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Kink in the intermodal supply chain: interorganizational relations in the port economy

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**ABSTRACT**

The intermodal logistics supply chain is designed to move goods from the point of production to the point of consumption as quickly and as cheaply as possible. The ability to accomplish this objective has allowed for the wholesale geographic relocation and offshoring of basic manufacturing and assembly. As a chain of linked and integrated organizations characterized by sequential interdependence, interorganizational relations play a key role in determining the level of integration and seamlessness. Yet there is one critical interorganizational link in the chain that deviates from this vision. This is the relationship between the shipping container terminal and drayage trucking operations which is better described as a form of intermodal *disintegration*. The weakness in this link of the supply chain is explained by the divergent industrial structures and labor market conditions, the unique nature of the transaction, and the externalization of costs to subordinate workers.

Globalization, containerization, deregulation, and interorganizational relations and strategies have shaped the logistics intermodal supply chain. The objective of the logistics system is the movement of commodities at the greatest speed and the lowest cost. The chain of linked organizations is characterized by sequential interdependence, spatial dispersion, and multiple transport modes and a range of industrial practices, organizational arrangements, labor market conditions, and workplace practices (Jaffee 2010). While the efficiency of this chain has allowed for the massive offshoring of basic US manufacturing and assembly operations, through a tightly integrated system, there is one critical interorganizational exchange that defies this broad characterization. This is the relationship between the port terminal that receives and unloads cargo-laden shipping containers and the drayage trucking operations that transport the containers to their next destination.

This paper attempts to analyze the relationship between these two segments of the intermodal logistics supply chain, identify the sources of the poorly integrated relationship, and understand the persistence of the arrangement in spite of its seemingly inefficient character. The analysis draws insights from organization theory and industrial sociology in outlining the ways in which environmental forces have differentially impacted
the terminal and drayage industries resulting in divergent organizational structures and practices. The core thesis is that the relationship between port terminal and drayage operations is characterized by **intermodal disintegration** – poorly integrated links between intermodal segments of the supply chain that exist and persist due to the particular form of the interorganizational relationship, the contrasting industrial characteristics of the interacting sectors, and the reduction of costs through their externalization to subordinate sectors and social groups. This paper compares and contrasts the organizational structures of the port container terminal operators and port drayage trucking segments of the intermodal supply chain, examines their interorganizational relationship, and identifies factors contributing to integrative inefficiencies.

**Intermodal logistics and interorganizational relations**

Most of the products purchased by US consumers at retail establishments enter the country through a maritime port, packed in a shipping container, and moved through the intermodal supply chain. With the demise of domestic manufacturing, a greater proportion of economic activity has shifted to the movement, rather than production, of goods. In spite of the increasing importance of this economic sector, transportation and logistics organizations have received insufficient attention in the socio-economic and organizational literature (see Bonacich and Wilson 2008 for an important exception).

The process of globalization has given rise to a range of concepts – global commodity chains, global production networks, and global value chains (Gereffi and Korzeniewicz 1994; Henderson et al. 2002; Coe et al. 2004) – designed to analyze the now well-established spatial dispersion of economic activities. The focus here will be on what are described as ‘buyer-driven’ commodity chains (Gereffi and Korzeniewicz 1994) of large (e.g. Wal-Mart) and branded retailers (e.g. The Gap) who import finished and semi-finished consumer goods through port container terminals. As the geographic space between production and consumption of these commodities has increased, **transportation and logistics** have taken on an increasingly vital role in the circulation and distribution of commodities and in the integration of interdependent units and activities (Panayides 2002).

These sequentially linked activities are referred to here as the intermodal logistics supply chain. A **supply chain** is defined as ‘a set of three or more entities … directly involved in the upstream and downstream flows of products, service, finances, and/or information from a source to a customer’ and **supply chain management** as:

> the systemic, strategic coordination of the traditional business functions and tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole. (Mentzer et al. 2001, 4, 18)

**Logistics** is considered one aspect of supply chain management and is concerned with the planning and management of the movement and distribution of materials through the supply chain.

**Intermodalism** refers to the movement of goods or materials using integrated but different modes of transportation. A singular technological innovation has driven and
facilitated the intermodal system and network. This is the shipping container (see Levinson 2006). The logistics challenge is moving the container, and its contents, door-to-door from the point of production to the point of consumption across space and between organizations and transport modes. The shipping container has enhanced and facilitated the intermodal transport of goods due to its standard size and the existence of common handling equipment. Thus, in a supply chain, a container holding finished or semi-finished cargo can be transported by and transferred between container ship, truck chassis, and/or rail car.

The primary emphasis here will be on the two industries and organizations responsible for handling shipping containers at the port terminal and moving the containers off the terminal by truck. These elements of the intermodal supply chain connected to maritime ports and regional logistics clusters represent nodes in the global commodity chains, and gateways to inland retail markets. The port economy is by-necessity a geographically concentrated set of organizational actors – given the need for the two sectors to physically interface in the movement of containers – integrated on the basis of intermodal functionality and interdependence (Van Der Horst and De Langen 2008). As an interorganizational relation, Robinson (2006) argues that ‘port-oriented freight movement, may be conceptualized as chain structures involving transactional relationships between corporate players in logistics pathways between sellers and buyers’ (46).

The two segments of the intermodal logistics supply chain – terminal and drayage operations – are very different in terms of industry structure and labor market conditions (Jaffee 2010). Yet these two segments must interface and ideally integrate their operations in a seamless fashion so that the goods can move rapidly through the supply chain. As the goods move between the various transport modes and organizations, there is enormous pressure for seamless integration and rapid transit (Panayides 2002; Capineri, Leinbach, and Gips 2006; Robinson 2006; Van Der Horst and De Langen 2008). As Panayides (2006) has observed,

The convergence of maritime transport and logistics may be largely attributed to the physical integration of modes of transport facilitated by containerization … At the centre of maritime logistics is the concept of integration, be it physical (intermodal), economic strategic (vertical integration, governance structure), or organizational (relational, people and process integration across organizations). (5)

The integration imperative for intermodal flows – or what one author describes as the ‘speed imperative’ (Kasarda 2000) that implies ‘time-based competition’ (Meersman and Van de Voorde 2001) – suggests a need for tighter control and coordination across the supply chain.

In the context of the integration imperative, there is a clear argument for viewing the port terminal as an integral, rather than peripheral or incidental, part of the supply chain and, further, that the port’s integration with other organizations is critical to its competitive viability (Heaver 1995; Marlow and Paixão Casaca 2003; Bichou and Gray 2004; Jacobs and Hall 2007; Song and Panayides 2008). The combination of containerization, intermodalism, and discretionary cargo gives shippers and carriers greater latitude in selecting ports of call which intensifies the competition between ports. This weakens the bargaining power of ports in terms of providing unique access to a particular geographic location or market, creates greater dependence of ports on the decisions of
ocean carriers, and relegates ports to ‘pawns in a game’ controlled by larger global corporations (Slack 1993). This has also required ports to be more entrepreneurial and more active in developing, marketing, and demonstrating their logistics and supply chain capacities. As Jacobs and Hall (2007, 328, emphasis added) argue:

... the port authority or operator’s competitive strategic advantage is not only based upon operational efficiency or location, but increasingly on the degree to which it is *embedded in supply chains*, is able to enhance the efficiencies within these supply chains, and is able to extract value from them.

They believe that ports vary in their level of embeddedness and, accordingly, their ability to provide highly integrative services to their customers.

In spite of the recognition that the terminal is most competitive and effective when it forges integrative connections, there seems to be a unanimous opinion that the terminal–drayage connection is the weakest and least efficient link in the intermodal logistics supply chain (Morlok and Spasovic 1994; Taylor and Jackson 2000; Monaco and Grobar 2005; Payne 2007; Bensman 2009, forthcoming; Coalition for Healthy Ports 2009; Srour 2010). Observers site a wide range of deficiencies. The various problems identified include the following interrelated factors: traffic congestion, environmental impacts, pickup scheduling, truck terminal delays, uncertainty, inadequate communication and application of IT solutions, poor working conditions and compensation for truck drivers, the inefficient allocation of empty containers, diseconomies stemming from atomization in the trucking industry, extended turn times, inefficient procedures for locating and positioning containers, and unavailability and poorly maintained maintenance of container chassis.

The litany of deficiencies related to the terminal–drayage nexus would suggest greater attention to interorganizational governance structures. However, as Van Der Horst and De Langen (2008) observe, ‘The limited attention paid to coordination in container hinterland transport is surprising, given that hinterland transport costs are generally higher than the maritime-transport costs, and that most bottlenecks in the door-to-door chain occur in the hinterland’ (109). For the relationship between trucking and terminal operations, they identify two specific inefficiencies: ‘The major coordination problem is the peak in the arrivals and departures of trucks at the gate of TOCs (terminal operating companies)’ (114). Another coordination problem is the ‘limited exchange of information between a container TOC, a truck company, and a forwarder. A lack of information exchange leads to an inefficient delivery and pick-up process at the deep-sea terminal’ (115).

The task here is to examine this relationship in more detail and consider some possible explanations for these inefficiencies and bottlenecks.

**Port terminal and drayage segments of the supply chain**

As a first step toward grasping the potential source of interorganizational inefficiencies, we can identify and describe the focal industries and organizations – container port terminals and drayage trucking. We will discuss the organizational characteristics of each and then turn to the apparent challenge of structurally integrating these segments of the intermodal supply chain. The description and analysis is confined to the US context.
Port terminal organizations

The importance of the container terminal, rather than the larger port, as the most relevant unit of analysis for the study of logistics supply chains, is reflected in the growing consensus for conceptualizing the ‘terminalization of seaports’ (Olivier and Slack 2006; Slack 2007; Rodrigue and Notteboom 2009). A more accurate description of the maritime port landscape, according to these researchers, is a corporate network of terminal-operating transnational corporations. A single port may have multiple terminals that ‘throughput’ very different types of cargo and are managed by very different types of administrative arrangements, public, and private. In an effort to remain competitive, port authorities are increasingly ceding control of the terminals to the shipping lines and/or privately owned global terminal operators (Slack and Frémont 2005; Olivier and Slack 2006) employing the now dominant ‘landlord’ port model that represents the furthest privatization of port operations (Baird 2002; Turnbull and Wass 2007). Under this increasingly common arrangement, a particular terminal is leased, managed, and operated by a private firm specializing in terminal operations (e.g. Dubai Ports World, Port of Singapore Authority, SSA Marine, Hutchison Port Holdings, and APM Terminals) or by a single shipping line that has vertically integrated their operations to include terminal operations (e.g. Mitsui shipping lines and Tra-Pac terminal operations).

Economies of scale are reflected in the increasing concentration in the container vessel industry, the increasing size of the container vessels, and the increasing investment in and space devoted to containers terminals (Heaver et al. 2000; Notteboom and Winkelmans 2001; Notteboom 2004). Concentration has resulted from horizontal integration through liner conferences, operating agreements, and mergers and acquisition (Notteboom 2004; Frémont 2009). Fewer shipping lines control a greater proportion of terminal slot capacity and the global TEU (20-foot equivalent) container throughput (Notteboom and Rodrigue 2012). In addition, a greater proportion of containers are being transported by the largest container vessels able to transport over 15,000 TEU (20-foot equivalent units) containers (Notteboom 2004). Container terminals are also becoming larger, and are controlled by a smaller number of global terminal operators who lease dedicated container terminal facilities and have been the recipient of massive financial capital investment. In 2006, American International Group bought six US terminals from Dubai-owned company DP World. In that same year, Goldman Sachs acquired Associated British Port Holdings, and in 2007 the investment bank bought a 49% share in Carrix, a subsidiary of SSA Marine, the largest US-based terminal operator. As reported in the business press at that time, ports and port operators have become the hottest investment targets for fund managers across the world (Arabian Business 2006).

Port drayage organizations

The shipping containers that are delivered to the increasingly privatized and specialized terminal operators must be physically transferred to the next location in the logistics supply chain. The most common mode of transport for the movement of containers from the terminal is by truck and referred to as ‘drayage’. Drayage is the short-hauling of intermodal containers on a detachable trailer chassis. It is an essential link in the intermodal movement of goods, serving as the link to/from the port terminal and to/from
railhead and distribution centers across inland portions. In sharp contrast to the container terminal operations, the drayage sector is characterized by a large number of logistics and trucking firms, many quite small, that contract with shippers and logistics firms for the movement of containers.

The current shape of the trucking industry and the working conditions of drivers is well-documented in Belzer’s *Sweatshop On Wheels* (2000). The evolving labor market conditions and intense industry competition are a direct result of the transition of trucking from a protected and regulated, to unprotected and deregulated, industry with the passage of The Motor Carrier Act of 1980 (Belzer 2000; Belman and Monaco 2001; Peoples and Talley 2004; Bensman 2009). Prior to the 1980 Act, licensing requirements enforced by the Interstate Commerce Commission restricted the number of trucking firms and trucks. This had the effect of stabilizing prices and, with Teamster representation of drivers, providing truckers with attractive compensation and benefits. Rising wages and operating expenses were simply passed on in the form of higher shipping costs. The Motor Carrier Act radically altered the trucking landscape allowing the entry of low-cost, non-union trucking firms. The low barriers to entry, increasing number of players, and the heightened competition exerted a downward pressure on trucker compensation and a steady decline in union representation. Particular sectors, including drayage, became highly competitive and fragmented and the net effect has been a decline in compensation levels and mass de-unionization (Belzer 1995).

Another major consequence of deregulation pertains to its impact on the drayage truck drivers who are (mis)classified as ‘owner-operators’ or ‘independent contractors’. Under this now-dominant drayage industry standard, trucking firms – rather than owning trucks and hiring workers as employees – contract with ‘self-employed’ drivers who own or lease their own truck. These drivers work for, but are not officially employed by, the trucking companies, and they are paid by the trip or load, instead of by the hour. They are typically prohibited from working for more than one company. The implication of being an independent owner-operator, as fictional as the designation might be in practice (see Bensman forthcoming), effectively frees trucking companies from any financial and legal obligations they would incur under an official employment relationship (e.g., social security, health benefits, and retirement). Finally, and quite significantly, as an ‘independent business,’ rather than a company employee, the owner-operator is prohibited from joining with other owner-operators in organizing a labor union, as this would violate federal anti-trust laws. As we shall see, any analysis of the interorganizational relations between the terminal and drayage operations would be seriously incomplete without a consideration of the labor market conditions of drayage drivers.

**Intermodal disintegration: identification and analysis**

There are now two related questions to address. First, how does one conceptualize the interorganizational relationship between the terminal and drayage operations? Second, and closely related, how can one explain the weak integration between the two sectors?

In attempting to conceptualize the interorganizational relationship between the terminal and drayage operations, one can consult a well-established literature in organization theory. The issue can be placed in the context of a larger meta-tension inherent to all organizations – arranging a rational division of economic activities and, at the same
time, ensuring that these activities are coordinated and integrated (Jaffee 2001). Differentiation, divisions of labor, and specialization are fundamental economic and organizational principles. No single organization is able to assume responsibility for all production and distribution activities. This necessitates interdependence and inter-party transactions. Once divided and differentiated, how do different organizations coordinate and integrate their interdependent activities? The interorganizational relationship between the terminal and drayage poses an interesting case in which to explore these questions.

**Transaction cost approach**

A consideration of this particular division of labor involves transactions among interdependent but distinct phases or sequences in a distribution process, and the functional integration of these interdependent units. One approach to this challenge is provided by the transaction cost model of Coase (1937) who identified the problems involved in market exchange under conditions of self-interest and insufficient information. This necessitates contractual verification and protection; but negotiating, writing, and enforcing contracts is costly. A ‘firm,’ or organization, may decide to reduce these costs by assuming the activity itself rather than relying upon another organization. This would be an alternative to market exchange. Once the activities are controlled by a single organization, market transactions are replaced by directives and commands. Transaction costs associated with establishing mutually agreeable economic relations with another party are eliminated.

Coase’s conceptual framework has been extended and modified in the work of Williamson (1975, 1985) who describes the non-market solution as ‘hierarchy’ and more commonly referred to as ‘vertical integration.’ In the context of a pure cost–benefit analysis, vertical integration makes sense when the cost of hierarchical administration is less than the cost of market transaction (Teese 1976). The tension arises as to whether the organization should specialize in what it does best and rely on the division of labor to access needed resources, integrate the entire process under a single organizational umbrella, or develop an alliance of independent but affiliated firms. Langlois and Robertson (1995) make the important distinction between ownership integration and coordination integration. Generally, ownership integration is the assumed outcome of hierarchy. One firm buys up another firm, owns its assets, and presumably integrates its economic activity into its own through command, rather than market exchange. Coordination integration implies coordinating the activities of legally independent entities. Langlois and Robertson correctly emphasize that ownership does not automatically create tight coordination, cooperation, or structural and social integration. It is conceivable that higher levels of collaboration and cooperation can exist between two legally independent firms. This suggests that control and certainty can be established without resorting to a vertically integrated arrangement.

Private terminal operators have recognized the value of extending their services into the supply chain in an effort to enhance integration. If not involving actual vertical integration into inland transport, and warehousing, there can be systematic coordination with these supply chain entities. SSA Marine, for example, boasts of its provision of rail yard, trucking, warehousing, and off-dock yard services. In the case of Hutchison Port Holdings, they have created a separate logistics division – Port Services and Logistics – which can offer customers ‘seamless logistics support around the world.’ Similarly, an ocean carrier may
‘in-source’ terminal operations to a subsidiary (e.g. Mitsui’s Tra-Pac Inc. or Maersk’s APM Terminals) that also forges an integrative relationship at least as far as the terminal. This is where one is most likely to find vertical integration in the intermodal chain. While a great deal has been written about the activities of shipping lines in more fully integrating their operations, it has been much more at the level of horizontal than vertical integration, and in maritime versus inland transport (Evangelista and Morvillo 1999). This has resulted in significant economies of scale at the ocean carrier level.

Some have attempted to apply the logic of transaction costs to predict potential integrative solutions in the logistics sector. For example, Panayides (2002, 406) argues:

In assessing the transaction costs associated with intermodal transport, there must be identification of the characteristics of the transaction and how they relate to the intermodal service characteristics. To the extent that transaction costs are high then this will provide an indication of the benefits that may be associated with a more integrated governance structure that would limit the transaction costs.

However, the divergent character of the two industries, and the nature of their exchange relationship, renders transaction cost theory less efficacious for explaining, predicting, or analyzing these particular interorganizational inefficiencies. Within the context of the theoretical literature on interorganizational integration (e.g. transaction cost and resource dependence), the logic and incentives for particular integrative strategies are based on a customer-supplier model and set of functional linkages that do not entirely apply to the intermodal transportation logistics chain generally, or the container terminal–drayage nexus, in particular. Most significant is the fact that the drayage sector is neither a customer nor a required resource for the terminal operator. The terminal is primarily concerned with meeting the needs of the backward linkage (on the import side) to the shipping lines. Once the terminal operators unload the cargo from the vessel they have a contractual obligation to make it available and accessible to the next mode of transport. Strong financial incentive structures are much weaker than they would otherwise be if terminal operators were paying trucking firms for a service provided.

Williamson’s (2008) recent application of transaction cost economics (TCE) to supply chain management reiterates that the ‘paradigm transaction’ of TCE is the make-or-buy decision. He asks: what is the paradigm problem for supply chain management? We would answer that for the intermodal case studied here it is not ‘make or buy’, or even ‘do or contract’, but simply ‘the expeditious handoff’ (of shipping containers). For the physical handoff, it is less about cost or quality of commodities than the velocity or the speed at which the objects are moving.

For this particular type of relationship, it seems clear that there are other parties that have an even greater economic interest in the expeditious and seamless handoff of containers than the terminal operator. One is the port authority that bases its competitive position on marketing and demonstrating the efficient integration of terminals with inland transportation modes. Under the increasingly common landlord status, the port authority would seem to have less control over this transaction. On the other hand, given inter-port competitive pressures, port authorities have tried to institute terminal procedures and policies that can facilitate the entry and exit of drayage trucking.

The other relevant organization that has an interest in the expeditious movement of the containers and cargo is the third-party logistics (3PL) firms who are often managing the
intermodal logistics functions for consignees. The 3PL may determine the shipping line, associated container terminal, and drayage operation to be used for the movement of cargo. If there is a relevant ‘do-or-contract’ transaction decision, it operates at this level with the consignees determining whether they will manage their own logistics activities in-house or contract out to a 3PL. Because the 3PL orchestrates and mediates the relationships between terminal and trucking, there is even less chance that these two sectors will establish a direct cooperative or collaborative relationship.

The consequences of the seemingly disarticulated terminal–drayage relationship is cited by Hall and Jacobs (2010) in their analysis of ‘spatial proximity’ in the maritime ports sector and the extent to which such proximities might contribute to organizational learning, innovation, and effectiveness. It is instructive that, in citing a case that contradicts such an expectation, they point to the drayage sector of global supply chains. The absence of positive organizational proximity effects between the terminal and drayage is attributed to the fact that

hinterland transporters are not contracted by the terminal operators; typically they are contracted by the shipping lines, shipper or freight forwarder. The shipping lines, in turn, are contracted by the shippers or freight forwarders. The various actors do not share with each other the terms of each and every contract, including the price … the vertical integration of transport actors in the supply chain may be understood as an attempt to internalize ‘hold-up’ risks that result from such a differentiated knowledge base. (8)

The absence of a mutual interest between the exchange parties in this case constitutes a concrete example of one of the general explanations employed by Van Der Horst and De Langen (2008) in their attempt to explain the less than effective levels of coordination existing in the hinterland transport sectors, ‘The unequal distribution of the costs and benefits of coordination. If one actor in the chain has to invest … while other actors obtain the benefits, coordination might not arise spontaneously’ (110; italics in original).

For all these reasons, the standard transaction cost approach involving a two party market exchange fails to capture the complexity and uniqueness of the interorganizational arrangement or to explain sufficiently the source of the integrative inefficiency.

**Dual economy approach**

One theoretical approach that has not been widely applied to interorganizational relations, but which is pertinent to this particular case, is the dual economy or segmented labor market approach. Work done primarily in the 1970s and 1980s on labor market outcomes identified a segmented, bifurcated, and non-equivalent labor market structure (Piore 1972; Reich, Gordon, and Edwards 1973; Harrison and Sum 1979; Dickens and Lang 1988). The segmented labor market theory provides a descriptive and explanatory framework for studying how work in different industries, economic sectors, and organizations shape the labor market outcomes of different workers (Reich, Gordon, and Edwards 1973; Edwards, Reich, and Gordon 1975; Beck, Horan, and Tolbert 1978). The contrasting labor market conditions tend to correlate with a workers location in the ‘dual economy’ (Beck, Horan, and Tolbert 1978) which draws a distinction between primary and secondary, core and periphery, or monopoly and competitive sectors of the economy. The primary sector is made up of large capital-intensive firms exercising quasi-monopoly
pricing power and larger profit margins. In contrast, the secondary sector is characterized by smaller labor-intensive firms, operating in highly competitive environments with downward pressure on profit margins.

The terminal and drayage segment of the intermodal supply chain, as described above, would seem to conform closely to this dualistic structure. More specifically, the global terminal operators, and the shipping lines to which many are linked, represent industries that would be classified for inclusion in the ‘primary’ or ‘monopoly’ sector of the economy. These organizations are capital intensive, hold pricing power, are multinational, and have profit margins making them attractive to major investment banks. In sharp contrast, the drayage industry is characterized by high levels of competition, low barrier to entry, low capital asset requirements, and a poorly organized labor force. Thus, drayage trucking fits squarely in the ‘secondary’ or ‘competitive’ sector of the economy.

In the context of economic dualism, but using somewhat different language, Rodrigue, Comtois, and Slack (2009, 212) have identified the intermodal integrative inefficiencies as a problem of ‘massification’ and ‘atomization’ within the larger phenomenon of the ‘last mile’ of freight distribution.

The containerization process is thus confronted with a growing tension between a massification at sea and an atomization on land. Growing vessel size has led to the massification of unit cargo at sea. On terminals and at the landside, massification makes place for an atomization process whereby each individual container has to find its way to its final destination.

Similarly,

once a load of freight has reached a terminal close to its destination it has to be fragmented and transferred to the local/regional freight distribution system. It is commonly referred as the ‘last mile’ and often represents one of the most difficult segments of distribution. (Rodrigue 2006, 3)

While this is an inevitable aspect of the geography of distribution, it is severely exacerbated and introduced prematurely by the fragmented drayage industry yielding an array of different trucking firms, brokers, and logistics companies moving containers off the terminal. In short, whatever economies of scale are achieved at the vessel and terminal level, they are quickly eroded at the drayage level.

Again, the decentralized and competitive nature of the drayage sector has been cited as an additional factor hindering potential advances that might result from organizational proximity. Hall and Jacobs (2010) note these difficulties as they impact the effort to reduce diesel fuel emissions from port trucks, and argue that the

challenges of diffusing new technological (for example low emission engines) and organizational (for example, gate booking) systems to reduce the environmental impact of the short-haul trucking industry in the Los Angeles basin have been confounded by radically decentralized and competitive nature of the local industry. (5)

This is also one of the explanations offered for the poorly integrated and weakly coordinated character of inland transport according to Van Der Horst and De Langen (2008). ‘The lack of resources or unwillingness to invest on the part of at least one firm in the transport chain … This issue is especially relevant for coordination problems involving relatively small firms’ (110; italics in original).
Power and externalization of costs

The divergent and distinct sectoral features of terminal and drayage operations translate into relative power positions within the intermodal chain. Cox et al. (2002) have theorized that these unequal power relations in supply chains – based on resource dependencies or sectoral differences – can be used by one party to extract greater value from the supply chain. Under such conditions, interorganizational integration and the distribution of value and profit may be inimical the interests of the more powerful firms in the chain.

There may be structural factors and economic forces impeding the implementation of ideal-type integrative strategies suggested by the assumptions of supply chain management. First, as with the commodity production process and related commodity chains, in the intermodal logistics supply chain there are strong pressures to squeeze costs out of the goods moving processes. This means that while theoretically there may be optimal means for ensuring interorganizational integration, as suggested above, there are also cost considerations and institutional/structural constraints that may work to support and preserve organizational arrangements that are less economically efficient but that shift costs from one party to another, and are therefore tolerated (see e.g. Nickerson and Silverman 2003). Second, intermodal chains of transportation and distribution may possess distinct properties that make models based on interorganizational chains of production less applicable (Pirrong 1993; Lafontaine and Masten 2002). For the relationship between the drayage sector and the port terminal operations, these factors may contribute to the persistence of intermodal disintegration.

In addition to the distinct nature of the transaction and the divergent sectoral structures, the persistence of this widely acknowledged dysfunctional system would suggest that there are some benefits deriving from the arrangement for particular parties. The ‘cost effectiveness’ of such a system may be associated with the ability of one party to shift economic costs – that is, externalize – to another party. This is where and why it is important to consider the situation of the drayage drivers. Poorly organized, as atomized as the industry in which they work, and largely powerless, costs and risks are shifted to, borne by, and concentrated among the owner-operators or, more accurately, ‘dependent contractors.’

One of the most consistent observations made by those who study the port drayage system pertains to the issue of who bears the costs and risks, and who would have the greatest economic incentive to institute alternative arrangements (Monaco and Grobar 2005; Bensman 2009, forthcoming). If the terminal operators paid a direct economic price for the delays and bottlenecks reported by all observers, there would be an incentive to streamline the system. If the drivers were organized and/or paid by the hour, the trucking firms would have an incentive to organize for a more rational system that would minimize time delays. However, firms have little incentive to pay drivers as employees, by the hour, when up to half the working day is spent waiting rather than actually moving a container. As it currently stands, the negative external effects of congestion, delays, or inefficient terminal operations are borne and absorbed by the drivers. In short, it is profitable, or at least cost effective, to take the ‘low road’ strategy when it comes to the drayage side of the equation (Milkman 2002). Or, as Taylor and Jackson (2000) conclude, ‘In short, the draymen’s weakness leads others in the channel to abuse them in a way that harms the overall channel’ (10).
There appears to be a general lack of concern for the problems faced by the drayage drivers. In their survey of carriers and shippers, Winterich et al. (2009, 15) report that ‘Shippers, receivers, and carriers are not particularly interested in average truck speeds and/or congestion, other than the fact that these things may affect fuel expenditure’ and ‘view congestion as a normal part of business operations.’

Finally, Hall and Hesse (2012, 11), in their study of urban freight flows, conclude that

Complete integration of all logistics functions is not a goal of supply chain actors … shipping companies and terminal operators have seen no reason to integrate local trucking into their operations …. Hence, at certain times and places, and in certain transactions, supply chain disintegration is productive for some supply chain actors, especially for dominant actors.

This observation lends further credence to a power perspective (Cox et al. 2002) in analyzing transactions such as those between terminal and drayage operations in the intermodal supply chain.

As is often the case in such situations, what is individually rational for the trucking firms is collectively irrational for the larger supply chain. These delays and inefficiencies impact all parties in the sequentially interdependent interorganizational supply chain. Therefore, there should be a common interest working to ensure a more timely movement of containers from the terminal to the subsequent mode of transport or distribution. More generally, this issue points to the need to internalize costs that are currently externalized and to modify the employment relationship that reinforces an arrangement that minimizes the costs to ‘employers’ and maximizes the costs incurred by one subordinate group of workers.

It is important to acknowledge that there are some small scale reforms that have been proposed and unevenly implemented across maritime ports in the United States. First, designed to reduce wait times and congestion, is an appointment system for procuring containers. Second, and most consistent with strategies discussed thus far, there is the vertical coordination between the ocean and landside carrier. Several recent examples include a joint venture between APL shipping lines with Con-way Freight to integrate and customize intermodal container transit. The fact that APL has access to dedicated terminals enhances the ability to make such collaboration possible. Similarly, J.B. Hunt Transport Services has partnered with ocean carrier Matson Navigation to integrate services and guarantee transit and delivery times. Finally, the fragmentation of the trucking industry is being addressed with the emergence of large scale nationwide trucking firms. Most notable is Roadlink USA which was created out of the merger of seven regional intermodal transportation companies. Roadlink claims to be the ‘largest private, independent North American Intermodal Logistics service provider’ combining local market expertise with the scale and scope of nationwide coverage and service. These strategies are designed to match the scale economy of terminal operations with scale economy of drayage operations (see Watson 1999).

A number of other proposals have been suggested for improving drayage related efficiencies. The ‘virtual container yard’ is aimed at eliminating the wasted transport time and resources devoted to returning and picking up empty containers (Theofanis et al. 2007; Rodrigue, Comtois, and Slack 2009). The system would coordinate the regional demand for containers with drivers delivering containers directly to the point of use rather than temporary port stockpiles. Two other proposed enhancements are related to
the congestion and delays associated with having to match a particular driver with a particular container or a particular chassis. Solutions involve the creation of a ‘trucking pool’ from which drivers working for different firms could be used to transport containers for any other firms (Payne 2007). Similarly, a chassis pool would be established from which drivers could use any available chassis regardless of which shipping line had ownership. All three of these proposals to address bottlenecks in this particular segment of the chain require cooperative and collaborative relations among separate and potentially competing firms. They also point to the way cooperation rather than competition can produce a more optimal arrangement for the efficiency of the supply chain.

However, none of the proposals above address directly the problematic owner-operator status of drayage drivers. The conversion of owner-operators to employees could conceivably be either a cause or consequence of improving the efficiency of the system. On the one hand, if firms were paying drivers as employees they would have an incentive to fix the system. On the other hand, if the system were more time efficient, the firm might be more willing to pay drivers as hourly employees. Until this particular employment relationship within the drayage sector is addressed, it is difficult to imagine how persistent intermodal disarticulation will be remedied.

Discussion and conclusion

This paper has examined two segments of the intermodal container supply chain – the port container terminal and drayage operations – as a unique case of interorganizational relations. The purpose was to develop a better understanding of the different organizational and industrial features of the two interdependent sectors, and the extent to which such differences impact the level of integration and seamlessness between the two interacting segments of the supply chain. The analysis has been informed by the interorganization theories of transaction cost as well as industrial organizational theories of segmentation and dualism. The sharp differences in industrial structure between the two segments – in terms of scale economy, capital intensiveness, concentration, and multinational reach – generates intermodal disintegration that undermines the supply chain objectives of integrative seamlessness.

There are some larger implications, both theoretical and practical, that are also worth noting. First, the study of interorganizational integration and governance structures has been heavily influenced by transaction cost theory. However, the analysis here would suggest that the intermodal transport chain is characterized by unique interorganizational relations and characteristics that cannot be completely incorporated into the logic of transaction cost theory. The terminal–drayage nexus does not conform to a ‘make-or-buy’ calculus or the common supplier–customer relationship inherent to production processes. More generally, this points to the need for greater specification of the differences between production and distribution processes in the application of transaction cost theory and what would constitute optimal governance arrangements in intermodal supply chains (see e.g. Pirrong 1993; Lafontaine and Masten 2002).

Even if we were able to easily apply transaction cost theory to this case, a second related issue would immediately emerge – the extent to which costs come into play and, more specifically, how they are externalized. From the perspective of the terminal operator,
the container has been received, is stacked in the container yard, and is made available for pickup. The primary costs are associated with container movement, storage and space utilization rather than expeditious departure. From the perspective of the trucking firm, there is an interest in moving the container expeditiously to its next destination. But while delays and bottlenecks associated with port terminal entry are widely recognized and acknowledged, there is no alternative terminal where a specific container can be obtained, and the time-related costs are absorbed by the drivers rather than the trucking firms. In this case, externalization of costs, rather than the absence of costs, makes the transaction cost model problematic as a basis for predicting interorganizational arrangements and solutions (see Bensman 2009 for a full inventory of externalized costs in the drayage sector). This is just one example of the larger phenomenon in which negative externalities are not cost-accounted for by firms and, in turn, not reflected in the market price of commodities or services (Patel 2010).

Among the policy implications, Bensman (2009) has outlined some of the key elements in his analysis from the drayage side of the equation. Generally, this would involve a regulation of the drayage sector with the objective of more accurately classifying owner-operators as employees, implementing stricter diesel emission standards that would remove older trucks from the road, and develop uniform chassis standards to address highway safety. As already noted, and as Bensman emphasizes, internalizing costs to trucking firms would provide a strong incentive to invest in the technologies and electronic information and communication systems that would tighten the drayage–terminal and drayage–warehouse interface.

There is also the larger question of responsibility and accountability for ensuring smooth relations among exchange partners in the local port economy, which often becomes muddled under particular port governance arrangements (Brooks 2004). For example, under the increasingly dominant ‘landlord’ model, the port leases its property to various ‘tenants’ (Slack and Frémont 2005). The landlord port is often reluctant to, or prohibited from, imposing prescriptive and/or restrictive business practices. Actions by tenants and other firms interacting with the port terminal, assuming they do not violate federal or state laws and regulations, are regarded as managerial prerogatives. This can make it more difficult to align the port economy with the interests of the larger community (Notteboom and Winkelmans 2001) or the full range of logistics supply chain stakeholders.

Disclosure statement

No potential conflict of interest was reported by the author.

References


