

Rodousakis, Nikolaos; Soklis, George

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Article

The Impact of COVID-19 on the US Economy: The Multiplier Effects of Tourism

Nikolaos Rodousakis ¹ and George Soklis ^{2,*} ¹ Centre of Planning and Economic Research (KEPE), 10672 Athens, Greece; nrodousakis@kepe.gr² Department of Public Administration, School of Economy and Public Administration, Panteion University, 17671 Athens, Greece

* Correspondence: g.soklis@panteion.gr

Abstract: This article explores the multiplier effects on domestic product, employment, and the external sector of the US economy due to the decline of tourism activities during the pandemic. For this purpose, we use an input-output model and the latest available input-output data from the Organisation for Economic Co-operation and Development (OECD's) database. It was found that for every USD million decrease in tourism receipts, the net output decreases about USD 1.53 million, the level of employment decreases about 16.86 persons, imports decrease about USD 0.20 million, while the comparative analysis of these results with the economy's average multipliers indicates that tourism constitutes a key sector of the US economy. From the evaluation of the results, it is deduced that the decline of tourism activities recorded in the year 2020 accounts for about one-fourth of the observed recession in the US economy.

Keywords: coronavirus; US economy; multiplier effects; tourism sector



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1. Introduction

The coronavirus shock to the growth dynamics of all the major economies in the world marked the year 2020. The economy of the United States (US), the largest economy in the world in terms of nominal gross domestic product (GDP), recorded a reduction in GDP of about 3.4% for the year 2020.¹ The recession of the US economy was close to the global average recession, but quite below the average recession amongst advanced economies (−4.7%), and the Euro area (−6.6%). These relatively good results for the US economy can be attributed to its structural characteristics.

Undoubtedly, tourism is one of the most vulnerable economic sectors in the pandemic. For example, according to World Tourism Organization (UNWTO), international tourism arrivals declined by 73% in the year 2020. Since tourism has become one of the major contributors to growth and employment worldwide in the last decades, it is important to study the effects on national economies caused by the decline of tourism activities during the pandemic. For example, the World Travel & Tourism Council (WTTC 2021) estimates that before the pandemic, tourism accounted for 10.4% of global GDP and 10.6% of employment, while international travel expenditures accounted for 6.8% of world's total exports and 27.4% of services exports.

Recently, a number of research studies have focused on the impact on the economic systems related to the decline of tourism activities (see, e.g., Farzanegan et al. 2020; Lee and Chen 2020; Mariolis et al. 2020; Qiu et al. 2020; Rodousakis and Soklis 2021; Tsionas 2020; Yang et al. 2020). In this article we explore the multiplier effects on domestic product, employment, and the external sector of the US economy due to the decline of tourism activities during the pandemic. For this purpose, we use (a) an extension of Kurz's (1985) matrix multiplier framework; and (b) the latest available input-output data from OECD's (Organisation for Economic Co-operation and Development) database, <https://stats.oecd.org> (accessed on 30 September 2021).

The remainder is structured as follows. Section 2 presents the analytic framework. Section 3 presents the empirical results. Finally, Section 4 concludes.

2. Methods and Materials

To assess the multiplier effects of tourism on the US economy, we use a Sraffian multiplier framework inspired by the contribution of Kurz (1985) and the further generalisations provided by Metcalfe and Steedman (1981) and Mariolis (2008). More specifically, we consider an open economy with n products produced by n single-product activities, only circulating capital, fixed input-output coefficients, “stationary prices”, two types of income (i.e., wages and profits), no pass-through from tax rates to prices, and heterogeneous labour. By combining the price and quantity system of the above economy, we may derive the following equation²

$$\mathbf{y}^T = \Pi \mathbf{d}^T$$

where \mathbf{y}^T denotes the net output vector with dimensions $n \times 1$, \mathbf{d}^T is the autonomous demand vector, which includes government consumption, investments and exports, $\Pi \equiv [\mathbf{I} - \mathbf{C} + \mathbf{M}]^{-1}$ represents the multipliers matrix of the economy, linking autonomous demand with net output, $\mathbf{C} \equiv [\mathbf{p} - (s_w \mathbf{w}\Lambda + s_p \mathbf{p}\mathbf{H})](\mathbf{p}\mathbf{c}^T)^{-1} \mathbf{c}^T$ represents the consumption demand of the economy, \mathbf{c}^T represents the consumption pattern (which is assumed to be uniform among wage and profit earners), s_w is the saving ratio associated with wage earners, s_p is the saving ratio associated with profit earners, $\Lambda \equiv \hat{\mathbf{I}}[\mathbf{I} - \mathbf{A}]^{-1}$ is the “vertically integrated labour coefficients” matrix, $\mathbf{A} (\geq \mathbf{0})$ is the matrix of technical coefficients, $\mathbf{H} \equiv \hat{\mathbf{A}}\mathbf{r}[\mathbf{I} - \mathbf{A}]^{-1}$ is the “ $\hat{\mathbf{r}}$ —vertically integrated technical coefficients matrix”, $\hat{\mathbf{r}}$ the diagonal matrix of sectoral profit rates, $\mathbf{M} \equiv \hat{\mathbf{m}}[\mathbf{I} - \mathbf{A}]^{-1}$ represents the total import demand matrix, and finally, $\hat{\mathbf{m}}$ the diagonal matrix of imports per unit of output. On the basis of the above, we may easily derive the matrix of employment multipliers linking autonomous demand to the levels of sectoral employment from $\mathbf{L}^T = \Lambda \Pi \mathbf{d}^T$, where \mathbf{L}^T gives the vector of employment per sector of the economy, and the matrix of import multiplier from $\mathbf{im}^T = \hat{\mathbf{m}}[\mathbf{I} - \mathbf{A}]^{-1} \Pi \mathbf{d}^T$, where \mathbf{im}^T denotes the import demand vector.

The necessary input-output data of the US economy for the empirical application of the multiplier analysis were retrieved from OECD’s database, <https://stats.oecd.org> (accessed on 30 September 2021). The OECD’s Input-Output Tables (IOTs) describe the production of 36 products by 36 corresponding sectors. The classification of the 36 sectors of the US economy is reported in Table 1 below.

Table 1. Sector classification.

No.	Nomenclature
1	Agriculture, forestry and fishing
2	Mining and extraction of energy producing products
3	Mining and quarrying of non-energy producing products
4	Mining support service activities
5	Food products, beverages and tobacco
6	Textiles, wearing apparel, leather and related products
7	Wood and products of wood and cork (except furniture)
8	Paper products and printing
9	Coke and refined petroleum products
10	Chemicals and pharmaceutical products
11	Rubber and plastics products

Table 1. *Cont.*

No.	Nomenclature
12	Other non-metallic mineral products
13	Manufacture of basic metals
14	Fabricated metal products, except machinery and equipment
15	Computer, electronic and optical products
16	Electrical equipment
17	Machinery and equipment NEC
18	Motor vehicles, trailers and semi-trailers
19	Other transport equipment
20	Other manufacturing; repair and installation of machinery and equipment
21	Electricity, gas, water supply, sewerage, waste and remediation services
22	Construction
23	Wholesale and retail trade; repair of motor vehicles
24	Transportation and storage
25	Accommodation and food services
26	Publishing, audiovisual and broadcasting activities
27	Telecommunications
28	IT and other information services
29	Financial and insurance activities
30	Real estate activities
31	Other business sector services
32	Public administration and defence; compulsory social security
33	Education
34	Human health and social work
35	Arts, entertainment, recreation and other service activities
36	Private households with employed persons

Now, to assess the multiplier effects of tourism receipts on the economic system we need to set the autonomous demand vector, \mathbf{d} , equal to the pattern of international travel receipts that corresponds to the 36 sectors classified in the IOTs of the US economy.³ Moreover, we divide all the elements of \mathbf{d} by the total tourism receipts of the economy and, therefore, it holds $\sum_{i=1}^{36} d_i = 1$. The distribution of tourism receipts to the commodities of the different sectors of the US economy is represented in Figure 1: about 77.7% of the international travel receipts of the US economy are directed to the sectors “Accommodation and food services” (31.6%), “Transportation and storage” (14.3%), “Education” (13.8%), “Arts, entertainment, recreation and other service activities” (6.8%), “Wholesale and retail trade” (5.8%), and “Real estate activities” (5.4%), while about 22.3% of the travel receipts are directed to the rest of the 30 sectors.

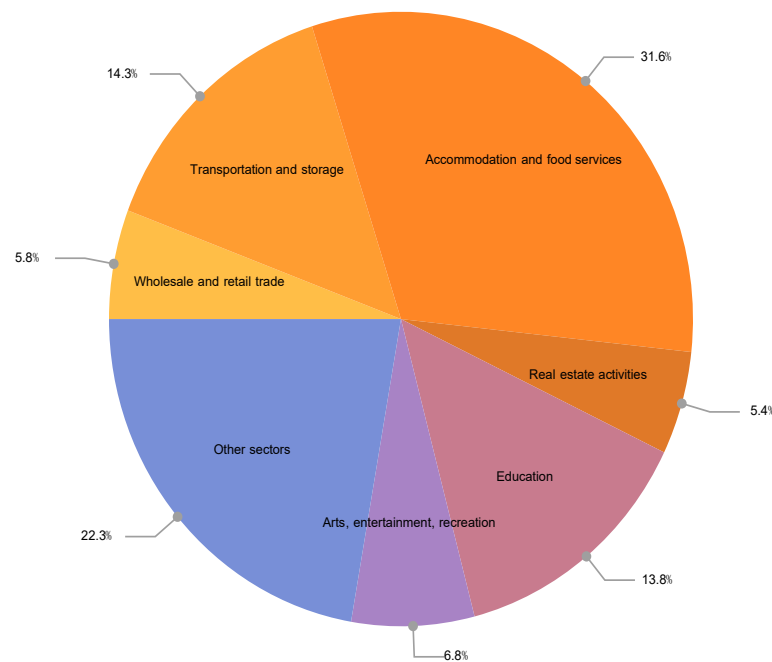


Figure 1. The distribution (%) of international travel receipts per sector, US 2015.

3. Empirical Results and Discussion

We apply the previous analysis to the IOTs of the US economy for the case where $s_w = 0$ and $s_p = 1$. According to our estimates, each USD million decrease in tourism receipts caused a direct and indirect:⁴

- Decrease in domestic product of about USD 1.53 million;
- Decrease in the level of employment of about 16.86 persons;
- Decrease in imports of about USD 0.20 million.

The decomposition of the multiplier effects on net output, employment, and imports, to each of the 36 sectors of the US economy is depicted in Figures 2–4, respectively.

From Figures 2 and 3, it follows that the output and employment multiplier effects in the US economy mainly affect the services, while, from Figure 4, it follows that the import multiplier effects are distributed to all the sectors of the US economy.

Now, to assess the relative significance of the tourism multiplier effects on the US economy, we compare the tourism multipliers with the average multipliers of the economy. Table 2 reports the average output, employment and import multipliers of the US economy. The third column of Table 2 reports the estimated tourism multipliers.⁵

Table 2. Average versus tourism multipliers for the US economy, 2015.

Multipliers	Economy's Average	Tourism
Output	1.35	1.53
Employment	12.87	16.86
Imports	0.28	0.20

From the multipliers reported in Table 2, it follows that the US economy demonstrates relatively favorable tourism multipliers and, therefore, the tourism sector constitutes one of the key sectors of the US economy.

The US GDP reached USD 21,433,224.7 million, while the total level of employment was 157,538,100 persons.⁶ Furthermore, UNWTO reports that the US's tourism receipts accounted for USD 193.3 billion in the year 2019, and USD 76.1 billion in the year 2020, recording a decline of about 61% in comparison to the previous year. Thus, from the previous analysis of the tourism multiplier effect on the US economy, it is deduced that the

decline of tourism receipts in the year 2020 is associated with a decrease in gross domestic output by 0.84%, a decrease in the employment level by 1.25%, and a decrease in the surplus of the balance of the external sector by USD 93.8 billion. It is interesting to note that if we make the extreme assumption that all tourism receipts of the US economy are lost (193.3 billion US dollars), then, according to our estimates, the gross domestic product would decrease by 1.38%, the employment level would decrease by 2.07%, and the surplus of the external sector would decrease by USD 154.6 billion. Now, if we take into account that the gross domestic product of the US economy declined by about 3.4% in the previous year, it then follows that the decrease of international travel receipts accounted for 24.7% of the actual recession in the US economy. Finally, to delve into the intersectoral dimensions of the multiplier effects of international travel receipts on the US economy, in Figure 5 we depict the decrease in domestic output per sector.

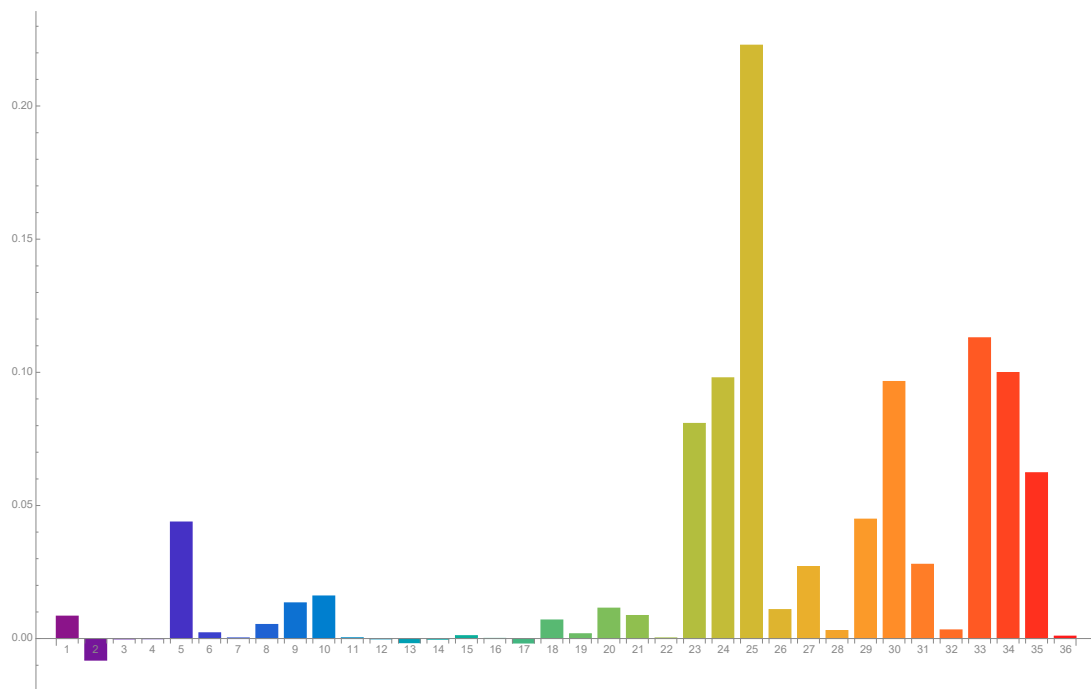


Figure 2. Sectoral decomposition of the tourism output multiplier, US 2015.

From Figure 5, it follows that 73.4% of the losses in domestic output of the US economy correspond to “Accommodation and food services” (22.3%), “Education” (11.3%), “Human health” (10.0%), “Transportation and storage” (9.8%), “Real estate services” (9.7%), “Wholesale and retail trade” (8.1%), and “Arts” (6.2%).

It is interesting to note that, using the same framework, [Rodousakis and Soklis \(2021\)](#) concluded that the decline in tourism receipts accounted for 11.8% of the actual recession in the German economy for the year 2020 and for 41.3% of the actual recession in the Spanish economy, while the sectoral decomposition of the output losses found in the current paper are more similar to those of the German than those of the Spanish economy. Thus, we may say that the relative impact of the decrease in tourism receipts in the US economy during the pandemic lies between those of the German and Spanish economies. These findings indicate that any travel restrictions imposed by the US authorities should carefully consider the economic impact of these restrictions. For example, before the pandemic, about one-fifth of the international visitors to the US came from Europe. Thus, the recent measures of the US government to lift travel restrictions from a number of countries while limiting the spread of COVID-19 will have a significant positive impact on the recovery of the economy.

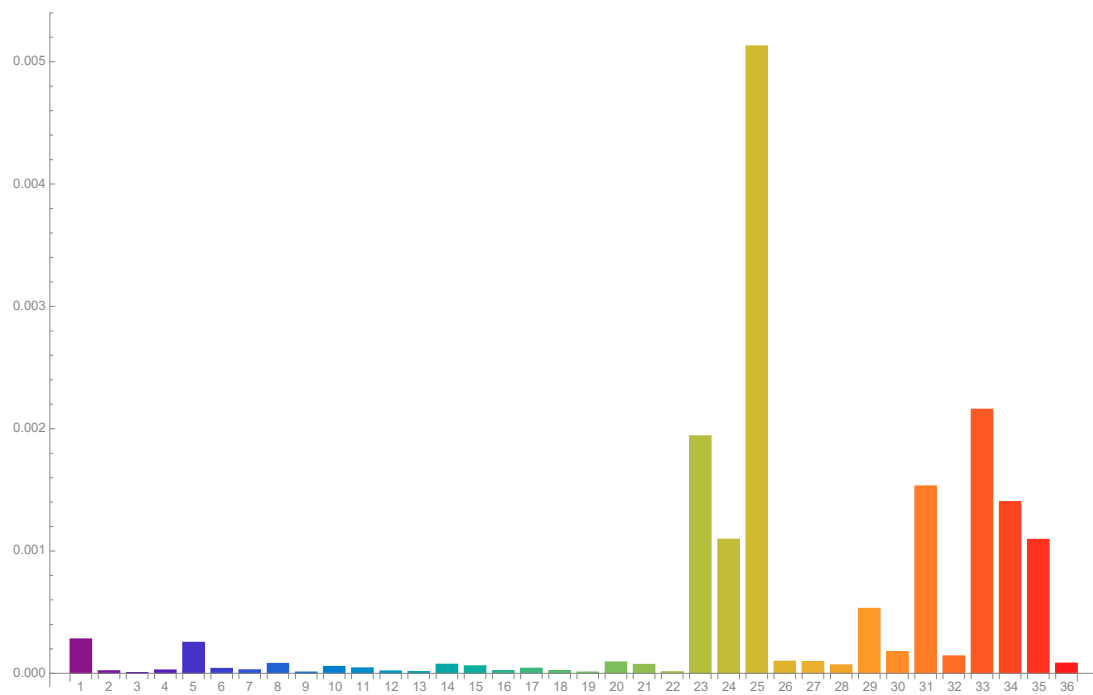


Figure 3. Sectoral decomposition of the tourism employment multiplier, US 2015.

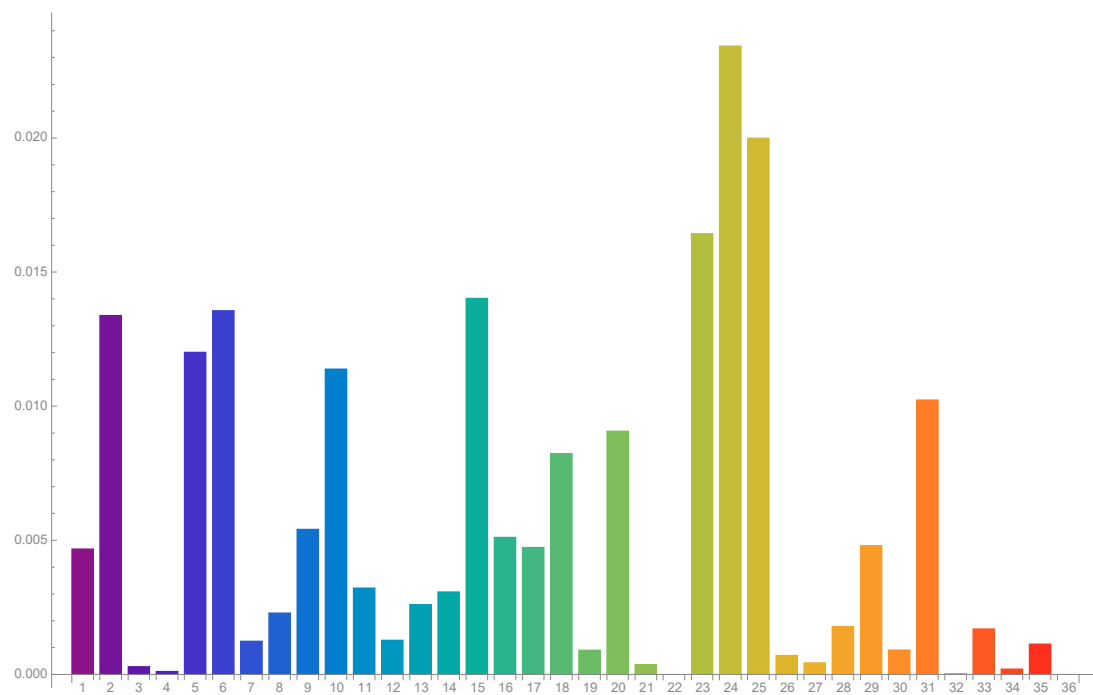


Figure 4. Sectoral decomposition of the tourism import multiplier, US 2015.

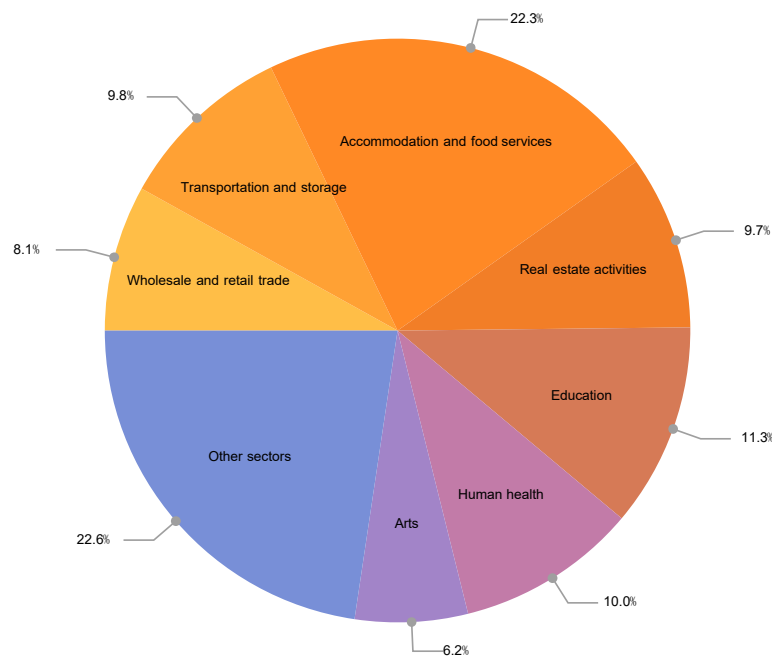


Figure 5. Sectoral decomposition (%) of the output losses in the US economy, 2015.

4. Concluding Remarks

Using an input-output model and data from OECD's input-output database, this article explored the multiplier effects on domestic product, employment, and the external sector of the US economy due to the decline of tourism activities during the pandemic. It was estimated that each USD million decrease in tourism receipts caused a direct and indirect decrease in domestic product of about USD 1.53 million, a decrease in the level of employment of about 16.86 persons, and a decrease in imports of about USD 0.20 million. These multiplier effects indicate that the tourism sector constitutes one of the key sectors of the US economy, while its sectoral decomposition reveals that the most affected activities belong to service sector and, more specifically, to the sectors "Accommodation and food services", "Education", "Human health", "Transportation and storage", "Real estate services", "Wholesale and retail trade", and "Arts". Moreover, it was estimated that the decline in travel receipts accounts for about one-fourth of the actual recession in the US economy for the year 2020. Thus, even for a technological advanced economy such as that of the US, the significance of tourism activities for the economic system cannot be underestimated.

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Conflicts of Interest: The authors declare no conflict of interest.

Notes

- ¹ After the longest recovery in its history, which started in June 2009, the US economy fell into recession in February 2020. For a detailed analysis of the developments of the US economy, see Papadimitriou et al. (2021).
- ² For a detailed exposition, see, e.g., Mariolis et al. (2021); Rodousakis and Soklis (2021). For corresponding applications in a joint production framework, see Mariolis and Soklis (2018); Mariolis et al. (2018, 2020).
- ³ This data is given by “Direct purchases by non-residents (exports)”, which is included in the IOTs of the OECD’s database.
- ⁴ The analytical results are available on request from the authors. The variables necessary for the empirical analysis were constructed using information from IOTs and following the standard procedure in the relevant literature (see, e.g., Mariolis et al. 2018, Appendix 1).
- ⁵ The average multipliers correspond to the changes on the money values of net output and imports, and on employment (measured in persons), respectively, induced by a simultaneous increase of $\frac{1}{36}$ units in the autonomous demand for the product of each of the 36 sectors.
- ⁶ The data are obtained from <https://stats.oecd.org> (accessed on 30 September 2021).

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