

1. Introduction: the rationale of the concept of port impact

There is a quite evident difference between the economic concepts of *output* (the technical result of a production process) and that of *input payback* (the remuneration to the factors used in the production).

Port service can be considered as a production process where land, capital, firm and labor inputs (e.g. location, space, infrastructure, superstructures, facilities, human resources, management and organizational skills) are combined in order to obtain a certain level of output (throughput). The point is that there is a general continuous interest on ports' results, while the issue of ports' input payback seems to be perceived, if not less important, at least finally referable to the traffic of the port as its direct consequence.

Ports are, in fact, internationally characterized mainly by their annual throughput. Each year major research institutes give the up-to-date figures of world ports traffic (TEU, tons) mainly focusing on (i) their shifts (upwards/downwards) in ranking, (ii) changes in the commodity mix (e.g. the increase in containerized traffic, the decrease in liquid bulk, etc.) and (iii) future forecasts.

Yet, emphasis on ports' throughputs seems to cover just one side of the medal.

What do "high traffic" data really mean?

We can say that a port that is increasing its throughput is first of all a port that is "good" for the ship and the cargo (it's the shipowners, in fact, who choose the port according to their

Ports and Economic Impact: main changes, assessment approaches and distribution disequilibrium

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It is nowadays widely accepted that the positive economic impact of ports tends to move away from a local environment (the earlier 'port city') to a much wider and often international one, including the consignors/consignees. It is thus the purpose of this paper to take a fresh look at the current changes in a ports' production function, based on a territorial cost-benefit analysis, i.e. taking into account that:

- *The port industry is no longer a labour intensive one;*
- *The port industry is becoming more capital deepening, but, given the functioning of international capital markets, the relevant payback does not necessarily spill over within the port region;*
- *Due to horizontal and vertical integration strategies, international groups often own firms which run terminals and port activities and local economies are no longer among the location selection criteria of holdings, corporations and administrative departments;*
- *Port development requires increasingly more space, which is a local factor, but land allocated to port activities seems to be paid less than its opportunity cost;*
- *On the other hand, ports still remain important from a national perspective: they generate taxes and duties and they often constitute growth poles for national industries and services;*
- *Finally, the costs suffered by local economies are getting higher and higher in terms of land consumption, coast waste, environmental problems and traffic congestion.*

The existence of a disequilibrium in the territorial distribution of ports wealth is thus quite evident. Port Impact Studies are powerful tools for assessing port impact, although there is an open debate on their main goals, on the different methodological approaches and on their role in port planning.

Finally the paper attempts to formulate some suggestions for a sustainable and efficient European port scenario.

port selection criteria and to shippers' demand). By the way, all the efforts to evaluate port performance based on different indexes (tariffs, transit time, reliability) are always referred to the *port users*, and not to wealth production and distribution. Therefore, high traffic means "only" that a port is more effective than another, or that it is more strategically located, close to important hinterlands and/or maritime routes. This doesn't mean, anyway, that the port is creating "value" to remunerate inputs.

Thus for successful ports we can think of the advantages and gains collected by port users (namely multimodal transport operators, carriers, agents, shipbrokers stevedores and traders) who extract a big share of the economic rent produced by ports, which evermore rarely stops within the port region.

Therefore we can surely assert that port throughput is not a correct, unique and exhaustive way for evaluating port real "performance". By doing so, the risk of a misunderstanding between the *user function* (the utility provided by the port for the ship and the cargo) and the *production and distribution function* (the inputs required to achieve that level of output, and their payback) could occur.

Thus we now focus on analyzing the *impact* of

ports for local economies, and its territorial distribution from a local environment towards a global "borderless" economy, by considering ports economic impact as the "source" of inputs payback. The need for a particular awareness of port

impact and its evolution over time is related to two main issues:

- nowadays there is no "automatic" link between the above functionsⁱⁱ. The remarkable growth in seaborne traffic, in fact, doesn't mean that port economies are getting wealthier. Although it is quite difficult to evaluate the impact of ports, the simple trend of traffic data, moreover in containerisation, is, in fact, getting less and less significant;
- the link between ports and *port-based* economies is changing towards a weakening both in the previous ties and in the economic significance.

The paper is organized as follows. Next section (§2) will briefly analyze the importance of assessing port impact on regional economies. In §3 a survey on main causes for changing impact of ports (from an economic, territorial, environmental and social point of view) is presented. An overview of different frameworks of analysis for evaluating the real positive and negative impact of ports on local economies - with a focus on the aims, methodologies, results and correct use of such studies is given in §4. Finally, the potential disequilibrium in ports impact (namely between a local and a wider level) is analyzed, stressing the importance of carrying the analysis beyond the local level (§5), and some possible policies for a sustainable port development are suggested while a number of open points are addressed (§6).

2. The economic vs. social trade off: the importance of estimating port impact

The proliferation of Port (economic) Impact Studies (PIS) over the last thirty years, despite numerous controversies regarding the strength of these kind of studies, is an indisputable objective fact that, after all, proves their relevance.

National and local governments, Port Authorities and port business communities, in fact, always stress the point that the development of ports could be a key factor in the economic development (and/or redevelopment) of local economies. Moreover ports play an important role from a national perspective due to the fact that they generate taxes and duties and they often constitute growth poles for national industries (e.g. manufacturing, transport, logistics), improving their competitiveness.

This emphasis on ports benefits can be considered as the driving force for a sound economic justification of expansionary goals for ports activities (typically capital and land intensive investments).

Although not formally stated in statutes, port management of public ports, in fact, could be implicitly characterized by a double aim:

- make the port attractive to users, providing a competitive supply of services for carriers and shippers (*micro-economic or entrepreneurial aim*);
- raising the welfare of its citizens, enhancing social welfare in terms of income, employmentⁱⁱⁱ, living environment, security and other aspects (*macro-economic or social aim*).

Despite the even existing relations between the different

goals, a clear trade-off is stated: while on one hand strategies of growth and development improve income and employment, on the other hand they may oppose other "social" goals (e.g. the need for a clean environment, for a high quality of life, for new housing development).

The outlined trade off is getting more and more difficult to solve, i.e. taking into account some current trends:

- due to the fact that many ports are close to the full capacity, as traffic volumes expand external diseconomies of scale, caused by congestion and lack of space, worsen the living conditions (especially for ports located in an urban context);
- the relation between port throughput and income and employment for port economy is weakening;
- fierce competition between ports is increasing and borders between traditional hinterlands are fading.

As a consequence of this schematized conflict, the expansion of the port industry should be considered, from a neutral perspective, as an *ex post* equilibrium between positive and negative impacts of ports. Extremely simplifying, in fact, the higher is the positive impact of ports on local economies, the higher the level of port expansion that would solve the trade off equilibrium, which maximizes the local utility.

Thus, only an accurate qualitative and quantitative assessment of ports positive and negative impacts, focusing also on the implicit risks as a result of spatially concentrated costs and widely distributed benefits, can provide an important tool in the policy makers decision process regarding ports development.

There seems to be a lack of convergence on the topic: different, and sometimes opposite thoughts, concerning the role of ports for modern economies, give rise to a hot debate.

Without approaching the matter of structuring an efficient PIS, Goss (1990) suggests at least four clear reasons for which port expansion or improvement is likely to be an inefficient tool of economic development strategy:

- port benefits are likely to "leak" to users in inland locations;
- assisting and investing public money in a port will probably mean assisting foreign exporters, some of which will be able to compete more effectively with home producers;
- any public assistance to a port is likely to indirectly lead to higher local taxes, running the risk to make the area less attractive to residents and possible businesses too;
- since the aggregate demand for labour within any given economy is determined by macroeconomics factors, ports are competing for a share of a reasonably fixed level of business (e.g. the expansion of a port belonging to a range could also be at the expense of lost trade in other regional or national ports belonging to the same range).

Even if some of the outlined points have to be considered in perspective of the current context of globalization and liberalization of the markets leading to higher competitive environment and increasing spatial interrelations and volumes of cargo traffic (also as a consequence of the improvement of the Hub and Spoke system), Goss' argument still remains quite effective.

Moreover another important element has to be taken into

account: most literature deals with the problem of port economic impact from a general perspective while it is quite evident that several local/national features can affect the analysis.

Gripaios-Gripaios (1995) and Gripaios (1999), for example, draw similar conclusions for UK ports; they provide empirical evidence suggesting that often the existing and potential role of ports in the regional development process is nowadays exaggerated.

On the other hand, looking for example at the Netherlands, NEI (1996) and Bossche (1997), emphasize, even though raising problems of sustainability of port development, the economic significance of the port of Rotterdam for local and, mainly, national economy.

The topic is evidently complex and it is worth to analyze in depth both the emerging changes in ports impact and the methodological approach in conducting a port impact study.

3. Ports changing role (and its potential consequence on impact): some economic and spatial evidence

It is nowadays widely accepted that the positive economic impact of ports tends to move away from a local environment (the earlier 'port city') to a much wider and often international one, including the consignors/consignees.

From an overall perspective, globalization and deregulation set the ground for current economic developments in which economic frontiers tend to fade and competition tends to intensify. Deregulation also allows businesses to re-organize their production systems internationally and to capitalize on advantages of different countries and regions.

For a long time the presence of a port meant not only traffic and transport activities, but also a wide range of economic activities, ranging from industries using mainly raw materials imported by sea and whose land transportation costs would have been too high, to those producing goods to be exported by sea and/or those whose optimal location was where the break of bulk took place. Nowadays, many of these industries, no longer technologically restricted to port areas, and suffering from the relative scarcity and/or high prices of space and other inputs, have moved to regions where these inputs are available at better conditions.

Besides, technological progress and lower costs in transportation have transformed port services market from a quasi-monopoly, where the distance from other ports "protected" each market area, to a more and more competitive market.

In this new scenario the "captive market" situation has been overthrown, and port users are more and more extracting the economic rent produced by ports, leaving a smaller payback to ports production inputs. The growing horizontal and vertical integrations involving terminal operators represent both an oligopolistic response, aiming at achieving economies of scale (horizontal integration) and the attempt of transport operators to "take over" the port and its value added (vertical integration).

Finally, innovations related to the port node have been *labour*

saving^{iv} and *capital intensive*, as well as – what can be considered almost unique – *land consuming* (namely in containerised traffic). Besides the dramatic change in benefits and costs related to the port, new and different costs for the local community must be considered, such as growing levels of congestion and pollution or the loss of a large amount of public resources (e.g. the coastal space).

Greater location indifference and diseconomies of congestion have allowed production activities to move away from ports. Since this coincides with an organizational upheaval of transport cycle and a reduction in land transport costs, this caused the growth of inter-modal inland terminals, which developed scale and concentration economies, and polarized traffic and induced activities. As a result, new spatial economic patterns arose, built around the new foci and routes of the transport cycle, with evident and deep consequences on ports and economic systems of port regions (Musso, 1996).

Thus, relations between the port and its local economy get weaker. Traffic flows increase, but port operations decrease, become of less importance, and require less manpower. Ports no longer give place to inter-industrial linkage, so that income multiplier effects not only are less relevant, but usually spread over industries and economies even quite far away from the port. The risk is that more and more commodities just pass through the port without stopping and/or without inducing economies activities (the port as a simple transit point), employment and value added (Vigarié, 1991).

Port services show a decreasing payback of labour and an increasing return on capital investment. While the former is located within the local economy, the latter, namely as a consequence of above mentioned horizontal and vertical integration, seldom comes either from the local economy or even from the country itself (given the functioning of international capital markets, the relevant payback does not necessarily stay in full within the port region).

This means that the economic impact of the port tends to spread more and more over the entire area of port customers (and often also internationally), while space consumption and negative externalities increase and remain spatially concentrated in the local system. This situation potentially brings about major socio-economic conflicts^v.

In summary, records growth in ports' throughput has not led to a corresponding increase in the number of jobs or in added value (sometimes also for all the transport and logistic functions). Therefore growing investments in port infrastructures and technologies are leading to an ever-widening gap between, on one hand, the regional use of the resources of territory, natural potentials and tax money and, on the other hand, the regional effects on employment and value added.

In the outlined scenario, costs and benefits deriving from the port should be carefully assessed, as well as their territorial impact and economic actors taking advantage from it. Namely, it is becoming ever more important using techniques for accurately measuring positive effects of the port on the local economy. These effects are largely related to the direct

and indirect employment impact within the area, since other inputs are increasingly of external or international origin (firms and capital), or do not attract a sufficient payback (land's rents).

This is relevant also from an institutional and financing point of view. In the past ports were perceived as *social capital* and it was the state that developed and financed ports infrastructures because of their capacity of generating employment and other indirect positive effects on the local and regional economy. But nowadays that ports are no longer the milestone in the structure of employment for the inhabitants of the port city, who are the real beneficiaries of new, subsidized infrastructures needed to maintain ports competitive? These sound doubts are leading to a different idea behind port investments, perceived as an *economic capital*, till some extreme positions that argue that ports should be developed and exploited as purely economic units, where public sector could not be always the prime mover (see for instance Goss, 1986, and the opposite view of Suykens, 1986, giving priority to port efficiency although subsidized).

4. Methodological approaches in Port Impact Studies

A number of articles have been "critically" important in discussing and analyzing problems and potentials of PIS^{vi}: Waters (1977), Chang (1978), Davis (1983), Yochum-Agarwal (1987, 1988), Warf-Cox (1989), DeSalvo-Fuller (1994, 1995), Gripaios-Gripaios (1995), Verbeke-Debisschop (1996), Castro-Millan (1998), Gripaios (1999), Musso-Benacchio-Ferrari (2000). Port Authorities usually invest on port impact research too. As an example, the US Maritime Administration and the New York and New Jersey Port Authority, in the late Seventies, developed, a famous regional port economic impact kit, based on a special form of using input-output tables, which has been updated on several occasions and which was flexible enough to adapt to the characteristics of small and medium-size US ports (U.S. Maritime Administration, 1979 and 1985).

4.1 Aims of PIS and the choice of economic explanatory variables

The basic aim of PIS is to show the whole net economic benefits for local (surrounding) communities to be associated with the existence and operation of a port. The defined general aim of PIS could be composed of different sub-goals, each of them can affect the choice of the proper methodology:

- 1) Facilitate the understanding of the (qualitative and quantitative) relationships that exist between the port and the regional economy;
- 2) Measure (also over time) the regional economic impact caused by the presence of the ports;
- 3) Operate as a simulation model, quantifying the economics effects derived, for example, from investments in new infrastructure.

These positive effects can be evaluated in many different ways; conventionally they are measured by the contribution of the activities of the port sector (in a broad sense) to the

level reached by some economic variables such as: employment, value added, incomes, taxes and duties^{vii}.

Quite often analyses are concentrated on employment terms considered as the most satisfactory *proxi* of the main economic positive effects for the local system. On the other side one can argue that the *value added* created by the port is the best variable for assessing the role of ports as catalysts for the creation of economic wealth.

In principle it could be correct, because the concept of value added^{viii} is the most comprehensive measure of the actual wealth produced by ports. It is quite evident that ports who achieve to establish industrial and logistic linkages are able to produce (and potentially extract at a local level) a wider economic rent from direct and indirect port activities^{ix}.

However, some remarks can be outlined on the use of the concept of value added.

First of all, employment is a clear (even if rough) indicator of the payback of a typical local input (labor), while value added, which is a more powerful estimator, refers to the wealth produced and induced by the port without providing details on its spatial distribution. For instance, what is the share of added value that goes in taxation (local and national)? Moreover if an input such as space were free, the value added of ports would be higher, but the local impact would be lower^x. Therefore value added figures are useful in providing a better knowledge of ports impact jointly and not alternatively to employment figures (the ratio "added value per employee" is a good measure of the economic significance of the additional port functions).

Secondly it is an indicator whose measurement is usually more subjectively biased than the employment figures. Substantial differences can be observed as regards the definition of the value-added concept. More specifically, inter-port comparisons reveal differences in defining, calculating and determining a weighing rule for converting nominal tons into intrinsic cargo handling or value tons (Charlier, 1996). Haezendonck *et al.* (2000) mention at least four different weighing rules within a single range, such as the Hamburg - Le Havre range, even if, in general terms, the value added concept always aims to assess the contribution of port activities to a nation's Gross Domestic Product.

Moreover, as well as for port-related employment, it is not clear if (and to what extent) the volume and the traffic structure of ports matter in creation of value added (while they are chosen as the independent explanatory variable). Moreover if value added is computed from Input-Output regional (or national) matrixes, the same advantages and drawbacks seeable for employment can be outlined (see *infra*).

Finally, there is no reason, due to the globalization of the economic processes and firms' ownership, to support the evidence that the higher value added produced by logistic ports such as Rotterdam and Antwerp surely stop in the port region. In fact the current trend of a widening and cross-bordering port economic impact is confirmed also by value added focused researches.

4.2 Defining the economic impact

Taking the employment as a proxy of the concept of ports economic impact we can distinguish (Castro-Millan, 1998):

- *primary* (direct) impact: "all activities necessary for the operation and use of port facilities"
- *secondary* impact: "all the economic activities of the area of influence of the port (local community and hinterland) that economically depend on primary activities".

It is not easy to avoid the risk of subjectivity in the definition of the economic activities involved.

Davis (1983) distinguishes the *direct effects* as the employment from the set of activities necessary for the operation of the port and other activities related to the outgoing and incoming shipment of the goods and passengers. The precise relationship of this set of activities may vary from port to port, which shows, on one hand, their different economic orientation and, on the other, the lack of consensus as to which economic activities are truly necessary. He splits secondary impact into two kinds of effects: indirect and induced. *Indirect effects* refer to all economic activities developed in the port region and dependent on the primary activities through a technical relationship, fundamentally of the buying and selling of goods and/or services. *Induced effects* refer to all activities that also take place in the wide port-region and that depend on the direct and indirect effects through "consumption" linkages.

The tri-partition of port economic effects can be considered a stable distinction in different studies.

Yochum-Agarwall (1987, 1988) proposed an interesting conceptual framework in which they provide general guidelines for conducting a port's economic impact analysis. The organization of an efficient search for port-related industries is based on three different *linkages* between the port and the region's economy.

- a) Employment in firms providing services necessary to the movement of waterborne commerce (*port required industry*). They include:
 - transportation services (e.g. freight forwarding, transport of cargo by rail and road);
 - port services (e.g. terminal operations, stevedoring, vessel supply, pilotage, towage, ship repair, diving services, insurance, legal services).
- b) Employment in firms attracted to the region because of the presence of the port (*port attracted industry*). The availability and potential access to port facilities may well serve as a "magnet" to attract industries to sites located near a port. The economic advantage of close proximity to a port is such that port attracted firms would be considering moving from a region if the port facilities were closed down. They typically fall into two categories:
 - firms that export commodities;
 - firms that import products or raw materials for assembly and distribution (e.g. steelworks, chemicals, refineries).
- c) Employment in firms that have expanded their markets (demand for their products) by exporting through the port (*port induced industry*). The port is a source of reduced

transportation costs, which results in industry expansion. Such industries are typically located at substantial distances from port facilities (and on the basis of a mere geographical criterion they would not be correctly identified). They are port dependent in that cost-effective access to the port affects demand for the firm's products. Such industries however could be located in the region regardless of the availability of port facilities (therefore is much more difficult to establish their degree of dependence on the port).

Quite similar is the "Dutch" functional approach to the segmentation of the economic impact of ports (Bossche, 1997), in which are distinguished:

- a) *Direct economic effects* - Those effects are related to the "core" of the port. It concerns the actual employment (and gross value added) to be found at the (geographical) centre of the port, related to the basic activities carried out in the port.
- b) *Backward linkages* - To perform their core activities, the economic players involved in the direct effect will use goods and services from subcontractors who need other subcontractors and so on. The total amount of employment connected with those subcontractors adds up the so-called backward linkages. The ratio between backward linkages and direct effects is called the *backward multiplier*.
- c) *Forward linkages* - Without the presence of the port, these activities either would not take place, or would take place against higher operating costs, or would be located elsewhere (maybe outside the national economy). As for the previous port induced industry, it is much more difficult to measure forward linkages in an objective and transparent way (e.g. risk of overestimating for possible doublecounting).

The picture is greatly complicated by what we can call the "historical" employment impact: that is, the employment in industries that are still located in the port area because they used to be "port oriented" in the past.

Moreover all these definitions implicitly identify a fourth set of firms that are not affected at all by the presence of the port. But it is not certain whether the fourth group even exists, as it is arguable whether any sector exists that is not at all affected by the distribution of wealth originating from port activities.

This is why, finally, also preliminary approaches concerning definitions can affect results from different PIS that should never be compared a-critically.

4.3 Choice of the methodology for employment assessment

- "Rough guess" and ad hoc survey methods

It is not rare to find port impact studies not based on rigorous methodology. When the "political" aim (i.e. emphasis on the port benefits) is the real goal for generating communication among main parties involved in the decision processes leading to the allocation of public resources to seaports projects, the issue of methodological approach for a careful assessment fades into the background. Port Authorities quite often justify tailor-made solutions due to the peculiarity of their case, but they do not provide transparency on

calculations. For a critical survey on such "geographical" and *ad hoc* survey methods for estimating port employment and value added see, for example, Isemar (1997) and Haezendonck et al. (2000).

- Models of port demand

Following a series of empirical studies based on the port of Tampa (USA), DeSalvo and Fuller (1994, 1995) have advanced a methodological proposal which attempts to offer a simple conceptual framework to evaluate a share impact of ports. The impact depends (i) on the cargo volumes transshipped by the port and (ii) – taking into account the changes in local output due to price changes – on the price elasticity of the demand for imports and exports channeled through that port.

They showed that a reduction in both exports and imports (due to an exogenous "shock", a stop or a decreasing in port activities), will cause, besides a loss in direct employment, an increase in transportation costs. This will lead to a final result of higher sale prices of the products and a progressive reduction in the global quantity imported/exported). Moreover also internal production costs, and consequently, the sale price of the domestic products that use imported goods in their production process will boost. This, in turn, will bring down the demand of such products, which, sooner or later, and depending on the market structure, will mean a reduction in employment and output in the analyzed area.

- The economic-base approach

The central aspect of the model, which implies that exports have an autonomous behavior, rests on the believe that regional income critically depends on the export sector, where the economic base multiplier is expressive of the changes income would experience in light of autonomous changes in exports.

The adoption of this model, in particular for port-impact analysis (Iseberg, 1957; Kraft, 1966), has been criticized for three main weaknesses:

- 1) It considers as a non-basic (or endogenous) sector all activities related to the flows of imports;
- 2) The model only provides an aggregate multiplier (a substantial increase in exports of a determined good has exactly the same multiplying effect as an equal increase in exports of a different good);
- 3) The model mainly computes the induced effects without offering satisfactory assessment of the indirect effects.

- The Keynesian Income-Expenditure approach

This model, derived from the core of most macroeconomic demand models, has been suggested to calculate the secondary impacts derived from port activity. In the income-expenditure final multiplier the critical element is the marginal propensity to consume goods produced internally.

From the point of view of port economic impact studies, this approach, which has some advantages over the base-export models (it considers that imports substitution can constitute

an income-generating factor), has also the disadvantage of only providing one multiplier for the computation of the induced effect, and not offering any information about the technical and/or economic interrelations that exist among different sectors.

- The Input-Output Approach

One of the most fruitful approaches to assess port economic impact is that based on an input-output analysis (Warf-Cox, 1989 and Castro-Millan, 1998). The system of producers and consumers is divided into different branches, which are defined in terms of the resources they require as inputs and what they produce as outputs. The quantities of input and output for a given time period, usually expressed in monetary terms, are entered into an input-output matrix in which one can analyze what happens within and across various sectors of an economy where growth and decline takes place and what effects various subsidies may have. In this way, the impact of the previously defined port-related sectors can be computed with a breakdown level depending on the matrix framework.

There are several reasons supporting the utility of the model. Firstly because this kind of analysis allows obtaining a multiplier for each one of the activity branches considered. Moreover, if also private consumption and households wages and salaries are considered, it permits to compute the whole sectional multipliers^{vi} (thus including direct, indirect and induced effects). On the other hand this method is very expensive (in terms of costs and time) and sometimes national I-O matrixes are used for a long period for regional purpose (what is obviously misleading as to local consequences).

- Economic specialization

Musso-Benacchio-Ferrari (2000) proposed (and applied to Italian ports) a technique for estimating the port's employment local impact assumed as the employment that can be ascribed to the port within the above mentioned *direct*, *indirect* and, partially, *induced* impact.

Employment impact is evaluated in terms of shares of employees to be ascribed to the port impact according to the estimated probability that industries are totally or partially port oriented (compensation approach). The technique basically consists of rules for estimating the importance of port in the employment of each industry. It is a mix of four different analytical tools: the "control regions" technique^{vii}, for the territorial definition of port economies and non-port economies (PE and NPE); the location quotients analysis, for the comparison between port economies and non-port economies; the shift share analysis, for the attribution of the share of employees for each selected industry belonging to a port economy; calculus of probability, to remove the random and/or biased component from the data.

Some advantages of the proposed approach are that:

- it avoids any discretionary bias: there is no arbitrary evaluation, neither on definition of "port related" industries, nor in the share of employment attributable to the port;

- it is relatively easy, from the point of view of time and cost, in that it does not require direct data collection but just census data: in most advanced countries there exists data available on employment, with suitable level of territorial and industrial breakdown.

By the way there are still some points open to improvement:

- it is largely discretionary in the choice of homogeneous control regions (which ideally should be homogeneous to the PE except for the existence of the port);
- the problem of underestimation as a result of compensations has no satisfactory solution, but can only be approximately addressed;
- the proposed technique does not join with input-output methods, neither with the wider Keynesian macro-economic inducement evaluation.

4.4 Some empirical results

In principle, comparing results obtained from different studies, different methodologies and different periods is not easy, neither correct.

A part from methodological issues, it is important to state that PIS are first of all decision supporting tools for regional planning, giving an estimation of ports inputs payback, and not a sort of model for benchmarking ports impacts in different contexts. In fact even if it was possible to compare ports positive effects computed for the same time and unbiased by methodological approaches and discretionary estimations, what would be the "value added" of such a comparison? Port direct and indirect activities have in fact a very close causal link with the historical, geographical and institutional background of the local economy, which are elements not at all (or partially) under the control of the port community^{viii}. Moreover what could be considered as a higher economic impact in terms of employment or value added might be lower, compared with other ports, in terms of dues, duties and tax flows.

Therefore, the comparative table of the results from different PIS is reported below just to provide some general elements of discussion.

The different approaches and the wide range of results suggest some comments.

From a methodological point of view most of the studies, although using sophisticated techniques, can't avoid a share of subjectivity (interviews, surveys, estimations). Moreover, sometimes the input-output matrixes used are "adapted" (regionalized) from national economy I-O matrixes, when a regional one is not available. Beside the fact that it doesn't seem to be a transparent method due to the fact that details of the "regionalising" procedures are not given, moreover this doesn't allow to take into account several local economic features.

Concerning data, it seems to be no apparent relation between the estimated impact and the total volume of ports throughput. A more accurate analysis (as performed by Warf-Cox, 1989) should distinguish between changes in cargo volumes, and changes in the commodity mix. The impact

Port	Year	Cargo Tons	Employment	Comments ⁱ
Rouen (FR)	1991	23 M.	14,535	Elaboration on census data (geographical criteria)
Dunkerque (FR)	1993	40 M.	20,343	Elaboration on census data (geographical criteria)
Nantes/St. Nazaire (FR)	1995	30 M.	24,265	I-O + weighed estimation
Anvers (BE)	1988	97 M.	63,500	Geographical criteria + direct survey: only direct employment
Anvers (BE)	1995	111 M.	114,440	Geographical criteria + direct survey: (56,770 direct)
Gand (BE)	1995	21 M.	24,428	Geographical criteria + direct survey
Bruges-Zeebrugge (BE)	1995	30 M.	11,263	Geographical criteria + direct survey
Rotterdam (NL)	1995-1996	284 M.	160,500	Direct survey + I-O analysis: 63,000 (direct) + 35,000 (backward) + 62,500 (forward on the national level)
Genova (IT)	1991	42 M.	35,390	Adjusted Location Quotients
Genova (IT)	1996	47 M.	35,771	Adjusted Location Quotients
Santander (ES)	1993	4,5 M.	28,935	Empirical survey + I-O analysis
London (UK)	1996	53 M.	28,337	Employment in a-priori defined port related activities: sea and coastal water transportation, cargo handling, storage, warehousing, other transportation activities and other transportation agencies.
Southampton (UK)	1996	34 M.	4,832	
Liverpool (UK)	1996	31 M.	5,161	
Plymouth (UK)	1989	2 M.	627	Survey + Estimation: direct + Indirect
New York/New Jersey (USA)	1977	61 M.	227,100	I-O + survey techniques*. Induced effects computed for USA
New York/New Jersey (USA)	1985	53 M.	250,800	I-O + survey techniques. Induced effects computed for USA
Hampton Roads (Virginia, USA)	1984	55 M.	45,732	Direct surveys: 12738 (p-required) + 3399 (p-attracted) + 29595 (p-induced)

Sources: Isemar, NEI, Warf-Cox, Yochum-Agarwal, Musso et al., Castro-Millan, Gripiaios-Gripiaios, Gripiaios, *op. cit.*

attributable in to changes in the commodity mix arise from the fact that different commodities require different handling methods, and thus different amount of labour, material and service inputs for their loading and unloading. For example a rise in the share of trade accounted for containerized traffic will decrease aggregate direct labour inputs such as stevedoring services, potentially increases indirect effects due to logistic activities performed on high value goods, increase capital investments and expenditures on items such as fuel oil, in turn indirectly altering patterns in the local economy. Within the traffic mix, the role of transshipment is generally not taken into consideration, while the effects of passengers (ferries and cruises) usually seem to be underestimated. Moreover, while all of the studies report global figures of port-related employment, few of these try to analyze the breakdown in different categories (e.g. Warf-Cox, 1989). Nevertheless it is quite evident that the structure of the induced employment (workers, professionals, engineers etc.) is an important indicator of the quality of the impact, of its value added and of the leadership functions of the port region. Moreover, the fact that containerization and standardization of cargo and related processes might change the role for ports from industrial/service linkage to a simple transit point, sometimes can also lead to moves of main port related premises of holdings, corporations and administrative departments towards inland locations, while executive branches still remain close to the port. This has to be seen as a high risk for the port local economy to loose important managerial and leadership functions.

Finally, the computed results are, in general, not so relevant^{vii}. Moreover quite often the growth in tons does not lead to a

comparable growth in terms of employment (for instance the throughput of Rotterdam grew on average 1.6% per year during the period 1987-1997, while direct and indirect impacts decreased on average 2.8% per year). In that respect the causal relationship of port and city economy has been reversed. Evidence shows that ports are no longer the economic engines of seaport towns, while the differentiated production and service networks of the region constitute a prerequisite for the economic benefit of the ports in term of a value added and employment oriented service center (i.e. the case of Rotterdam and Antwerp).

All the above considerations implicitly stress the point that PIS are more effective if repeated over time in order to constantly monitoring changes in the economic relationship between the port and the city.

4.5 Main criticisms to PIS and their role in economic and port planning

There are several criticisms moved versus those studies usually commissioned by some ports assessing their economic impact.

The main criticism made by Davis (1983) points out the lack of a thorough investigation of the degree of dependency on ports of the various activities included in the impact component. PIS investigators, in fact, not only have to face with the obstacle of searching for firms whose business is related to the port (roughly the first task), but, once identified, they have to establish the degree of a firm's (industry's) dependence on the port (second sub-goal). Unfortunately, the assessment of this degree of dependence runs the risk of a very subjective estimation. When data fail to correct assess ports impact, there may be a strong bias, of some of the parties involved in the decision making process, to overestimate mainly indirect effects.

The second criticism of PIS has been on their practical applications in terms of either estimating changes in economic impact over time or measuring the incremental benefits of additional port investments. Waters (1977) attributes to these lacks the drawback that PIS usually do not provide useful guidance for port planning. He concluded that they "apparently" are used principally as public relation tools, and "they cannot answer the key question of whether a community should finance the development of another port facility". Chang (1978) states that "PIS are static in that these studies measure the economic impact of port operation usually for one year only during which collected data are relevant".

The need for replications over a period of time, in order to use impact studies in a more correct and powerful way, is quite evident. The fact that, despite all the outlined remarks, PIS usually remain *una tantum* studies, is due on one hand to the high cost of data collection and calculation of this kind of analysis, and, on the other hand, on the short term political aim of promoting port expansion usually associated to PIS.

The most significant and relevant criticism made by Randall (1988) on the use of economic impact studies in the forms

indicated above, is that the selection of port specific industrial categories does not reflect the true functional profile of the port. He emphasizes the natural "proactive" role of seaports and, on the basis of the current trends in cargo handling (namely capital intensification and space consumption), supports justification for Port Authorities to engage in non-marine economic development (from real estate agency and development to custody of bridges and tunnels, from industrial tourism to co-ordination of community festivals). A part from the wealth effects, these non-marine functions often play an important role both in promoting the port itself and in strengthening the link between the port and the local community.

Goss (1986) claims the lack of consideration of opportunity costs. Sometimes multiplier effects are added in, though without verifying whether the resources involved (labor, capital and land) would otherwise have been unemployed or employed in some other activities.

A further remark is in the sense that PIS usually fail to provide reliable guidelines in determining whether or not port facilities should be expanded (while quite often they are used exactly for this goal). The simulation role of PIS has to be carefully considered. First of all it is important that they provide to assess the likely effects of projects in terms of *sustainable* employment and/or added value in order to avoid overestimated unrealistic expectations (e.g. construction and maintenance effects have to be reduced by the component which is probably not very different from other projects, while economic trends which are not sustainable over time have to be removed). Secondly they should be used only to estimate a port's short run economic impact, since technology is held constant, while the structure of the port (organization, management, equipment) may change. Furthermore port economic activities are affected by international events and by institutional changes as well.

More reasonably we can summarize that PIS work as an important tool to the community in understanding the structure of a port as well its immediate economic effects. They can provide insights for a meaningful address in port planning: from a pure supply-led *transportation* strategy (which sometimes leads to port overcapacity in order to compete in the market), to a more balanced incremental stepwise combination of supply-led and demand-led *industrial* strategy.

There is a further point that seems to be quite important and often underestimated. PIS are seldom recognized as an aid to the decision making process on the overall economic regional planning. The usual perspective of utilization, in fact, is quite "narrow": politicians and decision-makers usually look at them as the main tool for port (expansion) planning.

If the first general aim of PIS is to provide a detailed analysis of the existing relationships between the port and the regional economy, then we have to agree that their utility is wider than that of a "black box" for simulating port impact under different scenarios. Their "added value" is to give a better knowledge of the economic framework of a port region and

therefore they have to be considered as an important layer in the economic and spatial planning of the whole region. They support economic evidence (the benefits of the port) that have to be compared with costs, and then translated in *options* for an integrated global economic planning, and in *priorities* for better decisions on the economic, social and territorial development of the region (as well as other sector studies).

Only if PIS are considered as an important "cognition" estate for the local government, and their key role in port planning is correctly integrated in the overall economic and territorial planning, it could be possible to limit some of the frictions between the different players involved (port users, community groups, local business community, different government layers) enhancing cooperation and synergies (Hoyle, 1999).

5. The "local" cost-benefit analysis and the "wider" context

The port economic impact (direct and indirect) has finally to be compared to the costs suffered by local economies that are getting higher in terms of land consumption, environmental problems and traffic congestion.

Schematically the main (monetary and non-monetary) costs of the port presence for the local economy can be outlined as follows^{xvii}:

- the local share of investments in maritime, port and transport infrastructures;
- opportunity costs of port industry inputs: capital, labor, space (coast and landscape);
- negative "sunk" externalities: environmental aspects (air, water, acoustic pollution), landscape decay, irrecoverable investments in facilities, traffic congestion, costs for "harmonizing" the presence of the port in a urban context, the risk of hazardous material handling (chemicals, petrochemicals);
- possible loss of managerial and leadership functions for local port economies that are quite no longer among the location selection criteria of holdings, corporations and administrative departments of the firms located within the port region.

Verbeke-Debisschop (1996) argue that, even when PIS correctly perform a cost-benefit analysis, they usually don't take into account "external effects and do not allow to introduce shadow prices for the valuation of specific inputs and outputs". Given that the market prices are used for the measurement of all the costs and positive effects (when they are monetary valuable), any distortion of the market from a perspective of economic efficiency will lead to a biased picture of the real effects. Due to the fact that in port production function imperfections usually affect the inputs market (e.g. for the mechanism of land allocation and pricing in ports) the risk of overestimating net port impact is substantial.

The quite evident *disequilibrium* between a reduced positive economic impact of ports, which tends to move away from a local environment to a much wider and often international one, and the increasing costs and negative externalities, which

remain spatially concentrated in the local system, seems to have no straight solution.

A problem of territorial distribution effects in fact occurs, taking into account that:

- labor usually comes from the local port economy and its payback stops in port region;
- capital more rarely originates from local systems while it is quite often provided by national and international systems (and consequently its payback doesn't stop in port regions);
- firms may be local players, but *horizontal* concentration (between big stevedoring and logistic companies) and *vertical* integration (between shipping companies and terminal operators) tend to internationalise firms ownership;
- although port land use is usually regulated by leasing and concessions contracts, quite often land prices are a strategic tool for attracting companies and they don't reflect real value of the space;
- the use of the fixed social capital of the local system (namely transport infrastructures) is free (free-toll roads, parking spaces and highways) or it pays fees sometimes lower than costs (e.g. subsidisation) to economic agents who often operate on a wider territorial scale (rail/motorway operators);
- taxes and duties are just partly earned and managed by local port systems;
- port users who benefit from ports are more and more spread all over the world, while negative impacts affect mainly port regions.

The outlined *impasse* seems to have no straight solution: the risk is that of a "refuse tip" effect and a consequent "not-in-my-backyard" syndrome, as ports are facilities not desirable for local communities, more and more necessary for other countries economies while more and more economically less significant for their regions (Musso, 1996).

It seems meaningful, therefore, (re)considering the *disequilibrium* between cost and benefits for the local economy within a wider comparison between global cost and benefits, including those for the hinterland. Ports, in fact, still remain very important even from a mere national perspective. They generate tax flows and duties, provide direct positive effects on gross national product, balance of payments and balance of trade. Wider effects are in the sense that ports constitute growth poles for national industries (e.g. manufacturing, transport, logistics) and services, act as macro-economic tools for territorial policies aiming at developing depressed areas, and provide access to international markets and foreign investments.

On the other hand national costs for ports development seem to be sum of the local negative impacts (although not directly equally suffered by all the population), with in addition:

- the national share of investments in maritime and port infrastructures, transport infrastructures;
- organizational and coordinating costs between central government and local port authorities/harbour master offices;
- human resource costs (e.g. early retirements funds for ex-dockers of pools).

Even if these costs can be considered still compensated (even if with a decreasing margin) by overall benefits, a clearly imbalance on spatial distribution costs and benefits distribution still arises^{xviii}.

According to the perspective of a wider overall economic system, port industry plays more and more an irreplaceable role as central links in the logistic chains of the global economy. Port users benefit from the port activities mainly in order to reduce their own production costs and increase demand of their product and services.

Providing a comparative overview of the results of five investment projects in Belgian ports, Blauwens *et al.* (1993) shows, in the form of the net return per invested Belgian Franc (*benefit ratio*), that the benefit count is usually lower from a Belgian point of view than from an international one. In recent studies NEI (1996, 1997) has investigated the size of the forward linkages connected to the Rotterdam port activities both on a national and European scale. On the national level the direct effect brings along forwarded linkages for the 70% of the direct value added, and for the 100% of the direct employment. The cross-border relationships between the port and its users in its hinterland are even more evident. In 1997, on a basis of 24 billion Nlg of national added value generated by the port, an additional 24 billion Nlg of gross value added can be found in other countries (mainly in Germany and Norway).

Another important element has to be added to this unbalanced scenario, underlining the lack of control by port communities in the strategic planning of port development. Although port positive effects for regional economies are fading, ports are more and more under pressure due to the current high shipping lines' volatility in calling at ports (Meersman *et al.*, 1999) and the already highlighted location indifference of port related firms. This force ports (and port economies) to face potential crisis through a unconditioned supply-driven port planning leading to a structural overcapacity which worsen local conditions. Such a "vicious circle" may determine severe conflicts between local community and decision makers concerning port matters, sharpened also by the perceived lack of representation of local interests by port governance.

6. Facing the disequilibrium: some open points towards a sustainable port development

All the above considerations could be synthesized in the following points:

- the increasing competitive environment between ports decreases single port's economic rent;
- growing investments in new port infrastructures and technologies are leading to an ever widening gap between, on one hand, the regional use of the resources of territory, natural potential and tax money and, on the other side, the regional effects on employment an added value;
- while benefits are generally increasing, their distribution effects are widening (towards a "borderless" economic system) and they are becoming less concentrated in the

local port system;

- the local communities are bearing the weight port industry development, and the risk of an irrecoverable *overcapacity*;
- social conflicts related to port development are getting more and more important (Port Authorities, community groups, business community, national and local government).

Within such a scenario, is it still realistic (and to what extent) considering ports as catalysts for regional economy growth and development?

This issue has to be carefully addressed. It is, in fact, correct to look at the economic role for ports from a global perspective taking into account at the same time regional and wider contexts. While the former perspective of ports as powerful economic tools for regional growth seems to be outdated, the mere consideration of ports as critical links in the global transport network bypasses the main problem of a correct input payback for the local system. The synthesis can be achieved in recognizing that the issue of port development it is not an unconstrained maximisation model, but, first of all a matter of (spatial and overtime) *sustainability* of costs and benefits.

From a local point of view the idea of port sustainability implies the improvement of the trade off between costs and benefits (first of all through a more correct payback of ports input), and the possibility that all the players belonging to the port community (local community *in primis*) can play an active role in deciding the "quantum" of the port expansion and the amount of the resources to be allocated.

Several open points can be outlined concerning different factors, about which decision makers (at local, national and European level) should argue in order to co-operate in drawing meaningful policies, and consequently actions, for a fairer distribution of port effects.

Impact assessment - The first and concrete step in such a broad topic should be the effort of adopting common conceptual frameworks and "objective" quantitative methodologies in order to assess and constantly monitoring the role of ports for economic systems in terms of (i) local impact (*direct-indirect employment* and *territorial impact*), (ii) fiscal flows and returns on investments, (iii) international effects of the ports within a global economy.

Value added services - The exploitation by the local system of the economic rent (actually or potentially) generated by seaports involves opportune location policies aiming at promoting value added logistic activities. Logistic port clusters in the surrounding area avoid the risk that the port could perform just as a transit node distributing cargo and passengers towards hinterland locations.

Land use and pricing - Concerning inputs of port's production function, a suitable market structure in port land use (at the same time *efficient* for the "supplier", i.e. the local community, and *effective* for the "purchaser", i.e. direct and indirect users of port services), can be considered one of the main priorities (Musso-Benacchio, 1999). Consistent rental policies should try to link as much as possible leasing rents directly to the costs of local communities (including

opportunity costs of space) not otherwise countervailed by benefits.

Port Infrastructures - New schemes for infrastructure pricing and financing have to be implemented, also in order to correctly apply the *user pays* principle stated by the major recent policy document of European Commission (European Union, 1997). Following this perspective an efficient decentralization of port tax systems could be considered as a first step for allowing ports (mainly in the Mediterranean area) to have a tighter control on investment decisions.

Port networking strategies - It is not a futuristic scenario that which foresees breaking through administrative borders of single ports and entering into partnership with surrounding nodes and regions (Berg-Klink, 1997). This could lead to a more rational planning, selection and location of port activities based on compatible and complementary features of ports. Control of knowledge-intensive activities and co-ordination of partnerships with other nodes could be considered as new ports core business, allowing port regions to hold leadership and control of all transportation and logistical flows and related value added activities.

Co-operation in the decision making process - Analysis of interests/conflicts, co-operation and synergies among all the players (directly and indirectly) involved in port planning (from state government to ports users) have to be actively promoted. For this reason Port Authorities have to ideally play as "chairmen" in the roundtables of the decision making process regarding port planning and development. The meaningful involvement of local communities (which sometimes are among the weaker parts of the port stakeholders community) should be considered an important target, in order also to regain a sort of *legitimacy* of governmental institutions (firstly Port Authorities) in territorial planning, which quite often is questioned. Since critical inputs of port's production function are supplied mainly from local systems (natural resources, labor and infrastructures), it is therefore a main point that local communities take part in port decisions (although in the forms of representation).

ENDNOTES

¹ The paper is the result of a close co-operation between the authors. Nevertheless paragraphs 1,3 and 5 can be ascribed to E. Musso, while paragraphs 2,4 and 6 can be ascribed to M. Benacchio.

² Moreover also the "role" of the port in the transport network can affect its impact on local economies: the same number of TEUs handled in a transshipment port cannot be compared to that of a destination port.

³ The maximization of the jobs in the city or other administrative area is referred to the aggregate employment. It can be considered a long-term policy.

⁴ As an example, Hoyle (1990) reports that, between 1978 and 1981, employment in London Docklands fell from 37,200 to 27,200 (a decline of 27 per cent). Gripaios (1999) mentions that the port of London in 1996 employed only a quarter of the direct workers it did in 1971, and Liverpool only one sixth.

⁵ As an example, by 1981 male unemployment in the London Docklands had reached 23 per cent, and it was to raise to a peak of 29

per cent three years later (HMSO, 1988). For an historical survey of economic and spatial changes in ports see Hoyle-Hilling (1984).

⁶ In fact, even if ports can be considered transport infrastructures as roads or railways, due to their economical and social relevance and peculiarities, seems not correct to investigate their impact only from the perspective of an analysis of the growth and structural effects induced by a transportation facility (see Voigt-Witte, 1981; Rietveld, 1994).

⁷ There are also different positive impacts of ports on the local area: e.g. (i) the actual and potential accessibility to international markets, (ii) the potential attractiveness the port creates for the establishment an development of new productive activities in its area of influence, (iii) the eventual positive impact on tourism, (iv) cultural effects such as the presence of maritime and ports research institutes, universities, museums, festivals, (v) the role of ports in military defence. But the increasing difficulties in assessing qualitative and non-monetary elements restrict the focus of PIS on the previous economic variables. And also in this "narrower" sense impact studies have always lead to controversial debates on the appropriateness of the methodological framework.

⁸ Namely a measurement of the difference between the measure of performance (i.e. the value of production) and the resources expended to obtain the level of performance (i.e. the value of intermediate consumption).

⁹ This has been, for example, the leading policy of the Port of Rotterdam in the last decade. The so-called "Dutch Maritime Cluster", a solid embedded network of sea-related activities, connecting more than ten industrial and service sectors and promoting co-operation and synergies, is nowadays one of the brighter examples of "real" positive port economic impact for the Rotterdam region and for the Dutch economy (Lloyd's List, 1999).

¹⁰ The example is not random: the issue of the opportunity costs of land in port production is becoming more and more a central point in port planning (Musso-Benacchio, 1999).

¹¹ Haralambides (1996) provides an interesting application of I/O techniques to the economic impact of shipping on national economies.

¹² An interesting control region approach has been proposed by Rietveld (1994), on the basis of appropriate statistical methods developed by Isserman (1990).

¹³ An example could be more effective. It is widely recognised that the port of Antwerp, for its being mainly a general cargo port, should present better employment per tonnage and added value per tonnage ratios compared, for instance to the port of Rotterdam, which is traditionally a petrol-chemical port. But this consideration cannot lead to any coherent and straightforward strategy aiming at radically changing the product mix of the Dutch mainport.

¹⁴ If not otherwise specified the employment figure is comprehensive of direct, indirect and induced impacts.

¹⁵ To measure the extent of the regional purchase of port transportation services, survey techniques were used to derive a port Location Factor coefficient for these sectors.

¹⁶ In 1996, the London Travel-to-Work Area had just 0.8% of its employment in port activity, while Liverpool had 1.6% (Gripaios, 1999). This stresses also the importance of computing ratios between port related employment and the total active labour force of the region.

¹⁷ It is out of the target of this survey on port economic impact to deeply analyse quantitative methodologies for assessing negative effects induced by the presence of ports, and their results for different port environments. Our goal is, in fact, only to provide a general framework of analysis for the evaluation of the real role played by ports on local economies, highlighting the main difficulties of such analysis and trying to outline meaningful elements for port planning policies.

¹⁸ As an example Läßle (in Kreukels-Wever, 1998) shows what has been defined an "amazing development" concerning the impact of the port of Hamburg in the logistic sector. The Hamburg region, after having by far the most employees in the past, was overtaken by the

Frankfurt am Main region in 1987, while, by 1993, also the Rhine region had more people employed in the logistic sector.

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