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PORTS ECONOMIC IMPACT: LITERATURE REVIEW AND ALTERNATIVE PROPOSAL

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ABSTRACT

A review is undertaken in this article of the different alternatives which have been included in the literature applied to the analysis of the economic impact of port activity, detecting the main advantages and disadvantages of each of them, and confirming that the applications based on Input-Output tables are by far the most used, both nationally and internationally.

In the light of the review undertaken an alternative procedure is proposed which, including the main advantages of input-output methodology, allows for the systematic application to all Spanish regions and the regional location of the different impacts; direct, indirect and induced.

Key words: Input-Output tables, Economic impact of ports, Regionalisation.

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1 INTRODUCTION

The general objective of the analysis of the macroeconomic impact of the ports is part of a global trend to deepen the knowledge and quantification of economic phenomena in general, the origin of which we could establish at the beginnings of economic science itself, and was extensively developed alongside the large systems of national accounts.

In this general environment, and now that the systems of national accounts have been sufficiently standardised in most of the developed economies, the interest of the analysts has moved from large aggregates to levels closer to each of the specific economic activities, going from this macroeconomic level to what we could call a "metzo-economic" analysis, which would include both the analysis of more limited spatial units (regional or local analysis), and of specific economic branches or sectors (sectorial analysis).

In addition to this global interest, which is shared with the other economic activities, the implementation and management of ports has special characteristics which by themselves provide more than sufficient justification for the development of specific analyses of their economic impact.

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As with other large infrastructures for social facilities (airports, railways, main roads, etc.), ports must therefore generally be financed through large public investments which are placed at the disposal of society as a whole without being directly subject to a specific profitability analysis in the way that other types of private investments in activities which are completely subject to market mechanisms would.

For this reason, evaluating the profitability of these investments in public infrastructures cannot be limited to the mere comparative analysis of capital employed and returns received but should be studied thoroughly in areas such as the total contribution to the economic and social development of the specific commercial activity and irrespective of the specific commercial activity developed with these investments.

In addition, these large infrastructures usually generate a series of negative environmental externalities, which are geographically concentrated and whose acceptance by the groups affected may be made easier if they are presented along with the economic benefits resulting from them.

Finally, we could add a third factor of interest which in this case specifically affects port activity, and refers to the size of the economic activity linked to the port as regards the local economies.

By way of example, whilst the direct weight of the activities linked to sea transport and fishing would equate to slightly less than 0.5% of Spanish GDP, for some specific provinces this direct contribution would amount to over 2% of their total income.

Having established the specific interest of the analysis of the macroeconomic impact of ports we must define the different stages to be tackled in this type of study.

Firstly an estimation of the economic activity directly linked to this port activity should be made, where the fundamental tasks to be carried out will consist of the definition of this activity, the compilation of the economic information relating to the group of agents involved in it, and the consolidation of all the information included in accordance with preestablished standards. This procedure could be compared to the accounting consolidation in a multifunctional company.

In the second stage we would proceed with the definition of the level of interrelation in this activity compared to the rest of the branches of production which make up the economic system. In order to do this it would be necessary to carry out an additional structural analysis of clients and suppliers, in such a way that the possible "drag" effects on the rest of the economic system, as well as the possible potentialities and risks faced by this activity, could be defined.

Thirdly, in order to adequately evaluate the implied profitability of the investments in port infrastructures, an analysis should be carried out of the multiplying effects of this activity,

including not only the direct contribution, but also all the possible indirect effects which are generated as a consequence of the establishment and development of the port activity. In this case, the tasks to be carried out should include the development of some type of model of interaction between the different production branches which enables the direct effects to be transferred to the rest of the economic system and for all the possible indirect effects to then be evaluated.

Finally, in order to complete the analysis of the social effects of these investments, the induced effects on the geographical area in which these installations are located should be studied. An estimation will therefore be required of the possible induced effects, fundamentally in terms of income, which are generated in this geographical area and which allow for a comparison between the possible costs and benefits obtained by the community as a result of the port activity.

As a complementary action another type of alternative analysis could be considered on the effects which certain action taken concerning the port activity itself would generate on the rest of the economic system. The study of the effects of the expansion of the port infrastructure, the limitation or contraction of the services on offer or possible variations in pricing policies could thus be considered as possible alternative objectives.

2. METHODOLOGICAL APPROACH AND REVIEW OF LITERATURE

The calculation of the economic effects of a particular company or sector on the economic system as a whole has been the object of numerous studies throughout the history of applied economics and there are many alternative approaches which have been suggested in order to tackle these issues.

The main problem revolves around the establishment of a reasonable balance between the level of specific or microeconomic detail with which these studies are tackled and the possibilities of establishing sufficiently representative conclusions on a macroeconomic level.

This appropriate level of integration between micro and macroeconomic information can be found, as we hinted in the introduction, in what has become known as "metzo-economic" analysis, and the methodology based on Input-Output tables has become one of the most internationally widespread tools[1].

In the specific field for the study of the analysis of the economic impact of port activity, and as is shown in the review we present below, it is precisely this methodology based on Input-Output tables which has enjoyed great popularity. The alternative proposal which we will present in the following sections of this article is therefore fully justified.

For the purposes of facilitating the monitoring of the different methodological proposals reviewed we will begin by including those which are internationally recognised in order to subsequently show the different contributions made in our country.

The first works that we can strictly identify as an analysis of the impact of port activity are to be found in the second half of the 1960's in the United States and the majority of the studies consulted agree in highlighting the pioneering work carried out half-way through the above mentioned decade by the New York –New Jersey port authorities[2]

The concern with measuring the effects that port activity generates on the economy is already made clear in these first studies, fundamentally relating to the local or regional economy, where the ports are located, as well as the non-existence of a unanimously accepted method or procedure for this to be carried out.

In the second half of the 1970's, a certain amount of debate was generated about the usefulness of these studies and the methodology usually used for them to be carried out, which was mostly based on the development of the Input-Output model.

Thus, in 1977 Robert C. Waters[3] published an article in the *Transportation Journal* questioning the reliability of the numerous studies carried out up to that point which used the multiplier methodology derived from the Input-Output tables as the basis for the calculation of the economic impact of port activity.

The main doubts which the aforementioned author made clear, many of which have still not been completely resolved in subsequent studies, referred to the lack of dynamism in the procedure used, which did not take into account the possible benefits generated by the accumulation of capital, or the improvements in the transport infrastructure, or the possible technological changes undergone by production processes in general and by the transport systems in particular.

In addition, the representativeness of the results obtained was questioned as the assumptions of revenue generation and distribution resulting from port activity are, in general, excessively simplistic and do not adequately reflect the processes of the replacement of local production by imports as a consequence of the port activity itself, or the changes in pricing structures. This invalidated the possible use of these approximations to carry out an adequate evaluation of the profitability or real benefit resulting from possible actions to expand or close port installations.

One year later, Semoon Chang[4] published an article in reply to this in the same magazine in which, accepting most of the criticisms established by Waters, he makes a defence of the methodology used up to that time and proposes a complementary model in order to overcome some of the doubts raised by said author.

Cheng concludes that whilst not being exempt from difficulties of interpretation or inaccuracies in the results finally obtained, the studies of the economic impact of ports carried out using the Input-Output methodology are a very useful tool, both for the social justification of port infrastructures, and the planning by the corresponding authorities.

In any case, this interest in the methodological development of the analysis of the impact of port activity using methodologies based on Input-Output tables, led the American port authority, Maritime Administration MARAD, dependent on the North American Department of Transport, to begin a project for the harmonisation of the analysis methodology, in the second half of the seventies, which culminated in the first version of the **MARAD Port Kit**. This was software especially developed to carry out this type of analysis of the regional impacts of port activity and is currently still being developed in collaboration with *A. Strauss-Wider, Inc. (ASWinc)* and the *Center for Urban Policy Research* (CUPR) of Rutgers University in New Jersey.

This ***MARAD Port Kit*** is a system which integrates most of the basic aspects to be taken into account in an analysis of port activity including everything from the economic quantification of the port activities, both in terms of employment, added value, revenues or taxes, to the evaluation of the economic implications of potential investments or new business lines for the ports, including the analysis of interrelations with the other branches of activity, or the possibility of carrying out simulations of "What if?" hypothetical situations.

The methodology that it uses is based on an Input-Output model which today differentiates between a total of 517 sectors, plus those corresponding to specific port activities, and whose coefficients are based on the Input-Output table of the North American economy for 1992, updated to 1998.

The model is designed so that it can be applied to any port in the United States and uses, in all cases, the same technical coefficients, or multipliers deduced from the aggregated IOT (input-output table).

The regionalisation or localisation of the effects is obtained using regional purchase coefficients, obtained from the proportion of regional demand which it is assumed can be supplied by production from the region itself, and which are used to transform the implied multipliers of the aggregated model.

Despite this effort made by the North American government, this is not a debate which has been completely closed, and new critical references to the impact analysis methodology based on Input-Output tables can be found, as seen in Benacchio and others (2000), which are summarised in Table 1.

Even with all the necessary methodological nuances, it seems that the analysis of the macroeconomic impact of port activity is still a subject of special interest internationally. There is a constant flow of contributions to be found, from the beginnings of these types of applications to current day, as is shown in table 2 below, which has been produced for demonstrative purposes and is not by any means an exhaustive list of all the contributions made.

Table 1. Critical references and methodological contributions to the study of impacts

Authors	References
Waters, R.C. (1977)	"*Port Economic Impact Studies: Practice and Assessment*". Transportation Review. Pages 14-18.
Chang, S. (1978)	"*In Defence of Port Economic Impact Studies*". Transportation Journal. Pages 79-85.
Davis C. H. (1983)	"Regional Port Impact Studies: a critique and suggested methodology", *Transportation Journal*, Vol. 17, 61-71
Yochum G.R., Agarwal V.B. (1987)	"Economic impact of a port on a regional economy", Growth and Change, n.2, 74-87
Randall, J.E. (1988)	"Economic development and non-marine initiatives at American seaports", *Maritime Policy and Management*, Vol. 15, 225-240
Yochum G.R., Agarwal V.B. (1988)	"Static and changing port economic impact", Maritime Policy and Management, Vol.15, 157-171
Warf B., Cox J. (1989)	"The changing economic impacts of the port of New York", in *Maritime Policy and Management*, vol.16, pages 3-11
DeSalvo J., Fuller D. (1994)	"Measuring the direct impacts of a port", *Transportation Journal*, Vol. 33, 33-42
DeSalvo J., Fuller D. (1995)	"The role of price elasticities of Demand in the economic impact of a port", *Review of Regional Studies*, 25, 13-35
Gripaios P., Gripaios R. (1995)	"The impact of a port on its local economy: the case of Plymouth", *Maritime Policy and Management*, Vol. 22, 13-23
Verbeke A., Debisschop K. (1996)	"A Note on the Use of Port Economic Impact Studies for the Evaluation of Large Scale Port Projects", *International Journal of Transport Economics*; 23(3), October 1996, 247-66.
Castro Villaverde J., Millan Coto P. (1998)	"Port economic impact: methodologies and application to the port of Santander", *International Journal of Transport Economics*, Vol. XXV-2, 159-179
Gripaios P. (1999)	"Ports and their influence on local economies - a UK perspective", *The Dock & Harbour Authority* Vol. 79:894, March/April 99
Hoyle, B.S. (1999)	"Scale and sustainability: the role of community groups in Canadian port-city waterfront change", Journal of Transport Geography, vol.7, n.1, pages 65-78
Musso E., Benacchio M., Ferrari C. (1999)	The economic impact of ports on local economies: a technique for employment assessment, in Dombois R., Heseler H. (eds.), *Seaports under the conditions of globalisation and privatisation*, Bremen: Universität
Source: Benacchio, M, Ferrari, C., Haralambides, H.E. and Musso, E. (2000): *"On the Economic Impact of Ports: Local vs. National Costs and Benefits"* INTERNATIONAL WORKSHOP Genoa - June 8-10, 2000. Special Interest Group on Maritime Transport and Ports, a member of the WCTR Society	

The literature on the analysis of the impact of port activity in Spain is slightly more modern than that which we present internationally and the oldest references are from the beginnings of the nineties.

Although some contributions of a methodological type can be found, such as those made by Villaverde, J and Coto, P. (1998)[5], the majority of the studies consulted focus their interest on the estimation of the economic contributions of ports on the local, regional or national economy as a whole.

A large part of the works analysed tend to reproduce, with more or less original contributions, the methodological proposal included in the pioneering work in our country produced by the TEMA Consultancy Group in 1994 and 1995, for the analysis of the economic impact of the ports of Galicia[6]. We could therefore consider this work to be the basic point of reference for the group of applications carried out in our country and which use the Input-Output methodology as a central element of the study.

Table 2. List of international applications of economic impact of ports

Year	Title	Authors
In the United States		
1964	Measuring the impact of the waterborne commerce of the ports of Virginia on employment, wages and other key indices of the Virginia economy, 1953-1962	University of Virginia, Bureau of Population and Economic Research
1979	Port Economic Impact Kit	U.S. Maritime Administration (MARAD), Office of Port and Intermodal Development, Washington DC
1982	The regional Port impact model Handbook (guide for preparing Economic Impact Assessments Using Input-Output Analysis)	Maritime Administration U.S. Department of Transportation
1987	MARAD Port Kit	The Maritime Administration (agency of the U.S)
1989	South Carolina State Ports Authority: Economic Impact Study	South Carolina State Ports Authority
1990	Economic impact of the industry on the New York-New Jersey metropolitan region	The port Authority of New York-New Jersey Office of Business Development.
1991	Port of Halifax Economic impact Study.	Gardner Pinfold Consulting Economists Limited
1995	Economic impact of the industry on the New York-New Jersey metropolitan region	The port Authority of New York-New Jersey Office of Business Development.
2001	The economic impact of the Port of Esperance, 1999/00	Esperance Port Authority
2001	The economic impact of Connecticut's Deepwater Ports: An IMPLAN and REMI Analysis	Connecticut Center for Economic Analysis.
2001	Economic and Fiscal Impact Assessment: Port of Detroit Project.	Patrick L. AndersonIihan K. Geckil.
2002	Economic Evaluation of the Impact of Waterways on the State of Arkansas.	Heather Nachtmann, PhD.
In Europe		
	Economic impact of Dublin Port on its Hinterland 1st draft.	Simon Behan B. Comm.
	The future of the Dutch shipping sector: Economic Impact Study and policy analysis	DR. C. Peeters Drs. K. Debisschop P. Vandendriessche Dr. Ir. N. Wijnolst
1988	Anvers (BE)	
1991	Rouen (France)	
1991	Genova (Italy)	
1993	Dunkirk (France)	
1994	The Flemish Port sector – Economic structure and significance.	Ministry of the Flemish Community. Department of the Environment and Infrastructure.
1995	Nantes/St. Nazaire (FR)	
1995	Ghent (Belgium)	
1995	Bruges (Belgium)	
1996	Value added port of Rotterdam	Netherlands Economisch Instituut
2000	Srima dell'impatto economico ed occupazionale delle attivita´del porto di Genova.	
1996	London	
1996	Southampton (UK)	
1996	Liverpool (UK)	
1989	Plymouth (UK)	
2000	The Economic Contribution of the Port of Cork to the Irish Economy	Moloney, R., W. Sjostrom, and R. Burke The Port of Cork Company

Source: In-house development

As can be seen in table 3, the majority of the applications carried out in our country, concentrated in the second half of the nineties and the last few years, have used this methodology, based on Input-Output tables, in order to determine the economic impact of ports, although there are some references to direct estimations, econometric models or simulation models, as basic or complementary tools of this analysis.

In the aforementioned table 3, the main applications that it has been possible to identify have been included, indicating the year of publication of the study, its title and authors, together with an indication of the methodology used and, if Input-Output methodology has been used, the corresponding table used.

Table 3. Applications carried out in Spanish ports

Year	Title	Authors	Basic methodology	TIO Used
1992	Impact of the port of Santander on the Cantabrian economy.	J. Villaverde and P. Coto	Input-Output	Spain 1989
1992	The port of El Ferrol and its influence on the economy of the region	J.Fraga and J.A.Seijas	Measurement of the direct impacts	
1994	Economic activity and cost structure of the port of La Luz and Las Palmas.	G. de Rus., C. Román and L. Trujillo.	Activity accounting	
1994	Evaluation of the impact of the activity of the ports of Galicia on the economy of the region.	TEMA Consultancy Group.	Input-Output	Galicia 1990 updated to 1992
1995	Evaluation of the impacts of the activity of the ports of Galicia on the national economy.	Tema Consultancy Group.	Input-Output	Galicia 1990 updated to 1992
1995	Study of the economic impact of the Port of Bilbao on the Basque Country.	BILBAO PLAZA MARÍTIMA, S.L.	Input-Output	Basque Country 1990
1995	Study of the economic and social impact of the port of Motril.	TYPSA consultancy group.	Simulation and use of indices	
1996	Economic impact of the expansion of the bay port of Algeciras.	State Ports	Input-Output	Andalusia 1990
1998	Study of the economic impact of the port of Marín in Galicia and the province of Pontevedra in 1996.	BILBAO PLAZA MARÍTIMA, S.L.	Input-Output	Galicia 1990
1999	Analysis of the economic impact of the ports of Barcelona and Tarragona.	Consultrans-centre for economic studies / Tomillo Foundation	Input-Output + Econometric model	Catalonia 1987 updated to 1995
2000	Economic impact of the port of Castellón.	A. Cuadros, J.I Fernández, A.M Fuertes, L. García	Input-Output	Valencia Region 1990, updated to 1997
2000	Port Growth and Regional Development: An application to the Port of Santander.	P. Coto, J L. Gallego and J. Villaverde	Input-Output	Spain 1994 regionalised for Cantabria
2001	Analysis of the economic activity of the port of Seville and its provincial influence.	L.López, J.I. Castillo Man	Input-Output	Andalusia 1990 + localisation quotient
2001	The economic impact of the port of Almería on the Almerian and Andalusian economy.	M. Jaén, F. Fernández J. de Pablo, I. Amate L. Piedra and E. Acien	Input-Output	Andalusia 1995
2002	Study of the evaluation of the impact of the activities of the port of Cartagena on the economy.		Input-Output	Spain 1995
2002	Evaluation of the economic impact of the port of the bay of Cadiz.	J. M. Rey	Input-Output	Andalusia 1995

As can be seen, the applications for the analysis of port activity carried out in our country cover a large part of the Spanish port structure; Thus, of the 54 commercial ports

which are spread across our country, slightly less than half (20 ports) have been the object of analysis in the last few years.

In fact, 17 of the 27 port authorities into which our marine system is structured have carried out, on some occasion, an analysis of the impact of their respective ports on the regional or local economy as a whole. 8 of the 12 autonomous regions and cities which have port installations already therefore have some measurement of the effect of this port activity on their respective economies.

Only the autonomous regions of Asturias and the Balearics, along with the autonomous cities of Ceuta and Melilla, have not been the object of analysis to date.

This interest in the study of the economic impact of port activity in Spain is still alive today, to the extent that the State Port Authority itself, just as the American administration did in its time, has made an effort to standardise this type of analysis by producing a Guide for the Evaluation of the Economic Impact of Ports, produced together with the consultancy company TYPSA, and the direct participation of the authors of this article has been used as the basis for it to be written.

From the review of all the studies carried out, both national and international, we can draw some basic conclusions which we have used to develop our alternative proposal for the analysis of the macroeconomic impact of ports, which we can specify in the following points:

- The methodology based on Input-Output tables, with all the nuances related to their limited dynamism or the excessively simplistic scenarios with which certain aspects of the analysis are approached, seems to be the most appropriate for carrying out the studies of the economic impact of ports.
- The majority of the studies make clear the time limitation involved when working with tools, such as the Input-Output tables, which have, in general, a fairly significant time lag (the most common situation is to have an Input-Output table available around five years after the period to which it refers). On most occasions it is therefore necessary to carry out a process to update these tables in order to bring them into line, in terms of time, with the period in which the investigation or direct evaluation of the port activity is being carried out.
- In the same way, the different studies carried out underline the problem of the spatial assignment of the effects induced by port activity, and it is necessary to construct Input-Output tables which are specific to the geographical area referred to, usually regions. These regional tables have the special characteristic of differentiating the interior sector and the sector of the region referred to from the rest of the national territory, and from the rest of the world, so that all the direct, indirect and induced effects can be located within the region itself or in the rest of the national territory, this being understood as a total aggregate, without it generally being possible to differentiate the specific effects in the rest of the regions.

- Likewise, from the analysis of the different works consulted it seems a process of action can be deduced, fairly well divided, which would start from the need to disaggregate and specifically identify the port activity within table I-O, which, in most cases, is not strictly considered, and for which specific field work is carried out that enables the main cost components of the companies linked to the port activity to be differentiated (IOT columns), as well as the main clients of these companies or users of the services linked to the port activity (IOT Rows).
- In addition, it is important to consider the so-called induced effects or effects of the income generated as a consequence of the port activity. In this sense, if we analyse the different calculations made in the different studies we can see that there are two alternative ways in which port activity ends up affecting the economic system as a whole, and which we could respectively call direct transactions and induced transactions. In the first group we would include the operations which are originated directly by the agents included in the aggregate of port activity, which would include both the purchases of normal goods and services, and the investments made by these agents and would generate what we have called direct effects. On the other hand, the second type of transactions would be those which are generated as a consequence of income resulting from this direct activity, and which would correspond to what we have called induced effects.

In view of these basic features identified in the main studies consulted on the analysis of the macroeconomic impact of ports, we have designed our alternative proposal for the determination of these impacts which is based on the construction and use of a Multi-regional Multi-sector Input-Output Table (IOT-RS) whose basic features are outlined below.

3. PROPOSAL FOR THE CONSTRUCTION OF A MULTI-REGIONAL MULTI-SECTORIAL TABLE.

Indeed, as can be deduced from the bibliographical review undertaken, carrying out an adequate analysis of the impact of port activity must necessarily include the availability of an Input-Output table adapted to both the geographical area and the time at which the analysis is intended to be carried out.

However, we consider establishing the analysis of port activity behaviour, even if it differentiates different activities, to be a short-sighted view, particularly from an aggregated perspective, and all the more so if this methodology is intended to be applied to regionally specific and localised port structures, which would be expected to have a specific structure as regards the different services on offer.

Moreover, this structure for the services on offer will not only be conditioned by the sectorial composition of its regional economy, or by the economic development of the area, (an analysis which could be established by developing, updating or generating the corresponding regional IOT), but it's higher or lower level of specialisation, efficiency, quality, etc., allows it the possibility of gaining new market shares in inter-regional and international trade. That is to say, the differential growth of the sector, whichever it may be, in any region can and must affect the port activity which is being analysed in each case.

It is precisely this second element which invites an innovative methodological approach such as the one we propose, through which it is intended to generate a sectorised regional macro Input-Output table, derived from the latest available national table, produced with direct information (1995), which incorporates the information on the production structure included in the different available regional IOT's, consistent with the information on Regional Accounting and includes the estimation of the flows of trade between the different regions and sectors.

In a first approximation, and considering the current availability of regional information, a regional-sectorised IOT could be considered which would include 26 branches of activity, prior to the differentiation of port activity, and 19 regions, corresponding to the 17 Autonomous Regions, plus the aggregate of the two extra-peninsular autonomous cities (Ceuta and Melilla), and non-regionalised public activities (Extra-Regio), following the usual Regional Accounting structure of the INE (National Statistics Institute), and which maintains the classic concept of row and column symmetry, as this format facilitates the development of the classic applications of the Input-Output methodology.

In accordance with this proposal, our matrix will be composed of the usual three sub-matrices of intermediate consumption, primary inputs and final demand, each one of them having the classic characteristics of the Input-Output structure.

The most obvious advantage of this procedure, compared to others where only the table for the region where the port which is intended to be analysed is located is used, rests on the possibility of simulating impacts on the growth of other regions and/or sectors which are unconnected, or at least remote from the main activity of the port which is the object of the study, where it is possible not only to analyse the incidence of a change in port activity from the demand perspective, but also when this is a consequence of induced growth in any region or sector of the Spanish economy.

In summary, the methodology used has a clearly applied and fundamentally general use, in the sense that it is valid for it to be applied in any point of our national territory, with any of the analyses which the Input-Output methodology establishes (links, direct, indirect and induced effects) being obtained as output.

Below we move on to briefly describe the content and structure of each one of the sub-matrices which would make up this new IOT-RS.

Intermediate inputs matrix

Matrix with S x R columns and S x (R+1) rows, with S being the total number of sectors considered 27 and R the total of regions 19, given that to the 17 Autonomous Regions is added an aggregate of the extra-peninsular autonomous cities, Ceuta and Melilla, and another for non-sectorised public activities (Extra-Regio) following the usual Regional Accounting structure of the INE.

The fact that one more row is included would make it necessary to incorporate the imported inputs for each region and sector.

In this way each cell of the intermediate consumption matrix of the national IOT which is taken as a point of reference would be disaggregated into 19 columns, one for each region considered, and 20 rows, adding to the 19 regions the row corresponding to the intermediate consumption imported for each region.

Within each of these expanded cells, and considering each of the columns (regions), the main diagonal would be made up of the interior intermediate consumption of each of the regional IOT's, the imports row would be the one corresponding to consumption imported from the rest of the world in the regional tables, and the total of the rest of regions would be that equivalent to the consumption imported from the rest of the national territory.

Taking 4 regions and 5 sectors as an example, the intermediate consumption matrix proposed would be formed as is shown in table 4, its characteristic element being of the type:

$$a_{sr,sr}$$

Where **s** and **r** represent respectively the sectors and regions considered

Table 4. SIntermediate Inputs Matrix

Sectors / Regions	1 1	1 2	1 3	1 4	2 1	2 2	2 3	2 4	3 1	3 2	3 3	3 4	4 1	4 2	4 3	4 4	5 1	5 2	5 3	5 4
1.1	$A_{11.11}$	$a_{12.11}$	$a_{13.11}$	$a_{14.11}$	$a_{21.11}$	$a_{22.11}$	$a_{23.11}$	$A_{24.11}$	$a_{31.11}$	$a_{32.11}$	$a_{33.11}$	$a_{34.11}$	$a_{41.11}$	$a_{42.11}$	$a_{43.11}$	$a_{44.11}$	$a_{51.11}$	$a_{52.11}$	$a_{53.11}$	$a_{54.11}$
1.2	$A_{11.12}$	$a_{12.12}$	$a_{13.12}$	$a_{14.12}$	$a_{21.12}$	$a_{22.12}$	$a_{23.12}$	$A_{24.12}$	$a_{31.12}$	$a_{32.12}$	$a_{33.12}$	$a_{34.12}$	$a_{41.12}$	$a_{42.12}$	$a_{43.12}$	$a_{44.12}$	$a_{51.12}$	$a_{52.12}$	$a_{53.12}$	$a_{54.12}$
1.3	$A_{11.13}$	$a_{12.13}$	$a_{13.13}$	$a_{14.13}$	$a_{21.13}$	$a_{22.13}$	$a_{23.13}$	$A_{24.13}$	$a_{31.13}$	$a_{32.13}$	$a_{33.13}$	$a_{34.13}$	$a_{41.13}$	$a_{42.13}$	$a_{43.13}$	$a_{44.13}$	$a_{51.13}$	$a_{52.13}$	$a_{53.13}$	$a_{54.13}$
1.4	$A_{11.14}$	$a_{12.14}$	$a_{13.14}$	$a_{14.14}$	$a_{21.14}$	$a_{22.14}$	$a_{23.14}$	$A_{24.14}$	$a_{31.14}$	$a_{32.14}$	$a_{33.14}$	$a_{34.14}$	$a_{41.14}$	$a_{42.14}$	$a_{43.14}$	$a_{44.14}$	$a_{51.14}$	$a_{52.14}$	$a_{53.14}$	$a_{54.14}$
1.m	$A_{11.1m}$	$a_{12.1m}$	$a_{13.1m}$	$a_{14.1m}$	$a_{21.1m}$	$a_{22.1m}$	$a_{23.1m}$	$A_{24.1m}$	$a_{31.1m}$	$a_{32.1m}$	$a_{33.1m}$	$a_{34.1m}$	$a_{41.1m}$	$a_{42.1m}$	$a_{43.1m}$	$a_{44.1m}$	$a_{51.1m}$	$a_{52.1m}$	$a_{53.1m}$	$a_{54.1m}$
2.1	$A_{11.21}$	$a_{12.21}$	$a_{13.21}$	$a_{14.21}$	$a_{21.21}$	$a_{22.21}$	$a_{23.21}$	$A_{24.21}$	$a_{31.21}$	$a_{32.21}$	$a_{33.21}$	$a_{34.21}$	$a_{41.21}$	$a_{42.21}$	$a_{43.21}$	$a_{44.21}$	$a_{51.21}$	$a_{52.21}$	$a_{53.21}$	$a_{54.21}$
2.2	$A_{11.22}$	$a_{12.22}$	$a_{13.22}$	$a_{14.22}$	$a_{21.22}$	$a_{22.22}$	$a_{23.22}$	$A_{24.22}$	$a_{31.22}$	$a_{32.22}$	$a_{33.22}$	$a_{34.22}$	$a_{41.22}$	$a_{42.22}$	$a_{43.22}$	$a_{44.22}$	$a_{51.22}$	$a_{52.22}$	$a_{53.22}$	$a_{54.22}$
2.3	$A_{11.23}$	$a_{12.23}$	$a_{13.23}$	$a_{14.23}$	$a_{21.23}$	$a_{22.23}$	$a_{23.23}$	$A_{24.23}$	$a_{31.23}$	$a_{32.23}$	$a_{33.23}$	$a_{34.23}$	$a_{41.23}$	$a_{42.23}$	$a_{43.23}$	$a_{44.23}$	$a_{51.23}$	$a_{52.23}$	$a_{53.23}$	$a_{54.23}$
2.4	$A_{11.24}$	$a_{12.24}$	$a_{13.24}$	$a_{14.24}$	$a_{21.24}$	$a_{22.24}$	$a_{23.24}$	$A_{24.24}$	$a_{31.24}$	$a_{32.24}$	$a_{33.24}$	$a_{34.24}$	$a_{41.24}$	$a_{42.24}$	$a_{43.24}$	$a_{44.24}$	$a_{51.24}$	$a_{52.24}$	$a_{53.24}$	$a_{54.24}$
2.m	$A_{11.2m}$	$a_{12.2m}$	$a_{13.2m}$	$a_{14.2m}$	$a_{21.2m}$	$a_{22.2m}$	$a_{23.2m}$	$A_{24.2m}$	$a_{31.2m}$	$a_{32.2m}$	$a_{33.2m}$	$a_{34.2m}$	$a_{41.2m}$	$a_{42.2m}$	$a_{43.2m}$	$a_{44.2m}$	$a_{51.2m}$	$a_{52.2m}$	$a_{53.2m}$	$a_{54.2m}$
3.1	$A_{11.31}$	$a_{12.31}$	$a_{13.31}$	$a_{14.31}$	$a_{21.31}$	$a_{22.31}$	$a_{23.31}$	$A_{24.31}$	$a_{31.31}$	$a_{32.31}$	$a_{33.31}$	$a_{34.31}$	$a_{41.31}$	$a_{42.31}$	$a_{43.31}$	$a_{44.31}$	$a_{51.31}$	$a_{52.31}$	$a_{53.31}$	$a_{54.31}$
3.2	$A_{11.32}$	$a_{12.32}$	$a_{13.32}$	$a_{14.32}$	$a_{21.32}$	$a_{22.32}$	$a_{23.32}$	$A_{24.32}$	$a_{31.32}$	$a_{32.32}$	$a_{33.32}$	$a_{34.32}$	$a_{41.32}$	$a_{42.32}$	$a_{43.32}$	$a_{44.32}$	$a_{51.32}$	$a_{52.32}$	$a_{53.32}$	$a_{54.32}$
3.3	$A_{11.33}$	$a_{12.33}$	$a_{13.33}$	$a_{14.33}$	$a_{21.33}$	$a_{22.33}$	$a_{23.33}$	$A_{24.33}$	$a_{31.33}$	$a_{32.33}$	$a_{33.33}$	$a_{34.33}$	$a_{41.33}$	$a_{42.33}$	$a_{43.33}$	$a_{44.33}$	$a_{51.33}$	$a_{52.33}$	$a_{53.33}$	$a_{54.33}$
3.4	$A_{11.34}$	$a_{12.34}$	$a_{13.34}$	$a_{14.34}$	$a_{21.34}$	$a_{22.34}$	$a_{23.34}$	$A_{24.34}$	$a_{31.34}$	$a_{32.34}$	$a_{33.34}$	$a_{34.34}$	$a_{41.34}$	$a_{42.34}$	$a_{43.34}$	$a_{44.34}$	$a_{51.34}$	$a_{52.34}$	$a_{53.34}$	$a_{54.34}$
3.m	$A_{11.3m}$	$a_{12.3m}$	$a_{13.3m}$	$a_{14.3m}$	$a_{21.3m}$	$a_{22.3m}$	$a_{23.3m}$	$A_{24.3m}$	$a_{31.3m}$	$a_{32.3m}$	$a_{33.3m}$	$a_{34.3m}$	$a_{41.3m}$	$a_{42.3m}$	$a_{43.3m}$	$a_{44.3m}$	$a_{51.3m}$	$a_{52.3m}$	$a_{53.3m}$	$a_{54.3m}$
4.1	$A_{11.41}$	$a_{12.41}$	$a_{13.41}$	$a_{14.41}$	$a_{21.41}$	$a_{22.41}$	$a_{23.41}$	$A_{24.41}$	$a_{31.41}$	$a_{32.41}$	$a_{33.41}$	$a_{34.41}$	$a_{41.41}$	$a_{42.41}$	$a_{43.41}$	$a_{44.41}$	$a_{51.41}$	$a_{52.41}$	$a_{53.41}$	$a_{54.41}$
4.2	$A_{11.42}$	$a_{12.42}$	$a_{13.42}$	$a_{14.42}$	$a_{21.42}$	$a_{22.42}$	$a_{23.42}$	$A_{24.42}$	$a_{31.42}$	$a_{32.42}$	$a_{33.42}$	$a_{34.42}$	$a_{41.42}$	$a_{42.42}$	$a_{43.42}$	$a_{44.42}$	$a_{51.42}$	$a_{52.42}$	$a_{53.42}$	$a_{54.42}$
4.3	$A_{11.43}$	$a_{12.43}$	$a_{13.43}$	$a_{14.43}$	$a_{21.43}$	$a_{22.43}$	$a_{23.43}$	$A_{24.43}$	$a_{31.43}$	$a_{32.43}$	$a_{33.43}$	$a_{34.43}$	$a_{41.43}$	$a_{42.43}$	$a_{43.43}$	$a_{44.43}$	$a_{51.43}$	$a_{52.43}$	$a_{53.43}$	$a_{54.43}$
4.4	$A_{11.44}$	$a_{12.44}$	$a_{13.44}$	$a_{14.44}$	$a_{21.44}$	$a_{22.44}$	$a_{23.44}$	$A_{24.44}$	$a_{31.44}$	$a_{32.44}$	$a_{33.44}$	$a_{34.44}$	$a_{41.44}$	$a_{42.44}$	$a_{43.44}$	$a_{44.44}$	$a_{51.44}$	$a_{52.44}$	$a_{53.44}$	$a_{54.44}$
4.m	$A_{11.4m}$	$a_{12.4m}$	$a_{13.4m}$	$a_{14.4m}$	$a_{21.4m}$	$a_{22.4m}$	$a_{23.4m}$	$A_{24.4m}$	$a_{31.4m}$	$a_{32.4m}$	$a_{33.4m}$	$a_{34.4m}$	$a_{41.4m}$	$a_{42.4m}$	$a_{43.4m}$	$a_{44.4m}$	$a_{51.4m}$	$a_{52.4m}$	$a_{53.4m}$	$a_{54.4m}$
5.1	$A_{11.51}$	$a_{12.51}$	$a_{13.51}$	$a_{14.51}$	$a_{21.51}$	$a_{22.51}$	$a_{23.51}$	$A_{24.51}$	$a_{31.51}$	$a_{32.51}$	$a_{33.51}$	$a_{34.51}$	$a_{41.51}$	$a_{42.51}$	$a_{43.51}$	$a_{44.51}$	$a_{51.51}$	$a_{52.51}$	$a_{53.51}$	$a_{54.51}$
5.2	$A_{11.52}$	$a_{12.52}$	$a_{13.52}$	$a_{14.52}$	$a_{21.52}$	$a_{22.52}$	$a_{23.52}$	$A_{24.52}$	$a_{31.52}$	$a_{32.52}$	$a_{33.52}$	$a_{34.52}$	$a_{41.52}$	$a_{42.52}$	$a_{43.52}$	$a_{44.52}$	$a_{51.52}$	$a_{52.52}$	$a_{53.52}$	$a_{54.52}$
5.3	$A_{11.53}$	$a_{12.53}$	$a_{13.53}$	$a_{14.53}$	$a_{21.53}$	$a_{22.53}$	$a_{23.53}$	$A_{24.53}$	$a_{31.53}$	$a_{32.53}$	$a_{33.53}$	$a_{34.53}$	$a_{41.53}$	$a_{42.53}$	$a_{43.53}$	$a_{44.53}$	$a_{51.53}$	$a_{52.53}$	$a_{53.53}$	$a_{54.53}$
5.4	$A_{11.54}$	$a_{12.54}$	$a_{13.54}$	$a_{14.54}$	$a_{21.54}$	$a_{22.54}$	$a_{23.54}$	$A_{24.54}$	$a_{31.54}$	$a_{32.54}$	$a_{33.54}$	$a_{34.54}$	$a_{41.54}$	$a_{42.54}$	$a_{43.54}$	$a_{44.54}$	$a_{51.54}$	$a_{52.54}$	$a_{53.54}$	$a_{54.54}$
5.m	$A_{11.5m}$	$a_{12.5m}$	$a_{13.5m}$	$a_{14.5m}$	$a_{21.5m}$	$a_{22.5m}$	$a_{23.5m}$	$A_{24.5m}$	$a_{31.5m}$	$a_{32.5m}$	$a_{33.5m}$	$a_{34.5m}$	$a_{41.5m}$	$a_{42.5m}$	$a_{43.5m}$	$a_{44.5m}$	$a_{51.5m}$	$a_{52.5m}$	$a_{53.5m}$	$a_{54.5m}$

Primary Inputs Matrix

Matrix with S x R (27 x 19) columns in which both the rows and the elements are intended to differentiate in the primary input matrix. (Initially only the main elements, production, added value and equivalent imports were disaggregated)

Thus, starting from the national IOT each one of the columns in 19 Regions is disaggregated, where the only difference with the national tables is the disaggregation of the row of imports between a row of imports from the rest of the world, which would be equivalent to the national one, and a row of imports from the rest of the national territory, which would include the total flows of inter-regional trade.

This matrix thus defined, again using the simplification of 5 sectors and 4 regions would be formed, in a minimum specification, as is shown in table 5:

Table 5. Primary Inputs Matrix

Sectors / Regions	1 1	1 2	1 3	1 4	2 1	2 2	2 3	2 4	3 1	3 2	3 3	3 4	4 1	4 2	4 3	4 4	5 1	5 2	5 3	5 4
Int. Growth Rate	TCI_{11}	TCI_{12}	TCI_{13}	TCI_{14}	TCI_{21}	TCI_{22}	TCI_{23}	TCI_{24}	TCI_{31}	TCI_{32}	TCI_{33}	TCI_{34}	TCI_{41}	TCI_{42}	TCI_{43}	TCI_{44}	TCI_{51}	TCI_{52}	TCI_{53}	TCI_{54}
VAT	IVA_{11}	IVA_{12}	IVA_{13}	IVA_{14}	IVA_{21}	IVA_{22}	IVA_{23}	IVA_{24}	IVA_{31}	IVA_{32}	IVA_{33}	IVA_{34}	IVA_{41}	IVA_{42}	IVA_{43}	IVA_{44}	IVA_{51}	IVA_{52}	IVA_{53}	IVA_{54}
Net Imports	IN_{11}	IN_{12}	IN_{13}	IN_{14}	IN_{21}	IN_{22}	IN_{23}	IN_{24}	IN_{31}	IN_{32}	IN_{33}	IN_{34}	IN_{41}	IN_{42}	IN_{43}	IN_{44}	IN_{51}	IN_{52}	IN_{53}	IN_{54}
S.Salaries	SS_{11}	SS_{12}	SS_{13}	SS_{14}	SS_{21}	SS_{22}	SS_{23}	SS_{24}	SS_{31}	SS_{32}	SS_{33}	SS_{34}	SS_{41}	SS_{42}	SS_{43}	SS_{44}	SS_{51}	SS_{52}	SS_{53}	SS_{54}
E.B.E. (Gross Operating Surplus)	EBE_{11}	EBE_{12}	EBE_{13}	EBE_{14}	EBE_{21}	EBE_{22}	EBE_{23}	EBE_{24}	EBE_{31}	EBE_{32}	EBE_{33}	EBE_{34}	EBE_{41}	EBE_{42}	EBE_{43}	EBE_{44}	EBE_{51}	EBE_{52}	EBE_{53}	EBE_{54}
VAB. (Gross Value Added)	VA_{11}	VA_{12}	VA_{13}	VA_{14}	VA_{21}	VA_{22}	VA_{23}	VA_{24}	VA_{31}	VA_{32}	VA_{33}	VA_{34}	VA_{41}	VA_{42}	VA_{43}	VA_{44}	VA_{51}	VA_{52}	VA_{53}	VA_{54}
Effective Production	PE_{11}	PE_{12}	PE_{13}	PE_{14}	PE_{21}	PE_{22}	PE_{23}	PE_{24}	PE_{31}	PE_{32}	PE_{33}	PE_{34}	PE_{41}	PE_{42}	PE_{43}	PE_{44}	PE_{51}	PE_{52}	PE_{53}	PE_{54}
Total Imp.	MT_{11}	MT_{12}	MT_{13}	MT_{14}	MT_{21}	MT_{22}	MT_{23}	MT_{24}	MT_{31}	MT_{32}	MT_{33}	MT_{34}	MT_{41}	MT_{42}	MT_{43}	MT_{44}	MT_{51}	MT_{52}	MT_{53}	MT_{54}
Exter. Imp.	ME_{11}	ME_{12}	ME_{13}	ME_{14}	ME_{21}	ME_{22}	ME_{23}	ME_{24}	ME_{31}	ME_{32}	ME_{33}	ME_{34}	ME_{41}	ME_{42}	ME_{43}	ME_{44}	ME_{51}	ME_{52}	ME_{53}	ME_{54}
Nat. Imp.	MN_{11}	MN_{12}	MN_{13}	MN_{14}	MN_{21}	MN_{22}	MN_{23}	MN_{24}	MN_{31}	MN_{32}	MN_{33}	MN_{34}	MN_{41}	MN_{42}	MN_{43}	MN_{44}	MN_{51}	MN_{52}	MN_{53}	MN_{54}
T. Inputs	TE_{11}	TE_{12}	TE_{13}	TE_{14}	TE_{21}	TE_{22}	TE_{23}	TE_{24}	TE_{31}	TE_{32}	TE_{33}	TE_{34}	TE_{41}	TE_{42}	TE_{43}	TE_{44}	TE_{51}	TE_{52}	TE_{53}	TE_{54}

Final Demand Matrix

The final demand matrix has dimensions of S*S x (R+1) rows (23^2 x 20) and D x R columns, with D being the number of differentiated components of the final demand, which were initially the Households and IPSFL's (Non-profit-making organisations) Expenditures, the Final Expenditures of the Public Administrations, the Gross Fixed Capital Formation, the Change in Inventories and the Exports to the rest of the world.

The rows would be the same as those for the intermediate inputs matrix, whilst the columns would be the result of regionally disaggregating each of the columns of the national IOT.

Following this proposal, each cell of the national IOT would be disaggregated into a new expanded cell where each column would include the value of the final demand component of each region which is acquired in each of the regions included in the different rows or in the additional row corresponding to the imports from the rest of the world.

The exports column would not have to be regionally disaggregated as it would only include the values exported to the rest of the world, as the inter-regional exports would be included in the rest of the final demand matrix and in the intermediate consumption matrix.

Using the simplified example, the final demand matrix would end up as is shown in table 6.

Table 6. Final Demand Matrix

Components	Households Expen.				Public Administrations Expenditures				Total Investment				Exp.	Total Outputs
Regions	1	2	3	4	1	2	3	4	1	2	3	4		
1.1	$C1_{11}$	$C2_{11}$	$C3_{11}$	$C4_{11}$	$G1_{11}$	$G2_{11}$	$G3_{11}$	$G4_{11}$	$I1_{11}$	$I2_{11}$	$I3_{11}$	$I4_{11}$	X_{11}	TE11
1.2	$C1_{12}$	$C2_{12}$	$C3_{12}$	$C4_{12}$	$G1_{12}$	$G2_{12}$	$G3_{12}$	$G4_{12}$	$I1_{12}$	$I2_{12}$	$I3_{12}$	$I4_{12}$	X_{12}	TE12
1.3	$C1_{13}$	$C2_{13}$	$C3_{13}$	$C4_{13}$	$G1_{13}$	$G2_{13}$	$G3_{13}$	$G4_{13}$	$I1_{13}$	$I2_{13}$	$I3_{13}$	$I4_{13}$	X_{13}	TE13
1.4	$C1_{14}$	$C2_{14}$	$C3_{14}$	$C4_{14}$	$G1_{14}$	$G2_{14}$	$G3_{14}$	$G4_{14}$	$I1_{14}$	$I2_{14}$	$I3_{14}$	$I4_{14}$	X_{14}	TE14
1.m	$C1_{1M}$	$C2_{1m}$	$C3_{1m}$	$C4_{1m}$	$G1_{1m}$	$G2_{1m}$	$G3_{1m}$	$G4_{1m}$	$I1_{1m}$	$I2_{1m}$	$I3_{1m}$	$I4_{1m}$	X_{1m}	TE1m
2.1	$C1_{21}$	$C2_{21}$	$C3_{21}$	$C4_{21}$	$G1_{21}$	$G2_{21}$	$G3_{21}$	$G4_{21}$	$I1_{21}$	$I2_{21}$	$I3_{21}$	$I4_{21}$	X_{21}	TE21
2.2	$C1_{22}$	$C2_{22}$	$C3_{22}$	$C4_{22}$	$G1_{22}$	$G2_{22}$	$G3_{22}$	$G4_{22}$	$I1_{22}$	$I2_{22}$	$I3_{22}$	$I4_{22}$	X_{22}	TE22
2.3	$C1_{23}$	$C2_{23}$	$C3_{23}$	$C4_{23}$	$G1_{23}$	$G2_{23}$	$G3_{23}$	$G4_{23}$	$I1_{23}$	$I2_{23}$	$I3_{23}$	$I4_{23}$	X_{23}	TE23
2.4	$C1_{24}$	$C2_{24}$	$C3_{24}$	$C4_{24}$	$G1_{24}$	$G2_{24}$	$G3_{24}$	$G4_{24}$	$I1_{24}$	$I2_{24}$	$I3_{24}$	$I4_{24}$	X_{24}	TE24
2.m	$C1_{2M}$	$C2_{2m}$	$C3_{2m}$	$C4_{2m}$	$G1_{2m}$	$G2_{2m}$	$G3_{2m}$	$G4_{2m}$	$I1_{2m}$	$I2_{2m}$	$I3_{2m}$	$I4_{2m}$	X_{2m}	TE2m
3.1	$C1_{31}$	$C2_{31}$	$C3_{31}$	$C4_{31}$	$G1_{31}$	$G2_{31}$	$G3_{31}$	$G4_{31}$	$I1_{31}$	$I2_{31}$	$I3_{31}$	$I4_{31}$	X_{31}	TE31
3.2	$C1_{32}$	$C2_{32}$	$C3_{32}$	$C4_{32}$	$G1_{32}$	$G2_{32}$	$G3_{32}$	$G4_{32}$	$I1_{32}$	$I2_{32}$	$I3_{32}$	$I4_{32}$	X_{32}	TE32
3.3	$C1_{33}$	$C2_{33}$	$C3_{33}$	$C4_{33}$	$G1_{33}$	$G2_{33}$	$G3_{33}$	$G4_{33}$	$I1_{33}$	$I2_{33}$	$I3_{33}$	$I4_{33}$	X_{33}	TE33
3.4	$C1_{34}$	$C2_{34}$	$C3_{34}$	$C4_{34}$	$G1_{34}$	$G2_{34}$	$G3_{34}$	$G4_{34}$	$I1_{34}$	$I2_{34}$	$I3_{34}$	$I4_{34}$	X_{34}	TE34
3.m	$C1_{3M}$	$C2_{3m}$	$C3_{3m}$	$C4_{3m}$	$G1_{3m}$	$G2_{3m}$	$G3_{3m}$	$G4_{3m}$	$I1_{3m}$	$I2_{3m}$	$I3_{3m}$	$I4_{3m}$	X_{3m}	TE3m
4.1	$C1_{41}$	$C2_{41}$	$C3_{41}$	$C4_{41}$	$G1_{41}$	$G2_{41}$	$G3_{41}$	$G4_{41}$	$I1_{41}$	$I2_{41}$	$I3_{41}$	$I4_{41}$	X_{41}	TE41
4.2	$C1_{42}$	$C2_{42}$	$C3_{42}$	$C4_{42}$	$G1_{42}$	$G2_{42}$	$G3_{42}$	$G4_{42}$	$I1_{42}$	$I2_{42}$	$I3_{42}$	$I4_{42}$	X_{42}	TE42
4.3	$C1_{43}$	$C2_{43}$	$C3_{43}$	$C4_{43}$	$G1_{43}$	$G2_{43}$	$G3_{43}$	$G4_{43}$	$I1_{43}$	$I2_{43}$	$I3_{43}$	$I4_{43}$	X_{43}	TE43
4.4	$C1_{44}$	$C2_{44}$	$C3_{44}$	$C4_{44}$	$G1_{44}$	$G2_{44}$	$G3_{44}$	$G4_{44}$	$I1_{44}$	$I2_{44}$	$I3_{44}$	$I4_{44}$	X_{44}	TE44
4.m	$C1_{4M}$	$C2_{4m}$	$C3_{4m}$	$C4_{4m}$	$G1_{4m}$	$G2_{4m}$	$G3_{4m}$	$G4_{4m}$	$I1_{4m}$	$I2_{4m}$	$I3_{4m}$	$I4_{4m}$	X_{4m}	TE4m
5.1	$C1_{51}$	$C2_{51}$	$C3_{51}$	$C4_{51}$	$G1_{51}$	$G2_{51}$	$G3_{51}$	$G4_{51}$	$I1_{51}$	$I2_{51}$	$I3_{51}$	$I4_{51}$	X_{51}	TE51
5.2	$C1_{52}$	$C2_{52}$	$C3_{52}$	$C4_{52}$	$G1_{52}$	$G2_{52}$	$G3_{52}$	$G4_{52}$	$I1_{52}$	$I2_{52}$	$I3_{52}$	$I4_{52}$	X_{52}	TE52
5.3	$C1_{53}$	$C2_{53}$	$C3_{53}$	$C4_{53}$	$G1_{53}$	$G2_{53}$	$G3_{53}$	$G4_{53}$	$I1_{53}$	$I2_{53}$	$I3_{53}$	$I4_{53}$	X_{53}	TE53
5.4	$C1_{54}$	$C2_{54}$	$C3_{54}$	$C4_{54}$	$G1_{54}$	$G2_{54}$	$G3_{54}$	$G4_{54}$	$I1_{54}$	$I2_{54}$	$I3_{54}$	$I4_{54}$	X_{54}	TE54
5.m	$C1_{5M}$	$C2_{5m}$	$C3_{5m}$	$C4_{5m}$	$G1_{5m}$	$G2_{5m}$	$G3_{5m}$	$G4_{5m}$	$I1_{5m}$	$I2_{5m}$	$I3_{5m}$	$I4_{5m}$	X_{5m}	TE5m

Although the specific details for the estimation and updating of these types of tables by far exceed the objectives and limitations of this article, we can say that these tables have been estimated for the year 1995 and updated to 2002. They are based on the official information available, and specific analyses of port activity impact have already been carried out for the ports of Vigo and Pasajes, and will appear in the above mentioned Guide for the Evaluation of the Economic Impact of Ports, which will be published shortly by the State Public Ports Authority.

We would not wish to end this section of the presentation of our methodological proposal without making it clear that against its advantages as regards the regionalisation of effects compared to other alternative proposals, the main disadvantage of this procedure is the need to have much more detailed direct information available, which differentiates, both regionally and sectorially, the supplier and client structure of the different agents included in the so-called port activity

4. SUMMARY AND MAIN CONCLUSIONS

In this article a review of the national and international literature dedicated to the study of the economic impact of ports has been carried out, and it has been seen that the applications which use the methodology based on Input-Output tables are those which enjoy greater popularity and application.

However, these applications are not free from either methodological or application difficulties, as their fundamental basis, the Input-Output tables, are not always available with the disaggregation and updating required by these types of studies of the macroeconomic impact of port activity.

Against these limitations, it is proposed that new Input-Output tables be used, which include both regional and sectorial disaggregation, and may be updated using indirect processes, and on which the classic analyses of the impact of port activity derived from the Input-Output methodology can be carried out, with the regional dimension being directly incorporated.

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[1] A basic review of these types of methodologies can be found in Pulido, A. and E. Fontela (1993)

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EL IMPACTO MACROECONÓMICO DE LOS PUERTOS: REVISIÓN DE LA LITERATURA Y PROPUESTA ALTERNATIVA.

RESUMEN

En el presente artículo se realiza una revisión de las diferentes alternativas que han ido recogiendo en la literatura aplicada para el análisis del impacto económico de la actividad portuaria, detectándose las principales ventajas e inconvenientes de cada una de ellas y comprobándose que la aplicaciones basadas en tablas Input-Ouput son, con diferencia, las mas utilizadas tanto a nivel nacional como internacional.

A la luz de esta revisión realizada se propone un procedimiento alternativo que, recogiendo las principales ventajas de la metodología input-output, permita la aplicación sistemática a todas las regiones españolas y la ubicación regional de los diferentes impactos, tanto directos, como indirectos e inducidos.

Palabras clave: Tablas Input-Output, Impacto económico de los puertos, Regionalización.

RESUMEN Y CONCLUSIONES

En el presente articulo se ha realizado una revisión de la literatura, tanto nacional como internacional dedicada al estudio del impacto económico de los puertos, pudiendo comprobarse que las aplicaciones que utilizan la metodología basada en tablas Input-Output, son las que gozan de una mayor popularidad y aplicación.

No obstante dichas aplicaciones no están exentas de dificultades, tanto metodológicas como de aplicación, ya que su base fundamental, las Tablas Input-Output, no siempre están disponibles con la desagregación y actualización que precisan este tipo de estudios del impacto macroeconómico de la actividad portuaria.

Frente a estas limitaciones, se propone la utilización de unas nuevas Tablas Input-Output, que recojan una desagregación tanto regional como sectorial, que pueden ser actualizadas mediante procedimientos indirectos, y sobre las que elaborar los análisis clásicos de impacto de la actividad portuaria derivados de la metodología Input-Output e incorporando de forma directa la dimensión regional de los mismos.

De la revisión de todos estos estudios realizados, tanto nivel nacional como internacional, podemos deducir algunas líneas básicas que nos han servido para desarrollar nuestra propuesta alternativa para el análisis del impacto macroeconómico de los puertos y que podemos concretar en los siguientes puntos:

- La metodología basada en Tablas Input-Output, con todos los matices relativos a su escasa dinamicidad o los supuestos excesivamente simplistas con los que se abordan determinados aspectos del análisis parece ser la más adecuada para la realización de los estudios del impacto económico de los puertos.
- La mayoría de los estudios ponen de manifiesto la limitación temporal que supone el hecho de trabajar con unas herramientas, como son las Tablas Input-Output, que presentan, en general, un desfase temporal bastante significativo (lo más frecuente es disponer de una tabla Input-Output unos cinco años después de su periodo de referencia), por lo que, en la mayoría de las ocasiones es necesario realizar un proceso de actualización de dichas tablas para homologarlas temporalmente al periodo en el que se realiza la investigación o valoración directa de la actividad portuaria.
- En el mismo sentido, los diferentes estudios realizados ponen de relieve la problemática de la asignación espacial de los efectos inducidos por la actividad portuaria, siendo necesaria la construcción de Tablas Input-Output específicas del ámbito geográfico de referencia, en general regiones. Estas tablas regionales tienen la particularidad de diferenciar el sector interior, el propio de la región de referencia, del resto del territorio nacional, y del resto del mundo, por lo que el conjunto de efectos directos, indirectos e inducidos, pueden ubicarse, dentro de la propia región o en el resto del territorio nacional, entendido éste como un agregado total, sin que sea posible, en general diferenciar los efectos específicos en el resto de regiones.
- Igualmente, del análisis de los diferentes trabajos consultados parece deducirse un procedimiento de actuación, bastante compartido, que partiría de la necesidad de desagregar e identificar de forma específica la actividad portuaria dentro de la tabla I-O, que, en la mayoría de los casos, no se encuentra estrictamente contemplada, y para lo cuál se realiza un trabajo de campo específico que permite diferenciar los principales componentes de coste de las empresas vinculadas a la actividad portuaria (Columnas de la TIO), así como los principales clientes de dichas empresas o usuarios de los servicios vinculados a la actividad portuaria (Filas de la TIO).
- Adicionalmente, es importante considerar los denominados efectos inducidos o efectos de las rentas generadas como consecuencia de la actividad portuaria. En este sentido, si analizamos los diferentes cálculos realizados en los distintos estudios podremos comprobar que existen dos vías alternativas mediante las cuales la actividad portuaria termina afectando al conjunto del sistema económico, y que podríamos denominar, respectivamente como transacciones directas y transacciones inducidas. Dentro de las primeras incluiríamos las operaciones que se originan de forma directa en los agentes incluidos en el agregado de actividad portuaria e incluirían, tanto las compras de bienes y servicios corrientes, como las inversiones realizadas por dichos agentes y generarían lo que hemos denominado como efectos directos. Por el contrario, el segundo de tipo de transacciones serían las que generan como consecuencia de la distribución de rentas derivada de dicha actividad directa, y que responderían a lo que hemos denominado efectos inducidos.

A la vista de estos rasgos básicos identificados en los principales estudios consultados sobre el análisis del impacto macroeconómico de los puertos hemos diseñado nuestra propuesta alternativa para la determinación de dichos impactos y que se basa en la construcción y utilización de una Tabla Input-Output Multirregional Multisectorial (TIO-RS).

En efecto, y tal como se deduce de la revisión bibliográfica efectuada la realización de un adecuado análisis de impactos de la actividad portuaria pasa, necesariamente por la disponibilidad de una tabla Input-Output adecuada tanto al ámbito geográfico, como al momento temporal en el que se pretende realizar el análisis.

Sin embargo, consideramos una visión miope el establecer el análisis del comportamiento de la actividad portuaria, aún diferenciado en diferentes actividades, desde una perspectiva agregada espacialmente, máxime si se desea aplicar dicha metodología a estructuras portuarias concretas y localizadas regionalmente, que presentarán, previsiblemente, una estructura específica en cuanto a los diferentes servicios ofertados.

Es más, dicha estructura de la oferta de servicios estará condicionada no sólo por la composición sectorial de su economía regional, o por la evolución económica de la zona, (análisis que podría establecerse desarrollando, actualizando o generando la correspondiente TIO regional), sino que su mayor o menor nivel de especialización, de eficiencia, de calidad, etc., le infiere la posibilidad de captar nuevas cuotas de comercio interregional e internacional. Es decir, el crecimiento diferencial de un sector, sea cual fuere, en una región cualquiera puede y debe afectar a la actividad portuaria que en cada caso se esté analizando.

Precisamente es este segundo elemento el que invita a un novedoso planteamiento metodológico como el que proponemos, bajo el que se pretende generar una macro tabla Input-Output regional sectorizada, derivada de la última tabla nacional disponible, elaborada con información directa (1995), y que incorpora la información de la estructura productiva recogida en las distintas TIO regionales disponibles, congruente con la información de Contabilidad Regional y que recoge la estimación de los flujos de comercio entre las distintas regiones y sectores.