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The price elasticity of external demand: how does Portugal compare with other euro area countries?*

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Abstract

This paper estimates the price elasticity of external demand of Portuguese exports in the period 1995-2009 and compares it with those of other euro area countries. This proxy of the export price elasticity is computed as a weighted average of the import demand elasticities in each individual country-product destination market, using the elasticities of substitution across imported varieties of Broda et al. (2006). Overall, Portugal tends to export to individual markets which have, on average, a lower price elasticity than the markets where other euro area countries export to. Therefore, the product and geographical composition of Portuguese exports reduces their exposure to relative price fluctuations.

Keywords: Imports, Exports, Trade elasticities
JEL Codes: F12, F14

1 Introduction

Trade elasticities are important parameters in international economics that have been extensively studied for several decades. At present, the empirical literature provides a wide range of estimates for trade elasticities with different methodologies and at different data breakdown levels. The price elasticity of demand for exports measures the change in a country's exports with respect to changes in the price of exported goods relative to the prices of competing goods in destination markets. This paper computes a proxy of the price elasticity of exports as a weighted average of import demand elasticities using detailed trade data from 1995 to 2009 for Portugal and other euro area countries.

*The authors thank João Amador, João Sousa and José Ferreira Machado for their comments and suggestions. The opinions expressed in the paper are those of the authors and do not necessarily coincide with those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors. Address: Banco de Portugal, Economics and Research Department, R. Francisco Ribeiro 2, 1150-165 Lisboa - Portugal. E-mails: scabral@bportugal.pt and mcvmanteu@bportugal.pt

The starting point is to measure the price elasticity of external demand of Portuguese exports in a sample of individual destination markets, which are defined as product-country pairs. The basic assumption is that, for each importing country and each product, imports supplied by different countries are different varieties of the product, as in Armington (1969)'s formulation of product differentiation by country. Under certain conditions, the price elasticity of demand facing all the exporters of a given product in each importing country is given by the willingness of consumers in the importing country to substitute among foreign products, that is, the elasticity of substitution among imported varieties. A measure of the elasticity of a country's external demand can be obtained by taking the weighted average of these import demand elasticities across individual export destination markets.

The estimates of the import demand elasticities are obtained from Broda et al. (2006), who report elasticities of substitution for a sample of 73 countries estimated using the methodology originally proposed by Feenstra (1994) and extended by Broda and Weinstein (2006). In each importing country, these elasticities of substitution are the same for all countries exporting a given good and are also assumed constant over time. Therefore, the differences among countries in terms of the price elasticities of external demand are totally determined by the product and geographical structure of their exports. This feature allows us to analyse to what extent the product and geographical composition of Portuguese exports exposes them to a relatively more/less elastic demand than other euro area countries.

This paper is related to other studies examining the specialisation of Portuguese exports, namely the impact of the product and geographical structure on total changes of export shares.[1] Over the last decades, the relative product composition and the geographical distribution of Portuguese exports had a negative impact in the evolution of total market shares in world exports, as Portugal is relatively more specialised in individual markets than tended to grow below average. However, the main part of the unfavourable trend in total Portuguese market shares since mid-nineties resulted from effective losses of export share in individual markets, pointing to a deterioration of Portuguese external competitiveness. In a context of increased competition in international markets, a more elastic external demand would lead to a more negative impact of increases in relative export prices in real export growth.

The paper is organized as follows. Section 2 briefly presents the methodology and describes the database used. Section 3 starts by comparing the price elasticities of external demand of Portugal with those estimated for other euro area countries. The remaining of the section details the results along the product and geographical dimensions, comparing Portugal with Spain, Greece and Ireland in the 1995-2009 period. Section 4 presents some concluding remarks.

[1] Assessments of the effects of the product and geographical specialisation of Portuguese exports, using a constant market share analysis, can be found, for instance, in Cabral and Esteves (2006) and Amador and Cabral (2008). For a comprehensive analysis of complementary dimensions of Portuguese international trade, see Amador et al. (2009).

2 Methodology and data

In our framework, the response of the external demand of a country's exports to changes in relative prices depends on the willingness of consumers in importing countries to substitute among foreign goods. We start by defining that a specific good produced and exported by a particular country is a "variety". This is the standard definition of variety applied in several international trade papers, using Armington (1969)'s formulation of product differentiation by country. To give a concrete example, a good constitutes a particular product, e.g., clothing, while a variety constitutes a given good produced by a specific country, e.g., Portuguese clothing or Italian clothing. As is often the case, the choice of this definition of variety was determined by the availability of information. As discussed in Broda and Weinstein (2006), there are several definitions of variety in different theoretical and empirical frameworks, for instance, a brand produced by a firm, the output of a firm or the output of a country. Both Feenstra (1994) and Broda and Weinstein (2006) provide a discussion of the pitfalls of assuming an Armington-type definition of variety, but end up measuring varieties by import source due to data limitations.

The next step is to describe the preferences of consumers in importing countries. As in Broda and Weinstein (2006), consumers have a "taste for variety" in the sense that they prefer to consume a diversified bundle of varieties of the imported good. The utility function of the representative consumer in country j has three levels and the bottom level is represented by a Dixit-Stiglitz constant elasticity of substitution (DS-CES) utility function over varieties of the imported good i. The three-level utility function of the representative consumer in importing country j first aggregates imported varieties into imported goods, then aggregates these imported goods into a composite imported good and finally combines this imported good with a composite domestic good to generate utility (see Broda and Weinstein (2006) for details).

One advantage of the DS-CES framework is that it allows a close mapping between the preference parameters of consumers in the importing country and trade elasticities. The elasticity of substitution among imported varieties of good i by country j, σ_{ij}, is interpreted as the price elasticity of demand for a good i exported by any origin country to destination country j. The elasticity of substitution is equal to the price elasticity of demand if we assume a sufficiently large number of varieties so that the price of a single variety has no effect on the aggregated price index of the good. Using our example, if σ is the elasticity of substitution between Portuguese and Italian clothing for French consumers, then σ is also the price elasticity met by Portuguese and Italian clothing producers exporting to France.

The domestic production of good i in country j is not considered as a competing variety, so σ_{ij} only captures the substitutability between imported varieties of good i. The substitutability between foreign and domestic products is only allowed at a more aggregate rather than

good-specific level. This assumption is very useful empirically because, while trade data at a highly disaggregated level is available for many countries, detailed and comparable data on domestic production is still very scarce.

The elasticity of substitution between imported varieties reflects the degree of differentiation among them. When σ_{ij} is low, consumers in country j sees the imported varieties of good i as imperfect substitutes, that is, as differentiated varieties that are to some extent substitutable, based on actual physical product differences or other characteristics such as purchasing convenience, after-sales service or even consumers' perceptions of inherent unobservable quality. In contrast, when σ_{ij} is high, varieties of a particular good are assessed as more alike and consumers will easily substitute one for another when relative prices change.

For each importing country j, the import price elasticity results from the aggregation of σ_{ij} across goods. Likewise, the price elasticity of external demand directed to a country's exports can be obtained as a weighted average of σ_{ij}, but aggregated both across goods and destination markets. More precisely, the elasticity of the external demand faced by Portuguese producers in period t can be obtained as a weighted average of the elasticities of import demand in each individual product-country destination market, that is,:

$$\eta^t = \sum_i \sum_j \theta_{ij}^t \sigma_{ij}, \tag{1}$$

where σ_{ij} is the elasticity of substitution between imported varieties of good i in importing country j, assumed to be constant over time, and $\theta_{ij}^t = \dfrac{X_{ij}^t}{\sum_i \sum_j X_{ij}^t}$ is the share of exports of product i to destination country j in total Portuguese exports in period t.

In our analysis, the product and geographical dimensions of the external demand elasticity will be examined separately. The contribute of each sector k to this price elasticity in period t can be computed as:

$$\eta_k^t = \sum_{i \in K} \sum_j \frac{X_{ij}^t}{\sum_i \sum_j X_{ij}^t} \sigma_{ij} = \sum_{i \in K} \sum_j \left(\frac{X_k^t}{\sum_i \sum_j X_{ij}^t} \right) \left(\frac{X_{ij}^t}{X_k^t} \sigma_{ij} \right) = \theta_k^t \sigma_k^t, \tag{2}$$

where K is the set of all i goods of sector k, $X_k^t = \sum_{i \in K} \sum_j X_{ij}^t$ are total exports of sector k in period t, θ_k^t is the share of exports of sector k in total exports in period t, σ_k^t is the elasticity of import demand of sector k in period t and $\eta^t = \sum_k \eta_k^t$.

The contribute of each country of destination c to the external demand price elasticity in

period t can be computed as:

$$\eta_c^t = \sum_i \frac{X_{ic}^t}{\sum_i \sum_j X_{ij}^t} \sigma_{ic} = \sum_i \left(\frac{X_c^t}{\sum_i \sum_j X_{ij}^t} \right) \left(\frac{X_{ic}^t}{X_c^t} \sigma_{ic} \right) = \theta_c^t \sigma_c^t, \tag{3}$$

where X_{ic}^t are exports of product i to destination country c in period t, $X_c^t = \sum_i X_{ic}^t$ are total exports to country c in period t, θ_c^t is the share of exports to country c in total exports in period t, σ_c^t is the elasticity of import demand of country c in period t and $\eta^t = \sum_c \eta_c^t$.

The price elasticity of import demand σ_{ij} is assumed constant across all exporting countries. Thus, all exporters competing in a given individual market (product/geographical) face the same elasticity of demand by assumption. Carrying on with our example, the elasticity of substitution between Portuguese and Italian clothing in the French market is the same as the elasticity of substitution between Chinese and Portuguese clothing or Chinese and Italian clothing in the French market. This assumption is a drawback given the large differences found in unit values across origin countries, even with highly detailed product data (see Schott (2004)). These differences in import unit values point to differences in pricing power across exporters that can derive from differences in quality of the goods or any other non-price competitiveness factors, which are not captured by our framework. As a result, differences in the estimated elasticities of external demand across countries result only from differences in their sectoral and geographical specialisation of exports, a composition effect. Therefore, our analysis can not be used to state that Portuguese exports face a more or less elastic demand due to their own intrinsic characteristics.

Felettigh and Federico (2010) applied the same methodology to Italy, France, Germany and Spain in the period 1994-2008 and Imbs and Méjean (2010) obtained estimates of the price elasticities of external demand for around 30 countries in the period 1995-2004 using a similar approach.

The international trade data used in this paper comes from the BACI - CEPII database, which provides reconciled bilateral values (in US dollars) and quantities at the 6-digit of the 1992 Harmonized System (HS) classification, including over 5000 products and 200 trading partners in each year.[2] The sample period starts in 1995 and ends in 2009. We make all computations at the HS 3-digit level in bilateral terms. For the sectoral analysis described above, we use a breakdown based on the sections of the HS, defined at the 2-digit level, which includes 18 sectors.

We obtain estimates for the elasticity of substitution from Broda et al. (2006) who report the import demand elasticities at the 3-digit HS level (171 products) for a sample of 73 countries estimated according to the methodology originally proposed by Feenstra (1994)

[2] See Gaulier and Zignago (2010) for a detailed description of this database.

and extended by Broda and Weinstein (2006). The set of 73 countries includes most of the main trading countries in the world. However, countries like Belgium, Russia, Singapore and Taiwan are excluded, which, especially in the first two cases, can limit the coverage of the sample for some euro area countries. The use of these elasticities has also other caveats. These elasticities are assumed constant at the level estimated using import data from 1994 to 2003, not considering changes in the differentiation of goods over time. Broda and Weinstein (2006) report a slight decrease in the median elasticities of substitution from the 1972-1988 period to the 1990-2001 period, indicating that goods imported by the USA have become more differentiated. In our case, this shortcoming could be limited by the shorter time-span of the analysis.

Some import demand elasticities estimated by Broda et al. (2006) have extremely high values signalling that varieties of a given good are undifferentiated. Even taking into account that the theoretical price elasticity with perfect substitutability is infinite, these few extremely high values are clear outliers and have no significant economic interpretation, since differences in the values of the elasticities above a certain level are not meaningful in economic terms (see Felettigh and Federico (2010) and Mohler (2009) for a discussion). However, these abnormally high import elasticities have a large impact on the elasticity of external demand of some countries. We choose to drop all import demand elasticities above 500 from the analysis, eliminating 7 individual markets of the 11293 available in Broda et al. (2006).[3]

In the end, the individual markets selected represent between 70 and 90 per cent of total exports of each euro area country in every year considered. For Portugal, exports in the sample represent more than 80 per cent of total Portuguese exports in each year examined. On the average of the 1995-2009 period, the lower sample coverages are obtained for the Netherlands (73.5 per cent), Greece (75.5 per cent) and France (79 per cent), while Belgium, Portugal and Spain show the highest values (90.6, 86.3, and 85 per cent, respectively).

3 The price elasticity of external demand of Portuguese exports

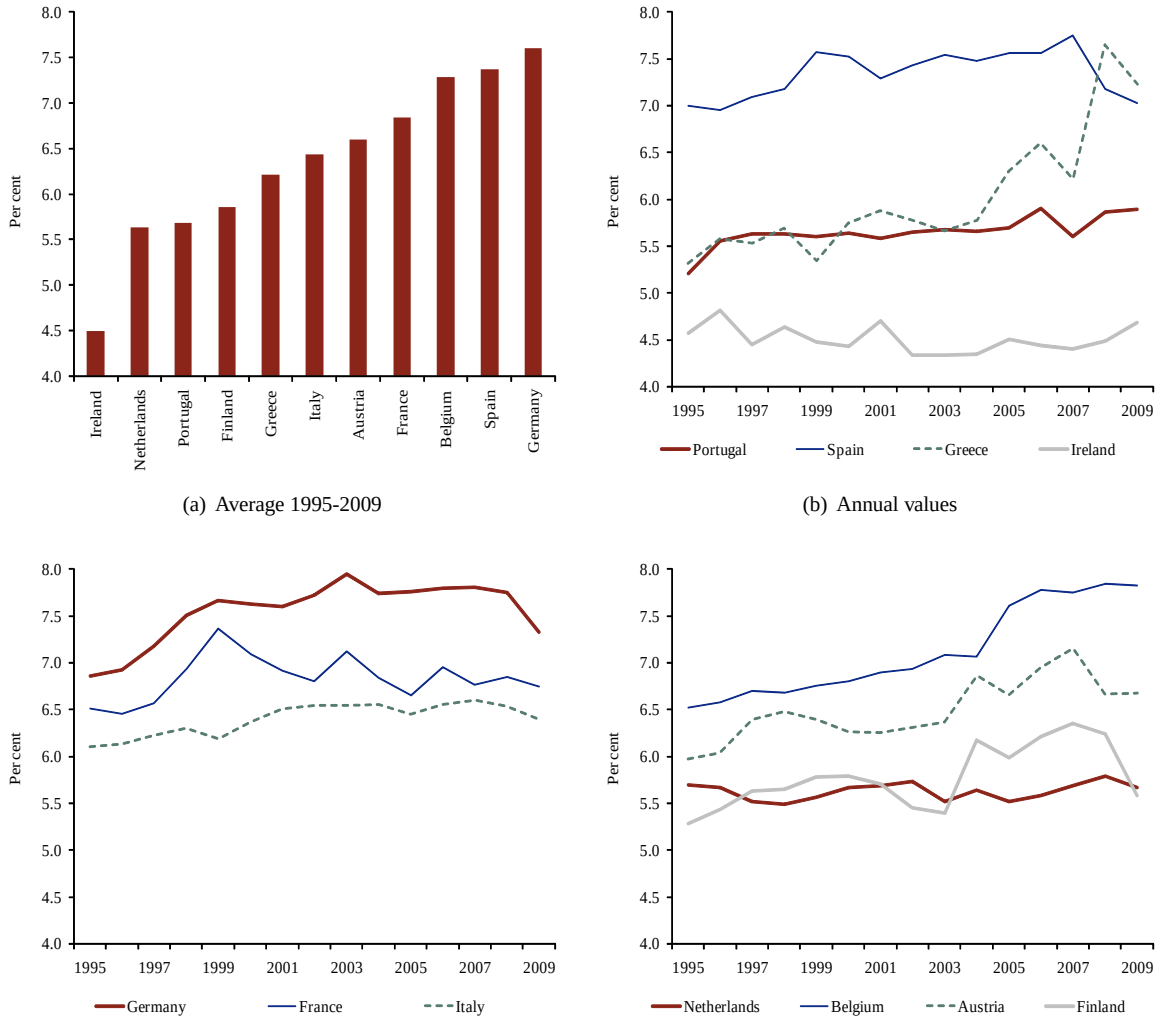
The methodology presented in the previous section was applied to data of the initial euro area countries and Figure 1 displays the results of the estimated price elasticity of external demand of exports in the period 1995-2009.[4] On average, the estimated price elasticity of external demand for Portugal is lower than for most euro area countries, with only the Netherlands and, especially, Ireland displaying smaller elasticities in this period. Ireland clearly stands out by its much lower elasticity of external demand than the other euro area countries considered. Finland also has below-average values, but slightly higher than those estimated for Portugal in this period. The highest external demand elasticity is estimated for

[3] Several additional thresholds were tested and the results remained qualitatively similar.

[4] Belgium and Luxembourg are examined together as the BACI database reports only information for the aggregate of the two countries.

Germany, with Spain and Belgium showing also high elasticities in the period. In France, external demand is also estimated to be more elastic than the average of the other countries examined.

Figure 1: Elasticity of external demand, 1995-2009



(a) Average 1995-2009

(b) Annual values

(c) Annual values

(d) Annual values

Sources: CEPII (BACI) and authors' calculations.

Our external demand elasticities, computed as a weighted average of import demand elasticities estimated from detailed data, are much higher than the export elasticities obtained from aggregated data, which tend to be closer to one. This result is in line with the robust finding from the empirical literature that trade elasticities estimated from aggregated data are lower than those based on disaggregated data (see, for instance, McDaniel and Balistreri (2002) for a discussion). One reason for the comparative higher responsiveness of sectoral exports to relative prices is that estimating the response of aggregate quantities to changes in aggregate prices implies constraining all sectoral elasticities to be the same. As discussed by Imbs and Méjean (2009), this procedure ignores that different goods are not substitutable to the

same extent and thereby creates a pure econometric bias. Imbs and Méjean (2009) estimate aggregate trade elasticities using detailed trade data for the USA both imposing equality across sectors and allowing for sectoral heterogeneity. They find that imposing homogeneity is enough to obtain aggregate estimates in line with conventional macroeconomic estimates even using a detailed dataset, while allowing for heterogeneity results in aggregated parameters that are more than twice as large.

Another reason for the higher estimates obtained with detailed data is related to the fact that studies with disaggregated and aggregated data may in fact be measuring different elasticities. As discussed by Feenstra et al. (2010), with aggregate import data, the price elasticity typically refers to the substitution between domestic goods and imports, which they call the "macro" elasticity. In contrast, with detailed trade data, the elasticity refers to the substitution between similar goods imported from different origin countries, that is, the "micro" elasticity. Feenstra et al. (2010) use a framework allowing the identification of both types of elasticities separately using a disaggregated dataset. They show empirically that the micro elasticities tend to have a large variation across products, with an average/median that takes higher values than the macro elasticities, which are not significantly different from the unity.

Strong conclusions on the evolution over time of the estimated elasticities are not possible with our results as the dynamics only emerge due to the varying composition of exports, since the underlying import demand elasticities (σ_{ij} in equation 1) are assume to be time-invariant. Therefore, we will not devote much attention analysing these dynamics, but, if anything, there seems to be some increase in the external demand elasticities from 1995 to 2009. This result just means that, on average in this sample, the share in total exports of the individual destination markets with higher import price elasticities increased in this period.

The next subsections analyse in more detail the elasticity of external demand of Portuguese exports over the 1995-2009 period, identifying the sectors and countries that contributed more to the results. A comparative analysis of the results for Portugal and three benchmark countries (Spain, Greece and Ireland) is included. Throughout the nineties, these four countries were commonly designated the "Cohesion countries", as per capita income stood clearly below the European Union average.[5] Moreover, in this case, the benchmark countries comprise the country with the lowest elasticity of external demand (Ireland) and one of the highest elasticity countries (Spain). Additional comments on the estimated elasticities of external demand of other euro area countries are included whenever relevant.

[5]The Cohesion Fund, which started in 1994, is a structural instrument that helps European Union (EU) Member States to reduce economic and social disparities and to stabilize their economies. Eligible Member States of the Union are those whose gross national product (GNP) per capita is below 90 per cent of the EU-average. Four Member States, Spain, Greece, Portugal and Ireland, were eligible under the Cohesion Fund until the end of 2003. The European Commission's mid-term review of 2003 deemed Ireland (GNP equal to 101 per cent of EU average) as ineligible under the Cohesion Fund as of 1 January 2004.

3.1 Product breakdown

This section identifies the individual sectors that contributed more to the estimated price elasticity of external demand directed to Portugal using a breakdown based on the sections of the HS, defined at the 2-digit level, which includes 18 sectors. Table 1 reports the sectoral breakdown of the average elasticities of external demand for Portugal, Spain, Greece and Ireland in the period 1995-2009 as described in equation 2. The complete set of results for all euro area countries examined is included in Appendix A. The first block of columns in Table 1 includes the elasticity of import demand of each sector, the second shows the share of exports of each sector in total exports of each country, and finally the last block of columns displays the contribute of each sector to the total external demand elasticity. To facilitate the analysis, the top 3 values of each column are highlighted in Table 1. In general, the different sectoral contributes to the external demand elasticities of these countries reflect mainly cross-country differences in terms of export specialisation since the import elasticities are relatively similar.[6] The fact that differences in specialisation patterns explain most of the cross-country variation in external demand elasticities is also reported by Imbs and Méjean (2010) and Felettigh and Federico (2010).

Table 1: Sectoral breakdown of the elasticity of external demand, average 1995-2009

		Import elasticity				**Export share**				**Contribute**			
HS codes	Description	PRT	ESP	GRC	IRL	PRT	ESP	GRC	IRL	PRT	ESP	GRC	IRL
1-5	Live animals and animal products	4.9	8.4	6.3	6.3	2.1	3.2	4.6	4.6	0.1	0.3	0.3	0.3
6-15	Vegetable products; Fats, oils and waxes	3.6	4.3	4.8	3.5	1.9	8.3	10.4	0.5	0.1	0.4	0.5	0.0
16-24	Foodstuffs, beverages and tobacco	5.4	5.4	7.8	4.4	4.6	4.7	10.7	6.1	0.3	0.3	0.8	0.3
25-27	Mineral products	5.4	7.1	4.6	3.8	4.2	3.3	10.0	0.9	0.2	0.2	0.5	0.0
28-38	Chemicals and allied industries	3.9	5.0	5.7	4.5	4.6	10.1	9.3	44.6	0.2	0.5	0.5	2.0
39-40	Plastics and rubber	3.8	4.7	5.0	3.4	4.5	5.5	4.3	1.2	0.2	0.3	0.2	0.0
41-43	Raw hides, skins, leather and furs	7.8	6.9	5.6	5.4	0.4	0.9	1.3	0.2	0.0	0.1	0.1	0.0
44-46	Wood, cork and straw	4.0	4.3	3.8	2.8	4.6	0.8	0.4	0.4	0.2	0.0	0.0	0.0
47-49	Pulp, paper and paperboard	5.3	4.6	4.4	3.6	5.2	2.9	1.4	0.6	0.3	0.1	0.1	0.0
50-59	Textiles and textile fibres	5.5	5.7	5.5	4.5	3.4	2.1	5.8	0.6	0.2	0.1	0.3	0.0
60-63	Apparel and clothing accessories	3.3	3.7	4.3	3.3	13.5	2.2	10.2	0.5	0.4	0.1	0.4	0.0
64-67	Footwear and headgear	5.1	4.1	5.4	3.9	5.9	1.4	0.3	0.1	0.3	0.1	0.0	0.0
68-71	Stones, plaster, ceramic, glass and glassware	3.6	4.7	10.5	6.5	4.0	3.2	1.7	0.8	0.1	0.1	0.2	0.1
72-83	Base metals	4.4	5.0	5.1	3.9	6.2	8.9	15.8	1.3	0.3	0.4	0.8	0.0
84-85	Machinery and electrical equipment	4.3	5.1	5.2	3.9	18.8	16.4	9.1	29.0	0.8	0.8	0.5	1.1
86-89	Transport equipment	14.7	14.9	32.5	18.1	12.8	22.9	2.8	1.1	1.9	3.4	0.9	0.2
90-92	Optical, precision, medical and musical instr.	6.0	3.9	3.7	4.0	0.9	1.1	1.0	6.7	0.1	0.0	0.0	0.3
93-97	Miscellaneous manufactured articles	3.7	5.3	5.2	4.1	2.4	2.0	1.0	0.7	0.1	0.1	0.1	0.0
	Total excluding transport equipment					87.2	77.1	97.2	98.9	3.8	4.0	5.3	4.3
	Total					100	100	100	100	5.7	7.4	6.2	4.5

Sources: CEPII (BACI) and authors' calculations.
Note: HS refers to the 1992 Harmonized System classification.

[6] For an analysis of the international trade patterns of Portugal and of the other three Cohesion countries, see Amador et al. (2007).

Which sectors have the higher and lower import elasticities? The very high elasticities of substitution of import demand of the sector "Transport equipment" in the four countries, with values clearly above all other sectors, is the main feature standing out in Table 1. This sector also has one of the highest elasticities in the other euro area countries considered. Hence, this sector gives a major contribute to the total external demand elasticities estimated, as it represents also a substantial share of total exports in most euro area countries, excepting Ireland and, to a lesser degree, Greece.[7] In fact, a large part of the difference in total external demand elasticities among euro area countries is driven by this sector. Accounting for this sector, the elasticities of external demand among euro area countries range from 4.5 per cent in Ireland to 7.6 per cent in Germany in this period. Excluding "Transport equipment", the range of total elasticities in the euro area becomes narrower, between 3.8 per cent in Portugal and 5.4 per cent in Belgium.[8] The result that the differences in the elasticities of external demand across countries are mostly due to the sector "Transport equipment" is also reported by Felettigh and Federico (2010), when examining the four larger euro area economies.

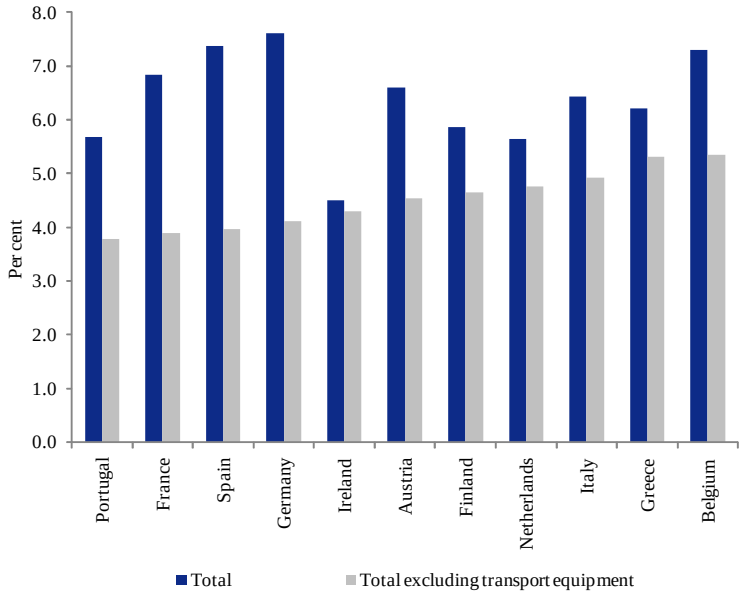
The ranking of the countries according to the estimated external demand elasticities also changes substantially excluding "Transport equipment" (Figure 2). While Portugal remains one of the euro countries with a less elastic external demand, it is now joined by France and Spain, which were in the higher than average elasticity group when the "Transport equipment" sector was included. Excluding "Transport equipment", Germany is also in the below average elasticity group when it had the highest elasticity when this sector was considered. In turn, the Netherlands moves from the group of countries with lower elasticities to the higher than average elasticity group. Italy had an average elasticity of external demand, but has a higher than average elasticity when "Transport equipment" is excluded.

One factor that may account for the extremely high import demand elasticity obtained for the sector "Transport equipment" is the fact that multinational corporations and their foreign direct investment decisions play a strong role in the organization of production of these goods that tend to be produced and traded within global supply chains. In addition, as described in Sturgeon et al. (2009), the global automotive industry has an extremely concentrated firm structure at the top of the value chain with only a few lead firms of worldwide dimension. These global lead firms own the final automobile brands and manage the local, national and regional value chains nested within its global organisational structure. As a result, the country that exports the final good becomes less relevant for the way consumers value additional varieties than the brand itself. For example, Portuguese exports of cars with German brands are perceived by consumers as German cars and, hence, are highly substitutable with German exports of cars produced in Germany. Such a factor may suggest that the elasticity estima-

[7] In our sample, the share of exports of "Transport equipment" in total exports of euro area countries ranges between 1.1 per cent in Ireland and 22.9 per cent in Spain in the 1995-2009 period.

[8] In the 1995-2009 period, the simple average of the external demand elasticities of the euro area countries examined drops from 6.4 to 4.5 per cent when excluding "Transport equipment". The sectoral results for each country are included in Appendix A.

Figure 2: Elasticity of external demand, average 1995-2009



Sources: CEPII (BACI) and authors' calculations.

tions for the sector "Transport equipment" could be biased because product classifications in international trade data do not closely map products as perceived by the consumers. However, our results are similar to those reported by Blonigen and Soderbery (2010), who apply the Broda and Weinstein (2006) methodology to the US automobile market considering two different definitions of variety: one is the usual Armington definition based on trade data at the 10-digit HS level and the other is a "market-based" definition of variety, which corresponds to specific car models. In both cases, the authors obtain relatively high estimates of import demand elasticities (average of around 11 per cent), suggesting that the estimation of elasticities in this sector is not very affected by the definition of variety used.

In Portugal, the sector "Raw hides, skins, leather and furs" has the second highest import elasticity in the period, followed by "Optical, precision, medical and musical instruments". In contrast, the smallest elasticity of import demand is found in "Apparel and clothing accessories", which shows also one of the lowest sectoral elasticities for the other three countries. Low demand elasticities for Portuguese exports are also observed in the sectors "Vegetable products; Fats, oils and waxes" and "Stones, plaster, ceramic, glass and glassware". In contrast, high import elasticities are found in "Stones, plaster, ceramic, glass and glassware" for Greece and Ireland. The large differences in elasticities obtained for this sector among the four countries can be related to the fact that it tends to aggregate very distinct products in each country. High import elasticities are also estimated in "Live animals and animal products" for Spain and Ireland. Some of the lowest import elasticities in this period are found in "Wood, cork and straw" for Ireland and Greece, while the sector "Optical, precision, medical and musical instruments" has small import demand elasticities for Spain and Greece.

As expected, the main contribution to the external demand elasticity of Portugal in the period from 1995 to 2009 comes from the sector "Transport equipment", reflecting both the extremely high import elasticity of this sector and its substantial share in Portuguese exports. The same pattern is evident in Greece and, especially, in Spain, but not in Ireland since this sector represents a very small percentage of total Irish exports. The second main sectoral contribute to the Portuguese elasticity of external demand comes from "Machinery and electrical equipment", reflecting its substantial export share. This sector gives also an important contribute to the external demand elasticities of Ireland and Spain. In the case of Ireland, the major contribute results from "Chemicals and allied industries", which accounts for almost 45 per cent of total Irish exports in this period. The influence of the product composition of exports is also evident in the high contributes of the sectors "Foodstuffs, beverages and tobacco" and "Base metals" in Greece, "Chemicals and allied industries" in Spain, and "Apparel and clothing accessories" in Portugal.

What sectors contribute to the lower elasticity of external demand of Portugal compared to other euro area countries in this period? The result is mainly driven by two sectors: "Apparel and clothing accessories" and "Machinery and electrical equipment". Both sectors account for a significant share of total Portuguese exports (13.5 and 18.8 per cent, on average in the period 1955-2009, respectively) and face relatively low demand elasticities of substitution in their main destination markets. In fact, among euro area countries, comparably low elasticities of "Apparel and clothing accessories" are found only in Ireland and Belgium and only Ireland has a lower elasticity of "Machinery and electrical equipment" than Portugal in this period. Thus, these two sectors drive down the price elasticity of demand directed to Portuguese exports and partly compensate the impact of the high elasticity of "Transport equipment", which represents also a large proportion of Portuguese exports. However, even in "Transport equipment", the demand elasticity in Portuguese export destination markets is, on average, lower than that faced by most euro area exporters. In this period, not only "Apparel and clothing accessories" but also "Textiles and textile fibres" have relatively low demand elasticities for Portugal, both compared with other Portuguese exporting sectors and with the same sectors in other euro area countries. These results suggest that the Portuguese specialisation in these two so-called "traditional" sectors was positive insofar as it contributed to reduce the exposure of total exports to changes in relative prices. However, this specialisation probably also implied more adverse movements in relative prices, as these sectors are among those most affected by the entrance of low price producers from developing countries in international trade.[9]

The high external demand elasticity estimated for Spain results mostly from the sector "Transport equipment", which accounts for a much larger share of Spanish exports than for other euro area countries. In contrast, Ireland not only benefits from a low share of this

[9] For a detailed analysis of the textiles and clothing sectors in Portugal, see Amador and Opromolla (2009).

sector in total exports but also from the very large export shares of the sectors “Chemicals and allied industries” and “Machinery and electrical equipment”, both of which seem to be exposed to relatively inelastic demand in their destination markets.

3.2 Geographical breakdown

Following what was done in the previous section, we now turn to the geographical analysis of the estimated external demand elasticity of Portugal. Table 2 presents the main contributions to the elasticity of external demand of Portugal, as well as the respective import demand elasticity and the export share of each destination country. The corresponding results for the Spain, Greece and Ireland are also included and the top 3 values of each column are highlighted. As in the sectoral breakdown, the cross-country differences in terms of elasticities of external demand are mainly due to the distinct geographical specialisations of these countries. The differences in terms of geographical import demand elasticities are not substantial, even if they are higher than those obtained for the sectoral elasticities.

Which destination countries have the higher and lower import elasticities? The USA have one of the lowest import demand elasticities for these four countries. This result is in line with other works that also found that the USA seem to value variety somewhat more than the average country (see, for instance, Broda et al. (2006) or Felettigh and Federico (2010)). In the case of Portuguese exports, Denmark and Brazil also have relatively low demand elasticities. Low import demand elasticities are also observed in the UK for Greece and Ireland and in Finland for Spain and Greece. In contrast, some of the highest demand elasticities for these four countries are found in Romania. Very high import elasticities are also found in Hungary for exports of Portugal and Spain, and in Switzerland for Portuguese and Greek exports. Norway has also high demand elasticities for products exported from Spain and Greece.

The main three contributions to the Portuguese external demand elasticity in the period 1995-2009 are given by Spain, Germany and France, reflecting the strong specialisation of Portuguese exports in these markets. For Spain, the three major destination countries (France, Germany and the UK) also contribute the most to the average elasticity of external demand in this period. The same occurs in Ireland with Germany, the UK and the USA contributing the most. In the case of Greece, the two main export destinations, Germany and Italy, give the higher contributes but there is also an important contribution from Romania, a country with extremely high demand elasticities for all countries considered but that represents a higher share of Greek exports. Among the main destinations, the fact that the USA market has one of the lowest import elasticities is specially relevant for Ireland, given its importance in total Irish exports.

What geographical markets contribute to the lower elasticity of external demand of Portugal

compared to other euro area countries in this period? The result is mainly driven by three destination countries: Spain, France and the USA. Spain is the most important destination of Portuguese exports, but France and, to a lesser extent, the USA also represent an important proportion of total exports. These three geographical destinations have relatively low elasticities of substitution for Portuguese exporters. Ireland, which shows the lowest elasticity of external demand in the euro area, also strongly benefits from its specialisation in some destination markets in which Irish exporters face relatively inelastic demands, namely the USA and the UK. In contrast, the relatively high elasticity of external demand estimated for Spain in this period reflects mostly its specialisation in the French market, where Spanish producers face a large import demand elasticity. In addition, two smaller destination markets, Hungary and Norway, also have very large demand elasticities for Spanish exporters.

Table 2: Geographical breakdown of the elasticity of external demand, average 1995-2009

	Import elasticity				**Export share**				**Contribute**			
	PRT	ESP	GRC	IRL	PRT	ESP	GRC	IRL	PRT	ESP	GRC	IRL
Portugal	-	6.6	4.5	4.7	-	10.7	0.8	0.5	-	0.7	0.0	0.0
Spain	4.7	-	3.6	4.1	24.5	-	4.4	3.9	1.2	-	0.2	0.2
Greece	4.2	7.4	-	3.2	0.5	1.3	-	0.5	0.0	0.1	-	0.0
Ireland	8.3	7.1	8.1	-	0.7	0.7	0.5	-	0.1	0.0	0.0	-
Germany	6.6	7.1	4.2	5.4	16.9	13.5	16.2	11.7	1.1	1.0	0.7	0.6
France	5.2	7.9	8.1	6.8	14.1	21.3	5.7	8.0	0.7	1.7	0.5	0.5
UK	5.1	7.5	3.0	3.2	10.6	10.0	7.9	19.4	0.5	0.7	0.2	0.6
Netherlands	6.2	6.6	7.2	3.7	4.2	3.8	3.2	4.3	0.3	0.3	0.2	0.2
Italy	5.9	5.6	4.5	5.5	4.2	7.5	14.8	4.6	0.2	0.4	0.7	0.3
USA	3.2	3.4	3.2	2.5	6.4	5.1	6.4	23.2	0.2	0.2	0.2	0.6
Switzerland	13.6	6.8	31.0	9.5	1.3	1.7	1.5	3.5	0.2	0.1	0.5	0.3
Sweden	9.6	8.4	9.2	8.4	1.6	1.1	1.4	1.6	0.2	0.1	0.1	0.1
Hungary	25.8	44.7	7.1	5.7	0.5	0.5	0.7	0.3	0.1	0.2	0.0	0.0
Canada	10.3	11.9	10.9	11.1	0.8	0.6	0.8	1.4	0.1	0.1	0.1	0.2
Norway	8.9	31.1	19.1	4.1	0.9	0.7	0.6	0.8	0.1	0.2	0.1	0.0
Austria	5.3	5.5	4.9	5.0	1.5	1.1	1.4	0.6	0.1	0.1	0.1	0.0
Romania	19.8	18.5	13.4	18.3	0.3	0.4	4.0	0.2	0.1	0.1	0.5	0.0
Poland	6.7	7.4	7.7	5.5	0.8	1.3	1.6	0.6	0.1	0.1	0.1	0.0
Denmark	3.7	5.7	3.9	5.0	1.4	0.8	1.1	0.9	0.1	0.0	0.0	0.0
Turkey	5.9	7.6	6.3	9.9	0.7	1.8	5.2	0.7	0.0	0.1	0.3	0.1
Finland	4.7	4.3	2.5	3.6	0.8	0.5	1.0	0.6	0.0	0.0	0.0	0.0
Brazil	3.8	14.1	4.6	5.5	0.9	1.1	0.4	0.4	0.0	0.2	0.0	0.0
Total of countries included					93.5	85.5	79.4	87.8	5.3	6.4	4.7	3.9
Total					100	100	100	100	5.7	7.4	6.2	4.5

Sources: CEPII (BACI) and authors' calculations.

4 Conclusions

This paper estimates the price elasticity of the external demand of Portuguese exports in the period 1995-2009 and confronts it with developments in other euro area countries, in particular in the other initial Cohesion countries (Spain, Greece and Ireland). This elasticity is obtained as a weighted average of the import demand elasticities in each individual country-product destination market. The import demand elasticities used in this paper are those of Broda et al. (2006), who report elasticities of substitution for a sample of 73 countries, estimated using the methodology originally proposed by Feenstra (1994) and extended by Broda and Weinstein (2006).

For all euro area countries considered, our estimates based on detailed trade data point to relatively high elasticities of external demand, which suggest important effects on real export growth of changes in relative export prices. However, on average, the elasticity estimated for Portugal is lower than in most euro area countries over this period, implying that Portuguese exports are relatively less vulnerable to increases in relative prices. Conversely, a less elastic external demand will also hinder the positive response of exports to improvements in relative export prices. Ireland stands out by its much lower elasticity of external demand, while Spain is among the countries with higher external demand elasticities.

Given the methodology used, the product and geographical specialisation of exports explain all the difference among countries in terms of external demand elasticities, since all countries face the same elasticity of substitution in each product/country destination market. Therefore, the relatively low elasticity obtained for Portugal only indicates that Portuguese exports are relatively more specialised in individual markets (product-country) that have, on average, a lower price elasticity of demand for imports. In sectoral terms, this result is mainly driven by two sectors: "Apparel and clothing accessories" and "Machinery and electrical equipment". These sectors account for a large share of total Portuguese exports and Portuguese exporters face relatively low elasticities of substitution compared to other euro area countries. The idea that the strong specialisation of Portuguese exports in "Apparel and clothing accessories" constitutes an additional challenge, because it implies a deeper exposure to the increasing competition from emerging countries, must be balanced against our results showing that demand in this sector is less sensitive to adverse changes in relative prices. Even in the sector "Transport equipment", which is characterized by the highest import demand elasticities for all euro area countries, the demand elasticity in Portuguese export destination markets is, on average, lower than that faced by other euro area exporters. Regarding geographical markets, the lower elasticity of external demand of Portugal compared to other euro area countries in this period results mostly from three destination countries: Spain, France and the USA. Portugal benefits from its specialisation in these markets that have relatively inelastic demands for Portuguese exports.

Our results indicate that the sectoral and geographical specialisation of Portuguese exports does not expose them to markets with a more elastic demand compared with other euro area countries. This finding, subject to the limitations inherent to the applied framework, suggests that the losses of market share of Portuguese exports in the last decade do not result from a more elastic external demand but reflect the observed deterioration in relative price and cost competitiveness indicators in a context of increased competition in world trade.

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Appendix

A Sectoral breakdown of the elasticity of external demand

Table A.1: Elasticity of import demand of each sector, per cent, average 1995-2009

HS codes	Description	PRT	ESP	GRC	IRL	DEU	FRA	ITA	NLD	BEL	FIN	AUT
1-5	Live animals and animal products	4.9	8.4	6.3	6.3	5.4	7.0	6.0	6.5	4.8	7.7	6.2
6-15	Vegetable products; Fats, oils and waxes	3.6	4.3	4.8	3.5	5.0	4.3	4.1	4.2	4.7	5.0	4.3
16-24	Foodstuffs, beverages and tobacco	5.4	5.4	7.8	4.4	6.4	5.1	5.1	5.5	6.3	8.1	4.9
25-27	Mineral products	5.4	7.1	4.6	3.8	10.6	5.5	6.6	7.0	15.7	5.8	6.4
28-38	Chemicals and allied industries	3.9	5.0	5.7	4.5	4.8	4.6	5.0	4.5	4.9	4.6	5.4
39-40	Plastics and rubber	3.8	4.7	5.0	3.4	4.6	4.9	4.4	5.1	5.1	4.5	4.9
41-43	Raw hides, skins, leather and furs	7.8	6.9	5.6	5.4	7.0	4.2	14.8	9.3	4.4	10.8	14.2
44-46	Wood, cork and straw	4.0	4.3	3.8	2.8	4.3	3.9	3.9	3.2	3.9	3.4	3.7
47-49	Pulp, paper and paperboard	5.3	4.6	4.4	3.6	4.3	3.9	4.3	4.0	4.3	4.2	4.3
50-59	Textiles and textile fibres	5.5	5.7	5.5	4.5	6.7	7.0	7.9	5.1	4.9	4.8	6.3
60-63	Apparel and clothing accessories	3.3	3.7	4.3	3.3	3.8	4.4	4.2	3.6	3.2	4.5	4.1
64-67	Footwear and headgear	5.1	4.1	5.4	3.9	4.6	5.9	4.7	6.1	4.7	4.2	5.5
68-71	Stones, plaster, ceramic, glass and glassware	3.6	4.7	10.5	6.5	8.4	7.2	9.0	5.2	9.0	5.7	5.9
72-83	Base metals	4.4	5.0	5.1	3.9	5.3	4.8	4.9	5.3	5.6	5.1	5.2
84-85	Machinery and electrical equipment	4.3	5.1	5.2	3.9	4.9	4.6	5.2	4.5	4.7	5.5	5.1
86-89	Transport equipment	14.7	14.9	32.5	18.1	17.7	15.0	14.3	16.5	14.5	18.0	18.0
90-92	Optical, precision, medical and musical instr.	6.0	3.9	3.7	4.0	3.8	4.1	4.2	4.9	4.1	3.8	4.6
93-97	Miscellaneous manufactured articles	3.7	5.3	5.2	4.1	4.1	4.0	3.7	4.4	4.4	4.6	4.1

Table A.2: Share of each sector in total exports, per cent, average 1995-2009

HS codes	Description	PRT	ESP	GRC	IRL	DEU	FRA	ITA	NLD	BEL	FIN	AUT
1-5	Live animals and animal products	2.1	3.2	4.6	4.6	1.6	3.1	1.1	5.5	2.5	0.6	1.7
6-15	Vegetable products; Fats, oils and waxes	1.9	8.3	10.4	0.5	1.2	3.2	2.5	7.0	2.7	0.5	0.9
16-24	Foodstuffs, beverages and tobacco	4.6	4.7	10.7	6.1	2.6	5.8	4.1	7.8	4.6	0.7	3.6
25-27	Mineral products	4.2	3.3	10.0	0.9	2.3	3.5	2.7	9.3	7.3	4.7	2.9
28-38	Chemicals and allied industries	4.6	10.1	9.3	44.6	11.3	14.7	8.1	14.0	17.3	4.9	7.5
39-40	Plastics and rubber	4.5	5.5	4.3	1.2	6.1	5.4	5.4	6.5	8.8	3.0	5.0
41-43	Raw hides, skins, leather and furs	0.4	0.9	1.3	0.2	0.3	0.9	2.4	0.4	0.3	0.8	0.6
44-46	Wood, cork and straw	4.6	0.8	0.4	0.4	0.8	0.6	0.5	0.3	0.9	5.8	3.7
47-49	Pulp, paper and paperboard	5.2	2.9	1.4	0.6	2.9	2.4	2.3	2.3	2.4	20.4	5.3
50-59	Textiles and textile fibres	3.4	2.1	5.8	0.6	1.7	1.7	4.3	1.6	2.9	0.6	2.1
60-63	Apparel and clothing accessories	13.5	2.2	10.2	0.5	1.5	1.8	5.3	1.3	1.7	0.4	1.9
64-67	Footwear and headgear	5.9	1.4	0.3	0.1	0.3	0.3	2.7	0.5	0.6	0.1	0.7
68-71	Stones, plaster, ceramic, glass and glassware	4.0	3.2	1.7	0.8	1.9	2.1	4.7	0.9	7.0	1.2	2.9
72-83	Base metals	6.2	8.9	15.8	1.3	8.8	7.7	9.8	6.8	10.9	12.3	13.5
84-85	Machinery and electrical equipment	18.8	16.4	9.1	29.0	30.7	22.5	27.1	24.7	13.6	33.6	30.5
86-89	Transport equipment	12.8	22.9	2.8	1.1	19.8	19.6	10.6	5.3	13.3	6.7	11.5
90-92	Optical, precision, medical and musical instr.	0.9	1.1	1.0	6.7	4.3	3.0	2.3	4.6	1.6	2.6	2.2
93-97	Miscellaneous manufactured articles	2.4	2.0	1.0	0.7	2.0	1.6	4.3	1.2	1.5	1.3	3.5
	Total excluding transport equipment	87.2	77.1	97.2	98.9	80.2	80.4	89.4	94.7	86.7	93.3	88.5
	Total	100	100	100	100	100	100	100	100	100	100	100

Table A.3: Contribute of each sector to the total elasticity of external demand, percentage points, average 1995-2009

HS codes	Description	PRT	ESP	GRC	IRL	DEU	FRA	ITA	NLD	BEL	FIN	AUT
1-5	Live animals and animal products	0.1	0.3	0.3	0.3	0.1	0.2	0.1	0.4	0.1	0.0	0.1
6-15	Vegetable products; Fats, oils and waxes	0.1	0.4	0.5	0.0	0.1	0.1	0.1	0.3	0.1	0.0	0.0
16-24	Foodstuffs, beverages and tobacco	0.3	0.3	0.8	0.3	0.2	0.3	0.2	0.4	0.3	0.1	0.2
25-27	Mineral products	0.2	0.2	0.5	0.0	0.2	0.2	0.2	0.7	1.1	0.3	0.2
28-38	Chemicals and allied industries	0.2	0.5	0.5	2.0	0.5	0.7	0.4	0.6	0.8	0.2	0.4
39-40	Plastics and rubber	0.2	0.3	0.2	0.0	0.3	0.3	0.2	0.3	0.4	0.1	0.2
41-43	Raw hides, skins, leather and furs	0.0	0.1	0.1	0.0	0.0	0.0	0.4	0.0	0.0	0.1	0.1
44-46	Wood, cork and straw	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1
47-49	Pulp, paper and paperboard	0.3	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.9	0.2
50-59	Textiles and textile fibres	0.2	0.1	0.3	0.0	0.1	0.1	0.3	0.1	0.1	0.0	0.1
60-63	Apparel and clothing accessories	0.4	0.1	0.4	0.0	0.1	0.1	0.2	0.0	0.1	0.0	0.1
64-67	Footwear and headgear	0.3	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
68-71	Stones, plaster, ceramic, glass and glassware	0.1	0.1	0.2	0.1	0.2	0.2	0.4	0.0	0.6	0.1	0.2
72-83	Base metals	0.3	0.4	0.8	0.0	0.5	0.4	0.5	0.4	0.6	0.6	0.7
84-85	Machinery and electrical equipment	0.8	0.8	0.5	1.1	1.5	1.0	1.4	1.1	0.6	1.9	1.6
86-89	Transport equipment	1.9	3.4	0.9	0.2	3.5	2.9	1.5	0.9	1.9	1.2	2.1
90-92	Optical, precision, medical and musical instr.	0.1	0.0	0.0	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1
93-97	Miscellaneous manufactured articles	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.1
	Total excluding transport equipment	3.8	4.0	5.3	4.3	4.1	3.9	4.9	4.8	5.4	4.7	4.5
	Total	5.7	7.4	6.2	4.5	7.6	6.8	6.4	5.6	7.3	5.9	6.6

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