

08 April 2020

Symmetric Input-Output Matrices

2017

One less (or additional) euro of exports generates a decrease (or an increase) of 44 cents of imports and 56 cents of GDP

This press release presents the Symmetric Input-Output Matrices for the Portuguese economy regarding 2017.

According to the baseline hypothesis and results of this system, each additional euro of expenditure on the main four aggregates of final demand aggregates generates the following impacts, in the same direction as the initial euro change:

- Final Consumption Expenditure of Households: 24 cents of imports and 76 cents of GDP;
- Final Consumption Expenditure of General Government: 10 cents of imports and 90 cents of GDP;
- Gross Fixed Capital Formation: 37 cents of imports and 63 cents of GDP;
- Exports: 44 cents of imports and 56 cents of GDP.

Illustrating the use of this analytic instrument to simulate a significant contraction in Tourism (as defined by the respective Satellite Account¹), which is particularly affected by the COVID-19 pandemic, an hypothetical annual decrease of 25% in Tourism expenditures in national territory would lead to a 2.9% nominal decrease of GDP.

Updating the Input-Output Matrix System

Statistics Portugal releases the Symmetric Input-Output Matrices for 2017, consistent with the 2016 benchmark year for National Accounts, updating the previous system that referred to 2015 and had 2011 as benchmark year. The information is available in the file attached to the current press release and is also available in the National Accounts section of the [Statistics Portugal website](https://www.ine.pt). In addition to the standard matrices – domestic production, imports and total flows, at basic prices – matrices for total flows at purchaser's prices, technical coefficients, Leontief's inverse matrix (known as the table of production multipliers) and primary input multipliers have also been made available². As it was done in 2015, information on primary input contents, both direct and indirect, of final demand, by product and at purchaser's prices is also released by Statistics Portugal.

Finally, at the end of this press release a working paper on the impacts of exogenous changes in input-output models for Portugal is summarily presented and is [available](#).

¹ See press release in:

https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaques&DESTAQUESdest_boui=354593882&DESTAQUESmodo=2&xlang=en

² About the compilation methodology and result interpretation, see the following link:

https://www.ine.pt/ngt_server/attachfileu.jsp?look_parentBoui=294445743&att_display=n&att_download=y

Symmetric Input-Output Matrices for 2017

The input-output system allows for the analysis of the interaction between the different domestic economic activities and from these with the rest of the world, in terms of transactions of goods and services. Essentially, the system reveals how each homogeneous branch is simultaneously a supplier and a client. As a supplier, products are made available for consumption by other branches and for final demand. As a client, it purchases products from other branches, imports and acquires services from productive factors. Through the established interactions, which are reflected in the several different types of multipliers, the system enables the user to evaluate the effect of economic shocks, also expressed by changes of components of final demand, on economic activity as well as in the different aggregates and on primary inputs.

As such, and even if under a set of assumptions that underlie the Leontief³ approach of this system, Statistics Portugal releases this work instrument that is a part of the National Accounts System and contributes to a deeper understanding of the Portuguese economy. As shown further on, and aiming at exemplifying the type of use of the input-output model, an exercise was carried out regarding the impact of the decrease in tourism due the COVID-19 pandemic on the Portuguese GDP.

Among the components of final demand, exports have the smallest impact on GDP changes (56 cents for each euro exported) and the largest impact on imports (44 cents)

Picture 1 summarizes the multipliers of final demand for the several demand aggregates, which is fundamental information to simulate the impact of changes in the several components of aggregate demand in other variables in the system, namely GDP, under certain conditions⁴. Using the aforementioned approach, each additional euro of exports will result in a 44 cents increase on imports and 56 cents on GDP (54.0 cents on GVA and 1.9 cents on net taxes), being the main aggregate of final demand which has a smaller impact on GDP and a larger impact on imports. The Final Consumption Expenditure of General Government has the most significant impact on GDP that increases by 90 cents per each additional euro of expenditure, and the smallest impact on imports (10 cents). A one euro change in the Final Expenditure of Households and on Gross Fixed Capital Formation (GFCF) has an impact on GDP of 76 and 63 cents, respectively, and of 24 and 37 cents on imports, in the same order. It is however noteworthy that while 15 cents on household's expenditure refer to net taxes, this impact decreases to 8 cents on GFCF and to just 2 cents on Exports.

³ Among these assumptions, we highlight: (i) constant technical coefficients; (ii) no economies of scale; (iii) inexistence of changes in relative prices and no substitution effects, (iv) unlimited productive capacity (this hypothesis is not relevant in the case of contraction in economic activity); (v) homogeneous goods and (vi) absence of financial restrictions and of feedbacks between the financial system, namely in what refers to changes in interest rates, and the productive branches.

⁴ It is assumed that global variations on any final demand aggregate are proportionally distributed amongst the several goods and services and not concentrated on specific groups. However, the model allows for very different scenarios including the concentration of changes of demand in a single product (good or service).

Figure 1 – Summary of the Final Demand Multipliers*, 2017

		Final consumption expenditure of Households	Final consumption expenditure of General Government	Gross Fixed Capital Formation	Exports	Final Demand	Domestic Demand	
GDP expenditure approach	Total final consumption expenditure	1.000	1.000	1.000	1.000	1.000	1.000	
	Imports	Direct ³	0.125	0.019	0.232	0.042	0.104	0.124
		Indirect ⁴	0.112	0.081	0.140	0.398	0.183	0.111
			0.237	0.100	0.371	0.440	0.287	0.235
		0.763	0.900	0.629	0.560	0.713	0.765	
GDP production approach	Output at basic prices	1.133	1.314	1.181	1.537	1.266	1.174	
	Intermediate consumption	Domestic origin	0.394	0.335	0.467	0.580	0.443	0.396
		Imported	0.112	0.081	0.140	0.398	0.183	0.111
		Taxes less subsidies	0.018	0.039	0.025	0.018	0.022	0.024
	Gross value added	0.524	0.455	0.632	0.996	0.648	0.531	
	Taxes less subsidies on products	Direct ¹	0.136	0.002	0.055	0.001	0.073	0.098
		Indirect ²	0.018	0.039	0.025	0.018	0.022	0.024
			0.154	0.042	0.080	0.019	0.096	0.122
		0.763	0.900	0.629	0.560	0.713	0.765	
GDP income approach	Compensation of employees	0.257	0.619	0.275	0.276	0.313	0.326	
	Other net taxes on production	0.161	0.035	0.084	0.022	0.099	0.125	
	Operating surplus, gross	0.345	0.246	0.270	0.262	0.301	0.314	
		0.763	0.900	0.629	0.560	0.713	0.765	

* The total may not equal the sum of the parts due to rounding

¹ - Taxes less subsidies, applied directly on the respective aggregate of final demand

² - Taxes less subsidies, applied on intermediate consumption required for national production

³ - Direct imports for their respective final use

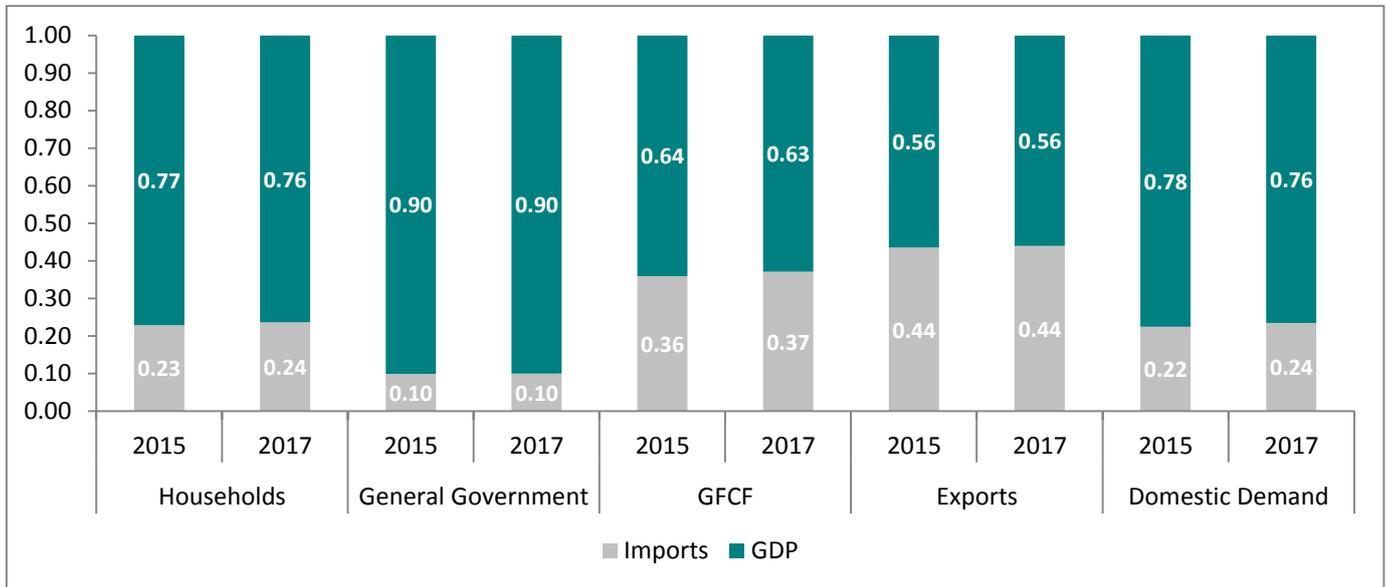
⁴ - Indirect imports, for intermediate consumption in the national production process

Imported content on domestic demand decreased 2 percentage points (p.p.) between 2015 and 2017

Despite the change of benchmark year in National Accounts (from 2011 to 2016), it is worth noting the stability of results for the main components obtained for 2017, when compared with the previous version, for the year 2015, published by [Statistics Portugal](http://www.inec.pt) in November 2018. This validates the hypothesis that technical coefficients, and consequently, multipliers only show significant changes over extended periods of time.

Overall it was registered, between 2015 and 2017, an increase of 2 p.p. on import content of domestic demand (includes private consumption, General Government expenditure and Gross Capital Formation) and, as a result, a 2 p.p. decrease on the contribution to GDP. This translates an increase of 1 p.p. in the import content of Households final expenditure and in Gross Fixed Capital Formation, with a symmetric impact on GDP. Both Exports and expenditure of General Government registered no change in the respective contents.

Figure 2 – Import Content and GDP, 2015 and 2017



A 25% decrease in touristic activity will lead to a 2.9% contraction in GDP

The COVID-19 pandemic will have significant and wide impacts in the Portuguese economy. Tourism, which represented 11.3% of GDP in 2018 according to the Tourism Satellite Account, will be one of the most affected sectors by this crisis, and a significant decrease in activity is expected.

Based on the Input-Output model, one of the available analytical instruments to study estimate this impact, the effect of a 25% annual decrease in tourism was simulated. Applying the matrix system, a 25% decrease in tourist activity, both from non-residents and internal tourism, would lead to a 2.9% decrease in annual GDP in Portugal.

It is noteworthy that this result is based on the underlying hypothesis of the matrix system that replicates in a simplified manner the economic inter-sectoral dynamics for 2017.

The impact of exogenous changes in Input-Output models, Portugal 2017

In parallel to this press release, a [working paper](#) on the impact of exogenous variations for the year 2017 is made available. This paper using the input-output matrices for Portugal is published today. This document has two main themes. The first one takes into account the framework of the input-output model within the context of the National Accounts. The second uses the input-output model as an instrument for analyzing the evolution of economies when the productive structure remains relatively constant, although subject to exogenous shocks.

In this paper, a comparative analysis of two modalities of the input-output model is developed: one in which the Final Demand is totally exogenous and another where the Final Demand is partially endogenous. This work shows that the dynamics of the latter is more comprehensive, in that it takes into account the dynamics between a broader set of variables, on the production side, on the distribution of income and on final demand. This greater complexity creates a multiplier of GVA, instead of just one of production.

The size of the multiplier is assessed comparing the impact of exogenous shocks of equal magnitude for each of the three variables: Final Consumption of General Government (GG), Gross Fixed capital Formation (GFCF) and Exports. The main conclusions are the following:

- The major impacts on GVA, Compensation of employees and Final Household Consumption occurs when there is an exogenous variation in the Final Consumption of General Government (GG), however, there is a worsening of the balance of the economy vis-à-vis the Rest of the World.
- The minor impacts are related to the exogenous variation in GFCF. The growth in GVA, Remuneration and Household Consumption are in the same order of magnitude as those of Exports (and less than in those of the final consumption of GG), and shows the most intense worsening of the external balance. This is due to the weight of direct imports, which reduces the multiplier effect.
- The case of the variation in Exports has the advantage of alleviating the external balance, but it has a much smaller multiplier effect than that of the variation in the Consumption of General Government. The weight of indirect imports and intermediate domestic consumption determines a very moderate multiplier effect on the GVA. Nonetheless, it reveals the highest spread of GVA and Remuneration variations among the different branches of production.