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Port Competition and Hinterland Connections

SUMMARY AND CONCLUSIONS

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1. INTRODUCTION

Maritime freight transport has experienced strong growth and profound change over recent decades. Freight volumes and container traffic in particular have grown with the intensification of global trade and the geographical dispersion of production. The industrial organization of the sector has evolved rapidly. These changes have rendered the ports business environment more challenging. Many agents along the supply chain have engaged in horizontal and vertical integration of activities. This has lead to more efficiency in the movement of cargo, but has reduced the number of players, with an attendant risk of abuse of market power. The market power of the ports *vis-à-vis* shippers and shipping companies has become correspondingly weaker.

The rapid expansion of trade has led to fast growth of throughput in many ports. As a result, in many large gateway ports, local communities are increasingly concerned about the negative impacts of port activity, including local pollution and congestion. The greenhouse gas emissions generated by freight traffic are also a growing policy concern. This paper explores the economic framework in which potential regulatory intervention to address the issues of competition, air pollution, congestion, greenhouse gas emissions, and financing and provision of infrastructure should be considered. It begins with an overview of the main changes in the sector, emphasizing how they have affected the role of ports and of other players in the supply chain (Section 2). Section 3 asks if ports' current responses to the changing environment are appropriate, or whether ports could and should play a more active role in shaping the supply chain. It is argued that there may be ways for ports to strengthen their positions within the supply chain, but that their actions may not always serve the public interest, even when ports effectively pursue a mix of public and private goals. Section 4 examines the policy issues that result. We first look at local authorities' scope for reducing negative local impacts, and conclude that some agents along the supply chain are sufficiently influential to affect policy design and potentially defeat its aims. At the same time purely local regulation of these impacts is likely to ignore the benefits of trade that occur outside the local economy. These observations highlight the need for better regulation at a national or multilateral level. Unfortunately, there is little evidence of systematic national – let alone transnational – policy frameworks towards ports or towards supply chains in general. This is problematic, given the emergence of large transnational conglomerates that have created agile and footloose supply chains with sufficient power to withstand or evade attempts to regulate them at national level.

2. THE CHANGING INDUSTRIAL ORGANIZATION OF SUPPLY CHAINS AND THE IMPACT ON PORTS

This section briefly discusses three of the major changes in the way maritime-based freight transport is organized: containerization, the emergence of global supply chains, and the rising importance of transshipment container terminals. The impact of these changes on the role and power of ports in the supply chain is then discussed.

2.1 Containerization, larger vessels, and expanding hinterlands

Containerization was a major technological innovation that revolutionized the nature of maritime-based freight transport of manufactured goods. It caused a substantial degree of standardization of port services, implying that ports cannot rely on specialization to maintain market share and generate revenues as much as they used to. With containerization, ports in the same region become closer substitutes, and hence are more exposed to competition from other ports and other routes. This tendency is reinforced by two other factors. First, the use of ever larger container vessels[1] implies that fewer port calls are required for the same freight volume. This move to larger ships reduces shipping lines' dependence on particular ports and intensifies competition among ports for the remaining calls (assuming each port can handle the larger vessels[2]). Second, the emergence of intermodal rail and barge corridors has extended gateway ports' geographical reach. The extension of hinterlands leads to more overlap among ports' hinterlands and hence to stronger competition.

These technological factors imply that the exposure of ports to competition has increased. At the same time, there has been widespread adoption by governments of new public management principles and the ensuing devolution of port management has resulted in a more commercial approach to the management of port operations (Brooks and Cullinane, 2007); this has led to intensified port competition as well. This is not to say that all ports behave like private firms as, in many cases, they pursue a mix of private and public objectives and there is considerable public sector involvement in infrastructure supply. The change in port behavior has been facilitated by a rather passive policy context; in section 3, the question to be tackled is: is a more active public policy towards port and supply chain developments now required?

Port competition is intense, but ports are not "perfect substitutes", i.e. they are not interchangeable perfectly or without cost. First, gateway ports still have a strong position in at least some of their service area, as hinterlands do not overlap completely. Second, the

1 The capacity of the world cellular container fleet increased by more than factor 4 between 1991 and 2006, and the share of ships with more than 4000 TEU increased from 8% to 47% (Wilson, 2007: 11)

2 Accessibility is an issue for upstream ports such as Antwerp and Hamburg, and both ports respond by engaging in dredging programs.

intensifying effect of containerization on port competition may be muted by congestion in ports or in their hinterland transport networks. When a port or its hinterland facilities are more strongly congested than is the case for competing ports, the quality of that port's service may be lower in that it takes more time to access and egress the port and the reliability of service declines, and this weakens its competitive position. The interaction between port competition and congestion is discussed in more detail later in this section. Third, switching ports is costly, although more from a terminal operator's point of view than from the perspectives of shipping lines or manufacturer-controlled supply chains. There is no consensus in the literature on the degree of inertia in port choice from shipping lines' point of view. It is widely accepted that supply chains are increasingly footloose, but it is less clear which elements of inertia remain.

2.2 The emergence of global supply chains

The second driver of change that directly affects the role of ports is the development of global supply chains. These chains link strongly dispersed production and sourcing sites to more geographically concentrated consumption regions. What matters from the point of view of shippers and customers is the performance of the supply chain in terms of price, service quality and reliability. This focus on the chain as a whole is reflected in efforts of the players in various segments to consolidate, vertically integrate or otherwise enter into long-term contracts, in order to drive costs down but also to increase the level of coordination and synchronization. Such concentration and restructuring carries a risk of generating excessive market power for some of the actors in the chain. It has also increased volatility, meaning that small deviations from expected or planned processes have large consequences for system performance. Volatility increases uncertainty and induces logistics providers to build in redundancy by using more than one of a set of routing options, so as to mitigate route risk. This trend further weakens the shipper or customer's reliance on a specific port.

The increase in levels of concentration, along several dimensions, is quite spectacular. In 1980 the top 20 of the world's shipping lines controlled 26% of TEU-slot capacity; by 2007 their share had increased to 81% (Notteboom, 2008).[3] Many of these top 20 further concentrate effort by engaging in alliances. Shipping lines also vertically integrate, in some cases working towards "extended gates" where shipping lines take control of inland transport and inland terminals and depots. At the level of port terminal operations, the market share in terms of throughput of the top 10 players rose from 42% in 2001 to 55% in 2005. This raises concerns over increasing market concentration. Some terminal operators have extended vertically in the direction of "terminal operator haulage". With respect to vertical integration, the current picture is one of widespread experimentation with ways of organizing the supply chain (see Notteboom, 2008, for an overview), and while it is not clear exactly which models will persist, the emerging picture is one of market dominance by a handful of large players at each segment of the supply chain, combined with fringe firms specialising in profitable niche markets. Despite the small number of players, competition in and for the market (within and between ports) is strong, and may be strong enough to alleviate concerns about market power in the supply chain in many circumstances. Concerns were expressed by participants that the market power of integrated, global transport and logistics companies is a concern for

[3] Increased concentration partly replaces the weakening impact of conferences (which set rates for specific routes), so that the effect of concentration on market power may be weaker than indicated by the percentage change.

ports themselves. Finally, geographical concentration of flows is increasing as well. For example, the North-South imbalance among ports in Europe is growing larger, and this is largely because of more favourable hinterland transport conditions in the North.

It is noteworthy that many actors along the supply chain are involved in attempts to vertically integrate, but that ports as such have not strongly engaged in this trend. In combination with the technological trends discussed earlier, this further weakens ports' market and bargaining power.

2.3 The rising importance of transshipment hubs

A third key change is the changing role of transshipments. Gateway ports become more engaged in transshipments, and pure transshipment hubs have emerged. More than 20 of the 100 largest ports worldwide are transshipment hubs, in the sense that at least half of traffic is ship-to-quay-to-ship (Baird, 2007). This evolution is related to increasing vessel size and fewer port calls per service discussed before, and is taking place in many regions. Major gateway ports are increasingly profiling themselves as transshipment terminals, because the fragmentation of production tends to pull production out of (relatively expensive) gateway cities.

Shifting transshipment to pure transshipment hubs reduces the pressure on gateway port capacity, which can then focus on serving expanding hinterlands. There is no such hub in Northern Europe at present, so that some 30% of activity in gateway ports in the region concerns transshipment. While these ports may have little incentive to shed this traffic, it is less clear whether maintaining the current port configuration is optimal from a broader point of view. The idea to construct a hub at Scapa Flow (Orkney Islands) is thought superior by Baird (2008). At the same time, transshipment hubs in the Western Mediterranean are currently moving towards more direct calls, a trend that may extend to the Eastern Mediterranean. More in general, the hub-and-spoke model is attractive when the density of demand is low, but becomes less attractive as market volumes rise. Assuming continued growth of demand, this suggests that the pure hub port model may not remain viable as, ultimately, handling costs are lower for direct service than for transshipment connections.

2.4 Impacts on ports

One consequence of the three drivers of change in the organization of supply chains is that gateway ports have in many cases become a replaceable element of the chain, with relatively weak bargaining power. A port that provides service of a given quality at the lowest price does not necessarily gain market share, as other factors – that are not under the port's control – also affect port choice. The focus shifts from port performance to supply chain performance. Among the other factors, hinterland transport costs have become relatively important, as the cost per kilogram per km on the hinterland is 5 to 30 times as high (depending on the hinterland transport mode) as the maritime shipping cost (Notteboom, 2008). Routing choices, and to some extent port choices, are strongly dependent on hinterland transport conditions and reliability of the total route has become increasingly important to those in the supply chain making the routing decisions.

This is not to say that port price and "internal performance" are irrelevant. For example, Blonigen and Wilson (2006) find that port efficiency affects port choice. Also, efforts to improve the reliability of port services can have a substantial payoff and, consequently, reduce the incentives for shipping lines to acquire dedicated terminal capacity. Ports can increase their attractiveness by exploiting complementarities with other parts of the supply chain, for example through closer ties with inland distribution centers, as well as by making efficient use of capacity in the port and the hinterland where they can (De Langen, 2008).

One way of increasing effective port capacity is through technological and operational innovations within the port. Rodrigue (2008) claims that improvements are available to double the throughput of existing terminal facilities.[4] A second way to effectively increase port capacity is to move some functions into the hinterland. For example, ports' distribution function is being decentralized by the creation of truck based inland distribution centers in the nearby hinterland ("port regionalization", Notteboom and Rodrigue, 2005), so relieving pressure on port capacity. In sum, it seems that port capacity is not a major constraining factor in determining a port's attractiveness, as no excessive levels of congestion should systematically arise there. This assessment is reinforced by the observation that capacity use in ports is organized in a more coordinated way than in general purpose transport networks (as usage patterns are less fragmented), leading to better (though not necessarily optimal) congestion management.

2.5 Impacts on modal split and on congestion in the hinterland

Hinterland transport uses a mix of road freight, rail, and marine (barge and short sea shipping variants). Rail and barge operators require cargo consolidation in order to provide an economically viable service. The combination of increased concentration at the level of shipping lines and terminal operators and increased vertical coordination should therefore provide conditions favourable to development of rail and barge transport, in the sense that it promotes carrier haulage and not merchant haulage. Nevertheless it is likely that the success of rail and barge will be limited to a fairly small number of corridors where densities of traffic are sufficient, and should not be expected to drastically change port impacts on hinterland road networks.[5] Short sea shipping is another potential competitor for road haulage. The "Motorways of the Sea" initiative in the European Union aims to stimulate sea-based hinterland services. The competitive position of sea-based hinterland transport depends to a large extent on the prevailing prices and infrastructure subsidies for other modes. Distortions in the pricing of infrastructure use may hamper its development, e.g. where road freight uses infrastructure at a price below marginal social cost. Furthermore, outside of Europe, the divergence of regulatory policies applicable to short sea shipping restricts its development by industry, with cabotage in US waters protected by the Jones Act.

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4 Examples of such innovations are on dock rail facilities, barge services or high volume container flows between dock and storage areas, as well as better stacking through operations research, etc. In addition, if information collected for security purposes were no longer proprietary, then it could be put to productive use in ports and along the supply chain.

5 It was mentioned during the discussion that this is corroborated by the Australian experience with comprehensive pro-rail policies, which were made ineffective by innovations in road freight alternatives . Subsequently policy shifted to support for specific projects.

It is noteworthy that inland distribution centers (port regionalization) increase pressure on hinterland road and rail networks in Europe, with adverse effects on congestion and air pollution. This form of port decentralization discourages a modal shift from truck to rail or barge (or from rail to short sea), an effect likely to persist in the long run given the land-use decisions involved. Ports tend to opt for regionalization because cheap land is available outside the port and externalities are not internalized, so that port regionalization is cheaper than increasing in-port capacity. If relatively cheap options to increase in-port capacity are available but ports nevertheless choose regionalization, there may be a role for public policy to stimulate the development of in-port capacity, preferably by bringing the costs of truck-based inland distribution centres in line with social costs through infrastructure pricing policies. Land-use policies may be used as well, but fragmentation of responsibilities and the risk of unexpected and unintended side effects make them less attractive.

The social costs of ports include not only congestion effects, but also local and global pollution. Global pollution matters because the decentralized port region model is likely to be more greenhouse gas-intensive than the centralized model and possibilities for carbon capture are smaller (e.g. plans to store carbon in gas fields in the Port of Rotterdam were mentioned during the discussion). There is considerable consensus that scale and integration of port and logistics activities support the development of rail alternatives to road haulage and are, therefore, more likely to be "sustainable" than decentralized and small scale development. Scale alone may not generate sustainable patterns, so that steering policy will be required.

The interaction between competing ports' pricing and investment strategies is studied in recent economic literature on competition between congestible facilities (De Borger et al., 2008; Zhang, 2008). A basic insight is that congestion in the port or in its hinterland increases costs and hence weakens a ports' competitive position. The hinterland congestion problem is particularly relevant. Figures for the Los Angeles/Long Beach ports presented in Zhang (2008) provide *prima facie* evidence that port growth and market shares suffer where congestion levels are high, and a survey of port managers by Maloni and Jackson (2005) highlights that their concerns on capacity expansion are mainly related to the hinterland, not the port. Hinterland congestion of course is not a pure port problem, as the networks serve a heterogeneous set of users and the share of port traffic often is fairly small. In fact, from the port and supply chain perspective, reliability – which is correlated with but different from congestion – may matter more than congestion itself.

It is clear that concerns about port and hinterland congestion are stronger when ports compete. Hence, calls for more capacity in the port or its hinterland to alleviate congestion are stronger in a competitive setting, and this may result in investment levels exceeding those where ports face less intense competition (Zhang, 2008). Whether these investments are closer in line with socially desirable levels is less clear, although the answer is likely to be yes. In general one would expect private ports to invest more when there is competition than when the port is a pure monopoly, with oligipolistic market structures falling between those polar cases. However, since decisions in investments in port capacity frequently are at least partly made by public authorities, insights about private port behaviour provide little guidance. In this regard, De Borger et al. (2008) find that privately owned competing ports invest less in port capacity than ports that set commercial prices but whose capacity is publicly financed, because the public investor has broader objectives than just port profits.

Port and hinterland congestion may be expected to affect the degree of ports' market share Specifically, one might assume that growth in traffic and rising congestion in the

hinterlands of large gateway ports would lead to an increase in the market share of smaller and less congested ports in the same port range. The evidence, however, shows that this has not so far been the case. To the contrary, prevailing patterns of concentration prevail or are strengthened. For example, the share of traffic handled by the large ports within the Northern European range is stable between 1975 and 2007 (but large upstream ports gain at the expense of large coastal ports; Notteboom 2008), and the Northern range has gained market share on the Mediterranean ports. Similarly, traffic on the US West coast remains strongly concentrated in the Los Angeles – Long Beach ports, with a reasonably constant 70% share of west coast container traffic over the last two decades. This is not to say that congestion has no impact on routing, and switching major container flows to smaller ports could have a large impact on local congestion. While up to now it appears that the benefits from further concentration still outweigh the decision-makers' costs, in some cases congestion does intensify the search for alternative routings. The US west coast is an example, where possibilities to substitute these routes with services via Panama and Suez to serve non-local markets are under consideration. Environmental constraints on capacity expansion nevertheless appear a more critical factor for growth in the ports of Los Angeles and Long Beach.

The geographical concentration of flows reflects the concentration patterns in supply chains just mentioned, and suggests that the costs of hinterland congestion generally do not outweigh supply chain benefits from increased concentration (internal returns to scale, or external sources such as agglomeration economies), at least from a supply chain operators' point of view. Whether the cost-benefit analysis is the same when broader social benefits (including congestion and other adverse effects incurred by non-port activities) are taken into account is a different question, to which the answer is unclear. On the one hand, concentration and centralization may be more amenable to managing congestion (and air emissions to the extent they are increased by congestion) than fragmentation of the supply chain but, on the other hand, the spatial concentration of the negative impacts of supply chain activity may excessively affect local communities. Irrespective of whether the local impacts are excessive or not, the concentration of negative impacts provokes strong resistance in communities adjacent to mega-gateway ports, and this may effectively constrain further growth. The benefits of concentration and scale need to be weighed against both the concentration of local environmental impacts and the potential costs of abuse of market power.

3. PORT AUTHORITIES' RESPONSES

De Langen (2008) argues that port authorities *can* and *should* become more strongly involved with hinterland access infrastructure and operations. They *can* become involved because port authorities control decision margins that affect the efficiency of hinterland access. Specifically, port authorities can provide infrastructure inside and outside of ports (for example, through the creation of inland terminals); they can manage infrastructure access to improve the efficiency of use of port and hinterland capacity (for example, Key Rail was created in Rotterdam to allocate slots for quayside access more efficiently); and they can improve data exchange among the various agents involved in moving a container from ship

to hinterland. While it has been suggested that concession contracts can be used to stimulate the use of some of these innovations, many ports have awarded very long-term concessions without clauses for re-opening, and so their use is often constrained.

De Langen (2008) argues that port authorities *should* introduce better coordination along the supply chain because other private and public parties have weaker incentives to do so. There can also be social benefits from improved coordination. Landlord port authorities that pursue a mix of private and public goals have an interest in providing efficiency-improving coordination of parts of the supply chain, as coordination can contribute to their net revenues from land leases and throughput growth. Even if not all benefits accrue to the port directly, the partly public role of the port suggests they might be interested in generating broader benefits as well. It was pointed out, however, that the business model underlying this view is unclear on exactly which public objectives are included and how they are traded off against narrower commercial concerns. Moreover, the landlord port authority model followed in Rotterdam is not universally applicable due to differences in governance and political cultures. When the model does work, it may help narrow the gap between responsibility for the strong impacts that port activities have outside the port area and the rather narrow set of competencies of a port in a traditional landlord port model.

Concession agreements with terminal operators are one lever that port authorities might use to pursue objectives regarding modal split, environmental impacts, and the like. The Port of Rotterdam uses them to influence the use of port space and transport modes, setting targets for the rail, barge and road shares in container movements out of terminals in the new Maasvlakte 2 development. The Antwerp Port Authority, in collaboration with cargo handlers, has developed an alternative approach, acting as a facilitator to develop the use of the rail mode through "Antwerp Intermodal Solutions (AIS)". This role may be extended in an Antwerp Intermodal Agency. The power of concession agreements is limited by the practice of renegotiations, which introduces considerable flexibility in these agreements. Concession agreements are also not always amenable to influencing business-to-business processes and decisions affecting the choice of transport mode.

However, it should not be taken for granted that a port authority's interest coincides with the broader public interest. For example, port authorities can become actively involved with the development of inland dry ports, to help decongest the seaport and possibly its adjacent transport network, but this is not necessarily ideal to improve hinterland access in as it may merely relocate the congestion.

Notteboom (2008: 25) noted that the policy push to achieve changes in modal split in the EU, through gradual liberalization of barge and rail markets, new pricing approaches and subsidy and support programmes, has to date failed, in the sense that modal shifts occur only when transformations in the supply chain make them attractive to those involved, and not by simply declaring the policy objective. Policy removed obstacles, but the actual change came about through "market pull" instead of through "policy push". As the decentralization issue suggests, market pull does not always work in socially preferable directions, in particular when external costs are present.[6]

[6] In addition, the increased levels of concentration makes designing effective policies harder, as powerful private entities may have considerable political bargaining power or can develop strategies to bypass policies.

Conflicts of interest may also arise because the port authority cares about negative side effects such as congestion and air pollution only to the extent that they affect its own performance. Port authorities' actions to limit such negative impacts do not necessarily reduce overall congestion and air pollution, and may indeed make them worse. The next section deals with policy-making to curb negative local impacts of port-related traffic in more detail.

4. PUBLIC POLICY FOR PORTS AND SUPPLY CHAINS

The overall principles for public policy towards ports and supply chains are no different from those for other sectors of the economy. Intervention may be indicated when market failures arise, e.g. to price external costs or preserve competition. Public investment may be merited where very long investment cycles make demand risk difficult for private investment to handle. A balance has to be struck in creating a climate for both competition and investment. High and increasing levels of concentration in the industry may generate substantial market power and suggests that vigilance against the abuse of market power is a growing policy imperative. Research is far from conclusive on the scale of the potential problem. As Slack (2007) points out, terminal ownership and access models are very diverse. There are even cases of shipping lines running terminals at which their own ships do not call. A more detailed understanding of market power is required to draw conclusions and this will be the subject of a companion report (OECD ITF 2009). Industry concentration also has an impact on the treatment of congestion (the external component of congestion costs is smaller than in a more competitive environment), and on the possibilities to shape public policy (see section 4.1). On a general level, policy towards supply chain activities currently is *ad hoc*. The adoption of more systematic, transparent and uniform policy frameworks is desirable. Given the extended geographical reach of supply chains and of some players in the market, and given that some of the policy issues (e.g. greenhouse gas emissions) are global, such policy frameworks need to be defined at central rather than local levels of government, and involve inter-governmental or multilateral consultation. While these recommendations seem straightforward, they are not always reflected in current policy (section 4.2).

4.1 Local authorities

Local communities near mega-port sites are confronted with the adverse impacts of increased port throughput. Port-generated traffic contributes to congestion on transport networks, and to safety risks, noise, and local air pollution.[7] As incomes in these communities grow, sensitivities to these side effects grow as well. From a public policy point of view, the question is: are these side effects excessively high? The answer is yes, in the sense that congestion and air pollution are external costs, i.e. they constitute real costs for

[7] Port traffic also contributes to regional and global pollution (e.g. greenhouse gas emissions), but these are ignored here.

local communities (as well as for port traffic) that are often ignored in decisions regarding port and hinterland traffic volumes.

There is thus a case for policy intervention, and the standard prescription is to find least cost ways of reducing these external costs to socially desirable levels. In some cases, e.g. for congestion, this means internalizing external costs through charges that reflect these costs. In other cases, technology regulation or defensive expenditures may turn out more effective than the use of charges. The internalization principle should not be applied to port traffic in isolation, and because the external costs mentioned are just one of many market distortions, it is not obvious which structure and level of charges or other policies would maximize benefits. Even if the "optimal" policies were known, it is not clear whether they are a practical – politically feasible – option.

The experience with policy-making to contain negative local side effects in the Los Angeles–Long Beach port region, described in Giuliano and O'Brien (2008), provides insight on how citizen concerns about such externalities shape policy outcomes. A study on the health impacts of pollution from diesel engines, and the experience with the port shutdown in 2002, changed the local public perception of the ports and stimulated regional policy to contain negative impacts. As a result, there is currently no public support for further port expansion. The policies introduced to deal with these have had mixed success.

Specifically, the contrast between the failure of Assembly Bill 2650 and the success of the PierPass program – both of which had the objective of stimulating the use of extended gate hours to reduce port traffic's impact on hinterland road congestion[8] – suggests that, in order to be successful, any attempt to implement measures that reduce negative impacts must take account of the interests of port-related businesses and, in this particular case, labour union demands and terminal operators' interests. Assembly Bill 2650 was passed in 2002, and prohibited truck queuing for more than 30 minutes at terminal gates. Terminals could respond by extending gate hours, but instead chose to introduce truck appointment systems. The impact on the time distribution of port traffic was negligible.

The PierPass program started in 2005 and successfully spread port traffic over more of the day, most notably shifting a significant share of the traffic to evening hours. The program is a form of cooperation between terminal operators, made possible by a Federal Maritime Commission ruling exempting this discussion from antitrust policies in the public interest, and implying that revenues from the program accrue to operators (with no public financial records). The PierPass fee is calculated on the basis of the incremental costs to terminal operators of operating a second shift, and bears no relation to marginal external costs. The program can also be seen as pre-empting the establishment of a new public authority charging for environmental impacts and using the revenue for mitigation. In this sense, the threat of regulation was sufficient to provoke a response.

The PierPass program gave the "dominant" players in the port-related business environment (including ports, terminal operators, shipping lines, port workers' unions, and large freight-generating clients) the opportunity to shape policy to serve their interests, so that the incidence of policies' costs is on more weakly represented and organized parties, mainly truckers. There seems to be a strong positive correlation between market power (vs. price-taking) and influence on policy (vs. "policy taking").

[8] Interestingly, the program focussed on moving traffic to the off-peak, not on changing the modal split.

It was noted in section 2 that concentration in the logistics industry is increasing, and that the position of individual ports in exerting influence on traffic flows is weakening. The Los Angeles – Long Beach examples suggest that strong economic power translates into strong influence on local policy. One interpretation is that this makes ambitious environmental and transport policy in port regions difficult, especially where one port can potentially be replaced by another. However, a more nuanced view seems warranted as the examples also show that there has been a response to increased local demand for action. The powerful players have strong influence on the nature of policy measures, but that does not mean these measures will necessarily be ineffective. Hence, there is some scope for "self-regulation", also in the presence of limited rivalry among ports and terminal operators. To enable private parties to overcome competitive concerns, communication and coordination on the specific issue being regulated is required. Such self-regulation will not produce the textbook ideal of regulation, but is preferable over a situation where a regulator proposes measures, the regulated parties insist the market works without intervention, and the compromise result is poor and ineffective regulation. Whatever the merits of the Los Angeles – Long Beach policy, it is not clear if the model of "self-regulation" at the local level can be exported to regions where port competition is more intense than along the US West coast. The San Pedro Bay ports serve a huge and affluent hinterland with much better connections to the main markets than neighbouring ports. Port rivalry is stronger in Europe.

While the incidence of costs of policies to reduce external costs may not meet common equity criteria, the current policy-making constellation does provide some balance between business interests and local community objectives. A more powerful local community may give insufficient weight to business interests, leading to 'nimby-ism' but ignoring local community interests may impose excessive costs on port regions.

4.2 Higher level authorities

There is at present a mismatch between levels at which policy is initiated and the scale at which regulated parties operate. The fragmentation and decentralization in governance contrasts with the wider geographic reach of (at least partially integrated) large conglomerates. Local governments are not very powerful vis-à-vis these conglomerates. Higher level (national) governments are better placed to handle them, and in some cases transnational approaches are desirable. There is also a risk that leaving port policies in the hands of local governments leads to the dominance of local issues over economic benefits of wider interest. This holds true for maritime transport in particular, as for example in Asia trade is seen as a primary engine of growth, and any regulation that slows it down as an impediment to growth. For global issues, such as climate change, a supranational approach clearly is desirable. Climate change policy as it relates to ports needs to be shaped at the highest level.[9]

High level policy responses may also be needed for other goals, such as avoiding any negative consequences of strong concentration in supply chains. Horizontal concentration is strong in several segments of the supply chain, and close scrutiny of mergers and acquisitions is warranted. Vertical integration raises additional concerns for competition, as fully or semi-integrated companies control several segments of the chain. The markets in

[9] Such a broad and high level approach may also help attain abatement goals at the lowest economic cost.

which these companies operate are hard to define and their boundaries are vague. Baird (2008) labels global logistics companies as “new empires”, with strong control over trade routes and prices, and sufficient power to withstand or bypass fragmented policy approaches. Here too, a systematic high level approach seems warranted.

On a more strategic policy level, higher level authorities need a vision on the likelihood and the desirability of continued growth in volumes and geographical span of supply chains. Until recently, the general expectation was one of further fast growth of freight volumes within the current geographical pattern of “globalization”. This expectation has triggered massive investments in transport infrastructure. However, it is not straightforward that this expectation will be realized. Rodrigue (2008) argues that containerization has matured so that future growth rates are likely to be lower than in the recent past. In addition, the medium term economic outlook implies moderate growth, translating in limited or even negative growth in traffic.

High energy prices also affect the organization of the supply chain. Some European and US manufacturers are re-relocating manufacturing closer to home market from overseas locations, in response to rising transport costs due to higher energy prices (Wall Street Journal Europe, 17 June 2008, US jobs return home as shipping costs from Asia rise; Financial Times, 27 June 2008). Cross-border security concerns are another factor in deciding on where to produce and upward pressure on overseas wages and in some cases on the value of local currencies may very well induce further re-relocation and restructuring of global supply chains. This evolution puts pressure on domestic transport systems, indicating that returns to infrastructure investment depend strongly on highly flexible production and trade patterns. The Asian trade model of the past two decades, characterized by Chinese imports of intermediate goods from other parts of Asia and exports to Western countries, is under pressure as well, reliant as it is on cheap transport. The share of Chinese exports based on imported intermediate goods has declined from 57% in 2001 to 44% in 2007 (Morgan Stanley Research, 2008).

The strategic policy stance with respect to the development of supply chains also depends on the wider normative economic perspective adopted. For example, it is sometimes argued that supply chains are too stretched out geographically, and that there is excessive growth in transport. There are several reasons why this may be the case. For example, ports aim to maximize throughput, and can do so by charging low prices for the use of infrastructure and dredging that is often publicly provided. The consequence is that shippers and supply chain operators do not face the full cost of infrastructure, let alone the full social cost of their decisions. Transport infrastructure pricing structures that do not reflect marginal costs, including externalities, in the hinterland exacerbate these problems. More cost-based pricing approaches are likely to improve the balance between overall costs and benefits of port and supply chain activity, and may result in growth rates below those observed in recent decades.

5. CONCLUSION

The supply chain industry is subject to increasing vertical and horizontal concentration. This arguably has lead to more efficiency in the movement of cargo, and possibly the concentrated model is more favorable in some respects towards sustainable development than a more fragmented landscape in the sense that it facilitates the development of rail and the internalization of port congestion costs to some extent. These benefits of concentration in terms of sustainable development would be smaller if hinterland transport prices were more in line with marginal social costs, for all modes. A downside of concentration is that there are fewer players, which increases the risk of abuse of market power, and requires close oversight by competition authorities.

From the ports point of view, the main consequence of developments in supply chains is that their market power has declined. Ports operate in an increasingly competitive environment within their range as well as in their function as nodes in supply chains increasingly prone to switch routings (route competition). From the perspective of welfare economics, there is little reason to deplore the weakening of ports' influence, as the economic benefits depend on supply chains' performance more than on a particular port's performance. However, when countries think of their ports as instruments for defending strategic economic interests, the weaker influence of ports vis-à-vis shipping lines becomes an issue of concern. The round table heard divergent views on how ports should respond to their weakening market power, with some supporting increased involvement with hinterland activities, and others doubting the social desirability of such an extended role for ports. Given the competitive context, ports need sufficient operational independence to respond to changing demands from their customers, in order to retain market share.

The growth in port throughput has triggered strong reactions from local communities, and in some cases (such as Los Angeles and Long Beach) policies to mitigate negative impacts have been implemented. Large supply chain players clearly influence policy design, and although this does not mean that policy is impossible or necessarily ineffective, it does suggest that local authorities are not always sufficiently powerful to handle port-related policy issues. Similarly, experience with policy efforts to change the modal distribution of hinterland transport in the EU suggests that the attainment of targets requires that the policy needs to be compatible with business interests. Concession agreements between ports and their clients have some potential to reduce local congestion and environmental impacts, but this is a piecemeal approach that intrinsically lacks transparency.

The current diversity in governance models and management arrangements in the port and supply chain business poses a problem for the development of systematic responses to negative impacts. In order to deal with these impacts, higher level authorities need to be involved and appropriate incentive structures are required. This holds for local impacts and to a stronger extent for regional or global effects. Local effects such as congestion and air pollution affect local communities and not just the port area. Local governments may be in a relatively weak bargaining position to design and enforce policy, particularly when port competition is strong, leading to ineffective policy. When local authorities are in a strong position, they may ignore part of the economy-wide benefits of port activity in policy design. A higher level response thus is called for. High-level, transnational responses are ideal for dealing with climate change, but there is little agreement on which supranational agency is best placed to handle this problem.

While the general principles for port and supply chain policies are fairly obvious (ensure a level playing field in the provision of infrastructure and in the handling of externalities between ports and between modes), these principles are far from systematically applied. A failure to price the social costs of hinterland transport use and land development may result in many ports preferring to develop inland distribution centres rather than more efficient port organization in response to increasing traffic. When the implicit subsidy to road is larger than for rail, this also undermines the performance of rail investments even in major hinterland corridors such as Los Angeles' Alameda corridor. Unfortunately, piecemeal, and not very effective policy is the norm. Globalisation increases the case for measures (such as road pricing) to internalize congestion costs on hinterland roads and develop explicit policy towards market power in logistics businesses[10].

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