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Did reverse logistics practices hit the triple bottom line of Chinese manufacturers?

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ABSTRACT

Reverse logistics (RL) practices represent an important and emerging trend in China's manufacturing practices. An increasing number of Chinese manufacturers have integrated RL practices in their operations to develop sustainable competitive advantage. There are six broad aspects of practicing RL which include waste management, recycling, reuse, reprocessing, materials recovery, and design for RL. The literature remains unclear, in particular Chinese manufacturing context, as to how these RL practices are related to organizational bottom line with respect to operational, financial, and social performance outcomes. Using survey data collected from Chinese export-oriented manufacturers, we applied seemingly unrelated regressions to determine if these six RL practices contribute to these three performance parameters simultaneously. The theory of production frontier is used to characterize the RL practices adoption and the performance implications. Our results indicate that the adoption of RL practices by Chinese manufacturers generates substantial environmental and financial gains, but not social benefits. This study extends the frontier of managerial knowledge for Chinese manufacturers by highlighting the emerging trends in RL practices and providing evidence on the business value of adopting RL practices.

1. Introduction

China's success in manufacturing was primarily based on low labor cost. This cost advantage attracts companies from developed countries to relocate their production base to China or outsource production function to their Chinese manufacturer counterparts. After three decade of development based on low cost structure, there comes to a concern on the sustainability of such manufacturing practice in China. The rapid economic growth in the country will eventually lead Chinese manufacturers to lose their cost advantages as what was experienced in Hong Kong, Taiwan, Singapore, and South Korea.

The country is also experiencing environmental degradation at catastrophic level due to industrial pollution where manufacturing is a major source and a solution is urgently needed. The increasing resources depletion together with the detrimental environmental burden due to productive activities have pressurized the Chinese government to develop and implement stricter regulatory policies such as the Chinese version of RoHS (i.e., Restriction of Hazardous Substances). These, in turn, have prompted many Chinese manufacturers to recognize the importance of ecological modernization, which stresses implementing innovative management practices to mitigate the environmental damage from the pursuit of profitable growth (Lai et al., 2012).

Serving as the global factory, Chinese manufacturers are increasingly expected to respond to the environmental quest of the international community to mitigate the damages caused by their produced items to other countries through better life cycle management of their merchandises from sourcing and manufacturing to distribution and disposal. In particular, export-oriented manufactures in China are encountering various institutional and operational pressures that prompt their adoption of green practices. For instance, regulations on environmental protection such as the Waste Electrical and Electronic Equipment (WEEE) and the End of life Vehicle (ELV) Directive in Europe as well as the local Cleaner Production Promotion Law and the Saving Energy Law are pressuring Chinese manufacturers to become more accountable for residual and final products, long after the final product is sold and in the hands of the customers. This regulatory pressure on environmental protection is particularly salient for Chinese manufacturers seeking to compete in the global market. The different stakeholders in the international community including

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customers, suppliers, and environmental groups expect manufacturers to reduce harms caused to the natural environmental by their products and operations.

To tackle all these challenges and pursue sustainable development, Chinese manufacturers need to build other competitive advantages in their operations system. Increasingly, they realize that a production system should not be a one-way system; rather it is a two-way closed loop. In fact, in many instances, manufacturers need to handle returned products which can be resulted from damaged or defective shipments, incorrect delivery, overstocks, and customer return due to dissatisfaction. Reverse logistics (RL) is one of the innovative practices helpful for Chinese manufacturers to improve business performance while preserving the environment in the locality and the global community. It is a viable environmentally friendly management approach helpful for Chinese manufacturers to better utilize resources, reduce wastes, improve efficiency, and meet the social expectation for environmental conservation (Lai and Wong, 2012).

One example to illustrate RL practices in Chinese manufacturing is the Haier group, a multinational consumer electronics and home appliances enterprise located in Qingdao. This company is proactive in various environmental management initiatives, for instance, green product development. With government's support, Haier launched a project to demonstrate how to handle end-of-life product management issues, including a site with an annual capacity to process 200,000 used electronic products (Park et al., 2010). In 2007, a total of RMB $80 million (approx. US$12 million) was invested to construct the Haier recycling centre in Qingdao where 15% of the cost contributed by the government for this project. It was estimated that about 200,000 used home appliances, including TV sets, air conditioners and washing machines can be recycled per year in this center (Yang et al., 2008). This recycling center of Haier is classified as a "*National-level wasted home appliances recycling demonstration site*"(*国家级废旧家电回收处理示范基地*) and is the first "*Environmental protection education demonstration site*" (*绿色环保教育示范基地*) of China.

Theoretically, adopting and implementing RL represent an attempt to develop new and innovative ways for environmental protection without compromising their capability to compete. Though anecdotal stories like Haier Group are encouraging, many Chinese manufacturers remain hesitant in investment decision on RL. One possible obstacle to diffuse RL among Chinese manufacturers can be uncertainty on its triple bottom-line benefits. The triple bottom-line essentially captures the intersection of social, economic, environmental, and social goals from the microeconomics standpoint. This study targets to evaluate how far Chinese manufacturers go along the line of sustainable development, providing insights of where to put more efforts specifically on RL to improve their chance for long-term success.

2. Conceptualization of reverse logistics

RL is a management approach whereby adopting companies can become more environmentally efficient through recycling, reusing, and reducing the amount of materials used (Carter and Ellram, 1998). In the manufacturing context, it is defined as the process by which a manufacturer systematically takes back previously shipped products or parts from the point-of-consumption for possible recycling, remanufacturing, or disposal (Dowlatshahi, 2010). RL is helpful for extending the life of materials and products and hence reducing environmental burdens from industrial operations (Jayaraman and Luo, 2007). It involves the management of goods flowing from their final destination back to the point of origin with the objective to recover value or reduce waste (Rogers and Tibben-Lembke, 2001). Conventionally, manufacturers create value in the sequence from inbound logistics to operations, outbound logistics, marketing and sales, and finally to service in the value chain (Porter, 1985). Nowadays, manufacturers are expected to assume the responsibility for environmental protection with particular respect to handling their end-of-life-cycle products, which requires collection, product recovery, or proper disposal (Zhu et al., 2008b).

In recent years, there is a stream of research examining ways to develop manufacturing competencies (Koufteros et al., 2007) and that RL is found to improve the profitability of manufacturers (Weeks et al., 2010). Using RL, manufacturers can systematically retrieve previously shipped products or parts from the consumption point back to the factory for possible product recycling. This management approach provides an alternative use of resources in a cost-effectively and ecologically friendly manner by extending a product's normal life beyond its traditional usage.

According to Flapper et al. (2005), the types of RL in a close-loop supply chain can be classified as production-related, distribution-related, use-related, and end-of life. There are obsolete materials, production scraps, and production defects below preset quality levels in the production-related stage that require RL for handling the returned materials. During distribution, there can be commercial returns of products that are sold with a return option, wrong deliveries as the products are refused by customers because they are delivered too early or too late, or otherwise not conforming to specification, and product recalls resulting from safety problems (e.g., food and automobile). A product currently in use may also need RL due to warranties and repair services. At the end-of-life stage, products are returned to the distributors or the original manufacturers because their components and materials can be valuable for reuse in other products, e.g., rare materials in electronic appliances. Previous research has also recognized the importance of greening the supply chain and the environmental management of product life cycle (Guide and Li, 2010; Klassen and Whybark, 1999; Zhu et al., 2010).

The concept of RL should be explored and integrated as a viable option in the product life cycle from product design to manufacturing to shipment to the ultimate consumers. In many instances, manufacturers need to deal with returned products, which may be the result of damaged or defective shipments, incorrect shipments, overstocks, and customer returns due to dissatisfaction, and take advantage of their residual value. Regulations on environmental protection are also pressing manufacturing enterprises to become more accountable for residual and final products, long after the final product is sold and in the hands of the customers (Zhu et al., 2010).

Since the entry of China into the World Trade Organization (WTO) in November 2002, Chinese manufacturers have been increasingly confronted with competitive challenges including fast changing international customer tastes, technology acceleration, and environmental-based trade barriers in their operations environment. The different stakeholders in the international community including customers, suppliers, and environmental groups also expect them to reduce damages caused to the natural environment by their products and operations. On the policy side, the Chinese government has increasingly emphasized corporate and industrial environmental measures through promoting the development of a circular economy in the country (Zhu et al., 2010). To tackle these challenges, Chinese manufacturers need to continuously develop new and innovative ways for environmental protection without compromising their capability to compete. There is growing interest on adopting RL in the manufacturing sector to gain cost efficiency while preserving the environment (Kenne et al., 2012).

Better inventory control, reduced waste disposal cost as well as improved customer service and corporate image have been identified as potential benefits that may accrue to enterprises competent in RL (Carter and Ellram, 1998; Chan and Chan, 2008; Marien, 1998). Previous studies have also identified the strategic importance of