DEPARTMENT OF TRANSPORT AND REGIONAL ECONOMICS

Port Pricing: Principles, Structure and Models

Hilde Meersman, Siri Pettersen Strandenes & Eddy Van de Voorde

UNIVERSITY OF ANTWERP
Faculty of Applied Economics

City Campus
Prinsstraat 13, B.226
B-2000 Antwerp
Tel. +32 (0)3 265 40 32
Fax +32 (0)3 265 47 99
www.uantwerpen.be

FACULTY OF APPLIED ECONOMICS

DEPARTMENT OF TRANSPORT AND REGIONAL ECONOMICS

Port Pricing: Principles, Structure and Models

Hilde Meersman, Siri Pettersen Strandenes & Eddy Van de Voorde

RESEARCH PAPER 2014-006
APRIL 2014

University of Antwerp, City Campus, Prinsstraat 13, B-2000 Antwerp, Belgium
Research Administration – room B.226
phone: (32) 3 265 40 32
fax: (32) 3 265 47 99
e-mail: joeri.nys@uantwerpen.be

The research papers from the Faculty of Applied Economics are also available at www.repec.org (Research Papers in Economics - RePEc)

D/2014/1169/006

Port Pricing: Principles, Structure and Models (*)

by
Hilde Meersman
Department of Transport and Regional Economics
Faculty of Applied Economics
University of Antwerp
hilde.meersman@ua.ac.be

Siri Pettersen Strandenes
Centre for International Economics and Shipping
Department of Economics
Norwegian School of Economics and Business Administration
siri.strandenes@nhh.no

Eddy Van de Voorde
Department of Transport and Regional Economics
Faculty of Applied Economics
University of Antwerp
eddy.vandevoorde@ua.ac.be

Abstract

Price level and price transparency are input to shippers' choice of supply chain and transport mode. In this paper, we analyse current port pricing structures in the light of the pricing literature and consider opportunities for improvement. We present a detailed overview of pricing criteria, who sets prices and who ultimately foots the bill for port-of-call charges, cargo-handling fees and congestion charges. Current port pricing practice is based on a rather linear structure and fails to incorporate modern pricing tools such as price differentiation or revenue management. Consequently, ports apply neither profit maximising pricing nor pricing designed to exploit available capacity more efficiently.

Keywords: infrastructure pricing, pricing models, seaports

(*) This paper has been accepted for publication in: Chris Nash and Jeremy Toner, eds., Handbook of Research Methods and Applications in Transport Economics and Policy, Edward Elgar, Cheltenham, forthcoming.

Introduction

The complexity of current port pricing schemes is striking. When calling at a port, ship operators are commonly presented with a detailed menu of services. Prices reflect the diversity that exists in terms of the kind of services and service standards offered, as well as the port entities or operators offering them, and whether the supplier is a private firm or a public infrastructure provider. The result is an opaque price structure that complicates ship operators' and cargo owners´ port choice and hence softens port competition (and competition among container lines).

Such multi-pricing structures reflect the fact that ports are complex service centres offering a considerable range of service products. The associated costs are usually arranged in three categories: port-calling costs, terminal-handling costs and concession pricing. By port-calling costs, we mean costs of all services offered to the vessel, ranging from access to quay or terminal, to pilotage, to the supply of water and bunkering, i.e. they encompass all ship-handling costs. Terminal-handling costs comprise costs for loading or unloading, storage, customs clearance, repacking and forwarding, i.e. they cover all services required for moving the cargo onwards through the port and down the supply chain. By terminal concession costs, we mean the cost of acquiring a dedicated terminal.

The focus on port operations, functioning and competitiveness has increased in recent times in consequence of stiffer competition between alternative supply chains in trade and transport, the high alternative costs of seashore areas, the high infrastructure cost

of ports[1] and, last but not least, the long-lived but hitherto rather unsuccessful policy of moving cargo transport off congested roads and onto sea and rail.

Price level and price transparency are input to shippers' choice of supply chain and transport mode. In this paper, we analyse current port pricing structures, in order to gain insight into the link with the pricing literature and possible opportunities for improvement. The structure of this paper is as follows. We first explain the heterogeneous nature of the port system. Subsequently, after a review of the port pricing literature, a detailed analysis is presented of the current port pricing structure. Finally, the current pricing structure is linked to pricing models.

Seaports: a heterogeneous network of entities

No two seaports are physically and economically the same. Therefore, each economic and/or pricing analysis should start from the port as a physical entity, taking into account the various activities: facilitating the loading/unloading of vessels, freight handling and storage, and transportation to the hinterland. Clearly these are quite diverse activities, which combine to make port services a heterogeneous product, involving multifarious operations (Pauwels et.al, 2009).

Moreover, any port activity should fit as perfectly as possible into the logistics chain of which seaports are an integral part. Hence successful seaports are essentially characterised by four important parameters: their maritime connection (e.g. the possibility of handling large vessels); actual freight handling (including

[1] This paper discusses pricing of port services for a given capacity. It does not discuss port investment appraisal.

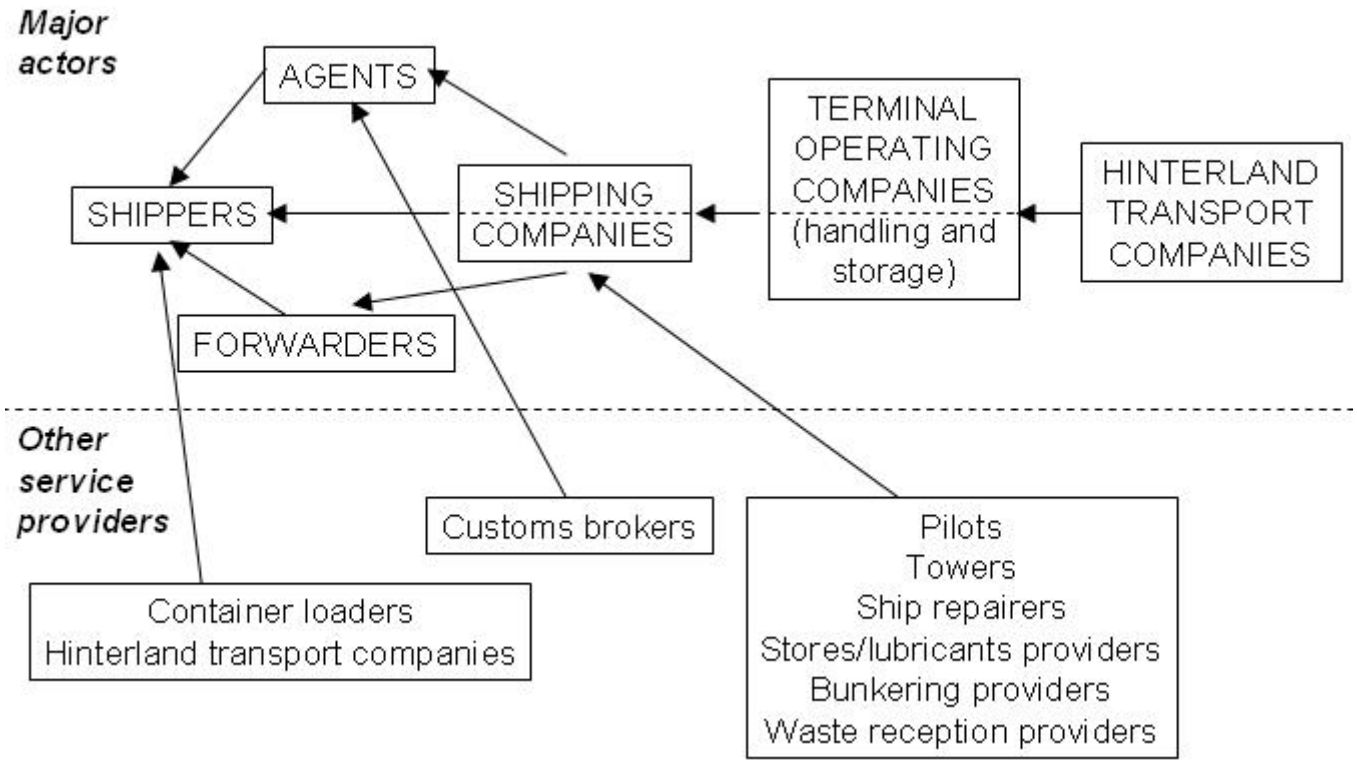
stripping/stuffing activities); data handling; and hinterland connectivity. The port product may thus be regarded as a chain of interconnected functions, while the port as such is a link in that global logistics chain (Suykens and Van de Voorde, 1998).

Port operations involve a great many players, both at management level and at operational level. These positions may be combined in a single company (as in some privately owned ports in the UK) or they may act separately from each other. The port as a physical entity is managed by a port authority in which the public authorities may or may not be a stakeholder. In addition, depending on the size of the port, any number of enterprises may be located within its perimeter. Figure 1 offers an overview of the various market players within a port, indicating who provides services to whom (Meersman, Van de Voorde and Vanelslander, 2009). The diagram confirms that shipping companies in particular rely on services provided by third parties (e.g. pilots, towage services, ship repairers, provisioning, waste reception facilities, and bunkering companies).

The large number of parties involved in port activities, each of which pursues its own objectives, gives rise to a considerable degree of heterogeneity, both within the port and between ports . Hence, a generalised comparison between ports makes little sense. Moreover, the situation is further complicated by the fact that different ports often work under different economic, legal, social and tax regimes (Meersman, Van de Voorde and Vanelslander, 2009).

The consequences for anyone wishing to investigate port pricing are clear to see: there is no such thing as a single pricing scheme, as all the actors involved are focused on their own cost structure and thus exhibit individual pricing behaviour.

Figure 1: Subprocesses of cargo throughput, from a commodity-flow point of view



Source: Meersman et al (2009)

Pricing principles

Transport costs constitute a sizeable portion of the end value of any product that is traded over some distance. The transport revolution has made conveyance affordable to a wider range of goods and consumers, and has thus contributed to and facilitated the steady rise in world trade. On the other hand, Hummels (2007) finds that sea cargo has not experienced the strong reduction in transport costs that is usually assumed to have occurred as a result of containerisation. Until the mid 1980s, higher fuel costs and port charges wiped out any efficiency gains due to containerisation. Today, the decline in transport costs in international shipping since the 1980s is largely or even completely cancelled out by rising port congestion costs following the strong growth that has occurred recently in transport volumes (Meersman et al, 2012).

It is often argued that transport costs generally constitute such a small portion of the value of the goods that formal analysis is not worthwhile (see for example Dowd and Fleming, 1994). If this is so for the total transport costs, then the level and structure of separate components of those costs, such as port dues and cargo-handling charges, are also of little relevance to decision-makers. Container shipping operators may indeed present examples of globally traded products where the cost of the sea leg represents less than 1 % of the value of the goods, the implication being that it makes much more sense to focus on other cost elements. On the other hand, Clark, Dollar and Micco (2002) refer to data from the World Bank indicating that transport costs are on the rise in many areas of trade, especially in the context of developing countries. Although most traded goods may be inelastic in their demand for the sea leg, port pricing is by no means an irrelevance. Non-traded goods or goods originating in new

sites may be sensitive to changes in transport costs even if traded goods are less sensitive.

Pricing of elements in the transport chain will reflect the competitive setting in these submarkets and may therefore allocate the gains from trade and transport in a way that mirrors market power rather than just the value added at each step in the production process and supply chain. Clark, Dollar and Micco (2002), who analyse the importance of distance and transport costs for the international flow of goods out of and into Latin American countries, find that trade flows are especially sensitive to port efficiency. They link port efficiency to regulations, organised crime and general infrastructure. If better structured port charges are introduced, the incentives to increase port efficiency may also be enhanced, which may in turn remove important obstacles to trade.

Several studies of current practice in port pricing exist. The seminal analysis in Bennathan and Walters (1979) presents a set of principles for port pricing. In another paper, Martinéz-Budria et. al (2001) estimate the effects across ports of the unified charging structure imposed on Spanish ports. They find that the price structure is not neutral across ports and hence that revenues accrued to the individual ports are reflective of traffic characteristics. They also find that the marginal revenue is higher for general cargo than for bulk cargoes, and that ports gain more from external than from coastal trade flows, while the unloading of goods is also relatively more lucrative than the loading of goods. This is consistent with the practice of charging more for international than for national trade, i.e. higher charges for imports than for exports.

Most existing studies analyse pricing from the perspective of port operators. The aim is to obtain efficient infrastructure prices that cover costs in seaports, so that neither

the local authorities nor the state need subsidise port activities. Since important cost elements in seaports display strong economies of scale, straightforward marginal cost pricing will induce losses. Bergantino (2002) analyses EU policy papers on transport infrastructure and points out that the EU is changing its port charging policy with the aim of facilitating shipping: by increasing port efficiency, one hopes to enhance the attractiveness of shipping relative to other modes of transport. To this end, the EU has introduced the principle that users should, irrespective of mode, pay the full social marginal costs of transport infrastructure. Such a policy might increase cost for road relative to sea.

Fung et al (2003) estimate the shift induced by the replacement of all-inclusive container freight rates with port-to-port freight rate and a terminal-handling cost (THC) levied directly on the shipper by the conference line. In so doing, they adopt the perspective of the shipper and the shipowner rather than that of the port. They find that splitting the freight costs into two elements increased the total revenue of the shipping line, despite a reduction in freight rates over that same period. They conclude that liner conferences are better at enforcing the collectively set THC than freight rates. However, important questions remain unanswered, including whether the THC system provokes a transfer from port to shipping line.

There exists an extensive body of papers discussing and suggesting various port pricing structures. Several of these studies are reviewed by Strandenes and Marlow (2000), who categorise the approaches taken as (1) cost-based pricing (e.g. Button, 1979); (2) methods for cost recovery (e.g. Gilman, 1978, Meyerick, 1989, Talley, 1994, Bergantino, 1977 and 2000); (3) congestion pricing[2] (e.g. Jansson and Rydén,

[2] In addition, Laih et al (2003) link port queue pricing to shipping lines' reactions. They demonstrate that container ships that pay the queuing toll are those who altered their original arrival times at the port before the toll was established.

1979, Vanags, A. H., 1977,); (4) strategic port pricing (Arnold, 1985, UNCTAD 1995); or (5) quality pricing (Strandenes and Marlow, 2000).

Port pricing issues are often analysed in the context of port revenue and cost recovery. Pricing schemes may be designed to enhance efficiency, for example by impacting on queuing in ports. Dasgupta and Ghosh (2000) show that port prices can indeed induce performance in a queue. In a subsequent paper, Ghosh (2002) considers the use of the standard sequential English auction to regulate the queue for berth slots. This setup assumes that all ships favour the same time slot and agree on the ranking of the available slots. Strandenes and Wolfstetter (2005), however, argue that the queuing problems in ports differs from this traditional impatience assumption. Ships trade in different schedules, hence the most attractive slot will not be the same for all vessels. They therefore propose an auction procedure that solves the problem of scheduling in ports. The mechanism yields non-negative shadow prices and allows for a forward market in port slots. Alvarez et al (2010) simulate the reduction in dwell times, cancellations, fuel consumption and contractual penalties that can result from a policy of guaranteed access to the berth at the estimated arrival time for the vessel. While they do not link the allocation to the port pricing schemes, their results point at the kind of gains better allocation of port capacity may offer.

Efficiency in the supply chain will also increase if the port employs a price structure that is set up to optimise truck arrivals. Xiaoming et al (2011) assess the effects of introducing time-varying congestion tolls to influence trucks' arrival times. They develop a model to determine the best time-varying toll pattern, while at the same time minimising the average toll. It may be worthwhile also to apply time-dependent queuing models with a time-varying port tariff pattern to allocate port capacity to vessels.

Ven Reeven (2010) analyses differences between port organisation models in terms of the price level implemented. Applying an oligopoly model with horizontal differentiation among ports, the author finds that a landlord or vertically separated port yields the highest profit for the port authorities and the highest prices for customers. Even when the landlord port allows for intra-port competition among the service providers the prices and the profit gained by the port authority lies above the prices charged and profit gained in a port organised as a service or vertically integrated port. The effect of separation on prices follows from the complementarity between the port authority and service providers in a landlord port. Separate firms offering complementary products ignore the effects of their mark-up on the other producer. This inevitably differs from the policy pursued in a service port, where the total mark-up effect is internalised. The higher profit follows, as in this model the prices set by the competing ports serving an overlapping hinterland are strategic complements. Hence, a price hike for one port induces a higher price in the other port. Landlord ports may introduce competition among the service providers in the port, but given the above results the ports have no incentive to introduce such intra-port competition.

The next chapter deals with the prevailing port pricing structure and evaluates it in the light of alternative pricing models and methodologies. The research should help answer the questions of who makes the pricing decisions and who foots the bill, and offer a better understanding of which variables codetermine the price level.

The prevailing port pricing structure

In order to prepare a port pricing typology, we distinguish between port-of-call pricing, terminal-handling pricing, and concession pricing. For each of these aspects, we make a further distinction between who is pricing, who is paying, and the manner in which the price is calculated (i.e. the variable(s) used for pricing). Obviously the price a port user must pay is a cost to that specific user and hence a basic determinant of that user's own pricing behaviour.

Due account should be taken of the type of operation involved (e.g. container liner traffic, bulk and industrial shipping), the vessel type (i.e. in terms of size and draught), and other relevant variables. Hence it soon becomes apparent that port pricing is rather a complicated matter. Quite illustrative in this respect is the relationship between carrier, stevedore and the shipper or consignee in respect of terminal pricing in container transport. What follows summarises the various pricing steps in the case of container transport:

- The stevedore will demand from the carrier or shipping line a price per container move, or per two moves;[3]
- The carrier will demand from the shipper or consignee an ocean freight to compensate for the maritime transport between origin and destination, and usually also including (normal) handling in both ports; the ocean freight level

[3] It is better not to use the concept of a 'shipowner'. In most cases, the shipping line is not actually the owner of the vessel. Therefore 'carrier' or 'shipping line' will be used.

should cover both the fixed (capital) and variable (operating, cargo handling etc.) costs of the carrier.[4]

Moreover, in the case of container transport, the carriers will additionally demand that the shipper or consignee pay Terminal Handling Charges (THCs) [5]; The level of THCs is a continuing source of dispute. Is there any relationship between the amount due in ocean freight and the level of THC? May THC be regarded as a surcharge on ocean freight? Are THCs an instrument whereby carriers are able to cream off the consumer surplus of the shipper or consignee?

Not all ports apply the same pricing structure. In some ports, THCs are paid directly to the stevedore, without involvement of the carrier, as the example of the port of Casablanca (Morocco) illustrates. Here, stevedoring and stacking are paid for directly and in their entirety by the shipper or consignee. The carrier pays nothing at land side and hence no THCs apply.

Tables 1 to 3 provide a generic overview of the current port pricing structure. It distinguishes between the various activities, who is setting the price level, who is paying, and the variable(s) determining the price level.

The table is conceived as a general framework. Obviously there will be differences between ports and port actors in terms of how the various elements apply. Let us illustrate this with the case of the agents. Agents can act independently or as an

[4] The recipient of the goods acts on behalf of the owner of the goods. In some cases, ownership of the goods may change during the transportation process The owner (recipient) of the goods will pay directly to the customs broker only for clearance.

[5] Carriers are quite inventive when it comes to adding charges to the ocean freight. They all started from an ocean freight they deemed to constitute the shippers' share of the port costs. In the meantime, however, there appears to be a trend towards THCs that are significantly higher than the actual stevedoring costs. Carriers often determine THCs according to their own criteria, and the shippers or consignees are required to pay. The actual THC being paid by the carrier to the stevedores in the port is determined under the service contract agreed upon between shipping lines and ports (usually more favourable to the carriers as more containers are loaded and discharged at the terminal).

‘owner’s agent’. In the former case, they will be paid for specific tasks and actions, such as:

- Generating freight volume (known as ‘canvassing’), at a price negotiated with the client/shipowner, a commission of which is due to the agent; the commission usually amounts to between 5 and 10%, depending on the contract with the shipowner and the total volume involved;
- Additional tasks, such as liaising with the ship broker’s clerk, whose job it is to arrange berths, pilotage, towage…

The freight price is payable to the agent by the owner of the goods or by his/her representative, who in exchange receives a tradable Bill of Lading (B/L). Payment by the agent to the carrier or the shipping line will ensue within the next twenty days. This way, a major agent applying good daily cash management can generate substantial revenues.

Some carriers or shipping lines have their own agents, in order to avoid dependence on third parties. In such arrangements, the carrier does not pay a fee to the agent per job performed, but rather a lump sum per year. Such a pricing model arguably creates less incentives to perform well.

For most port actors, the port pricing structure is less complicated than in the case of agents. Tables 1 to 3 provide an overview.

Table 1: Port of call pricing

Activity	Who is pricing?	Who is paying?	Variable(s) applied
Port dues	port authority	Shipping line	
• Tonnage dues			Gross tonnage (vessel)
• Mooring dues			Load (ton)
Pilotage		Shipping line	
• Sea pilotage	Government		Draught (entering and leaving)
• River pilotage	Government		Draught (entering and leaving), and distance
• Dock pilotage	Port authority (plus shipowners association(s))		Length of the vessel plus distance
Towage			
• River tugboat	Private company	Shipping line	Length of the vessel plus distance
• Port tugboat	Port authority		Gross tonnage plus distance
Agency costs	Shipping agents	Shipping line	Job-by-job fee in case of independent agent; lump sum in case of ship owner's agent
Other costs			
• berthing/unberthing	Private company (can be linked to port authority	Shipping line	Per port call
• ship reporting	Private company (or port authority)	Shipping line	Per port call
Port state control	n.a.	government	Condition of the vessel
Waste reception facilities	Service company	Shipping line	Quantity and type of waste
Bunkering	Bunker supplier	Shipping line	Quotation international markets; quantity supplied; number of bunkers a year
Supplies (water, electricity etc.)	Supplier (may be private company, port authority, or government	Shipping line	Quantity supplied

Table 2: Handling pricing

Activity	Who is pricing?	Who is paying?	Variable(s) applied
Cargo handling on quay	TOC[6]	Shipping line through its agent if terms of sale are liner terms. Recipient depends on the contract (free out)	Per weight (tons) or movements (containers)
Transport to/from storage	TOC Carrier if cargo is transported to storage area outside the terminal premises	Shipping line or receiver depending on the terms of sale (see above)owner	Per weight (tons) or movements (containers)
Storage	TOC	Recipient of the goods	Per unit of weight (ton of TEU) and time (cf. dwell time)
Delivery/receiving	TOC	Recipient of the goods	Per unit weight or TEU
Cargo moving inland	Inland transport operator (rail operator, barge, truck)	If carrier haulage: shipping line; If merchant haulage: the recipient of the goods	Per TEU unit or per ton
Customs	Customs authority	Owner of the goods via customs broker	According to value of goods and customs clarification
Handling of empty boxes	TOC	Shipping line	Per box
Storing of empty boxes	TOC	Shipping line or leasing company if boxes out of lease	Per box and dwell time

[6] TOC stands for Terminal Operating Company (or stevedore)

Table 3: Concession pricing

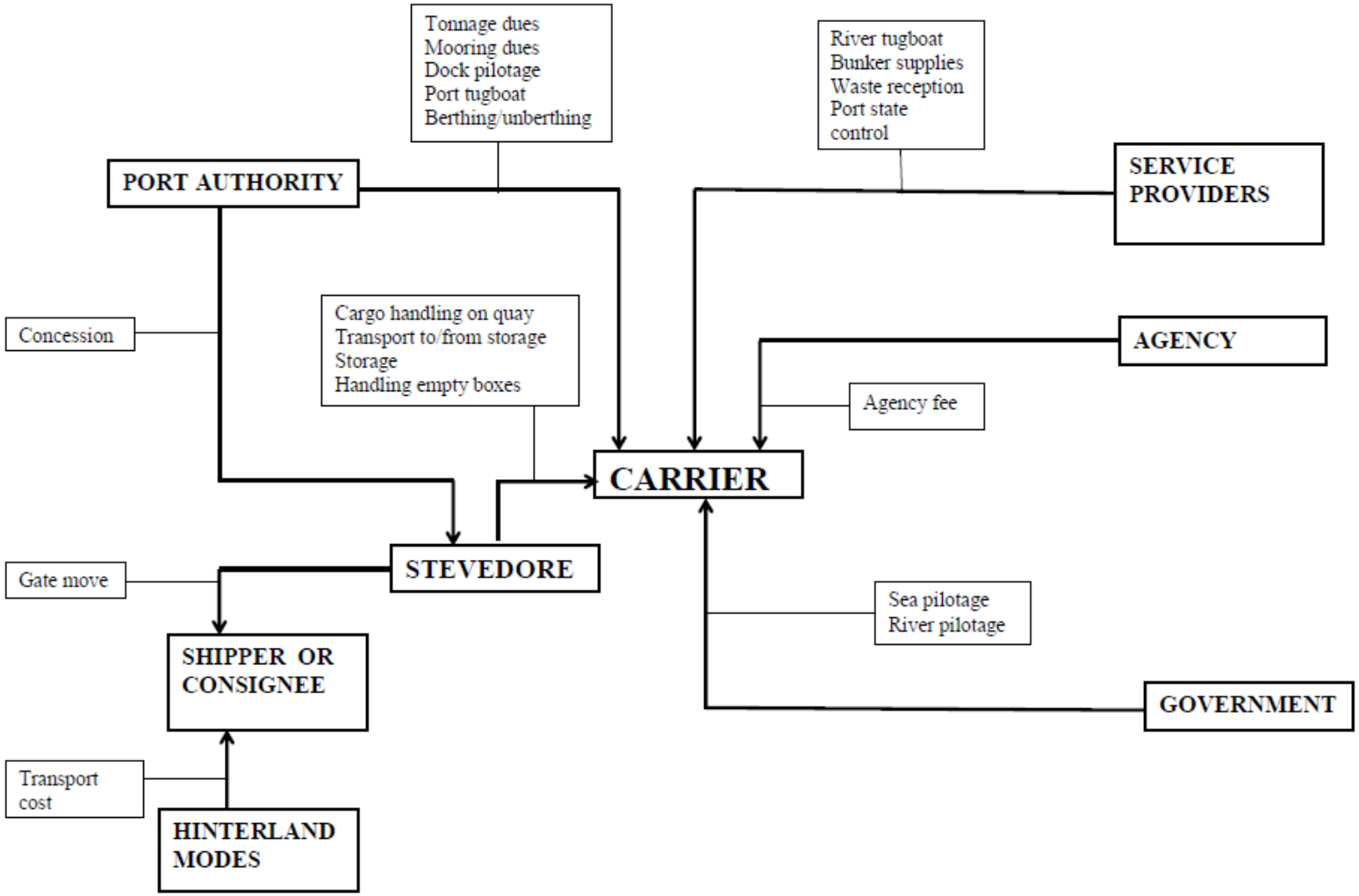
Activity	Who is pricing?	Who is paying?	Variable(s) applied
Granting concession	Port authority (i.e. market-based, after tendering)	Concessionaire (stevedore, industry, …)	Size of the area, location, facilities,…

So what do we learn from these tables? Within a port context, the carrier is billed by the port authority, the agents, stevedores, government and all other service providers.[7] These payments may be regarded as 'out-of-pocket' costs borne by the carrier. Obviously, to a carrier, this port-of-call cost is an important consideration in setting the price for the end client, i.e. the owner of the goods and/or the forwarder.

Figure 2 visualises the relationships between who sets and who pays the different fees.

[7] In a number of cases, the agent may act as the sole representative of the carrier and pay/collect all bills. Ultimately, the agent bills the carrier for all costs associated with the port call.

Figure 2: Pricing and payment of port bills



Port Pricing Models

The short-run marginal cost is always the appropriate base for pricing, irrespective of the existence of any under- or overcapacity. The aim of pricing is to confront the user with the additional costs that he/she causes. Only the short-run marginal cost indicates precisely the difference in costs between acceptance and refusal of an additional user. In a port context, it sometimes may make sense to charge for the long-run marginal cost. If one equates prices to the short-run marginal cost, we risk to get strong variations over time, with different rates for peak and off-peak periods (e.g. function of tides), different prices in the high and the low season. Moreover, transport prices will also fluctuate over the years. With growing demand, prices will increase, up to the point when an investment is made in new capacity, after which prices will suddenly decline[8]. Such a strong differentiated and fluctuating tariff, though desirable from the perspective of economic allocation, may meet with resistance for political and/or organizational reasons. It may therefore be deemed necessary to impose prices that remain constant for some time. This price should then be a kind of average of the short-run marginal cost at different moments. This average can be approximated by the long-run marginal cost (for a detailed analysis of the short run versus long run pricing discussion see Meersman et al (2010)).

Pricing and revenue optimisation incorporates costs, customer demand (or willingness to pay), and the competitive environment in determining the prices that maximise expected net contribution. Table 4 summarises the alternative approaches to pricing.

[8] Port expansion for instance takes a long time (in some cases several years) and in construction and operations there may be large discontinuities. In case of such discontinuous jumps, the long- and short-run marginal costs will coincide for wide ranges of output from a a port or terminal of fixed capacity. Pricing based on long-run marginal cost can be acceptable for all output levels if one does not operate too small or too large a port or terminal (Meersman et al, 2010).

Table 4: Alternative approaches to pricing

Approach	**Based on**	**Ignores**	**Liked by**
Cost-plus	Costs	Competition, customers	Finance
Market-based	Competition	Cost, customers	Sales
Value-based	Customers	Cost, competition	Marketing

Source: Phillips, 2005, p. 22.

Cost-plus pricing, a very simple method, calculates prices based on cost plus a standard margin. Market-based pricing bases prices on what competitors are doing, and is often used in markets in which there is a clear market leader. Value-based pricing sets prices based on an estimate of how clients 'value' the services sold.

So how does this apply to the real world of port pricing? The current pricing behaviour of port actors cannot be reduced exclusively to any one of these traditional pricing approaches. The generic port pricing structure follows a linear pricing structure. It is in most cases based on easily measurable units: the vessel and the vessel size in the case of a port call, the number of tons and/or TEUs if it concerns handling and storage operations. In some instances, elements may be added that result in non-linear pricing, such as the application of surcharges (BAF and CAF). Port pricing is complicated, though this complexity is due more to the heterogeneous nature of port activities and port actors than to the price-setting mechanism as such.

Port prices involve a somewhat complex set of decisions, including a multitude of discounts, adjustments and rebates. Consequently, it is critical to distinguish between the list price of a service and its so-called 'pocket price', which is the actual price that a particular port user (e.g. a shipowner) ends up paying. The list price is generic,

while the pocket price may be different for each customer (Phillips, 2005, p. 18). This obviously contributes to the non-transparency of port costs.

All carriers aim to maximise profits. Their pricing behaviour is based on that ultimate aim. However, this is not always the case for other port actors. The behaviour of a port authority, for example, may be determined not so much by profit maximisation as by other considerations, such as maximisation of throughput, employment and/or value added (Suykens and Van de Voorde, 1998). A similar reasoning applies to port activities such as pilotage and towage. The terminal operating business, meanwhile, has moved towards an economic structure with a limited number of major players acting at a global scale. This seems rather far removed from the textbook situation of a perfectly competitive market.

So what might an alternative pricing strategy look like? One possibility is price differentiation, a concept applied by most port actors, including port authorities and TOCs. Price differentiation refers to the practice of a service provider charging different prices to different customers, either for exactly the same service or for a slightly differentiated one. It is a powerful way for sellers to improve profitability, and can be time-based and/or volume-based. Volume discounts are often applied on the total yearly volume, rather than on the size of a single call, thereby introducing deferred discounts and customer lock-in. Pricing may be non-linear, i.e. the total price paid may not be a linear function of the number of units loaded and/or unloaded.

The increasing tendency towards price differentiation might be occasioned by ongoing evolutions in the structure of the port market. In the container business, shipping lines are now cooperating in so-called strategic alliances. The terminal operating business has globalised and is now dominated by a limited number of large

companies (PSA, Hutchison, DP World,…). As a result, certain types of negotiation, including over the price of port handling, now commonly unfold in a context of a bilateral oligopoly. In some of Europe's principal container ports, the major client/shipping line accounts for over half the boxes handled.[9] There is no doubt that in certain negotiations, especially between shipping lines and terminal operating companies, so-called 'customised pricing' is applied. Under such a scenario, potential clients (i.e. shipping lines) approach potential sellers (i.e. a TOC as the service provider) one by one and ask them to quote a price for a well-defined assignment. Each potential client may have different specifications, hence the seller may quote a different price for different requests. This price may be determined by the relationship with the client, the precise nature of the services required by the shipping line, and a variety of other factors, including general market conditions and competitive offerings (Phillips, 2005, p. 164).

Demand for port calls may be (temporarily) confronted with port capacity constraints. In any situation where there is a significant likelihood that demand will exceed available supply, such constraints need to be explicitly acknowledged in setting the optimal price. However, that principle would appear not to be universally applied in the port business. Advanced price-setting systems, such as revenue management, are not yet widely implemented. The auction scheme proposed by Strandenes and Wolfstetter (2005) also provides ports with the option of selling port slots forward. This way, the port may become better informed on future demand.

One may wonder why, in a port context, price setting is not based on revenue management techniques. After all, most port activities are service tasks that meet the

[9] One example by way of illustration: in 2011 the port of Antwerp recorded a total container throughput of 8,662,035 TEU, 55 % of which was transported by the MSC shipping line

conditions for effective revenue management. Capacity is limited and immediately perishable; an unused handling 'slot' at a terminal cannot be stored to satisfy future demand; and shipowners need to ensure ahead of time that capacity will be available when they need it. This creates opportunities for port authorities and service providers to track future demand for capacity and to adjust prices accordingly in order to balance supply and demand.[10]

However, in the current port context there are a number of pending issues that give rise to disincentives to opt for revenue management. First of all, quite a lot of ports and port actors face considerable problems of overcapacity (see a.o. Liu and Medda, 2009). The port container business is an apt example, with overcapacity at both the carriers' and the TOCs' side. This excess capacity may reflect the need to limit waiting times for important/large carriers. If so, however, this constitutes quite a costly way of securing prompt service for those carriers that the port deems to be of strategic importance and which it is therefore keen not to see switching to another port. The capital invested in the overcapacity and excess port area is associated with an alternative cost that is usually high. This is especially true for ports located in cities, where land is scarce and therefore expensive.

Moreover, port authorities and port actors have an incentive to try and 'capture' important clients, as this will make their own market more stable. In some cases, they try to do so by negotiating package deals and long-term prices. In a future bilateral oligopolistic environment - involving strategic alliances between shipping lines and

[10] Pricing and revenue management is a tactical function, linked to the fact that prices need to change rapidly and frequently. Hence, the purpose is to exploit price variations and to signal constrained capacity instead of the more common practice of making vessels wait ashore for access. This is different from strategic pricing, where the goal is usually to assume a position within a marketplace.

large TOCs - such package deals may be expected to extend beyond a single port, and perhaps even across continents.

Conclusions

Port pricing is a very complicated matter. It is also an area lacking in transparency. This might explain why little research has hitherto been devoted to trying to understand the structures underlying port pricing strategies and the behaviour of the actors setting port-of-call-related prices.

This paper presents an analysis of current port pricing structures. These structures have, thus far, been rather linear in nature, and they tend to ignore modern pricing tools proposed in the literature. On the other hand, they are not linked directly to traditional pricing approaches such as price differentiation (e.g. two-part tariff pricing) or revenue management. As a consequence, certain pricing opportunities, which could lead to profit maximisation and/or a better use of available capacity, are left unexploited.

The ultimate aim of future research is to propose more effective pricing schemes than are currently applied in order to facilitate shippers' choice of transport mode and to enhance the competitiveness of ports.

References

Alvarez, J. Fernando, Tore Longva and Erna S. Engebrethsen (….), A methodology to asses vessel berthing and speed optimization policies, Maritime Economics and Logistics, , p. 327-346.

Arnold, John (1985), Port Tariffs: Current practices and trends, World Bank Report.

Bennathan, Esra and W. W, Walters (1979) Port pricing and investment policy, Oxford University Press (for the World Bank), Oxford.

Bergantino, A (2002), The European commission approach to port policy: some open issues, International Journal of Transport Economics, p. 337-379.

Button, K. J. (1979), The economics of port pricing, Journal of Maritime Policy and Management, p. 201-207.

Clark, et al (2002), Maritime Transport Costs and Port Efficiency, World Bank, Washington, Policy Research WP #2791,

Dasgupta, A and M. Gosh (2000), Inducing performance in queue via prices: the case of a riverine port, Management Science, p. 1466-1484.

Dowd, T. J. and D. K. Fleming (1994), Port Pricing, Journal of Maritime Policy and Management, p. 29-35.

EU (1995) Towards fair and efficient pricing in transport, European commission, COM(95)691, Brussels

Fung, K. Michael, Leonard K. Cheng, Larry D Qui (2003), The impact of terminal handling charges on overall shipping charges: an empirical study, Transport research part A, p. 703-716.

Gilman, S. (1978), Pricing policy and operational controls in container terminals, Journal of Maritime Policy and Management, p. 89–96.

Gosh, M (2002) Bidding for a Berth: an auction based queue management mechanism for ports. Singapore Port and Maritime Journal, p. 162-169.

Hummels, D (2007) Transport cost and international trade in the second are of globalisation, Journal of Economic Perspectives, p. 131-154.

Huybrechts, M et al. (2002) Port Competitiveness, An economic analysis of the factors determining the competitiveness of seaports, Antwerp, De Boeck Ltd

Jansson, J. O. (1984), Transport System Optimisation and Pricing, New York, Wiley

Kleywegt Anton and Mee Leng Goh (2002) Competition between the Ports of Singapore and Malaaysia, mimeo

Lah, Chen-Hsiu, Bin Lin and Kuan-Yu Chen (2007) Effects of the optimal port queuing pricing on arrival decision for container ships, ,p. 1855-1865.

Laih, Chin-Hsiu and Pai, Chin-Ying (2003). Economics on port congestion pricing, Journal of the Eastern Asia Society for Transportation Studies, p. 742-754.

Liu, QW and F. Medda (2009) Port infrastructure efficiency: the Europe-Mediterranean case, International Journal of Shipping and Transport Logistics, p. 361-385.

Meyrick, S. (1989), Port Pricing; some observations on principles and practice, ASRRF Working Paper 5, Centre for Transport Policy Analysis, University of Wollongong.

Martínez-Budría, E., P. Coto-Millán and M. Navarro-Ibañez (2001), Traffic revenues of Spanish port authorities, International Journal of Transport Economics, p. 249-262.

Meersman, H., Van de Voorde, E. and T. Vanelslander (2009), The economic fabric of ports, in: Meersman, H., Van de Voorde, E. and T. Vanelslander (editors), Future challenges for the port and shipping sector, Informa, London.

Meersman, H., Pauwels, T., Van de Voorde, E. en T. Vanelslander (2010), Applying SMC pricing in PPPs for the maritime sector, Research in transportation economics, p. 87-101.

Meersman, H., Van de Voorde, E. and T. Vanelslander, 2012, Port Congestions and Implications to Maritime Logistics, in: Song, Dong-Wook and Photis Panayides (eds.), Maritime Logistics: Contemporary Issues, Emerald, UK p. 49-68.

Phillips, R.L. (2005), Pricing and revenue optimization, Stanford Business Books, Stanford.

Strandenes, Siri Pettersen and Peter Marlow (2000) Port pricing and competitiveness in short sea shipping, International journal of transport economics, p. 315-334.

Strandenes, Siri Pettersen (2004), Port Pricing Structures and Ship Efficiency, Review of Network Economics, p. 135-144.

Strandenes, Siri Pettersen and Elmar Wolfstetter (2005) Efficient (re-)scheduling: An auction Approach, Economic Letters, p. 187-192

Suykens, F. and E. Van de Voorde (1998), A Quarter of a Century of Port Management in Europe. Objectives and Tools, Maritime Policy & Management, p. 251-261.

Talley, Wayne K. (1994) Port pricing: a cost axiomatic approach, Journal of Maritime Policy and Management, p. 61-76.

UNCTAD (1995), Strategic Port Pricing, /SDD/PORT/2, UNCTAD, Geneva.

Van Reeven, Peran (2010) The Effect of Competition on the Economic Rents in Seaports, Journal of Transport Economics and Policy, p. 79-92.

Vanags, A. H. (1977) Maritime Congestion: An Economic Analysis, in: R. O. Goss (ed.) Advances in Maritime Economics, Cambridge University Press.

Wilmsmeier, Gordon (2007), Changing practices in European ports – user reaction on differentiation of charges, ETC, Association for European Transport and Contributors, London.

Xiaoming, Chen, Xuesong Zhou and Georg F. List (2011) Using time-varying tolls to optimize truck arrivals at ports, Transport Research Part E, p. 965-982.