



# An exploration of firms' awareness and behavior of developing circular economy: An empirical research in China



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## ABSTRACT

Despite the wealth of information concerning environmental awareness and the behavior of firms, there is little empirical research on the awareness and behavior of firms in developing the circular economy. The study employed a questionnaire survey and in-depth interviews with 157 firms from manufacturing clusters in China. Results indicated that the firms had a relatively good understanding about the circular economy and its values and had a strong willingness to operate a circular economy, but this was not indicative of enthusiastic behavior. A striking “gap” existed between a firm's awareness and its actual behavior in developing a circular economy. Reasons for the gap are explored mainly based on the results of interviews. Finally, recommendations for overcoming the gap between the awareness and behavior are suggested.

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## 1. Introduction

The world has finite resources; however, ongoing consumption levels and developing economies on a global scale result in the continual generation of large amounts of waste. Waste is a pressing environmental, social and economic issue. The circular economy approach could transform the function of resources in an economy. In a circular economy, the waste from factories would become a valuable input to another process—and rather than disposing of defunct products, they could be repaired, reused or upgraded (Preston, 2012). Many countries and regions, such as Germany, Japan, the European Union (EU), and the United States have launched circular economy plans (Geng et al., 2013). This concept is particularly relevant to China; during the course of its industrialization, significant numbers of enterprises of various sizes have formed and clustered together. Such industrial clusters are fundamental to the economic growth of China, but they have caused serious problems including the depletion of natural resources and the degradation of major ecosystems (Liu, 2008). Thus, it is essential for China to focus on the development of its circular economy as the country experiences continuously growing energy and resource demands, piling waste, and rising pressure to tackle climate change. The success of such a scheme includes allocating additional funds,

developing new technologies, and training the workforce. However, it should also be based on a thorough understanding of firms' awareness of, behavior toward and barriers to operating a circular economy.

## 2. Literature review

Previous studies focused on the environmental awareness and behavior of individuals and enterprises (Hines et al., 1986/87; Bamberg and Moser, 2007; Liu, 2009a,b) and on the gap between awareness and behavior; for example, Blake (1999) studied the value-action gap in environmental policy. Kollmuss and Agyeman (2002) found that increases in knowledge and awareness generally did not lead to pro-environmental behavior, similar to the findings of Padel and Foster (2005), Csutora (2012), and Courtenay-Hall and Rogers (2002).

Other prior studies focused on the awareness and behavior of firms toward developing a circular economy. For example, it is widely adopted by large waste-management companies in the EU, including SITA UK (2011), Veolia Environment (2010) and the Van Gansewinkel Groep (2011). In China, Liu (2009a,b) and Gu et al. (2007) put forward three levels of behavior relating to the circular economy. Lin et al. (2009) found increasing circular economy knowledge levels among industrial firms, supporting the findings of Yu (2008) and Wang (2008). A SMEs (small and medium-sized enterprises) survey in Zhejiang conducted by the Bureau of Zhejiang SMEs (2008) found high awareness levels for the need to reduce the consumption of raw material among SMEs. However,

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the State Electricity Regulatory Commission of China deems there to be considerable scope for electrical businesses to improve such “reduction” awareness levels.

There has also been a research focus on the factors influencing company behavior. For companies, the circular economy economic potential is huge. If a subset of the EU manufacturing sector adopted circular economy models, it could realize net materials cost savings worth up to US\$630 billion per year by 2025. The typical influencing factors are the cost of circular economy development (Luo and Li, 2005; Logožar et al., 2006; Ma et al., 2006), and firms’ environmental awareness (Bush and Araman, 1997). In Greece, Georgiadis and Besiou (2008) found that ecological motivation and technological innovation affected the long-term behavior of a closed-loop supply chain with recycling activities. Other researchers proved that the pressure influenced by governmental regulation is the main factor influencing a firm’s environmental behavior, such as waste reduction (Henriques and Sadorsky, 1996; Stafford, 2002; Reijnders, 2003; Xu and Luan, 2004; Wang et al., 2007; Wen et al., 2009). Market pressure also affects the environmental behavior of a firm (Bermmer, 1989; Weber, 1990; Chase, 1991; Wen and Chang, 1998; Johnstone and Labonne, 2009); this has a close relationship with the development of circular economy (Zhu, 2007). In contrast, Wang et al. (2007) showed that market pressure in China, particularly domestic market pressure, does not influence the environmental behavior of an industrial firm. This reflects the situation relating to community pressure. Community pressure plays an active role in developed countries and has become a key factor in determining the environmental behavior of a firm (Dasgupta et al., 2000; Chen and Soye, 2003); however, in China, there are fewer examples of communities playing positive roles in encouraging firms to reduce pollution. Community pressure is not found to be the key factor in determining the behavior of Chinese firms (Cai, 2002; Wang et al., 2007).

A further interesting research stream focused on the domestic policies in place to promote the development of a circular economy, such as a recycling subsidy or a tradable permit (Luo and Li, 2005; Ma et al., 2006; Chang, 2008). Gu et al. (2007) and Zhou (2008) concentrated on a firm’s internal management policies systems (such as social consciousness, technical production innovations, and purposeful decisions by stakeholders throughout the materials system), and their findings supported those of Kirchain and Cosquer (2007).

There are few specific empirical investigations on the relationship that the awareness and behavior of firms has on developing a circular economy. Consequently, it is necessary to narrow the scope and provide insight into the awareness and behavior of firms in manufacturing clusters. This will facilitate decision-makers in planning for the development of a circular economy and promote the sustainable development of manufacturing clusters in China.

### 3. Material and methods

A multiple-choice questionnaire was the main data collection tool. The awareness and behavior of firms toward developing a circular economy are multidimensional constructs. Therefore, Churchill’s (1979) research paradigm was applicable to create measures. Aimed at developing constructs, this paradigm was successfully employed in previous research (Liu, 2009a,b; Bai and Liu, 2013).

Additionally, parallel in-depth interviews were conducted throughout the survey period. As a research strategy, the in-depth interview has been used in many situations to contribute to knowledge on individual, group, organizational and political processes. Following systematic procedures, this method is not “soft” but

**Table 1**  
Characteristics of interviewees.

Gender	Educational level	Age
Male 51%	University 34%	[20–30] 35%
Female 49%	Postgraduate 66%	[31–40] 45%
		[41–60] 20%
Specialty	Environmental economics 29%; population, resource and environmental economics 24%; marketing 26%; MBA 21%	

remarkably “hard” (Yin, 2002). The flow of our research is shown in Fig. 1.

#### 3.1. Questionnaire survey

##### 3.1.1. Questionnaire design

The study involved specifying the construct domain, generating items, collecting data and purifying measures, in addition to assessing reliability and validity. A circular economy focuses on “reducing”, “reusing” and “recycling” (3Rs) materials and energy; this has a close relationship with environmental awareness and behavior. Environmental awareness has been described as a multidimensional construct (Maloney and Ward, 1973; Hammer, 1994). Zsoka (2008) showed that the dimensions of environmental awareness include environmental knowledge, values, attitudes and willingness to act, as well as actual behavior. Further, Fryxell and Lo (2003) considered that environmental knowledge could be defined as knowledge of fact and concept. Sakr et al. (2010) investigated environmental awareness from five dimensions, including the dissemination of information and the contractors’ environmental responsibilities. Existing literature was used to specify the awareness domain for developing the circular economy, including the knowledge, values of the circular economy and willingness to act. The behavior domain was specified primarily from the thesis of Liu (2008), including purchasing, production and management behaviors. Consequently, 18 items (each mentioned more than twice in reviewed literature) were identified to specify the awareness and behavior domains, and a series of semi-structured elite interviews were conducted to provide feedback on the items.

The semi-structured interview included 18 closed questions and one open question. They were told the full nature of the survey and why they were selected to participate, and then we asked, by email or telephone conversation, the 18 closed questions just like: *Do you think “whether the questionnaire respondents have heard of circular economy or not” is*  *Least important*  *Somewhat Important*  *Important*  *More Important*  *Most Important*. The only one open question was: *Do you have other suggestion for the item of a firm’s CE awareness and behavior?* In fact, most of the respondents said “no”. A few respondents gave us their suggestion, but because of low frequency we did not put to use.

Because the participants were contacted by email or telephone, their feedbacks have been provided also by email or telephone conversation. The participants’ ability to comment on the items was established from their educational level and specialties. 150 participants were contacted and 120 of those contacted interviewees participated (see Table 1).

According to practicability, we combined the interview and survey in the research. We emailed our questionnaires to most of the interviewees, firstly. Some of them replied us with their answers via email. Then, we called those nonrespondents and asked if they would like to participate in the telephone interview. Thus we employed both email survey and telephone interview.

Five-point Likert scales were used as measurements, for example, least important (1 mark), somewhat important (2 marks), important (3 marks), more important (4 marks), and most

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