Chapter 8
A Framework for Economic and Environmental Sustainability and Resilience of Supply Chains

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Abstract Traditionally supply chain management decisions are based on the economic performance which is expressed by financial and non-financial measures, i.e. costs and customer service. From this perspective, in the last decades, several logistics trends, i.e. outsourcing, offshoring and centralization, emerged. Recently, studies have shown that the focus on the cost aspect is no longer sufficient. Due to internal and external drivers (e.g. customer pressure, regulations, etc.) environmental criteria become more and more important for the decision-making of individual enterprises. Furthermore, the risk which is related to the increased transportation distances resulting from these strategies is often not taken into account or underestimated. These shifts in priorities of companies force them to search for new logistics strategies that are at the same time cost-efficient, environmentally friendly and reliable. Based on this integrated perspective new logistics trends, like on- and nearshoring, flexible supply base or flexible transportation, have come up recently and will gain more importance in the near future. Relying on a flexible supply base a company can benefit from low costs in an offshore facility and simultaneously be able to respond quickly to demand fluctuations and react to delivery delays and disruptions by serving the market also from an onshore site. A single-period dual sourcing model is presented to show the effects of emission costs on the offshore, onshore and total order quantity.

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8.1 Introduction

Traditionally supply chain management decisions are based on the economic performance which is expressed by financial and non-financial measures, i.e. costs and customer service. From this perspective, in the last decades, different logistics trends, i.e. outsourcing, offshoring and centralization, have emerged.

Even though these trends seem to be rather “old” they are still prevailing in today’s businesses. Recently, a study conducted in Austria has shown that 41% of the interviewed companies still intend to offshore some of their production activities in the following two years. Furthermore, 35.4% of them plan to move their production sites to Asia; especially China is a prominent destination for offshoring. The low cost of the production factors (personal, material, etc.) are the key drivers for their decisions (Breinbauer et al, 2008).

A European-wide study carried out by Fraunhofer ISI concerning offshoring showed similar results. Between 25% and 50% of the surveyed enterprises moved parts of their production abroad in the years 2002 and 2003 (Dachs et al, 2006).

Further examples can be found. For instance, the Austria-based Knill Group, which is active in the field of infrastructure, supplying systems and applications for energy and data transmission, built new production facilities in India and China within the past 36 months in order to take advantage of lower wages in Asia (Breinbauer et al, 2008). NXP, a leading semiconductor company is headquartered in Europe and employs more than 33,500 employees. The company pursued a strong offshoring strategy and now more than 60% of its production activities are located in Asia, 5% in America; only 33% have remained in Europe. Also, AT&S, a large Austrian manufacturer of printed circuit boards, continues its offshoring strategy. In January 1999, AT&S started operating in India by acquiring the largest Indian printed circuit board manufacturer and now it will build a second facility located nearby. The investments for this project will amount to 37 million Euros and production activities shall start in the third quarter of 2009. Besides, AT&S operates facilities in China and Korea.

In section 2 prevalent logistics trends are presented focusing on a cost perspective, thereby showing the trade-offs that exist between the different cost components. The trends presented, i.e. outsourcing, offshoring and centralization, usually lead to lower production (procurement) costs in the case of offshoring and outsourcing or lower inventory costs in the case of physical centralization. But, in general, they result in an increase of transportation distances, therefore making supply chains longer and/or more complex. Often in the evaluation of these strategies side effects of increased transportation distances are not taken into account adequately. Therefore, in section 3 in addition to the economic criteria, “soft” factors, like lead time, delivery reliability, flexibility, etc. and the environmental impact are included. Based on this integrated perspective consisting of costs, risks and environment new logistics trends are highlighted. One of these new logistics trends is then analyzed in more detail, namely flexible supply base with the specific variant dual sourcing. In section 4 a transport-focused framework for dual sourcing (off- and onshore supply source)