SPANISH-UK RELATIVE EXPORTS TO OECD COUNTRIES: PRICES, TASTE BIAS AND QUALITY

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Abstract

This paper studies the determinants of Spanish relative exports of ten differentiated products to 16 OECD countries under the period 1970-1996. An export-demand model is derived in order to show how the relative demand for exports of a product variety changes with changes in relative prices, relative quality and taste bias. A dynamic version of our model is tested for Spanish relative to British manufacturing exports to the main foreign markets. The study uses a highly disaggregated data set searching for evidence of the role that product quality, taste differentials and prices play as determinants of exports flows. The findings highlight the importance of non-price competitiveness factors and the differences among products concerning price elasticities.

KEY WORDS: Consumer Demand, Exports, Quality, Tastes

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1. Introduction

The Spanish economy has undergone a radical transformation over the last 25 years, with it emerging as an industrial power in the last decade. For much of the last 40 years, the Spanish growth rate has exceeded the EU average, excluding the unique epoch of 1976-1981. The country has been facing the challenge of promoting exports and growth without excessive foreign trade deficits or unacceptable levels of unemployment. To promote exports required the redirection of trade and the injection of competition into a largely projected market.

One of the major catalysts in the transformation process was the accession of Spain, along with Portugal, into the European Community in 1986. The main challenge from membership of the European Community was the redirection of trade and the injection of competition into what was previously a largely protected market. Writing in 1990, Martin views the international competitiveness of Spanish firms as

"This impression is worse if one takes into account that all trade performance indicators … offer an upwardly biased image of Spanish industry's competitiveness, given that they incorporate the effects of its relatively high level of both tariff and non-tariff barriers." (Martin (1990), pp 207, 209)

Trade problems were further compounded as Spain lacked an indigenous high-tech base and imported technology and licensing was limited to the domestic market. The missing high-tech sector and the existence of labour market rigidities was reflected in non-price factors, for example inferior product design, quality and reliability. Price competitiveness on the basis of a cheaper labour force has been one of the sources of comparative advantage in traditional sectors. However, recent investigations show that non-competitiveness factors have improved in the 1990s (Barcelina, 1999).

The theoretical framework of imperfect competition is adopted to analyse Spanish exports, where product quality may well be an additional form of competition. A country may shift its export demand curve outwards by increasing the quality of the goods produced, with the theoretical support of trade flows deriving from the new trade theories outlined by Krugman (1983), Helpman and Krugman, (1985), and Grossman and Helpman (1991a). Grossman and Helpman (1991a) built a model where consumers choose between goods on the basis of both quality and price. They acknowledge the role of variety but also stress the importance of product quality, where increasing R&D expenditure enables firms to manufacture new products and move up the quality ladder.

Spanish exports performed strongly in the 1980s, especially after the entry into the European Community in 1986. Since then, there has been a significant reorientation of trade, with a decline in exports to third countries and a substantial increase of exports to the Economic Community.

Table 1 here

Table 1 presents the destination of Spanish exports over the period 1970-1996. While the share going to Nordic member countries has decreased, the share going to France has doubled and the share going to Portugal has increased three-fold.

There has been a change in the composition of Spanish exports since 1970 as can be observed from Table 2. Traditional sectors, such as food, textiles and wood and paper, have declined and while there has been a notable increase in more elaborated goods (chemicals, metal manufactures), especially after 1986.

Table 2 here

The change of commodity composition and the redirection of destination make the modelling of the Spanish exports a demanding challenge.

Spain is not unique in witnessing a change in its export markets. Information on the direction of UK exports can be gleaned from a review of the destination of UK exports, Table 4. The entry into the European Economic Community in 1973 saw a reorientation of trade, with a decline in exports to Commonwealth countries and a steady increase of exports to the Economic Community. While the share going to other member countries has doubled, the share going to Spain has increased three-fold.

Table 3 here

Similar to Spain the UK experienced an improvement in the quality of its product. Casual evidence suggests that the quality of UK products improved during the 1980s, in particular the Thatcher supply-side policies are frequently cited as the catalysts for the turnaround in the fortunes of UK manufacturing.

Table 4 here

Table 4 provides an account of the composition of UK exports since 1970, with the most striking feature being the decline in manufacturing in the 1980s and its recovery in the 1990s.

The focus of attention is the investigation is on relative Spanish-UK exports from 1975 to 1996 in order to infer the size of long-run price elasticities, the character of the dynamic adjustment, the role of preference bias and the importance of product quality. One hypothesis for the strength of Spanish exports is that relative quality of some products improved. A central focus on the research is whether there is any evidence of an improvement in the quality of Spanish exports in the last two decades, in comparison to a main competitor, and if so, in which industries did it occur, and when.

Quality is very difficult to define and to measure. Goods can become more reliable, more durable, less space-consuming, faster and easier to use, more flexible or

more conductive to health. Standards can improve and marketing could become more effective. One approach consists on measuring objective improvements in such characteristics trying to identify hedonic prices for them. Some economists have followed that direction, Gorman (1980). However in the context of the vast range of diverse exports, such a task would be impractical. A second alternative consists on measuring quality as a time fixed effect, assuming that quality of any good supplied by a country can change year by year, but it is common across the different markets into which it is sold. A third alternative is to proxy quality with factor related to non-price competitiveness as research and development expenditure (R&D).

The approach adopted in the current research is the third alternative but it is recognised that R&D expenditure does not have instantaneous results. Non-price competitiveness can be achieved via high research and development spending, which results in a shift to the 'high-tech' sectors. Industries that spend relatively more on R&D find that their share of an export market increases as competitiveness improves. Consequently, it is customary to consider 'non-price competitiveness' and 'high-tech' are concomitant factors in export performance. As the amount of technology embodied in a product rises through time, an economy which produces a relatively large proportion of high-tech firms captures a higher proportion of exports. Consideration must be given to the various export markets of Spanish products; products of different provenance depend on a preference parameter, which can vary across different national markets but is taken to be constant over time. These preference parameters could be identified with the individual fixed effects.

Four main sections follow the introduction of this paper. Section 2 presents the model of demand for exports developed by Martínez-Zarzoso and Sinclair (1997) in

which the empirical application is based on. Section 3 describes data and their sources. Section 4 deals with the empirical application and Section 5 concludes.

2. Export demand model

The underlying theoretical model is based on the variety approach of monopolistic competition devised by Dixit and Stiglitz (1977). Preferences are Cobb-Douglas between product sets but CES between different national supplies in any given product set. Our specification shares, with the quality-ladder model of Grossman and Helpman (1991a), the way in which quality enters the utility function.

All residents in country j at time t are assumed to maximize the utility function given by,

$$U_j = Y_j^{(1-\alpha_j)} A_j^{\alpha_j} \tag{1}$$

where Y_j is a homogeneous good taken as the numeraire, A_j is the demand for differentiated goods in country j, given by,

$$A_{ij} = \left(\sum_{k=1}^{m} b_{ijk} \left[q_{ik} X_{ijk} \right]^{(\sigma_i - 1)/\sigma_i} \right)^{\sigma_i/(\sigma_i - 1)} \tag{2}$$

where b_{ijk} is country j's, $\{j=1,2,..., J\}$, demand parameter for a product in set i imported from country k, $\{k=1,2,..., m\}$. b_{ijk} represents the strength of preference in country j for a variety in commodity group i. These parameters are allowed to differ across importers. Therefore, consumers in country j are permitted to display taste differences between the products of any two countries in the model. Set i, $\{i=1,2,..., n\}$, is a product group within which there are different varieties of a good. The variable X_{ijk} represents the volume of goods purchased of a variety in commodity group i by country j. The quality of country k's exports in commodity group i is measured by q_{ik},

the Harrod-neutral "quality" parameter, measuring the quality of country *k*'s exports in commodity group *i*, is assumed to be common across destinations, *j*, but it varies over time. P_{ijk} is the fob price of purchases of a commodity *k* in product group *i*. Consumers allocate a share of their spending, α_j, to the vertically differentiated products and a share $(1-\alpha_j)$ to the outside good Y_j, at every point in time.

Taking logarithms of equation (1) and substituting A_{ij},

$$u_j = (1-\alpha_{ij}) \ln Y_j + \alpha_{ij} \frac{\sigma_i}{\sigma_i - 1} \ln \left(\sum_k^m b_{ijk} \left[q_{ik} X_{ijk} \right]^{(\sigma_i - 1)/\sigma_i} \right) \quad (3)$$

subject to a budget constraint,

$$I - Y_j - \sum_i^n \sum_k^m P_{ijk} X_{ijk} = 0 \quad (4)$$

Since u_j is the upper tier utility function that translates all sectoral subutility levels into an overall welfare level and our interest here is to analyse the demand for exports of differentiated products, we assume that the numeraire Y_j, is a homogeneous product, the subutility of which depends only on the quantity consumed. Given the separability of the underlying utility function, the optimization problem for the subutility function of differentiated products can be analysed in the second stage.

There are n groups of commodities, indexed by *i=1, ..., n*. Within each group, there are up to *m* varieties for sale. Each variety is produced by a different country *k=1, ..., m*. The number of varieties potentially available can be infinitely large. Nevertheless, given that there are some fixed costs in production, the scarcity of resources puts a limit to the number of differentiated products that are supplied in equilibrium.

The elasticity of substitution between varieties in commodity group *i*, "intra-sectoral elasticity of substitution" is σ_i. Let us assume that σ_i is identical across

countries, although in the empirical application of the model, this restriction is not necessarily imposed. σ_i is expected to be larger than one in order to capture the idea that each of the varieties is a closer substitute for another than for the numeraire (or any product outside its group)[1].

The maximization problem can be solved for the subutility function of differentiated products constructing the following Lagrangean,

$$\psi_j = \alpha_{ij} \frac{\sigma_i}{\sigma_i - 1} \ln\left(\sum_k^m b_{ijk} \left[q_{ik} X_{ijk} \right]^{(\sigma_i - 1)/\sigma_i} \right) + \lambda \left[I - \sum_i^n \sum_k^m P_{ijk} X_{ijk} \right] \qquad (5)$$

The first order conditions for a maximum for (5) are,

$$\frac{\partial \psi_j}{\partial X_{ijk}} = \frac{\alpha_{ij} b_{ijk} q_{ik}^{\frac{\sigma_i - 1}{\sigma_i}} X_{ijk}^{\frac{-1}{\sigma_i}}}{D_{ij}} - \lambda P_{ijk} = 0 \qquad (6a)$$

$$\frac{\partial \psi_j}{\partial \lambda} = I - \sum_j^n \sum_k^m P_{ijk} X_{ijk} = 0 \qquad (6b)$$

where $D_{ij} = \sum_k^m b_{ijk} \left[q_{ik} X_{ijk} \right]^{(\sigma_i - 1)/\sigma_i}$ and λ, the Lagrangean multiplier attached to the constraint represents the marginal utility of income. From the first order conditions, the demand in *j* for a single *i* industry variety produced in country *k* which is,

$$X_{ijk} = \frac{P_k^{-\sigma} b_k^{\sigma} q_k^{\sigma - 1}}{\sum_k^m P_k^{1-\sigma} b_k^{\sigma} q_k^{\sigma - 1}} I_i \qquad (7)$$

The total demand for good *i*, produced in country *k* is, $X_{ik} = \sum_{j=1}^{n} X_{ijk}$.

For a single industry with many firms operating and producing different varieties of the good, a reasonable assumption is to consider that the actions of a single

[1] Under the assumption of monopolistic competition.

firm are independent of the expenditure level, I. The price elasticity of demand for the firm producing variety *k* is,

$$\mathrm{E}_p^d = \sigma + (1-\sigma)\frac{P_k^{1-\sigma} b_k^{\sigma} q_k^{\sigma-1}}{\sum_k^m P_k^{1-\sigma} b_k^{\sigma} q_k^{\sigma-1}} \tag{8}$$

Here the second term may be disregarded when the number of varieties is very large, and therefore, σ approximates to the elasticity of demand faced by the firm. This approximation is exact when the set of potential varieties is continuous and the set of varieties is of nonzero measure.

From equation (6a), we have that the ratio of sales of country *k* to country *j* with respect to the sales of country *l* to country *j* is,

$$\frac{X_{ijk}}{X_{ijl}} = \left(\frac{P_{ijk}}{P_{ijl}}\right)^{-\sigma_i} \left(\frac{b_{ijk}}{b_{ijl}}\right)^{\sigma_i} \left(\frac{q_{ik}}{q_{il}}\right)^{\sigma_i - 1} \tag{9}$$

where country *l* is another source of a product in set *i*, different from country *k*, X_{ijl} are exports from country *l* to country *j* in product set *i* and P_{ijl} are the relevant unit-values. However, what we observe in the real world is not a single variety, *l*, produced by each country; but the aggregate ΣX_{ijl}. Therefore, we suggest a normalization in order to approach for the number of brands that each country is actually producing. Suppose there are *h* varieties in country *k*, all with common *P*, *b* and *q*; *g* varieties in *l* again with common *P, b,* and *q*.

For each variety,

$$\frac{\sum_h X_{ijk}^h}{\sum_g X_{ijl}^g} = \left(\frac{P_{ijk}}{P_{ijl}}\right)^{-\sigma_i} \left(\frac{b_{ijk}}{b_{ijl}}\right)^{\sigma_i} \left(\frac{q_{ik}}{q_{il}}\right)^{\sigma_i - 1}$$

where *h=1,...,H; g=1,...,G*. The observed quantity is $\sum_h X_{ijk}^h$, $\sum_g X_{ijl}^g$;

The proposed adjustment gives,

$$\frac{\sum_h X_{ijk}^h \Big/ H}{\sum_g X_{ijl}^g \Big/ G} = \left(\frac{P_{ijk}}{P_{ijl}}\right)^{-\sigma_i} \left(\frac{b_{ijk}}{b_{ijl}}\right)^{\sigma_i} \left(\frac{q_{ik}}{q_{il}}\right)^{\sigma_i - 1}$$

Since we lack information on the number of branches of a commodity produced by each country, we use the number of firms in the correspondent industry in 1990 as a proxy of the number of firms and subproducts. Therefore, export volumes are deflated by number of firms producing good *i* in the supplying country. Let N_{ij} be the number of firms producing good *i* in country *j* at time *t*. Then, the observed export volume is given by,

$$V_{ijk} = \frac{\sum_h X_{ijk}}{N_{ij}} \tag{10}$$

From equations (9) and (10) we have,

$$\frac{V_{ijk}}{V_{ijl}} = \left(\frac{P_{ijk}}{P_{ijl}}\right)^{-\sigma_i} \left(\frac{b_{ijk}}{b_{ijl}}\right)^{\sigma_i} \left(\frac{q_{ik}}{q_{il}}\right)^{\sigma_i - 1} \tag{11}$$

Equation (11) shows the relative demand for exports as a function of relative prices, relative quality and relative preference bias. The relative demand of variety *k* increases when its relative quality rises and when the taste for this variety is more pronounced, while it decreases when its relative price increases. Income does not appear as an explanatory variable because preferences are homothetic. Since income elasticities are unitary, income distribution issues can be ignored[2]. Considering that industrialized countries in general and the European Union's members in particular have similar income elasticity of imports,[3] (excluding Greece), this assumption seems plausible.

[2] Income effects are also ignored in Smith and Venables (1988), and Venables (1994), Chapter 2 in "Empirical Studies of Strategic Trade Policy", edited by P. Krugman and A. Smith.
[3] See Krugman, 1989.

Equation (11) highlights the fact that taste differences across countries are an important determinant of the demand for exports. Few attempts have been directed to the empirical evaluation of taste preferences across countries in the literature. For example, in this context, Smith and Venables (1988) and Venables (1994), include a parameter reflecting taste preferences in their models. However, in the calibration of their models they assume that taste parameters are equalized in the markets that are liberalizing; this means that consumers in country *j* are supposed to display no taste differences among the products of any other countries. In their work, this assumption reflects their focus on the effects of a reduction in protection, since any market share changes, apart from transport costs, are then due to tariff reductions. Brenton and Sinclair, (1996), analysed Britain's export performance and estimated an export-demand model where preference bias was identified through the use of country-dummies and quality changes were identified with time-dummies. Their results support in some cases a "gravity effect".

Finally, equation (11) also stresses that relative quantities exported to a foreign market depend upon the qualities of the products being sold. Little formal work has been done to quantify these effects in the framework outlined above[4]. This is mainly due to the complexity of the variable quality and associated difficulty of measuring it. Several approaches could be taken to this end. Quality can be defined as the willingness of a consumer to purchase a product that cannot be explained by income, prices or tastes. Alternatively, one could adopt the view that any change in the physical characteristics of a good could represent a change in quality. The latter approach is more accurate but at the same time is only feasible when only a group of different varieties of a commodity is under study and the identification and measurement of the

characteristics of each variety is possible. This is not the case here since we aim to study different sectors and the time dimension is important in the analysis[5].

3. Data and sources

Ten products have been selected for econometric investigation. These belong to several larger industries export-oriented, whose shares in Spanish total exports are substantial. All the products are classified as differentiated goods according to Rauch (1999) classification, therefore we have disregarded products whose prices are fixed in organised exchange markets or those with referenced prices. The reason for doing that is that we want to analyse products for which the quality dimension is important. The products are leather footwear, glazed ceramic sets, printed books, tyres, preserved vegetables, vacuum cleaners, electronic lighting, medicaments, machinery and furniture of wood. A full list is appended in Appendix 1, with the numerical Standard International Trade Classification (SITC) code for each.

The data set comprises relative Spanish-UK exports to Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Sweden, Britain and United States. The period covered by the data set is 1970 to 1996, although for some products we have an unbalance panel with some data starting in 1978 or 1980. The data are annual. They are based on the five-digit SITC classification. Export data are from the International Trade by Commodity Statistics data base (OECD-2000). Export volumes were deflated by the number of firms in the correspondent industry (ISIC code) as a simple proxy for the number of firms and subproducts included in each category. The number of firms

[4] Brenton and Sinclair, (1996), estimated relative quality changes of UK exports in the last two decades.

are from OECD/GD(96) 128 the UK and from the Instituto Nacional de Estadística (INE) for Spain.

As discussed above, the empirical analysis consists on using relative research and development expenditures as a proxy of relative "quality". It is generally believed that non-price competitiveness can be achieved via high research and development spending. Industries that spend relatively more on R&D find that their share of an export market increases as competitiveness improves. R&D data are from the ANBERD data base (OECD 1998). Production data are from STAN data base (OECD 1998).

4. Empirical Application

The data is pooled across export destination for relative Spanish-UK exports for each commodity. The same long-run parameters are being imposed across the different export markets but differing short-run price elasticities are allowed. Spanish-UK relative exports is based on the estimated equation,

$$\ln\left[\frac{X_{ijk}}{X_{ijl}}\right]_t = \delta_{ij} + \beta_{0i} ln\left[\frac{p_{ijk}}{p_{ijl}}\right]_t + \gamma_{it}\,\beta_{1i} ln\left[\frac{q_{ik}}{q_{il}}\right]_t + \beta_{2i} ln\left[\frac{X_{ijk}}{X_{ijl}}\right]_{(t-1)} + \beta_{3i} ln\left[\frac{p_{ijk}}{p_{ijl}}\right]_{(t-1)} + \mu_{ijkt} \quad (12)$$

where X_{ijk} (X_{ijl}) are countries k's (l's) exports to country j in year t for product i. P_{ijkt} (P_{ijlt}) are country k's (l's) export unit values for exports to country j in year t for product i. α_i is the constant. q_{ik} (X_{il}) are countries k's (l's) R&D investment as a proportion of production in year t for product i . Country specific fixed effects are included in the regression to capture the relative intensity of preference between

[5] The period under study is 27 years, to observe changes in the physical characteristics of different goods along three decades is practically unfeasible.

Spanish and UK exports in country j. β_{0i} represents the elasticity of substitution between commodities that we expect to vary across products groups.

Since dynamic models are more appropriate for time series data, all regressions have been run with the lagged value of the dependent variable and the price-ratio terms added as explanatory variables. In dynamic panels, the inclusion of a lagged dependent variable rules out simple estimation techniques. The main problems arise from the heterogeneity of the model parameters, an issue extensively covered by Pesaran and Smith (1995). These authors pointed that although it is implausible that the dynamic specification is common to all countries, is it likely that the log-run parameters of the model may be common. The regressions are estimated by seemly unrelated regressions with fixed effects. Short-run coefficients to vary across importers while long-run coefficients are restricted to be equal, following Pesaran and Smith (1995).

The main features of the regression results are presented in Table 5. The preferred estimation method is in most cases the Seemly Unrelated Regression with fixed effects. The Hausman χ^2 statistic test for the orthogonality of the random effects and the regressors. A significant test statistic indicates a high importance of group-specific effects and their correlation with the right-hand variables. In such a case the random effect estimates are significantly inconsistent, but under the null hypothesis they are both efficient and consistent. The results reveal that only the fixed effects are consistent since we cannot accept the null hypothesis of no correlation in any case.

We observe that the elasticity of substitution differs widely across industries. It is greater than one in most cases. Relative quality improvements for Spanish exports appear to have been substantial in electronics, ceramic sets and vegetables; books; footwear and furniture.

The country-dummy coefficients show a mixed picture. In the Spanish-UK regressions, Portugal and France displays a significantly positive coefficient in seven of the ten products. This tells us that Portuguese and French residents have a clearly stronger bias in preference to Spanish, as against British products in eight of ten products. This could be expected on the basis of relative proximity, which is known to exert a powerful influence on bilateral trade volumes (gravity effect). Similarly Irish consumers have a tendency to have a preference for British products. For the more sophisticated products, customers in any destination market always prefer medicaments from Britain against Spanish medicaments. For other machinery Britain products are almost always preferred.

4. Conclusions

In this paper we have analysed how relative demand for Spanish-UK exports depends on relative prices, product quality and preference bias. We have selected ten differentiated products at a high level of disaggregation (5-digit level SITC). These are products heavily traded by the selected sample of countries.

Our empirical results show that the elasticity of substitution is very different across products and it is consistent with expected. A second finding is that relative quality improvements for Spanish-UK exports have occurred mainly in ceramic sets and electronics.

The preference bias parameter shows a clear gravity effect. For example, Portuguese residents have a clearly stronger bias in preference to Spanish, as against UK products. Likewise, Irish consumers favour British goods over Spanish goods. Moreover, there is some evidence in the results showing that electronics and medicaments have a country preference bias for the UK, relative to Spain. One

plausible explanation will be the role of differences in technology in explaining the demand for exports.

Relative quality improvements for Spanish exports with respect to Britain appear to have been substantial in ceramic sets, vegetables and footwear, medicament, machinery, tyres and vacuum cleaners. The results should be interpreted as a first attempt towards the measurement of preference differences and quality. The introduction of additional factors as explanatory variables is an area of further research to see whether the results can be refined (e. g. number of patents as a proxy for quality).

Finally, the findings of this paper might be at variance with the conventional view that preferences are similar across countries. They also suggest that any industrial policy needs to incorporate quality considerations.

Table 1. Geographic structure of Spanish exports

Destination of Spanish Exports						
% Shares over total exports	1970	1975	1980	1985	1990	1996
UE	53.03	51.49	54.61	54.83	72.17	71.32
Asia	3.10	9.08	11.23	12.92	6.51	8.17
NAFTA	16.63	12.45	8.26	11.97	7.54	5.12
Central and South America	11.83	9.28	8.42	4.91	2.87	5.53
Africa	7.71	10.74	11.40	8.45	4.63	3.54
Oceania	0.72	0.57	0.37	0.55	0.32	0.40
France	10.34	13.68	16.51	15.51	20.63	20.12
Germany	12.13	10.92	10.37	9.99	13.59	14.60
Italy	6.58	3.42	7.82	7.02	10.66	8.73
Portugal	2.92	2.17	2.73	2.18	6.13	8.76
United Kingdom	8.82	7.58	7.02	8.44	9.05	8.29
Netherlands	5.24	4.94	3.83	5.48	4.73	3.41
Belgium-Luxembourg	2.15	3.18	2.68	2.53	3.06	2.96
Greece	0.37	1.27	0.55	0.39	0.76	0.97
Sweden	1.55	1.35	1.01	0.94	0.97	0.91
Austria	0.40	0.48	0.37	0.43	0.72	0.84
Denmark	1.07	0.87	0.53	0.62	0.55	0.62
Norway	0.74	0.47	0.47	0.55	0.55	0.37
Finland	0.38	0.90	0.40	0.41	0.43	0.29
Ireland	0.32	0.26	0.33	0.34	0.34	0.45
United States	14.11	10.51	5.52	9.94	5.85	4.17
Canada	1.29	1.16	0.71	1.02	0.63	0.43
Japan	1.10	1.19	1.28	1.30	1.15	1.20

Table 2. Composition of Spanish exports (percentage of total)

Composition of Spanish exports						
Sectors:	1970	1975	1980	1985	1990	1994
Food, Beverages & Tobacco	24.65	12.82	11.43	9.67	9.19	9.56
Textiles, Apparel & Leather	14.06	14.60	9.90	9.98	8.08	7.41
Wood Products & Furniture	3.01	2.44	2.10	1.81	1.66	1.53
Paper, Paper Products & Printing	4.39	4.28	4.35	3.36	3.27	3.18
Chemical Products	15.30	14.48	16.74	23.17	18.72	15.07
Non-Metallic Mineral Products	1.97	4.21	4.99	3.39	3.55	3.97
Basic Metal Industries	5.89	9.74	14.17	13.21	7.22	6.75
Fabricated Metal Products	29.66	36.05	35.19	34.40	46.91	51.12
Other Manufacturing	1.06	1.38	1.12	1.00	1.05	0.96

Table 3. Geographic structure of British exports

	1970	1975	1980	1985	1990	1995
EU	28.3	32.3	42.2	48.8 (12)	57.3	57.5
Japan	1.2	1.5	1.7	2	2.5	2.5
US	11.4	8.9	9.5	14.8	12.6	12.1
Africa	10.6	10.8	8.7	5.4	3.6	3.1
Oceania	5.4	4.5	2.2	2.3	2	1.7
Germany	5.6	6.4	10.4	11.4	12.7	13
Italy	4.2	5.9	7.4	9.9	10.5	9.7
Ireland	5.3	4.6	5.4	4.6	5.1	5.2
Sweden	4.1	4.2	3.3	3.9	2.6	2.6
Italy	2.6	2.9	3.8	4.4	5.4	5
Spain	1.8	1.7	1.5	2.1	3.6	4.6

Table 4. Composition of UK exports (percentage of total

	1975	1980	1985	1990	1995
Agriculture	2	2	2.2	1.8	1.5
Mining	5.4	15.6	19.5	7.6	7.2
Manufacturing	92.6	82.5	78.3	90.6	91.3
Food	6.2	5.4	5	5.5	6.4
Textiles	6	5.3	4.5	5	4.9
Wood	0.2	0.2	0.1	0.2	0.2
Paper	2.1	1.9	2	2.7	2.9
Chemicals	17.1	17.1	18.4	17.4	18.7
NMM	1.7	1.4	1.1	1.3	1.2
Basic Metals	6.3	5.9	4.3	5.3	4.6
Metal manufactures	49.2	41.5	39	48.2	48.9
Others	3.9	3.6	3.8	5.1	3.5

Table 5. Elasticity of substitution, country preference bias and relative quality of Spanish exports, 1970-1996: comparison of Spanish and British exports

Product	Estimation Technique	Long-run Coefficients	Country Preference Bias	Time period	$\overline{R}^2$
Books	SUR, FE χ^2(3d.f.)=27.14	EoS: 1.22[h] R&D: 0.63[h]	Spain: Rest Britain: IR, JA, NO, DK, SW	1976-95	0.87
Ceramics	SUR, FE χ^2(3d.f.)=32.65	EoS: 1.08[h] R&D: 0.80[h]	Spain: Rest Britain: IR	1976-95	0.82
Electronics	SUR, FE χ^2(3d.f.)=58.33	EoS: 1.67[h] R&D: 1.34[h]	Spain: Rest Britain: DK, IR, JA, NO, US	1978-92	0.85
Footwear	SUR, FE χ^2(3d.f.)=22.53	EoS: 0.79[h] R&D: 0.62	Spain: Rest Britain: FI, IR, JA, NO	1976-95	0.91
Tyres	SUR χ^2(3d.f.)=55.60	EoS: 0.97[h] R&D: 0.51	Spain: Rest Britain: FR, PO	1979-94	0.93
Vegetables	SUR, FE χ^2(3d.f.)=63.92	EoS: 0.88[h] R&D: 0.39[h]	Spain: Rest Britain: IR	1976-95	0.95
Vacuum Cleaners	SUR, FE χ^2(3d.f.)=26.18	EoS: 1.47[h] R&D: 0.83[h]	Spain: None Britain: All	1979-94	0.81
Medicaments	SUR, FE χ^2(3d.f.)=34.27	EoS: 1.32[h] R&D: 0.81[h]	Spain: None Britain: All	1981-95	0.64
Machinery	SUR, FE χ^2(3d.f.)=93.62	EoS: 1.02[h] R&D: 0.66[h]	Spain: PO Britain: Rest	1986-96	0.54
Furniture of wood	SUR, FE (Cr.W.) χ^2(3d.f.)=47.20	EoS: 1.27[h] R&D: 0.40	Spain: Rest Britain: DK, IR, NO, US	1981-95	0.80

Notes: SUR: Seemingly Unrelated Regression, FE: Fixed Effects. When fixed effects are positive signed, products from Spain are preferred in the correspondent destination market. Countries: AU, BL, CA, DK, FI, GE, IR, IT, JA, NT, NO, PO, SW, UK, US: Austria, Belgium-Luxembourg, Canada, Denmark, Finland, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Sweden, Britain and United States.

EoS = Elasticity of Substitution

R&D = Coefficient on research and development

[h] Significant at 1%.[s] Significant at 5 %.

χ^2(3d.f.): Hausman test , three degrees of freedom.

The standard errors are heteroskedasticity consistent.

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Appendix 1. List of selected product and their corresponding SITC codes

05459	*Vegetables prepared/preserved otherwise than by vinegar*
54179	*Medicaments containing other substances*
62599	*Tyres, tyre cases, interchang. treads/flaps*
66245	*Glazed ceramic setts, flags and paving*
72848	*Other machinery having individual functions*
77571	*Vacuum cleaners and floor polishers*
77832	*Electronic lighting and signalling equipment, defrosters etc.*
82192	*Furniture of wood*
85102	*Footwear with outer soles of leather*
89211	*Printed books, booklets, brochures, leaflets*

Graph A1. Percentage over total exports of Spanish selected products