Abstract

The paper assesses two different approaches for the economic organization of intermodal freight transportation, i.e., the vertical integration and market contract, and reviews the changes occurring in the organizational context of intermodal transportation in North American railway industry. The paper points out that vertical integration completed by M&A may not be the best governance structure in organizing the intermodal transport economics. The paper considers that the existence of many intermediaries which greatly reduce transaction costs make the approach of market contract more available and attractive in organizing the intermodal transport economic system. On this basis, the paper considers that China railroads must improve their capability and quality of services in rail transport and Chinese government should attach importance to improve the circumstance of intermediaries.

1. Introduction

The concept of intermodal transportation logistically linking a freight movement with two or more transport modes is centuries old [1]. Although, as a kind of special transport service, namely the coordinated passage of goods and people which intermodal transport operator (ITO) uses two or more primary modes of transport, from origin to destination, as defined by the passenger or the shipper and consignee, its wider use has been occurring only within the last several decades. Generally speaking, intermodal transportation is an advanced stage of transportization, but it has been prevalent in the international good transportation due to increasing economic globalization. It should be pointed out, this paper focuses on the modern concept of intermodal freight transportation (IFT).

As an advanced organized form of transportation, IFT utilizes the inherent advantages of each mode involved, creating synergies and efficiencies not otherwise attainable and realizes the integration and high efficiency of transport service. Especially, the phenomenal growth of containerization during the past 50 years has expanded the scale of IFT. In order to meet the increasing customer demand for high quality transport service, ITO has to improve the efficiency of IFT. And this efficiency depends on the coordination among different modes of transport and the ITO’s control of the intermodal transport chain. From the perspective of economics, the coordination and control lie on the appropriate modes of economic organization relating to the economic relationship among different stakeholders in the intermodal transport chain. These stakeholders include shippers, carriers in different modes of transport, ITO,
intermediaries and consignee and so on (See Figure 1). Generally, the economic organizations include market or hierarchy. We can find much evidence of these two approaches in the industry of IFT. For example, some carriers of one mode or intermediaries contract with shippers firstly, and then they subcontract with carriers of other modes to cooperate with each other to provide intermodal through service. While some others may setup or merger companies of different modes to provide the same service. Of course, these economic organizations are variable to different kinds of business.

![Figure 1: Stakeholders and their relationship in the intermodal freight transportation](image)

From the perspective of history, these economic organizations are also variable in time. Take North American railways for example, many railway companies set up their subsidiary motor companies during the 1960s and 1970s. In the middle of 1980s, many Class I railways merged or acquired some large truck or water companies. By the mid 1980s, however, many railroads had shed their non-rail modes. So far, almost every Class I railways in America doesn’t own companies of other transport modes. Instead, they just act as one “link” in the intermodal chain and cooperate with other stakeholders by way of market contract.

These interesting things induce our thinking about the economic organization of IFT. What are the reasons for the evolution of economic organization of railway intermodal transportation in America? What are the factors impacting on the choices of economic organizations of IFT. We will discuss these questions within the next sections.

2. Some theories and practices on economic organization of Intermodal freight transport

The United States is an original place of modern IFT and the most successful country in the development of IFT. Although, it was not good for the cooperation between different transport modes in the early days. To some extent, this is attributed to the Federal Government policies of transportation regulation at that time. Among these policies, the Federal intermodal ownership policy was representative.

In 1972, Robert C. Lieb reviewed and evaluated this policy in his book which is titled “Freight Transportation: A study of Federal intermodal ownership policy”. According to this book, transportation integration was controlled by a fragmented collection of policies which were
reflected in several statutes. Legislation guidelines which applied to intermodal ownership, operation, or control were contained in the Panama Canal Act of 1912, the Motor Carrier Act of 1935, the Civil Aeronautics Act of 1938, and the Freight Forwarder Act of 1942. Thereinto, the Panama Canal Act of 1912 was passed to impede rail controlled water operations or, more specifically, to impede combinations between railroads and barge companies. Intermodal ownership or control of motor carrier operations by carriers engaged in other forms of transportation was limited by the Motor Carrier Act of 1935. The Civil Aeronautics Act of 1938 also limited the ownership of air carrier operations by carriers engaged in other forms of transportation. However, the area where combinations have been permitted, without much difficulty, is in air forwarding ownership. Several independent regulatory agencies, including the Interstate Commerce Commission (ICC) and the Civil Aeronautics Board (CAB), interpreted and administered these statutes. These regulatory agencies considered that the purpose of these statutes was to protect the troubled forms of carriers from the domination of more established modes. They attempted to provide such protection by limiting intermodal ownership [2].

By the 1970s, more people have gradually come to a deep understanding that the strict controlling policy has become a huge obstacle to transportation, especially to the development of multi-modal transportation. Thereupon some insightful people in business, politics and transportation couched criticism on the controlling policy. They suggested that the administrative institutions should relax the control on merger and acquisition among enterprises over different modes of transportation and allow the consolidation among them. Their proposal engaged the support of many interest groups including the shippers. Supporters considered that such singal company integration would eliminate the economic waste which typifies our transportation system. They suggested that integrated transportation ownership would also provide shippers with one-stop transportation service, and simplify claims and documentation procedures. Although, there were still some opponents. They insisted that railways would strengthen their monopoly power by mergering companies of other modes. And this situation would be not consisted with the public interest [3].

The truth turned out to be exactly as Lieb stated, the strict control not only restricted the capital that needed in the development of transportation, but also hindered the cooperation among the various modes of transportation. As a result, instead of promoting the development of the so-called disadvantaged mode of transportation at that time, it held back the development of multi-modal transportation.

At the same time, the voice of asking for relaxing the control became louder and louder. Until the late 1970s and the beginning of 1980s, the strict control in American transportation finally ended, and it entered a period of relaxed control. The control on merger and acquisition among enterprises over different modes of transportation also relaxed. Not long after that, a rush of mergers and acquisition among enterprises over different modes of transportation came into being, and the main side that implemented the Mergers & Acquisition (M&A) was American Class I Railway Companies. For example, In 1984, the ICC approved CSX’s $725 million acquisition of American Commercial Lines, Inc., which had as a subsidiary the nation’s largest inland water carrier. In 1986, Burlington Northern, Inc., a railroad holding company, received
ICC approval to acquire six motor carriers. That same year, the ICC approved the Norfolk/Southern Railway’s $370 million acquisition of North American Van Lines, the nation’s largest household goods carrier. In June of 1986, CSX acquired Sea-Land Corporation for $800 million [4]. There were many motivations for these M&A, however, these railways which became multimodal companies through M&A were able to provide the intermodal service by way of internal organization.

However, these multimodal companies didn’t go long. Some years later, many railroads had shed their non-rail modes. Norfolk Southern sold its North American van Lines, while CSX shed its ocean carriers. Clinton H. Whitehurst noticed this interesting thing. He considered that there were two reasons for this phenomenon. First, at the peak of multimodal interest by railroads return on investment was relatively low compared to alternate investment opportunities. Rail companies probably concluded that integrating non-rail modes into their systems was a long-term proposition with respect to making a contribution to the bottom line and that their limited capital could be better employed in rail projects. Second, intermodal cooperation between different ground transport companies, primarily ocean, rail and highway, continued to grow thereby negating the requirement of different mode ownership to ensure the efficient movement of freight [5]. Thus, Whitehurst asked: “In the 21st century is the multimodal transportation concept dead or only sleeping?” In our words, is the vertical integration an efficient approach for the intermodal transportation?

For the phenomena that ocean carriers merged and acquired companies of inland transportation, Photis M. Panayides analysed the vertical integration in intermodal transportation. He pointed out that a vertically integrated government structure would be more appropriate for the intermodal transport because a market-related governance structure would entail the higher possibility of incurring the transaction costs associated with the specific intermodal service characteristics (See Table 1) [6]. Of course, Panayides also considered that it required further empirical evidence to ascertain what may be conceptually inferred from this paper, i.e. that a more vertically integrated governance structure would minimize transaction-costs and, hence, increase efficiency in an intermodal transport context. In terms of strategic factors such as achievement of market and competitive advantage, it would seem that a more integrated governance structure could be more beneficial for the ocean carrier that contemplates intermodal transportation. A vertically integrated organization could exercise greater control over its strategic direction and by virtue of its size exert greater bargaining power over clients and suppliers. It would also raise barriers to entry, as newcomers could not compete at the same level as an organization that already has established and integrated links over sea and inland transport [6].

From Panayides's point of view, a more vertically integrated governance structure would minimize transaction-costs. Well then how those companies which Whitehurst observed reduce transaction-costs without a vertically integrated governance structure? We have got an answer for this question from the history. That is, many intermediaries as market makers reduced transaction-costs in the intermodal chain through innovative transaction methods rather than vertical integration. This wasn’t mentioned by both Whitehurst and Panayides. Next, we will analyse the role of intermediaries in the IFT.

3. The role of intermediaries in the economic organization of intermodal transportation

3.1 Theory of intermediaries

Daniel F·Spulber, founder of intermediation theory, make a systematic research and explanation in his published book Market Microstructure, in which he defines an intermediary as a middle man connecting traders or a buy-in-and-sell role player. In Spulber’s opinion, intermediated exchange can have advantages over direct exchange for many reasons, including: lowering the cost of transacting through centralization of exchange, reducing cost of searching and bargaining, avoiding moral hazard and opportunism, alleviating the effects of adverse selection, allowing buyer and sellers to make credible commitments, and reducing the cost of monitoring performance through agents ¹. Therefore he concludes that intermediated exchange could benefit more than direct exchange to all related parties, which, he explains further, is resulted from coordination that reduces searching cost by pooling and sharing information between traders, from some sort of scale and scope economy, and from the motive

¹ Actually, these advantages could be summed as reducing transaction costs.
for long term business and reputation. It is definitely more advantageous to refer to reliable intermediaries who make credible promises than to counting on negotiation for consistent short term contracts [7].

The intermediation theory that Spulber generates defines intermediaries as the principal part creating and controlling the market, and explains that transaction cost could be reduced and thus the efficiency improves in trades. Though it is not generally applicable especially to manufacturing firms, yet it is still a powerful theory for studies on intermediaries in intermodal transportation.

3.2 The role of intermediaries in intermodal transportation

In the United States, intermediaries in the IFT include intermodal marketing companies (IMCs), freight forwarders, consolidators, brokers, shippers association, third parties logistics (3PLs), non-vessel operating common carriers (NVOCCs) and so on ². Some scholars call these intermediaries as “Third Party” which mean is an independent party between shipper and carriers. Some scholars, ie, John C Taylor, George C Jackson (Taylor, Jackson, 2000)³ (See Table 2) [8], Rong Chaohe, Andy Hokfan Sz and Robert E. Gallamore (Rong, Sze and Gallamore, 2005) [9], have ever studied the intermediaries in transport industry. These research achievements obtained have reference for us to study the role of intermediaries in IFT.

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<th>Intermediaries Functions</th>
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Source: Taylor, J.C. and G.C. Jackson, Conflict, power, and evolution in the intermodal transportation industry’s channel of distribution.

Table 2: Intermediaries and their functions

However, it is different from the investigation of Taylor et al, we conclude the functions of intermediaries in IFT according to Spulber’s theory. These functions are as follows:

1) Reduction of searching costs. Intermodal transportation is a professionally operated system with many complicated procedures. It is hard for consignors to get much information enough to

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² Some carriers, i.e., ocean carriers, express companies could be also called intermediaries in broad concept.

³ It should be emphasized that the intermediaries which Taylor et al defined is different from our conception of intermediaries, because their conception include shippers.
handle goods transportation, so they need ‘One stop’ freight service. On the other hand, carriers operating in one mode of freight service could not meet various requirements of intermodal transportation. This opens up room for knowledgeable transport intermediaries to grow. It is also important to find consignors timely especially for possible “empty return”, which is imperatively meaningful to improve transportation facilities usage efficiency for the unstorability of freight service. To avoid the big cost in searching consignors, intermediaries play positive roles in consolidating transaction information to better transportation cooperation with their powerful network and social resources, and meanwhile transportation firms could input more in their main business—freight service with the result in the improvement of transportation business.

(2) Reducing transaction costs via scale economy. Intermediaries help to make scale economy in transportation market by means of goods collection and consolidation. They could make better use of their resources to collect goods with the same freight service requirements and arrange them for mass transportation, which meets the requirements of separate demand and mass supply of transportation firms. Therefore they become key customers of transportation firms for their mass supply capability. The existence of intermediaries makes it beneficial to both transportation firms and minor consignors by satisfying the former with scale economy and the latter the lower freights, and finally to a large extent reducing the transaction cost. While in the U.S. transportation market, most of the Class I rail transportation firms are as the freight wholesalers and intermediaries like freight forwarders and intermodal transportation sales firms are as retailers to final customers.

(3) Avoidance of moral hazard and opportunism. Due to information asymmetry caused by variety of parties involved in intermodal transportation chain, it implies opportunism such as taking transportation liabilities. If different carriers in the chain worm out of their responsibilities, it will make a good cost for consignors to handle negotiation and solve the problems and they might have tried it vainly. Intermediaries may help to avoid consignors’ worries by taking their risk of this opportunism as a core contractor and later arbitrator in case of disputes occurring. They could also help to establish cooperation between parties who do not give each other enough trust to make it by signing bilateral or multilateral contracts with different parties and transferring the trade connection to themselves as middle men, thus to make them credible in the chain and keep the operation doing well.

As a result, intermediaries are capable of organizing, consolidating and controlling the whole intermodal transportation due to their power of enormously reducing transaction cost. We could see it and prove it in intermodal transportation development history. According to the description of Mckenzie et al, the growth of so-called “Third Parties” during the last half of the 1980s was truly remarkable, both in terms of the sheer number of companies and in terms of the range of services they provide. According to The Private Carrier, between 1980 and 1986, brokers represented the fastest growing segment of transportation, going from just a handful to 6000 licensed brokers in only six years [10]. Muller (1999) also described that more than 300 IMCs existed in the United States by the late 1980s and this number had grown to more than 400 by the early 1990s. Moreover, IMCs represent the largest share of the intermodal market with 42% of revenue.IMCs have participated in a business that has grown from approximately 2.5 million units in 1980, to more than double that by 1985. By 1997, the total
volume increased to 8.6 million loads. He noted that the part of the success of IMCs owed to the
deregulation at that time. It is interesting that Class I railways just shed their non-rail modes at
this same period. Thus, this big change in the intermodal market gives us a powerful evidence
for our explaination.

In addition, what is worthy of mention is another explanation for the historical phenomenon that
railroad companies sell truck transportation companies. Andy Sze believes that this phenomenon
is due to the great differences in the management mind and system of the railroad companies
and highway companies, which leads to their bad mixture. In another word, this means the
higher internal organization cost. But in our opinion, this explanation exactly states that the
market mechanism which is created by the middle layer organization offers a substituted solution
to reduce the internal organization cost for the railroad companies.

At this point, our explanation of the phenomenon that American railroad companies sequentially
sell their original highway companies and shipping companies during the mid- and late 1980s
reaches the unity of history and logic. That is, intermediaries acted as market makers, made in
possible for railways to complete intermodal transportation by virtue of innovational transaction
methods rather than vertical integration. It also present that, in the American intermodal market
at that time, in most situations, railways didn’t have both motivation and capability to control the
whole chain of intermodal transportation. Actually, until now, most Class I railways in America
just act as one “link” in the intermodal chain. They pay more attention to improve railway service.

4. Determinants of economic organization of intermodal transportation

The above discussion was mainly from the perspective of transaction cost economics. However,
transaction cost is not the only determinant of the economic organization of intermodal
transportation. Panayide considered that the governance structure in the case of intermodal
transport will depend upon three factors: the costs of production, the transaction costs, and the
strategic costs and benefits associated with the different governance structures. In addition, the
decision to organize intermodal transport by adopting a particular structure may have policy
implications that need to be taken into account [6]. We basically agree with this view, but
Panayide mainly use these factors to explain the vertical integration, we will carry out a more
comprehensive study.

According to Panayide, the costs of production may be influential in that a particular governance
structure may entail their potential reduction through the achievement of scale and scope
economies and associated economic efficiencies. Whereas, people may pay more attention to
the functions of vertical integration in reducing the production cost and neglect the increase costs
of infrastructure and equipment. In fact, people do not always reduce production costs by
through vertical integration, especially purchase the transport companies with huge infrastructure
networks. In recent years, some observer noticed that some railways gradually outsourced their
equipment management. For example, BNSF Railway turned over to Swift Intermodal its leases
on 3,800 domestic containers in 2005. BNSF projects that by getting out of asset management, it
will eliminate 100,000 empty movements a year through terminal gates, 74,200 lifts of empty
containers or trailers, and 760,000 days of idle “dwell time” for equipment. It presented that specialization division through outsourcing could reduce production costs. Moreover, because of the intense market competition, the organizers of the intermodal transportation chain can access supportive services from the market by a lower cost, which reduces the necessity of cutting the costs of factors through integration. It is obvious that production cost can affect the organization mode by two ways, and decision makers have to balance the cost of production itself. Panayide thought that strategic factors include entering new markets and overcoming entry barriers, marketing and satisfaction of customer requirements, diversification, and the achievement of competitiveness and growth. And he also considered that it would seem that a more integrated governance structure could be more beneficial for the ocean carrier that contemplates intermodal transportation in terms of strategic factors such as achievement of market and competitive advantage. A vertically integrated organization could exercise greater control over its strategic direction and by virtue of its size exert greater bargaining power over clients and suppliers. It would also raise barriers to entry, as newcomers could not compete at the same level as an organization that already has established and integrated links over sea and inland transport. In addition, Panayide referred that a firm can improve its competitive positioning by choosing a partially integrated governance mechanism according to Bello et al. For instance, ocean carriers that are members of liner conferences are prohibited from setting door-to-door transport prices whereas the European Commission wants to make joint inland operation a prerequisite for granting rate-making authority. It follows that companies should integrate vertically on an independent basis to avoid costs of market transactions on one hand and stay within the limits imposed by the regulations. It should be said that the explanation of vertical integration by Panayide from a strategic perspective is reasonable, but we point out that strategic expansion through vertical integration is one strategy of intermodal transportation, not the only one. Before the selection of strategic action, the manager of enterprise should set down strategic objectives according to the external market, the policy environment and the conditions of the enterprise. In other words, the orientation of strategy is the chief question. In the intermodal transportation chain, vertical expansion is not the only way to obtain enterprise competitive advantage, and not all enterprises have the capability to expand. For most enterprises which can not control the end-consumer market, improving their professional service capabilities is the right strategic choice. Specialization is their competitive advantage. Of course, such specialization also includes the scope of the market that their business network can cover and the effective convergence with other modes of transport, but such expansion of business network and effective convergence with other modes of transport does not always depend on enterprise merger by the way of intermodal ownership. To sum up, the decision-makers who organize intermodal transport should take into account the production costs, transaction costs and strategic costs and benefits. In fact, it is just because different companies have different production costs, transaction costs and strategies while facing different links of multi-modal transportation. The modes of economic organization on the chain of multi-modal transportation are characterized by diversify.

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4 BNSF said companies that specialize in asset management can do a better job than a railroad. BNSF determined that rail-controlled containers experience 19 turns per year, while assets managed by private companies average 26.
5. Conclusion and revelation

The efficiency of IFT depends on the coordination of different transferring methods and the ITO's controlling of the whole chain. From the perspective of economics, the efficiency of the coordination and control relies on one appropriate economics organization. The past research discuss the vertical integration which is considered to be the best mode in IFT industry with the transaction cost economics. Although, this theory did not well explain the situation that many American Class I railways shed their non-rail assets in the 1980s and now these railways promote IFT through the market contacts methods.

After a review of the history, this paper argues this problem using the theory of intermediaries. This paper's conclusion is that vertical integration is not the only way to save the transaction cost, and the intermediaries as a market maker, creates new transaction methods which can help the company to decrease different kinds of transaction costs, and realize a high efficient coordination between different transferring methods with the market contacts, so the efficiency of IFT chain can be improved.

This paper considers that the policy-maker should make a choice of the economic organization of IFT base on a proper policy environment, after comprehensively considering the effects of product cost, transaction cost and strategy. Because M&A between companies of different modes may increase product costs, and considering the profit of the business strategy, the application of vertical integration in IFT industry will suffer greater restrictions. On these basis, we believe that China Railway must firstly clear up all the obstacles existing on the railway lines and decrease transport cost greatly so that it can be attractive to the transport chain. For Chinese government, it should attach importance to improve the circumstance of intermediaries [11].

Acknowledgements

This research has been financially supported by the funded project (NO.:40571044) from the National Natural Sciences Foundation of China and the key project of China MOE Fund for Social Sciences (NO.:07JZD0012). The support is gratefully acknowledged.

References


