



Ecological modernisation of Chinese export manufacturing via green logistics management and its regional implications

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ARTICLE INFO

Article history:

Received 1 April 2011
Received in revised form 4 August 2011
Accepted 5 October 2011
Available online 3 November 2011

Keywords:

Ecological modernisation
Environmental management
Chinese export manufacturing
Developing economy
Empirical

ABSTRACT

We investigate how various ecological modernisation forces in terms of environmental regulations, customer pressure, and economic pressure are associated with the implementation of green logistics management (GLM) by Chinese export manufacturers to manage the logistics life cycle of their products. Based on survey data from 128 Chinese export manufacturers, we find that customer pressure is a significant factor affecting the extent of their GLM implementation, which in turn is positively associated with their environmental, financial, and operational performance. Contrary to our expectation and previous findings on environmental management in developed countries, both environmental regulations and economic pressure are not significant drivers for Chinese export manufacturers to pursue GLM.

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1. Introduction

Under growing pressure for *ecological modernisation*, which stresses implementing innovative management practices to mitigate the negative environmental impacts from the pursuit of profitable growth, enterprises in China are increasingly seeking environmentally sustainable solutions that improve business performance while preserving the local, as well as the global environment [1,2]. In particular, Chinese export manufacturers face the need to mitigate the environmental damage of their activities by implementing management systems with formal procedures to monitor, report, and control their merchandise's logistics life cycle [3,4].

Green logistics management (GLM) aims to deploy processes that produce and distribute goods in a sustainable way, with a view to reducing waste and conserving resources in performing logistics activities [5]. GLM can be viewed as a management approach by which firms formally manage, evaluate, report, and control the environmental impacts of their actions throughout the life cycles of their products [6]. This management approach requires firms to: (i) adopt procedures to formally operate, document, and report their logistics activities, (ii) conduct evaluation of their performance, (iii) inform and communicate with various stakeholders regarding their logistics activities, and (iv) comply with environmental standards.

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In this study we seek to understand the impact of Chinese export manufacturers' actions on the environment and on the reputation of their developed-country customers [7] by exploring the ecological modernisation forces (EMFs) encountered by the former. Specifically, the purpose of this study is threefold, namely: (i) examining the key EMFs from the institutional perspective of environmental responsibility that drives Chinese export manufacturers to implement GLM, (ii) investigating the performance impact of GLM implementation in Chinese export manufacturing, and (iii) exploring the mediating role that GLM plays in helping adopting manufacturers to cope with the EMFs in their pursuit of preserving the environment without compromising business performance.

2. Theoretical background and hypotheses

GLM advocates that enterprises adopt an array of environmental management practices such as reducing carbon dioxide emissions in distribution, remanufacturing, reuse, recycling, extending the product life cycle, and capturing value from used products [8–10]. The adoption of such practices is highly desirable for Chinese export manufacturers in their quest to reduce the environmental harm of their activities and to institutionalise changes to develop an ecologically modernised industry [11,12]. By collecting and analysing returned products, Chinese export manufacturers can identify problems related to product use patterns, as well as opportunities for product improvement and development. Such indirect market feedback provides useful input to Chinese export manufacturers to improve product design, sourcing decisions, forward and reverse logistics planning, and new product development [7]. Such an approach can help the Chinese export manufacturing industry sustain its world leadership position in manufacturing, and alleviate the local and regional environmental problems caused by the corresponding product flows. By implementing GLM, Chinese export manufacturers stand a better chance of reducing the environmental burden of developing, distributing, and disposing of their products in overseas markets, while improving their operational and financial performance. Therefore, we predict that:

Hypothesis 1 (H1). The extent of GLM implementation by Chinese export manufacturers is positively related to their environmental, financial, and operational performance.

Chinese enterprises have been fraught with challenges in accessing natural resources in recent years due to polluted air and water, energy shortage, and deforestation as a result of rapid industrialisation [13,14]. Dwindling natural resources are detrimental to China's continued growth and economic development. With resource scarcity and rising raw material prices, e.g., crude oil, copper, nickel, steel, and resin, where material costs make up approximately 50% of the total cost of the goods sold, Chinese export manufacturers are under economic pressure to reduce material costs by taking such environmental initiatives as using reprocessed or scrap materials for new merchandise production. At the same time, they have to comply with environmental requirements and market expectations in exporting and sales to foreign customers. These customer-based environmental requirements vary from ISO 14000 certification [15] to retrieval of reusable parts or products from their countries. In many instances, these requirements are imposed by customers to fulfil their own environment-related obligations, as well as to demonstrate their environmental responsibility [14]. In addition, Chinese export manufacturers are increasingly expected to comply with the environmental regulations of the countries that import their manufactured products, e.g., WEEE and REACH [16]. Covering product development, as well as management of the logistics life cycle, such regulations mandate Chinese export manufacturers to collect end-of-life products and capture their residual value to satisfy the environmental expectation of the international market. The implementation of GLM by Chinese export manufacturers reflects that the industry is ecologically modernising [17]. In view of the above observations, we expect that:

Hypothesis 2 (H2). The extent of the ecological modernisation forces – as characterised by customer, economic, and regulatory pressures – encountered by Chinese export manufacturers is positively related to the extent of their GLM implementation.

According to Mol [18], the ecological modernisation of China requires changes by Chinese export manufacturers to address emerging environmental problems. Their roles in resolving these problems and their actions to improve and balance their economic and environmental performance are crucial to environmental protection. GLM is highly valuable to the ecological modernisation of China's industry, the export manufacturers of which often strive for self-interest fulfilment and consider environmental issues secondary. For instance, the worsening environmental problems in China have reached a point that erodes its GDP growth [14]. This situation urgently begs for a balance between economic and environmental performance in running such a high-polluting sector as manufacturing [19]. To strike such a balance requires the efficient use of resources such as energy, fuel, raw materials, and water, as well as the effective manufacturing and distribution of products that create customer value. Due to the growing desire for environmental protection in international markets, many Chinese export manufacturers have pursued GLM in the hope of improving their environmental, financial, and operational performance, which are the underlying goals of ecological modernisation [17]. Accordingly, we conjecture that:

Hypothesis 3 (H3). GLM mediates the relationships between the ecological modernisation forces – as characterised by customer, economic, and regulatory pressures – encountered by Chinese export manufacturers and their environmental, financial, and operational performance.

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