Port Reorganisations and the Worlds of Production Theory

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Taking into account the new dimensions of port production that have become evident during the resent past, this paper tackles the issue of port reorganisation. In the light of the changes in the world economy and the new competitive environment, the paper focuses on the new structures of the port industry and the characteristics of the contemporary port product within a more general analytical framework of 'Worlds of Production'. This conceptualisation suggests that neither the industrial model of mass production, nor any other model alone, can determine a single effective pattern of organisation of port production. Within the new reality, modern ports must provide a greater variety of services to port users than in the past. The diversity and complexity of the contemporary port product demand the application of multiple organisational transformations incorporating elements of different possible action frameworks. In this vein, the introduction of intra-port competition, the development of strategic or regional networks, and the reconsideration of the role of port authority turn to critical parameters of the essential restructuring.

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1. Introduction

It is widely acknowledged that the port industry has experienced a wide restructuring. For long, the organisation of the industry had been dominated by the post-war industrial paradigm of mass production, characterised by standardised port products and long production runs, and served as a motor of steadily rising productivity levels. Since the late 1970s new dimensions of port production systems have become evident representing an across-the-board break with the conventional Mass Production System (MPS). The main reasons being: technological changes (unitisation or containerisation, introduction of informatics), organisational changes (just-in-time manufacturing, logistics, multimodal transport operation), liberalisation of world markets (creation of the European Union, globalisation) and a shift of political attitudes in favour of less state intervention in the economy (i.e. privatisation in the case of public ports etc.). These changes have affected profoundly the port industry and have intensified port competition.

During an era of new and intensive competition ports are facing significant challenges that require both productive and organisational restructuring to secure a competitive edge. The traditional perceptions of port activities have been widely expanded to include a variety of new tasks and operations under a qualitatively new operational logic.

The main aim of this paper is to develop a theoretical discussion by charting the new realities and proposing an analytical framework that explicitly tackles the issue of port reorganisation in the light of the diversity and complexity (a) of the new competitive environment and (b) of the port industry itself.

In order to achieve this aim the paper proceeds by briefly presenting the contemporary changes in the world economy and the port industry. Secondly, it details the new structures and characteristics of the port industry by focusing on the port product itself within a more general analytical framework of “Worlds of Production”. In this vein, it discusses the implications of this approach to the productive and organisational restructuring of ports, and presents some concluding thoughts on the state of the debate along with some proposals from this new point of view.

Rather than suggesting a single new alternative model, the authors present several possible forms of restructuring under which the port production process might be effective in the new reality. Given the heterogeneity of ports around the world, the decision-makers need to take into account the peculiarities of each port and decide which of the suggested forms fits best on a case-by-case basis.

2. Challenges to the Patterns of Port Production

The world economy, during the last decades, has undergone a period of rapid change and transformation. These changes have had a significant impact on the way scholars and policy makers perceive the operations of an economy (cf. Piore and Sabel, 1984; Best, 1990). The certainties that had prevailed were strongly challenged by a plethora of new phenomena (a few examples would include: a fragmentation of markets, increased and unpredictable shifts in demand patterns, a general rise in the levels of risk and uncertainty concerning all aspects of economic action). Further, not only the previously mentioned scholars but also many more (for a reader: Amin, 1994), agree that various organisational forms, alternative to ‘hierarchy’

(i.e. vertically integrated, mass-production enterprises) and the 'market', are gaining a significant competitive edge; these include various kinds of network-like structures.

Industrial growth and success has been the result of the adoption and widespread diffusion of mass production during a specific historic period (cf. Piore & Sabel, 1984). Mass production should not be understood in terms of simplistic references to size and efficiency but in terms of a system of markets, technologies, and scientific management, complemented at the institutional level by a comprehensive code of social ethics and economic regulations designed to stabilise and sustain demand. Thus, the creation of the large, vertically integrated, hierarchical corporation has been the outcome of strategies to balance supply and demand in mass production industries. The rise and dominance of mass production (defined as Fordism complemented by Taylorism) was a result of conscious and/or strategic consideration and choice rather than a consequence of any inherent supremacy of that model in terms of efficiency (i.e. economies of scale etc.).

The system of mass production started to face a prolonged crisis whose origins can be traced in the early-to-mid 1970s, when the system itself had reached its limits of growth under the particular institutional and regulatory framework. This crisis has been attributed to both endogenous and exogenous factors. One of the most important exogenous factors was the emergence of some qualitatively new forms of industrial organisation (i.e. in Japan, Germany, Italy) whose competitive power put great pressure on the mass production firms/regions/nations. The success of newly formed industrial agglomerations was attributable to the new and qualitatively distinct principles of productive and socio-political organisation. This was an event signifying the possibility, and not the certainty, of new dominant paradigms of industrial organisation.

2.1 Changes in the Port Industry

Ports around the world face new challenges, not least because the port product has undergone a great transformation. Since ports, as enterprises, entail a mixture of industry and services that serves specific production processes (Suykens, 1986), the transformation of the port product has partially been the result of the preceded fundamental changes in the production processes world-wide, and partially the result of endogenous technological developments.

Nowadays, ports constitute areas where highly sophisticated logistics activities are concentrated, largely due to fundamental modifications in the production and distribution of goods. The short product lifecycles and the short time-to-market affect transport flows in the sense that the number of products to be shipped and the shipment frequency increase, whereas batch sizes are becoming smaller (cf. Notteboom and Winkelmans, 2001). The creation of functionally comprehensive 'industrial networks' and logistics implementation - that is, the management of physical and informational flows into, through, and out of a business - resulted in a new trading context and altered the industry-transport relationship. Transport services are an integral part of production and marketing strategies. All types of seagoing trade, even cabotage, are becoming increasingly integrated into logistics chains. Foremost, the rapidly expanding feedering traffic requires its integration into the individual links of the inland transport chain and the co-operation between short-sea and inland transport operators. Freight corridors should expand further and many ports are creating the necessary conditions and infrastructure for setting up networks dedicated solely to multimodal freight transportation (Meersman & Van de Voorde, 1997).

The increasingly widespread use of unitisation has led to the incorporation of further criteria in deciding the route of a cargo as well as in modal choice. Once the efficiency of port cargo handling and of ocean and inland transportation services have significantly increased, the geographical monopoly powers of ports have been eroded (Heaver, 1995). The market share of ports depends mostly on the provision of more specialised facilities. Ports compete to attract containers and/or traditional freights that are transported via novel transport methods. Port users, either shippers or shipowners, have assumed the role of multimodal operators and are increasingly demanding 'new' services. Capital-intensive terminals, that serve few logistics systems, and the ability of a port to provide value added services based on both economies of scale and variety, are becoming more important parameters of the selection of port routings. The provision of specialised warehousing, or other technological infrastructure and facilities that guarantee an uninterrupted multimodal transportation have become substantial income generators. Thus the importance of the traditional port selection criteria is in decline and the core business of ports no longer consists of loading/unloading activities. Higher port productivity is mostly associated with the upgrading of the total transport chain, and not so much with the upgrading of the maritime transport sector alone. Subsequently, port competitiveness depends on the other elements of the transport network (i.e. railroads, road transhipment), thus port planning is becoming the focal point of a holistic planning strategy of this multimodal transport network.

A vital consequence is the decentralisation of production and the connection of the port zone with semi-autonomous (in relation to the port) areas. In several European ports a number of complementary services are already supplied by enterprises located in the hinterland that are virtually co-ordinated via communication systems (BCI, 1996). Apart from the 'internal' geographical area, the port zone includes cargo and passenger corridors determined by the requirements of the inland parts of the transport chain. Value-added services are supplied by production units located in wider geographical areas and are integrated through communication networks. Two types of port activities are being developed. Firstly, *port-specific activities*, essential for the daily operation of the port and provided by production units located within the 'internal' port zone (i.e. loading/unloading). Secondly, *port-related activities*, which are essential for the transportation of goods but whose efficient supply does not require the location of the production units within the port zone (i.e. warehousing).

The transformation of the port industry has been accelerated by the advent of technological developments and informatics and their widespread application in ports. Through the application of technological developments, ports are able to supply specialised, 'clever', port services - based less in materials and more on innovation, knowledge, decentralised planning, and intra-industry support. The traditional port-gate has been replaced by the port logistics centre (a transformation that commenced in the early 1990s: Pesquera & De La Hoz, 1992), which provides complementary transport operations, logistics services and co-ordinates the integrated multimodal traffic. Along with conventional services, it provides innovative services such as integrated management systems, Electronic Data Interchanges (EDI) and Electronic Data Processing (EDP) linking port authorities, shippers, stevedores, and shipowners, and facilitates multimodal transportation within the requirements of the 'just-in-time' system of distribution. In this respect it is possible to talk in terms of logistics polarisation.

Without ignoring the importance of modern infrastructure and superstructure, within this polarisation, high productivity levels can be achieved through the organisational restructuring

of port production and the adoption of operational methods that respond to the new requirements of the port users. Until the early 1970s ports operated as forces of regional and industrial development, within the principles of the aforementioned Mass Production System (MPS). This process incorporated linear production - the combination of specific operations and the harmonisation of the rhythms of various industrial operations (the 'assembly line') - and the standardisation of services. The direct result was the reaping of various benefits associated with large-scale production such as the significant decreases of the average production cost per service. Port businesses had to satisfy the demand for massive quantities of standardised services, generate sufficient returns to the substantial funds that were being invested in ports, and achieve the steady employment of the production factors. The existence of huge and stable markets required (or was more efficiently served by) large-in-size, horizontally and vertically integrated, hierarchical and labour intensive port enterprises.

The new trading context demands a different orientation and organisational structure of port businesses. The main reasons are: (a) the stagnation of the demand for specific 'traditional' port services complemented by more rapid and unpredictable shifts in demand patterns (the MPS is characterised by an endogenous trend towards the homogenisation of the market and the standardisation of the produced services thus suffering from inflexibility and incapability to adjust to structural demand changes); (b) the difficulty to synchronise the flow of the MPS huge markets when port operations perplex due to the expanding geographical disparity of the production functions (i.e. quay, warehouse, distribution centre); (c) the absence of integrated quality-control mechanisms within the MPS model (in the manner it was applied in the port industry); and (d) the costly maintenance of the, essential to achieve economies of scale, port infrastructure and superstructure.

Moreover, within the MPS, the experts at the top, who supposedly had the means and the knowledge to administer the whole port, were expected to resolve any problem at any stage, even those resulting from the day-to-day operations in a particular terminal. Two main features that differentiate the contemporary port society are the remarkably fast rhythm of changes in port organisation and the short life span of several of these changes. In this context, neither the generic norms of scientific management in the framework of a typical hierarchically structured enterprise, nor the application of such type of administration and management in all ports seem possible and efficient.

The traditional mass production model of port management and organisation has been significantly challenged since the late 1970's. Thus, the issue that needs to be addressed is how to implement efficiently the fundamental re-engineering and redesign of port activities. In other words, which characteristics should the organisational restructuring of a port incorporate in order to ensure competitiveness? Understanding the nature of the contemporary port product and the port production activities is critical.

3. The Nature of the Contemporary Port Product

The challenges posed by the new competition have direct implications both to the organisational structure and to the productive activities of an individual port. Competition between ports is focused on a range of port products that are provided to the users. Thus it is necessary to discuss the nature of the port product, since "the port product may be regarded as a chain of interlinking functions, while the port, as a whole, is in turn a link in the overall

logistics chain" and "within the port itself, the respective significance of the constituting links has clearly changed in the course of time" (Suykens & Van de Voorde, 1998:252). When earlier definitions (i.e. Jansson and Shneerson, 1982; Goss, 1990) became obsolete or in need of adjustment, a clear understanding of "which product do ports have to offer" is critical to the future of port management.

Table 1 represents an attempt to decompose the contemporary port product and classify the various products/services/facilities that can be provided by a port nowadays. This classification serves as an analytical tool to advance the theorisation of port organisational restructuring.

Table 1. The Contemporary Port Product

Port Product	Nature of Port Product	Nature of Productive Action
Water Transportation Services		
Pilotage	Generic or/and Dedicated	Standardised
Pilotage infrastructure	Generic	Standardised
In-port Vessels Traffic Management	Generic	Standardised
Waste management / bunkering	Generic	Standardised
Towing of ships	Dedicated	Specialised
	Generic	Standardised
Vessels Reception Infrastructure (i.e. quays)	Generic or/and Dedicated	Standardised
Other services to ships (i.e. electricity, other utilities)	Generic	Standardised
Cargo Administration		
Loading/unloading onto the quay	Dedicated	Specialised
	Generic	Standardised
Transportation towards/from warehouses	Dedicated	Specialised
	Generic	Standardised
Warehouses	Dedicated	Specialised or/and Standardised
	Generic	Standardised
Goods processing in the warehouses (i.e. packing , crating)	Dedicated	Specialised or/and Standardised
Preparation for distribution to the hinterland	Dedicated	Specialised or/and Standardised
Services related to inland transport modes		
Transloading in inland modes	Dedicated	Specialised and/or Standardised
	Generic	Standardised
Inland mode networks	Generic	Standardised
Communication Services		
Electronic Data Interchange	Dedicated	Specialised and/or Standardised
	Generic	Standardised
Vessel Traffic System	Generic	Standardised
Other Services		
Security Services	Dedicated	Specialised and/or Standardised
	Generic	Standardised
Port Free Zone	Dedicated	Specialised and/or Standardised
	Generic	Standardised
Ship Repairing Services	Dedicated	Specialised and/or Standardised
Traffic management in inland port area	Generic	Standardised

In the second column, port products are characterised as either *generic* or *dedicated*. The classification refers to whether a port product is conceived as being impersonal and having general applicability to all port users and thus is defined in advance by the producer without consideration of the specific needs of an individual port user (generic), or whether it's conception and design is the result of the producer's response to individual needs of particular port user(s) (dedicated).

In the third column there is a classification according to the principles governing the production of the respective product. These principles can be materialised and applied as either *a process of specialisation* or *a process of standardisation* of the activity of production. Both cases refer to the way various resources are mobilised in production. In the first case, standardised production involves the use of interchangeable and reproducible resources resulting in a product that does not reflect the individuality of its maker. The product simply reflects general and objective characteristics. In the opposite side of the spectrum, specialised production involves the mobilisation of highly specialised, idiosyncratic and even unique resources whose characteristics are directly reflected on the observed qualities of the product.

Moreover, the port production process might exhibit characteristics that favour either increased volume or increased range of products. In the first case, which is closely related to productive standardisation, there are *economies of scale* at work. These economies are associated with the production of long-series of standardised products aiming to minimise unit costs since these products have to face strong price-competition. In the second case, which is closely related to productive specialisation, there are *economies of variety* (or scope) at work. These economies are associated with the production of a relatively broad range of products. Competition in this case is not centred primarily on price but on a variety of strategic variables such as innovation and differentiation, design, promptness of response and various after-sales services.

Finally, the market structure of a product may be characterised by conditions of predictability or unpredictability. The first case refers to calculable risk, while the second refers to conditions of true uncertainty. Whether the market of a product exhibits characteristics of risk or uncertainty has direct and profound implications on both producers and consumers and their respective behaviours.

Apparently, as the products, services, and facilities that a port can potentially provide increase, there are a variety of different possible combinations that lead to various forms of port organisation.

4. Port Industry and Possible Worlds of Production

Each successful port production activity is taking place within a coherent action framework that shapes, and at the same time is conditioned by, the understandings, the expectations, the ways of cognition, action and interaction of all those involved in the production and exchange of the port product (producers, labour, users and the various institutions involved). Taking into account the possible combinations of: a) products (generic or dedicated); b) production processes (standardised or specialised); c) the technology associated with each production process (economies of scale or economies of variety or scope); and d) the conditions characterising the market of a product (risk or uncertainty); there exist only four 'ideal-type'

organisational forms that have been named Possible Worlds of Production (in the sense that each of them comprises a distinct and complete framework within which the efficient production of a product is possible – each world has different rules (conventions) and organisational logic and distinct requirements in terms of institutional supportive frameworks). Each of these ideal-types corresponds to a more material and directly observable manifestation that is called Real World of Production. Thus, the contemporary port product is conceived, created and exchanged within distinct real worlds of production (the major issue being whether a specific port product is being produced according to the best possible way). Following Salais and Storper's (1992; also: Storper and Salais, 1997) terminology of the possible worlds of production, these are the *Industrial World*, the *Interpersonal World,* the *Market World* and the *World of Intellectual Resources*.[2]
The operational and organisational logic of most port activities during the conventional era was conforming to the principles of the *Industrial World*, given that they exhibited the following characteristics:

- Production of generic-standardised port products whose qualitative characteristics were being defined in advance by the producer;
- The production process was characterised by standardisation, using interchangeable and reproducible resources;
- Inter-port competition was centred around the price of very similar products whose quality characteristics were codified;
- Production technology often involved high levels of investment in fixed capital to reap the benefits of economies of scale;
- Labour was unskilled and expected to perform according to pre-defined rules;
- The market of the product was characterised by conditions of predictable risk.

Apparently, the last two decades are characterised by fundamental changes that cannot be addressed by ports operating solely according to the principles of the industrial model. The restructuring and reorganisation of ports assumed various forms that reflected diverse strategic choices. The main issues that a modern port must address are the following: increased quality of services, high levels of flexibility and adaptability, closer integration with other transport modes, higher levels of product- and process-innovation, better management and marketing strategies, more efficient labour mobilisation and participation. The achievement of these goals requires the existence of ports that exhibit hybrid organisational structures, which incorporate elements-principles of two other possible worlds of production, the market world and the interpersonal world.
The *Market World* is a framework of action that exhibits the following characteristics:

- Production of dedicated-standardised products in shorter series for specific clients;
- The production process is characterised by standardisation, using interchangeable and reproducible resources;
- Inter-firm competition is centred around price *and* promptness of response to demand;

[2] The World of Intellectual Resources (Storper and Salais, 1997) refers to the research and development activities that lead to the conception of entirely new products. Thus it has little or no *direct* significance to the individual ports since very few, if any, have their own dedicated R&D departments devoted to scientific research on innovation.

- Production technology involves the use of flexible and multi-use machinery in order to achieve, at the same time, economies of scale and a degree of product differentiation (mass customisation) according to specific demands;
- In most cases labour is semi-skilled but is expected to be able to perform several tasks;
- The producers face conditions of market uncertainty since it is not possible to predict future demand and prices for their products.

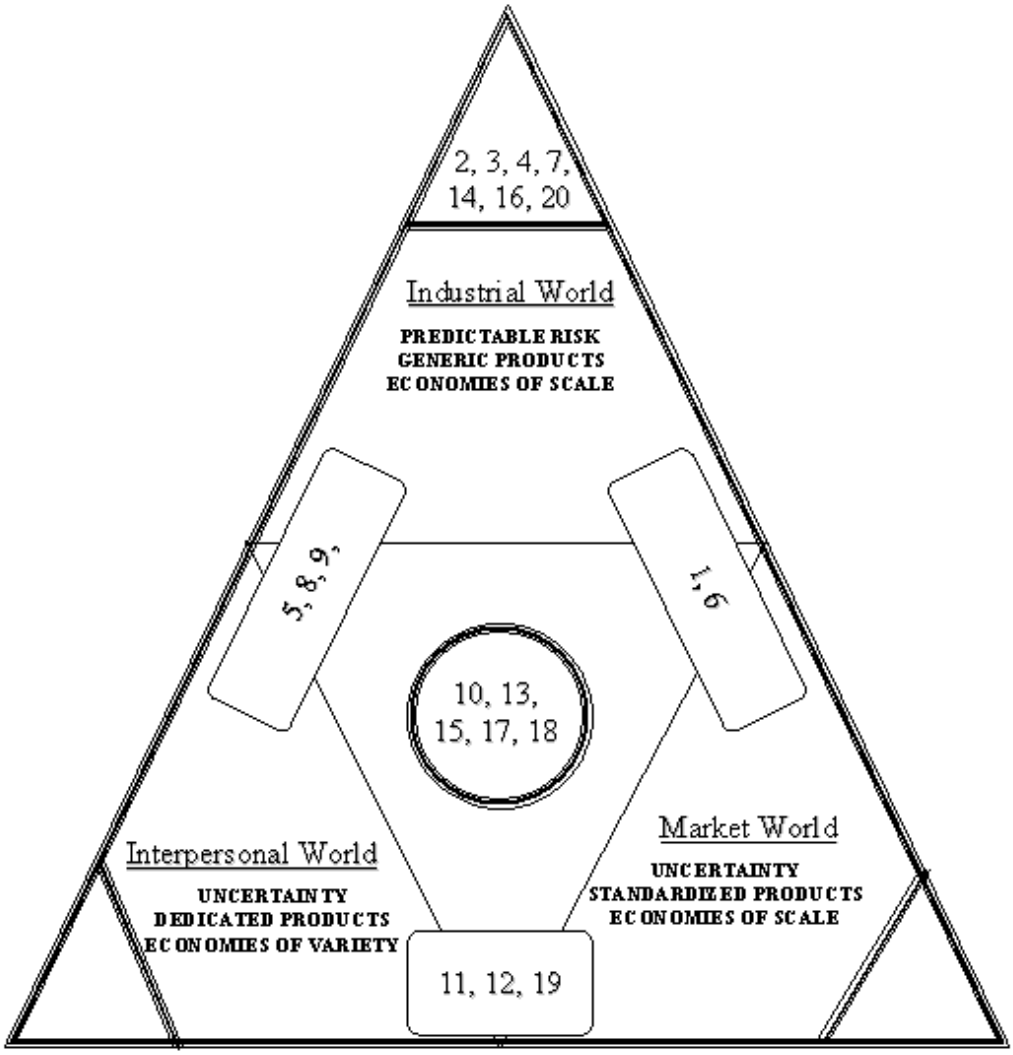
The organisational model associated with this world corresponds to enterprises with variable sizes (small, medium, large), which may be order-takers (sub-contractors) or order-givers. These enterprises pursue a strategy of product differentiation and rely on their sub-contractors to achieve promptness of response to customers. Two broad organisational structures may be distinguished. The first refers to the case where medium or relatively large firms, with potential to exploit economies of scale, use the services of smaller companies in an input-output chain. The selection of input-providing firms is based on price and promptness of response within a biding-out framework. The various types of network markets (i.e. "a closed set of selected and explicit linkages with preferential partners in a firm's space of complementary assets and market relationships, having as major goal the reduction of static and dynamic uncertainty." - Camagni, 1991:135) represent a more sophisticated and durable manifestation of this model.

On the other hand, the *Interpersonal World* is an economic action framework that exhibits the following characteristics:

- Production of dedicated-specialised products as a direct response to individual demands;
- A production process characterised by specialisation utilising highly specialised, even unique, resources and competencies;
- Inter-firm competition is centred around product quality while the product's price directly reflects its assessment by the users in terms of quality;
- Production technology involves the use of flexible and multi-use machinery and tools with a view to reap the benefits of economies of variety;
- Labour is skilled or even highly skilled, able to perform a wide variety of tasks;
- Both producers and consumers face conditions of true market uncertainty since there is no way to assess *a priori* a product's quality, this fact makes the producer-user relationship the single most important element of tackling uncertainty.

The organisational model associated with this world of production (the Marshallian market model) corresponds to firms or units that pursue a strategy of diversified quality production, which is transactions- and information- intensive. In this case the producer-user relation is of paramount importance. Further, these firms are part of localised networks characterised by dense interpersonal relationships. In other words, this model incorporates the characteristics of regional networks and dynamic networks (Table 2).

Table 1 classifies the characteristics of the contemporary port product. These characteristics indicate which model of production is better suited to the production of the said product according to the *world of production* concept. Port products can also be classified with reference to which world of production they belong in (i.e. which framework of action is particularly suited to the production of the said product). This classification is illustrated in the following Figure 1.



No.	Port Product (Nature of Port Product, Nature of productive action)
1	Pilotage (Generic, Standardised) and/or (Dedicated, Standardised)
2	Pilotage Infrastructure (Generic, Standardised)
3	In-port Vessels Traffic Management (Generic, Standardised)
4	Waste Management, Bunkering (Generic, Standardised)
5	Towing of Ships (Generic, Standardised) and/or (Dedicated, Specialised)
6	Vessel's Reception Infrastructure (Quays) (Generic, Standardised) and/or (Dedicated, Standardised)
7	Other services to ships (electricity, other utilities) (Generic, Standardised)
8	Loading/Unloading at the Quay (Generic, Standardised) and/or (Dedicated, Specialised)
9	Transportation to/from warehouses (Generic, Standardised) and/or (Dedicated, Specialised)
10	Warehousing (Dedicated, Standardised) and/or (Dedicated, Specialised) and/or (Generic, Standardised)
11	Goods processing (packing & crating) (Dedicated, Standardised) and/or (Dedicated, Specialised)
12	Preparation for distribution to the hinterland (Dedicated, Standardised) and/or (Dedicated, Specialised)
13	Transloading in inland transport modes (Dedicated, Standardised) and/or (Dedicated, Specialised) and/or (Generic, Standardised)
14	Inland Transport Networks (Generic, Standardised)
15	EDI (Generic, Standardised) and/or (Dedicated, Specialised) and/or (Dedicated, Standardised)
16	Vessel Traffic System (Generic, Standardised)
17	Security Services (Dedicated, Standardised) and/or (Dedicated, Specialised) and/or (Generic, Standardised)
18	Port Free Zone (Dedicated, Standardised) and/or (Dedicated, Specialised) and/or (Generic, Standardised)
19	Ship Repairing Services (Dedicated, Standardised) and/or (Dedicated, Specialised)
20	Traffic Management in Inland Port Area (Generic, Standardised)

Figure 1. Port products in worlds of production

This diagram illustrates the major transformation that has taken place: given their characteristics, there are relatively few port products that are exclusively suited to the Industrial model of mass production. These include the traffic management of vessels in the port, pilotage infrastructure, traffic management in inland port area, Vessel Traffic Systems, waste management & bunkering, the supply of utility services to ships (such as electricity etc.), access to inland transport networks. In other words the production of these services is more efficient by a single firm using standardised production methods and exploiting economies of scale that result in low prices.

There is a second category of port products whose combinations of characteristics require production either within the Industrial model or within the Marshallian market model. These are: towing of ships, loading/unloading at the quay, and transportation to/from warehouses. The production of these products is open to alternative organisational structures that correspond to the Marshallian market model (Interpersonal World).

The characteristics of a third category of port products, i.e. pilotage, vessel's reception infrastructure, favour their production within organisational models associated with the Industrial model or within the Market model. A fourth category of port products, including goods processing at the warehouse, preparation for distribution to the hinterland, and ship repairing services, favour their production within the Marshallian Market model or within the Market Model.

Finally, there are products, namely transloading in inland transport modes, security services, activities in port free zones, EDI services, and warehousing, whose characteristics allow any of the three models of production.

The above conceptualisation suggests that neither the Industrial model of mass production, which had been traditionally applied in the case of the port industry, nor any other model alone can provide, on its own, an effective pattern of port production. Within the new reality, modern ports must provide a greater variety of services to port users than in the past in order to be competitive. Many of these services cannot be efficiently produced by a single port enterprise. The provision of various port services can be more efficient when regional or strategic networks operate under the logic of the Interpersonal and the Market World respectively.

It is clear that several of the products or services demanded by port users can be provided effectively by organisational forms responding either to the Market Model or the Interpersonal Model of production. Still, any possible departure from the conventional MPS involves the introduction of network-like structures within a single port.

Various port authorities may still favour the operation of a single port enterprise. In this case an organisational restructuring that introduces the principles of internal networking to the operation of the port enterprise is expected to result in significant competitive advantages (with regards to the former mass production structure). When port authorities favour the idea of allowing several independent enterprises to operate within a single port there is a wide variety of possible organisational forms. One might be the existence of few large firms and many small and medium enterprises (SMEs) who act as sub-contractors in a biding-out system. Other arrangements may involve (a) the operation of strategic networks, that is long-term, arrangements among distinct but related firms in order to gain or sustain a competitive advantage vis-à-vis their competitors (Jarillo, 1988), or regional networks made up of small and medium-sized firms embedded in an industrial district (Sydow, 1992). Networks can also evolve out of personal ties, or market relationships among various parties (Powell, 1990).

The more sophisticated version of the market model incorporates the characteristics of strategic networks along with the characteristics of dynamic networks. In the case of ports the other two types of networks, stable and internal networks, can also apply (Table 2).

Table 2. Types of Networks

Type of Network	Operating logic	Primary Application
Stable	A large core firm creates market-based linkages to a limited set of upstream and/or downstream partners.	Mature industries requiring large capital investments. Varied ownership limits risks and encourages full loading of all assets.
Internal	Commonly owned business elements allocate resources along the value chain using market mechanisms.	Mature industries requiring large capital investments. Market-priced exchanges allow performance appraisal of internal units.
Dynamic	Independent business elements along the value chain form temporary alliances from among a large pool of potential partners.	Low tech industries with short product design cycles and evolving high tech industries (e.g. electronics, biotech, etc.)

Adapted from: Miles and Snow, 1992.

5. Implications of Port Reorganisation

The preceded perspective opens the possibility of *intra-port* competition - defined as the competition between similar or complementary production units, which provide the same services in the context of the same port. The demand for specialised as well as new types of port services - which frequently represent only a small component of the total of the services that a port supplies - is profound. So, the introduction of specialised production units focused on the production of specific services, and involving decentralised management and various forms of employment and technologies, creates the potential to match rapidly, innovatively and effectively the demands of a port's current and potential users. These units can provide services integrated within a wider cohesive programme of port planning, whilst the responsibility for the effective supply of the services remain to the executives of these units. Aiming to improve their competitive position they can act with greater autonomy and demonstrate the essential entrepreneurship and creativity.

Stakeholders with expertise in dedicated services might also be involved in cooperation strategies aiming to improve the quality of their product. Scholars have observed positive outcomes by the development of both cooperation and competition strategies by key actors in container terminal management (Heaver et al. 2001), though the presence of "mega" players rise questions regarding the contestability in the container handling industry (Noteboom, 2002).

The developments towards the formation of a long-term European port policy advance the introduction of such intra-port competition. The main objective of the recent EU proposal regarding access to the port services market (CEU, 2001) is to enable free market access to competent and qualified service providers for the provision of services in the following three

categories: First, techno-navigational services, including pilotage, towage, and mooring. Second, cargo handling services, which include: a) stevedoring, stowage, transhipment, and other intra-terminal transport, b) storage, depot and warehousing, depending on cargo categories, and c) cargo consolidation. Third, passenger services, including embarkation and disembarkation.

The public financing and charging practices in EU ports, as well as the transparency of port financial accounts are already exposed to further debate. The actual goal of this process is to create conditions of unrestricted access to port services and establish internal competition as a means to promote higher quality services in ports (Chlomoudis and Pallis, 2002).

When the port product is provided within multiple frameworks of action, changes in the patterns of employment become essential as well. The structural modification of the qualitative characteristics of those employed in ports becomes part of the restructuring process. Skilled personnel must replace chains of unqualified workers, especially as the implementation of new technologies modifies the demand for this production factor (Haralambidis & Veenstra, 1997). With regards to the administration of this production process, the flexible co-operation/participation of personnel along with new type of employee relations and management practices become essential, while the importance of the traditional hierarchical administrative structure faces its limitations.

The movement towards a post-industrial period of port organisation, combined with the rather justified criticism of the public sector performance, minimise the potential of effective responses by the public sector alone. The introduction of the principles governing both the market and interpersonal world is necessary. This might include the conversion of ports to flexible enterprises governed by the concepts of accountability, quality, systemic design, creative administration, innovation, networking, profitability, and entrepreneurship. Thus, practices such as port planning which is influenced by unemployment pressures or other clientelistic relationships should come to an end. This does not mean the exclusion of the public sector from the production of the 'port product'. The exclusion of the public sector would simply reverse the economic irrationality of the past: the private sector would produce a public good bearing a private cost and without this process resulting in respective private benefits. Sooner or later, this process would collapse.

On the other hand, both theory and practice underline that answers regarding the optimum interface of the public and private sectors remain difficult and the certainties limited (Thomas, 1994; Johnston, 1995; Saundry & Turnbull, 1997, Baird, 2001). Holistic models of port organisation, despite (or because of) their influence, remain limited to suggestions for the repetition of already applied reforms, without the latter having indisputable results. However, the port sector cannot afford to be directed by the temporary dominant preferences. Rather than that, port planning, management, and operation should be designed and executed on the basis of models with long-lasting effects and allow for the essential adaptability to vastly changing trading conditions, respecting geographical peculiarities.

To the 'public utility or private good' dilemma the answer can be that the contemporary port product is 'both public and private'. Rather than attempting to exclude either the public or the private sector on ideological grounds, it is worthy to focus on sharing the costs of the port services production including those of infrastructure/superstructure provision. Due to the multiplicity of those who benefit from the efficient operation of a commercial port, the role of the public and private sectors should be seen as complementary (Chlomoudis & Pallis, 2000).

The diversity and complexity of the contemporary port product require the application of multiple organisational transformations incorporating elements of the different possible worlds of production. The heterogeneity of the port industry in terms of size, geographical location, management practices, port operations - i.e. 'comprehensive' 'service' and 'landlord' ports – and employment patterns is remarkable (Pallis, 1997). This has several implications at the institutional and the operational level along with other market developments (Langen, 1999). Therefore the organisational strategy formulation for any particular port has to be supplemented by a specific analysis for this port and its competitive position. Each port attracts different users, depends on markets that are structurally different and characterised by distinctive financial structures, hence each port might choose to provide a different range of products aiming to proceed towards specific directions. There are many possible combinations of organisational forms available and it is a matter of strategic choice to pick the one that serves best the needs of a specific port.

5.1 The 'Smart' Port Authority

In this context, a reform of the role of port authorities is important. It is also questionable why should the whole port operate according to *a priori* defined rules and norms, instead of following up the dynamics of the market – including its ethical rules. A new institutional hybrid has to arise, governed by different principles than those of the 'conventional' port authority of the past: overcoming even the role of the 'regulator', the port authority should be transformed to the smart institution that coordinates the implementation of new organisational forms.

Furthermore, the port authority is called to control the rules of competition between production units providing the same but also multiple port services. Once a process of restructuring that incorporates elements of the interpersonal and market worlds is initiated, the role of the port authority should be significantly reconsidered. A system of many independent firms that are competing and co-operating requires an institutional framework that prevents potentially destructive price competition and favours competition based on innovation and other non-price parameters.

From an organisational point of view, a new institutional framework emerges from the distinction between the administration of the port services production and the production process itself. The former should be the responsibility of the port authority. This authority needs to administer a coherent attempt to overcome both the inefficient operation of the public sector and the failures of the market mechanism. It: (a) sets the targets in co-operation with several partners (public authorities, municipal authorities, scientific societies, voluntarily organisations, chambers of commerce, and trade unions), (b) directs the process by defining the operational framework; monitors the results; advances the networking of market players (i.e. co-ordinates the strategic or regional networks of port production taking advantage of the potential of new technologies application), and (c) forecasts. In other words, it is the 'brain' of the port society and, moreover, it controls the application of the rules of the game. This 'smart' co-ordinator needs to follow market developments and intervene only when necessary. Phenomena such as monopoly, the breaking of competition rules, the fair coastal impact sharing among private and public firms and the integration of environmental concerns in the process of producing port services all represent cases that port authority intervention remains essential.

Port production might be a process left to enterprises that operate under market conditions. The nature and extent of each port production process should be the outcome of the particular features of each port, the trade it serves, and the willingness of entrepreneurs to participate. This is not to say that the public involvement contradicts the attempt to improve the efficiency of port operation. The public sector might develop entrepreneurship, supply services and become profitable. Such involvement may still happen and assume various forms (i.e. private/public partnerships). It is conditional, however, upon the introduction of market principles. When this condition applies, the result is the development of competition between private ports or between public ports, and intra-port competition between private/public enterprises. International experience suggests that the coexistence of public/private might result in multiple benefits. Among others, these include decreases in the costs of the provided port services; quality upgrading; a focused and thus more effective public control; transparency improvement; and the implementation of strategic port planning.

The 'smart' port authority is the systemic co-ordinator of those participating in this process. A main responsibility of the port authority concerns the advancement and maintenance of good relationships between all those involved in the achievement of a plurality of targets. There are conditions for the development of a port 'culture of trust', so the port authority should influence and set the tempo towards common frameworks of action. Rather than providing hierarchically predefined directions, the active 'smart port authority, along with the decentralised forms of organisation, should provide incentives to adjust (i.e. advance and reward innovations and their diffusion).

6. Conclusions

The substantial structural changes in the world economy, the trading context and the port industry itself, force ports towards productive and organisational restructuring. Within the new reality, the traditional perceptions of port activities have been widely expanded to include a variety of new tasks and operations under a qualitatively new operational logic. The new dimensions of the port production process observed during the last decades are not irrespective of these developments. Similarly to other industries, these developments can be interpreted as attempts to overcome the limits of the conventional mass production system, at least in so far as its application to the port industry is concerned, and represent a break with it.

Utilising the theoretical framework of the possible worlds of production, and an indicative analysis of the contemporary port product, it is clear that several of the products or services demanded by port users can be provided effectively by organisational forms corresponding either to the Market Model or the Interpersonal Model of production. The industrial model of mass production might remain the more effective organisational form for the production of another range of port services. Rather than expecting the MPS to fail and ultimately be abandoned because of its own endogenous problems, more complex and diverse forms of port organisation might arise, involving the development of concepts deriving from the implementation of the different frameworks of action. These concepts include the introduction of intra-port competition, the supply of services by several competing enterprises, a new role for the port authority, and the restructuring of the labour.

Since there are many possible combinations of organisational forms available, and changes should take into account the peculiarities of each port, variations should be expected as the adjustment of the port industry to the new reality progresses. Given the heterogeneity of ports around the world, it is a matter of strategic choice to pick the one that serves best the needs of a specific port.

The last remark highlights a major issue in this discussion: there is no golden rule. The economic and social characteristics of ports do not allow for a single, comprehensive, restructuring strategy. Each port faces a significantly different environment and has equally different objectives and constraints. To propose a generally applicable reorganisation strategy apart from being an exercise in futility would also be in contradiction with the whole logic that underlies this paper. The aim of the paper is mainly to offer an innovative theoretical approach to the economic-organisational problems that burden the port industry and initiate a debate on new theoretical and methodological terms.

There are several issues that have not been tackled in this paper due to the obvious space and time limitations associated with the writing of an academic paper. Nonetheless these issues can be included in the agenda for future research. A non-exhaustive list of such issues would have to include: various cultural, legislative and regulatory issues not only concerned with the management within the port but also with those of the numerous transport and freight infrastructures that interface with the port. Empirical research (i.e. the comparison of existing practices in specific ports with the described potential forms of action) would be helpful to identify two major issues (a) which patterns of reorganisation have been applied, and (b) which elements determine the selection of a specific restructuring strategy, either by a port or a regulatory authority.

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