SECTORAL PRODUCTION STRUCTURE OF THE SOUTH COAST OF THE STATE RIO GRANDE DO SUL/BR: AN APPROACH WITH INPUT OUTPUT MATRIX

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Abstract: The objective of this paper was to estimate an Input Output Matrix of the South Coast of Rio Grande do Sul State in Brazil, to know the economic profile from the analysis indicators. The results of the income and employment multipliers indicated that the sectors with the greatest impact were: Forest production, fishing and aquaculture; storage and mail; construction; trade; agriculture and forestry and road freight transport. In relation the production multiplier, the most representative sectors were: Wood products; other transport equipment; other food products; pesticides; slaughtering and manufacturing and manufacturing of chemicals, resins and elastomers. In addition, key sectors of the region were considered based on the following indices: Construction; other services; wood products - exclusive furniture; water, sewage and waste management; manufacturing of chemicals and resins and elastomers and other transportation equipment. In general terms, activities related to forestry production, port activity and agribusiness are highly representative.

Key words*: Input Output Matrix, South Coast of Rio Grande do Sul, Analysis indicators*.

1. Introduction

The South Coast is one of the less known and inhabited areas of the Rio Grande do Sul coast. It covers the Santa Vitória do Palmar, Rio Grande, São José do Norte, Tavares and Mostardas counties. The region has approximately 400 km of coast between the piers of the Chuí bar in Santa Vitória do Palmar county and the district of loneliness in Mostardas county.

The coastal region is rich in natural resources that includes the Patos Lagoon and its estuary in the Rio Grande county, where one of the largest ports in Brazil is located, the binational Mirim lagoon in Santa Vitória and Rio Grande counties, the Fish Lagoon between Tavares and Mostardas counties, the Mangueira Lagoon in Santa Vitória do Palmar county, the ecological station of Taim beyond hundreds of miles of deserted beaches.

The region's fauna includes hundreds of species of migratory seabirds, large marine mammals, numerous species of fishs, mollusks and crustaceans. The region also includes an extensive coastal area, dunes with vegetation and biome known as concheiros, which includes an immense amount of archaeological and paleontological material on the coast of Santa Vitória do Palmar county. In addition, the area has seven lighthouses that are located in the coastal zone.

The economic activity of the region is characterized mainly by agribusiness, which extends over much of the region, forestry for the removal of resin and wood that extends over much of the coast. The lagoons, ocean and estuarine zones are also exploited by artisanal and industrial fishing, which since the 1940s has been operating

in the region. In the estuary of the Patos Lagoon in Rio Grande there is intense port activity, which includes several industries, such as fertilizer, soy processing, oil refinery, fish processing, naval pole, metallurgy among others, as well as commercial and transportation activities of loads. In addition, the tourist activity is practiced mainly in the beaches: Cassino, Hermenegildo, Barra do Chuí, Mar Grosso, Mostardas, among others.

In view of this, a question arises: How does the understanding of the productive structure help the formulation of public policies for the region, allowing a knowledge of the economic characteristics of the South Coast of the state of Rio Grande do Sul in Brazil.

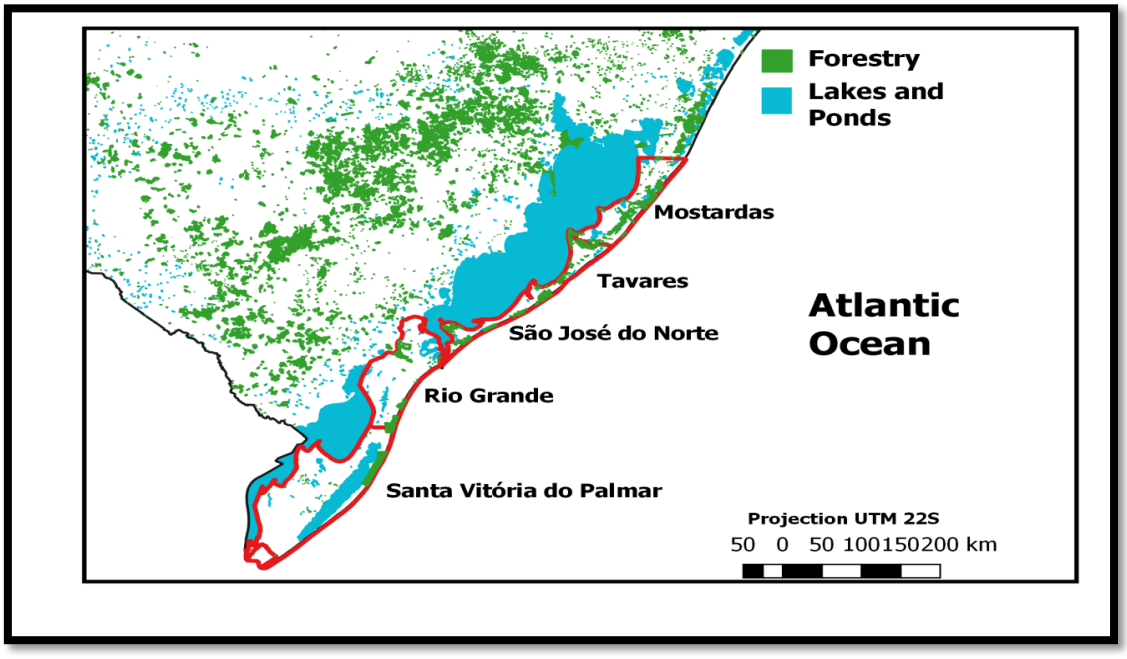
The matrix was regionalized using the Locational Quotient method, starting from a matrix calculated for Rio Grande do Sul in 2011, based on the sector structure in the 2010 national matrix. Data from the IBGE 2011 and the Annual Social Information Report (RAIS) were used.

The article is structured in five sections, in addition to this introduction. In the second section we present to the South Coast of Rio Grande do Sul, in section three a literature review on Matrix Input Product and the procedures adopted for the estimation of the matrix of the region. In the fourth section are presented and discussed the results of the economic indicators, such as link indexes and multipliers. Finally, in the fifth section the final considerations.

2. The South Coast of Rio Grande do Sul

The study area comprises the coastal region highlighted in red on the map below, we can also observe the large lagoons in blue and the production of forest in green.

Map 1: South coast of the State of Rio Grande do Sul/Br



Source: Elaboration of the authors.

As we can see in the table below, the county of Rio Grande has the largest population and economy in the region. But it has the highest infant mortality rate. The municipality of Santa Vitória has the largest area among those mentioned, however, with very low population density. The high levels of illiteracy in the São José do Norte county call attention to and instigate public policies in this sense. In relation of the participation in the GDP, we highlight the Rio Grande and Santa Vitória do Palmar counties, both of which concentrate around 91% of the income generated in the region.

Table 1: Characteristics of the counties studied

County	Pop.	Área km^2	D. Dens	Illiteraci	Life. Exp	Child Mor	GDP R$
St Vitória	**32.326**	**5.244,4**	**5,8**	**6,46%**	**76,6**	**2,26**	834.362,24
R. Grande	214.532	2.709,5	73,8	**4,65%**	**76,6**	15,03	7.274.579,59
S. J. Norte	26.424	1.118,1	23,2	**17,3%**	**72,5**	3,30	351.389,82
Tavares	5.430	604,3	**8,9**	**14,4%**	**74,69**	**n.d**	74.923,54
Mostardas	12.583	1.983,0	**6,2**	**11,31%**	75,94	**8,2**	283.361,84

Source: Foundation for Economy and Statistics 2015.

In Table 2, we show the GDP in 2011 of the South Coast, according to data from the Matrix Input Product 2011 was approximately R$ 6392,73 million. Being the most relevant sectors in its composition: Forest production, fishing and aquaculture; trade; public administration; manufacture of chemicals and resins and elastomers; agriculture, forestry; other transport equipment; construction and others.

Table 2: Composition of the GDP of the South Coast of Rio Grande do Sul

Sectors	Part.%	Sectors	Part.%
Agriculture and forestry	5,47%	Maintenance, repair and installation of maq.	0,76%
Livestock including support	0,89%	Electricity, natural gas and other utilities	1,51%
Forestry, fishing and aquaculture	15,56%	Water, sewage and waste management	0,95%
Extraction of coal	0,00%	Construction	4,31%
Extraction of Oil and Natural Gas	0,00%	Trade	12,28%
Extraction of non-ferrous metal ores	0,00%	Railway freight transport	0,08%
Slaughter and products	0,07%	Road freight transport	0,85%
Manufacture and refining of sugar	0,00%	Waterborne cargo transportation	0,24%
Other Food Products	0,22%	Air freight transportation	0,00%
Manufacture of beverages	0,00%	Other cargo transports	6,16%
Smoke products	0,00%	Road transport of passengers	0,08%
Textiles	0,02%	Water transport of passengers	0,04%
Clothing articles and accessories	0,05%	Railway transport. and met. of passengers	0,00%
Manufacture of footwear and leather	0,00%	Airline passenger transport	0,00%
Wood products - exclusive furniture	0,73%	Other passenger transport	0,78%
Manufacture of pulp and paper products	0,00%	Storage and mail	2,46%
Printing and reproduction of recordings	0,03%	Accommodation	0,29%
Oil refining and coke	4,49%	Food	1,50%
Manufacture of biofuels	0,00%	Editing, Embedded Editing and Printing	0,15%
Manufacture of chemicals and resins, elast.	6,53%	Activ. television, radio, cinema, sound and imag.	0,35%
Agricultural defenses, paints and chemicals	0,14%	Telecommunications	1,35%
Perfumery, hygiene and cleaning	0,04%	Des. system and other information services	0,53%

Sectors	Part.%	Sectors	Part.%
Pharmaceutical Pharmacochemical Prods	0,00%	Financial intermediation and insurance	4,08%
Rubber & Plastics	0,00%	Services rentals	3,01%
Manufacture of mineral products nec met.	0,05%	Activ. legal, accounting and consulting services	1,09%
Manufacture of steel and its derivatives	0,00%	Serv. architecture, engineering, R & D	0,33%
Metallurgy of nonferrous metals	0,00%	Out. Professional, scientific and technical activities..	0,76%
Metal products - excluding machines, eq	0,23%	Rent housing services and property management	0,62%
Manufacture of electronic equipment, inf.	0,00%	Other administrative activities	0,31%
Manufacture of electrical equipment. and electrod.	0,00%	Activ. security and research	0,40%
Machines and equipment	0,03%	ADP	7,93%
Fab. of cars, trucks and buses	0,00%	Merchant education	2,35%
Auto Parts and Accessories.	0,03%	Mercantile Health	2,46%
Other transportation equipment	5,01%	Other services	2,38%
Furniture	0,00%	Domestic services	0,02%
Total	**39,60%**		**60,40%**

Source: Search results.

3. Input Output Matrix: Theoretical definitions, empirical evidence and procedures for estimation of the MIP of the South Coast

The input-input matrix (IPM) approach is an analytical framework that maps the intersectoral relationships of the agents that make up the economic system, being considered an economic planning tool available to the public policy-maker. From this tool, one can evaluate the impact of sectoral policies and their effects on a national and / or regional economy.

The initial works of IOM are grounded and inspired by Quesnay's contributions on the circular flow of income and the simplified general equilibrium model proposed by Walras. The economist and mathematician Wasily Leontief pioneered the formulation of the input output model in his seminal paper (1936), constructing an instrument that enabled an analysis of intersectoral relations in production.

The basic model (production) of Leontief is usually constructed from data for a specific geographic region (nation, region, mesoregion and etc.). The fundamental information used in the analysis refers to the product flows of each economic sector, considered as a producer and / or consumer in each of the sectors, given the sectoral interactions. According to Miller and Blair (2009) the lines describe the distribution of the production of a producer across the economy (sales) and the columns of the composition of the inputs required by a given sector to produce a output (purchases).

The production model allows the comparison between the impacts that the adoption of certain policies has on a nation and / or a region and what the intersectoral repercussions, based on the assumption that changes in the final demand occurred. Thus, given the linkage of the sectors of the economy under analysis, one can verify which sectors are impacted, which are the magnitudes and the sectors most sensitive to changes in the final demand.

$$X = AX + F \quad (1)$$

Being: X is the vector column of the supply (national production) and F is the column vector of the final demand. As in the open model, the final demand vector is considered an exogenous variable, we can solve the system with the equation:

$$X = BF \quad (2)$$

Where: $-1B = I - A$ (3)

and B is the matrix of the direct and indirect technical coefficients, better known as the Leontief inverse matrix.

$$B = (I - A)^{-1} \quad (4)$$

The matrix *A* represents the matrix of the direct technical coefficients, that is, the matrix that provides the direct impact caused by the increase in the final demand, while $(I - A)^{-1}$, besides the direct effects, it also evaluates the indirect ones. Therefore, the model defined in equation (4) is the one that will allow to evaluate the total impact that a variation in the final demand will cause in the production of the economy, given the increase in demand in one unit.

Starting from Leontief matrix *B* multipliers, several analyzes are carried out, regarding variables such as employment, income, product, and so on. In addition, from matrix B we can also find the key indices and key economic sectors. The evolution of the I-P techniques has allowed the analysis of regional and interregional models, being necessary for this the estimation of input product matrices. The following is a summary of the economic literature on the regionalization of IOMs.

Originally, the applications of the input output model were carried out at the national level, but theoretical modifications led to modifications in the original model, thus allowing analysis of regional issues, MILLER and BLAIR, 2009.

The production structure of a given region may be identical or differ significantly from a national matrix, so for regional applications it is necessary to take into account the relationship between the technical coefficients of the national table and the regional matrix to be estimated. In addition, the smaller the region analyzed, the more dependent will this economy be on foreign trade, MILLER and BLAIR, 2009.

In addition, regional and / or interregional matrices have the same accounting identities as a national matrix, there is always a balance between supply and aggregate demand, but issues related to foreign trade and the level of government are different, with the result that vectors of regional and / or interregional imports and exports. Wiebusch (2007) mentions that work with regional input-output matrices must take into account regional data even if the technical coefficients adopted are the same at the national level.

In this sense, Guilhoto (2011) says that a regional matrix presents the same structure of a national matrix, having as basic difference the discrimination of the export (import) to the other regions of the country and the export (import) to other countries. In turn, the matrix of interregional models, which are modeled on the Isard model (1951), require a large body of actual or estimated data, mainly for information on intersectoral and interregional flows.

Ribeiro (2013) points out that for the estimation of regional matrices, the international literature indicates two methods, census and noncensus. The second is

recommended when there is no lack of regional statistics, as census methods have a complex application and require a large amount of information. The best known noncensus method is RAS and can be seen in Stone (1966) and Bacharach (1970) for regional matrix estimation.

The literature also presents techniques for estimating matrices that use characteristics of regional economies through a process of adjustment of the national matrix of technical coefficients, using estimations of percentage of supply for each sector of the region studied, such as Isard and Kuenne (1953) and Miller (1957).

On the other hand, Ribeiro (2013) points out that in Brazil two techniques of regionalization of technical coefficient matrices are highlighted: i) The locational quotient method (QL) and ii) The RAS biproportionality method. The first method considers the adjustment of technical coefficients from the relationship between two economies, the regional and the national, usually taking into account whether a particular sector has a comparatively higher concentration in the region or outside it, mainly through the number of jobs. The second, using the proportions of a national matrix, based on regional statistics, makes the adjustment of lines and columns, in order to guarantee the balance of social accounting identities.

In Brazil the literature of studies with matrices input product is extensive, both with the estimation of interregional and regional models. Brene et al. (2011) carried out a study for the municipality of São Bento do Sul. It was estimated the municipal input output matrix of the city through the Locacional Quocient Method seeking to calculate the economic indicators to identify key sectors for the economic and social development of the counties. The results showed that the wood and furniture sector was important in production and employment. However, it does not appear to be a larger product and income multiplier, especially in the steel and product sectors, particularly in the steel, services to the family and public administration.

Nunes and Melo (2012) estimated an input product matrix using the QL method as well, for the one for the Southeastern Meso-region of Paraná. The authors prepared an input output matrix for the Southeast region of Paraná for the year 2009, seeking to identify the key sectors, as well as the effects of linkage and multipliers of production, employment and income. As a result, they showed that some non-traditional activities have high economic performance indexes, the Rasmussen-Hirschmann normalized linkage indexes showed that eight sectors had forward linkage indices greater than one, and twelve sectors had linkage indices for behind the unit and two sectors were considered key (chemical industry and metallurgy). In relation the multipliers, electrical and electronic material (production), food and beverages (income) and transport material (employment) stood out.

By end, Leivas and Feijó (2014), they estimated the Input Output Matrix of the Regional Development Council of the Southern Region of the State of Rio Grande do Sul (COREDE), seeking to identify the key segments for the region's economy and calculating impact multipliers for value production, value added and employment using the QL method. According to the authors, the results showed that the Region presents a little diversified and not very dynamic economy, with key segments related, basically, to the agribusiness and services sectors.

Regarding the key sectors, the Region has presented six activities that can be considered fundamental, in the perspective of the forward chain, that is to say, in the sale of inputs, such as: agriculture, forestry, vegetal exploration and fishing; oil refining; trade; transport; services provided to families and businesses; and chemical industry. On the other hand, the key sectors with backward chaining were: manufacturing of vegetable oils; dairy industry; processing of plant products; slaughter of animals; other food products; transport; oil refining; chemical industry; various industries; and trade.

As mentioned, the national empirical literature on input output is extensive, and the contributions of Parré (2000), Talamini and Pedrozo (2004), Leite and Pereira (2010), Moretto et al. (2008), Carvalho and Perobelli (2009) with the estimation of interregional or regional models.

Regarding the applications of regional models of product input in Rio Grande do Sul, the work of Porsse et al. (2004) and Porsse et al. (2008), which estimate the interregional matrixes Rio Grande do Sul and the rest of Brazil from RAS Techniques. On the other hand, Wiebusch (2007), Leivas and Feijó (2014) estimate product input matrices for the CORDES Vale do Taquari and Sul from the regionalization of the intermediate consumption by the Locational Quotient.

It can be noticed that the RAS methods and the Locational Quotient are the main techniques used in the regionalization of product input matrices in Brazil. There is still a shortage of works estimating MIPs for Costa regions. In the specific case of Rio Grande do Sul, the empirical literature indicates that there is no work that estimates a similar matrix in the state, this underscores the relevance of this work.

Thus, the calculation of product multipliers, employment and income, taxes etc., knowledge of the sectoral structure of the economy in question. Being the product multiplier MP_j the main reference of the level of economic activity, obtained by the sum of the columns of $\mathbf{b_{ij}}$, shows how much a column **(j)** sector can generate of production in all sectors of the economy, according to the alteration of a monetary unit of the total final demand, in relation to the production of sector **(j)**. Formally:

$$MP = \sum_{1=i}^{n} b_{ij} \tag{5}$$

Having $\mathbf{b_{ij}}$ as an element belonging to the inverse matrix of Leontief **(B).**

Besides that, when the variable of interest is related to production, one obtains the direct coefficient of the variable in question:

$$v_j = \frac{V_j}{X_j} \tag{6}$$

From the direct coefficients presented in equation (14) we arrive at the total direct and indirect impact on the variable of interest defined as generators:

$$GV_j = \sum_{1=i}^{n} b_{ij} v_i \tag{7}$$

Since the variable of interest value is added, one can find the generator by means of the following equation:

$$VA_{ix1} = \sum_{1=i}^{n} b_{ij} va_{ix1} \quad (8)$$

Where **(va_{ix1})** is the ratio between the Gross Value Added and the Gross Value of Production, it shows the variation in the Gross Value Added of sector i due to a unit variation in the final demand. The ratio between the generator **(VA_{ix1})** and the direct coefficient **(va_{ix1})** is called the value-added multiplier.

Analogously, there are the multipliers of jobs, wages, taxes and imports, which are considered indicators of economic (qualitative) development. In this work the multipliers are limited to the intermediate consumption, that is, only the indicators named by Guilhoto (2011) of type 1 are analyzed.

When you want to see how sectors are intertwined in purchases and sales with other industries, backward and forward link rates are used. These indicators were formulated by Rasmussen (1956) and Hirschman (1958), measure the dispersion power of the upstream or downstream threads and the index of dispersion sensitivity of the downstream or forward threads.

Thus, considering (B) as the inverse matrix of Leontief, $\mathbf{b_{ij}}$ as being an element of the inverse matrix of Leontief B^*, as the mean of all elements of (B), b_j and b_i as being respectively the sum of a column and a line typical of (B), the backward and forward linkage indices are formally:

Indexes of back links (scattering power):

$$U_j = [B_j / n] / B^* \quad (9)$$

Forward link indexes (dispersion sensitivity):

$$U_i = [B_i / n] / B^* \quad (10)$$

Where $\mathbf{U_j}$ is the backward binding coefficient, which shows how much is demanded by each sector in its backward threads, that is, how much a particular sector buys from other sectors.

On the other hand, U_j it is the forward link coefficient, which demonstrates how much is offered by each sector in its forward threads, that is, how much a particular sector sells to the other sectors of the economy.

According to Miller and Blair (2009) from the results of the previous indices, four classifications appear depending on the results: i) independent or little related, when both indexes are less than 1; (ii) dependent or strongly related, where the two indices simultaneously exceed 1; iii) dependents of the interindustrial supply, when only the backlink index is greater than 1; and iv) dependent on interindustrial demand, when only the forward link index is greater than 1.

According to the literature on product input matrix, the previous indices may present deficiencies, so there are other coefficients to minimize such problems. However, the backward and forward link rates are sufficient to indicate the sectoral structure of the region.

3.1. Procedures for Estimation of the MIP of the South Coast

The estimation of the Input Output Matrix of the South Coast was performed using the Locational Quotient method applied in the Rio Grande do Sul matrix for the year 2011, estimated by Gonçalves (2018). The matrix uses the sectoral structure similar to the national matrix of 2010 and also follows the same theoretical structure.

Although the latest IOM released in 2010 presents a breakdown of products and sectors, it is necessary to reconcile the IBGE's regional accounts with the 2011 Annual Information Report (RAIS) on the South standardization with the RS matrix of 2011. The compatibility of RAIS was performed by the CNAE (2.0) class following the IBGE classification commission (CONCLA). The 672 activities were classified in 70 sectors (according to the table below) and can be seen in the Annex:

Table 3: MIP Costa Sul sectoral structure

SECTORS		SECTORS	
1	Agriculture and forestry	35	Furniture and decorations, garden
2	Livestock including support	36	Maintenance, repair and installation of maq. and equip.
3	Forestry, fishing and aquaculture production	37	Electricity, natural gas and other utilities
4	Extraction of coal	38	Water, sewage and waste management
5	Extraction of Oil and Natural Gas	39	Constructions
6	Extraction of non-ferrous metal ores	40	Trade
7	Slaughter and products	41	Railway freight transport
8	Manufacture and refining of sugar	42	Road freight transport
9	Other Food Products	43	Waterborne cargo transportation
10	Manufacture of beverages	44	Cargo air transportation
11	Smoke products	45	Other cargo transport
12	Textiles	46	Road transport of passengers
13	Clothing articles and accessories	47	Water transport of passengers
14	Manufacture of footwear and leather	48	Railway transport. and met. of passengers
15	Wood products - exclusive furniture	49	Airline passenger transport
16	Manufacture of cellulose and paper products	50	Other passenger tranport
17	Printing and reproduction of recordings	51	Storage and mail
18	Oil refining and coke	52	Accommodation
19	Manufacture of biofuels	53	Food
20	Manufacture of chemicals and resins and elastomers	54	Editing, Embedded Editing and Printing
21	Agricultural defenses, paints and various chemicals	55	Television, radio, film, sound and image recording activities
22	Perfumery, hygiene and cleaning	56	Telecommunications
23	Pharmaceutical and pharmaceutical products	57	Development of system and other information services
24	Rubber & Plastics	58	Financial intermediation and insurance
25	Manufacture of non-metallic mineral products	59	Housing services and rentals
26	Manufacture of steel and its derivatives	60	Legal, accounting and consulting activities and venues
27	Metallurgy of nonferrous metals	61	Architectural, engineering, R & D services
28	Metal products - exclusive machinery and equipment	62	Other professional, scientific and technical activities
29	Manufacture of electronic equipment, inf.	63	Non-housing services and Non-Intellectual Property

	SECTORS		SECTORS
30	Manufacture of electrical equipment	64	Other administrative activities
31	Machines and equipment	65	Surveillance, security and research activities
32	Manufacture of cars, trucks and buses	66	Public administration and social security
33	Parts and accessories for motor vehicles	67	Merchant education
34	Other transportation equipment	68	Mercantile Health
		69	Other services
		70	Domestic services

Source: Own elaboration.

According to Miller and Blair (2009) the Locational Quotient method is a way to analyze the level of specialization of the productive sectors of a region, since it compares the participation of the sector in a certain region with a larger region. If the value found is greater than one, it means that the region is specialized in that sector, and its production is sufficient to serve the local market, producing exportable surpluses. On the other hand, if it is less than one the region is not specialized in the sector.

The results of the locational quotients are in table 4 below, we observe that the region has a specialization in the sectors of forest production, fishing and aquaculture; other transport equipment; other cargo transports; manufacture of chemicals and resins and elastomers; oil refining and coke; storage and mail; waterborne cargo transportation; agriculture, forestry; wood products and others.

Table 4: Locational quotient of the sectors of the Input-Output Matrix of the South Coast

SECTORS	QL	SECTORS	QL
Forestry, fishing and aquaculture production	44,6816	Television, radio, film, sound and image recording activities	0,8182
Other transportation equipment	31,3087	Financial intermediation and insurance	0,77271
Other cargo transports	25,5925	Architectural, engineering, testing and research and development services	0,77076
Manufacture of chemicals and resins and elastomers	13,8236	Surveillance, security and research activities	0,76634
Oil refining and coke	9,47674	Other professional, scientific and technical activities	0,73797
Storage and mail	4,79528	Telecommunications	0,72618
Waterborne cargo transportation	4,74863	Legal, accounting and consulting activities and venues	0,68758
Agriculture and forestry	3,06777	Agricultural defenses, paints and various chemicals	0,56977
Wood products - exclusive furniture	2,63676	Development of system and other information services	0,53952
Non-housing services, Rentals and Non-Intellectual Property Management	1,77521	Housing services and rentals	0,52843
Maintenance, repair and installation of maq. and equipment	1,64551	Editing, Embedded Editing and Printing	0,49619
Other services	1,58412	Domestic services	0,47547
Other passenger transport	1,46607	Perfumery, hygiene and cleaning	0,25323
Merchant education	1,28728	Metal products - exclusive machinery and equipment	0,22848
Water, sewage and waste management	1,26218	Other Food Products	0,21406
Accommodation	1,23405	Railway freight transport	0,19204
Trade	1,09022	Other administrative activities	0,17918
Mercantile Health	1,04788	Printing and reproduction of recordings	0,16847

SECTORS	QL	SECTORS	QL
Food	1,02696	Road transport of passengers	0,16049
Livestock including support	0,96747	Clothing articles and accessories	0,09995
Water transport of passengers Public administration	0,96465	Textelis	0,09236
Public adm	0,95665	Manufacture of non-metallic mineral products	0,08056
Road freight transport	0,91923	Slaughter and products	0,07705
Constructions	0,90433	Parts and accessories for motor vehicles	0,02506
Electricity, natural gas and other utilities	0,8763	Machinery and equipment, exclusive maintenance and repairs	0,0189

Source: Search Results.

Starting from the Locational Quotient, the same method of Leivas and Feijó (2014) was used to estimate the intermediate consumption and value-added vectors, gross production value and final demand.

4. Results and discussions

In order to observe the correlation between the productive sectors, the forward and backward linkage indexes were calculated. These indices show how much a sector is demanded by the others (seller) and how much each sector demands from the other sectors (buyers), respectively.

Considering monetarily, the forward link ratio shows the impact of an increase in the final demand of all sectors over a given sector. Analyzing Table 5, an increase of R $ 1.00 in the final demand of all sectors generates an impact of R $ 3.68 on the value of the production of the Commerce sector, since it is the sector that presented the highest forward link index .

We also emphasize that agriculture, forestry; construction; road freight transport; other passenger transport; maintenance, repair and installation of maq. and equipment and warehousing and mail are the sectors with the highest index of forward connection, that is, more demanded by other sectors.

Regarding the backward linkage index, this indicates the impact that an increase in the final demand of a given sector generates over the production of other sectors, that is, a shock of R $ 1.00 in the final demand of the Products sector of wood - exclusive real estate causes an impact on the production of the other sectors in order of R $ 1.30.

It should be mentioned that the sectors of other transport equipment; television, radio, cinema, sound and image recording; food products; pesticides, dyes and various chemicals; waterway passenger transport; slaughtering and products have along with the wood products sector the highest rates of back bonding.

Table 5: Forward and backward linkage indices of the sectors of the Input-Output Matrix of the South Coast

SECTORS	Index for Front	SECTORS	Índex for Back
Trade	3,680075	Wood products - exclusive furniture	1,301138
Agriculture and forestry	2,090295	Other transportation equipment	1,277368
Constructions	1,818456	Television, radio, film, sound and image recording activities	1,218609
Road freight transport	1,772845	Other Food Products	1,164402
Other passenger transport	1,687791	Agricultural defenses, paints and various chemicals	1,161163
Maintenance, repair and installation of maq. and equipment.	1,623724	Water transport of passengers	1,150702
Storage and mail	1,501269	Slaughter and products	1,134584
Other services	1,424237	Waterborne cargo transportation	1,120807
Wood products - exclusive furniture	1,420869	Manufacture of chemicals and resins and elastomers	1,114631
Financial intermediation and insurance	1,343452	Other services	1,085448
Water, sewage and waste management	1,26183	Manufacture of cellulose and paper products	1,083726
Food	1,204514	Textelis	1,067539
Forestry, fishing and aquaculture production	1,176562	Telecommunications	1,062628
Electricity, natural gas and other utilities	1,15653	Constructions	1,047826
Manufacture of chemicals and resins and elastomers	1,108227	Road transport of passengers	1,047658
Other transportation equipment	1,107056	Other cargo transports	1,033909
Merchant education	1,096397	Water, sewage and waste management	1,021324
Metal products - exclusive machinery and equipmen	1,068244	Mercantile Health	1,017567
Other professional, scientific and tec ativ	1,062468		

Source: Elaboration of the authors as basis in the results of the research.

In Table 6 it is possible to identify the key sectors of the economy. According to the criterion used in Najberg and Vieira (1996), key sectors are those that present backward and forward interconnection index greater than one simultaneously. With this, it is possible to identify six key sectors of the South Coast Region.

According to the results of the table below, we realize that construction; other services; wood products - exclusive furniture; water, sewage and waste management; manufacturing of chemicals, resins and elastomers and other transportation equipment are the leading sectors in the region. The results indicate that the South Coast is extremely dependent on activities related to the production of forests (wood products and chemical and resin manufacturing) and activities related to the naval industry (other transport equipment).

Table 6: South Coast key sectors

	Índex	
SECTORS	**Front**	**Back**
Construction	1,8185	1,0478
Other services	1,4242	1,0854
Wood products - exclusive furniture	1,4209	1,3011
Water, sewage and waste management	1,2618	1,0213
Manufacture of chemicals and resins and elastomers	1,1082	1,1146
Other transportation equipment	1,1071	1,2774

Source: Elaboration of the authors as basis in the results of the research.

The Impact Multipliers of RS South Coast found make it possible to analyze the direct and indirect impacts caused by changes in the final demand, that is, as a shock in the final demand of a given sector boosts a series of intersectoral stimuli, affecting almost all sectors of the economy, Porsse (2007) quotes that the model is a very important tool for economic planning. Such input output multipliers can aid in the decision-making process of public policies that aim at regional development, as they show the sectors that have the greatest impact on production, employment and value added.

The production multiplier shows which sectors are relevant to the production level of the region, that is, the sector that generates more income for the region's economy. This means that if the final demand of these sectors increases by R $ 1.00, what will be the increase in production, for example, in the case of wood products an increase of R $ 1.74 in the sector.

From the table below we can see that the sectors of the region with the highest production multipliers are respectively: Wood products - exclusive furniture; other transport equipment; television, radio, cinema, sound and image recording; other food products; pesticides, dyes and various chemicals; waterway passenger transport; slaughter and products; waterborne cargo transportation; manufacturing of chemicals and resins and elastomers.

With respect to the Value Added multiplier, which considers (wages, profits and taxes), the sectors that have the greatest multiplier effect on the generation of value as shown in the table below are respectively: Trade; real estate services and rent; commercial education; other passenger transport; forestry, fisheries and aquaculture; agriculture, forestry; transport of road cargo. In the opposite sense, the sectors of other food products and slaughter and products have little contribution to the generation of added value.

Table 7: Production Multiplier and Value Added South Coast: Sectors selected

SECTORS	PROD. M	SECTORS	GAV. M
Wood products - exclusive furniture	1,7481	Trade	1,4723
Other transportation equipment	1,7162	Domestic services	1,0000
Television, radio, film, sound and image recording activities	1,6372	Housing services and rentals	0,9725
Other Food Products	1,5644	Merchant Education	0,9631
Agricultural defenses, paints and various chemicals	1,5601	Other passenger transport	0,8586
Water transport of passengers	1,5460	Storage and mail	0,7922
Slaughter and products	1,5243	Financial intermediation and insurance	0,7858
Waterborne cargo transportation	1,5058	Forestry, fishing and aquaculture production	0,7704
Manufacture of chemicals and resins and elastomers	1,4975	Agriculture and forestry	0,7376
Other services	1,4583	Road freight transport	0,7006
Manufacture of pulp and paper products	1,4560	Surveillance, security and research activities	0,6619
Railway freight transport	1,4410	Development of system and other information services	0,6366
Textiles	1,4343	Electricity, natural gas and other utilities	0,6084
Telecommunication	1,4277	Legal, accounting and consulting activities and venues	0,5896
Constructions	1,4078	Water, sewage and waste management	0,5202
Merchant Education	1,0979	Perfumery, hygiene and cleaning	0,1199
Parts and accessories for motor vehicles	1,0968	Other transportation equipment	0,1001
Maintenance, repair and installation of maq. And equipment	1,0826	Machinery and equipment, including maintenance and repairs	0,0978
Surveillance, security and research activities	1,0788	Other Food Products	0,0833
Housing services and rentals	1,0423	Slaughter and products	0,0423

Source: Elaboration of the authors as basis in the results of the research.

The employment multiplier indicates how many jobs would be generated given the change in the sectors, that is, for each one million of Reais, an X value of direct and indirect jobs is generated. Analyzing the following table, we highlight the best and worst sectors in the generation of jobs. For each one million of Reais are generated around 69 jobs in the surveillance, security and research activities sector. Another important sector is the trade that would originate 25 jobs. In addition, the sectors of other passenger transport are relevant in the generation of jobs in the region; systems development, and other information services; commercial education; textiles; storage and mail; accommodation and wood products - exclusive furniture.

Table 8: South Coast Employment Multiplier: Selected Sectors

SECTORS	EMP.M	Ranking
Surveillance, security and research activities	69,7740	1º
Trade	25,3871	2º
Other passenger transport	18,8807	3º
Road freight transport	18,7440	4º
Development of system and other information services	17,6979	5º
Merchant Education	16,6804	6º
Textiles	15,7183	7º
Storage and mail	15,5051	8º
Accommodation	14,1300	9º
Wood products - exclusive furniture	12,7008	10º
Foods	11,7998	11º
Other Services	10,8523	12º
Agriculture and forestry	10,0178	13º
Merchant Health	9,9133	14º
Construction	9,8594	15º
Slaughter and products	0,8286	47º
Oil refining and coke	0,2647	48º
Other cargo transports	0,2016	49º
Water transport of passengers	0,1569	50º
Railway freight transport	0,1157	51º

Source: Elaboration of the authors as basis in the results of the research.

Therefore, analyzing the results, it is important to note that these multipliers should be analyzed with caution, since the trade sector showed a high multiplier in production and employment, but it is not a key sector. Given the results, we can see that we do not only have one key sector and that the South Coast region is very diversified in its productive structure. Therefore, public policies aimed at raising growth can be directed to the different key sectors, according to the purpose and objective to be achieved.

4. Conclusion

The objective of this paper was to estimate an Input Product Matrix of the South Coast of Rio Grande do Sul, seeking to know the economic profile from the analysis indicators. The matrix was regionalized using the Locational Quotient method, starting from a matrix calculated for Rio Grande do Sul State in 2011, based on the sector structure in the 2010 Brazilian national matrix. We used data from IBGE 2011, from the Annual Social Information Relation (RAIS).

The results of the income and employment multipliers indicated that the sectors with the greatest impact were: Forest production, fishing and aquaculture; storage and mail; construction; trade; agriculture and forestry and road freight transport. In relation the production multiplier, the most representative sectors were: Wood products; other transport equipment; other food products; pesticides; slaughtering and manufacturing and manufacturing of chemicals, resins and elastomers.

In addition, key sectors of the region were considered based on forward and backward linkages: construction; other services; wood products - exclusive furniture; water, sewage and waste management; manufacturing of chemicals and resins and elastomers and other transportation equipment.

It should be remembered that the region has a rich coastal ecosystem that includes the Patos lagoon and its estuary in the Rio Grande county, where one of the largest ports in Brazil is located, the binational Mirim lagoon, the Fish Lagoon between Tavares and Mostardas counties, Mangueira Lagoon in Santa Vitória Palmar county, the ecological station of Taim beyond hundreds of kilometers of deserted beaches. It should be noted that these activities have impacts on local ecosystems and on services provided by nature. Fisheries have a strong downward trend, caused by intense activity since the 1970s. Most forestry activities occur in coastal areas, which are sensitive to human activities, and agriculture is a main responsible for the chemical pollution of local lagoons.

The work can be considered as a pioneer for assessing the economic context of a region with great potential, so future research should include the disaggregation of the main activities with the incorporation of a satellite module that evaluates the environmental impacts of the main sectors in the ecosystem services of the region.

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