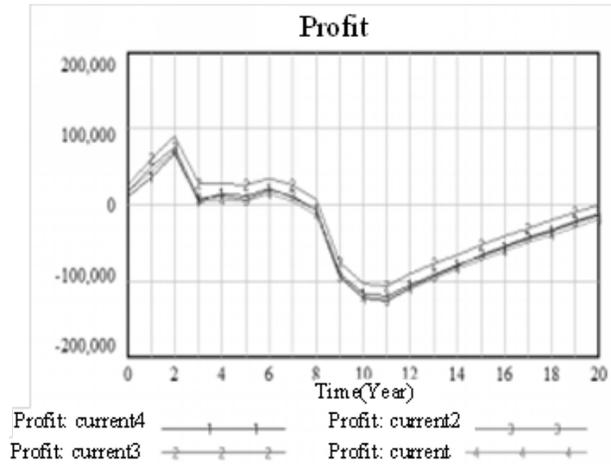


Figure 4. Four Modes of Profit

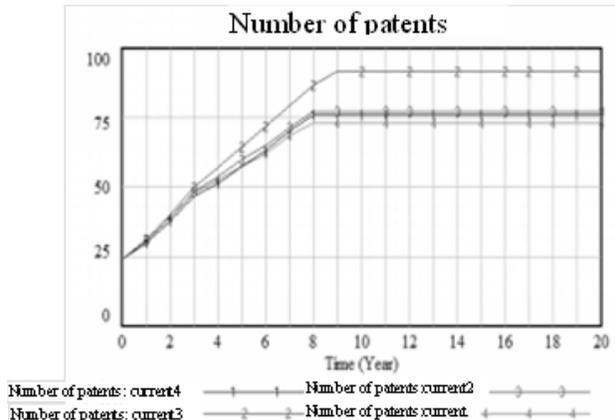


Figure 5. The Number of Patents in Four Modes

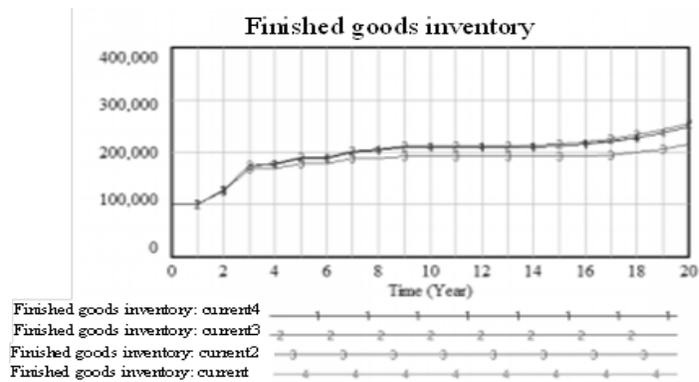


Figure 6. Finished Goods Inventory in Four Practice Modes

From the simulation results, it can be concluded that for the profit and number of patents, the third mode of operation achieves the best result, and the second practical mode is the best mode of operation for the finished product inventory. Based on this comprehensive study of best performance, results indicate that the unit raw material cost is the most sensitive factor in the overall performance of electrolytic green supply chain management. This conclusion is in line with the reality.

### Conclusion and Inspiration

Based on the analysis of the green supply chain management practice subsystems and management performance subsystems, this study built a systematic dynamic model of the impact of green supply chain management practices on the performance of enterprises, using field interviews and the audit report from the years 2005-2015 of an aluminum company for simulation. The research shows:

The environmental performance of electrolytic aluminum enterprises indicated a slow growth trend over the past 20 years: this was due to the fact that enterprises were unable to invest too much in environment protection because of poor economic performance. However, under the dual pressures of market demand and green trade barriers, enterprises must improve environmental performance on the basis of ensuring economic performance to avoid greater losses.

In the path system of the impact of green supply chain management practice performance in electrolytic aluminum enterprise, when the time step is maintained at about 0.5, the overall performance will be steadily

upgraded to the optimal state. In this state, the most appropriate R&D conversion rate and supplier product greenness are 0.6001 and 0.5005, respectively.

Among the 12 controllable constants, the performance of green supply chain management did not respond sensitively to the eight constants, which are R&D investment rate, training investment rate, training effect, the average response time of order, product rejection rate, regeneration rate, unit labor cost and unit inventory cost. For the four sensitivity factors, namely demand fluctuation, unit raw material cost, production rate and capacity investment rate, the increase of fluctuation of demand and production rate will lead to the increase of overall performance, while the increase of unit raw material cost and capacity investment rate will lead to the decrease of overall performance. Unit raw material cost is the most crucial factor that affects the performance of electrolytic aluminum enterprises in improving green supply chain management.

According to the conclusion of the study, the revelations of this article are as follows:

1. When enterprises reach a certain level of profitability, they will actively adopt green supply chain management practices to produce high environmental performance. On the one hand, in the context of supply-side reform, enterprises continuously improve their practical ability of green supply chain management, promote continuous accumulation of economic performance, and finally, enter the virtuous circle of independent and active green supply chain management; on the other hand, the core of supply-side reform stimulates entrepreneurial innovation vitality, which in turn, relies on the innovative management practices (Cheng, Luo, & Liu, S, 2016). If the managers of electrolytic aluminum enterprises do not attempt to change their traditional supply chain mode, they will not be able to meet the requirements of supply-side reform of “going to production, stock removal, deleveraging, lowering costs and making up shortcomings”. A certain level of profitability is the threshold for micro-profit electrolytic aluminum enterprises to practice green supply chain management. However, to achieve a win-win situation of economic performance and environmental performance, innovations in management practices also need to be relied on. Green supply chain management requires more than the traditional supply chain, but a considerable part of the managers still pin their hopes on government subsidies and macroeconomic environment improvement, which needs for the government to reduce the direct subsidies to enterprises and increase support for enterprise research projects so that the market can choose those managers who have the ability to innovate, encouraging electrolytic aluminum enterprises to actively adopt green supply chain management practices to achieve the improvement of social welfare.
2. In the green supply chain management practice of electrolytic aluminum enterprises, it is necessary to determine the matching R&D conversion rate according to their comprehensive performance status and select the raw material suppliers that meet the green degree of products. Under the pressure of overcapacity and shortage of resources, enterprises need to take the initiative to adjust the investment structure: they should not excessively pursue investment in patent research and development and improvement of staff quality, or blindly focus their practice on reducing the reaction time of orders and increasing the rate of regeneration. They should balance between the various elements of resources to improve efficiency of resource utilization. Enterprises should focus their performance improvement on the green cooperation with the upstream alumina enterprises or waste aluminum recycling enterprises to reduce their purchase cost of raw materials and select the suppliers with suitable green degrees of raw materials.

3. Innovation driving the overall performance of electrolytic aluminum green supply chain can fundamentally enhance the competitiveness of micro-profit electrolytic aluminum enterprises. For micro-profit electrolytic aluminum enterprises, the unit raw material cost and capacity investment rate will lead to overall performance decline, but by making use of knowledge, technology and other elements, based on the limited traditional factors of production, production methods can be optimized, quality of workers will be enhanced, resources will be redistributed, and efficiency of the use of traditional factors of production will be improved, thereby reducing unit costs and improve capacity utilization. Ultimately, the goal is to improve the market competitiveness of micro-profit electrolytic aluminum enterprises by further adjusting the structure of the supply chain, investing in projects of high quality and adding high value to enhance the attractiveness of products.

The system in this study included more than a dozen direct and indirect factors that affect the economic performance of green supply chain management. It is worth mentioning that the two system constants of “product unit price” and “consumer green preference” are beyond the control of the enterprises, therefore concerns about the product price trend and consumer green preferences trend can amend the model in time to provide a more effective reference for the practice of the enterprise in the new economic situation.

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# **An Empirical Study on the Impact Factors of Employment in Private-Owned Large and Medium Companies in Chinese Manufacturing Industry: Based on Data of Listed Companies**

**Zhou Huiwen**

*School of Public Administration, Zhejiang University of Finance & Economics,  
Hangzhou, China*  
Email: zhu@zufe.edu.cn

**Liu Hui**

*School of Business Administration, Zhejiang University of Finance & Economics,  
Hangzhou, China*  
Email: liuhui@zufe.edu.cn

*[Abstract] Based on the data of 810 private-owned listed enterprises in China's manufacturing industry, this paper analyzes various factors that affect the employment in different regions under the influence of industrial transfer. The result shows that local market environment plays a key role in promoting employment. Other factors such as total asset, fixed asset and intangible asset positively contribute on some level on employment issue, while tax burden makes a negative contribution. Nowadays, private-owned enterprises have been the major providers of employment opportunities in China. In the future, sustainable employment, to some extent, may depend on the local government to improve the macro market environment and the enterprise to enlarge intangible asset and optimize management.*

*[Keywords] employment; private-owned enterprises; manufacture industry; investment*

## **Introduction**

China's manufacturing industry has gained very obvious comparative advantages internationally and its employment scale is ranked top in the world; millions of job opportunities exist in manufacturing industry. The large and medium-sized enterprises in the manufacturing industry have the leading effect, which is conducive to the formation of advantageous industries and a manufacturing industrial chain with a competitive advantage, so as to drive the growth of a large number of medium, small and micro manufacturing industries, bringing prosperity of other related industries and finally, greatly promote the local employment growth.

At current, as the pillar industry of the national economy of China, the private-owned manufacturing industry serves as the dominant sector for economic growth and basis for job security. Since enterprises pay more attention to performance, they are greatly affected by market environment factors. This paper analyzes the employment situation of listed large and medium-sized non-state manufacturing enterprises in China in order to explore the impact of their asset allocation behaviors, management levels and business environment on the number of employees.

## **Literature Review**

Internationally, manufacturing employment is under the influence from both home and abroad. Drucker (2014) examined the relationship between the regional industrial structure and employment change in the manufacturing sector and nineteen subsectors in the United States from 1987 to 1997. The relative associations of economic diversity, industrial specialization and competitive structure with economic performance were assessed using a non-causal regression framework. The findings suggest the

importance of an industrial competitive structure for understanding regional employment change. Since India opened up to international trade in the early 1990s, the manufacturing sector, in particular, has increased phenomenally. The direct impact of trade on manufacturing jobs has been positive. However, the trade-induced decrease in labor demand has neutralized direct job gains to a great extent. Therefore, unlike other Asian economies, the overall employment gain from trade has been minimal. Vashisht (2016) argues that supply side constraints should be addressed urgently to enhance job gains from international trade. Globalization has, for decades, been associated with a rise in the female share of employment. Tejani, and Milberg's study concludes that the capital intensity of production, evidenced by shifts in labor productivity, is negatively and significantly related to shifts in the female share of employment in manufacturing, while exports are statistically insignificant (2016).

The studies of employment have focused on the manufacturing industry in China in recent years and found that both the macroscopic and microscopic factors had a direct impact. The discussion of the employment growth in China's manufacturing industry reveals that with the scientific and technological progress and the industrial structure adjustment, the industries absorbing the laborers have gradually shifted from the original labor-intensive industries to the knowledge and capital-intensive industries with the new demand of the compound, high-tech and high-skilled talents (Li Zhen, & Wei Tianwei, 2008). Overall manufacturing and high-tech industries' export trade has played a significant role in promoting employment in China, and the influence on employment in the Eastern region is greater than that in the Central and Western regions. Imports of the overall manufacturing industry have a significantly negative effect on employment in the Eastern region, but a positive one on employment in the Central and Western regions (Geng & Yan, 2016; Xiao, 2017). A study of the dynamic labor demand of 508 listed manufacturing companies in Shenzhen and Shanghai found that the expansion of the total assets scale of the listed manufacturing companies could significantly drive employment (Li, W., 2013). Market reaction of job creation is faster than job destruction, which implies a benign characteristic of job dynamics. Export contributes the most to job creation and mainly affect inter-sector job reallocation (Qu, Gao, & Jia, 2016). The elasticity coefficient of the labor input in China's labor-intensive manufacturing industries was still higher than that in the capital-intensive manufacturing industries, but the labor-intensive manufacturing industries' absorption capacity of laborers was reduced, leading to the obvious slow growth in the number of jobs (Wang, & Sun, 2014). A study of 28 sectors in China's manufacturing industry indicated that the technological progress of the manufacturing industry was positively related to the employment, and the technological progress of the medium and low-tech industries could promote the employment demand more obviously (Zeng, & Liug, 2014). Real market potential is not beneficial to female employment in state-owned and foreign companies, but significantly promotes female employment in non-state-owned domestic enterprises and labor-intensive industries (Li, H., et al., 2014).

Thus, the manufacturing industry is the main channel for employment in China. For a long time, despite two fluctuations of the total employment, the manufacturing industry has still absorbed a large number of laborers. Now, the manufacturing industry is undergoing an industrial upgrading and transformation. Under the influence of government policy, social environment and internal management, its future employment situation is complex and uncertain.

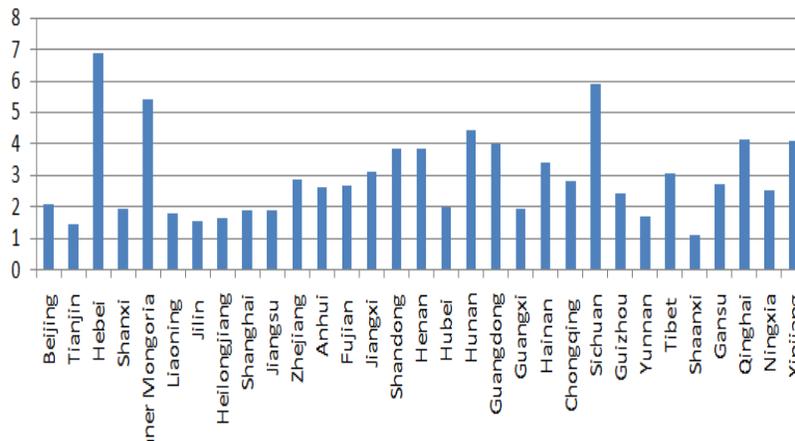
## Sample and Descriptive Statistics

### *Selection of the Research Samples*

According to the industry classification method of the Guidelines for the Industrial Classification of Listed Companies, Class C listed manufacturing companies were selected for this study. After excluding enterprises marked as Special Treatment Stock, the numbers of employees of those companies varied from 6000 to 550,000. In order to make an in-depth study of the employment absorption in China's manufacturing enterprises, the paper excluded the companies with a small number of employees, minimized the interference with the financial statements due to the merger of listed parent companies and focused on those having a large number of employees and having comprehensive production and operation activities; we tried to select large and medium-sized enterprises with more than 300 employees with reference to the classification standard of large and medium-sized enterprises. After excluding those with less than 300 employees, there were 1270 large and medium-sized enterprises, including 810 private-owned ones.

### *Data Description*

The 810 private-owned listed manufacturing companies were located as follows: 588 were in the eastern provinces with the average number of 3060 employees, 133 were in the central provinces with the average number of 2925 employees, and 84 in the western provinces with the average number of 3908 employees. The sample companies were mostly concentrated in the eastern provinces. The average number of employees of all enterprises was about 3000 to 4000. The figures of the companies in the eastern and central provinces varied little, but that of the companies in the western provinces was about 30% more. From the data analysis of the different provinces (see Figure 1), Hebei had the most employees with an average number of 6868 employees, followed by Sichuan, Hunan, Inner Mongolia, Qinghai, and Xinjiang, etc. The average numbers of employees in Beijing, Shanghai and Tianjin were smaller, reflecting the characteristic of the division of the industrial structure. The labor-intensive enterprises are gradually transferring to the second and third-tier cities and provinces.



**Figure 1. Average Number of Employees of Private-Owned Sample Manufacturing Companies in Different Provinces (millions)**

### **Model Specification and Regression Analysis**

To analyze the influence of all kinds of capital inputs of the enterprises on the demand of the human resources quantity, we drew on the experience of the studies of Qin, & Meng (2011) and Xu, & Fang

(2015). Also, our analysis considered the availability of the indicators and the factors affecting the number of employees of the non-state manufacturing enterprises. The indicators can be roughly divided into four categories:

1. Asset allocation. Usually, the fixed assets (Asset<sub>1</sub>) and the total assets (Asset<sub>2</sub>) were selected for study. In this paper, intangible assets (intAssets) was also taken as an indicator. Previous studies have not yet given full attention to it, but it can reflect the innovation and value promotion capacity of the manufacturing enterprises.
2. Management. It's represented by asset turnover. Goodwill is also added to be an indicator. It can represent the reputation of the products and services of the enterprises, the potential economic value of bringing excess profits for the enterprises in the future or the capitalized value that the expected profitability of one enterprise exceeds the normal profitability of others in the same industry.
3. Management scale and profitability. It's represented by turnover and net profit. Their good growth will increase the employment demand level of the enterprise.
4. Indicators related to the management environment. They are represented by tax and marketization. It is generally considered that the higher tax has a negative impact on the enterprise's employment absorption ability; the marketization index of different places measured is taken as the local marketization (Qing, 2016).

It can be seen from the correlation coefficient in Table 1 that the correlation coefficients between the number of employees and asset turnover, taxes, net profit, turnover, Asset<sub>1</sub>, goodwill, intAssets and Asset<sub>2</sub> are significantly positive (the correlation coefficients were 0.130, 0.583, 0.490, 0.690, 0.578, 0.172, 0.644 and 0.674, respectively) at the level of 0.01.

**Table 1. Correlations**

Variable	Mean	Std. Dev.	Employee	Manage	Tax	Net-profit	Turn-over	Asset <sub>1</sub>	Asset <sub>2</sub>	Goodwill	int-Assets	Market-ization
Employee	3125.56	8335.377	1									
Manage	86.99	78.420	0.130**	1								
Tax	13546.94	31922.775	0.583**	0.117**	1							
Netprofit	17212.10	42236.770	0.490**	0.157**	0.795**	1						
Turnover	248483.27	606494.744	0.690**	0.328**	0.799**	0.637**	1					
Asset <sub>1</sub>	77967.7140	1.87852E5	0.578**	0.037	0.565**	0.443**	0.597**	1				
Asset <sub>2</sub>	323858.55	595664.271	0.674**	0.067	0.774**	0.633**	0.775**	0.857**	1			
Goodwill	1879.64	9293.906	0.172**	-0.010	0.149**	0.156**	0.208**	0.107**	0.252**	1		
intAssets	14815.90	36936.677	0.644**	0.047	0.639**	0.415**	0.665**	0.669**	0.776**	0.294**	1	
Market-ization	13.71	5.878	0.056	-0.013	0.038	0.021	0.028	-0.026	-0.015	0.023	0.019	1

\*\*Correlation is significant at the 0.01 level (2-tailed).

Table 1 shows the correlations among different explanatory variables. The level of correlation between Asset<sub>1</sub> and Asset<sub>2</sub> was the highest with a correlation coefficient of 0.857. Considering the great impact of those two variables on the number of employees, two regression equations were established with these two variables separately to avoid multicollinearity, and put forward a following basic multivariate linear model.

The paper applied stepwise regression to screen the appropriate explanatory variables for the equations. After that, the tolerance tests, variance inflation factor (VIF) and characteristic root tests were used to examine the established model. The results show that the model has no multicollinearity.

**Table 2. Private-Owned Manufacturing Enterprise's Employment Absorption Ability Regression Model**

	Model 1		Model 2	
	<i>Coefficients</i>	<i>t</i>	<i>Coefficients</i>	<i>t</i>
<b>Manage</b>	-5.200	-0.382*	-4.518	-1.590
<b>Tax</b>	-0.047	-1.849***	-0.056	-3.931***
<b>Netprofit</b>	0.031	-3.345***	0.029	3.574***
<b>intAssets</b>	0.067	3.955***	0.065	7.195***
<b>Goodwill</b>	-0.025	7.742	-0.042	-1.875*
<b>Turnover</b>	0.007	-1.124***	0.006	9.313***
<b>Asset<sub>1</sub></b>	0.006	10.152***		
<b>Asset<sub>2</sub></b>			0.003	3.837***
<b>Marketization</b>	62.604	1.879*	65.872	1.972**
<b>Constant</b>	-213.639	-0.382	-406.126	-.712
<b>R<sup>2</sup></b>	0.561		0.560	
<b>AdjustR<sup>2</sup></b>	0.556		0.556	
<b>F</b>	127.755		127.547	
<b>N</b>	810		810	

Note: \*, \*\* and \*\*\* represent significant at the 0.10, 0.05, and 0.01 level (2-tailed), respectively.

In Model 1 of Table 2 (Asset<sub>1</sub>), the results show the regression coefficient of tax is significantly negative at the level of 0.01 and more taxes will have a negative impact on the number of employees of the enterprise. The regression coefficient of asset turnover is negative with weak significance, so there is little evidence that management has a negative impact on the number of employees of the enterprise. The regression coefficients of net profit, intAssets, turnover, Asset<sub>1</sub> and marketization index are significantly positive at the level of 0.01, indicating that the higher those indicators are, the more employees the enterprise will have. Among them, the impact of the degree of marketization is the greatest. The regression coefficient of goodwill is not significant, so it has no effect on the number of employees of the enterprise.

In Model 2, Asset<sub>2</sub> replaces fixed assets to enter the model and the result is roughly the same as that of Model 1. The difference is that the regression coefficient of goodwill is significantly negative at the level of 0.05 and the impact of the degree of marketization is more significant.

### Conclusion and Suggestions

This paper selected 810 listed large and medium-sized non-state manufacturing enterprises in China as the research objects to analyze their employment absorption capacity. In addition to total assets, fixed assets and other indicators which are commonly used by other researchers, the paper also looked at the impact of the management level of the enterprises and the degree of local marketization. Moreover, it used two indicators of intangible assets and goodwill to observe the impact of the competitive advantages of the non-state large and medium-sized enterprises in the long term operation. Based on the analysis, we put forward the following main points:

1. The average number of employees is small in the non-state manufacturing enterprises in Beijing, Shanghai and other central cities in the mainland and western provinces. This indicates that the

labor-intensive enterprises have begun to shift from the mega cities and coastal areas to the central provinces.

2. Higher total assets, fixed assets, net profit and turnover of the non-state manufacturing enterprise leads to a larger number of employees; the degree of local marketization has a great impact on investment and employment. A good marketization situation can promote the enterprises' employment absorption capacity, indicating that the current non-state enterprises are sensitive to the business environment.
3. Larger amounts of intangible assets improve the tax capacity of the large and medium-sized non-state manufacturing enterprises, increase their turnover and net profits and enhance their employment absorption ability.
4. The improvement of the management levels of the large and medium-sized non-state manufacturing enterprises may raise the labor efficiency and reduce their employment absorption capacity. However, it's conducive to making full use of their human resources, improving their market competitiveness and ensuring stable employment in the long run.

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# Attractiveness Evaluation of Land Resources Development in Tourist City: A Case Study from Jiujiang City

**Cifang Wu**

*School of Public Administration, Zhejiang University, Hangzhou, China*  
Email: 39477622@qq.com

**Jun Zhang**

*School of Public Administration, Zhejiang University, Hangzhou, China*  
Email: zj6262666@126.com

**Xi Li**

*Beijing Institute of Control and Electronic Technology, Beijing, China*  
Email: htlx123@sina.com

***[Abstract]** The attractiveness evaluation of land resources development is the basis for the optimization of land spatial development in tourist cities. In particular, this study assessed the attractiveness of land resources development in Jiujiang, China. Principle component analysis was selected to assess the values of attractiveness in land resources development. Results shows that the attractiveness of land and resources development of all counties in Jiujiang in 2014 has significantly improved compared with that in 2009. In addition, there is a spatial difference of attractiveness of land resources development among the 11 counties in Jiujiang.*

***[Keywords]** land resources; development attractiveness; attractiveness evaluation*

## **Introduction**

Tourist cities pay more attention to green development. But green development may restrict investment in tourist cities. This phenomenon reduces the economic development in tourist cities. The attractiveness of land resources development refers to the capability of land resource development to attract funds, talents, labor forces, materials and equipment, technologies and information (Wu, Fei, & Ye, 2011; Ustinovichius, Barvidas, Vishnevskaja, & Ashikhmin, 2011; Pemberton & Morphet, 2013). The development of land resources directly affects the comprehensive competitiveness of a city (Ruijgrok, 2006; Fürst, Volk, Pietzsch, & Makeschin, 2010; Gerber, & Loh, 2011). During the stage of emphasizing green development, it is crucial for the development of tourist cities whether they can balance land resources development and environmental protection so as to achieve sustainable development (Cataldo, & Rinaldi, 2010; Dikou, Papapanagiotou, & Troumbis, 2011). Therefore, the attractiveness of land resources in tourist cities is one important index for the development potential in prompting green development. Jiujiang is a typical tourist city in China, so we selected it for analyzing the characteristics and evaluating the attractiveness of land resources development in tourist cities.

Jiujiang city is located in the northern part of Jiangxi Province, in the middle of the Beijing-Kowloon Railway. It is on the south bank of the middle and lower reaches of the Yangtze River at the junction of the four provinces of Jiangxi, Hubei, Hunan and Anhui provinces. When considering economic location, Jiujiang is at intersection of the three major economic development zones of the Yangtze River, Poyang

Lake and the Beijing-Kowloon Railway. The topography of Jiujiang city is quite complex and diversified, constituted by hills, mountains, lake plains and plains along rivers with Jiangnan hilly land.

We specifically attempt to (1) put forward an indicator system for attractiveness evaluation of land resources development, (2) assess the attractiveness of land resources development in Jiujiang, and (3) analyze the reasons that cause the differences in the attractiveness of land resources development in Jiujiang.

## **Data and Method**

### ***Data***

In this study, the data from 2009 to 2014 of every county (cities and districts) of Jiujiang City were selected as samples. The primary data affecting the attractiveness of land resources development were collected from the Statistical Yearbook of Jiujiang, the National Economy and Social Development Statistical Bulletin of Jiujiang, and the Land Use Planning (2006-2020) of Jiujiang City. The data were also collected from relevant government websites of Jiujiang, such as those of the Bureau of Statistics, Environmental Protection Agency, Transport Bureau, and the Administration for Industry and Commerce, etc., as well as CNKI China Economic and Social Development Statistics Database and other reliable statistical information websites of Jiujiang City.

### ***Indicator System***

Based on the analysis of the factors that affect the attractiveness of Jiujiang's land resources development, an index system to evaluate the attractiveness of land resources development was constructed by summarizing and classifying the factors in terms of nature, market, society and culture, and government (See Table 1). Among the evaluation index system of attractiveness of land resources development, the degree of land resources dominance and the degree of land resources coordination are the key indicators that are difficult to quantitatively characterize (Yi, 2015). The degree of land resources dominance is a concept of comparative advantage, which is measured by comparing the advantages and disadvantages of the quantity, quality and intensity of the land resources of a certain area with other areas, and by comparing those land resources with other resources in the same area. The measurement of the degree of land resources dominance needs to consider the requirements of comprehensiveness, dynamics and dominance. By comprehensively comparing the advantages and disadvantages of land resources of Jiujiang City with other cities in Jiangxi Province and comparing those land resources with water resources, tourism resources and mineral resources, the comprehensive comparative value is obtained to characterize the degree of land resources dominance. The degree of land resources coordination mainly refers to the degree of variety and compatibility among different types of land resources. The degree of land resources coordination in this study was obtained using the expert scoring method. Specifically, we invited 15 experts to grade and score based on their understanding of the spatial distribution and combination of land resources of Jiujiang City, and then carried out weighted calculation based on those scores. Regions with higher degrees of land resources dominance and coordination can promote a stronger agglomeration effect and thus, create stronger attraction for the development of land resources.

**Table 1. The Nature of the Evaluation Index for Attractiveness of Land Resources Development**

Elements	Index	Sub-index	Nature of the index
Natural Elements	<i>Land Resources</i>	Degree of land resources dominance	Quantitative
		Coordination degree of land resources	Quantitative
	<i>Natural environment</i>	Domestic tourists	Quantitative
		Excellent air quality rate	Quantitative
Market Elements	<i>Market demand</i>	permanent residents	Quantitative
		Urbanization rate growth	Quantitative
		GDP	Quantitative
		GDP growth rate	Quantitative
		Per capita GDP	Quantitative
		Urban per capita disposable income	Quantitative
	<i>Market competition</i>	Region development site area	Quantitative
		Per ten thousand capita over-hundred -million-yuan investment projects	Quantitative
Social and Cultural Elements	<i>Infrastructure</i>	Per capita road area	Quantitative
		Per ten thousand capita public (electric) buses	Quantitative
		Total passenger volume	Quantitative
		Total freight	Quantitative
		Regional gas penetration	Quantitative
		Per capita sewage pipe length	Quantitative
		Year-end comprehensive production capacity of water supply	Quantitative
	Telephone users	Quantitative	
<i>Education information</i>	Per capita education expenses	Quantitative	
Government Elements	<i>Law and policy perfection</i>		Qualitative
	<i>Government regulation and control efforts</i>		Qualitative
	<i>Government efficiency</i>		Qualitative
	<i>Impact of land and resources development in the peripheral areas on the evaluation areas</i>		Qualitative

**Metrology Model**

In this study, the factor analysis model was first used to analyze the original data with SPSS16.0. The factor extraction method was Principle Component Analysis (PCA). Formula (1) was applied to calculate the contribution of the principal component numbered *i* to the problem to be evaluated. The contribution rate of the *i* principal component is the proportion of its cumulative variance in the sum of the variances. The greater the contribution rate of the principal component to the problem to be evaluated, the stronger the ability of the principal component to contain the comprehensive information, in other words, the higher the proportion of the original variable contained in the principal component to the total amount of all the information. In general, when the cumulative contribution rate exceeds 80%, it indicates that a number of *p* principal components basically contain the information of the original variables.

$$\gamma_i / \sum_{i=1}^m \gamma_i \tag{1}$$

Where  $\gamma_i$  is the contribution of the *i* principal component.

Finally, by applying PCA method, the weights of each factors to the problem were extracted from the proportion of the variance contribution rates of each common factor to the sum of the variance contribution rates of those common factors, and then the regression coefficients of variables were obtained from

regression analysis, as shown in Formula (2). The model for evaluation of the attractiveness of land resources development was formed, as follows:

$$F = \sum_{\gamma=1}^p \gamma_i F_i / \sum_{\gamma=1}^p \gamma_i \quad (2)$$

Where  $i=1,2,\dots,p$ , where  $\gamma_i$  is the variance contribution of the  $i$  common factor, and  $F_i$  is the score of the  $i$  common factor.

## Results

The results are shown in Table 2. KMO value is  $0.856 > 0.8$ , indicating that the selected indicators are not independent of each other, and are suitable for factor analysis; The significant probability in the Bartlett's Test of Sphericity is 0, indicating that the correlation between indicators is appropriate for factor analysis.

**Table 2. Test Results of KMO and Bartlett Sphericity**

<b>KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy)</b>		.856
<b>Bartlett's Test of Sphericity</b>	Approx. Chi-Square	103.995
	Df	45
	Sig.	.000

The common factor variance extraction is shown in Table 3 by applying the PCA method. As can be seen from Table 3, only the index of excellent air quality rate has an information extraction rate lower than 70%, and all the other indicators contain an information extraction rate more than 70%, most of which are greater than 80%, indicating an effective extraction in this analysis.

**Table 3. Communalities**

<b>Factors</b>	<b>Initial</b>	<b>Extraction</b>
Degree of land resources dominance	1.000	.808
Coordination degree of land resources	1.000	.752
Domestic tourists	1.000	.898
Excellent air quality rate	1.000	.633
Resident population	1.000	.733
Urbanization rate	1.000	.933
GDP	1.000	.859
Regional GDP growth rate	1.000	.833
Regional residents' per capita disposable income	1.000	.814
Per capita GDP	1.000	.999
Area construction land area	1.000	.975
Per ten thousand capita over-hundred-million-yuan investment projects	1.000	.834
Per capita road area	1.000	.980
Per ten thousand capita public (electric) buses	1.000	.836
Total passenger volume	1.000	.922
Total freight	1.000	.943
Regional gas penetration	1.000	.870
Per capita sewage pipe length	1.000	.845
Annual electricity consumption per capita	1.000	.992
Per hundred capita telephone users	1.000	.991
Per capital education expenditure	1.000	.998

In order to retain more original information, this study extracted seven principal components whose variance contribution rate were greater than 80%, while preserving the principal components with Eigen values greater than 1. It can be seen from Table 4 that the first seven principal components concentrate 80.985% of the information of original variables. In other words, the first seven principal components contributed to the research problem with a cumulative contribution rate of regional land resource development as high as 80.985%, and the first principal component had the highest contribution rate of 33.765%, and the contribution rate of the other components decreased as follows.

**Table 4. Total Variance Explained**

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative (%)	Total	% of Variance	Cumulative (%)
1	11.837	33.765	33.765	11.837	33.765	33.765
2	5.472	14.723	48.489	5.472	14.723	48.489
3	2.397	13.971	62.459	2.397	13.971	62.459
4	1.969	9.687	72.146	1.969	9.687	72.146
5	1.464	4.644	76.790	1.464	4.644	76.790
6	1.126	2.264	79.055	1.126	2.264	79.055
7	1.083	1.930	80.985	1.083	1.930	80.985

*Extraction method: Principal component method*

After extracting the principal components and converting them to the appropriate seven common factors, twiddle factor analysis was carried out, resulting in a factor load matrix (see Table 5) and a component score matrix (see Table 6). As for the common factors,  $F_1$  is the element of land resources,  $F_2$  is the natural environment factor,  $F_3$  is the living infrastructure element,  $F_4$  is the economic and social development factor,  $F_5$  is the educational information exchange factor,  $F_6$  is the government planning factor, and  $F_7$  is the market competition factor. According to the index order of the above table, each index is represented by  $x_1, x_2, x_3, \dots, x_{21}$  (the data here is standardized data), and the score coefficient of each index was added to the corresponding factor to obtain Formula (3), Formula (4), Formula (5), Formula (6), Formula (7), Formula (8), and Formula (9).

$$F_1 = 0.081x_1 + 0.059x_2 - 0.316x_3 + 0.158x_4 + 0.309x_5 + \dots - 0.045x_{20} - 0.015x_{21} \quad (3)$$

$$F_2 = 0.092x_1 + 0.880x_2 + 0.292x_3 - 0.121x_4 - 0.046x_5 + \dots + 0.106x_{20} + 0.081x_{21} \quad (4)$$

$$F_3 = 0.369x_1 - 0.317x_2 - 0.055x_3 - 0.045x_4 + 0.054x_5 + \dots + 0.058x_{20} + 0.058x_{21} \quad (5)$$

$$F_4 = -0.297x_1 - 0.168x_2 + 0.208x_3 + 0.787x_4 + 0.060x_5 + \dots - 0.121x_{20} - 0.022x_{21} \quad (6)$$

$$F_5 = -0.176x_1 - 0.033x_2 + 0.413x_3 - 0.149x_4 - 1.018x_5 + \dots - 0.039x_{20} - 0.032x_{21} \quad (7)$$

$$F_6 = 0.232x_1 - 0.135x_2 - 0.006x_3 + 0.151x_4 + 0.189x_5 + \dots + 0.131x_{20} - 0.056x_{21} \quad (8)$$

$$F_7 = -0.210x_1 - 1.039x_2 + 1.093x_3 + 0.045x_4 + 0.064x_5 + \dots + 0.083x_{20} + 0.035x_{21} \quad (9)$$

**Table 5. Component Matrix**

<b>Component</b>	<b>F1</b>	<b>F2</b>	<b>F3</b>	<b>F4</b>	<b>F5</b>	<b>F6</b>	<b>F7</b>
Degree of land resources dominance	.861	-.155	.152	-.396	.154	.020	.375
Coordination degree of land resources	.857	.670	-.034	-.420	-.258	.020	.201
Domestic tourists	.750	.774	.452	.272	-.158	-.347	-.164
Excellent air quality rate	.678	.725	-.020	-.448	.109	.189	-.020
Resident population	.633	.0779	.018	.001	.001	-.001	.428
Urbanization rate	.411	.299	-.068	.806	-.319	-.096	-.029
GDP	.632	.705	-.349	-.168	.387	-.106	-.089
Regional GDP growth rate	.425	.655	-.232	.700	.062	-.008	.046
Regional residents' per capita disposable income	.026	.421	-.355	.774	.220	.092	.195
Per capita GDP	.261	-.232	-.192	.873	-.077	.416	.104
Area construction land area	-.310	-.06	.098	.375	.080	.570	.364
Per ten thousand capita over-hundred-million-yuan investment projects	.653	.432	.316	-.314	.435	.420	-.683
Per capita road area	.809	-.240	.303	.211	-.166	.139	-.034
Per ten thousand capita public (electric) buses	.542	-.310	.025	-.035	.324	-.025	.524
Total passenger volume	.683	.350	-.022	.030	.221	-.330	.526
Total freight	.734	.223	-.003	.040	.011	-.041	.201
Regional gas penetration	.808	-.201	.635	.235	-.187	-.173	-.152
Per capita sewage pipe length	.461	.576	.425	-.304	.046	.390	.002
Annual electricity consumption per capita	.870	.080	.635	-.026	.032	-.176	.081
Per hundred capita telephone users	.832	-.089	.519	-.062	-.097	-.087	.020
Per capital education expenditure	.845	.057	-.171	.183	.495	.012	-.354

Extraction method: Principal component method, with 7 principal components extracted

**Table 6. Component Score Coefficient Matrix**

<b>Component</b>	<b>F1</b>	<b>F2</b>	<b>F3</b>	<b>F4</b>	<b>F5</b>	<b>F6</b>	<b>F7</b>
Degree of land resources dominance	.081	.092	.359	-.297	-.176	.232	-.210
Coordination degree of land resources	.059	.880	-.317	-.168	-.033	-.135	-1.039
Domestic tourists	-.316	.292	-.055	.208	.413	-.006	1.093
Excellent air quality rate	.158	-.121	-.045	.787	-.149	.151	.045
Resident population	.309	-.046	.054	.060	-1.018	.189	.064
Urbanization rate	-.205	.166	.393	-.058	.535	-.005	-.996
GDP	-.314	-.369	.907	.126	-.081	-.004	.405
Regional GDP growth rate	.090	-.149	.115	.173	-.312	1.009	-.187
Regional residents' per capita disposable income	-.036	.177	.053	-.122	.015	.026	-.110
Per capita GDP	1.017	-.139	-.417	.268	-.414	.030	-.678
Area construction land area	.024	-.083	-.010	.023	.128	.024	.579
Per ten thousand capita over-hundred-million-yuan investment projects	-.009	.012	.023	.071	.012	-.063	.013
Per capita road area	-.003	.006	-.039	-.074	.506	.089	-.042
Per ten thousand capita public (electric) buses	-.005	-.049	.140	-.010	.517	-.001	.129
Total passenger volume	.053	.050	.141	-.143	-.002	-.151	.123
Total freight	.088	.041	-.129	-.045	-.070	.123	-.118
Regional gas penetration	.575	-.077	-.221	-.130	-.459	-.076	1.327
Per capita sewage pipe length	.002	.006	-.246	.347	.063	.002	-.138
Annual electricity consumption per capita	-.008	.153	-.105	.114	-.009	-.046	-.099
Per hundred capita telephone users	-.045	.106	.058	-.121	-.039	.131	.083
Per capital education expenditure	-.015	.081	.058	.022	-.052	-.056	.035

Extraction method: Principal component analysis; Rotation method: Kaiser-standardized orthogonal rotation method

Thus, the evaluation model for the attractiveness of land resources development of Jiujiang City is:

$$Y = \frac{33.765\%F_1 + 14.723\%F_2 + 13.971\%F_3 + 9.687\%F_4 + 4.644\%F_5 + 2.222\%F_6 + 1.93\%F_7}{80.985\%} \quad (10)$$

According to the above Formula (10), the comprehensive score of the attraction of land and resources development in each region will be obtained by substituting the score of each common factor in each county in Jiujiang. Here, in order to compare and to directly observe the score, all the above formulas on the right side are multiplied by 100 to obtain the comprehensive scores and rankings of the attractiveness of land resources development in 11 counties of Jiujiang in 2009 and 2014 (see Table 7).

**Table 7. Scores and Rankings of Attractiveness of Land Resources Development in Jiujiang City**

County	Scores in 2009	Ranking	Scores in 2014	Ranking
City area	90.26	2	118.37	1
Xingzi	9.18	3	32.18	7
Yongxiu	-15.51	4	79.42	2
Wuning	-23.06	5	27.98	8
Duchang	-29.69	6	18.70	9
Hukou	-32.83	7	51.02	5
Jiujiang	-33.10	8	43.75	6
Ruichang	-37.48	10	66.35	3
Dean	-39.90	11	-9.13	11
Xiushui	-41.30	12	57.26	4
Pengze	-57.29	13	-2.48	10

### Discussion

Overall, the attractiveness of land and resources development of all the counties in Jiujiang in 2014 had significantly improved compared with that in 2009, mainly due to the economic development of each region, the improvement of science and technology and living infrastructure conditions and other conditions, which helped to reduce obstacles to the development of land resources and increase external attractions. The rankings of the municipal district and Yongxian County remained basically the same in 2009 and 2014, and always rank within the top 5, while the rankings of De'an County and Pengze County also steadily remained in the lower reaches. This indicates that the degree of attractiveness of land resources development among the counties of Jiujiang City is relatively steady. The land resources development along the Yangtze River appears to be more attractive, which can be attributed to the region's large-scale development of land resources and a series of more complete supporting facilities, the rising infrastructure and service systems for land resources development, various famous scenic spots such as Lushan, a better region image for land resources development, and the continuously improving collaboration between the land resources development zone and the surrounding areas. Analysis of the ranking of each county in Jiujiang city reveals some significant changes. Ruichang and XiuShui had a relatively obvious increase in rankings in the past five years. The reason may be that Ruichang City is an ideal "satellite area" for economic and social development in Jiujiang city, with its superior geographical conditions being located in the northern margin of the Yangtze "Golden Waterway". Especially since 2012, Xiu-Shui County has enjoyed a tremendous pace of development in recent years. Since then, the county's emphasis on the development of enterprises, its flourishing development and investment, and the county's increasing

popularity due to the thriving tourism industry, all have contributed to the growing attractiveness of land resources development in Xiu-Shui County.

### Conclusion

During the stage of emphasizing green development, it is crucial for the development of tourist cities whether they can balance land resources development and environmental protection so as to achieve sustainable development. The evaluation of the attractiveness of land resources development is the basis for the optimization of land spatial development. In particular, this study assessed the attractiveness of land resources development in Jiujiang, China. Principle component analysis was selected to assess the values of the attractiveness of land resources development. Results showed that the attractiveness of land and resources development of all counties in Jiujiang in 2014 had significantly improved compared with that in 2009. There also was a spatial difference of attractiveness of land and resources development among the 11 countries in Jiujiang.

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# Quantifying the Coordinated Degree between Urbanization and Intensive Urban Land Use in Zhengzhou, China

**Jun Zhang**

*School of Public Administration, Zhejiang University, Hangzhou, China*

Email: zj6262666@126.com

**Chenmeng Bie**

*School of Public Administration, Zhejiang University of Finance and Economics, Hangzhou, China*

Email: 1017457164@qq.com

**Heyuan You**

*School of Public Administration, Zhejiang University of Finance and Economics, Hangzhou, China*

Email: youheyuan@qq.com

***[Abstract]** The coordinated degree between urbanization and intensive urban land use has important impacts on sustainable urban development. In particular, this study assessed the coordinated degree between urbanization and intensive urban land use based on the multi-dimensional index systems for urbanization and intensive urban land use in Zhengzhou, China. And entropy method is selected to determine weights of indices. Results showed that the urbanization level and urban land use intensity had an increasing trend. The coupling coordination degree between them increased gradually after 2004.*

***[Keywords]** urbanization; intensive urban land use; coordinated degree*

## Introduction

Urbanization has accelerated in China since reform and opening-up and has resulted in immense changes in socio-economic aspects in China (Kojima, 2015). The population in rural areas continues to migrate to urban areas in the process of urbanization. Therefore, urbanization brings more demand for houses, factories and office buildings, having important impacts on the land use in cities. Urbanization can promote intensive urban land use because of the growing population (Hui, Wu, Deng, & Zheng, 2015). Meanwhile, it also can bring about extensive urban land use. One phenomenon in urbanization that arouses widespread attention is urban sprawl in China. Urban sprawl presents the unsustainable land use in cities in urbanization (Zeng, Liu, Stein, & Jiao, 2015). It reveals that the drastic changes of urban land use in urbanization do not meet the needs for sustainable urban development (You, 2016a). Consequently, urban land use should be kept at appropriate levels of land use intensity in urbanization. Under this circumstance, the aim of this paper is to quantify the coordinated degree between urbanization and intensive urban land use in Zhengzhou, China.

Located in east-central China, Zhengzhou city covers approximately 7500 km<sup>2</sup>, with geographic context of 34° 46'N 113° 39'E. As the most populous and urbanized place in east-central China, Zhengzhou is one of the largest economic centers in inland China. Urbanization has boomed in Zhengzhou because the central government has accelerated the rise of the central regions in China. Intensive urban land in Zhengzhou has experienced a large variation. Mu, Mayer, He, & Tian (2016) found that the landscape in

Zhengzhou transitioned from a primarily agricultural to an urban-dominated landscape after 2004. Therefore, it can be typically used to analyze the coordinated degree between urbanization and intensive urban land use.

We specifically attempt to (1) put forward multi-dimensional index systems for urbanization and intensive urban land use, (2) assess the urbanization level and urban land use intensity, and (3) analyze the coordinated degree between urbanization and intensive urban land use.

## Methods

### *Multi-Dimensional Index System*

Multi-dimensional systems for urbanization typically incorporate four dimensions: demographic, economic, social, and land scope. Multi-dimensional systems for intensive urban land use typically incorporate four dimensions: land use degree, input intensity, output intensity and ecology. Following these frameworks, we first selected 13 relevant indices for urbanization and 13 relevant indices for intensive urban land use based on the literature review and data availability (Table 1).

In order to quantify the coordinated degree between urbanization and intensive urban land use, the urbanization level and urban land use intensity are assessed. The weights of indices play a key role in assessing values of urbanization level and urban land use intensity. The entropy method was selected to determine the weights of the indices. The steps to compute the weights by entropy method can be expressed as follows: The original values of indices were normalized by Equations (1) and (2):

$$X'_{ij} = \frac{X_{ij} - \min X_{ij}}{\max X_{ij} - \min X_{ij}} \quad (1)$$

Where  $X'_{ij}$  is the normalized value of the negative index,  $Max_{ij}$  and  $Min_{ij}$  are the maximal value and minimal value of index. The negative index in this study is Engel coefficient.

$$X'_{ij} = \frac{\max X_{ij} - X_{ij}}{\max X_{ij} - \min X_{ij}} \quad (2)$$

Where  $X'_{ij}$  is the normalized value of the positive index. The indices for urbanization and intensive urban land use are the positive indices except the Engel coefficient.

Then the entropy of indicators was calculated by Equation (3).

$$e_j = -\frac{1}{\ln n} \sum_{i=1}^n P_{ij} \cdot \ln P_{ij}, \text{ where } P_{ij} = \frac{X'_{ij}}{\sum_{i=1}^n X'_{ij}} \quad (3)$$

Where if  $P_{ij}=0$ ,  $P_{ij}=0.0001+P_{ij}$

Lastly, the entropy weight of indicator was computed by Equation (4).

$$w_j = \frac{g_j}{\sum_{j=1}^m g_j} \text{ where } g_j = 1 - e_j, 0 \leq w_j \leq 1, \sum_{j=1}^m w_j = 1 \quad (4)$$

The results of entropy weight are shown in Tables 1 and 2.

**Table 1. Multi-Dimensional Index System of Urbanization for Zhengzhou, China**

Dimension	Index	Unit	Weight
Demographic dimension	Urban population proportion	%	0.0766
	Tertiary industry employment proportion	%	0.0772
	Number of students in general college per 10,000 people	person	0.0783
Economic dimension	Per capita gross domestic product	Yuan/person	0.0754
	Value-added of Tertiary industry proportion	%	0.0775
	Engel coefficient	%	0.0786
Social dimension	Number of hospital beds per 10,000 people	bed/10 <sup>4</sup> persons	0.0747
	Number of health technical persons per 10,000 people	person	0.0745
	Per capita consumption expenditure of urban residents	Yuan/person	0.0744
	Number of bus per 10,000 people	bus/10 <sup>4</sup> persons	0.0786
Landscape dimension	Built-up area	km <sup>2</sup>	0.0776
	Per capita urban Road area	m <sup>2</sup> /person	0.0793
	Per capita public green area	m <sup>2</sup> /person	0.0774

**Table 2. Multi-Dimensional Index System of Intensive Urban Land Use for Zhengzhou, China**

Dimension	Index	Unit	Weight
Land use degree	Population density	person/km <sup>2</sup>	0.0762
	Per capita construction land area	m <sup>2</sup>	0.0792
	Green coverage ratio in built-up area	%	0.0792
Input intensity	Fixed investment per land area	10 <sup>4</sup> Yuan/km <sup>2</sup>	0.0746
	fiscal expenditure per land area	10 <sup>4</sup> Yuan/km <sup>2</sup>	0.0743
	real estate investments per land area	10 <sup>4</sup> Yuan/km <sup>2</sup>	0.0742
	Road pavement area per land area	m <sup>2</sup> /km <sup>2</sup>	0.0802
Output intensity	Revenues per land area	10 <sup>4</sup> Yuan/km <sup>2</sup>	0.0739
	Total retail sales of consumer goods per urban land area	10 <sup>4</sup> Yuan/km <sup>2</sup>	0.0736
	Value-added of Tertiary industry per construction land area	10 <sup>4</sup> Yuan/km <sup>2</sup>	0.0751
Ecology	Per capita public green area	m <sup>2</sup>	0.0783
	Elastic coefficient between GDP and built-up area	%	0.0806
	Elastic coefficient between urban population and built-up area	%	0.0806

**Comprehensive Evaluation for Urbanization Level and Urban Land Use Intensity**

The urbanization level ( $X_i$ ) is evaluated by Equation (5), and the urban land use intensity ( $Y_i$ ) is evaluated Equation (6).

$$X_i = \sum_{j=1}^n X_{ij} \times w_{ij} \tag{5}$$

$$Y_i = \sum_{j=1}^n Y_{ij} \times w_{ij} \tag{6}$$

Relative change degree between urbanization and intensive urban land use is defined as follows:

$$E_i = \frac{Y_i}{X_i} \tag{7}$$

### ***Coupling Coordination Degree Model***

The coupling coordination degree model (Equations 8 and 9) originated from the coupling coefficient model of physics.

$$C_i = \frac{X_i^k \times Y_i^k}{(\alpha X_i + \beta Y_i)^{2k}} \quad (8)$$

$$D_i = \sqrt{\frac{(X_i + Y_i) \times C_i}{2}} \quad (9)$$

Where  $C_i$  is coupling coordination degree coefficient.  $D_i$  is coupling coordination.  $A$  and  $\beta$  represent the contributions of urbanization and intensive urban land use. In this study, the contribution of urbanization is as same as the contribution of intensive urban land use. Therefore,  $\alpha=\beta=1/2$ . In order to reveal the differences in the different yeas, the value of  $k$  was selected as 2.

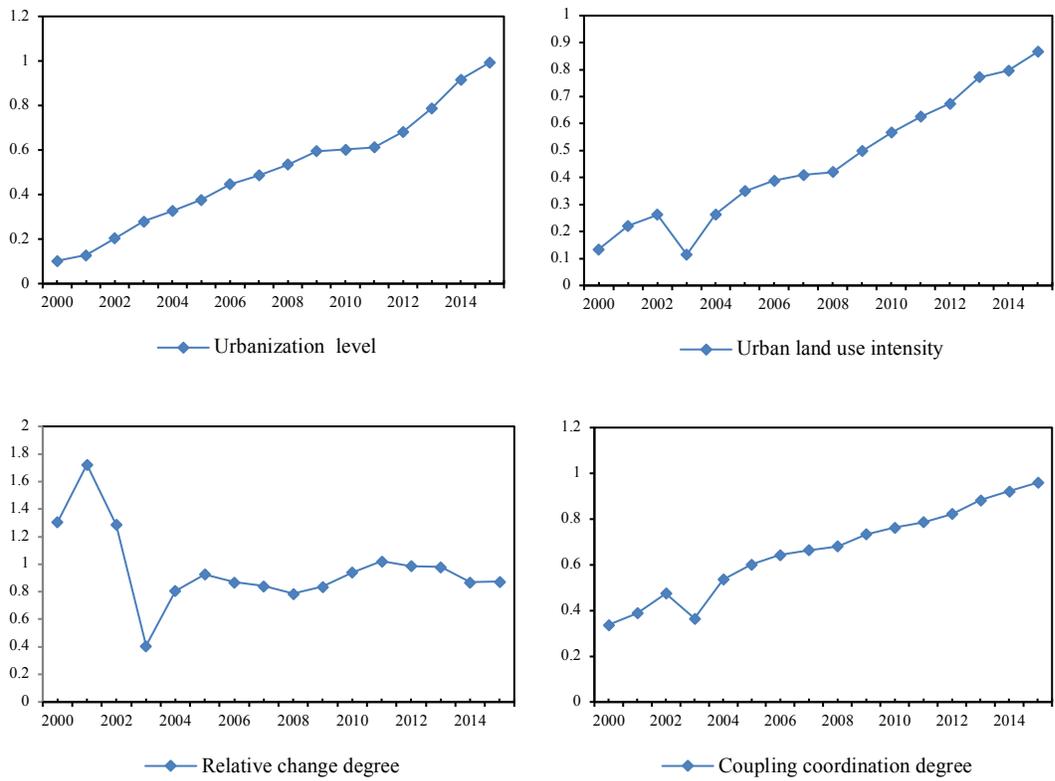
The coupling coordination degree can be classified into five levels:  $C < 0.3$  (very low),  $0.3 \leq C < 0.5$  (low),  $0.5 \leq C < 0.6$  (medium),  $0.6 \leq C < 0.8$  (high),  $C > 0.8$  (very high) (You, 2016b; Ni, Lei, Zhou, & Wang, 2008). If  $X > Y$ , then intensive urban land use progresses more slowly than urbanization. If  $X < Y$ , then urbanization progresses more slowly than intensive urban land use. If  $X = Y$ , urbanization synchronizes with intensive urban land use.

### **Results and Discussions**

The coupling coordination degree between urbanization and intensive urban land use in Zhengzhou, China is shown in Table 3. Temporal change of coupling coordination degree in Zhengzhou is presented in Figure 1.

**Table 3. Coupling Coordination Degree between Urbanization and Intensive Urban Land Use in Zhengzhou, China**

Year	Urbanization Level (X)	Urban Land Use Intensity (Y)	Relative Change Degree (E)	Coupling Coordination Degree (D)	Coupling Coordination Level	
2000	0.1026	0.1339	1.3059	0.3378	low	X<Y
2001	0.1283	0.2210	1.7231	0.3884	low	X<Y
2002	0.2035	0.2616	1.2859	0.4747	Low	X<Y
2003	0.2797	0.1142	0.4082	0.3654	Low	X>Y
2004	0.326	0.2628	0.8060	0.5363	medium	X>Y
2005	0.3771	0.3493	0.9263	0.6018	high	X>Y
2006	0.4471	0.3888	0.8695	0.6434	high	X>Y
2007	0.4858	0.4089	0.8416	0.6639	high	X>Y
2008	0.5356	0.4205	0.7851	0.6814	high	X>Y
2009	0.5953	0.4978	0.8362	0.7334	high	X>Y
2010	0.6015	0.5661	0.9412	0.7634	high	X>Y
2011	0.6121	0.6254	1.0217	0.7865	high	X<Y
2012	0.6825	0.6731	0.9863	0.8232	very high	X>Y
2013	0.7875	0.7717	0.9798	0.8829	very high	X>Y
2014	0.9159	0.7961	0.8692	0.9207	very high	X>Y
2015	0.9925	0.8659	0.8725	0.9595	very high	X>Y



**Figure 1. Temporal Dynamics of Coordinated Degree in Zhengzhou**

The urbanization level and urban land use intensity had an increasing trend between 2000 and 2015. Meanwhile, the coupling coordination degree also presented an increasing trend. But the relative change degree had a decreasing trend, declining from 1.3059 in 2000 to 0.8725 in 2015. This demonstrates that the variation range of the urbanization level is close to the variation range of the urban land use intensity. The coupling coordination degree between urbanization level and urban land use intensity was lower than 0.5 before 2004. This denotes that the main reasons for low coupling coordination level is that urbanization progresses more slowly than intensive urban land use. The coupling coordination degree between them increased gradually after 2004. This reveals that urbanization progresses accelerated after 2004, and the gap between urbanization progress and intensive urban land use narrowed. Urbanization has boomed in Zhengzhou because the central government accelerated the rise of the central regions in China. Although the demand for land used for urban purposes had rapidly accelerated in the process of urbanization, the conversion from farmland to construction land was controlled by the local government. Intensive urban land use was encouraged in Zhengzhou. Urban land use intensity was kept at a suitable level in Zhengzhou. Consequently, the coupling coordination level between the urbanization level and urban land use intensity improved gradually after 2004.

**Conclusion**

The coordinated degree between urbanization and intensive urban land use has important impacts on sustainable urban development. In particular, this study assessed the coordinated degree between urbanization and intensive urban land use based on the multi-dimensional index systems for urbanization

and intensive urban land use in Zhengzhou, China. The entropy method was selected to determine weights of indices. Results showed that the urbanization level and urban land use intensity had an increasing trend. The coupling coordination degree between urbanization level and urban land use intensity was low before 2004, gradually increasing after this time.

### **Acknowledgement**

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# **The Effect of the Farmer College in the Construction of a Rural Ecological Civilization – Based on Lishui Farmer College**

**Yao Xintao**

*Lishui Vocational and Technical College, Lishui, China*

Email: 779579781@qq.com

**Pan Yaoting**

*Lishui Vocational and Technical College, Lishui, China*

Email: bright2506@163.com

*[Abstract] As an ecological city, Lishui is famous for its beautiful natural environment. Agriculture and tourism are two eco-related industries in Lishui city. As the national government promoted the “Two Mountains’ Theory” and the local government has aimed at building Lishui city into a big garden, the Lishui Farmer College was established. This paper is a summary of the Lishui Farmer College and a suggestion for its promotion.*

*[Keywords] Farmer College; rural ecological civilization; support; new generation of farmers*

## **Introduction**

As two eco-related industries, agriculture and tourism play important roles in Lishui city. However, these two industries remain in extensive operating modes. To enhance these two industries, Lishui Farmer College was established. Lishui Farmer College was established with the thought of improving Lishui farmer’s agriculture skills, and by improving the local farmer’s skills, Lishui Farmer College helps construct a rural ecological civilization. The scholars in the national program “Practical Study of New Farmer-Training College’s Innovatory Mechanism” conducted empirical research on Lishui Farmer College (Liu, Hu, Wang, Chen, Zhan, Pan, Han, & Zhong, 2014). Based on the target of establishing Lishui Farmer College as a successful case for the construction of a rural ecological civilization and making it a model to be studied, this paper analyzes national and local policy and describes the ways and methods of Lishui Farmer College by using the research method of case study. Finally, this paper makes a conclusion on Lishui Farmer College and a conclusion on Lishui Farmer College’s contribution to the construction of a rural ecological civilization.

## **Literature Review**

### ***Current Studies on Farmer Education***

Li Bingshan and Zhao Fangyin studied the farmer college model in Japan, Korea, England, France, Holland, American, and Canada. They pointed out that because of Japan and Korea’s small agricultural output, farmer education in these two countries is orientated and targeted (2006). In Europe, farmers are educated to get a certificate (Li & Zhao, 2006). In North America, as agricultural outputs are large, farmer colleges play the key roles in farmer education (Li, & Zhao, 2006). In China, farmer education is targeted at training farmers to be knowledgeable, skillful and good at management (Liu, C., 2008).

### ***Current Studies on the Local College's Responsibilities in Ecological Civilization Construction***

Local colleges undertake the responsibility of cultivating professional and technical talents, scientific research and local social service (Zhou, C., 2014). They have become an important part of higher education in China. Therefore, in the construction of an ecological civilization, local colleges have large responsibilities (Shi, K., & Liu, C., 2016).

### ***Current Study on Rural Ecological Civilization***

The introduction of ecological civilization has put forward higher requirements for the process and goals of new rural construction. Farmers are the main power to achieve the goal of new rural construction, which has brought greater challenges to them (Wang, H., 2017). The development of a rural economy has brought abundant material wealth to farmers, but it has also brought unprecedented impact to the rural ecological environment. The construction of a rural ecological civilization has become more and more urgent (Liu, W., 2017). The construction of rural ecological civilization is an important point in the construction of ecological civilization in China. (Zhang, H., 2017).

## **Policy Analysis for Rural Ecological Civilization**

### ***National Policy***

Agriculture's importance to a country is known to all. Zhu Qizhen and Lu Kerong suggested that agriculture should be a public good industry which mainly depends on the necessities of human needs for agricultural products, consumptive non-exclusion, supplying integration and multi-function of agriculture (Zhu, Q., & Lu, K., 2007). Nowadays, in China, there is a popular slogan, that is “绿水青山就是金山银山” which means “nature is the real treasure.” Under this slogan, national policy supply-side reform was promoted last year. The Chinese government has already recognized that Chinese farmers are growing extensive produce, which means the quality of farmer produce is not high. Our country needs high quality agriculture and high quality farmer produce. Therefore, education for farmers was put on the agenda.

### ***Local Policy***

Agriculture and tourism are the two eco-related industries in Lishui city. The local government has aimed at establishing Lishui city into a large garden and this goal has been written into Lishui's local policy. To reach this goal, the local 2,910,000 farmers should be educated. However, improving the farmers' technology and the quality of their produce is a large topic for local government.

## **Local Reality**

### ***Local Agriculture is Extensive***

In Lishui, the local farm products are tea, plant oil, bamboo, mushroom and vegetables. These plants were grown in an extensive way before Lishui Famer College's guidance. Except for doing farm work, farmers sell their produce or manage their own homestead. Research shows that local famers need to promote their agriculture skills, marketing skills and management skills.

### ***Teacher in Local College is not Realistic***

A common problem of farm colleges is that the teachers are not realistic; they only know theory, but do not have chance to use them. Before the Farmer College was established, teachers at Lishui Vocational and the Technical College had the same problem. After the College was established, teachers on management area and agriculture area got progressed by teaching the farmers skills and how to use their skills in agricultural.

## **Lishui Farmer College Supports Rural Ecological Civilization**

This paper used case study and deduction as its research method. The method of case study means scholars study a typical case and then deducted it into general case. Lishui Farmer's College is a typical case which is established to be a model. Scholars want this model to make a contribution to rural ecological civilization.

In recent years, Lishui Farmer College has supported local agriculture by educating local farmers, leading CSA (community support agriculture), supporting "Lishui Shangeng" which is a regional public brand of agriculture products, and supporting "Lishui Shanju" which is a regional public brand of homestead.

### ***Lishui Farmer College Educates the Local Farmers***

Farmer College has a main target of farmer training. According to the research our scholars did, the Farmer College trained farmers in management skills, agriculture skills, marketing skills and so on. Until now, Lishui Famer College has already provided management knowledge such as e-commerce skills, marketing skills, and legal knowledge to local farmers. It also has provided agriculture knowledge such as mushroom growing and oil processing skills, and marketing knowledge such as knowledge of agriculture product pricing, promotion, product and placement. Lishui Farmer College has trained 8000 people to be good homestead managers, good guides, good cooks, and good farm cooperatives managers. "Yunhe Shifu" is a brand based on farmer training. This brand has made a big effect on local agriculture and ecological civilization construction, so that many other counties want to learn from it.

### ***Lishui Farmer College Helps Train the "New Generation Farmer" to Form CSA***

Lishui Farmer College helps local agriculture in forming "Community Supported Agriculture" (CSA) which means people invest in the farms to grow vegetables and then they receive a share of the vegetables. Scholars at the Lishui Farmer College conducted deep research on the local farmers, farmer produce enterprisers and farmer cooperative managers, and found out that the local farmers who are thirty years are new generation farmers. Scholars defined "new generation farmers" as "young farmers who are from 16 to 35 years old". What is more, "new generation farmers" are qualified with hi-tech farmer skills and management skills. Lishui Farmer College chose local farmers and their children to train them. As a non-profit organization, Lishui Farmer College aims at training local farmers to be professional farmers by providing agriculture skills, management skills and legal knowledge.

The Yunhe brand of "Baihejian" is a successful example. It is led by a trained "new generation farmer", Zhang Jianfen. This young girl collected land and trained local famers to grow high quality plants. She also collected investment for high-quality plants. This is a model of a "new generation farmer-formed CSA". The agricultural products under the brand of "Baihejian" get a higher price.

### ***Lishui Farmer College Supports "Lishui Shangeng"***

Lishui Shangeng is a regional public brand of agriculture product promoted by the Lishui Government. Soon after Lishui Government promoted the brand "Lishui Shangeng", Lishui Farmer College got its target on brand designing, brand researching, and brand marketing. Lishui Farmer College helped design its name, gave suggestions on logo design, and wrote the story of the brand. Some teachers at the Lishui Farmer College have done the research for "Lishui Shangeng". As a result, the research showed some problems of "Lishui Shangeng", and the researchers offered some suggestions to these problems. Researchers also helped build the marketing system for "Lishui Shangeng". Lishui Farmer College also did the translation

work for “Lishui Shangeng”. At present, there are 1004 local agricultural products based on “Lishui Shangeng”. With total sales over 6 billion yuan, the brand is taking shape.

### ***Lishui Farmer College Supports “Lishui Shanju”***

Lishui shanju is a regional public brand of homestead. Lishui Farmer College also helped design this brand, designed the homestead and led artist groups drawing in rural areas. By doing this, the rural areas are becoming more beautiful. Take “Yankenglingtou” as an example; Li Yueliang, a teacher from Lishui Farmer College helped make “Yankenglingtou” become an artist village. He helped design the local homestead for farmers and led his students to “Yankenglingtou” to draw. By doing this, he made “Yankenglingtou” prosperous.

### **Lishui Farmer College Helps Local Rural Ecological Civilization Construction**

Based on the case study on Lishui Farmer College, scholars have reached the conclusion that Lishui Farmer College has helped local rural ecological civilization construction.

### ***Local Rural Environment Has Changed***

The most important thing that Lishui Farmer College brought is that farmers’ income has increased. Farmers’ agriculture skills were improved so they are able to grow better and more vegetables for a better price. The second important change is that villages’ environment in Lishui has been promoted. As extensive growing methods are replaced by advanced and ecological methods, the rural environment gets better.

### ***Combination College Promotes “Positive-Sum Game” Model***

Lishui Government, local college, farmers, farmer enterprises and farm cooperatives formed a combination college. These five parts in the model are all winning, which is called the “positive-sum game” model. And this model is a success to be generated.

### ***Train the New Generation of Farmers***

Scholars in Lishui Farmer College defined the new generation of farmers as “young farmers who are from 16 to 35 years old”. They are qualified with hi-tech farmer skills and management skills. Lishui Farmer College chooses local farmer and their children to train them, and this is also a success to be generated.

### ***Lead Local Agriculture to the Market***

Lishui Farmer College has given marketing suggestions to the farmers, and taught them how to make the products, how to get a higher price for their agriculture products, how to design the place of farmer products and how to promote their products. Lishui Farmer College also gives suggestions for farmer cooperation.

## **Conclusion**

We did empirical study on Lishui Farmer College and obtained this conclusion. As in the achievement of empirical study in the national program “Practical Study of New Farmer-Training College’s Innovatory Mechanism”, Lishui Farmer College has gotten many prizes. Its project “supermarket, e-commerce, farmhouse hostel” was named the outstanding brand innovation project of the State Department. “Yankenglingtou” project was appraised by the China Rural Civilization Research Center of National School of Administration in 2015 as one of “the ten moving stories of the construction of new countryside in China”. The host of Lishui Farmer College won the prize of the first Zhejiang Huang Yanpei Vocational Education Award.

After listening to the Lishui Farmer College presentation, Professor Zhang Xiaode, the director of National College of Administration, director of Research Center of Ecological Civilization, and director of Chinese Rural Civilization Research Center, gave a positive evaluation. He pointed out that Lishui Farmers College was a worthy of its name and was also an innovative idea. He also pointed out that Lishui Farmers College would soon become a universal educational model. Professor Sui Yifan and Professor Zhu Qizhen believed that Lishui Farmers College was a research combining theory and practice. Professor Ye Peihong said, Lishui Farmers College was a beautiful model and easy to copy.

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# **Elaboration: The Effective Way of Green Management in Volunteer Service of Large-Scale Games – Take the Thirteenth National Student Games as an Example**

**Jixu Chen**

*Education College, Hangzhou Normal University, Hangzhou, China*

Email: 380979307@qq.com

**Jiangshun Zhong**

*School of Economics and Management, Hangzhou Normal University, Hangzhou, China*

Email: 53464838@qq.com

*[Abstracts] Large-scale games are becoming more and more normal in China, but the level of green management is still insufficient. Based on the theory of elaboration, this paper put forward the four modules of green management in volunteer service of large-scale games through the analysis of the voluntary service framework and applies the elaboration theory to explore the way of green management from trigger module, organization module, support module and incentive module.*

*[Keywords] volunteer service of large-scale games; elaboration; green*

## **Introduction**

Due to its high level of standards, large number of participants and social influence, large-scale games are becoming another focus subject in the academic circle after the western plan, community volunteer service, left-behind children and elderly volunteer service. How to ensure the smooth operation of volunteer service and the effective utilization of resources in the face of large-scale games? How to increase the awareness of the environmental protection and push the large-scale games toward going green? Pu (2017) believe that volunteer service is an important means to promote social governance and realize “good governance”. This study proposes establishing a large data diagnosis service, to jointly build and share volunteer service data, optimizing the system mechanism of voluntary service and collecting the quantitative data of voluntary services through multiple channels, so as to realize the precision of volunteer service. Ni (2011) made a comprehensive and in-depth discussion on the recruitment, training planning, training types and forms, training contents and other aspects of the volunteer team of large-scale sports games in China in recent years. Pan (2015) discussed the evaluation index system of volunteer service from the indicators of service conditions, service content and service effect. These literatures have certain reference significance for the green management of large-scale games, but lack theoretical support and in-depth detail. This paper attempts to apply the theory of elaboration, and to explore the ways and methods of green management in volunteer service in large-scale games, and to provide research support for the management of volunteer service of large-scale games.

## **Elaboration: The Necessity of Green Management in Volunteer Service of Large-Scale Games**

In December 2016, a number of organizations in Hangzhou organized and formulated the first local standard of voluntary service in China – the standard of volunteer service for large-scale games (Zhang,

2016). As it turns out, along with the social development and growing volunteer service influence, green management has also begun to enter the line of sight of volunteer service managers, and standardization of volunteer service will be beneficial to improve the level of green management. In spite of this, green management is still inadequate in the large-scale games, which is manifested in the lack of green ideas, poor matching of job requirements, and insufficient coordination and deployment of on-site management. The standardization of volunteer service has made up many deficiencies and established a template with wide applicability, but it has inadequate response to problems such as volunteer motivation and emergency response and it also lacks flexibility and mobility. Elaboration can effectively avoid these problems and improve the green management level of volunteer service in large scale games.

Elaboration theory is a theory of educational orientation, but it has a certain origin with lean production in Japanese scientific management thought (Zhang, 2009). The representative is famous contemporary international teaching design theorist, Charles M. Reigeluth. Reigeluth's elaboration theory attempts to integrate intellectual content and puts forward the optimal management prescription through a standardized design scheme (Sheng, 1998). He summarized a set of elaborate steps, including the analysis of the active object, the activity program, the control of the prerequisites, the management of organizational, and supporting content. In the process, he proposes "Seven strategic components: Precision processing, learning prerequisites, summaries, synthesis, analogies, cognitive strategy triggers, learner control" (Sheng, 1998). The elaboration theory is a paradigm of teaching design, but its application scope involves education management and even various social affairs management. It regards instructional design as an organic whole, focusing on the relation between the whole and the local and the individual, and it's a systematic idea. In the process of precision sorting, it focuses on the coherence and fluency with traces of process management. Focusing on cognitive strategy and learner control, it is humanist. Therefore, the elaboration management combines "scientific management and humanistic management with the organic integration of the two ideas and modes, and combines the advantages of the two to avoid their one-sidedness (Wang, 2007)".

From normalization management to elaboration management, it is the product of the higher stage of voluntary service, and elaboration will help to improve the green management level of the volunteer service in large-scale games. First, elaboration focuses on the scientific nature of the work system and highlights the continuous refinement of the management process. On the one hand, it can help the system to construct volunteer service in large-scale games and make an overall plan for the system elements. On the other hand, it can help to form a standardized work procedure by refining the volunteer service work. Second, elaboration focuses on summarizing, synthesizing, and optimizing the system process. Through evaluation of the content, procedures, methods and results of the volunteer service, it will help to repair the target deviating behavior, optimize the volunteer service policies and procedures, make volunteer service in large-scale games be more persistent, pertinent and operable. Third, elaboration focuses on being people-oriented, highlighting the participation and experience of the object. The subjective experience of the volunteers is very important in the volunteer service of large-scale games, and it is necessary to take care of the inner feelings and evaluation of the volunteers. With the help of elaboration theory, it can help to exert the subjective initiative of volunteers, enhance their participation awareness, and stimulate their vitality, so that they can harvest a sense of accomplishment and satisfaction in their volunteer service.

## **Analysis of the Elaboration Framework of the Volunteer Service of Large-Scale Games**

### ***Content Analysis***

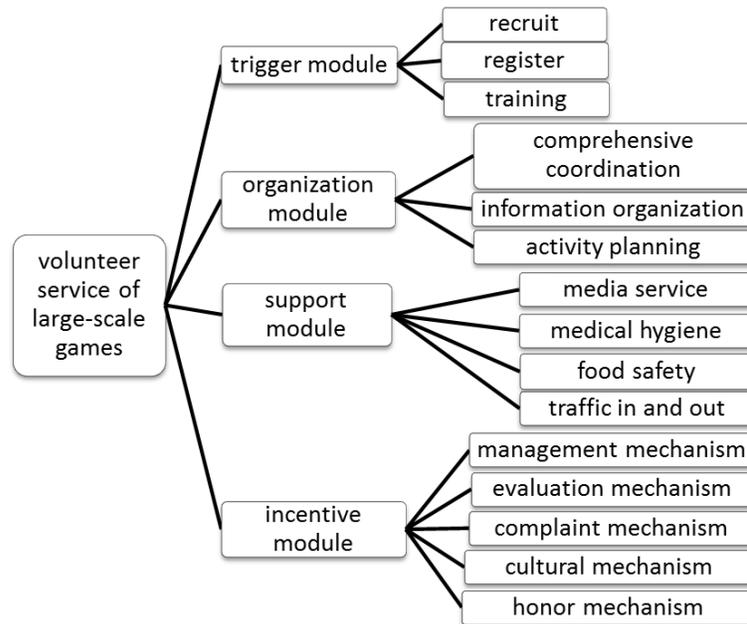
After analyzing the 16th Asian games in Guangzhou in 2010, the 9th Annual International Garden e\Expo in Beijing in 2013, and the G20 Summit in Hangzhou in 2016, it can be found that the number of volunteer services in large-scale games was more than 10,000 (13,000 people in the Beijing garden expo, about 4,000 in the G20 and 60,000 in the Asian games). The process is specific that basically requires 7 processes such as recruitment, registration, training, management, security, evaluation and incentive. The division of labor is relatively clear, including: site guidance, media service, reception and delivery, medical treatment, catering and so on. In addition, according to the nature of the games, the service content is slightly different. For example, competition service, award ceremony, and doping tests in the Asian games, exhibition area of the expo, banquet services, gift reception in the G20 summit and so on.

### ***Object Analysis***

From the perspective of volunteer status, the volunteer sources of large-scale games are diverse: students, enterprises and institutions, retirees, etc., but mainly college students. In terms of participation, volunteers' participation in the competition shows a u-shaped curve, with higher enthusiasm at the early stage and late stage, and relatively low intermediate mood. From the perspective of participation motivation, Clary, et al. (1998) proposed six motivations for volunteers: value motivation, understanding motivation, growth motivation, career motivation, social motivation, and protective motivation, etc. These motivations are reflected in different volunteers. In particular, in college students' volunteer groups, their personal basic attributes such as political status and subject matter will partly influence their motivation volunteer service (Zhuo, Kong, & Che, 2014). With various identities and motivations, the voluntary participation characteristics determine that the management of voluntary services cannot simply adopt the standardized model and compulsory assessment methods in similar enterprise management.

### ***Structure Analysis***

Based on the above content and object analysis, according to the strategy and teaching mode of elaboration theory, the volunteer service in large-scale games can be designed as four modules: the trigger module, the organization module, the support module, and the incentive module. These four modules have a series of sub-modules, each of which has an organic connection.



**Figure 1. Volunteer Service of Large-Scale Games Module**

### **The Elaboration Management of Volunteer Service of Large-Scale Games Module – Take the Thirteenth National Students Games as an Example**

The Thirteenth National Students Games (hereinafter referred to as the “Student Games”) was held in Hangzhou, Zhejiang Province in September 2017. It was the first national student games organized after the merger of the university games and the Students’ Games. A total of 5,966 athletes from 34 delegations across the country participated in the competition, recruiting more than 3,000 volunteers (Wang, 2017).

#### ***The Elaboration Management of the Trigger Module***

The trigger module is a prerequisite for the implementation of volunteer service in a large-scale games module. When organizing an event, we must consider what needs to be done in advance for the event to be held successfully: what are the modules and their relationship between the hierarchy? That is, prioritize the learning concepts and procedures for the activities. Specific to the Student Games, the trigger module needed to do the following: First, the top-level design was forward-looking. Make the overall work plan, clarify lead department and staff, determine the flow chart, time schedule, and division of labor, and determine the criteria and principles of various issues, budget and other funds. Second, set up volunteer service standards. In the seven links of volunteer service, recruitment, registration, and training belong to the trigger module. In the recruitment link, we should understand the job needs and size in advance as much as possible so as to determine the number of volunteers and positions. Recruitment must be open and transparent, making the best use of talent to meet the needs of volunteers. In the registration link, establish the registration and training standards, and clarify job settings and responsibilities. The training links are well versed in training, professional training and job training. This is a process from universal to professional, from theory to actual combat. The quality of training directly affects the volunteer service levels of the competition (Ni, Huang, & Zhang, 2011). These aspects establish standards that can be

followed, which are conducive to enhancing the efficiency of voluntary service work and promoting green management.

### ***Elaboration Management of the Organization Module***

In elaboration theory, the management of the organization modules is divided into two steps. First, determine the organizational framework, that is, clarify the content to be managed, and show them one by one. Second, determine the organizational relationship, that is, the relationship between rank and decision-making, and consider the order of the contents of various organizations, as well as the ways and means to effectively communicate the decision-making.

Elaboration of organization and management needs to pay attention to three aspects: First, is the professional aspect. Professional counterparts, make the best use of people, for different projects and positions, and choose the right candidate. Commanding and coordinating departments may organize the coordination and dispatch matters from the organizing committee and the volunteer service dispatching units may be responsible for the overall coordination and dispatch. In the specific competition units, volunteer services should be delegated authority, and their respective institutions should voluntarily provide volunteer services according to the actual situation work; this is conducive to the timely treatment of unexpected situations. The second aspect is gridding. Based on five types of volunteer service such as arrival and departure, food safety and so on, we can delineate the regions and tasks, determine the uniform norms and standards, and provide corresponding management staff with a certain number of volunteers. This approach can make the work area, and the content of work fixed, and the amount of personnel division of labor, and the responsibility to implement people to take management from passive response into active docking and help mobilize the subjective initiative of volunteers and managers. The third aspect is informatization. Build a smart management platform through technical means to form the APP and groups, such as the use of the Student Games, “voluntary remit” and so on. We can understand the distribution and volunteer time of volunteers through big data analysis and establish a highly efficient and environmentally-friendly way of coordination and communication to improve work efficiency and reduce information loss.

### ***Elaboration Management of the Support Module***

Support module work can be started from four dimensions. First, condition dimension, thinking of the preconditions for each task, and making the connection; second, time dimension, schedule and mission planning, important time node volunteer service arrangements can be accurate to the minute; third, the logical dimension, carefully consider the logic of each step between the content of the service, whether there is the possibility of optimization, simplify procedures, straighten out the relationship to ensure speed, efficiency and reason; fourth, the object dimension, ensure development of traffic, catering, health and other items of norms and standards, are in strict accordance with the standards.

Take the student games as an example. In terms of conditions, we should consider the number of personnel, the type and schedule of vehicles, the number of volunteers to be chauffeured and the reception etiquette in advance. The time dimension needs to consider arrival and departure times, vehicle departure time, and journey time. The logical dimension needs to consider how to arrange optimal driving routes; how to ensure the balance of passenger load and each team’s waiting time in the aspect of vehicle scheduling so as to improve transportation efficiency; and to coordinate the arrival and departure and accommodation catering, then make the team feel welcome. The object dimension needs to consider the

connection between leaders and volunteers, consider whether the requirements of each team are within the scope of volunteer service, and consider the job arrangements and rules of every volunteer including following the car volunteers, picking up volunteers, explaining volunteers and team volunteers.

### ***Elaboration Management of the Incentive Module***

The incentive module is the spiritual motivation and intellectual support for the volunteer service of large-scale competition. American psychologist Abraham Maslow divided human needs into five types in *A Theory of Human Motivation*: physiological needs, security needs, social needs, respecting needs and self-realization needs; these five kinds of needs are progressive. The needs of volunteers are more reflected in the levels of social, respect and self-realization, which are a higher level of demand. Therefore, the encouragement to volunteers is also reflected in the affirmation of volunteer service, complimenting the quality of the volunteers, and achievements recognition. Student Games volunteer service as a whole is in place, and the image of the small @ design also enjoys popular support. The flaw lies in that the management of the Student Games also uses a standardized system of management, the establishment of volunteer positions, responsibilities and norms in place, but there is a relative lack of flexibility. Volunteers cannot give full play to the initiative of individuals. Once the workload of volunteers is misjudged, it easily leads to uneven distribution of the workload, volunteers' idle time, and a lack of a sense of belonging and motivation. Therefore, the incentive module can be developed through the five-in-one mechanism of feedback, evaluation, complaint, culture and honor. The feedback mechanism allows for keeping abreast of job requirements, adjusting the remaining gaps, increasing flexibility and flexibility of work, to increase the sense of belonging for the volunteers. The evaluation and complaint mechanisms allow for volunteer work assessment, identification, correcting volunteer attitudes, communicating the awareness of the importance of volunteer service work; publicizing and promoting the volunteer service culture through cultural mechanisms and using distinctive volunteer service labels and activities to attract and involve young people at large. The spread of the volunteer service culture can also enable the broad masses of society to realize the social value of voluntary service, form a courageous dedication to society, and enhance the volunteer's sense of mission and value. Honor the hard work of the volunteers through honor mechanisms and inspire the volunteer's sense of honor and enthusiasm. Volunteers participating in the Student Games did not seek rewards, nor were they paid a lot. Therefore, the organizers needed to be more humane, to be accommodating, considerate, and understanding of the volunteers, to stimulate their sense of responsibility and enthusiasm for work.

### **Conclusion**

The green management of volunteer service of large-scale games is an internally-driven, normally sustainable and cost-effective model of management that can be achieved by triggering, organizing, supporting and motivating the refinement of the four modules. The triggering module is the prerequisite, but also the source of the green idea; the organization module is the center, and it can reduce the information loss; the support module is the main body to ensure the implementation of the process is green; the incentive module is motivation which can stimulate vitality from the volunteers. The four modules are interconnected and mutually reinforcing. It is worth mentioning that, similar to chaos fractal theory, through elaboration of the program sorting and processing, in the vertical division of each horizontal structure, the four modules can be recycled, but the mining of the content is more detailed and in-depth. Practice has proven that elaboration itself as a management philosophy, through top-level

design make the trigger module specific and orderly, with coordination of the organization module, support for multiple modules, and internal and external incentive module interaction. Then, it can make the complex volunteer service work in large-scale games clear, more planned and operate more smoothly. In addition, innovation is the DNA of elaboration theory, especially in today's information age, so the use of information technology innovation to promote the realization of elaboration contributes to the long-term effectiveness of green management.

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