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The implications of alternative import assumptions on multipliers: Should we be concerned?

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Abstract

The basic tool for studying the effects of a policy or a structural change in multi-sectorial general equilibrium models is the multiplier matrix. No matter how we dress it up, the results always depend on the multiplier matrix. Therefore, the robustness of this matrix is of paramount importance when we want to report sensible estimates of changes. In an input-output (I-O) model with no external sector—a closed economy assumption—the multiplier matrix is unique and there are no interpretive doubts about the information it provides. But imports exist and are always present in real-world data. And this is where the difficulty arises since the introduction of imports in a model requires establishing assumptions regarding their incorporation with the domestic side of the economy. As a result, the domestic and total multiplier matrices will no longer be unique, and each type of imports' incorporation will give rise to a different estimate of the multiplier matrix. We study in this note three different incorporation of imports that cover the vast majority of cases: non-competitive and competitive imports, and imports that follow a hybrid Armington-Leontief assumption. For each of them we calculate the multiplier effects to find out whether the assumptions about imports matter or not. This is empirically illustrated using OECD I-O data for the U.S.

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1. Introduction

Real-world data that capture economic interdependencies, such as input-output tables (IOT) or social accounting matrices (SAM), always include disaggregated information on imports. The treatment of these data on imports becomes a relevant question when we move from a purely descriptive analysis to an economic model. Consequently, the inevitable presence of imports in empirical data requires making assumptions regarding the role they play in the production process (Miller and Blair 2022, chapter 4). Two main types of data protocols are considered in presenting Input-Output (I-O) data in relation to imports: non-competitive and competitive imports (Su and Ang 2013). To this respect, the compilation of I-O data by the OECD (2021) is particularly useful as it distinguishes imports based on intermediate and final demands, maximizing the visibility of the data. The World Input-Output Database (WIOD; Timmer et al. 2015) follows the same data protocols. The complete separation of domestic data and imports allows for their interpretation in terms of non-competitive goods.

It is not uncommon to find, however, that national I-O tables aggregate domestic and imported goods into a single composite category. This is the case of Spain for the latest available I-O table for 2016 compiled by the National Institute for Statistics (INE 2022). Under this presentation of I-O data using total flows, the implicit assumption is that domestic and imported goods are competitive and may substitute for each other. Be that as it may, I-O data from the OECD or WIOD can be presented and interpreted both ways regarding the relationship between domestic and imported goods. The interpretations are in themselves relevant because they will give rise to alternative ways of specifying the rules of operation that a model purports to describe. Obviously, different rules are going to lead to different results. The important question, therefore, is whether the ensuing simulation results from different modeling assumptions may end up being different and to what degree.

For example, the I-O modelling framework that we will use below to illustrate the topic at hand assumes fixed coefficients between inputs and outputs. In interpretive terms, this linearity assumption about the structure of technology involves a short-term perspective in which possible substitution adjustments between inputs, in response to systemic changes in relative prices, have not yet come into action. Thus, the short-term changes that the I-O approach allows us to examine focus strongly on the determination of equilibrium quantities. For its part, the specific assumption under which imports are integrated into the general economic model will condition the response in equilibrium quantities to changes caused by policy decisions or external events. Within this type of model, the comparative statics analysis is fully driven by the multiplier matrix, whose structure directly depends on the particular assumptions made about the behaviour of imports, as we will see in what follows.

In addition to the two conventional interpretations of import behaviour, competitive and non-competitive, we will also explore a third hybrid assumption that integrates Armington's (1969) original idea into the I-O model. It is well known that linear I-O models exhibit a dichotomy in the determination of quantities and prices. On its part, the Armington assumption links the demand for imports to relative prices (domestic versus world prices), subject to an elasticity governing the degree of substitution. At first glance, one might think that this approach renders Armington's assumption inapplicable in I-O models. However, the dichotomy between prices and quantities implies that the multiplier matrix's structure does not depend on prices. In this case, and in the short term with constant prices, it becomes possible to integrate the Armington assumption into an I-O model[1]. The resulting hybrid structure corresponds to the limit case in which, due to the absence of short-term substitution, the relevant elasticity is zero. This allows for a formulation to determine domestic production and imports under fixed coefficients.

In Section 2 of this note we work out the details of the integration of the three import modelling options we consider in light of the type of empirical data available. Section 3 shows the multiplier results obtained from using OECD I-O data for the U.S. for 2018. Section 4 briefly concludes.

2. Methodology: from data to modelling imports' behaviour

We will use U.S. 2018 I-O data obtained from the OECD database. The choice of the U.S. is driven by two primary considerations. First, the United States is one of the world's largest economies, providing a well-established and diversified economic structure as the basis for our study. Consequently, we anticipate that our results will be more robust compared to using data from a smaller economy. Second, for the 2018 I-O database year, the U.S. was the global leader in terms of volume of imports, making it a good case study. If imports are relevant and their behaviour can affect the results of an analysis, it is better to examine the role they play in a case where their presence is significant.

The data we use comprises a disaggregation of n=44 distinct sectors. For each sector, domestic and imported flows are specified. In Table 1, to provide a better visualization of the structure of the economy, we aggregate the I-O data available from the OECD for the United States into three sectors (Primary-1, Manufactures-2, and Services-3). This presentation of data is tailored to reflect the non-competitive nature of imports and refers to domestic I-O data. In Table 2, in contrast, we aggregate the same OECD data to display its competitive version, where both domestic and imported goods are aggregated into a single category labelled 'total' flow. In this case, the data refers to the total I-O data. Notice that we can go from Table 1 to Table 2, but the reverse trip is not possible if data are presented in aggregated total flows.

[1] The integration of the Armington assumption within an I-O structure is due to Guerra and Sancho (2018) and Sancho (2019).

Table 1: IOT USA 2018: 3 sector aggregation of OECD data in non-competitive format

Millions of dollars		Intermediate demand			Final demand	Exports	Total output
	$\mathbf{Z}_d$	1	2	3	$\mathbf{y}_d$	$\mathbf{y}_e$	$\mathbf{x}_d$
Intermediate inputs	1	82,976.5	211,531.8	17,252.7	102,224.7	52,604.2	466,589.9
	2	71,790.6	2,167,538.0	1,602,297.2	4,150,409.5	1,077,147.8	9,069,183.1
	3	96,236.9	1,858,021.5	8,169,903.1	15,108,041.8	1,051,764.3	26,283,967.6
	$\mathbf{Z}_m$				$\mathbf{y}_m$		$\mathbf{x}_m$
Imports	1	7,402.7	24,569.1	6,818.1	14,197.7		52,987.6
	2	11,320.4	730,139.2	242,069.3	1,001,361.9		1,984,890.8
	3	4,353.9	132,379.2	204,044.4	454,562.6		795,340.1
Value added	$\mathbf{v}$	192,508.9	3,945,004.3	16,041,582.8			
Total input	$\mathbf{x}_d$	466,589.9	9,069,183.1	26,283,967.6			

Table 2: IOT USA 2018: 3 sector aggregation of OECD data in competitive format

Millions of dollars		Intermediate demand			Final demand	Exports	Imports	Total output
	$\mathbf{Z}_d+\mathbf{Z}_m$	1	2	3	$\mathbf{y}_d+\mathbf{y}_m$	$\mathbf{y}_e$	$-\mathbf{x}_m$	$\mathbf{x}_d$
Intermediate inputs	1	90,379.2	236,100.9	24,070.8	116,422.4	52,604.2	-52,987.6	466,589.9
	2	83,111.0	2,897,677.2	1,844,366.5	5,151,771.4	1,077,147.8	-1,984,890.8	9,069,183.1
	3	100,590.8	1,990,400.7	8,373,947.5	15,562,604.4	1,051,764.3	-795,340.1	26,283,967.6
Value added	$\mathbf{v}$	192,508.9	3,945,004.3	16,041,582.8				
Total input	$\mathbf{x}_d$	466,589.9	9,069,183.1	26,283,967.6				

The notation[2] is as follows in both these Tables:

- $\mathbf{Z}_d$: matrix of domestic intermediate flows
- $\mathbf{A}_d$: matrix of domestic input-output technical coefficients
- $\mathbf{Z}_m$: matrix of imported intermediate flows
- $\mathbf{A}_m$: matrix of imports' input-output technical coefficients
- $\mathbf{Z}$: matrix of total intermediate flows
- $\mathbf{A}$: matrix of total input-output technical coefficients
- $\mathbf{y}_d$: final demand for domestic output
- $\mathbf{y}_m$: final demand for imported goods
- $\mathbf{y}_e$: final demand for exports
- $\mathbf{x}_d$: total domestic output
- $\mathbf{x}_m$: total imports

All matrices are square with dimensions (44×44), corresponding to the sectoral disaggregation in the dataset. Likewise, all vectors are column vectors with dimensions (44×1).

From the definition of intermediate flows, we have total intermediate flows as $\mathbf{Z} = \mathbf{Z}_d + \mathbf{Z}_m$. The fixed coefficients assumption in production typical of interindustry analysis, in turn, gives us that

[2] In general, x will denote a scalar, $\mathbf{x}$ a vector (column or row from context), $\mathbf{X}$ a matrix, $\mathbf{D}(\mathbf{x})$ the diagonal matrix version of vector $\mathbf{x}$, and $\mathbf{X}^{-1}$ the inverse matrix of $\mathbf{X}$. The operator "$\cdot$" in all the matrix operations will indicate the standard multiplication of matrices.

$\mathbf{A}_{\mathrm{d}} = \mathbf{Z}_{\mathrm{d}} \cdot \left(\mathbf{D}(\mathbf{x}_{\mathrm{d}})\right)^{-1}$, $\mathbf{A}_{\mathrm{m}} = \mathbf{Z}_{\mathrm{m}} \cdot \left(\mathbf{D}(\mathbf{x}_{\mathrm{d}})\right)^{-1}$, and from here $\mathbf{A} = \mathbf{Z} \cdot \left(\mathbf{D}(\mathbf{x}_{\mathrm{d}})\right)^{-1} = \mathbf{A}_{\mathrm{d}} + \mathbf{A}_{\mathrm{m}}$. The diagonal matrix $\mathbf{D}(\mathbf{x}_{\mathrm{d}})$ is invertible because all of the terms in vector $\mathbf{x}_{\mathrm{d}}$ are positive.

The balance equations under the assumption of non-competitive imports (as presented in Table 1) and fixed coefficients take the form (Su and Ang, 2013):

$$\mathbf{x}_{\mathrm{d}} = \mathbf{Z}_{\mathrm{d}} \cdot \mathbf{u} + \mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}} = \mathbf{A}_{\mathrm{d}} \cdot \mathbf{x}_{\mathrm{d}} + \mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}} \quad (1)$$

The solution of expression (1) for domestic output $\mathbf{x}_{\mathrm{d}}$ turns out to be[3]:

$$\mathbf{x}_{\mathrm{d}} = \left(\mathbf{I} - \mathbf{A}_{\mathrm{d}}\right)^{-1} \cdot (\mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}}) = \mathbf{L}_{\mathrm{d}} \cdot (\mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}}) \quad (2)$$

$\mathbf{L}_{\mathrm{d}}$ represents the Leontief multiplier matrix under the non-competitive assumption. Notice that imports play no role in determining the domestic supply of goods.

If we now consider total flows (as presented in Table 2), the balance equations for the data become:

$$\mathbf{x}_{\mathrm{d}} = \mathbf{Z} \cdot \mathbf{u} + \mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}} + \mathbf{y}_{\mathrm{m}} - \mathbf{x}_{\mathrm{m}} = \mathbf{A} \cdot \mathbf{x}_{\mathrm{d}} + \mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}} + \mathbf{y}_{\mathrm{m}} - \mathbf{x}_{\mathrm{m}} \quad (3)$$

The solution for domestic output under the assumption of competitive imports (Su and Ang, 2013) is now:

$$\mathbf{x}_{\mathrm{d}} = \left(\mathbf{I} - \mathbf{A}\right)^{-1} \cdot (\mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}} + \mathbf{y}_{\mathrm{m}} - \mathbf{x}_{\mathrm{m}}) = \mathbf{L} \cdot (\mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}} + \mathbf{y}_{\mathrm{m}} - \mathbf{x}_{\mathrm{m}}) \quad (4)$$

Matrix $\mathbf{L}$ represents now the Leontief multiplier matrix under the competitive assumption on imports.

Expression (4) is quite general; however, it leaves total imports $\mathbf{x}_{\mathrm{m}}$ unexplained. Moving beyond Su and Ang (2013), we now introduce assumptions regarding the operational rules of imports. First, as final demand is typically determined outside interindustry models, we will consider domestic final demand for imports $\mathbf{y}_{\mathrm{m}}$ as exogenously given from now on. Second, note that the difference ($\mathbf{x}_{\mathrm{m}} - \mathbf{y}_{\mathrm{m}}$) between total imports and imports for final demand corresponds to the intermediate imports used in production. We now introduce a hypothesis that establishes a link between this intermediate demand for imports and their corresponding domestic activity levels. We define the column vector of intermediate import coefficients as follows:

$$\mathbf{t}_{\mathrm{m}} = \left(\mathbf{D}(\mathbf{x}_{\mathrm{d}})\right)^{-1} \cdot (\mathbf{x}_{\mathrm{m}} - \mathbf{y}_{\mathrm{m}}) \quad (5)$$

From (5) it follows that $\mathbf{D}(\mathbf{t}_{\mathrm{m}}) \cdot \mathbf{x}_{\mathrm{d}} = (\mathbf{x}_{\mathrm{m}} - \mathbf{y}_{\mathrm{m}})$. Substituting in expression (3) and solving for $\mathbf{x}_{\mathrm{d}}$ yields:

$$\mathbf{x}_{\mathrm{d}} = \mathbf{A} \cdot \mathbf{x}_{\mathrm{d}} + (\mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}} - \mathbf{D}(\mathbf{t}_{\mathrm{m}}) \cdot \mathbf{x}_{\mathrm{d}}) = \left(\mathbf{I} - \mathbf{A} - \mathbf{D}(\mathbf{t}_{\mathrm{m}})\right)^{-1} \cdot (\mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}}) = \mathbf{L}_{\mathrm{m}} \cdot (\mathbf{y}_{\mathrm{d}} + \mathbf{y}_{\mathrm{e}}) \quad (6)$$

[3] Matrices of the type ($\mathbf{I}$-$\mathbf{A}_{\mathrm{d}}$) will be invertible, and the inverse will be nonnegative, provided their maximal eigenvalue is less than 1 (Nikaido, 1970, Ch.3). For matrices built from empirical I-O data this will always be the case (Miller and Blair, 2022, Ch.2).

Matrix $\mathbf{L}_m$ is another multiplier matrix, now calculated under the outlined assumption used for the determination of intermediate imports. We will refer to the model in expression (6) as the "standard" competitive model[4]. Notice that model (6) determines domestic output as well as total imports, in this case from the aggregation of intermediate imports $\mathbf{D}(\mathbf{t}_m)\cdot\mathbf{x}_d$ (endogenously determined) and final domestic demand for imports $\mathbf{y}_m$ (kept exogenous).

A different modelling alternative to competitive imports derives from the Armington (1969) assumption widely used in applied general equilibrium analysis (Burfisher 2016; Cardenete et al. 2016). Under Armington, the total supply of goods $\mathbf{x}$ is an aggregation of domestic output $\mathbf{x}_d$ and total imports $\mathbf{x}_m$ usually governed by a CES function. Within the confines of the linear model this translates into a zero elasticity of substitution in each sector *j* which takes the mathematical form:

$$x_j = \text{Min}\left(\frac{x_j^d}{\alpha_j^d}, \frac{x_j^m}{\alpha_j^m}\right) \tag{7}$$

with α_j^d and α_j^d indicating the shares of domestic output and imports on total output in sector *j*. In the efficient point of the isoquants, it follows from (7) that:

$$\mathbf{x}_m = (\mathbf{D}(\boldsymbol{\alpha}_m))\cdot(\mathbf{D}(\boldsymbol{\alpha}_d))^{-1}\cdot\mathbf{x}_d = \mathbf{D}(\boldsymbol{\beta})\cdot\mathbf{x}_d \tag{8}$$

with matrix $\mathbf{D}(\boldsymbol{\beta})$ incorporating the Armington share ratios of imports to domestic output. Back to expression (3) we now obtain:

$$\mathbf{x}_d = \mathbf{A}\cdot\mathbf{x}_d + \mathbf{y}_d + \mathbf{y}_e + \mathbf{y}_m - \mathbf{x}_m = \mathbf{A}\cdot\mathbf{x}_d + \mathbf{y}_d + \mathbf{y}_e + \mathbf{y}_m - \mathbf{D}(\boldsymbol{\beta})\cdot\mathbf{x}_d \tag{9}$$

Solving for domestic $\mathbf{x}_d$ output gives:

$$\mathbf{x}_d = \left(\mathbf{I} - \mathbf{A} - \mathbf{D}(\boldsymbol{\beta})\right)^{-1}\cdot(\mathbf{y}_d + \mathbf{y}_e + \mathbf{y}_m) = \mathbf{L}_\beta\cdot(\mathbf{y}_d + \mathbf{y}_e + \mathbf{y}_m) \tag{10}$$

Once again $\mathbf{L}_\beta$ is a multiplier matrix now constructed under the hybrid Armington-Leontief approach. Summing up, equations (2), (6) and (10) give us three alternative ways of calculating domestic output $\mathbf{x}_d$ and each one has its specific multiplier matrix. In turn, using equations (5) and (8) and the solutions for domestic output in (6) and (10), we can calculate total imports $\mathbf{x}_m$ in the competitive and Armington-Leontief cases, respectively. We still need to define an import demand equation for the non-competitive case. One possibility is by assuming that intermediate non-competitive imports are driven by domestic activity levels:

$$(\mathbf{x}_m - \mathbf{y}_m) = \mathbf{A}_m\cdot\mathbf{x}_d \tag{11}$$

[4] In the sense that it is standard in I-O analysis to model the components in the value-added submatrix (such as labor or capital services, or imports) that intervene in production in terms of their direct unitary coefficients (Chenery and Clark 1959).

From equations (11) and the solution for domestic output in (2) we can derive demand for imports in the non-competitive case.

Notice that in a closed economy there would be no imports whatsoever and the two multiplier matrices $\mathbf{L}_m$ and $\mathbf{L}_\beta$ would collapse to $\mathbf{L}_d$, hence a unique multiplier matrix would describe the interdependence effects. We can now proceed to calculate, and compare, multipliers for domestic output and imports for the three modelling alternatives.

3. Case study

In I-O models, final demand is typically considered exogenous. In our calculations, we explore the consequences of a one unit increase in final demand for each of the n=44 goods and services in the dataset. By comparing simulated domestic output and imports with their initial levels in the dataset, we calculate the induced changes and express them in multiplier terms. The full numerical results are presented in Table 3 in the Appendix, and the meaning of the figures there is straightforward. For example, in the first row of the domestic block, we interpret 2.037 as the increase in aggregate domestic output if final demand addressed to sector 1 would increase by one unit, assuming non-competitive import behaviour. Correspondingly, 1.991 and 1.881 represent the increases in domestic output under the competitive and Armington-Leontief assumptions. This pattern continues with the rest of the figures. The second block indicates multiplier changes in imports, and the third block combines the results to provide estimates of multiplier effects on total supply.

On average, non-competitive multipliers for domestic output are larger than those of the competitive and hybrid alternatives. In contrast, Armington-Leontief multipliers for imports exceed those of its counterparts. However, they are insufficient to offset the larger domestic effects, resulting in the same ordering for total output supplied as observed in the multiplier ordering for domestic output.

Figure 1 Domestic output multipliers

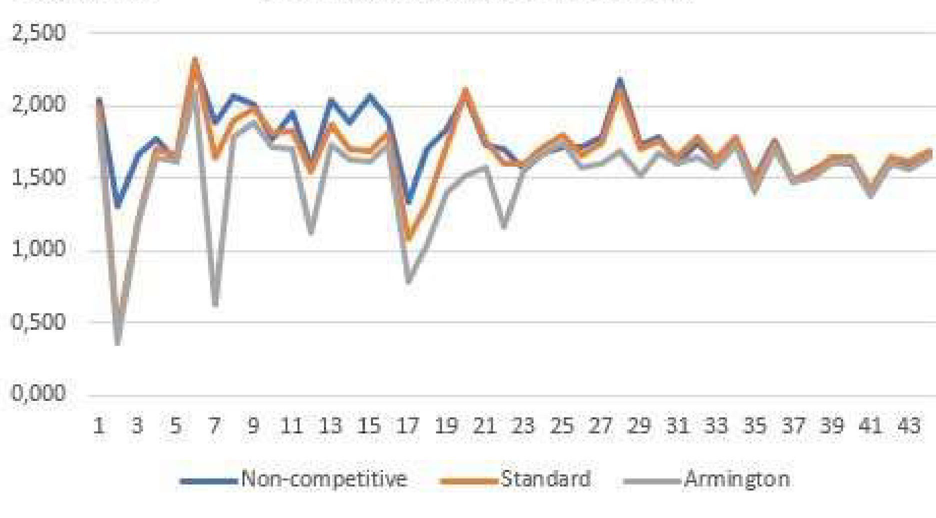
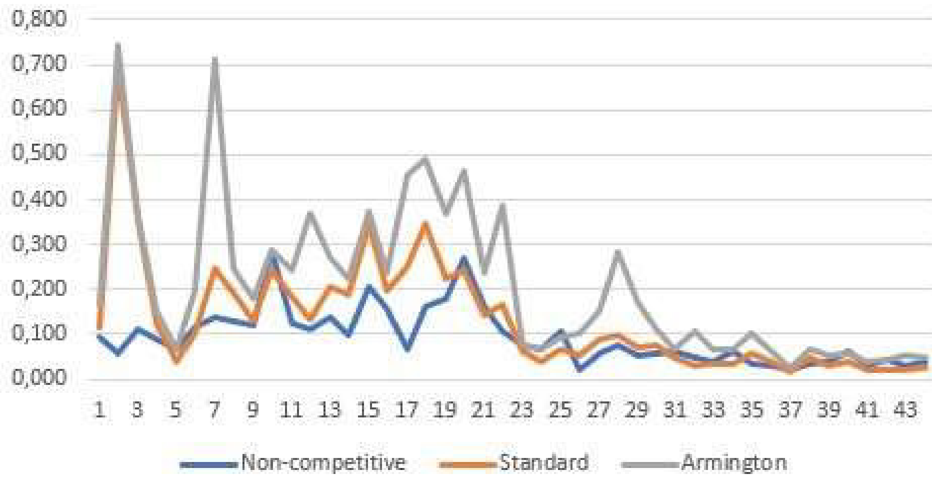


Figure 2 Import multipliers



Figures 1 and 2 allow us to grasp the structure of the individual multipliers in the three cases. The Agriculture and Manufacturing sectors exhibit the greatest variability in multiplier values, a result aligned with the fact that these sectors have the highest proportion of imports over total output. In contrast, the Services sectors display greater uniformity in multiplier results. This is consistent with the aforementioned idea that the smaller the share of imports, the smaller the discrepancies between the multiplier matrices. Examining the aggregate 3-sector I-O data in Table 1, we observe that the proportion of imports to domestic output is approximately 3 percent in the Services sectors, while it increases to just over 11 percent and 22 percent for Agriculture and Manufacturing, respectively. The contrast in multiplier response between Services and non-Services sectors suggests, therefore, that modelling assumptions for imports become more critical and should be scrutinized more carefully in the non-Services sectors.

4. Concluding remarks

In this note, we have examined the implications of alternative rules regarding the integration of imports in linear I-O models. As anticipated, these implications differ and become more significant as imports constitute a higher share of available goods in the total output of a sector. Results also differ in average values, yielding higher domestic multiplier values when imports are considered non-competitive, while import multiplier values, in marked contrast, are higher under the competitive and hybrid assumptions.

Arranging the average domestic multiplier values from highest to smallest, the difference can be evaluated to be close to 15 percent in favor of the non-competitive assumption. However, when calculating the change in terms of total supply, this percentage reduces to close to 6.5 percent, reflecting the fact that the average Armington-Leontief import multiplier more than doubles the non-competitive one. Certainly, discrepancies would tend to be smaller for economies less open in terms of the demand for imports. The numerical results emphasize the need to pay special attention when we introduce imports into the analysis. The different modelling options must obviously be tested to weigh their implications and thus provide us with a broader and more robust evaluation of the results that our models generate.

Data availability: The data that support the findings of this study are openly available from the OECD at: https://www.oecd.org/sti/ind/input-outputtables.htm

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Appendix

Table 3: Multipliers according to imports assumptions

Sector	Domestic Output Multipliers			Import Multipliers			Total Supply Multipliers		
	Non Competitive imports	Standard imports	Armington imports	Non Competitive imports	Standard imports	Armington imports	Non Competitive imports	Standard imports	Armington imports
1. Agriculture, hunting, forestry	2,037	1,991	1,881	0,095	0,115	0,166	2,132	2,105	2,046
2. Fishing and aquaculture	1,301	0,427	0,355	0,058	0,693	0,744	1,359	1,120	1,099
3. Mining and quarrying, energy producing products	1,653	1,209	1,183	0,113	0,353	0,366	1,766	1,561	1,548
4. Mining and quarrying, non-energy producing products	1,769	1,701	1,651	0,088	0,125	0,150	1,857	1,827	1,801
5. Mining support service activities	1,611	1,663	1,613	0,066	0,041	0,066	1,677	1,704	1,679
6. Food products, beverages and tobacco	2,302	2,324	2,103	0,118	0,102	0,195	2,419	2,426	2,298
7. Textiles, textile products, leather and footwear	1,891	1,642	0,635	0,136	0,247	0,710	2,027	1,889	1,345
8. Wood and products of wood and cork	2,065	1,900	1,783	0,129	0,194	0,248	2,195	2,094	2,031
9. Paper products and printing	2,015	1,984	1,879	0,118	0,128	0,178	2,134	2,112	2,057
10. Coke and refined petroleum products	1,766	1,820	1,720	0,283	0,242	0,286	2,049	2,063	2,006
11. Chemical and chemical products	1,959	1,824	1,699	0,126	0,183	0,242	2,086	2,007	1,941
12. Pharmaceuticals, medicinal chemical and botanical products	1,580	1,543	1,129	0,113	0,135	0,366	1,693	1,678	1,496
13. Rubber and plastics products	2,046	1,868	1,732	0,137	0,207	0,269	2,183	2,074	2,001
14. Other non-metallic mineral products	1,892	1,707	1,634	0,099	0,186	0,222	1,991	1,893	1,856
15. Basic metals	2,062	1,683	1,621	0,206	0,345	0,374	2,269	2,028	1,995
16. Fabricated metal products	1,914	1,813	1,727	0,156	0,197	0,238	2,070	2,010	1,965
17. Computer, electronic and optical equipment	1,339	1,080	0,788	0,067	0,251	0,452	1,406	1,331	1,240
18. Electrical equipment	1,696	1,316	1,033	0,160	0,347	0,489	1,856	1,663	1,522
19. Machinery and equipment, nec	1,840	1,727	1,409	0,178	0,225	0,369	2,018	1,951	1,779
20. Motor vehicles, trailers and semi-trailers	2,089	2,104	1,520	0,267	0,243	0,462	2,357	2,347	1,982
21. Other transport equipment	1,726	1,752	1,568	0,162	0,144	0,237	1,889	1,896	1,805
22. Repair and installation of machinery and equipment	1,704	1,601	1,168	0,107	0,163	0,389	1,811	1,764	1,557
23. Electricity, gas, steam and air conditioning supply	1,566	1,599	1,572	0,076	0,060	0,074	1,643	1,659	1,646
24. Water supply; waste management and remediation activities	1,667	1,717	1,670	0,064	0,040	0,064	1,731	1,757	1,733
25. Construction	1,717	1,794	1,738	0,104	0,066	0,094	1,822	1,861	1,832
26. Wholesale and retail trade; repair of motor vehicles	1,718	1,664	1,573	0,021	0,052	0,102	1,739	1,716	1,675
27. Land transport and transport via pipelines	1,791	1,739	1,609	0,057	0,086	0,153	1,848	1,825	1,762
28. Water transport	2,176	2,110	1,686	0,074	0,099	0,283	2,250	2,208	1,969
29. Air transport	1,730	1,700	1,515	0,051	0,068	0,169	1,781	1,769	1,684
30. Warehousing and support activities for transportation	1,782	1,752	1,680	0,058	0,076	0,112	1,840	1,828	1,792
31. Postal and courier activities	1,604	1,641	1,601	0,063	0,046	0,066	1,667	1,688	1,667
32. Accommodation and food service activities	1,747	1,783	1,644	0,048	0,030	0,105	1,795	1,813	1,748
33. Publishing, audiovisual and broadcasting activities	1,617	1,627	1,572	0,038	0,033	0,065	1,655	1,660	1,637
34. Telecommunications	1,736	1,787	1,733	0,063	0,034	0,064	1,799	1,820	1,797
35. IT and other information services	1,505	1,473	1,400	0,034	0,056	0,100	1,538	1,528	1,501
36. Financial and insurance activities	1,756	1,743	1,698	0,030	0,037	0,062	1,785	1,780	1,760
37. Real estate activities	1,478	1,492	1,471	0,022	0,015	0,027	1,500	1,507	1,497
38. Professional, scientific and technical activities	1,557	1,542	1,503	0,034	0,046	0,068	1,591	1,587	1,571
39. Administrative and support services	1,623	1,641	1,602	0,039	0,030	0,051	1,662	1,671	1,653
40. Public administration and defense; compulsory social security	1,600	1,647	1,610	0,062	0,038	0,057	1,662	1,685	1,667
41. Education	1,391	1,413	1,382	0,031	0,020	0,037	1,422	1,433	1,419
42. Human health and social work activities	1,604	1,640	1,602	0,042	0,022	0,043	1,645	1,662	1,645
43. Arts, entertainment and recreation	1,592	1,615	1,555	0,032	0,020	0,054	1,623	1,635	1,609
44. Other services	1,653	1,684	1,640	0,041	0,025	0,049	1,694	1,709	1,689
Average	1,747	1,670	1,520	0,092	0,133	0,207	1,839	1,803	1,727