Promoting Corporate Social Responsibility in Logistics throughout Horizontal Cooperation

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This paper discusses how Corporate Social Responsibility (CSR) can be promoted in Logistics and Transportation (L&T) companies by means of Horizontal Cooperation (HC) practices. The L&T sector is experiencing important changes because of new trends in markets and society. These changes have a strong impact on the way L&T companies develop their distribution activities. On the one hand, globalisation and increasing competition are creating incentives for these companies to cooperate in different ways – with the aim of becoming more efficient by sharing resources and reducing costs. On the other hand, the increasing sustainability awareness within society is pressuring L&T companies to integrate CSR principles into their strategies and policies. Accordingly, this paper discusses the current trends in these areas and offers some examples of how HC can contribute to reduce both distributions costs as well as the environmental impact of the distribution activities.

Key Words: corporate social responsibility; green logistics; horizontal cooperation
JEL *Classification:* M14; C61; C63; L92

Introduction

During the last few years, customers are increasingly seeking benefit in the products they demand. Nowadays, this benefit comprises not only products and services with high quality and cheap prices, but also products and services, which are socially and environmentally respectful. Today's customers are worried about sustainable development, and Corporate Social Responsibility (CSR) is currently considered as the main contribution of corporations to sustainable development (Bansal 2005). In a brad sense, CSR entails the adoption by organisations of a very wide range of polices and compromises covering social, environmental and economic dimensions and their translation into processes to be applied over the whole organisation's influence area.

In this new context, companies no longer can base their commercial strategies in achieving competitive advantages on the traditional 'four Ps' (price, product, promotion, and place), as they can be used to externalise negative impacts. Instead, the 'four Rs' (reliability, responsiveness, resilience, and relationships) are now considered to provide real added value, and logistics play a key role in all of them (Waters 2010). Globalisation has also introduced several changes in Logistics and Transportation (L&T). Globalisation of production and markets has caused supply chains to stretch and become less predictable. L&T companies now deal with an increasing competition where international L&T companies are coping with local markets, reducing profit margins, and reducing the number of available service providers (Verstrepen et al. 2009).

The application of CSR to the area of L&T is widely known as logistics social responsibility. Carter and Jennings (2000, 9) define LSR as 'the socially responsible management of the supply chain from a cross-functional perspective.' Apart from the standard policies and practices that companies acting according to CSR principles are expected to integrate – which include stakeholders' engagement and transparency, among others –, logistics social responsibility comprises some specific activities related to the sustainable management of the supply chain. These activities are purchasing management, transportation, packaging, warehousing management, and reverse logistics (Ciliberti, Pontrandolfo and Scozzi 2008b). Therefore, it is possible to find several works in the scientific literature which propose the integration of corporate social responsibility and sustainability principles in logistics (Carter and Jennings 2002; Ciliberti, Pontrandolfo and Scozzi 2008b; Miao, Cai and Xu 2012). Many of those works pay special attention on the environmental pillar of sustainability, and they deal with important negative impacts such as pollution or fuel consumption.

From an integrated sustainability point of view, these works could be classified as 'Business Cases' (Bieker et al. 2001). This is because their ultimate goal is to increase corporate benefits, because of both eco-efficiency and social productivity. Logistic social responsibility is aimed at reaching sustainability in a practical way, balancing eco-efficiency, social productivity, and social equity. The compromise among the social and environmental aspects must be taken into consideration too.

Optimisation has traditionally been used to reduce costs in logistics. Optimisation methods can be used, for example, to determine optimal stock levels (Sevastjanov and Dymova 2009) or to reduce transportation costs (Tsao and Lu 2012). Transportation is a major task in any logistics service. It also represents the largest proportion of the total logistics cost (Rushton, Croucher and Baker 2006). Therefore, researchers have historically devoted heavy efforts to optimise transportation costs. When optimising transportation costs, several measures can be used in the objective function, which is generally defined to pursue the maximum profit or, alternatively, the minimum cost. These components can be then combined with other objectives, for example: reduction of emissions or a fairer workload distribution among workers. This paper illustrates some examples on how horizontal cooperation practices can contribute to promote CSR in the L&T sector by reducing the company costs as well as the environmental emissions and negative social impacts.

The remaining of this paper is structured as follows: the following two sections complete a literature review on the topics CSR and HC, respectively; then, two visual examples contribute to illustrate the potential benefits of HC practices and their relationship with CSR; some numerical experiments contribute to get a quantitative measure of the benefits that can be attained by using HC in logistics and transportation. Finally, a conclusion section highlights the main contributions of this paper.

Corporate Social Responsibility in Logistics

CSR can play a fundamental role in achieving worldwide objectives of growth, competitiveness, better governance, and overall sustainable development. Those companies acting according to CSR principles are expected to contribute to economic development while improving the quality of life of the workforce and their families, as well as of that of the local community and society at large (Holme and Watts 2000). It is therefore worth advancing in those efforts aimed at promoting CSR practices at any level. According to CSR principles, companies adopting CSR are compelled to integrate ecological and social aspects into their decisions and actions across their supply chains (Ciliberti, Pontrandolfo and Scozzi 2008a), and they should hold themselves accountable for the social and environmental impacts arising from their activity. Of course, logistics represents a key element at most stages of the products' lifecycle.

The logistics and transportation sector is global in nature, and it has a great variety of impacts that can affect the economic, environmental, and social dimensions of society – both in positive and negative ways. As an increasingly important sector on a global level, a wide range of stakeholders are progressively gaining interest in what these organisations are currently doing as well as their future plans with regards to sustainability. The importance of the application of CSR principles in logistics has been widely recognized by scholars and practitioners (Poist 1989; Carter and Jennings 2002; Ciliberti Pontrandolfo and Scozzi 2008b), who use the term Logistics Social Responsibility (LSR) to refer to the socially responsible management of logistics. Modern logistics are no longer limited to the mere management of transport and storage of physical goods. Instead, nowadays they have been extended to the coordination of all phases identified in the course of supply, production and sale of a company and its relations with the rest of the environment in which it operates (Pulina and Timpanaro 2012). In this regard, the Council of Supply Chain Management Professionals (2013) define logistics management as 'that part of the supply chain process that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements.' From this definition, it can be derived that logistic management encompasses several processes such us inbound and outbound transportation, warehousing, inventory management, management of third-party logistics service providers, sourcing and procurement, packaging and assembly, or customer service – which includes the movement and management of products and resources after the sale and after delivery to the customer.

There is not a global agreement on what practices are included in LSR, and several frameworks can be found in the literature. According to the proposal of Poist (1989), LSR includes employee training, philanthropy, environment, urban renewal, workplace diversity, health and safety, and community issues. Carter and Jennings (2002) defined an integrative framework comprising a wide set of specific activities for the socially responsible management of purchasing, transportation, and warehousing management. The aforementioned authors classified these activities into broad categories, including environment, ethics, diversity, working conditions and human rights, safety, and philanthropy and community involvement. In a similar way, Ciliberti, Pontrandolfo, and Scozzi (2008b) proposed taxonomy with 47 LSR practices, classified in five broad categories, including: purchasing social responsibility (24), sustainable transportation (13), sustainable packaging (2), sustainable warehousing (2), and reverse logistics (6). Finally, the model used by Miao, Cai and Xu (2012) considers five main dimensions to deal with for a sustainable management of logistics: supplier selection, product delivery to customers, environmental protection, humanity to employees, and philanthropy/community aspects.

The importance of a sustainable management of logistics has also been recognised by the Global Reporting Initiative (GRI). The GRI is the most relevant institution in the sustainability-reporting context, and it has developed what is considered the best-known framework for voluntary reporting of environmental and social performance by business and other organisations worldwide. This framework is the GRI Guidelines for Sustainability Reporting. While these guidelines are designed to be applicable by almost any kind of organisation, GRI has also developed a specific supplement for the logistics and transportation sector (Global Reporting Initiative 2006). This supplement provides special attention to the sustainable management and transparent disclosure of information in the logistics and transportation sector, which is especially important for assessing the triple bottom line performance of companies operating at the sector. In this regard, the supplement emphasizes the need of identifying the environmental and social impacts of the organisation's method of ship disposal or other types of transportation fleet disposal. To help organizations, the supplement also proposes some complementary environmental performance indicators to be included in the sustainability reports of L&T companies. Those indicators are related to the description of the following topics:

- Breakdown of fleet composition.
- Policies and programmes on the management of environmental impacts – such as using hybrid vehicles or improving route planning.
- Initiatives to use renewable energy sources and to increase energy efficiency.
- Initiatives to control urban air emissions in relation to road transport (e. g., use of alternative fuels, frequency of vehicle maintenance, driving styles, etc.).
- Policies and programmes implemented to manage the impacts of traffic congestion (e. g., promoting off-peak distribution, new inner city transport modes, percentages of delivery by modes of alternative transportation, etc.).
- Policies and programmes for noise management/abatement.

- Environmental impacts of the organisation's major transportation infrastructure assets and real estate.

Horizontal Cooperation in Logistics

Globalisation has brought important changes in the way Logistics Service Providers (LSPs) operate. This is due, in part, to the growing intensity of competition, which has resulted in an increasingly challenging scenario. Nowadays, customers expect goods to be delivered in the right amount, at the right time and place, in perfect condition and at the lowest possible price. Today, customers require a wider variety of services as well, and they are increasingly searching for LSPs that can offer them full packages of logistics services. Under this new reality, cooperation appears as an interesting commercial strategy for LSPs companies, either vertically with customers or horizontally with other LSPs (Schmoltzi and Wallenburg 2011).

By cooperating, LSPs can reduce operational costs, reach wider markets and offer integrated service packages to their clients. Vertical cooperation is generally known as supply chain management. This concept has been widely addressed in the literature, and while many definitions can be found (Chistopher 1992; Simchi-Levi, Kaminsky and Simchi-Levi 2000), most of them share the concept of cooperation among companies involved in the lifecycle of a product or a service, from raw material to distribution to costumers. Whereas the literature is plenty of works about supply chain management, from both academics and practitioners, the study of horizontal cooperation is still in an early stage. Bahinipati, Kanda and Deshmukh (2009, 880) define horizontal cooperation as 'a business agreement between two or more companies at the same level in the supply chain or network in order to allow ease of work and co-operation towards achieving a common objective.' According to the definition provided by Cruijssen, Dullaert and Fleuren (2007), horizontal cooperation is about identifying and exploiting win-win situations among companies that are active at the same level of the supply chain in order to increase performance. To this end, cooperating companies are expected to reach agreements by means of dialog and partnership, both of which are key factors to promoting CSR. The literature on HC emphasizes that it can improve the performance of both core and non-core LSPs processes (Esper and Williams 2003).

Economic motivations of horizontal cooperation have been widely treated in the literature. Thus, for instance, Cruijssen, Dullaert and

Fleuren (2007) found that significant cost reductions and productivity increases are seeing as the most important opportunities of horizontal cooperation. Schmoltzi and Wallenburg (2011) found that, apart from those identified by Cruijssen, Dullaert and Fleuren (2007), the motivational factors driving cooperation also include service quality improvement and market share enhancement. In addition, some researches also argue that horizontal cooperation can increase the performance of companies by providing access to additional knowledge and to new financial resources or markets (Sakakibara 1997). Reasons linked to eco-efficiency – such as reducing fuel consumption – and social productivity would be enclosed within these economic motivations, as both of them pursue an economic profit aligned with environmental and social sustainability.

There are, however, several social and environmental issues which can also motivate horizontal cooperation in the field of logistics and transportation, and which can therefore promote the development of corporate social responsibility in the logistics and transportation sector. Regarding social issues, satisfaction and life quality of transportation workforce can be considered one of the most important benefits of horizontal cooperation in L&T sector. As it will be discussed in the following examples, also environmental benefits can be derived from HC practices.

EXAMPLE 1: BACKHAUL STRATEGIES

One of the aims of horizontal cooperation in logistics is to contribute to reduce empty backhauls or deadheading (return trips with no load). According to a report from the European Commission (2011), empty backhauls represent about 25% of road transportation activities in Europe. Therefore, regulations exist so that haulers crossing foreign countries during their return trip home can pick up loads in countries where the vehicle is not registered. This practice, called 'cabotage,' helps to optimize the use of capacity of the hauls. The upper part of figure 1 shows a typical non-cooperative scenario where each service provider (square node) designs its own set of routes to deliver its own customers (set of nodes represented by a common symbol). In contrast, the lower part of figure 1 shows the same routing problem in a cooperative scenario, where backhauling strategies are considered – i. e. some routes are merged in order to increase the actual utilization of vehicles during a roundtrip. The comparison of both figures provides a first intuitive idea regarding the benefits, in terms of routing distances and number of necessary vehicles that can be reached throughout horizontal cooperation.

Although the main goals of HC are to reduce shipping costs and also to provide a faster distribution service to customers, other important benefits are related to a reduction of the environmental impact of distribution activities. In the European Union, about 18% of the greenhouse gas emissions are due to road transportation (Hill et al. 2012). Thus, collaboration among partners in the transportation industry can help reducing environmental footprint as it can reduce the number of necessary trips and increase the efficiency of the haulers.

EXAMPLE 2: MERGING DEPOTS

Similar to the example above, the upper part of figure 2 shows a typical non-cooperative scenario where each service provider (square node) designs its own set of routes to deliver its own customers (set of nodes represented by a common symbol). In contrast, the lower part of figure 2 shows the same routing problem in a cooperative scenario, where each customer is delivered by its closest provider. The comparison of both figures provides a first intuitive idea regarding the benefits, in terms of routing distances, routing times, and gas emissions that can be reached throughout horizontal cooperation.

Numerical Experiments

Regarding the aforementioned multi-depot example, and in order to provide a quantitative estimation of the economic and environmental benefits that can be obtained throughout HC practices, we decided to run some numerical experiments based on classical benchmark instances for the Multi-depot Vehicle Routing Problem (MDVRP). These instances are available from http://neumann.hec.ca/chairedistributique/data/mdvrpv. In order to solve the MDVRP (collaborative scenario), we employed the algorithm developed by Juan et al. (2012). A standard personal computer, Intel® Core™2 Duo CPU at 2.4 GHZ and 2 GB RAM was used to perform all tests. Each instance was run 10 times, each time for a maximum period of 2 minutes. Results of these tests, comparing the collaborative scenario (Multi-depot VRP) with the non-collaborative ones (Multiple VRPs) are summarized in table 1 (instances p01 to p10). The table shows the details of each instance, that comprises the following: (1) instance name; (2) number of customers, *n*; (3) number of available vehicles, *m*; (4) number of depots, *d*; (5) maximum route length – when applicable; (6) maximum load capacity of any vehicle, *Q*; (7) the Best-Known Solution (BKS) for the collaborative scenario; (8) the Our Best Solution (OBS) – in terms

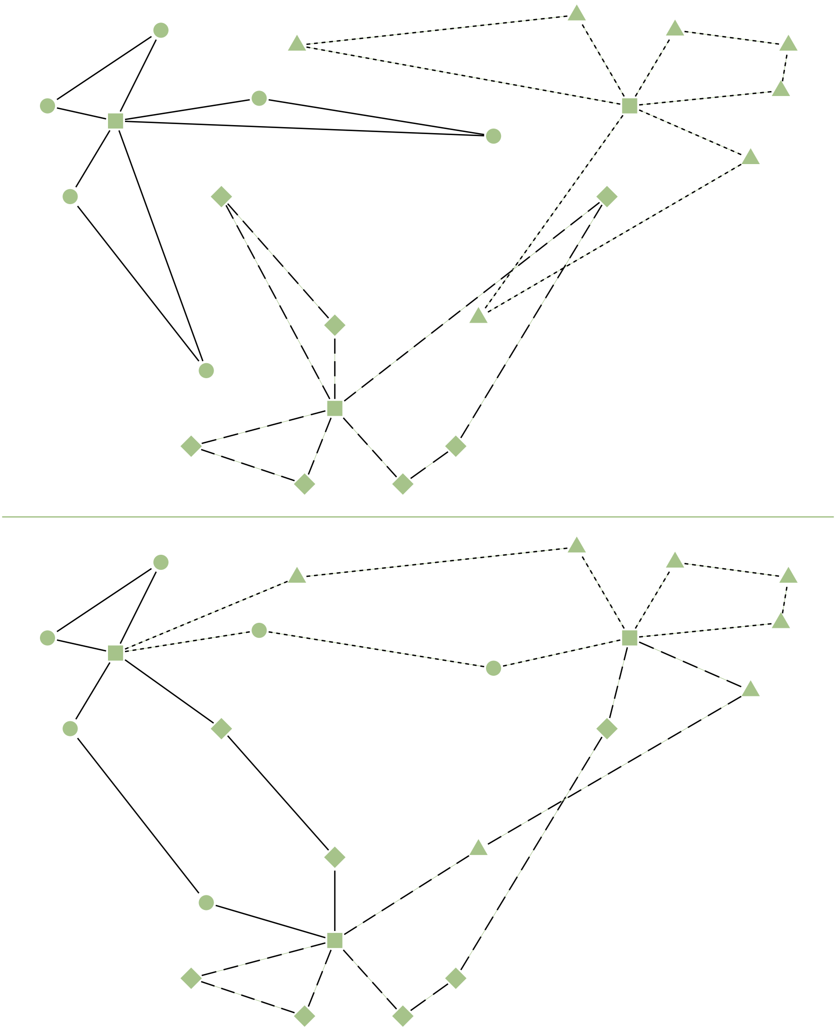

FIGURE 1 Backhaul Case with Non-Cooperative (above) vs. Cooperative (below) Scenarios

of distance-based costs – for the collaborative scenario; (9) the percentage gap between 7 and 8, which shows that the results obtained with our algorithm for the collaborative scenario are fairly competitive with the state-of-the-art results for these benchmarks; (10) the estimated emissions costs associated with OBS in 8, which have been computed according to Ubeda, Arcelus and Faulin (2011) – who proposed a table of coefficients to approximate these costs as a function of the truck load level and

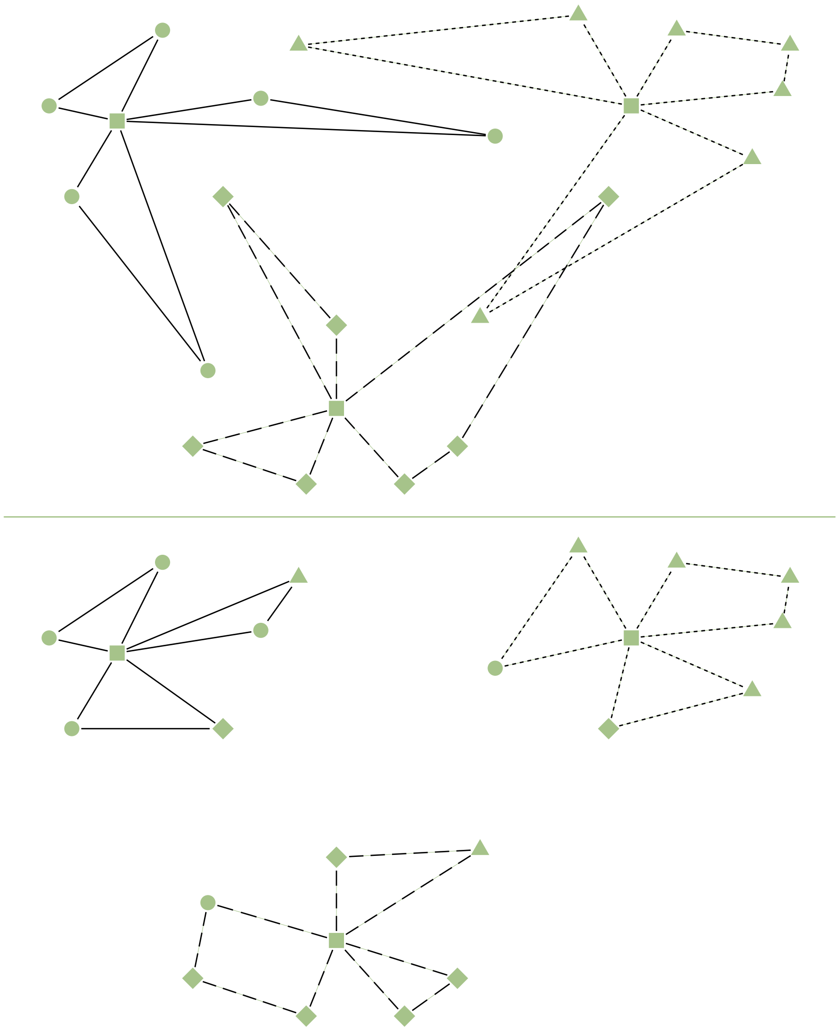

FIGURE 2 Multi-Depot Case with Non-Cooperative (above) vs. Cooperative (below) Scenarios

the travelling distances while covering each segment (edge) in a route; (11) our best solution – in terms of distance-based costs – for the non-collaborative scenario; (12) the gap between 9 and 11; (13) the estimated emissions costs associated with our solution in 11; and (14) the gap between 10 and 13.

First of all, it should be noticed that the approach we proposed to solve the MDVRP – i. e. the full-collaboration scenario – is quite competitive,

TABLE 1 Comparative Results for Instances p01 to p10

						Cooperative Scenario (MDVRP)				Non-Cooperative Scenario			
						BKS	OBS						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
p01	50	4	4	n/a	80	576.9	576.9	0.0%	509.8	622.0	7.8%	557.8	9.4%
p02	50	2	4	n/a	160	473.5	473.9	0.1%	433.1	518.7	9.5%	460.7	6.4%
p03	75	3	5	n/a	140	641.2	641.2	0.0%	580.9	679.9	6.0%	613.2	5.5%
p04	100	8	2	n/a	100	1,001.0	1,003.5	0.2%	865.1	1,021.6	1.8%	926.8	7.1%
p05	100	5	2	n/a	200	750.0	751.9	0.2%	683.6	766.9	2.0%	702.0	2.7%
p06	100	6	3	n/a	100	876.5	876.5	0.0%	762.3	918.6	4.8%	794.6	4.2%
p07	100	4	4	n/a	100	882.0	885.2	0.4%	796.9	905.6	2.3%	828.0	3.9%
p08	249	14	2	310	500	4,372.8	4,409.2	0.8%	4,012.4	4,456.4	1.1%	3,943.7	−1.7%
p09	249	12	3	310	500	3,858.7	3,882.6	0.6%	3,510.5	4,125.3	6.3%	3,452.7	−1.6%
p10	249	8	4	310	500	3,631.1	3,646.7	0.4%	3,346.0	3,882.1	6.5%	3,515.3	5.1%
Averages								0.3%			4.8%		4.1%

NOTES (1) instance, (2) n, (3) m, (4) d, (5) max. route length, (6) Q, (7) distance-based costs, (8) distance-based costs, (9) gap 7 – 8, (10) emissions costs, (11) distance-based costs, (12) gap 9 – 11, (13) emissions costs, (14) gap 10 – 13.

showing average gaps of just about 0.3% with respect to the best-known solutions. The routing algorithm used inside this approach, i. e., the SR-GCWS-CS developed by Juan et al. (2011), is the same algorithm we use in solving the non-collaborative strategies (Multiple VRPs), which contributes to make a fair comparison among the different scenarios considered in this paper.

Now, regarding the gaps among collaborative and non-collaborative strategies, the results show that the horizontal cooperation is able to produce solutions outperforming non-collaborative strategies, both in terms of distance-based costs as well as in terms of emission costs. In the case of distance-based costs, the average gap between the collaborative strategy and the non-collaborative strategy is about 4.8%. In the case of gas emissions costs, the average gap between the collaborative strategy and the non-collaborative strategy is about 4.1%.

Conclusions

This paper has discussed the importance of considering Corporative Social Responsibility in logistics and transportation, and how it can be promoted throughout the use of Horizontal Cooperation practices. In effect, HC might imply a reduction not only of distribution costs, but also of pollutant gas emissions and delivery times – thus providing a better service to final customers. We have proposed two examples of HC practices that can contribute to improve CSR in small- and medium-size enterprises. For one of these examples, we have carried out some numerical experiments to quantify the benefits that HC practices can offer. According to the experimental outputs, a horizontal cooperation strategy can contribute to a noticeable reduction in expected costs, both in terms of distance travelled as well as in terms of pollutant gas emissions. Additional savings in routing costs related to time or environmental factors could be also considered, thus making horizontal cooperation even a more desirable praxis for managers in the L&T field.

The results obtained in the numerical experiments are promising, and although the benefits obtained in simulated scenarios would differ from those obtained in real scenarios, there is no doubt that important savings and other benefits may be obtained through horizontal cooperation in transportation. However, in a globalised market, regulations can strongly limit horizontal cooperation agreements, and practices such as cabotage may be limited by local regulations with the aim of protecting local markets.

It is therefore unsurprising that regulators and policy makers are being encouraged to gradually open transportation markets, as it is expected it will increase the flexibility of operations and competition in national markets, whilst ensuring fair competition, maintaining adequate social norms and allowing important savings, thus contributing to the sustainability and social responsibility of the sector. In the case of the European Union, the High Level Group (2012) identified and researched four key obstacles to the creation of a Single European Transport Area, in which, in addition, cross-border cooperation needs to be explicitly promoted between Member States. Those obstacles, namely driver shortage, enforcement practices, cabotage practices, and lack of innovations and applications of good practice, are closely linked to sustainability issues, and many of the recommendations provided in this and other reports are in line with corporate social responsible principles.

Acknowledgments

This work has been partially supported by the Spanish Ministry of Economy and Competitiveness (TRA2013-48180-C3-3-P), the Ibero-American Program for Science, Technology and Development (CYTED2010-511RT 0419, http://dpcs.uoc.edu), the Jaume I University (P101B2010-13), and the Master of Sustainability and Corporate Social Responsibility offered by UJI-UNED.

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