

The networks of inter-industry flows in a SAM framework.

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Abstract: The networks of nominal flows between industries in a Social Accounting Matrix (SAM) framework are studied.

The flows of the SAM submatrices of production (or output of goods and services) and intermediate consumption, are identified, which are constructed from the supply and use tables of the National Accounts. From these flows, the inter-industry networks are induced. The structure of these networks are analysed, as well as, the underlying generation of income.

An application to Portugal illustrates the approach.

Keywords: Social Accounting Matrix; Inter-Industries flows; Network Analysis

JEL Classification: C55; C89; D57; E01; E16.

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1. Introduction

There is no unanimity regarding the relationship between the Social Accounting Matrix (SAM) and Input-Output Matrix (IOM). For some, the first is an extension of the second, for others, it is not.

Approaches based on SAMs and IOMs involve working with the corresponding numerical and algebraic versions.

A numerical version quantifies facts of a specific economic activity during a specific period, which gives a picture of the reality under study, focussing on the part that we intend to study.

An algebraic version, or model, represents that facts in the form of an equation or system of equations, which allows for the simulation of interventions on the part that we intend to study and the construction of possible scenarios for that reality.

When worked together, numerical versions can be understood to be databases of algebraic versions or models. The numerical versions allow for both the calibration² of models, as well as the assessment of the scenarios constructed with the interventions experimented with the latter.

The way how numerical and algebraic versions are worked together is not unanimous in the case of the SAM, but it is in the case of the IOM. For some a numerical SAM is a database completely adjusted to a previously defined model. For others both, the SAM and the IOM numerical versions are the starting point for an algebraic version or model.

The SAM or the IOM are both matrix representations of the nominal or monetary flows underlying the economic activity, usually that of countries. Both cover the generation and use of income, considering industries (activities), factors of production (labour, capital), goods and services (products), and institutions (corporations, government, households). However, the SAM also allows for the coverage of specific details regarding the distribution and the accumulation of income.

Generated income being the difference between the output of goods and services and the intermediate consumption, a special focus on the latter can be provided either by the IOM, or by the SAM, although in different ways. The IOM represents the intermediate consumption either of industry by industry, or of product by product, separating (in both cases) what is domestically produced and that which is imported. The total output of industries or of products is also provided by the IOM in each of these possibilities.

The SAM, as presented here, represents the (total) intermediate consumption and output of industries by products.

² We can say that a model is calibrated when the numerical version is replicated after its running, without any intervention.

Therefore, the way that intermediate consumption and output is represented is very different in the SAM and in the IOM, which is why we think that a SAM is not an extension of an IOM. Each matrix covers specific aspects and provides very important information about the generation of income.

Graham Pyatt, one of the main authors studied in this research, addresses this issue as follows:

“... SAMs and extended IO tables are not equivalent and one key difference can be explained by analogy. The essence of IO is not that production activity is disaggregated into different industries, but that these industries are related, one to other, through transactions between them, i.e. through the buying and selling of raw materials, and that the structure of production is conditioned by these linkages. By the same token, the essence of a SAM, in this context, is not the disaggregation of institutions into different household types plus various categories of companies, government and the rest of the world, all of which is on offer through an extended IO approach. Rather, the essential detail is to be found in the matrix of transactions and transfers between different types of institutions. These details include the unrequited transfers which characterize the social security system and direct taxation, all types of private remittance and all property income flows. The pattern of these transfers conditions the distribution of income in exactly the same way as the pattern of inter industry transactions conditions the structure of production” (Pyatt, 1999, p.366)

In this study, we present a numerical version of a SAM, constructed from the National Accounts, with the output of goods and services and the (total) intermediate consumption taken directly from the supply and use tables. That SAM is a version of S. Santos which resulted from research based on the study, mainly, of the works of Stone, Pyatt, and Round³. Among the results of this research, which started with Santos, 1999, the following are highlighted: Santos, 2018, 2015, 2009, and 2007.

Focussing our attention on the output of goods and services and the (total) intermediate consumption submatrices of that SAM, within the scope of the research of T. Araújo, we study the inter-industry linkages through the network analysis of inter-industry flows. Among the results of this research, the following are highlighted: Araújo and Faustino, 2017; Araújo and Banisch, 2016; Araújo and Ferreira, 2016, and; Araújo and Fontainha, 2016.

In fact, many economic systems – mostly those constructed from empirical data – adopt a network representation. As these systems are characterised by a low abstraction level, it turns out that the network representation appears as the most obvious solution, as in the case of air-traffic and trade networks. This also happens with the specific field of supply and use tables, which is an

³ Among the works of these authors, the following are highlighted: Pyatt, 1991, 1991a, 1988; Pyatt and Round, 1985, and; Stone, 1986, 1981, 1973.

important part of the national accounting systems. Since these tables are quite similar to adjacency matrices, there has been an increased interest in applying network theory to represent flows between industries.

With the purpose of obtaining a better knowledge of the generation of income from a numerical version of a SAM for Portugal in 2015, we therefore study, on the one hand, the output of each industry, which is distributed by products that this industry produces, and the inter-industry relations, which are defined by the production of common products. On the other hand, we study intermediate consumption, which is distributed by the products that each industry uses, and the inter-industry relations, which are defined by the uses of common products. Through the analysis of these inter-industry relations or networks, the type of interdependence and causal relationships are studied, as well as the connection with the generation of income.

Section 2 describes the SAM framework and presents the above-mentioned numerical version of a SAM for Portugal in 2015. Firstly (Subsection 2a), we describe the rows and columns (the accounts structure) and the cells' contents (flows) of the matrix. Next (Subsection 2b), the main macroeconomic aggregates, the generation of income, and its distribution are identified and quantified.

Focusing on the output of goods and services and intermediate consumption, Section 3 analyses the networks of inter-industry flows. Subsequently, after presenting the underlying methodology (Subsection 3a), the inter-industry networks are induced and the structure of these networks are analysed (Subsection 3b).

We conclude with a summary and some remarks (Section 4), both about the contribution of the results of the network analysis to knowledge of the generation of income in a SAM framework, and also about the potentialities of the SAM as a tool to study the network of linkages of the nominal or monetary flows of an economy. That tool is presented, on the one hand, as not being an extension of the IOM and, on the other hand, which numerical versions are the starting point for algebraic versions or models. This also permits the study of both the inter-industry flows and the inter-institution flows, although the latter cannot be performed in such a detailed way, due to the lack of data. In fact, the supply and use tables provide detailed information for the study of inter-industry flows, but there is no detailed information that can be used for the study of inter-institution flows.

2. The SAM framework

a. Structure and the flows

In a SAM, the rows and the columns are the same and by convention the former represent the inflows, and the later the outflows. As mentioned above, the SAM presented here is constructed from the National Accounts, and thus it has a structure adapted to the System of National Accounts, and covers practically all the monetary or nominal flows measured by the National Accounts. Thus, in the SAM rows, the inflows can be described as incomes, resources, receipts, or changes in liabilities, and also net worth. Whereas, in the SAM columns, the outflows can be described as expenditures or changes in assets. Therefore, each SAM cell provides information that can be read in different ways, depending on the row-column perspective in which we position ourselves. We can thus say that SAM cells represent transactions and transfers, to which are associated monetary or nominal flows.

By adopting a top-down methodology, Table 1 represents the possible highest level of aggregation, covering all the grand totals associated with each account. We associate the so called “basic SAM” to this level of aggregation. These totals are described in the cells of the basic SAM, whose rows and columns represent its accounts. Details of the contents of this basic structure can be found in Santos (2018). Numbers between brackets represent the Portuguese reality in 2015, which will be used to illustrate all the presentation.

The thicker borders of the cells represent “production” and “intermediate consumption”, which mark the part where we will focus our attention in this study.

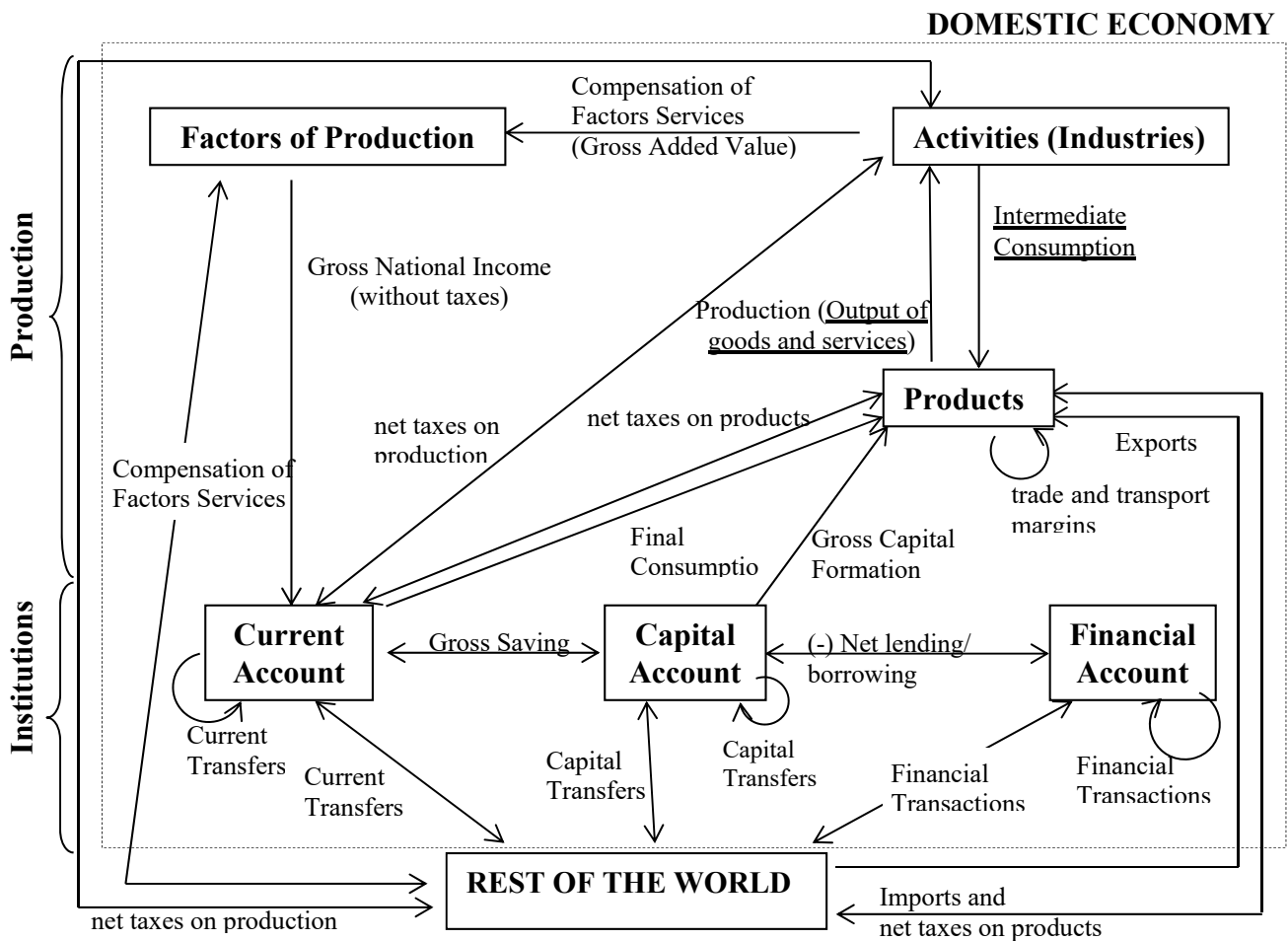
A schematic representation of Table 1, without the illustrative numbers, can be seen in Figure 1.

Table 1. A basic SAM (Social Accounting Matrix) of Portugal in 2015 (in millions of euros).

Outlays (expenditures) Incomes (receipts)		Production			Institutions			Rest of the World (RW)	TOTAL
		Factors of Prod.	Activities (Industries)	Products	Current A.	Capital A.	Financial A.		
Production	Factors of Production	0	Gross Added Value (155 958)	0	0	0	0	Compensation of Factors from the RW (6 347)	Aggregate Factors Income (162 306)
	Activities (Industries)	0	0	Production (318 313)	0	0	0	0	Production Value (318 313)
	Products	0	Intermediate Consumption (161 475)	Trade and Transport Margins (0)	Final Consumption (150 311)	Gross Capital Formation (28 452)	0	Exports (72 648)	Aggregate Demand (412 884)
Institutions	Current A.	Gross National Income (without taxes) (149 923)	Net taxes on production (1 867)	Net taxes on products (23 078)	Current Transfers (90 027)	0	0	Current Transfers from the RW (6 716)	Aggregate Income (271 610)
	Capital A.	0	0	0	Gross Saving (26 858)	Capital Transfers (2 131)	0	Capital Transfers from the RW (2 436)	Investment Funds (31 425)
	Financial A.	0	0	0	0	Net Lending (567)	Financial Transactions (878)	Financial Transactions from the RW (-7 144)	Total financial transactions (-5 699)
Rest of the World (RW)		Compensation of Factors to the RW (12 382)	Net taxes on production (-986)	Imports + net taxes on products (71 601 - 108)	Current Transfers to the RW (4 415)	Capital Transfers to the RW (276)	Financial Transactions to the RW (-6 577)		Transactions Value to the RW (81 003)
TOTAL		Aggregate Factors Income (162 306)	Total Costs (318 313)	Aggregate Supply (412 884)	Aggregate Income (271 610)	Aggregate Investment (31 425)	Total financial transactions (-5 699)	Transactions Value from the RW (81 003)	

Sources: Statistics Portugal (*INE*); Portuguese Central Bank (*Banco de Portugal*) [following the Integrated Economic Accounts Table – Appendix A.1].

Figure 1: Monetary or nominal flows between the accounts of a basic SAM, as presented in Table 1.



Source: Own construction, following Santos (2009).

From this Figure, where the arrows represent the flows directed towards incomes (receipts), it is easier to see the network of linkages of the flows recorded by a SAM, either within the (domestic) economy, or between it and the rest of the world.

With the (domestic) economy represented by production and institutions, an extended “circular flow of income” can be identified and specified, as follows.

The income is generated in the production process and is quantified through the gross added value. In this process, the industries, or activities, have a determinant role, which deserves a special attention in this study, as they buy the so-called intermediate consumptions (the inputs – raw materials, etc.) and the services of the factors of production (labour, etc.). Industries also have to pay taxes to produce, yet also receive subsidies for this, which are the only receipts they have, besides those that come from the sales of the produced products. Therefore, as can be seen in Table 1, for the activities (row-column) account, the total costs balance with the value of production.

In turn, the factors of production (owned by the institutions) receive a compensation for the sale of services to (domestic and foreign) industries. Since these services are supplied by (domestic and foreign) institutions, outlays can be incurred by the domestic institutions (current account) through gross national income, as can be seen in Table 1, for the factors of production (row-column) account. The supply and demand of products, or goods and services, in the (domestic) economy, either domestically produced or imported, are also represented by the SAM in the products (row-column) account. On the supply side, there are (domestic) output and the imports of goods and services, to which are added the (net) taxes on products, and the trade and transport margins. The demand side has intermediate consumption, final consumption, gross capital formation, and exports.

The part related with the so-called production, was described above, in which was possible to identify where domestic income (the gross added value) is generated and where national income is firstly distributed, as well as, the components of supply and demand of goods and services (products).

In the part related with (domestic) institutions, through the current (row-column) account, it is possible to identify, on the one hand, who receives the above-mentioned national income, the (net) taxes on production and products, and the current transfers. On the other hand, it is possible to identify who and how that (current) income is spent on final consumption, current transfers or is saved. It is here that the national income, through current transfers within and between institutions, is transformed into disposable income, which is the so-called ‘redistribution of income’.

Investment in non-financial and financial assets, to which the accumulation of income can be associated, is recorded through capital and financial (row-columns) accounts.

Finally, in the rest of the world (row-column) account, all the flows from and to abroad are recorded, quantifying the international economic relations of the (domestic) economy.

At this stage, the activities and products (rows-columns) accounts were disaggregated, because the inter-industry flows we want to study involve the cells of Table 1 for “intermediate consumption” and “production”. Thus, these cells, were transformed in submatrices, as well as, all the others of the same (rows-columns) accounts. As described in Table 2, 38 activities and products were identified and some disaggregation was also made to the factors of production and the institutions.

Ignoring the “Total” row-column, a matrix with 7 rows and columns (in Table 1) was transformed into another with 90 rows and columns, without losing the consistency of the whole system, as can be checked by comparing Table 1 with the totals of Table A.4, in the Appendix, considering the description in Table 2.

From that disaggregated SAM, the (now) submatrices of “production” and “intermediate consumption” (or output of goods and services) were extracted to Tables 3 and 4, respectively.

Table 2. Disaggregation of the basic SAM accounts.

Description				Row/ column		
Factors of Production	labour			1		
	others			2		
Production	Activities (industries) ^{a)}	Products (goods and services) ^{b)} of activity...	Agriculture, forestry and fishing	A	3	41
			Mining and quarrying	B	4	42
			Manufacture of food products, beverages and tobacco products	CA	5	43
			Manufacture of textiles, wearing apparel and leather products	CB	6	44
			Manufacture of wood and paper products, and printing services	CC	7	45
			Manufacture of coke and refined petroleum products	CD	8	46
			Manufacture of chemicals and chemical products	CE	9	47
			Manufacture of basic pharmaceutical products and pharmaceutical preparations	CF	10	48
			Manufacture of rubber and plastics products, and other non-metallic mineral products	CG	11	49
			Manufacture of basic metals and fabricated metal products, except machinery and equipment	CH	12	50
			Manufacture of computer, electronic and optical products	CI	13	51
			Manufacture of electrical equipment	CJ	14	52
			Manufacture of machinery and equipment n.e.c. (not elsewhere classified)	CK	15	53
			Manufacture of transport equipment	CL	16	54
			Manufacture of furniture; other manufacturing; repair and installation of machinery and equipment	CM	17	55
			Electricity, gas, steam and air-conditioning supply	D	18	56
			Water collection, treatment and supply; sewerage, waste management and remediation services	E	19	57
			Construction	F	20	58
			Wholesale and retail trade; repair of motor vehicles and motorcycles	G	21	59
			Transport; warehousing and support activities for transportation; postal and courier activities	H	22	60
			Accommodation; food and beverage service activities	I	23	61
			Publishing, audio-visual and broadcasting activities	JA	24	62
			Telecommunications	JB	25	63
			Computer programming, consultancy and related activities; information service activities	JC	26	64
			Financial and insurance activities	K	27	65
			Real estate activities	L	28	66
			Legal and accounting activities; activities of head offices; management consulting activities; architectural and engineering activities; technical testing and analysis activities	MA	29	67
			Scientific research and development	MB	30	68

Description				Row/ column		
			Advertising and market research; other professional, scientific and technical activities; veterinary activities	MC	31	69
			Administrative and support activities	N	32	70
			Public administration and defence; compulsory social security	O	33	71
			Education	P	34	72
			Human health activities	QA	35	73
			Social work activities	QB	36	74
			Arts, entertainment and recreation activities	R	37	75
			Other service activities	S	38	76
			Activities of households as employers of domestic personnel; undifferentiated goods-and-services-producing activities of private households for own use	T	39	77
			Activities of extraterritorial organisations and bodies	U	40	78
(domestic) institutions	Current ^{c)}	Capital ^{d)}	Households		79	84
			Non-financial corporations		80	85
			Financial corporations		81	86
			General government		82	87
			Non-profit institutions serving households		83	88
	Financial				89	
Rest of the world					90	

Source: Own construction.

Notes:

- a) Rows/columns 3-40; letters following descriptions correspond to the codes, for 38 activities (A38), according with the revision 2 of the Statistical Classification of Economic Activities in the European Community (NACE).
- b) Rows/columns 41-78; letters following descriptions correspond to the codes according with the version 2.1 of the Classification of Products by Activity (CPA).
- c) Rows/columns 79-83.
- d) Rows/columns 84-88.

Details on flows description (cells of Table 1 and arrows denomination of Figure 1) can be seen in Section 2.1 of Santos (2018).

Diagonals of Tables 3 and 4 represent, respectively, the industries' output and intermediate consumption of products of the same (industry). As mentioned in Section 1, in this study, the inter-industry relations are defined, respectively, by the production and uses of common products, which means that our network analysis is out of diagonals, although they are used in the calculations of the strength of the links. Table 5 shows, for each industry, the relative importance of diagonals, in other words, of production and intermediate consumption of products of the same activity, as well as, of production and intermediate consumption of products of other industries. The last amounts, that is to say, the products of other industries, represent, on average, 6.5% of the output (production), and 67.1% of the intermediate consumption of Portuguese industries in 2015. In the latter (intermediate consumption), it would be interesting to identify, as IOMs do, what is domestically-produced and what is imported, however we do not have information for that - we only know that 28.3% of the total intermediate consumption of Portugal in 2013 was imported (Santos, 2018).

Table 5. Relative importance of products of the same and of other activities in the production (or output of goods and services) and intermediate consumption of industries in Portugal in 2015 (in percentage).

Activities (industries)			Production, of products		Intermediate consumption, of products	
			of the same activity (diagonal)	of other activities	of the same activity (diagonal)	of other activities
Agriculture, forestry and fishing	A	3	92.9	7.1	23.5	76.5
Mining and quarrying	B	4	94.0	6.0	31.3	68.7
Manufacture of food products, beverages and tobacco products	CA	5	97.1	2.9	28.3	71.7
Manufacture of textiles, wearing apparel and leather products	CB	6	96.6	3.4	66.0	34.0
Manufacture of wood and paper products, and printing services	CC	7	93.0	7.0	47.4	52.6
Manufacture of coke and refined petroleum products	CD	8	94.7	5.3	10.9	89.1
Manufacture of chemicals and chemical products	CE	9	95.2	4.8	54.5	45.5
Manufacture of basic pharmaceutical products and pharmaceutical preparations	CF	10	81.8	18.2	26.6	73.4
Manufacture of rubber and plastics products, and other non-metallic mineral products	CG	11	93.8	6.2	19.0	81.0
Manufacture of basic metals and fabricated metal products, except machinery and equipment	CH	12	91.6	8.4	58.8	41.2
Manufacture of computer, electronic and optical products	CI	13	74.9	25.1	38.5	61.5
Manufacture of electrical equipment	CJ	14	87.2	12.8	19.8	80.2
Manufacture of machinery and equipment n.e.c. (not elsewhere classified)	CK	15	86.0	14.0	27.0	73.0
Manufacture of transport equipment	CL	16	91.4	8.6	57.1	42.9
Manufacture of furniture; other manufacturing; repair and installation of machinery and equipment	CM	17	88.8	11.2	13.5	86.5
Electricity, gas, steam and air-conditioning supply	D	18	96.9	3.1	72.4	27.6
Water collection, treatment and supply; sewerage, waste management and remediation services	E	19	94.1	5.9	59.0	41.0
Construction	F	20	97.7	2.3	36.0	64.0
Wholesale and retail trade; repair of motor vehicles and motorcycles	G	21	84.5	15.5	6.4	93.6
Transport; warehousing and support activities for transportation; postal and courier activities	H	22	95.7	4.3	39.4	60.6
Accommodation; food and beverage service activities	I	23	97.6	2.4	4.6	95.4
Publishing, audio-visual and broadcasting activities	JA	24	92.8	7.2	31.1	68.9
Telecommunications	JB	25	94.5	5.5	29.0	71.0
Computer programming, consultancy and related activities; information service activities	JC	26	94.9	5.1	31.9	68.1
Financial and insurance activities	K	27	93.7	6.3	55.7	44.3
Real estate activities	L	28	97.9	2.1	8.1	91.9
Legal and accounting activities; activities of head offices; management consulting activities; architectural and engineering activities; technical testing and analysis activities	MA	29	95.8	4.2	37.5	62.5
Scientific research and development (R&D)	MB	30	95.5	4.5	21.7	78.3
Advertising and market research; other professional, scientific and technical activities; veterinary activities	MC	31	92.5	7.5	16.7	83.3
Administrative and support activities	N	32	98.2	1.8	42.3	57.7
Public administration and defence; compulsory social security	O	33	87.5	12.5	0.5	99.5
Education	P	34	91.6	8.4	7.0	93.0
Human health activities	QA	35	98.4	1.6	13.1	86.9
Social work activities	QB	36	97.3	2.7	0.8	99.2
Arts, entertainment and recreation activities	R	37	93.6	6.4	14.3	85.7
Other service activities	S	38	96.3	3.7	5.0	95.0
Activities of households as employers of domestic personnel; undifferentiated goods-and-services-producing activities of private households for own use	T	39	100.0	0.0	0.0	0.0
Activities of extraterritorial organisations and bodies	U	40	0.0	0.0	0.0	0.0
Total			93.5	6.5	32.9	67.1

Sources: Own calculations, from Tables 3 and 4.

b. Macroeconomic aggregates, the generated income and the corresponding distribution

As practically all the flows observed and measured by the National Accounts are included in the above-presented SAM, it is possible to calculate and/or extract from it the main macroeconomic aggregates that are usually considered.

The following description is based on Table 1, with the numbers between brackets representing the Portuguese reality in 2015, and can be checked in the Integrated Economic Accounts Table, of the National Accounts, in Appendix A.1.

Gross Domestic Product (GDP) can be calculated using the three known approaches: the production approach, where intermediate consumption (161 475) is subtracted from production, or from the output of goods and services (318 313), adding the net taxes on products (23 078 - 108); the expenditure approach, whereby final consumption (150 311), gross capital formation (28 452), and net exports (72 648 – 71 601) are added; and the income approach, where net taxes on production and imports (23 078 - 108 + 1 867 -986) are added to the gross added value (155 958). The Portuguese GDP in 2015 was 179 809 million Euros.

GDP is the income generated in the domestic economy by residents and non-residents, added to the total net taxes on production and imports, to be valued at market prices.

Special attention is given in this paper to this income, before adding the above-mentioned taxes. In the production approach, Section 3 presents a network analysis of output of goods and services and intermediate consumption. In turn, it is the income approach that underlies possible studies of the functional distribution of the same (generated) income – Table 6 illustrates the type of information that is provided and that can be used, for the level of disaggregation adopted for this study.

Table 6. Functional distribution of generated income in Portugal in 2015.

Factors of Production			generated income, or gross added value, or gross domestic income (millions of euros)			structure of activities by factors (%)			structure of factors by activity (%)			
			Labour (employees)	Other (employers and own-account workers; capital)	total	Labour (employees)	Other (employers and own-account workers; capital)	total	Labour (employees)	Other (employers and own-account workers; capital)	total	
			1	2								
Activities (industries)												
Agriculture, forestry and fishing	A	3	1 018	3 261	4 279	1.3	4.2	2.7	23.8	76.2	100.0	
Mining and quarrying	B	4	222	272	494	0.3	0.4	0.3	45.0	55.0	100.0	
Manufacture of food products, beverages and	CA	5	1 693	2 117	3 810	2.2	2.7	2.4	44.4	55.6	100.0	
Manufacture of textiles, wearing apparel and	CB	6	2 356	1 622	3 977	3.0	2.1	2.6	59.2	40.8	100.0	
Manufacture of wood and paper products, and	CC	7	1 026	1 220	2 246	1.3	1.6	1.4	45.7	54.3	100.0	
Manufacture of coke and refined petroleum	CD	8	119	450	569	0.2	0.6	0.4	21.0	79.0	100.0	
Manufacture of chemicals and chemical	CE	9	357	503	860	0.5	0.7	0.6	41.5	58.5	100.0	
Manufacture of basic pharmaceutical products and pharmaceutical preparations	CF	10	204	225	429	0.3	0.3	0.3	47.6	52.4	100.0	
Manufacture of rubber and plastics products, and other non-metallic mineral products	CG	11	1 226	1 229	2 455	1.6	1.6	1.6	50.0	50.0	100.0	
Manufacture of basic metals and fabricated metal products, except machinery and equipment	CH	12	1 563	715	2 277	2.0	0.9	1.5	68.6	31.4	100.0	
Manufacture of computer, electronic and optical products	CI	13	278	137	415	0.4	0.2	0.3	67.1	32.9	100.0	
Manufacture of electrical equipment	CJ	14	394	194	588	0.5	0.3	0.4	67.0	33.0	100.0	
Manufacture of machinery and equipment n.e.c. (not elsewhere classified)	CK	15	449	381	830	0.6	0.5	0.5	54.1	45.9	100.0	
Manufacture of transport equipment	CL	16	864	539	1 403	1.1	0.7	0.9	61.6	38.4	100.0	
Manufacture of furniture; other manufacturing; repair and installation of machinery and equipment	CM	17	1 103	613	1 717	1.4	0.8	1.1	64.3	35.7	100.0	
Electricity, gas, steam and air-conditioning supply	D	18	420	4 081	4 500	0.5	5.3	2.9	9.3	90.7	100.0	
Water collection, treatment and supply; sewerage, waste management and remediation services	E	19	750	1 063	1 813	1.0	1.4	1.2	41.4	58.6	100.0	
Construction	F	20	4 012	2 321	6 333	5.1	3.0	4.1	63.4	36.6	100.0	
Wholesale and retail trade; repair of motor vehicles and motorcycles	G	21	10 906	11 445	22 351	13.9	14.8	14.3	48.8	51.2	100.0	
Transport, warehousing and support activities for transportation; postal and courier activities	H	22	4 104	3 453	7 557	5.2	4.5	4.8	54.3	45.7	100.0	
Accommodation; food and beverage service activities	I	23	3 914	4 665	8 578	5.0	6.0	5.5	45.6	54.4	100.0	
Publishing, audio-visual and broadcasting activities	JA	24	565	330	895	0.7	0.4	0.6	63.1	36.9	100.0	
Telecommunications	JB	25	636	1 784	2 419	0.8	2.3	1.6	26.3	73.7	100.0	
Computer programming, consultancy and related activities; information service activities	JC	26	1 534	398	1 932	2.0	0.5	1.2	79.4	20.6	100.0	
Financial and insurance activities	K	27	3 816	3 971	7 787	4.9	5.1	5.0	49.0	51.0	100.0	
Real estate activities	L	28	463	17 836	18 299	0.6	23.1	11.7	2.5	97.5	100.0	
Legal and accounting activities; activities of head offices; management consulting activities; architectural and engineering activities; technical testing and analysis activities	MA	29	3 110	1 011	4 121	4.0	1.3	2.6	75.5	24.5	100.0	
Scientific research and development (R&D)	MB	30	254	331	585	0.3	0.4	0.4	43.5	56.5	100.0	
Advertising and market research; other professional, scientific and technical activities; veterinary activities	MC	31	555	374	929	0.7	0.5	0.6	59.7	40.3	100.0	
Administrative and support activities	N	32	3 570	1 750	5 320	4.5	2.3	3.4	67.1	32.9	100.0	
Public administration and defence; compulsory social security	O	33	8 795	3 153	11 949	11.2	4.1	7.7	73.6	26.4	100.0	
Education	P	34	7 767	1 962	9 729	9.9	2.5	6.2	79.8	20.2	100.0	
Human health activities	QA	35	5 336	1 760	7 095	6.8	2.3	4.5	75.2	24.8	100.0	
Social work activities	QB	36	2 106	526	2 633	2.7	0.7	1.7	80.0	20.0	100.0	
Arts, entertainment and recreation activities	R	37	863	452	1 315	1.1	0.6	0.8	65.6	34.4	100.0	
Other service activities	S	38	1 122	1 211	2 333	1.4	1.6	1.5	48.1	51.9	100.0	
Activities of households as employers of domestic personnel; undifferentiated goods-and-services-producing activities of private households for own use	T	39	1 135	0	1 135	1.4	0.0	0.7	100.0	0.0	100.0	
Activities of extraterritorial organisations and bodies	U	40	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	
Total			78 604	77 355	155 958	100.0	100.0	100.0	50.4	49.6	100.0	

Source: Statistics Portugal (INE) [from: Appendix A.4 – parts 1 and 2].

Gross Domestic Product can be converted into Gross National Product or Income (GNI), by adding the compensation of factors of production (labour and capital) received from the rest of the world (6 347), and by deducting the compensation of factors of production and net taxes on production and imports sent to the rest of the world (12 382 – 986 - 108). Gross National Income can also be calculated directly from the SAM by adding the compensation of factors received by domestic institutions to the net taxes on production and on products received by domestic institutions (149 923 + 1 867 + 23 078). The corresponding amount for Portugal in 2015 was 174 868 million Euros.

GNI is the income generated in the domestic economy and in the rest of the world by residents, added to the part received by the general government in the form of net taxes on production and imports, to be valued at market prices.

Special attention is paid to this income, before adding the mentioned taxes, which allows possible studies of the institutional distribution of the same (generated) income – Table 7 illustrates the type of information that is provided and that can be used, for the level of disaggregation adopted for this study.

Table 7. Institutional distribution of generated income in Portugal in 2015.

Factors of Production		generated income, or gross national income (millions of euros)			structure of institutions by factors (%)			structure of factors by institutions (%)		
		Labour (employees)	Other (employers and own-account workers; capital)	total	Labour (employees)	Other (employers and own-account workers; capital)	total	Labour (employees)	Other (employers and own-account workers; capital)	total
Domestic institutions		1	2							
Households	79	78 724	42 984	121 708	100.0	60.4	81.2	64.7	35.3	100.0
Non-financial corporations	80	0	23 770	23 770	0.0	33.4	15.9	0.0	100.0	100.0
Financial corporations	81	0	5 062	5 062	0.0	7.1	3.4	0.0	100.0	100.0
General government	82	0	- 1 330	- 1 330	0.0	-1.9	-0.9	0.0	100.0	100.0
Non-profit institutions serving households	83	0	713	713	0.0	1.0	0.5	0.0	100.0	100.0
Total		78 724	71 199	149 923	100.0	100.0	100.0	52.5	47.5	100.0

Source: Statistics Portugal (*INE*) [from: Appendix A.4 – parts 5].

Disposable Income (DI) can be calculated by adding the net current transfers received by domestic institutions (6 716 – 4 415) to Gross National Income. In our application for Portugal, this was 177 168 million Euros.

The following macroeconomic aggregates are usually presented with the above: Gross Saving (S) and Net Lending (NL), or Net Borrowing (NB), which are items that are provided directly by the SAM. In the case of Portugal in 2015, there were 26 858 and 567 million Euros, respectively. As confirmed by its position in the SAM structure, these figures integrate the investment funds, either in non-financial or in financial assets, which we call ‘accumulated income’.

3. The networks of inter-industry flows within production and intermediate consumption SAM submatrices

a. Methodology

In the induction of any network, there are many different design decisions to be taken. The choice of a given set of nodes and the definition of the links between them is only one out of several other ways to look at a given system. In this study, we define bipartite networks, where similarities between industries are used to set the existence of every link in each network. In turn, the weighted or bipartite graphs show that the weight of each link is proportional to the intensity of the similarity between the linked pair of industries, relative to the overall output or intermediate consumption values of each involved industry.

Because these bipartite networks have a large number of links, we compute their corresponding Minimal Spanning Trees (MST). In fact, when networks are induced from similarity measures, the issue of deriving a sparse network from a dense or even a complete one becomes meaningful. The less-arbitrary choices (or the most endogenously-based ones) usually relies on the construction of a MST. In so doing, we ensure that the connectivity is preserved (the resulting network is necessarily connected), while moving from a dense network to a sparse one. Furthermore, we are able to emphasise the main topological patterns that emerge from the network representations.

Thus, using the methodological details described below, two network representations are created, one in which the inter-industry relations are defined by the output of common products (or goods and services), and the other in which these relations are defined by the use, or intermediate consumption, of common products.

In our application to Portugal, which is introduced in Section 2, the networks have 36 nodes, instead 38, because industries T and U were excluded, as U has no data, and the T produces only one product, therefore remaining therefore without any inter-industry relationship⁴.

a.1. Bipartite networks of industries

A bipartite network N consists of two partitions of nodes I (industries or activities) and P (products or goods and services), such that edges connect nodes from different partitions, but never those in the same partition. A projection of such a bipartite network onto I is a network consisting of the nodes in I , such that two nodes i and i' are connected, if and only if there exist a node $p \in P$, such that (i,p) and (i',p) are edges in the corresponding bipartite network (N).

⁴ As can be seen in Tables 3 and 4, activity 40 (U) - product 78 has no output or intermediate consumption, and activity 39 (T) – product 77, only has output of the same activity, that is to say, it is not related to any other.

As mentioned above, in our application, the two partitions of nodes I and P are the set of industries and the set of products, respectively, both at the resolution of 36 elements: $I = \{I1, I2, \dots, I36\}$; $P = \{P1, P2, \dots, P36\}$.

The links between any two industries (i, i') in the network N are defined by the existence of products ($p \in P$) such that $(i, p) \in N$ and $(i', p) \in N$. Thus, we have bipartite networks and their corresponding projections $N(i, p)$, where $i \in I$ and $p \in P$, as described below.

Given that each industry can produce or use many products and that each product can be produced or used by several industries, from the SAM submatrices of output (Table 3) and of intermediate consumption (Table 4), or supply and use tables (Tables A.2 and A.3), the values $v(i,p)$ relating industries to products are taken and the proximity networks N are then induced.

Thus, the values $v(i,p)$ of the product p produced or used by industry i are normalised (V) by industry, summing up the output or intermediate consumption values of all the product that industry i produces or uses:

$$V_{ip} = \frac{v(i,p)}{\sum_{p=1}^{36} v(i,p)} \cdot 10^3$$

The higher the value of the mutual production or intermediate consumption of two industries (nodes i and i'), the greater is the strength or weight of the connection or link $n(i,i')$ between industries i and i' , which is defined by:

$$n(i,i') = \sum_{p=1}^{36} V_{ip} \cdot V_{i'p}$$

where the V_{ip} and $V_{i'p}$ are the normalised values of the outputs or intermediate consumptions of industries i and i' for the product p , respectively.

These networks are represented in graphs for our application, as shown in Figures 2 and 4.

Because the structure shaping these networks of industries is difficult to identify, the MST is also constructed.

a.2. Minimum Spanning Trees (MST)

When networks are induced from similarity measures, in obtaining a sparse representation from a dense one, the less arbitrary choices rely on filtering the complete network with the threshold distance

value used in the last step of the hierarchical clustering process of the construction of a MST. In so doing, we ensure that the connectivity is preserved, as the resulting network is necessarily connected. A MST of a connected and weighted graph can be constructed by taking its nodes and links and applying the nearest neighbour method. The first step in this direction is the computation of the distances $d(i, i')$ between each pair of nodes i and i' as the inverse of the weight of the link $n(i, i')$ between them:

$$d(i, i') = \frac{1}{n(i, i')}$$

From the distance matrix D (of $d(i, i')$) a hierarchical clustering is then performed. Initially 36 clusters corresponding to the 36 industries are considered. Then, at each step, two clusters c_i and $c_{i'}$ are clumped into a single cluster if $d\{c_i, c_{i'}\} = \min\{d\{c_i, c_{i'}\}\}$ with the distance between clusters being defined by $d\{c_i, c_{i'}\} = \min\{d_{z,q}\}$ with $z \in c_i$ and $q \in c_{i'}$. This process is continued until there is a single cluster. In a connected graph with n nodes, the MST is a tree of $n - 1$ edges which minimizes the sum of the edge distances. In a network with 36 nodes, as that of our application, the hierarchical clustering process takes 35 steps to be completed, and uses, at each step, a particular distance $d(i, i') \in D$ to clump two clusters into a single one.

Let $C = \{d_q\}$, $q = 1, \dots, m$, the set of distances being $d(i, i') \in D$ used at each step of the clustering and the threshold distance. After the last step, we are able to define a representation of D with sparseness replacing high-connectivity in a suitable way.

This is graphically represented in the MST for our application, as shown in Figures 3 and 5.

This methodological description follows Araújo and Faustino (2017).

b. Results

This Subsection shows the results of the application of the methodology described previously in the data of the SAM for Portugal in 2015, as presented in Section 2.

Because the purpose is to obtain a better knowledge of the generation of income, that is to say, the gross added value, the following network analysis is focused, on the one hand, on the output of industries and, on the other hand, on the corresponding intermediate consumption, the inter-industry relations being defined, respectively, by the output and use of common products, as already mentioned above.

Our study starts with the bipartite networks of industries in which the strength of the connection between industries is proportional to a weighted value of the mutual production or intermediate

consumption of involved nodes - Figures 2 and 4. As can be observed in these figures, and was mentioned above, these networks are not very informative about any structure shaping these networks of industries. Thus, by filtering the complete network, Minimum Spanning Trees (MST) are added to complement the analysis – Figures 3 and 5.

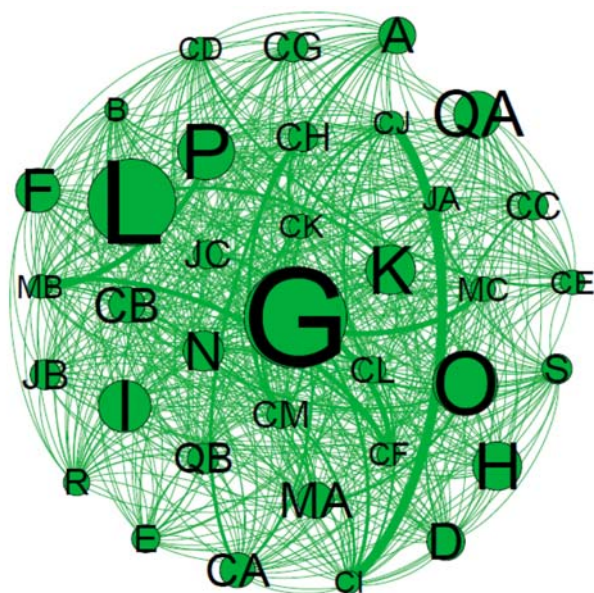
In both representations (network and MST) the size of the nodes is proportional to their generated income, or gross added value, as shown in Table 6.

In the following analysis, from the reading of these representations, evidences are systematised in the form of items. Each of these items is subtitled by the meaning of the nodes, according to the descriptions in Table 2, the relative importance of products of other activities, as shown in Table 5, and also, between brackets, the corresponding position in the structure of the total gross added value, that is to say, the corresponding contribution to the total generated income (or gross domestic income), as shown in Table 6.

b.1. Output of goods and services

Figure 2 shows the network of industries N_{2015}^O induced from the production, or output of goods and services, submatrix of the SAM of Portugal in 2015, as shown by Table 3.

Figure 2. The network of industries N_{2015}^O .



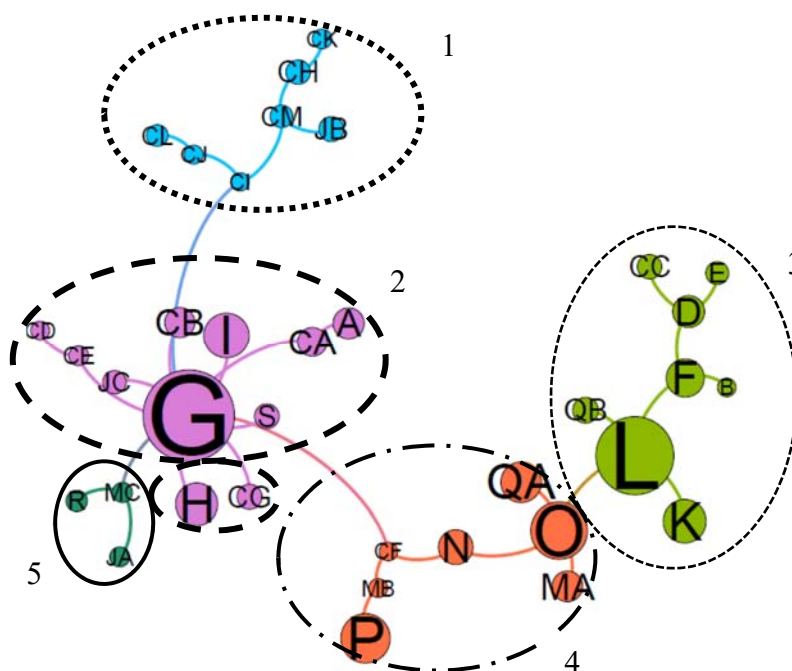
Source: Own calculations and construction, from Table 3.

Considering that the higher the value of mutual production, the greater is the strength or weight of the connection or link represented in Figure 2, the following aspects can be identified as evidence of inter-industry relations defined by the output of common products. Numbers between brackets after the description of nodes are: the relative importance of production of products of other activities in

the total production of each industry (or output of goods and services), as shown in Table 5, and; the contribution of each industry to the total generated income, as shown in Table 6:

- The strongest link connects CI and CJ.
 CI: manufacture of computer, electronic and optical products (25.1%; 0.3%).
 CJ: manufacture of electrical equipment (12.8%; 0.4%).
- A relatively strong link involves the pair of nodes (MB, P).
 MB: scientific research and development (4.5%; 0.4%).
 P: education (8.4%; 6.2%).
- Other (relatively) strong connection involves the pair of nodes (G, MC).
 G: wholesale and retail trade, repair of motor vehicles and motorcycles (15.5%; 14.3%).
 MC: advertising and market research, other professional, scientific and technical activities and veterinary activities (7.5%; 0.6%).
- The more evident links are those involving industries with production of products of other industries, almost always, above the average (6.5%).
- There is no relation between the strength of the connection generated by the output of common products by industries and relative importance of income generated by them.

Figure 3. The Minimum Spanning Tree of N_{2015}^0 .



Source: Own calculations, from Table 3.

Figure 3 organises clusters according to inter-industry distances (the inverses of the strength or weight of the connections or links) regarding the corresponding production (or output) of common products. The following aspects are evidenced. Numbers between brackets have the same meaning as the previous ones.

– Five partition clusters are defined:

1. (.....) Involving seven nodes or industries.

CH: manufacture of basic metals and fabricated metal products, except machinery and equipment (8.4%; 1.5%).

CI: manufacture of computer, electronic and optical products (25.1%; 0.3%).

CJ: manufacture of electrical equipment (12.8%; 0.4%).

CK: manufacture of machinery and equipment n.e.c. (not elsewhere classified) (14%; 0.5%).

CL: manufacture of transport equipment (8.7%; 0.9%).

CM: manufacture of furniture; other manufacturing; repair and installation of machinery and equipment (11.2%; 1.1%).

JB: telecommunications (5.47%; 1.5%).

2. (— — —) The largest, involving eleven industries.

A: agriculture, forestry and fishing (7.1%; 2.7%).

CA: manufacture of food products, beverages and tobacco products (2.9%; 2.4%)

CB: manufacture of textiles, wearing apparel and leather products (3.4%; 2.6%)

CD: manufacture of coke and refined petroleum products (5.3%; 0.4%)

CE: manufacture of chemicals and chemical products (4.8%; 0.6%)

CG: manufacture of rubber and plastics products, and other non-metallic mineral products (6.2%; 1.6%)

G: wholesale and retail trade; repair of motor vehicles and motorcycles (15.5%; 14.3%)

H: transport; warehousing and support activities for transportation; postal and courier activities (4.3%; 4.8%)

I: accommodation; food and beverage service activities (2.4%; 5.5%)

JC: computer programming, consultancy and related activities; information service activities (5.1%; 1.2%)

S: other service activities (3.7%; 1.5%)

3. (-----) With seven industries.

B: mining and quarrying (6%; 0.3%).

CC: manufacture of wood and paper products, and printing services (7%; 1.4%).

D: electricity, gas, steam and air-conditioning supply (3.1%; 2.9%)

E: water collection, treatment and supply; sewerage, waste management and remediation services (5.9%; 1.2%).

F: construction (2.3%; 4.1%).

K: financial and insurance activities (6.3%; 5.0%).

L: real estate activities (2.2%; 11.7%).

QB: social work activities (2.7%; 1.7%).

4. (— . . —) Involving seven industries.

CF: manufacture of basic pharmaceutical products and pharmaceutical preparations (18.2%; 0.3%).

MA: legal and accounting activities; activities of head offices; management consulting activities; architectural and engineering activities; technical testing and analysis activities (4.2%; 2.6%).

MB: scientific research and development (4.5%; 0.4%).

N: administrative and support activities (1.8%; 3.4%).

O: public administration and defence; compulsory social security (12.5%; 7.7%).

P: education (8.4%; 6.2%).

QA: human health activities (1.6%; 4.5%).

5. (——) The smallest, involving three industries.

JA: publishing, audio-visual and broadcasting activities (7.2%; 0.6%).

MC: advertising and market research; other professional, scientific and technical activities; veterinary activities (7.5%; 0.6%).

R: arts, entertainment and recreation activities (6.4%; 0.8%).

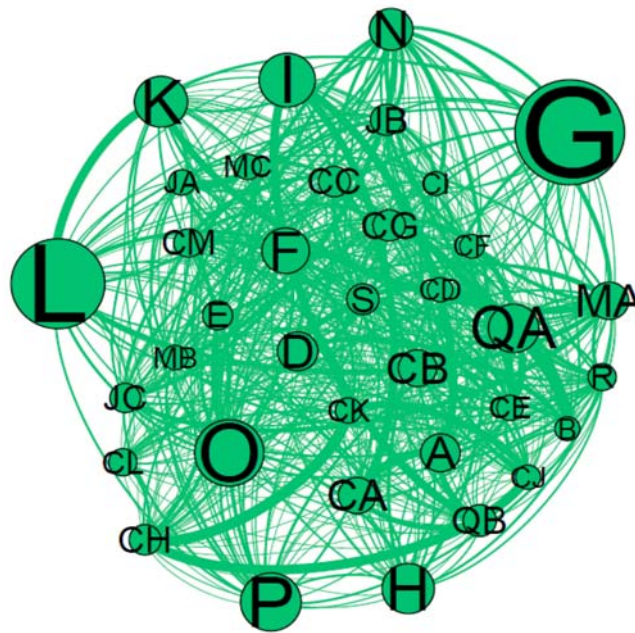
- This clusters are in line with the results presented in Araújo and Faustino (2017). In Cluster 2, G (wholesale and retail trade; repair of motor vehicles and motorcycles) being the industry with the highest degree of centrality, the above MST shows that this industry holds the shortest distances (strongest links) to that large number of industries (10). Cluster 1 represents the opposite situation, where most of the nodes, or industries, have a very low degree, showing that they are the ones with the weaker links in the production networks of industries.
- Some similarity can be identified within clusters regarding the relative importance of industries' production of products of other industries.

- No relation can be identified between the strength of the connection generated by the output of common products by industries and the corresponding contribution to the total generated income.

b.2. Intermediate Consumption

Figure 3 shows the network of industries N_{2015}^{IC} induced from the intermediate consumption submatrix of the SAM of Portugal in 2015, as shown by Table 4.

Figure 4. The network of industries N_{2015}^{IC} .



Source: Own calculations, from Table 4.

Considering that the higher the value of mutual intermediate consumption, the greater is the strength or weight of the connection or link represented in Figure 4, the following aspects can be identified as evidences on inter-industry relations defined by the use of common products. Numbers between brackets after the description of nodes are: the relative importance of intermediate consumption of products of other activities in the total intermediate consumption of each industry, as shown in Table 5, and; the contribution of each industry to the total generated income, as shown in Table 6:

- One of the strongest links connects K and L.
 - K: financial and insurance activities (44.3%; 5%)
 - L: real state activities (91.9%; 11.7%)
- Another prominent link connects CK, CH and CJ.
 - CK: manufacture of machinery and equipment n.e.c. (not elsewhere classified) (73%, 0.5%)

CH: manufacture of basic metals and fabricated metal products, except machinery and equipment (41.3%; 1.5%)

CJ: Manufacture of electrical equipment (80.2%, 0.4%)

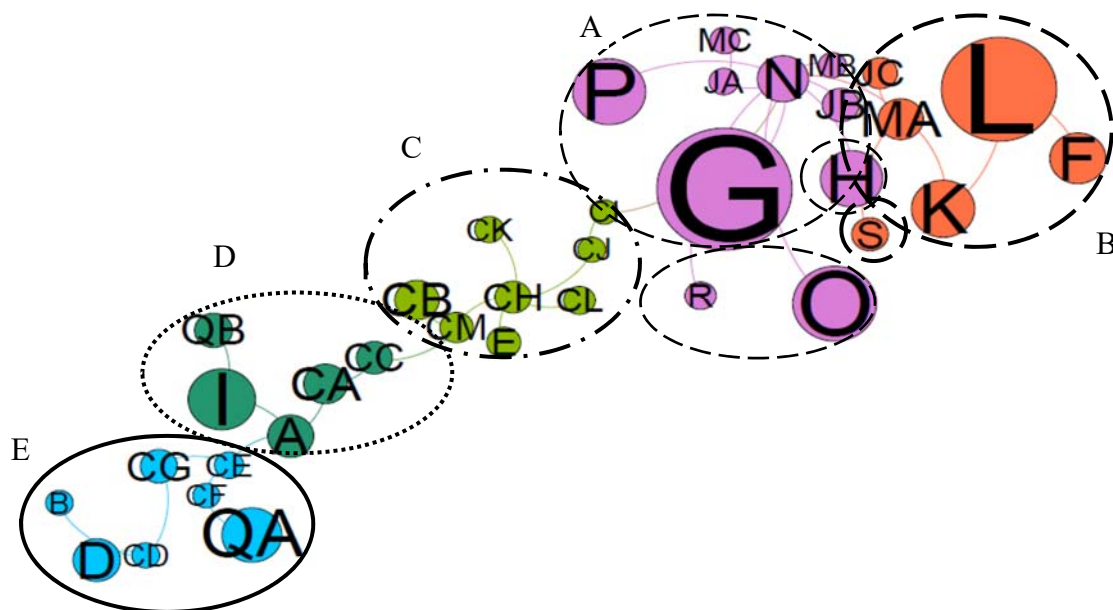
- Of mentioning the link that connects G and MA.

G: wholesale and retail trade; repair of motor vehicles and motorcycles (93.6%, 14.3%)

MA: legal and accounting activities; activities of head offices; management consulting activities; architectural and engineering activities; technical testing and analysis activities (62.5%, 2.6%)

- The more evident links are those involving industries with intermediate consumption of products of other industries, almost always, above the average (67.13%).
- No relation can be identified between the strength of the connection generated by the use of common products by industries and the corresponding contribution to the total generated income.

Figure 5. The Minimum Spanning Tree of N_{2015}^{IC} .



Source: Own calculations, from Table 4.

Figure 5 organises clusters according with inter-industries distance (the inverses of the strength or weight of the connection or link) regarding the corresponding intermediate consumption of common products. The following aspects are evidenced. Numbers between brackets have the same meaning as the previous ones.

- Five partition clusters are defined.

A. (_ _ _) The largest, involving ten nodes or industries, with G maintaining the highest centrality.

G: wholesale and retail trade; repair of motor vehicles and motorcycles (93.6%, 14.3%)

H: transport; warehousing and support activities for transportation; postal and courier activities (60.6%, 4.8%).

JA: publishing, audio-visual and broadcasting activities (68.9%, 0.6%).

JB: telecommunications (71%, 1.6%).

MB: scientific research and development (78.3%, 0.4%).

MC: advertising and market research; other professional, scientific and technical activities; veterinary activities (83.3%, 0.6%).

N: administrative and support activities (57.7%, 3.4%).

O: public administration and defence; compulsory social security (99.5%, 7.7%).

P: education (93%, 6.2%).

R: arts, entertainment and recreation activities (85.7%, 0.8%).

B. (- -) with six nodes or industries.

F: construction (64%, 4.1%).

JC: computer programming, consultancy and related activities; information service activities (68.1%, 1.2%).

K: financial and insurance activities (44.3%, 5%).

L: real estate activities (91.9%, 11.7%).

MA: legal and accounting activities; activities of head offices; management consulting activities; architectural and engineering activities; technical testing and analysis activities (62.5%, 2.6%).

S: other service activities (95%, 1.5%).

C. (— . -) with eight nodes or industries.

CB: manufacture of textiles, wearing apparel and leather products (34%, 2.6%).

CH: manufacture of basic metals and fabricated metal products, except machinery and equipment (41.3%, 1.5%).

CI: manufacture of computer, electronic and optical products (61.5%, 0.3%).

CJ: manufacture of electrical equipment (80.2%, 0.4%).

CK: manufacture of machinery and equipment n.e.c. (not elsewhere classified) (73%, 0.5%)

CL: manufacture of transport equipment (43%, 0.9%).

CM: manufacture of furniture; other manufacturing; repair and installation of machinery and equipment (86.5%, 1.1%).

E: water collection, treatment and supply; sewerage, waste management and remediation services (41%, 1.2%).

D. (.....) with five nodes or industries.

A: agriculture, forestry and fishing (76.5%, 2.7%).

CA: manufacture of food products, beverages and tobacco products (71.7%, 2.4%).

CC: manufacture of wood and paper products, and printing services (52.6%, 1.4%).

I: accommodation; food and beverage service activities (95.4%, 5.5%).

QB: social work activities (99.2%, 1.7%).

E. (——) with seven nodes or industries.

B: mining and quarrying (68.7%, 0.3%)

CD: manufacture of coke and refined petroleum products (89.1%, 0.4%)

CE: manufacture of chemicals and chemical products (45.5%, 0.6%)

CF: manufacture of basic pharmaceutical products and pharmaceutical preparations (73.4%, 0.3%)

CG: manufacture of rubber and plastics products, and other non-metallic mineral products (81%, 1.6%)

D: electricity, gas, steam and air-conditioning supply (27.6%, 2.9%).

QA: human health activities (86.9%, 4.5%).

- No similarity can be identified within clusters regarding the relative importance of industries' use of products of other industries.
- No relation can be identified between the strength of the connection generated by the use of common products by industries and the corresponding contribution to the total generated income.

b.3. Output of goods and services, intermediate consumption and gross added value

Above we saw that the strength of the inter-industry relations in production (or output of goods and services) and in intermediate consumption is defined by the production and use of common products and is independent of the position of industries in the generation of income structure.

In turn, from the previous description and with the aid of Tables 8 and 9, the clusters of industries, organised through MST showed independence of the identified inter-industry relationships in

production and intermediate consumption, with regard to the corresponding positions in the structures of production, intermediate consumption, and gross added value or generated income.

Table 8. Network of inter-industry flows. Results with industries organised by clusters in output of goods and services.

Activities (industries)	Position in		the structure of			MST N ₂₀₁₅ ^O	MST N ₂₀₁₅ ^{IC}
			O (1)	IC (2)	GAV (3)		
Manufacture of basic metals and fabricated metal products, except machinery and equipment	CH	12	2.5	3.6	1.5	1	C
Manufacture of computer, electronic and optical products	CI	13	0.5	0.8	0.3	1	C
Manufacture of electrical equipment	CJ	14	0.8	1.2	0.4	1	C
Manufacture of machinery and equipment n.e.c. (not elsewhere classified)	CK	15	0.8	1.0	0.5	1	C
Manufacture of transport equipment	CL	16	2.6	4.2	0.9	1	C
Manufacture of furniture; other manufacturing; repair and installation of machinery and equipment	CM	17	1.4	1.6	1.1	1	C
Telecommunications	JB	25	1.7	1.8	1.6	1	A
Agriculture, forestry and fishing	A	3	2.6	2.9	2.7	2	D
Manufacture of food products, beverages and tobacco products	CA	5	5.1	7.6	2.4	2	D
Manufacture of textiles, wearing apparel and leather products	CB	6	3.3	4.0	2.6	2	C
Manufacture of coke and refined petroleum products	CD	8	2.2	4.0	0.4	2	E
Manufacture of chemicals and chemical products	CE	9	1.4	2.2	0.6	2	E
Manufacture of rubber and plastics products, and other non-metallic mineral products	CG	11	2.4	3.2	1.6	2	E
Wholesale and retail trade; repair of motor vehicles and motorcycles	G	21	11.7	9.1	14.3	2	A
Transport; warehousing and support activities for transportation; postal and courier activities	H	22	6.1	7.3	4.8	2	A
Accommodation; food and beverage service activities	I	23	4.8	4.1	5.5	2	D
Computer programming, consultancy and related activities; information service activities	JC	26	1.2	1.1	1.2	2	B
Other service activities	S	38	1.1	0.9	1.5	2	B
Mining and quarrying	B	4	0.4	0.4	0.3	3	E
Manufacture of wood and paper products, and printing services	CC	7	2.5	3.6	1.4	3	D
Electricity, gas, steam and air-conditioning supply	D	18	4.6	6.3	2.9	3	E
Water collection, treatment and supply; sewerage, waste management and remediation services	E	19	1.2	1.3	1.2	3	C
Construction	F	20	5.3	6.6	4.1	3	B
Financial and insurance activities	K	27	4.6	4.0	5.0	3	B
Real estate activities	L	28	6.7	1.3	11.7	3	B
Social work activities	QB	36	1.2	0.8	1.7	3	D
Manufacture of basic pharmaceutical products and pharmaceutical preparations	CF	10	0.4	0.4	0.3	4	E
Legal and accounting activities; activities of head offices; management consulting activities; architectural and engineering activities; technical testing and analysis activities	MA	29	2.7	2.8	2.6	4	B
Scientific research and development (R&D)	MB	30	0.3	0.2	0.4	4	A
Administrative and support activities	N	32	2.7	2.0	3.4	4	A
Public administration and defence; compulsory social security	O	33	4.9	2.4	7.7	4	A
Education	P	34	3.4	0.9	6.2	4	A
Human health activities	QA	35	4.0	3.5	4.5	4	E
Publishing, audio-visual and broadcasting activities	JA	24	0.7	0.9	0.6	5	A
Advertising and market research; other professional, scientific and technical activities; veterinary activities	MC	31	0.8	1.0	0.6	5	A
Arts, entertainment and recreation activities	R	37	0.8	0.9	0.8	5	A

Sources: Own calculations, from Tables 3, 4, 6; Figures 3, 5.

- (1) Percentage of the output of goods and services of each industry in the total.
- (2) Percentage of the intermediate consumption of each industry in the total.
- (3) Percentage of the gross added value of each industry in the total.

Table 9. Network of inter-industry flows. Results with industries organised by clusters in intermediate consumption.

Activities (industries)	Position in		the structure of			MST N ₂₀₁₅ ^O	MST N ₂₀₁₅ ^{IC}
			O (1)	IC (2)	GAV (3)		
Wholesale and retail trade; repair of motor vehicles and motorcycles	G	21	11.7	9.1	14.3	2	A
Transport; warehousing and support activities for transportation; postal and courier activities	H	22	6.1	7.3	4.8	2	A
Publishing, audio-visual and broadcasting activities	JA	24	0.7	0.9	0.6	5	A
Telecommunications	JB	25	1.7	1.8	1.6	1	A
Scientific research and development (R&D)	MB	30	0.3	0.2	0.4	4	A
Advertising and market research; other professional, scientific and technical activities; veterinary activities	MC	31	0.8	1.0	0.6	5	A
Administrative and support activities	N	32	2.7	2.0	3.4	4	A
Public administration and defence; compulsory social security	O	33	4.9	2.4	7.7	4	A
Education	P	34	3.4	0.9	6.2	4	A
Arts, entertainment and recreation activities	R	37	0.8	0.9	0.8	5	A
Construction	F	20	5.3	6.6	4.1	3	B
Computer programming, consultancy and related activities; information service activities	JC	26	1.2	1.1	1.2	2	B
Financial and insurance activities	K	27	4.6	4.0	5.0	3	B
Real estate activities	L	28	6.7	1.3	11.7	3	B
Legal and accounting activities; activities of head offices; management consulting activities; architectural and engineering activities; technical testing and analysis activities	MA	29	2.7	2.8	2.6	4	B
Other service activities	S	38	1.1	0.9	1.5	2	B
Manufacture of textiles, wearing apparel and leather products	CB	6	3.3	4.0	2.6	2	C
Manufacture of basic metals and fabricated metal products, except machinery and equipment	CH	12	2.5	3.6	1.5	1	C
Manufacture of computer, electronic and optical products	CI	13	0.5	0.8	0.3	1	C
Manufacture of electrical equipment	CJ	14	0.8	1.2	0.4	1	C
Manufacture of machinery and equipment n.e.c. (not elsewhere classified)	CK	15	0.8	1.0	0.5	1	C
Manufacture of transport equipment	CL	16	2.6	4.2	0.9	1	C
Manufacture of furniture; other manufacturing; repair and installation of machinery and equipment	CM	17	1.4	1.6	1.1	1	C
Water collection, treatment and supply; sewerage, waste management and remediation services	E	19	1.2	1.3	1.2	3	C
Agriculture, forestry and fishing	A	3	2.6	2.9	2.7	2	D
Manufacture of food products, beverages and tobacco products	CA	5	5.1	7.6	2.4	2	D
Manufacture of wood and paper products, and printing services	CC	7	2.5	3.6	1.4	3	D
Accommodation; food and beverage service activities	I	23	4.8	4.1	5.5	2	D
Social work activities	QB	36	1.2	0.8	1.7	3	D
Mining and quarrying	B	4	0.4	0.4	0.3	3	E
Manufacture of coke and refined petroleum products	CD	8	2.2	4.0	0.4	2	E
Manufacture of chemicals and chemical products	CE	9	1.4	2.2	0.6	2	E
Manufacture of basic pharmaceutical products and pharmaceutical preparations	CF	10	0.4	0.4	0.3	4	E
Manufacture of rubber and plastics products, and other non-metallic mineral products	CG	11	2.4	3.2	1.6	2	E
Electricity, gas, steam and air-conditioning supply	D	18	4.6	6.3	2.9	3	E
Human health activities	QA	35	4.0	3.5	4.5	4	E

Sources: Tables 3, 4, 6; Figures 3, 5.

- (1) Percentage of the output of goods and services of each industry in the total.
- (2) Percentage of the intermediate consumption of each industry in the total.
- (3) Percentage of the gross added value of each industry in the total.

Therefore, the above described network analysis does not identify any type of interdependence and causal relationships of the inter-industry flows with the structures of production, intermediate consumption, and generation of income.

4. Summary and concluding remarks

A SAM, constructed from the National Accounts, is presented, with the aid of an application to Portugal in 2015.

Starting by disagreeing with the understanding that the SAM is an extension of the IOM, the parallelism between approaches based on both matrices is then established, as well as the agreement that both the SAM and the IOM numerical versions are the starting points for algebraic versions or models.

With an equal number of rows and columns representing accounts, the SAM registers the inflows (incomes, resources, receipts, or changes in liabilities) in rows, and the outflows (expenditures or changes in assets) in columns, adding to each of them the same amount.

At its highest level of aggregation, ours is a (7x7) matrix which covers practically all the grand totals of the National Accounts, from which it is possible to extract the main macroeconomic aggregates and balances, namely: the GDP (Gross Domestic Product), based on the three known approaches, the GNI (Gross National Income), the DI (Disposable Income), etc.

Without losing its initial consistency, that matrix is then transformed into a (90x90) matrix, with the purpose of studying the network of inter-industry flows in production (or output of goods and services) and intermediate consumption, in order to identify some type of causality and better understand the generation of income.

Accordingly, the generated income being the difference between the output of goods and services (or products) and the intermediate consumption, special focus is given to the corresponding SAM (38x38) submatrices. In these submatrices, which are taken from the supply and use tables, respectively, we obtain, on one hand, the output of each industry, distributed by the products that this industry produces, and, on the other hand, the intermediate consumption of each industry, distributed by the products that this industry uses. This way of representing intermediate consumption justifies the above-mentioned disagreement with the understanding that the SAM is an extension of the IOM. In fact, the representation of the latter is either of industries by industries, or of products by products, separating (in both cases) what is domestically produced from what is imported, whereas in the SAM shows industries by products, without any separation. Thus, both provide very important information, although they cover different aspects.

Pyatt (1999), who also disagrees with the understanding that the SAM is an extension of the IOM, identifies the inter-industry relations and the underlying intermediated consumption as being conditioners of the structure of production and the essence of the IOM. In turn, he identifies the inter-institutions relations and the underlying un-requited transfers (social security, direct taxation, etc.), as being conditioners of the structure of the distribution of income, and the essence of the SAM.

On the other hand, in a study of the structural features of the socio-economic activity of a country based on a SAM, Santos (2018) identified a direct interconnection between the functional and institutional distribution of the generated income. The functional distribution of the generated income is the distribution of the gross added value, or gross domestic product, (the difference between production and intermediate consumption) of industries by factors of production. The institutional distribution of the generated income is the distribution of the gross national product of institutions by factors of factors of production. An important role was then attributed to the SAM factors of production account, to establish the linkage between these two types of distribution of the generated income. Accordingly, any advance in knowledge of the latter, especially with regards to interdependence and causal relationships, will certainly contribute to a better knowledge of income redistribution, where the potential of the SAM institutions accounts is well-researched – see, for instance, Santos (2013).

This paper uses the network analysis to identify evidence, on one hand, of the structures of inter-industry relations in production and in intermediate consumption and, on the other hand, of the connection between these relations and the structures of production, intermediate consumption, and gross added value, or generated income, of industries. This analysis is focused on the production and use of common products, by industries.

No type of interdependence and causal relationships of the inter-industry flows was found, which can be understood as confirming Graham Pyatt's statement, with which we introduced this paper. According to that statement, "the essential detail" of a SAM "is to be found in the matrix of transactions and transfers between different types of institutions", whereas the essence of a IOM is that "industries are related, one to other, through transactions between them, i.e. through the buying and selling of raw materials, and that the structure of production is conditioned by these linkage" (Pyatt, 1999, p.366). Therefore, the study of the relationship between the generation of income and the corresponding distribution and redistribution should involve both the SAM and IOM, although inter-institutions flows in the SAM cannot be performed in such a detailed way as inter-industry flows in a IOM, due to the lack of data.

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Appendices

A.1. Integrated Economic Accounts Table of Portugal in 2015 (in millions of euros).

Current accounts												
Uses												
Accounts	Total	Goods and Services Account (Resources)	S.2 Rest of the World Account	S.1 Total of the Economy	S.15 NPISHs	S.14 Households	S.13 General Government	S.12 Financial Corporations	S.11 Non-Financial Corporations	Code	Transactions and other flows, stocks and balancing items	
I. Production / external account of goods and services	71 601	71 601								P.7	Imports of goods and services	
	72 648		72 648							P.6	Exports of goods and services	
	318 313	318 313								P.1	Output of goods and services	
	161 475			161 475	2 381	7 386	9 994	6 258	135 455	P.2	Intermediate consumption	
	22 970	22 970								D.21-D.31	Net taxes on products	
	156 839			156 839	3 339	35 125	25 598	8 105	84 673	B.1g	Gross added value	
				179 809						B.1*g	Gross domestic product	
	31 013			31 013	597	9 577	5 239	905	14 695	P.51c	Consumption of fixed capital	
	125 826			125 826	2 743	25 548	20 359	7 199	69 978	B.1n	Value added, net	
				148 796						B.1*n	Net domestic product	
			- 1 047						B.11	External balance of goods and services		
II.1.1. Generation of income account	78 937		333	78 604	2 993	2 971	20 349	3 816	48 475	D.1	Compensation of employees	
	881			881	- 251	423	- 322	445	585	D.2-D.3	Net taxes on production and imports	
	2 880			2 880	4	935		453	1 488	D.2	Taxes on Production and Imports	
										D.21	Taxes on Products	
										D.29	Other Taxes on Production	
	- 2 000			- 2 000	- 255	- 512	- 322	- 8	- 903	D.3	Subsidies	
										D.31	Subsidies on Products	
										D.39	Other Subsidies on Production	
					77 355	597	31 730	5 571	3 844	35 613	B.2g+B3g	Gross operating surplus and Gross mixed income
	57 786			57 786	597	12 161	5 571	3 844	35 613	B.2g	Gross operating surplus	
	19 569			19 569		19 569				B.3g	Gross mixed income	
	29 239			29 239	597	7 803	5 239	905	14 695	P.51c1	Consumption of fixed capital on gross operating surplus	
	1 773			1 773		1 773				P.51c2	Consumption of fixed capital on gross mixed income	
28 547			28 547		4 358	332	2 938	20 918	B.2n	Net operating surplus		
17 795			17 795		17 795				B.3n	Net mixed income		
46 650		6 014	40 636	10	1 732	8 224	11 893	18 777	D.4	Property income		
174 868			174 868	713	121 708	23 615	5 062	23 770	B.5g	Gross national income/ Gross balance of primary incomes		
143 855			143 855	117	112 131	18 376	4 156	9 075	B.5n	Net national income/ Net balance of primary incomes		
II.2. Secondary distribution income account	19 736		344	19 393	8	13 656	22	1 020	4 686	D.5	Current taxes on income, wealth, etc	
	24 718		51	24 666		24 666				D.61	Social contributions	
	35 017		49	34 968	326	14	31 338	1 790	1 500	D.62	Social benefits other than social transfers in kind	
	21 559		6 272	15 287	119	5 793	4 579	3 359	1 436	D.7	Other current transfers	
	177 168			177 168	3 397	120 757	30 932	3 953	18 129	B.6g	Gross disposable income	
146 156			146 156	2 800	111 181	25 693	3 048	3 434	B.6n	Net disposable income		
II.3. Redistribution of income in kind account	19 947			19 947	3 669		16 278			D.63	Social transfers in kind	
	177 168			177 168	- 272	140 704	14 654	3 953	18 129	B.7g	Gross adjusted disposable income	
II.4. Use of income account	146 156			146 156	- 868	131 128	9 415	3 048	3 434	B.7n	Net adjusted disposable income	
	177 168			177 168	3 397	120 757	30 932	3 953	18 129	B.6g	Gross disposable income	
	146 156			146 156	2 800	111 181	25 693	3 048	3 434	B.6n	Net disposable income	
	150 311			150 311		134 005	16 305			P.4	Actual Final Consumption	
	150 311			150 311	3 669	114 058	32 584			P.3	Final consumption expenditure	
	127			127				127		D.8	Adjustment for the change in the net equity of households in pension funds reserves	
26 858			26 858	- 272	6 826	- 1 652	3 826	18 129	B.8g	Gross saving		
- 4 155			- 4 155	- 868	- 2 750	- 6 891	2 921	3 434	B.8n	Net saving		
			1 594						B.12	Current external balance		
Accumulation accounts												
Changes in Assets												
III.1.1. Change in net worth due to saving and capital transfers account										B.8n	Net saving	
										B.12	Current external balance	
										D.9r	Capital transfers, receivable	
										D.9p	Capital transfers, payable (-)	
- 2 561		- 537	- 2 024	- 603	- 2 112	- 8 927	4 855	4 762	B.10.1	Changes in net worth due to saving and capital transfers		
27 844			27 844	574	5 230	4 045	- 318	18 312	P.51g	Gross fixed capital formation		
- 31 013			- 31 013	- 597	- 9 577	- 5 239	- 905	- 14 695	P.51c	Consumption of fixed capital (-)		
505			505		112	92		300	P.52	Changes in inventories		
103			103	3	62	8		31	P.53	Acquisitions less disposals of valuables		
0		30	- 30		- 1 914	84	- 329	2 129	NP	Acquisitions less disposals of non-produced non-financial assets		
0		- 567	567	- 583	3 975	- 7 918	6 408	- 1 315	B.9	Net lending (+) / borrowing (-)		
			S.2	S.1	S.15 + S.14	S.13	S.12	S.11				
III.2 Financial account	- 11 177		- 7 144	- 4 033	110		- 1 137	- 3 399	393		Net acquisition of financial assets\	
	1		0	1				1		F.1	Net incurrence of liabilities	
	- 4 402		- 1 234	- 3 168	7 425		- 2 245	- 7 814	- 534	F.2	Monetary gold and SDRs	
	- 3 488		- 6 990	3 502	- 4 238		- 1 559	9 265	34	F.3	Currency and deposits	
	731		- 1 828	2 559	- 805		2 773	- 1 814	2 405	F.4	Debt securities	
	6 540		2 951	3 589	920		- 146	881	1 934	F.5	Loans	
	- 1 988		- 11	- 1 977	- 1 370		- 1	- 569	- 37	F.6	Equity and investment fund shares or units	
	377		1	376	223		- 291	24	420	F.7	Insurance, pension and standardised guarantee schemes	
			- 33	- 8 915	- 2 045		332	- 3 373	- 3 829	F.8	Financial derivatives and employee stock options	
										F.8 F	Other accounts receivable/ payable	
									B.9 F	Net lending (+) / borrowing (-)		
										Statistical discrepancy		

Sources: Statistics Portugal (INE); Portuguese Central Bank (Banco de Portugal).

A.1. (continued) Integrated Economic Accounts Table of Portugal in 2015 (in millions of euros).

Current accounts											
Resources											
Code	Transactions and other flows, stocks and balancing items	S.11	S.12	S.13	S.14	S.15	S.1	S.2	Goods and Services Account (Uses)	Total	Accounts
		Non-Financial Corporations	Financial Corporations	General Government	Households	NPISHs	Total of the Economy	Rest of the World Account			
P.7	Imports of goods and services							71 601		71 601	I. Production / external account of goods and services
P.6	Exports of goods and services								72 648	72 648	
P.1	Output of goods and services	220 128	14 362	35 592	42 511	5 720	318 313			318 313	
P.2	Intermediate consumption								161 475	161 475	
D.21-D.31	Net taxes on products						22 970			22 970	
B.1g	Gross added value						156 839			156 839	II.1.1. Generation of income account
B.1*g	Gross domestic product						179 809			179 809	
P.51c	Consumption of fixed capital										
B.1n	Value added, net	69 978	7 199	20 359	25 548	2 743	125 826			125 826	
B.1*n	Net domestic product						148 796				
B.11	External balance of goods and services							- 1 047			
D.1	Compensation of employees				78 724		78 724	213		78 937	II.1.2. Allocation of primary income account
D.2-D.3	Net taxes on production and imports			24 945			24 945	- 1 094		23 851	
D.2	Taxes on Production and Imports			26 069			26 069	158		26 227	
D.21	Taxes on Products										
D.29	Other Taxes on Production										
D.3	Subsidies			- 1 124			- 1 124	- 1 252		- 2 376	
D.31	Subsidies on Products										
D.39	Other Subsidies on Production										
B.2g+B3g	Gross operating surplus and Gross mixed income	35 613	3 844	5 571	31 730	597	77 355			77 355	
B.2g	Gross operating surplus	35 613	3 844	5 571	12 161	597	57 786			57 786	
B.3g	Gross mixed income				19 569		19 569			19 569	
P.51c1	Consumption of fixed capital on gross operating surplus	14 695	905	5 239	7 803	597	29 239			29 239	
P.51c2	Consumption of fixed capital on gross mixed income				1 773		1 773			1 773	
B.2n	Net operating surplus	20 918	2 938	332	4 358		28 547			28 547	
B.3n	Net mixed income				17 795		17 795			17 795	
D.4	Property income	6 934	13 111	1 323	12 986	126	34 480	12 170		46 650	
B.5g	Gross national income/ Gross balance of primary incomes	23 770	5 062	23 615	121 708	713	174 868			174 868	II.2. Secondary distribution income account
B.5n	Net national income/ Net balance of primary incomes	9 075	4 156	18 376	112 131	117	143 855			143 855	
D.5	Current taxes on income, wealth, etc			19 529			19 529	207		19 736	
D.61	Social contributions	1 500	1 917	20 783	13	390	24 603	114		24 718	
D.62	Social benefits other than social transfers in kind				34 794		34 794	223		35 017	
D.7	Other current transfers	482	3 144	2 944	8 372	2 747	17 688	3 871		21 559	
B.6g	Gross disposable income	18 129	3 953	30 932	120 757	3 397	177 168			177 168	II.3. Redistribution of income in kind account
B.6n	Net disposable income	3 434	3 048	25 693	111 181	2 800	146 156			146 156	
D.63	Social transfers in kind				19 947		19 947			19 947	
B.7g	Gross adjusted disposable income	18 129	3 953	14 654	140 704	- 272	177 168			177 168	II.4. Use of income account
B.7n	Net adjusted disposable income	3 434	3 048	9 415	131 128	- 868	146 156			146 156	
B.6g	Gross disposable income	18 129	3 953	30 932	120 757	3 397	177 168			177 168	
B.6n	Net disposable income	3 434	3 048	25 693	111 181	2 800	146 156			146 156	
P.4	Actual Final Consumption							150 311		150 311	
P.3	Final consumption expenditure							150 311		150 311	
D.8	Adjustment for the change in the net equity of households in pension funds reserves				127		127			127	
B.8g	Gross saving										
B.8n	Net saving										
B.12	Current external balance										
Changes in liabilities and net worth											
B.8n	Net saving	3 434	2 921	- 6 891	- 2 750	- 868	- 4 155			- 4 155	III.1.1. Change in net worth due to saving and capital transfers account
B.12	Current external balance							1 594			
D.9r	Capital transfers, receivable	1 594	2 829	1 400	642	289	6 754	306		7 060	
D.9p	Capital transfers, payable (-)	- 266	- 895	- 3 436	- 4	- 23	- 4 624	- 2 436		- 7 060	
B.10.1	Changes in net worth due to saving and capital transfers	4 762	4 855	- 8 927	- 2 112	- 603	- 2 024	- 537		- 2 561	III.1.2. Acquisitions of non-financial assets account
P.51g	Gross fixed capital formation										
P.51c	Consumption of fixed capital (-)										
P.52	Changes in inventories										
P.53	Acquisitions less disposals of valuables										
NP	Acquisitions less disposals of non-produced non-financial assets										
B.9	Net lending (+) /borrowing (-)										
		S.11	S.12	S.13	S.14 + S.15	S.1	S.2				
Net acquisition of financial assets\											III.2. Financial account
Net incurrence of liabilities		- 1 192	- 10 067	6 689	- 1 696	- 6 604	- 4 911			- 11 515	
F.1	Monetary gold and SDRs		0			0	1			1	
F.2	Currency and deposits		280	4 839		5 119	- 9 521			- 4 402	
F.3	Debt securities	- 328	- 13612	10 595	0	- 3 345	- 143			- 3 488	
F.4	Loans	- 993	11518	- 6 732	- 2795	1 287	- 266			1 021	
F.5	Equity and investment fund shares or units	4 340	- 1566	- 145	2	2 608	3 908			6 516	
F.6	Insurance, pension and standardised guarantee schemes	- 161	- 1819	- 24	0	- 2 607	16			- 2 591	
F.7	Financial derivatives and employee stock options	7	- 28		0	- 21	398			377	
F.8	Other accounts receivable/payable	- 4 057	- 4840	- 1 844	1097	- 9 644	696			- 8 948	
B.9 F	Net lending (+) /borrowing (-)	1 585	6 668	- 7 826	1 806	2 233	- 2 233			0	
Statistical discrepancy		2 900	- 260	92	- 1586	1 666	- 1 666			0	

A.2. Supply Table of Portugal in 2015 (in millions of euros).

Supply of goods and services (or products)	Output (P1)																					
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	A	B	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	D	E	F	G	H	I	JA
41	7 733	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	
42	0	1 050	0	0	0	5	3	0	32	0	0	0	0	0	0	0	0	11	4	1	0	
43	353	0	15 680	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	632	0	19	5
44	0	0	0	10 146	6	0	14	0	4	5	0	0	0	17	5	0	0	0	109	0	0	0
45	8	0	0	3	7 532	0	7	0	26	1	0	0	0	0	47	0	0	4	31	0	0	4
46	0	0	0	0	0	6 696	0	0	0	0	0	0	0	0	0	0	0	0	92	0	0	0
47	0	0	8	22	23	231	4 149	6	33	0	0	0	0	0	0	2	0	0	76	0	0	0
48	0	0	1	0	0	0	0	962	0	0	0	0	0	0	0	0	0	0	189	0	0	0
49	0	9	0	70	1	0	8	0	7 128	45	1	5	20	0	14	0	0	77	31	0	0	0
50	0	0	0	0	1	0	0	0	10	7 405	4	52	89	8	51	0	49	13	110	0	0	0
51	0	0	0	0	0	0	0	0	0	1	1 270	15	10	247	11	0	0	0	80	0	0	0
52	0	0	0	0	0	0	8	0	0	17	207	2 198	10	144	12	0	0	4	6	0	0	0
53	0	0	0	0	2	0	0	0	0	51	13	55	2 130	31	16	0	0	16	4	0	0	0
54	0	0	0	7	0	0	0	0	48	7	1	34	15	7 429	93	0	0	0	17	0	0	0
55	2	0	0	0	27	0	0	0	3	326	52	28	81	32	3 871	0	0	2	402	102	0	0
56	2	0	0	2	190	49	0	0	21	0	0	0	0	0	1	14 239	73	0	0	0	0	0
57	0	0	0	0	98	3	2	0	0	18	0	7	3	4	9	1	3 732	0	9	5	0	0
58	14	18	6	3	6	2	7	0	8	12	2	4	25	26	6	220	35	16 619	166	133	11	6
59	146	11	252	135	69	0	58	87	134	120	73	83	55	44	99	152	28	63	31 488	137	152	52
60	0	0	0	0	0	70	0	0	0	0	0	0	0	0	0	3	0	131	18 663	0	0	0
61	0	0	1	0	0	0	0	0	0	1	0	0	0	1	28	0	0	1	83	1	14 888	0
62	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	2 203
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	340	29	0	0	2
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	0	0
66	0	0	0	1	11	0	0	1	0	0	0	0	0	0	0	0	0	79	17	119	3	0
67	29	10	74	30	14	0	41	11	43	25	4	6	9	49	9	37	14	65	46	77	1	54
68	5	8	46	29	28	3	25	76	43	30	30	27	17	48	15	4	5	11	57	11	0	3
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 856	20	9	1
70	28	11	82	54	86	15	33	33	65	19	19	7	12	47	21	44	25	46	651	150	157	44
71	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	2	26	1	2	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	2	0
76	0	0	0	0	0	0	0	0	0	20	0	0	0	0	50	0	0	0	456	3	11	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total by industry	8 321	1 116	16 151	10 506	8 098	7 073	4 356	1 176	7 601	8 084	1 695	2 521	2 476	8 132	4 359	14 700	3 967	17 014	37 258	19 507	15 254	2 374
Direct purchases abroad by residents	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cif/fob adjustments on imports	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total	8 321	1 116	16 151	10 506	8 098	7 073	4 356	1 176	7 601	8 084	1 695	2 521	2 476	8 132	4 359	14 700	3 967	17 014	37 258	19 507	15 254	2 374

Source: Statistics Portugal (INE).

Notes: This table was constructed from the Supply and Use Table and the Production Matrix disclosed by INE.

The meaning of activities and products can be seen in Table 2.

The network of inter-industry flows in a SAM framework. Santos, S. and Araújo, T.

A.2. (continued) Supply Table of Portugal in 2015 (in millions of euros).

Supply of goods and services (or products)	Output (P1)																Imports (P7)	Trade and transport margins	Net taxes on products (D.21-D.31)	Total Supply at purchasers' price	
	25 JB	26 JC	27 K	28 L	29 MA	30 MB	31 MC	32 N	33 O	34 P	35 QA	36 QB	37 R	38 S	39 T	40 U					total by product
41	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	7 766	3 347	3 115	84	14 312
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 107	6 458	285	10	7 860
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16 688	6 271	8 300	4 046	35 304
44	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	10 305	4 859	4 218	1 432	20 814
45	0	1	0	0	0	0	3	0	4	0	0	0	0	0	0	0	7 672	1 776	1 067	227	10 743
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6 787	2 274	1 498	4 167	14 727
47	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	4 555	5 960	1 602	514	12 630
48	0	0	0	0	0	0	0	0	0	1	8	0	0	0	0	0	1 161	2 443	1 789	232	5 624
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7 409	2 601	1 127	268	11 406
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7 793	4 442	1 055	160	13 450
51	0	18	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1 653	3 844	1 013	341	6 852
52	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	2 611	2 244	770	236	5 860
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 318	3 537	621	65	6 541
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7 650	8 216	1 445	1 639	18 950
55	96	2	0	0	1	0	2	3	0	0	2	0	4	0	0	0	5 040	1 966	1 539	599	9 144
56	0	0	0	0	38	0	0	0	3	0	0	0	0	0	0	0	14 619	238	0	825	15 682
57	0	0	0	0	0	0	0	55	0	0	0	0	0	0	0	0	3 946	446	112	51	4 556
58	26	0	0	336	11	4	3	18	212	10	3	0	27	3	0	0	17 984	100	0	440	18 524
59	43	85	0	0	68	3	63	56	17	6	11	17	30	29	0	0	33 866	262	- 29 676	338	4 790
60	0	0	0	0	0	0	0	0	21	1	0	0	0	0	0	0	18 888	1 953	- 342	410	20 909
61	0	0	0	1	1	0	0	0	66	10	2	23	5	0	0	0	15 115	586	0	1 556	17 258
62	0	0	0	0	0	0	76	0	12	0	0	0	0	0	0	0	2 315	604	462	114	3 494
63	5 143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5 223	531	0	674	6 428
64	0	3 493	90	0	0	2	0	0	82	17	16	11	1	1	0	0	4 088	535	0	176	4 799
65	0	0	13 837	0	0	0	0	0	0	0	0	0	0	0	0	0	13 893	758	0	1 059	15 711
66	7	0	604	20 872	2	1	0	1	280	10	9	33	3	8	0	0	22 065	18	0	8	22 091
67	16	22	0	0	8 322	9	17	70	564	45	0	2	4	6	0	0	9 724	549	0	1 228	11 501
68	42	25	121	0	112	793	9	10	15	787	57	2	4	56	0	0	2 556	147	0	6	2 709
69	32	0	0	0	0	0	2 351	0	12	0	1	0	61	0	0	0	4 343	624	0	211	5 178
70	34	35	0	118	128	12	16	8 497	431	16	81	11	29	30	0	0	11 084	1 431	0	603	13 118
71	0	0	107	0	0	0	0	0	13 745	0	0	0	0	0	0	0	13 857	0	0	0	13 857
72	0	0	0	0	0	0	0	0	3	9 923	1	0	0	0	0	0	9 927	23	0	25	9 976
73	0	0	0	2	2	0	0	0	138	2	12 589	3	2	0	0	0	12 774	32	0	0	12 806
74	0	0	2	0	0	0	0	0	19	1	3	3 773	0	0	0	0	3 797	1	0	0	3 798
75	0	0	0	0	0	0	0	0	3	2	0	1	2 481	0	0	0	2 524	64	1	900	3 489
76	0	0	0	0	0	0	0	0	17	1	7	0	0	3 507	0	0	4 072	1	0	323	4 397
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 135	0	1 135	0	0	0	1 135
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total by industry	5 440	3 682	14 760	21 330	8 688	830	2 542	8 656	15 714	10 832	12 793	3 877	2 652	3 641	1 135	0	318 313	69 141	0	22 970	410 425
Direct purchases abroad by residents	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2 706	---	---	2 706
Cif-fob adjustments on imports	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	- 247	---	---	- 247
Total	5 440	3 682	14 760	21 330	8 688	830	2 542	8 656	15 714	10 832	12 793	3 877	2 652	3 641	1 135	0	318 313	71 601	0	22 970	412 884

A.3. Use Table of Portugal in 2015 (in of millions of euros).

Use of goods and services (or products)	Intermediate Consumption (P2)																
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	A	B	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	D	E
41	1 091	0	4 660	67	1 107	0	175	2	69	0	0	0	1	9	4	0	0
42	2	193	15	0	3	4 837	45	0	408	15	0	1	1	0	1	1 416	6
43	1 504	3	3 478	79	31	1	145	28	7	10	2	2	3	4	9	2	5
44	39	3	2	4 303	7	0	9	13	62	4	0	1	17	218	181	0	1
45	85	5	536	52	2 763	1	43	22	122	49	8	28	13	24	391	22	8
46	331	65	146	58	101	705	239	7	150	70	4	11	14	10	50	136	65
47	347	41	192	527	386	355	1 894	141	1 523	192	19	195	56	300	143	13	43
48	6	0	25	1	0	1	5	178	0	0	0	0	0	0	0	2	1
49	93	6	625	151	70	0	102	25	970	270	57	119	82	304	237	4	19
50	58	17	194	90	75	6	42	15	203	3 400	49	675	632	676	303	19	22
51	2	0	0	0	7	0	4	0	3	20	492	55	9	222	63	15	4
52	0	1	0	1	0	0	2	1	18	35	231	383	59	222	95	78	0
53	10	6	21	7	17	0	4	7	65	97	24	96	444	129	65	12	18
54	1	27	0	1	0	0	1	0	14	19	0	2	4	3 835	44	0	1
55	37	25	251	81	85	38	34	19	90	90	10	22	19	34	356	64	67
56	132	57	325	232	302	146	195	14	295	206	15	29	25	63	61	7 344	99
57	11	1	31	4	91	12	14	2	98	621	1	1	39	3	5	3	1 256
58	104	14	60	22	39	28	22	3	33	24	3	10	8	23	25	62	46
59	22	11	73	86	48	6	25	11	44	33	4	23	9	20	28	17	19
60	210	45	413	219	181	104	168	24	317	209	41	71	58	117	102	212	41
61	13	2	33	20	16	7	12	7	17	15	6	5	5	11	20	6	17
62	4	1	9	10	5	1	3	2	8	2	1	1	1	3	4	1	1
63	49	5	34	27	20	8	11	4	19	29	4	6	8	10	23	20	31
64	12	3	41	18	26	25	15	13	27	18	3	8	5	18	20	60	18
65	150	20	201	137	123	29	65	21	111	97	11	29	30	36	62	188	121
66	6	1	87	62	49	18	22	14	45	22	9	10	11	23	57	12	20
67	183	14	196	89	107	58	57	33	114	85	17	44	28	88	144	262	55
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	28	2	358	35	27	30	25	22	31	20	6	14	7	14	29	28	26
70	65	46	252	120	119	47	90	39	228	116	259	81	50	292	103	138	104
71	9	0	6	0	0	18	0	0	0	0	0	0	0	0	0	1	4
72	2	0	4	3	3	0	1	1	3	3	0	1	1	3	2	0	1
73	3	0	5	3	3	0	1	1	3	5	0	1	1	2	2	1	1
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0
76	28	3	21	9	14	2	6	4	12	9	1	3	2	5	6	9	7
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total by industry	4 635	616	12 297	6 516	5 825	6 483	3 478	671	5 112	5 787	1 277	1 930	1 642	6 718	2 634	10 147	2 128
Direct purchases abroad by residents (+)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Purchases on the domestic territory by non-residents (-)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ciffo adjustments on imports	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total	4 635	616	12 297	6 516	5 825	6 483	3 478	671	5 112	5 787	1 277	1 930	1 642	6 718	2 634	10 147	2 128
Gross Added Value (GDP)	3 687	500	3 854	3 990	2 273	589	879	505	2 490	2 298	419	592	833	1 414	1 725	4 553	1 839
Compensation of Employees (D1)	1 018	222	1 693	2 356	1 026	119	357	204	1 226	1 563	278	394	449	864	1 103	420	750
Other taxes less subsidies on production (D29-D39)	- 593	6	44	13	27	20	19	76	34	20	4	3	4	11	8	53	26
Gross Operating Surplus and Gross Mixed Income	3 261	272	2 117	1 622	1 220	450	503	225	1 229	715	137	194	381	539	613	4 081	1 063
Total Output (P1)	8 321	1 116	16 151	10 506	8 098	7 073	4 356	1 176	7 601	8 084	1 695	2 521	2 476	8 132	4 359	14 700	3 967

Source: Statistics Portugal (INE).

Note: This table was constructed from the Supply and Use Table disclosed by INE.

The meaning of activities and products can be seen in Table 2.

A.3. (continued) Use Table of Portugal in 2015 (in millions of euros).

Use of goods and services (or products)	Intermediate Consumption (P2)																
	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	F	G	H	I	JA	JB	JC	K	L	MA	MB	MC	N	O	P	QA	QB
41	1	73	0	340	2	0	0	0	1	3	0	6	32	28	2	2	55
42	134	6	4	0	0	0	0	0	1	1	0	0	2	7	1	0	0
43	25	301	17	3 285	12	1	4	3	19	22	1	10	16	26	11	22	451
44	16	50	4	37	3	0	0	0	6	1	0	5	6	5	5	30	19
45	502	318	50	40	164	8	26	49	78	84	2	35	129	35	76	51	9
46	398	609	2 492	48	8	8	10	53	9	58	5	15	100	194	42	83	155
47	240	241	36	107	20	0	17	2	62	22	6	7	44	25	40	509	14
48	3	100	10	2	0	0	0	0	2	1	2	14	2	12	2	1 535	32
49	1 795	624	75	80	16	0	11	0	80	49	3	26	91	32	4	27	2
50	1 083	357	93	72	11	1	12	2	9	57	2	19	36	29	12	21	15
51	30	328	21	0	13	375	69	0	2	10	1	2	23	3	2	33	0
52	382	139	22	50	10	79	26	0	9	14	0	3	28	1	1	0	0
53	243	94	16	24	1	0	2	0	41	8	1	1	6	19	1	4	15
54	1	636	113	0	0	0	0	0	0	0	0	0	1	11	1	0	0
55	110	136	306	117	17	57	49	13	76	64	2	27	83	42	50	336	23
56	53	626	249	462	14	45	12	52	70	41	6	8	39	271	86	154	52
57	11	69	31	108	2	1	1	5	13	6	2	1	5	308	31	54	26
58	3 828	227	569	57	6	41	29	78	317	40	3	6	47	479	76	78	10
59	26	947	147	27	8	25	17	0	9	25	1	8	59	41	17	22	33
60	130	1 706	4 672	56	36	20	51	93	18	160	13	33	210	295	64	64	12
61	43	195	193	305	24	4	30	100	11	51	9	21	37	222	142	179	96
62	5	54	24	11	463	149	5	3	1	13	15	657	9	14	39	9	1
63	50	385	97	105	29	849	61	211	24	198	5	37	96	205	47	149	17
64	36	201	94	55	47	82	562	406	21	163	24	31	60	60	40	115	14
65	569	875	610	249	37	47	47	3 633	646	957	7	41	144	214	45	98	94
66	78	943	124	155	61	48	57	327	169	80	7	22	69	171	60	118	24
67	349	1 151	481	198	129	408	362	494	186	1 711	17	124	325	161	123	611	31
68	0	0	0	0	0	0	0	14	0	0	55	0	0	7	0	0	0
69	66	1 428	138	111	75	141	47	451	41	125	3	271	135	157	41	167	13
70	389	1 791	1 028	465	147	429	231	313	159	481	58	142	1 380	623	177	422	95
71	3	0	47	0	0	86	0	48	0	18	0	0	0	19	1	0	0
72	6	24	17	2	2	3	6	16	1	13	1	1	5	55	99	3	5
73	15	41	9	13	13	4	10	40	6	61	1	10	12	31	32	744	23
74	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	11
75	0	6	7	31	118	0	0	4	0	1	0	36	19	81	25	0	1
76	22	67	53	22	4	10	7	106	10	20	1	3	12	30	13	30	3
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total by industry	10 645	14 747	11 852	6 635	1 488	2 924	1 762	6 518	2 097	4 559	254	1 619	3 259	3 915	1 413	5 673	1 353
Direct purchases abroad by residents (+)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Purchases on the domestic territory by non-residents (-)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cifjob adjustments on imports	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total	10 645	14 747	11 852	6 635	1 488	2 924	1 762	6 518	2 097	4 559	254	1 619	3 259	3 915	1 413	5 673	1 353
Gross Added Value (GDP)	6 370	22 511	7 656	8 619	886	2 516	1 920	8 242	19 233	4 130	577	923	5 397	11 800	9 419	7 120	2 523
Compensation of Employees (D1)	4 012	10 906	4 104	3 914	565	636	1 534	3 816	463	3 110	254	555	3 570	8 795	7 767	5 336	2 106
Other taxes less subsidies on production (D29-D39)	37	160	99	41	- 9	97	- 12	455	934	9	- 8	- 6	78	- 149	- 310	25	- 109
Gross Operating Surplus and Gross Mixed Income	2 321	11 445	3 453	4 665	330	1 784	398	3 971	17 836	1 011	331	374	1 750	3 153	1 962	1 760	526
Total Output (P1)	17 014	37 258	19 507	15 254	2 374	5 440	3 682	14 760	21 330	8 688	830	2 542	8 656	15 714	10 832	12 793	3 877

A.3. (continued) Use Table of Portugal in 2015 (in millions of euros).

Use of goods and services (or products)	Intermediate Consumption (P2)					Final Consumption (P3)				Gross Capital Formation (P5)				Exports (P6)	Total Use at purchasers' price
	37	38	39	40	total by product	Households	NPISH	Government	total	GFCF	Changes in inventories	ADV	total		
	R	S	T	U		(S14)	(S15)	(S13)		(P51g)	(P52)	(P53)			
41	1	31	0	0	7 765	4 639	0	0	4 640	471	210	0	682	1 226	14 312
42	1	0	0	0	7 101	7	0	0	7	0	77	0	77	676	7 860
43	8	3	0	0	9 549	20 641	0	10	20 651	0	81	0	81	5 023	35 304
44	48	5	0	0	5 098	9 040	0	0	9 040	13	29	0	42	6 633	20 814
45	16	38	0	0	5 883	894	0	2	896	17	26	0	43	3 920	10 743
46	33	33	0	0	6 515	4 550	0	0	4 550	0	13	0	13	3 648	14 727
47	14	126	0	0	7 902	1 892	0	13	1 904	0	5	0	5	2 820	12 630
48	0	1	0	0	1 943	1 516	0	1 210	2 726	0	18	0	18	937	5 624
49	6	12	0	0	6 068	641	0	0	641	25	28	0	53	4 644	11 406
50	21	18	0	0	8 346	332	0	1	333	408	14	1	424	4 348	13 450
51	9	5	0	0	1 822	1 303	0	7	1 310	1 734	- 16	45	1 763	1 957	6 852
52	5	1	0	0	1 897	1 061	0	0	1 061	450	10	0	460	2 442	5 860
53	1	3	0	0	1 500	31	0	0	31	2 816	13	0	2 829	2 181	6 541
54	0	8	0	0	4 721	5 204	0	0	5 204	2 050	126	0	2 176	6 849	18 950
55	53	32	0	0	2 915	2 826	0	21	2 847	1 437	12	17	1 466	1 916	9 144
56	68	103	0	0	11 951	3 616	0	2	3 617	0	0	0	0	115	15 682
57	38	20	0	0	2 924	1 087	0	177	1 264	0	1	0	1	368	4 556
58	37	32	0	0	6 484	115	0	166	281	11 339	- 144	0	11 194	565	18 524
59	24	9	0	0	1 923	2 547	0	0	2 547	24	0	0	24	296	4 790
60	42	88	0	0	10 293	2 976	0	1 750	4 726	0	0	0	0	5 890	20 909
61	38	39	0	0	1 949	14 530	1	14	14 545	0	0	0	0	763	17 258
62	12	10	0	0	1 551	988	23	161	1 172	524	3	0	527	245	3 494
63	33	69	0	0	2 975	2 892	0	0	2 892	0	0	0	0	561	6 428
64	31	26	0	0	2 400	0	0	0	0	1 667	- 4	0	1 664	736	4 799
65	72	47	0	0	9 861	5 188	0	158	5 345	0	0	0	0	504	15 711
66	36	45	0	0	3 060	17 373	0	40	17 412	1 614	0	0	1 614	5	22 091
67	145	185	0	0	8 767	685	0	121	807	971	2	0	973	954	11 501
68	0	0	0	0	77	0	137	110	248	2 254	0	0	2 254	130	2 709
69	89	79	0	0	4 281	140	0	5	144	0	0	0	0	753	5 178
70	249	150	0	0	10 878	1 050	0	18	1 067	0	0	0	0	1 173	13 118
71	2	0	0	0	262	155	153	13 286	13 595	0	0	0	0	0	13 857
72	1	1	0	0	290	2 096	325	7 229	9 650	0	0	0	0	36	9 976
73	16	11	0	0	1 124	4 205	113	7 332	11 650	0	0	0	0	33	12 806
74	0	0	0	0	15	1 450	1 872	461	3 782	0	0	0	0	1	3 798
75	202	153	0	0	692	2 121	286	241	2 648	31	0	40	71	78	3 489
76	66	73	0	0	693	2 897	759	47	3 702	0	0	0	0	2	4 397
77	0	0	0	0	0	1 135	0	0	1 135	0	0	0	0	0	1 135
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total by industry	1 416	1 453	0	0	161 475	121 820	3 669	32 584	158 072	27 844	505	103	28 452	62 427	410 425
Direct purchases abroad by residents (+)	---	---	---	---	---	2 706	---	---	2 706	---	---	---	---	---	2 706
Purchases on the domestic territory by non-residents (-)	---	---	---	---	---	- 10 468	---	---	- 10 468	---	---	---	---	10 468	0
Cifjob adjustments on imports	---	---	---	---	---	---	---	---	---	---	---	---	---	- 247	- 247
Total	1 416	1 453	0	0	161 475	114 058	3 669	32 584	150 311	27 844	505	103	28 452	72 648	412 884
Gross Added Value (GDP)	1 236	2 187	1 135	0	156 839										
Compensation of Employees (D1)	863	1 122	1 135	0	78 604										
Other taxes less subsidies on production (D29-D39)	- 79	- 146	0	0	881										
Gross Operating Surplus and Gross Mixed Income	452	1 211	0	0	77 355										
Total Output (P1)	2 652	3 641	1 135	0	318 313										

A.4. A SAM of Portugal in 2015 (in millions of euros) [part 1 of 8].

	1	2	total	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	0	0	0	1 018	222	1 693	2 356	1 026	119	357	204	1 226	1 563	278	394	449	864	1 103	420	750
2	0	0	0	3 261	272	2 117	1 622	1 220	450	503	225	1 229	715	137	194	381	539	613	4 081	1 063
total	0	0	0	4 279	494	3 810	3 977	2 246	569	860	429	2 455	2 277	415	588	830	1 403	1 717	4 500	1 813
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Sources: Statistics Portugal (*INE*); Portuguese Central Bank (*Banco de Portugal*).

A.4. (continued) A SAM of Portugal in 2015 (in millions of euros) [part 2 of 8].

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	total
1	4 012	10 906	4 104	3 914	565	636	1 534	3 816	463	3 110	254	555	3 570	8 795	7 767	5 336	2 106	863	1 122	1 135	0	78 604
2	2 321	11 445	3 453	4 665	330	1 784	398	3 971	17 836	1 011	331	374	1 750	3 153	1 962	1 760	526	452	1 211	0	0	77 355
total	6 333	22 351	7 557	8 578	895	2 419	1 932	7 787	18 299	4 121	585	929	5 320	11 949	9 729	7 095	2 633	1 315	2 333	1 135	0	155 958
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The network of inter-industry flows in a SAM framework. Santos, S. and Araújo, T.

A.4. (continued) A SAM of Portugal in 2015 (in millions of euros) [part 3 of 8].

	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	7 733	0	353	0	8	0	0	0	0	0	0	0	0	0	2	2	0	14	146	0	0	0	0	0	0	0	
4	0	1 050	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	18	11	0	0	0	0	0	0	0	
5	1	0	15 680	0	0	0	8	1	0	0	0	0	0	0	0	0	6	252	0	1	0	0	0	0	0	0	
6	2	0	0	10 146	3	0	22	0	70	0	0	0	0	7	0	2	0	3	135	0	0	0	0	0	0	1	
7	0	0	0	6	7 532	0	23	0	1	1	0	0	2	0	27	190	98	6	69	0	0	5	0	0	0	11	
8	0	5	0	0	0	6 696	231	0	0	0	0	0	0	0	0	49	3	2	0	70	0	0	0	0	0	0	
9	0	3	0	14	7	0	4 149	0	8	0	0	8	0	0	0	0	2	7	58	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	6	962	0	0	0	0	0	0	0	0	0	0	87	0	0	0	0	0	0	0	
11	0	32	0	4	26	0	33	0	7 128	10	0	0	0	48	3	21	0	8	134	0	0	0	0	0	0	1	
12	0	0	0	5	1	0	0	0	45	7 405	1	17	51	7	326	0	18	12	120	0	1	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	1	4	1 270	207	13	1	52	0	0	2	73	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	5	52	15	2 198	55	34	28	0	7	4	83	0	0	0	0	0	0	0	
15	0	0	0	0	0	0	0	0	20	89	10	10	2 130	15	81	0	3	25	55	0	0	0	0	0	0	0	
16	0	0	0	17	0	0	0	0	0	8	247	144	31	7 429	32	0	4	26	44	0	1	0	0	0	0	0	
17	0	0	0	5	47	0	0	0	14	51	11	12	16	93	3 871	1	9	6	99	0	28	0	0	0	0	0	
18	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	14 239	1	220	152	0	0	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	0	49	0	0	0	0	0	73	3 732	35	28	3	0	0	0	3	0	0	
20	0	11	0	0	4	0	0	0	77	13	0	4	16	0	2	0	0	16 619	63	0	1	0	0	0	0	79	
21	16	4	632	109	31	92	76	189	31	110	80	6	4	17	402	0	9	166	31 488	131	83	19	80	340	0	17	
22	0	1	0	0	0	0	0	0	0	0	0	0	0	0	102	0	5	133	137	18 663	1	0	0	29	57	119	
23	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	152	0	14 888	0	0	0	0	3	
24	0	0	5	0	4	0	0	0	0	0	0	0	0	0	0	0	0	6	52	0	0	2 203	0	2	0	0	
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	0	0	26	43	0	0	0	5 143	0	0	7	
26	0	0	0	0	1	0	0	0	0	0	18	0	0	0	2	0	0	0	85	0	0	0	0	3 493	0	0	
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	13 837	604	
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	336	0	0	1	0	0	0	0	20 872	
29	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	38	0	11	68	0	1	0	0	0	0	2	
30	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	4	3	0	0	0	0	2	0	1	
31	0	0	0	0	3	0	0	0	0	0	0	0	0	0	2	0	0	3	63	0	0	76	0	0	0	0	
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	18	56	0	0	0	0	0	0	1	
33	13	0	0	1	4	0	0	0	0	0	0	0	0	0	3	55	212	17	21	66	12	0	82	0	280		
34	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	10	6	1	10	0	0	17	0	10	
35	0	0	0	0	0	0	3	8	0	0	0	0	0	0	2	0	0	3	11	0	2	0	0	16	0	9	
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	23	0	0	11	0	33	
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	27	30	0	5	0	0	1	0	3	
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	29	0	0	0	0	1	0	8	
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	7 766	1 107	16 688	10 305	7 672	6 787	4 555	1 161	7 409	7 793	1 653	2 611	2 318	7 650	5 040	14 619	3 946	17 984	33 866	18 888	15 115	2 315	5 223	4 088	13 893	22 065	

A.4. (continued) A SAM of Portugal in 2015 (in millions of euros) [part 4 of 8].

	67	68	69	70	71	72	73	74	75	76	77	78	total	79	80	81	82	83	total	84	85	86	87	88	total	89	90	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	333	78 937
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6 014	83 369
total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6 347	162 306
3	29	5	0	28	0	0	0	0	0	0	0	0	8 321	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8 321
4	10	8	0	11	0	0	0	0	0	0	0	0	1 116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 116
5	74	46	0	82	0	0	1	0	0	0	0	0	16 151	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16 151
6	30	29	0	54	0	0	1	0	0	0	0	0	10 506	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10 506
7	14	28	0	86	0	0	0	0	0	0	0	0	8 098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8 098
8	0	3	0	15	0	0	0	0	0	0	0	0	7 073	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7 073
9	41	25	0	33	0	0	0	0	0	0	0	0	4 356	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4 356
10	11	76	0	33	0	0	0	0	0	0	0	0	1 176	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 176
11	43	43	0	65	0	0	0	0	0	0	0	0	7 601	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7 601
12	25	30	0	19	0	0	1	0	0	0	0	0	8 084	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8 084
13	4	30	0	19	0	0	0	0	0	20	0	0	1 695	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 695
14	6	27	0	7	0	0	0	0	0	0	0	0	2 521	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 521
15	9	17	0	12	0	0	0	0	0	0	0	0	2 476	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 476
16	49	48	0	47	4	0	0	0	0	0	0	0	8 132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8 132
17	9	15	0	21	0	0	0	0	0	50	0	0	4 359	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4 359
18	37	4	0	44	0	0	0	0	0	0	0	0	14 700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14 700
19	14	5	0	25	0	0	0	0	0	0	0	0	3 967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3 967
20	65	11	0	46	0	0	2	0	0	0	0	0	17 014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17 014
21	46	57	1 856	651	0	0	26	0	34	456	0	0	37 258	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37 258
22	77	11	20	150	0	0	1	0	0	3	0	0	19 507	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19 507
23	1	0	9	157	0	0	2	0	2	11	0	0	15 254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15 254
24	54	3	1	44	0	0	0	0	0	0	0	0	2 374	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 374
25	16	42	32	34	0	0	0	0	0	0	0	0	5 440	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5 440
26	22	25	0	35	0	0	0	0	0	0	0	0	3 682	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3 682
27	0	121	0	0	107	0	0	2	0	0	0	0	14 760	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14 760
28	0	0	0	118	0	0	2	0	0	0	0	0	21 330	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21 330
29	8 322	112	0	128	0	0	2	0	0	0	0	0	8 688	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8 688
30	9	793	0	12	0	0	0	0	0	0	0	0	830	0	0	0	0	0	0	0	0	0	0	0	0	0	0	830
31	17	9	2 351	16	0	0	0	0	0	0	0	0	2 542	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 542
32	70	10	0	8 497	0	0	0	0	0	0	0	0	8 656	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8 656
33	564	15	12	431	13 745	3	138	19	3	17	0	0	15 714	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15 714
34	45	787	0	16	0	9 923	2	1	2	1	0	0	10 832	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10 832
35	0	57	1	81	0	1	12 589	3	0	7	0	0	12 793	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12 793
36	2	2	0	11	0	0	3	3 773	1	0	0	0	3 877	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3 877
37	4	4	61	29	0	0	2	0	2 481	0	0	0	2 652	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 652
38	6	56	0	30	0	0	0	0	0	3 507	0	0	3 641	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3 641
39	0	0	0	0	0	0	0	0	0	0	1 135	0	1 135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 135
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	9 724	2 556	4 343	11 084	13 857	9 927	12 774	3 797	2 524	4 072	1 135	0	318 313	0	0	0	0	0	0	0	0	0	0	0	0	0	0	318 313

The network of inter-industry flows in a SAM framework. Santos, S. and Araújo, T.

A.4. (continued) A SAM of Portugal in 2015 (in millions of euros) [part 5 of 8].

	1	2	total	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
41	0	0	0	1 091	0	4 660	67	1 107	0	175	2	69	0	0	0	1	9	4	0	0
42	0	0	0	2	193	15	0	3	4 837	45	0	408	15	0	1	1	0	1	1 416	6
43	0	0	0	1 504	3	3 478	79	31	1	145	28	7	10	2	2	3	4	9	2	5
44	0	0	0	39	3	2	4 303	7	0	9	13	62	4	0	1	17	218	181	0	1
45	0	0	0	85	5	536	52	2 763	1	43	22	122	49	8	28	13	24	391	22	8
46	0	0	0	331	65	146	58	101	705	239	7	150	70	4	11	14	10	50	136	65
47	0	0	0	347	41	192	527	386	355	1 894	141	1 523	192	19	195	56	300	143	13	43
48	0	0	0	6	0	25	1	0	1	5	178	0	0	0	0	0	0	0	2	1
49	0	0	0	93	6	625	151	70	0	102	25	970	270	57	119	82	304	237	4	19
50	0	0	0	58	17	194	90	75	6	42	15	203	3 400	49	675	632	676	303	19	22
51	0	0	0	2	0	0	0	7	0	4	0	3	20	492	55	9	222	63	15	4
52	0	0	0	0	1	0	1	0	0	2	1	18	35	231	383	59	222	95	78	0
53	0	0	0	10	6	21	7	17	0	4	7	65	97	24	96	444	129	65	12	18
54	0	0	0	1	27	0	1	0	0	1	0	14	19	0	2	4	3 835	44	0	1
55	0	0	0	37	25	251	81	85	38	34	19	90	90	10	22	19	34	356	64	67
56	0	0	0	132	57	325	232	302	146	195	14	295	206	15	29	25	63	61	7 344	99
57	0	0	0	11	1	31	4	91	12	14	2	98	621	1	1	39	3	5	3	1 256
58	0	0	0	104	14	60	22	39	28	22	3	33	24	3	10	8	23	25	62	46
59	0	0	0	22	11	73	86	48	6	25	11	44	33	4	23	9	20	28	17	19
60	0	0	0	210	45	413	219	181	104	168	24	317	209	41	71	58	117	102	212	41
61	0	0	0	13	2	33	20	16	7	12	7	17	15	6	5	5	11	20	6	17
62	0	0	0	4	1	9	10	5	1	3	2	8	2	1	1	1	3	4	1	1
63	0	0	0	49	5	34	27	20	8	11	4	19	29	4	6	8	10	23	20	31
64	0	0	0	12	3	41	18	26	25	15	13	27	18	3	8	5	18	20	60	18
65	0	0	0	150	20	201	137	123	29	65	21	111	97	11	29	30	36	62	188	121
66	0	0	0	6	1	87	62	49	18	22	14	45	22	9	10	11	23	57	12	20
67	0	0	0	183	14	196	89	107	58	57	33	114	85	17	44	28	88	144	262	55
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	28	2	358	35	27	30	25	22	31	20	6	14	7	14	29	28	26
70	0	0	0	65	46	252	120	119	47	90	39	228	116	259	81	50	292	103	138	104
71	0	0	0	9	0	6	0	0	18	0	0	0	0	0	0	0	0	0	1	4
72	0	0	0	2	0	4	3	3	0	1	1	3	3	0	1	1	3	2	0	1
73	0	0	0	3	0	5	3	3	0	1	1	3	5	0	1	1	2	2	1	1
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0
76	0	0	0	28	3	21	9	14	2	6	4	12	9	1	3	2	5	6	9	7
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	0	0	0	4 635	616	12 297	6 516	5 825	6 483	3 478	671	5 112	5 787	1 277	1 930	1 642	6 718	2 634	10 147	2 128
79	78 724	42 984	121 708	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	23 770	23 770	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81	0	5 062	5 062	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
82	0	- 1 330	- 1 330	- 1 257	13	93	27	57	43	40	161	73	43	7	7	8	24	17	112	55
83	0	713	713	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	78 724	71 199	149 923	- 1 257	13	93	27	57	43	40	161	73	43	7	7	8	24	17	112	55
84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	213	12 170	12 382	664	- 7	- 49	- 14	- 30	- 23	- 21	- 85	- 39	- 23	- 4	- 4	- 4	- 13	- 9	- 59	- 29
Total	78 937	83 369	162 306	8 321	1 116	16 151	10 506	8 098	7 073	4 356	1 176	7 601	8 084	1 695	2 521	2 476	8 132	4 359	14 700	3 967

The network of inter-industry flows in a SAM framework. Santos, S. and Araújo, T.

A.4. (continued) A SAM of Portugal in 2015 (in millions of euros) [part 6 of 8].

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	total
41	1	73	0	340	2	0	0	0	1	3	0	6	32	28	2	2	55	1	31	0	0	7 765
42	134	6	4	0	0	0	0	0	1	1	0	0	2	7	1	0	0	1	0	0	0	7 101
43	25	301	17	3 285	12	1	4	3	19	22	1	10	16	26	11	22	451	8	3	0	0	9 549
44	16	50	4	37	3	0	0	0	6	1	0	5	6	5	5	30	19	48	5	0	0	5 098
45	502	318	50	40	164	8	26	49	78	84	2	35	129	35	76	51	9	16	38	0	0	5 883
46	398	609	2 492	48	8	8	10	53	9	58	5	15	100	194	42	83	155	33	33	0	0	6 515
47	240	241	36	107	20	0	17	2	62	22	6	7	44	25	40	509	14	14	126	0	0	7 902
48	3	100	10	2	0	0	0	0	2	1	2	14	2	12	2	1 535	32	0	1	0	0	1 943
49	1 795	624	75	80	16	0	11	0	80	49	3	26	91	32	4	27	2	6	12	0	0	6 068
50	1 083	357	93	72	11	1	12	2	9	57	2	19	36	29	12	21	15	21	18	0	0	8 346
51	30	328	21	0	13	375	69	0	2	10	1	2	23	3	2	33	0	9	5	0	0	1 822
52	382	139	22	50	10	79	26	0	9	14	0	3	28	1	1	0	0	5	1	0	0	1 897
53	243	94	16	24	1	0	2	0	41	8	1	1	6	19	1	4	15	1	3	0	0	1 500
54	1	636	113	0	0	0	0	0	0	0	0	0	1	11	1	0	0	0	8	0	0	4 721
55	110	136	306	117	17	57	49	13	76	64	2	27	83	42	50	336	23	53	32	0	0	2 915
56	53	626	249	462	14	45	12	52	70	41	6	8	39	271	86	154	52	68	103	0	0	11 951
57	11	69	31	108	2	1	1	5	13	6	2	1	5	308	31	54	26	38	20	0	0	2 924
58	3 828	227	569	57	6	41	29	78	317	40	3	6	47	479	76	78	10	37	32	0	0	6 484
59	26	947	147	27	8	25	17	0	9	25	1	8	59	41	17	22	33	24	9	0	0	1 923
60	130	1 706	4 672	56	36	20	51	93	18	160	13	33	210	295	64	64	12	42	88	0	0	10 293
61	43	195	193	305	24	4	30	100	11	51	9	21	37	222	142	179	96	38	39	0	0	1 949
62	5	54	24	11	463	149	5	3	1	13	15	657	9	14	39	9	1	12	10	0	0	1 551
63	50	385	97	105	29	849	61	211	24	198	5	37	96	205	47	149	17	33	69	0	0	2 975
64	36	201	94	55	47	82	562	406	21	163	24	31	60	60	40	115	14	31	26	0	0	2 400
65	569	875	610	249	37	47	47	3 633	646	957	7	41	144	214	45	98	94	72	47	0	0	9 861
66	78	943	124	155	61	48	57	327	169	80	7	22	69	171	60	118	24	36	45	0	0	3 060
67	349	1 151	481	198	129	408	362	494	186	1 711	17	124	325	161	123	611	31	145	185	0	0	8 767
68	0	0	0	0	0	0	0	14	0	0	55	0	0	7	0	0	0	0	0	0	0	77
69	66	1 428	138	111	75	141	47	451	41	125	3	271	135	157	41	167	13	89	79	0	0	4 281
70	389	1 791	1 028	465	147	429	231	313	159	481	58	142	1 380	623	177	422	95	249	150	0	0	10 878
71	3	0	47	0	0	86	0	48	0	18	0	0	0	19	1	0	0	2	0	0	0	262
72	6	24	17	2	2	3	6	16	1	13	1	1	5	55	99	3	5	1	1	0	0	290
73	15	41	9	13	13	4	10	40	6	61	1	10	12	31	32	744	23	16	11	0	0	1 124
74	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	0	11	0	0	0	0	15
75	0	6	7	31	118	0	0	4	0	1	0	36	19	81	25	0	1	202	153	0	0	692
76	22	67	53	22	4	10	7	106	10	20	1	3	12	30	13	30	3	66	73	0	0	693
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	10 645	14 747	11 852	6 635	1 488	2 924	1 762	6 518	2 097	4 559	254	1 619	3 259	3 915	1 413	5 673	1 353	1 416	1 453	0	0	161 475
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
82	78	339	209	87	- 19	205	- 26	965	1 979	19	- 18	- 13	164	- 316	- 656	52	- 231	- 167	- 309	0	0	1 867
83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	78	339	209	87	- 19	205	- 26	965	1 979	19	- 18	- 13	164	- 316	- 656	52	- 231	- 167	- 309	0	0	1 867
84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	- 41	- 179	- 110	- 46	10	- 108	14	- 510	- 1 045	- 10	9	7	- 87	167	347	- 28	122	88	163	0	0	- 986
Total	17 014	37 258	19 507	15 254	2 374	5 440	3 682	14 760	21 330	8 688	830	2 542	8 656	15 714	10 832	12 793	3 877	2 652	3 641	1 135	0	318 313

