



HAL
open science

DO TRANSPORT COSTS HAVE A DIFFERENTIAL EFFECT ON TRADE AT THE SECTORAL LEVEL?

Inmaculada Martínez-Zarzoso, Eva María Perez-Garcia, Celestino Suárez-Burguet

► **To cite this version:**

Inmaculada Martínez-Zarzoso, Eva María Perez-Garcia, Celestino Suárez-Burguet. DO TRANSPORT COSTS HAVE A DIFFERENTIAL EFFECT ON TRADE AT THE SECTORAL LEVEL?. Applied Economics, 2008, 40 (24), pp.3145-3157. 10.1080/00036840600994179 . hal-00582093

HAL Id: hal-00582093

<https://hal.science/hal-00582093>

Submitted on 1 Apr 2011

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



**DO TRANSPORT COSTS HAVE A DIFFERENTIAL EFFECT ON TRADE AT THE
SECTORAL LEVEL?**

| | |
|--------------------|--|
| Journal: | <i>Applied Economics</i> |
| Manuscript ID: | APE-06-0167.R1 |
| Journal Selection: | Applied Economics |
| JEL Code: | F14 - Country and Industry Studies of Trade < F1 - Trade < F - International Economics |
| Keywords: | sectoral exports, transport costs, infrastructure, instrumental variables, Spain |
| | |

DO TRANSPORT COSTS HAVE A DIFFERENTIAL EFFECT ON TRADE AT THE SECTORAL LEVEL?

Authors

MARTÍNEZ-ZARZOSO, Inmaculada[§]
PÉREZ-GARCÍA, Eva María^{**}
SUÁREZ-BURGUET, Celestino^{***}

Institution:

* Instituto de Economía Internacional and Departamento de Economía. Universidad Jaume I. Castellón (Spain) and Ibero American Institute for Economic Research, Goettingen (Germany). martinei@eco.uji.es. Tel: 0044551399770. Fax:0044551399773.

** Instituto de Economía Internacional. Universidad de Valencia. Edificio Dep. Oriental 3-F12. Campus dels Tarongers. 46022 and Fundació valenciaport, Valencia. Spain. Eperez@iei.uv.es. Tel:0034963828440. Fax: 0034963828437.

*** Instituto de Economía Internacional and Departamento de Economía. Universidad Jaume I. Campus del Riu Sec. 12080 Castellón. Spain. celes@eco.uji.es. Tel: 0034964728591. Fax:0034964728590.

ABSTRACT

This paper aims to analyse the determinants of transport costs and to investigate their influence in international trade with a sample of disaggregate trade data. First, we estimate a transport cost function using cross-section data on maritime and overland transport for four sectors: agro-industry, ceramic tiles, motor vehicle parts and accessories, and electrical and mechanical household appliances, obtained from interviews held with Spanish exporters and logistics operators in 2001. Second, we study the relationship between transport costs and trade and estimate the elasticity of trade with respect to transport costs for each sector. Important differences for high and low value-added sectors are observed. The trade equation estimation shows that higher transport costs significantly deter trade, especially in high value-added sectors.

Key words: Exports; transport costs; infrastructure index; sectoral exports; Spain

JEL classification: F14

[§] Address for correspondence: Ibero American Institute for Economic Research, Platz der Goettinger Sieben 3, Goettingen (Germany). E-mail: martinei@eco.uji.es. Tel: 0044551399770. Fax:0044551399773.

DO TRANSPORT COSTS HAVE A DIFFERENTIAL EFFECT ON TRADE AT THE SECTORAL LEVEL?

1. INTRODUCTION

Trade costs play a crucial role in models of international specialization and trade. Several authors have recently provided theoretical evidence supporting this view: Krugman (1991), Deardorf (2001), Henderson et al. (2001), Hummels et al. (2001), Venables and Limao (1999). Since recent liberalization processes have substantially reduced artificial trade costs, such as tariffs and non tariff barriers, nowadays the importance of transport costs in relative terms is considerably higher than in the past decades. In most cases, there is no direct way of observing these transport costs between nations, and therefore indirect measurement and trade modelling must be relied upon in order to assess their relevance. Any accurate attempt to provide direct evidence of transport costs will contribute to the understanding of the determinants of these costs and will shed some light on the magnitude of the barriers that they generate.

In this paper we investigate the determinants of transport costs and study the relationship between trade and transport costs in four Spanish exporting sectors. Our estimation proceeds in two parts. We start with evidence on transport costs and their determinants, and then relate this evidence to estimates of trade volumes. A major contribution of the paper lies on the use of a data set consisting of primary data on shipment freight rates at firm level. The data was directly obtained from interviews held with exporters and logistic operators in the Spanish territory, as opposed to the more common measures taken from national trade data sources, based on "free on board"/"cost, insurance and freight" ratios (Hummels and Lugovsky, 2003). A minor contribution is the construction of a new index to measure the infrastructure of a country, based on information for road

1
2
3 transport. Finally, to our knowledge, only one paper¹ has examined the differential impact
4 of transport costs on sectoral trade using survey data. A few papers used sectoral trade
5 data to estimate the elasticity of trade with respect to transport costs, but they did only
6 calculate an average elasticity for all sectors (Martinez-Zarzoso and Suarez-Burguet,
7 2005) or used secondary data (Hummels, 1999a).

8
9
10 Section 2 presents a literature review. Data and sources are described in Section 3. In
11 Section 4, a transport cost function is estimated by using data on Spanish exports by
12 sector. Section 5 presents and estimates a variant of the standard gravity model of trade.
13 Section 6 comments on the results of the empirical application and concludes.

14 15 16 17 18 19 20 21 22 23 24 25 **2. LITERATURE REVIEW**

26
27 In the recent economic literature there have been several attempts to measure directly or
28 indirectly transport costs. Some authors used cif/fob² ratios as a proxy for shipping costs
29 (Baier and Bergstrand, 2001, Limao and Venables, 2001; Radelet and Sachs, 1998). Since
30 most importing countries report trade flows inclusive of freight and insurance (cif) and
31 exporting countries report trade flows exclusive of freight and insurance (fob), transport
32 costs can be calculated as the difference of both flows for the same aggregate trade.
33 However, Hummels (1999b) showed that importer cif/fob ratios constructed from IMF
34 sources are poor proxies for cross-sectional variation in transport costs and such a
35 variable provides no information about changes over time or across sectors. Oguledo and
36 Mcphee (1994) also doubted the usefulness of cif/fob ratios from IMF sources as a proxy
37 of transportation costs.

38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
Hummels (1999a, 1999b) used data on transport costs from various primary sources
including shipping price indices obtained from shipping trade journals (Appendix 2 in
Hummels, 1999b); air freight prices gathered from survey data; and freight rates (freight

¹ Martínez-Zarzoso et al. (2003) analysed the impact of transport cost on trade in the ceramic sector.

² Cif stands for "cost, insurance and freight"; fob stands for "free on board."

1
2
3 expenditures on imports) collected by customs agencies in United States, New Zealand
4 and five Latin-American countries (Mercosur plus Chile)³. Hummels (1999a) classified
5 the trade costs implied by trade flows into three different categories: explicit measured
6 costs, given by tariffs and freight rates; costs associated with common proxy variables
7 such as distance, sharing a language, sharing a border or being an island, and implied but
8 unmeasured trade costs, given by geographical position, cultural ties or political stability.
9

10 His results indicated that explicit measured costs were the most important component.

11 In addition to cif/fob ratios reported by the IMF, Limao and Venables (2001) used
12 shipping company quotes for the cost of transporting a standard container (40 feet) from
13 Baltimore to sixty-four destinations. The authors pointed out that it is not clear how the
14 experience of Baltimore generalised. Martínez-Zarzoso et al. (2003) used data on
15 transportation costs obtained from interviews with logistic operators in the Spanish
16 ceramic sector. They found import elasticities with respect to transport costs similar in
17 magnitude to those found by Limao and Venables (2001).
18

19 Micco and Perez (2001) used data from the U.S Import Waterborne Databank (U.S.
20 Department of Transportation), where transport cost is defined as "the aggregate cost of
21 all freight, insurance and other charges (excluding U.S. import duties) incurred in
22 bringing the merchandise from the port of exportation to the first port of entry in the
23 U.S.". Sanchez, Hoffmann and Micco (2002) analysed data on maritime transport costs
24 obtained from the International Transport Data Base (BTI). They focused on Latin
25 American trade with NAFTA. Martinez-Zarzoso and Suarez-Burguet (2005) also used
26 cif/fob ratios obtained from the BTI. Data from the BTI for transport costs include all
27 modes and are defined as the expenditure on international freight and insurance. Freight
28 rates are in general inclusive of loading costs. The main difference between these ratios
29 and those reported by the IMF is that the BTI data on imports at cif prices and imports at
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

³ Hummels (1999a).

1
2
3 fob prices are obtained from the same reporting country. Since information is collected
4 using identical methodology, the data are more reliable than the IMF rates. A second
5
6 difference is that the data are disaggregated at 3 digit level SITC. However, the authors
7
8 estimated a single equation for all the sectors and obtained a trade elasticity with respect
9
10 to transport costs of -2.30.
11
12

13 14 15 **3. THE DATA**

16
17 The empirical application of this paper is based on extensive fieldwork based on personal
18 interviews with import/export and logistics managers at export companies (160
19 interviews), and freight forwarding agents (78 interviews)⁴. Four sectors were selected for
20 analysis: agro-industry (wine, cereals, canned food and vegetable oils), ceramic tiles,
21 motor vehicle parts and accessories, and electrical and mechanical household appliances.
22 The selection was made attempting to find sectors with differentiated transport needs⁵. All
23 four selected sectors are among the top 10 exporters, both in terms of weight and exported
24 value, with the exception of household appliances (which only ranks among the top 10
25 exporters in terms of value). Agroindustrial products and ceramic tiles may be considered
26 low value-added commodities –in comparison to motor vehicle parts and household
27 appliances-, these two goods showing a large weight-to-value ratio. On the other hand,
28 motor vehicle parts and household appliances may be seen as high value-added products,
29 while presenting a large volume-to-weight ratio. The particular features of these four
30 commodities will allow an evaluation of the influence of variables such as distance,
31 weight, volume, number of shipments, transit time, among others, on transport costs.
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51

52 Aiming at building a database that would permit the specification and estimation of a
53 transport cost/trade model, 238 interviews were conducted in November 2001 among
54
55
56
57

58 ⁴ See appendix 3 for additional details of how the data were collected and from whom.

59 ⁵ Given the complexity of studying all Spanish export trade flows, the aim of selecting four sectors was to
60 achieve a significant overview of transport cost and trade determinants by researching a representative sample of the Spanish production framework.

1
2
3 transport decision-makers in the following 11 autonomous regions in Spain: Andalucía,
4 Aragón, Cantabria, Castilla La Mancha, Cataluña, Comunidad Valenciana, La Rioja,
5 Madrid, Murcia, Navarra and País Vasco, –which are the most industrialised Spanish
6 regions-. Fieldwork conducted was based on personal interviews with import/export and
7 logistics managers at export companies (160 interviews), and freight forwarding agents
8 (78 interviews). 1,251 observations were compiled as a result of these 238 interviews, of
9 which, 1,028 were valid observations for the regressions. The distribution of interviews
10 across sectors is shown in Table A.3 in the appendix and in Table A.4 the destination
11 countries for exports are listed.
12
13
14
15
16
17
18
19
20
21
22
23

24 From a statistical point of view, the collected sample is representative of the studied
25 population and the results and conclusions should therefore be in line with those to be
26 expected from the Spanish industrial structure. Detailed information concerning the
27 regional distribution of interviews carried out and averages of the variables is shown in
28 the Appendix in Tables A.1 and A.2 respectively.
29
30
31
32
33
34
35

36 With respect to sectoral exports, the interviewees did not directly report the value or
37 quantity exported. They only indicated the percentage of exports directed to each foreign
38 market. Therefore export data (quantity and value) were obtained from the database
39 “Spanish Foreign Trade Statistics” published by the Spanish Custom Agency for the
40 different sectors under analysis. A careful matching of the export data and the transport
41 costs data were made at a high disaggregation level (8 digits). For illustration, Export
42 codes at 4 digits and product descriptions are listed in the Appendix A.5.
43
44
45
46
47
48
49
50
51
52

53 **4. DETERMINANTS OF TRANSPORT COSTS**

54 A number of authors have recently investigated the determinants of international transport
55 costs. Estimates are given in Hummels (1999), Limao and Venables (2001), Radelet and
56 Sachs (1998), Micco and Pérez (2001) Fink et al. (2001), Sánchez et al. (2002) and
57
58
59
60

1
2
3 Kumar and Hoffmann (2002). The explanatory variables used in their analysis are
4 basically related to distance and connectivity, such as if countries are land-locked, or if
5 trading partners are neighbours, and to country characteristics such as GDP per capita.
6 Some of them focus on the impact of specific factors on transport costs, for example
7 Micco and Pérez (2001) and Sánchez et al. (2002) analyse the impact of port reform on
8 transport costs, and study the possible effects of port reform in Latin America. Fink et al.
9 (2001) investigate how liberalisation in trade and transport services leads to further
10 reductions in transport costs, which in turn leads to a further promotion of trade in goods.
11 Kumar and Hoffmann (2002) consider the mutual relationship between trade volumes,
12 transport costs, and the quality of transport services. They find that the market for
13 maritime transport services is growing and observe increased concentration in the
14 maritime industry and, at the same time, more competition. Although transport unit costs
15 decline, the incidence of the maritime transport costs in the final value of the good
16 increases since many components are purchased internationally. The authors state that the
17 strong relationship between trade and transport costs detected by Limao and Venables
18 (2001) does not only reflect the elasticity of trade towards transport costs, but might be
19 also reflecting the economies of scale through which higher volumes lead to lower costs
20 of transport.
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44

45 More evidence is needed at sector level and using primary sources, as most of the
46 research has used aggregated data and secondary sources. In this line, we estimate a linear
47 equation where transportation costs are specified as a function of distance, mode of
48 transport, infrastructure, port efficiency, transit time, number of shipments, average size
49 of shipments and various dummies. Distance has been widely used in gravity equations as
50 a proxy for transport costs since a higher distance implies a longer journey and a higher
51 associated cost, and it is very difficult to collect transport costs data of good quality. A
52
53
54
55
56
57
58
59
60

1
2
3 differential relationship is observed in our data between transport cost and distance for
4 road and sea transport, indicating that as distance grows road transport costs always
5 increase but sea transport costs only increase for shorter distances and then, slightly
6 decrease. This feature will be considered in the transport costs equation by adding
7 interaction variables (distance*mode) and (distance square*mode). Infrastructure in the
8 exporting country and in the transit countries has also proved to be an important
9 determinant of transport costs (Limao and Venables, 2001). Infrastructure measures are
10 related to the quality of communications and transport infrastructure that countries
11 possess. Transit time, average number of shipments per year and average size of the
12 shipments in each sector are also taken into account as explanatory variables. Transit time
13 may be a proxy for the quality of the service, whereas average number of shipments
14 (frequency) and average size of shipments could be indicating high volumes of exports
15 going through a particular route, pointing towards the existence of economies of scale.

16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34 The costs of the journey between countries are influenced by other geographic
35 characteristics such as adjacency, being an island or being landlocked. Countries sharing
36 a common border usually have better communication network connections and more
37 possibilities for back-hauling, due to the fact that they trade more extensively, allowing
38 for fixed costs to be shared over two trips and thereby reducing total costs. Some cultural
39 similarities, such as a common language, could also be considered as determinants of
40 transport costs, assuming that this facilitates trade transactions. Furthermore, being
41 landlocked normally adds extra costs, because it means that the commodities being traded
42 must be transported on a relatively more expensive and on average longer leg by road and
43 need to face customs formalities twice, at the landlocked country and at the country where
44 the port of loading/unloading is located. We added a dummy according to the mode of
45 transport. The basic specification is given by:
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

$$\ln TC_{ijk} = \alpha_0 + \alpha_1 \ln D_{ij} + \alpha_2 (\ln D_{ij})^2 + \alpha_3 Mode + \alpha_4 \ln INF_{ij} + \alpha_5 \ln PE_j * Mode + \alpha_6 \ln TT_{ij} + \alpha_7 \ln NS_{ijk} + \alpha_8 \ln AS_{ijk} + \mu_{ijk} \quad (1)$$

where TC_{ijk} denotes transport costs incurred when transporting product k from province i in Spain to country j , D_{ij} denotes distance from the city of origin in Spain (i) to destination j , $Mode$ is a dummy that takes the value one when products are transported by sea and zero when goods are transported by road, INF_{ij} denotes the quality of roads that connect i and j , PE_j denotes port efficiency in country j , TT_{ij} is transit time from door to door, NS_{ijk} is the average number of shipments per year for a specific company to a particular destination and for sector k , AS_{ijk} is the average size of the shipments for a given route and for sector k . All the variables except dummies are in natural logs. μ_{ijk} denotes the error term that is assumed to be independently normally distributed.

The variable INF_{ij} is constructed⁶ for road transport. We consider the quality of roads in the countries that have to be crossed scaled by the area of the countries and weighted by the number of borders:

$$INF_{ij} = \frac{(m_i PR_i / A_i + \sum m_t PR_t / A_t + m_j PR_j / A_j)}{NB_{ij}} \quad (2)$$

where NB_{ij} depends on the number of borders that have to be crossed to reach the final destination. It takes the value 1 for transport inside the EU, the value increases by 0.10 when a border is crossed. A_i , A_t and A_j are the areas of the countries which infrastructure is considered. PR_i , PR_t and PR_j are kilometres of paved road in countries i , t and j , t denotes transit countries. m takes a value between zero and one according to the quality of roads in a given country (equals 0.75 for paved roads and 1 for motorways).

⁶ The variable INF_{ij} has been initially constructed as an index (by taking information on roads, paved roads, railroads and number of telephone lines) differentiating between importer and transit countries' infrastructure as explanatory variables of transport costs. This index is comparable to that of Limao and Venables (2001) but opposite signed.

1
2
3 A summary of the estimation results is shown in Table 1. Different regressions were run
4 for each sector since we could not accept equality of slopes for the independent variables
5 in a pooled regression. The number of cross-sections is higher for agroindustry (668) and
6 ceramic products (548) than for household appliances (318) and vehicle parts (450). We
7 tried several specifications, by testing for the significance of the explanatory variables.
8 First, for comparative purposes we estimated a model with only distance and mode
9 variables⁷. A number of conclusions were reached. Firstly, the distance coefficient has the
10 expected positive sign showing that a 1% increase in distance increases transport costs by
11 approximately 0.25% for low value added sectors and by 0.13% for high value added
12 sectors. This magnitude is slightly lower than those found in other studies for different
13 commodities. Hummels (1999) finds commodity specific distance coefficients clustered
14 between 0.2 and 0.3 and Kumar and Hoffmann (2002) found a distance elasticity of 0.24
15 for the case of Intra-Latin American trade. Secondly, the mode dummy has a negative and
16 significant coefficient, showing that transport costs for a given distance are lower for sea
17 transport.

18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38 ***Table 1. Determinants of transport costs***

39
40
41 When infrastructure variables are added in the model, they show a statistically significant
42 coefficient with the expected negative sign for agro-industry and ceramics (low value-
43 added sectors). A 1% improvement in the infrastructure of the destination country lowers
44 transport costs by 0.20% on average. However, we find that infrastructure variables are in
45 most cases not significant at conventional levels for high value-added sectors: household
46 appliances and vehicle parts. A plausible reason could be that these products are generally
47 sold to the most developed European countries and these countries already have the

58
59
60
⁷ Results are available upon request.

1
2
3 highest levels of infrastructure quality. Additionally, the port efficiency variable is only
4
5 significant and negative signed for agro-industry and in some cases for vehicle parts.
6

7
8 The estimated coefficient for the variable transit time shows that for agro-industry,
9
10 ceramics and household appliances a 1% increase in the time of transit increases the cost
11
12 by 0.15%. The number of shipments and the average size of shipments are also shown to
13
14 be significant and negative signed almost always (apart from the number of shipments for
15
16 household appliances). This result may be indicating the existence of economies of scale,
17
18 as a higher frequency or a greater size of shipment indicates that more trade goes through
19
20 a particular route. However, the first variable may also be (indirectly) showing a better
21
22 quality of the service offered by a particular route.
23
24
25

26
27 The inclusion of additional variables improves the fit of the regression since the adjusted
28
29 R^2 considerably increases corroborating the importance of infrastructure, transit time,
30
31 number of shipments and average size of the shipments in determining transport costs for
32
33 these sectors.
34

35
36 The adjacency dummy presents a negative and significant coefficient for three out of four
37
38 sectors, showing that being neighbours reduces transport cost by 0.25%. The dummy
39
40 island is only significant for agro-industry and negative signed, and the landlocked
41
42 dummy is significant and positive signed for high value-added sectors. Dummy variable
43
44 coefficients are not significant for the adjacency, language, island and landlocked
45
46 dummies for the ceramic sector. This result validates earlier findings obtained in
47
48 Martinez-Zarzoso et al. (2003) with a different data set for the same sector.
49
50

51
52 Finally, since not only the levels of freight rates might be affected by the mode of
53
54 transport, but also the distance elasticities, we introduce interaction variables
55
56 (Mode*Distance).
57
58
59
60

1
2
3 The (Mode*Distance) coefficient is significant for all the sectors apart from ceramics. For
4 the agroindustry sectors a second interaction variable (Distance square*Mode) is found to
5 be statistically significant and negative signed, whereas the (Mode*Distance) coefficient
6 is significant and positive signed. In this particular case, the results indicate that transport
7 costs are increasing with distance for road transport, however for sea transport costs are
8 increasing only for shorter distances and decreasing for longer distances. Finally, for high
9 value-added sectors the (Mode*Distance) coefficient presents a negative sign indicating
10 that unit cost is decreasing with distance when the mode of transport is sea.
11
12

13
14
15
16
17
18
19
20
21
22 Summing up, we find that distance is a significant determinant of transport costs; it has a
23 higher impact for road transport than for sea transport and higher sea distances reduce
24 transport costs in the agroindustry sector. Infrastructure variables are only significant for
25 low-value added sectors (agroindustry and ceramics) and economies of scale in transport
26 are present in all the sectors (proxied by average size and number of shipments).
27 Concerning geographical dummies, interior countries face higher transport costs, whereas
28 neighbour countries have lower transport costs. These two dummies are non-significant
29 only for the ceramic sector.
30
31
32
33
34
35
36
37
38
39

40 41 **5. TRADE VOLUMES**

42
43 In order to assess the relative importance of transport costs on trade we need an
44 appropriate theoretical framework. In recent years, the gravity model of trade has become
45 the workhorse of international trade⁸. From the large empirical literature in this field (see
46 Oguledo and Macphee (1994) for a survey of the literature), it is commonly accepted that
47 gravity models explain well bilateral trade patterns.
48
49
50
51
52
53

54
55 We estimate a demand model for sectoral exports, based on a log-linear form of a gravity
56 equation augmented with infrastructure variables. The model is specified as,
57
58
59
60

⁸ Bayoumi, T. and Eichengreen, B. (1997, p. 142).

$$\ln X_{ijk} = \beta_0 + \beta_1 \ln Y_j + \beta_2 \ln D_{ij} + \beta_3 \ln INF_{ij} + \beta_4 Ldl + \beta_5 lang + \beta_6 Isl + \beta_7 Adj + \varepsilon_{ijk} \quad (3)$$

where \ln denotes natural logarithms, Y_j is the income in the destination market, D_{ij} is distance from the province of origin to the destination market, INF_{ij} is the infrastructure variable defined previously, Ldl is a dummy for landlocked countries, $Lang$ is a dummy for countries sharing the same language, Isl takes the value 1 when countries are an island and zero otherwise and Adj takes the value 1 when countries share the same border, zero otherwise.

The model is jointly estimated for the four sectors with 2001 data. Pooled estimation with fixed effects was the best option since most of the explanatory variables are common across sectors and we only found statistical differences for the distance variable. We perform OLS estimation on the double log specification as given by Equation 3.

Table 2. Determinants of sectoral exports

Table 2 shows our results. Model 1 presents the OLS results for the baseline case, which excludes infrastructure variables and dummies. The standard regressors are income and distance variables. The coefficient on income is positive, as expected, and the income elasticity is 0.64. The coefficient on distance is negative signed and highly significant.

In Model 2 the mode variable is added, showing a negative and significant coefficient, indicating that exports are higher if the goods are transported by road. In Model 3 we add the list of dummies that might influence exports. The landlocked dummy presents the expected negative sign showing that when a country has no sea-shore, exports to this country are 282% [$\exp(1.34)-1$] lower than for a coastal country. The adjacency dummy presents a slightly significant positive signed coefficient, showing that neighbour countries trade 249% [$\exp(1.25)-1$] more than non-neighbour countries. The island dummy presents a positive sign and the coefficient is also significant. The remaining

1
2
3 variable coefficients have the same sign and similar magnitude as before, apart from the
4 distance coefficient that decreases in magnitude. In Model 4 the infrastructure variable is
5 added showing a positive and significant coefficient and high elasticity (3.46). We can see
6 how the distance coefficient is not significant, as it shows the correct sign but a smaller
7 magnitude (-0.63) when compared to Model 3. The fit of the equation is also better (R^2
8 increases a 0.05). In Model 5 we estimate different distance coefficients⁹ for each sector
9 to allow for more flexibility in the model. We find that the distance coefficient is
10 significant and with the expected negative sign for the agriculture and food sector and for
11 vehicle parts, whereas it is lower in magnitude and insignificant for ceramics and
12 household appliances. The sectoral dummies are not significant in Model 5.
13
14

15
16
17
18
19
20
21
22
23
24
25
26
27 Finally, Model 6 was estimated in order to check whether there were problems of reverse
28 causation between exports and income. The model was estimated using the Two Stages
29 Least Square estimator. Two additional variables are selected as instruments for the
30 income variable: the area of the country and the distance to the Equator. In this model the
31 distance specific coefficients are significant and above unity for high value-added sectors,
32 whereas the coefficient is smaller and less significant for low value-added sectors¹⁰.
33
34
35
36
37
38
39

40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
In order to compare our results with those obtained by Limao and Venables (2001), using
estimates from Model 6 we will be able to link trade volumes to transport costs by
calculating parameter τ , the elasticity of trade volumes with respect to transport costs.
We use the coefficients of significant variables (at least for some sectors) included in both
the transport cost and the import demand equations. We focus on the distance variable.
Table 3 presents the parameter estimates for this variable and the ratio of the trade

⁹ We used a Wald test to test for the equality of slopes in the sectoral-distance elasticities. The test is included at the end of Table 2 and the result indicates rejection of the null hypothesis (equality of slopes).

¹⁰ Sectoral dummies are excluded since they were non-significant in Model 5.

1
2
3 elasticities to the freight elasticities indicates the elasticity of trade with respect to
4
5 transport costs.
6
7

8 ***Table 3. Estimates of export elasticity with respect to transport costs***
9

10
11 For comparative purposes, we estimated τ in the same way as Limao and Venables
12 (2001). They calculated implied elasticities of -2.95 on the basis of distance. However, as
13 aggregated data was used as opposed to the sector data that we use, our results are more
14 specific and not directly comparable to Limao and Venables (2001). We obtain export
15 elasticities with respect to transport costs implied by the point estimates on the basis of
16 distance of -1.52 and -1.20 for low value-added sectors and -2.82 and -3.93 for high
17 value-added sectors. According to our calculations low value-added sectors seem to have
18 considerably lower export elasticity with respect to transport cost than high value-added
19 sectors, pointing towards a lower incidence of transport costs in trade for the former.
20
21 Vehicle parts present the highest elasticity, indicating that a decrease of 1% in transport
22 costs would increase exports by 3.93%. An explanation of the sectoral differences in
23 trade-transport-cost elasticities could be related to searching costs and consumer risk
24 aversion as determinants of exports. These two factors are relatively more important for
25 differentiated products than for homogeneous products. Huang (2006) shows that distance
26 deters trade to a higher extent for differentiated commodities than for homogeneous
27 goods. In fact, Table 2 in the Appendix show that average distances travelled for high
28 value-added products are lower than for low value-added products. A second explanation
29 could be based on Yeats' (1977: p.469) findings. He noted that some processed products
30 have a tendency to be more difficult to handle, more fragile or even subject to higher
31 insurance costs and these factors contribute to increased transport costs for differentiated
32 products. A higher unitary transport cost and a lower distance travelled for differentiated
33 products than for more homogeneous products could give rise to a higher trade-transport-

1
2
3 cost elasticities for the former. Finally, the elasticity of trade with respect to transport
4 costs is also related to the elasticity of substitution among products. Since the elasticity of
5 substitution is higher for processed products, that could also explain that trade is more
6 elastic with respect to transport costs for this type of goods, that have more closer
7 substitutes than homogeneous products (Hummels 1999a).

15 6. CONCLUSIONS

17 The objective of this paper was to investigate the determinants of sectoral transport costs
18 and the role they play in deterring international trade. We estimated a transport cost
19 equation using data on transportation costs for four sectors obtained from interviews held
20 with Spanish exporters and logistics operators. We also studied the relationship between
21 transport costs and trade and we estimated an export supply (import demand) model. Our
22 results from the first estimation show that the distance variable behaves differently
23 according to the mode of transport. The infrastructure variable is only significant for low-
24 value added sectors, poor infrastructure leads to a notable increase in transport costs.
25 Inclusion of infrastructure measures improves the fit of the regression in low-value added
26 sectors, corroborating the importance of infrastructure in determining transport costs.
27 Additionally, higher frequency or larger size of the shipments lowers transport costs in all
28 four sectors, indicating the presence of economies of scale.

29 Our results from the second estimation show that importer income, as expected, has a
30 positive influence on bilateral trade flows. The distance variable loses significance when
31 infrastructure variables are considered and it is only significant for half of the sectors. The
32 inclusion of distance specific coefficients improves the fit of the trade equation and once
33 the endogeneity of the income variable is considered, distance is clearly significant for
34 high value-added sectors and less significant and with a lower magnitude for low value-
35 added sectors.

1
2
3 The calculation of trade elasticities with respect to transport costs indicates that transport
4 cost have a greater effect on trade flows for high value-added sectors, whereas its
5 influence is significantly lower in the case of low value-added sectors. However, future
6 estimations for sectors and products with different logistic processes will be of interest in
7 order to improve the knowledge of the effects of transportation costs on trade flows under
8 diverse conditions of international transport.
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For Peer Review

Table 1. Determinants of transport costs

| Variable | Agroindustry | Ceramics | Household Appliances | Vehicle Parts |
|---------------------------|----------------------|---------------------|----------------------|---------------------|
| Constant term | -2.56*** (-3.42) | -0.88 (-1.25) | 1.52** (2.07) | 3.58*** (3.24) |
| Distance | 0.61*** (9.33) | 0.69*** (8.13) | 0.46*** (3.37) | 0.31** (1.93) |
| (Distance*mode) | 1.94* (1.22) | -0.86 (-1.31) | -0.55*** (4.54) | -0.36*** (-2.47) |
| (Distance square*mode) | -0.18** (-2.29) | 0.01 (0.24) | - | - |
| Mode | -4.23 (-0.88) | 5.38** (2.02) | 3.49*** (3.26) | 2.68** (2.30) |
| Infrastructure | -0.17*** (-2.58) | -0.23*** (-3.78) | 0.02 (0.15) | -0.09 (0.88) |
| (Port efficiency*mode) | -0.33*** (-2.98) | -0.008 (-0.07) | 0.10 (0.44) | -0.21 (-1.14) |
| Transit time | 0.10*** (2.45) | 0.12*** (2.87) | 0.18* (1.45) | -0.05 (-0.65) |
| Number of shipments | -0.05*** (-4.85) | -0.02* (-1.77) | -0.025** (-0.84) | -0.08*** (-3.83) |
| Average size of shipments | -0.15*** (-12.55) | -0.08*** (-7.61) | -0.23*** (-7.76) | -0.15*** (-4.63) |
| Cereals | 0.26** (2.08) | - | - | - |
| Wine | 0.19** (2.08) | - | - | - |
| Canned food | -0.02 (-0.19) | - | - | - |
| Oil | 0.25*** (2.93) | - | - | - |
| Adjacency | -0.18*** (-4.13) | 0.03 (0.73) | -0.18* (-1.77) | -0.26*** (-2.88) |
| Island | -0.10*** (-2.74) | 0.02 (0.81) | -0.12 (-1.05) | -0.02 (-0.18) |
| Landlocked | 0.02 (0.23) | 0.03 (0.25) | 0.29** (2.49) | 0.35** (2.48) |
| Number of observations | 668 | 548 | 318 | 450 |
| R-squared | 0.66 | 0.55 | 0.47 | 0.34 |
| Adjusted R-squared | 0.65 | 0.54 | 0.450 | 0.32 |
| S.E. of regression | 0.330 | 0.316 | 0.613 | 0.626 |

Note: All variables are for the year 2001. ***, **, * indicate significance at 1%, 5% and 10% respectively. T-statistics, based on White Heteroskedasticity-Consistent Standard Errors, are in brackets. The dependent variable is the natural log of transport costs measured in € per tonne. All the variables except dummies are in natural logs. Mode is a dummy variable that takes the value one when the good is transported by sea and zero otherwise. Distance*mode is an interaction variable that takes a positive value (distance in Km between trading cities) when the good is transported by sea and zero otherwise. Port efficiency*mode is another interaction variable that takes a positive value when the good is transported by sea and zero otherwise.

Table 2. Determinants of sectoral exports

| Variable | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|--|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| Constant term | 23.28*** (6.01) | 19.98*** (5.81) | 19.46*** (3.80) | 14.72** (4.35) | 25.92*** (4.50) | 21.4** (4.40) |
| Importer income | 0.64*** (5.52) | 0.64*** (5.63) | 0.51*** (4.23) | 0.27** (2.08) | 0.23** (1.80) | 0.57** (2.69) |
| Distance | -1.66*** (-4.17) | -1.15** (-2.64) | -0.98** (-2.27) | -0.63* (-1.52) | - | - |
| Distance*mode | - | - | - | - | - | 0.51 (0.66) |
| Distance*dummyagro | - | - | - | - | -0.55* (0.32) | -0.94* (-1.51) |
| Distance*dummycer | - | - | - | - | -0.34 (0.54) | -0.84 (-1.34) |
| Distance*dummyha | - | - | - | - | -1.00 (-1.04) | -1.31** (-2.05) |
| Distance*dummyauto | - | - | - | - | -1.57** (-2.06) | -1.22** (-1.93) |
| Mode | - | -1.43** (-3.66) | -1.61*** (-4.13) | -1.49*** (-2.35) | -2.22*** (-5.30) | -5.99 (0.98) |
| Infrastructure | - | - | - | 3.46*** (4.97) | 3.52*** (5.67) | 2.62*** (3.42) |
| Landlocked dummy | - | - | -1.34*** (-2.57) | -1.63*** (-3.24) | -1.82*** (-3.62) | -1.54*** (-2.82) |
| Island dummy | - | - | 0.90** (2.01) | 0.84 (1.74) | 0.68 (1.39) | 0.59 (1.30) |
| Adjacency dummy | - | - | 1.25* (1.87) | 1.74** (2.45) | 1.64** (2.38) | 1.15* (1.56) |
| Dummyagro | 2.18*** (4.17) | 2.16*** (4.79) | 2.18*** (4.82) | 2.14*** (4.88) | -5.75 (-0.84) | - |
| Dummycer | 3.02*** (5.92) | 3.06*** (6.22) | 2.99*** (6.24) | 2.97*** (6.53) | -11.86 (-1.71) | - |
| Dummyha | -0.53 (-0.81) | -0.47 (-0.79) | -0.50 (-0.87) | -0.49 (-0.90) | -4.95 (-0.56) | - |
| Number of observations | 255 | 255 | 255 | 255 | 255 | 255 |
| R-squared | 0.33 | 0.380 | 0.427 | 0.493 | 0.50 | 0.48 |
| Adjusted R-squared | 0.32 | 0.364 | 0.401 | 0.467 | 0.47 | 0.45 |
| S.E. of regression | 2.60 | 2.516 | 2.442 | 2.303 | 2.29 | 2.29 |
| Ramsey Reset test | 2.74* | 6.09** | 2.28* | 10.85** | 8.61** | 0.357 |
| F- test (equality of slopes _ldist); d.f.(3,198) | | | | | | 23.92** |

Note: White Heteroskedasticity-Consistent t-values are in brackets. All variables are for the year 2001. ***, **, * indicate significance at 1%, 5% and 10% respectively. T-statistics are in brackets. The dependent variable is the natural log of exports in volume. Mode is a dummy variable that takes the value one when the good is transported by sea and zero otherwise. All the variables except dummies are in natural logs.

Table 3. Estimates of export elasticity with respect to transport costs

| | Transport cost equation | Trade equation | Export Elasticities |
|----------------|----------------------------|----------------|-----------------------------|
| | α_1 | β_2 | $\tau = \beta_2 / \alpha_1$ |
| | Dist. | Dist. | |
| Agro-industry | 0.61 | -0.94 | -1.52 |
| Ceramics | 0.69 | -0.84 | -1.20 |
| Household App. | 0.46 | -1.31 | -2.82 |
| Vehicle Parts | 0.31 | -1.22 | -3.93 |

Note: The point estimates for distance in the transport cost equation, are from Table 1. The point estimates for distance in the export equation are from Model 6 in Table 2.

ACKNOWLEDGEMENTS

Financial support from Fundación Caja Castellón-Bancaja, Generalitat Valenciana and the Spanish Ministry of Education is gratefully acknowledged (P1-1B2005-33, Grupos 03-151, INTECO; Research Projects GV04B-030, SEJ 2005-01163 and ACOMP06/047). We also would like to thank two anonymous referees and the participants in the 6th INFER Workshop on Economic Policy in Reus (Spain) and in the I International Transport Congress held in Castellón (Spain) for their comments and suggestions. We thank Elena Sanjuan-Lucas for excellent research assistance.

REFERENCES

- Baier, S. L. and Bergstrand, J. H. (2001), The Growth of World Trade: Tariffs, Transport Costs and Income similarity, *Journal of International Economics* 53 (1), 1-27.
- Bayoumi, T. and Eichengreen, B. (1997), Is Regionalism Simply a Diversion? Evidence from the Evolution of the EC and EFTA, in *Regionalism versus Multilateral Arrangements*. Edited by Takatoshi Ito and Anne O. Krueger. Chicago, the University of Chicago Press.
- Fink, C, Mattoo, A and Neagu, IC (2000), Trade In International Maritime Service: How Much Does Policy Matter?. World Bank WRP 2522. Washington DC, United States.
- Henderson, JV, Shalizi, Z, and Venables, AJ (2001), Geography and Development. *Journal of Economic Geography*, 1: 81-106.
- Huang, R.R. (2006), Distance and Trade. *European Economic Review*, forthcoming.
- Hummels, D (1999a), Towards A Geography of Trade Costs. University of Chicago. Mimeographed document.
- Hummels, D. (1999b) Have International Transportation Costs Declined?. University of Chicago. Mimeographed document.
- Hummels, D (2001), Have International Transportation Costs Declined? *Journal of International Economics* 54 (1), 75-96.

1
2
3 Hummels, D, Ishii, J and Yi, K-M (2001), The Nature and Growth of Vertical
4 Specialisation in World Trade. *Journal of International Economics* 54 (1); 75-96.
5
6

7
8 Hummels, D and Lugovskyy, V. (2003), Usable Data? Matched Partner Trade Statistics
9 as a Measure of International Transportation Costs. *Review of International Economics*,
10 forthcoming.
11
12

13
14
15
16 Krugman, P (1991), Increasing Returns and Economic Geography. *Journal of Political*
17 *Economy* 99 (3), 483-499.
18

19
20
21 Kumar, S and Hoffmann, J (2002), Globalization - The Maritime Nexus. In Handbook of
22 Maritime Economics, LLP, London. November.
23

24
25 Limao, N, Venables, AJ (2001), Infrastructure, Geographical Disadvantage and Transport
26 Costs. *World Bank Economic Review* 15, 451-479.
27

28
29
30 Martínez-Zarzoso, I., García-Menendez, L. and Suárez-Burguet, C. (2003) The Impact of
31 Transport Cost on International Trade: The Case of Spanish Ceramic Exports. *Maritime*
32 *Economics & Logistics* 5 (2), 179-198.
33
34

35
36
37 Micco, A and Pérez, N (2001), Maritime Transport Costs and Port Efficiency. Inter-
38 American Development Bank, Research Working Paper.
39

40
41 Oguledo, V.I. and Macphee, C.R. "Gravity Models: A Reformulation and an Application
42 to Discriminatory Trade Arrangements" *Applied Economics*, 26, 1994, pp.107-120.
43
44

45
46
47 Radelet, S., Sachs, J. (1998) Shipping Costs, Manufactured Exports and Economic
48 Growth. Harvard University, Harvard Institute for International Development.
49 Mimeographed document.
50
51

52
53
54 Sánchez, RJ, Hoffmann, J, Micco, A, Pizzolitto, G, Sgut, M and Wilmsmeier, G (2002),
55 Port Efficiency And International Trade, Conference proceedings, International
56 Association of Maritime Economist, annual meeting and conference, Panama, November.
57
58
59
60

1
2
3 Venables, A.J. and Limao, N. (2002), Geographical disadvantage: a Heckscher-Ohlin-von
4
5 Thunen model of international specialisation, *Journal of International Economics* 58 (2),
6
7 239-263.
8
9

10 Yeats, A. J. (1977), Do International Transport Costs Increase with Fabrication? Some
11
12 Empirical Evidence, *Oxford Economic Papers* 29 (3), 458-471.
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For Peer Review

APPENDIX**Table A1. Fieldwork: Regional distribution of interviews**

| Sectors: | Andalucía | Aragón / La Rioja | Cataluña | Comunidad Valenciana | Madrid / Castilla La Mancha | Murcia | País Vasco / Navarra / Cantabria | Total |
|-----------------------|-----------|-------------------|----------|----------------------|-----------------------------|--------|----------------------------------|-------|
| Agro-industry (Xc) | 10 | 3 | 9 | 11 | 15 | 14 | 2 | 64 |
| Ceramic Tiles (Xc) | 0 | 0 | 2 | 31 | 0 | 0 | 0 | 33 |
| Vehicle Parts (Xc) | 0 | 6 | 13 | 1 | 4 | 0 | 8 | 32 |
| Hous. Appliances (Xc) | 0 | 1 | 23 | 0 | 0 | 0 | 7 | 31 |
| Total Xc | 10 | 10 | 47 | 43 | 19 | 14 | 17 | 160 |
| Agro-industry (Ff) | 3 | 1 | 4 | 8 | 4 | 2 | 0 | 22 |
| Ceramic Tiles (Ff) | 1 | 1 | 1 | 16 | 2 | 1 | 0 | 22 |
| Vehicle Parts(Ff) | 3 | 4 | 5 | 4 | 8 | 0 | 0 | 24 |
| Hous. Appliances (Ff) | 2 | 1 | 3 | 0 | 4 | 0 | 0 | 10 |
| Total Ff | 9 | 7 | 13 | 28 | 18 | 3 | 0 | 78 |
| Total | 19 | 17 | 60 | 71 | 37 | 17 | 17 | 238 |

Note: Xc Denotes Export Companies And Ff Denotes Freight Forwarders.

Table A2. Variable Averages

| Variables | Sector 1: Agro-industry | | Sector 2: Ceramic Tiles | | Sector 3: Vehicle Parts | | Sector 4: Household Appliances. | |
|--|-------------------------|----------|-------------------------|----------|-------------------------|----------|---------------------------------|----------|
| | Road | Sea | Road | Sea | Road | Sea | Road | Sea |
| Frequency of Shipments (No. of Shipments per Annum) | 109.60 | 125.30 | 962.90 | 205.83 | 141.52 | 47.42 | 184.92 | 78.75 |
| Average Size of Shipments (m ³) | 124.17 | 358.21 | 942.02 | 129.76 | 64.90 | 247.45 | 61.09 | 51.80 |
| Frequency of Shipments (No. of Shipments per Annum) Export Companies | 101.92 | 68.51 | 1,005.40 | 124.22 | 79.04 | 42.23 | 173.98 | 69.64 |
| Average Size of Shipments (m ³) Export Companies | 51.03 | 312.55 | 83.89 | 74.42 | 30.54 | 330.72 | 55.05 | 53.58 |
| Distance (Km) | 1,759.72 | 3,074.15 | 1,640.50 | 3,433.68 | 1,527.41 | 1,538.83 | 1,389.43 | 2,379.66 |
| Transport Cost (Euro/Tm) | 109.84 | 66.83 | 82.16 | 53.89 | 285.22 | 77.21 | 238.27 | 113.06 |
| Transit Time (Hours) | 77.05 | 181.70 | 59.77 | 188.30 | 65.67 | 118.11 | 56.25 | 153.20 |
| % of Delayed Shipments | 0.47 | 4.18 | 0.95 | 1.13 | 2.76 | 9.35 | 2.93 | 5.60 |
| Average Delay (Hours) | 1.20 | 9.26 | 3.24 | 14.33 | 6.16 | 8.66 | 4.71 | 16.29 |
| % of Shipments Damaged or Lost | 0.98 | 0.28 | 0.29 | 0.44 | 0.10 | 2.35 | 0.98 | 0.00 |
| Average Damage (% of Total Value of Shipment) | 0.23 | 3.07 | 0.16 | 0.62 | 0.40 | 3.71 | 3.59 | 0.00 |
| % of Consolidated Shipments | 31.03 | 12.18 | 58.82 | 20.25 | 77.14 | 43.26 | 46.21 | 31.67 |
| Transport Restrictions (No. of Days per Year) | 107.39 | 0.00 | 104.07 | 0.00 | 110.93 | 0.00 | 106.29 | 0.00 |
| % of Shipments Delayed due to Restrictions | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Average Delay due to Restrictions (Hours) | 0.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

A.3 Data collection

A.3.1 Fieldwork: Number of interviews

| <u>Sector</u> | <u>Exporters</u> | <u>Logistic Operators</u> |
|----------------------|------------------|---------------------------|
| Agroindustry | 33 | 22 |
| Ceramic Tiles | 64 | 22 |
| Vehicle Parts | 32 | 24 |
| Household Appliances | 31 | 10 |
| Total | 160 | 78 |

A.3.2. Interview process

The interviews were carried out by 4 research assistants who worked for the Institute of International Economics (University of Valencia). Most interviews were personal interviews arranged previously with logistics managers and/or import/export managers in exporting companies as well as logistic operators and freight forwarders. The sample was selected according to a previously designed segmentation of the market. The objective of this sampling procedure was to undertake the fieldwork with a highly representative sample of the Spanish exporting industry, in terms of geographical location, company size and exported commodities. A structured questionnaire was prepared in advance and detailed questions were asked concerning the commodity exported, the most commonly covered transport routes, the transport mode selected for each route, the specific characteristics (cost, transit time, frequency) of the transport mode chosen and its alternative mode. Currently, the Institute of

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

International Economics and the Foundation Valenciaport are presently in the process of building a more complete sectoral transport costs database.

A.4. Destination Countries

| | | | |
|--------------------|------------|-----------------|---------|
| Algeria | France | Netherlands | Turkey |
| Austria | Germany | New Zealand | Ukraine |
| Byelorussia | Greece | Norway | |
| Belgium | Hungary | Poland | |
| Bosnia-Herzegovina | Ireland | Portugal | |
| Bulgaria | Israel | Rumania | |
| Croatia | Italy | Russia | |
| Czech Republic | Latvia | Saudi Arabia | |
| Cyprus | Libya | Slovak Republic | |
| Denmark | Lithuania | Syria | |
| Egypt | Luxembourg | Sweden | |
| Estonia | Malta | Switzerland | |
| Finland | Morocco | Tunisia | |

A.5. Sectoral trade HS codes

| <u>Sectors</u> | <u>Codes</u> | <u>Product Description</u> |
|----------------|--|--|
| AGROAL | 1001 | Wheat and meslin |
| | 1002 | Rye |
| | 1003 | Barley |
| | 1004 | Oats |
| | 1005 | Maize (corn) |
| | 1006 | Rice |
| | 1007 | Grain sorghum |
| | 1008 | Buckwheat, millet and canary seed; other cereals |
| | 1101 | Wheat or meslin flour |
| | 1102 | Cereal flour other than of wheat or meslin |
| | 1103 | Cereal groats, meal or pellets |
| | 1104 | Cereal grains otherwise worked (for example, hulled, rolled, flaked, pearled, sliced or kibbled), except rice of heading 1006; germ of cereals, whole, rolled, flaked or ground |
| | 1105 | Flour, meal, powder, flakes, granules and pellets of potatoes |
| | 1106 | Flour, meal and powder of the dried leguminous vegetables of heading 0713, of sago or of roots or tubers of heading 0714 or of the products of chapter 8 |
| | 1107 | Malt, whether or not roasted |
| | 1108 | Starches; inulin |
| | 1109 | Wheat gluten, whether or not dried |
| | 1509 | Olive oil and its fractions, whether or not refined, but not chemically modified |
| | 1510 | Other oils and their fractions, obtained solely from olives, whether or not refined, but not chemically modified, including blends of these oils with oils or fractions of heading no. 15.09 |
| | 1512 | Sunflower-seed, safflower or cotton-seed oil and fractions thereof, whether or not refined, but not chemically modified |
| | 2001 | Vegetables, fruit, nuts and other edible parts of plants, prepared or preserved by vinegar or acetic acid |
| | 2002 | Tomatoes prepared or preserved otherwise than by vinegar or acetic acid |
| 2004 | Other vegetables prepared or preserved otherwise than by vinegar or acetic acid, frozen, other than products of heading 2006 | |
| 2005 | Other vegetables prepared or preserved otherwise than by vinegar or acetic acid, not frozen, other than products of heading no 2006 | |
| 2006 | Vegetables, fruit, nuts, fruit-peel and other parts of plants, preserved by sugar (drained, glaze or crystallised). | |
| 2007 | Jams, fruit jellies, marmalades, fruit or nut puree and fruit or nut pastes, obtained by cooking, whether or not containing added sugar or other sweetening matter | |
| 2204 | Wine of fresh grapes, including fortified wines; grape must other than that of heading no 2009 | |
| 2205 | Vermouth and other wine of fresh grapes flavoured with plants or aromatic substances | |
| CERAMICS | 6907 | Unglazed Ceramic Flags And Paving. Hearth Or Wall Tiles; Unglazed Ceramic Mosaic Cubes |
| | 6908 | Glazed ceramic flags and paving, hearth or wall tiles; Glazed Ceramic Mosaic Cubes |
| HOUSE. A. | 8418 | Refrigerators, freezers and other refrigerating or freezing equipment |
| | 8422 | Dish washing machines; machinery for cleaning or drying bottles or other containers. |
| | 8423 | Weighing machinery (excluding balances of a sensitivity of 5 cg or better), including weight operate |
| | 8450 | Household or laundry-type washing machines, including machines which both wash and dry |
| | 8509 | Electro-mechanical domestic appliances, with self-contained electric motor |
| | 8516 | Electric instantaneous or storage water heaters and immersion heaters; electric space heating apparatus |
| | 8519 | Turntables (record-decks), record-players, cassette-players and other sound reproducing apparatus |
| | 8520 | Magnetic tape recorders and other sound recording apparatus |
| | 8521 | Video recording or reproducing apparatus |
| | 8525 | Transmission apparatus for radio-telephony, radio-broadcasting or television |
| 8528 | Television Receivers (Including Video Monitors And Video Projectors), whether or not combined | |
| VEHICLES | 8708 | Parts and accessories of the motor vehicles of headings 87.01 to 87.05. |