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Linder Revisited: Trade and Development in the Spanish Economy

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ABSTRACT *The literature has tended to treat Linder's hypothesis with excessive simplicity given the absence of any formalization for this intuitive theory on trade potential in manufacturers, closely related to the intra-industry trade paradigm. Against this background, in this paper we first propose a complete empirical model of bilateral trade containing all the determinants suggested by Linder, with special emphasis being placed on non-homothetic preferences, national income distribution, international economic convergence and geographic distance. We then test the model in an appropriate case, namely that of Spain during the period of its economic transition running from approximately 1959 to 1986. This period was characterized by increasing openness and structural change, as well as by convergence until that country's integration into the then European Economic Community. The results confirm the importance of the characteristics of internal demand, essentially of income distribution and non-homothetic preferences. We find that trade horizons delimited by bilateral proximity in development and geographical distance, together with multilateral convergence in economic development are the main indicators for selecting trade partners as markets and suppliers, thereby reinforcing the idea that foreign markets can be considered as an extension of the national market.*

KEY WORDS: Economic development; international trade; demand; economic convergence

Introduction

The traditional explanations of international trade place emphasis on the role played by factor endowments as determinants, with priority being given to the supply side. However, during the last few decades it has been argued from different perspectives that trade between industrial countries cannot be satisfactorily explained from this single viewpoint. From amongst the earliest alternative approaches, we find that of Linder (1961). His approach has come to be usually identified with the demand side, and as Leamer and Levinsohn (1995, p. 1383) have written, 'while Linder did not have a formal model, he had a compelling story'. This reaction has caused his theory to enjoy a certain degree of success and

to be included amongst the explanations of trade even in the standard texts. However, it has also led to a relative paucity in the number of critical tests to which it has been subjected and to the stylisation of his ideas. In this regard, the most frequently adopted line has been to test whether greater differences in income between trading partners imply less trade.[1] In our view, although this relationship captures an essential aspect of the approach, it nevertheless tends to oversimplify what is a complex argument. Linder considers potential trade to be explained by the so-called 'trade-creating forces', whilst certain 'brakes' will deviate real trade away from its potential, with the pattern of trade and the trading partners of each country being determined by this conjunction of trade creating and braking forces.

In this paper, we reconsider Linder's original arguments, before going on to propose and test a model which reflects the richness of this theory, with which we offer what we believe to be two novel contributions. The first is an attempt to systematise and include in the model a broad range of trade determinants considered by Linder, which is not direct; rather, it has required the *ad hoc* construction of variables in order to approximate them in an adequate manner. The second is the way in which we combine the econometric technique of panel data and SURE estimations in testing Linder's theory. This allows us to adopt a dynamic and relative perspective, particularly appropriate for this theory, by using cross-section analysis over the length of the economic transition period, and a simultaneous analysis of exports, imports and two-way trade.

The model we propose to test the explanation of trade proposed in Linder's theory is applied to Spanish foreign trade during the period of economic transition, from the Stabilisation Plan of 1959, which signalled the liberalisation of foreign trade, to the entry of Spain into the European Economic Community in 1986. During this period of a little over 25 years, both the size and the composition of Spanish productive structure and international trade underwent significant change. At the same time, there was a convergence between its levels of per capita income and those of the industrialised countries. The following data clearly illustrate it: the coefficient of foreign openness was some 13.7% of GDP in 1960, and reached 33.1% in 1985; the proportion of food, drinks, vegetable oils and fats in Spanish exports, which totalled 55.4% in 1960, had fallen to 16.2% by 1985, whilst that of industrial manufactures increased during the same period from 30.3% to 81.5%; and that of raw materials and energy products, fell from 14.3% to 2.3%. It should also be noted that during this period the direction of Spanish export flows did not substantially change, with approximately two thirds of the total going to OECD countries at both the beginning and at the end of the period in question.

Convergence in per capita income to developed countries continued after Spain's entry into the then EEC, but phenomena 'appropriate to the successive enlargements of the regional block, with significant trade creation and diversion' are now introduced into the experiment. In the Spanish case, this gives rise to the usual results of the fall in exports and increase in imports, subsequently followed by the significant creation of trade with Community partners, together with the deviation of trade from the other OECD countries. The case under analysis has particular current interest as a 'precedent in order to better understand the transition of the Central and Eastern European countries' from the earliest reforms aimed at macroeconomic stabilisation and opening of the economy to the exterior until the integration of these countries into the European Union (EU) and represents a period during which political transition is cemented in place (Frankel *et al.*, 1997, p. 241).

The rest of the paper is organised as follows. In the next section we consider Linder's theory and its subsequent developments, placing particular emphasis on the theory underlying his concepts of creating and braking forces for trade. These two concepts act as the basis of our model, which is described in the following section. The penultimate section is devoted to the estimation of this model and the presentation of the results, while the final section reviews the main conclusions.

The Underlying Theory. Linder and Subsequent Developments

In his *Essay on Trade and Transformation*, Linder (1961) challenged some beliefs on the theory of international trade at that time, particularly the Heckscher–Ohlin theorem. While relative endowments of productive factors provided an explanation both for exchange in differentiated goods and the countries with which such trade was established, the type of trade which was enjoying the strongest rate of growth at that time was in goods of similar characteristics and between countries with comparable levels of development. Linder's theory tried to provide an answer to these two aspects, namely the pattern of trade and the trading partners that correspond to each country, by adopting an original bilateral approach and suggesting that it is possible to choose markets and suppliers, and to use the potential trade approach as a scope for trade.

Another original characteristic of Linder's theory is the emphasis it places on the dynamic aspects of the relationships between trade and development. The growth experienced by a country modifies its demand structure and, thereby, the range of both potential and real exports, explaining how the pattern of trade changes over time. Within this scope of potential trade, actual trade is determined from a set of factors that tend to strengthen it, the so-called trade creating forces, and others which tend to limit it, the so-called trade braking forces, in this way offering an underlying theoretical basis for prediction. Trade will take the concrete form of a trade in varieties, in such a way that those in greater demand within the country will be exported—the so-called expansion thesis—while those in less demand will be imported. This illustrates the point of contact between the essentially empirical thesis of intra-industry trade and Linder's approach; for example, on the basis of the latter, differences in the quality of tradable products could be known *a priori*, according to the level of development and the income distribution of the trading partners. In reality, as Gray (1988) suggests, we should speak more of a 'paradigm' rather than a 'model' of intra-industry trade, with one of its elements being Linder's approach. Although a number of differences persist between the usual formulations of intra-industry trade and those derived from Linder, there has also been some convergence, as long as both national and sectorial conditioning factors are considered.

At this point it is appropriate to briefly consider the trade creating and braking forces in Linder's theoretical structure, as well as their subsequent developments, as the basis of the model to be tested.

The Trade-creating Forces

It is well known that Linder turned his attention towards demand when seeking to explain trade, rather than considering it as simply a question of supply and relative prices. According to his thinking, certain of the demand characteristics of two

countries would act as decisive factors in explaining potential trade, and it is this aspect that has been developed in a significant part of the subsequent literature. However, he also considered monopolistic competition as a possible factor in the growth of intra-industry trade, by virtue of the differentiation of the goods, whether real or created by advertising.

According to Linder, the relationship between demand and international trade can be established in two ways, that is to say, through the complementarity of the demand structures of two countries and through the degree of representativity of the demand for common products. The determinants of the demand structure are the modal or median per capita income,[2] the income-elasticity of demand in the different types of goods and cultural factors. The dispersion around the average income will extend the range of varieties demanded, and thus contribute towards shaping the demand. Furthermore, and as can be deduced from Engel's law, by increasing per capita income, the same necessity is satisfied with more sophisticated and higher quality goods, at the same time as other goods are demanded with the emergence of new necessities. With respect to the degree of representativity of demand, when this is greater, the probability of exporting will be higher whilst a minority demand will be satisfied with imports.

Subsequent theoretical developments in the analysis of demand using models inspired by Linder have concentrated on three topics. First, the association between the level of income and the demand for quality, on the basis of consumer preferences expressed in terms of the characteristics of the goods and not just in terms of quantities. This approach allows us to explain why economic growth leads to a higher horizontal differentiation of products and to an increase in the average quality or sophistication that is demanded.

The second topic refers to the existence of non-homothetic preferences. The growth in income affects the demand for different goods in different ways, giving rise to structural changes. The usual models of international trade assume identical and homothetic preferences. It was Markusen (1986) who used Linder's observation that people with similar per capita incomes consume similar sets of goods. Logically enough, the change in the structure of demand will have implications over the composition of trade,[3] in that the greater the non-homothetic nature of demand, the more intense will be the trade between two countries with similar per capita incomes.

The third topic refers to the distribution of income and preferences within countries. This is an essential point when considering the possible overlapping of demands and defining the varieties or qualities of a good to be traded. However, the theoretical framework is somewhat diffuse. The usual models of international trade leave the details to history or chance, but Linder's ideas allow us to be more exact. With an even income distribution, it would be possible to represent each country by its average income and one single quality in its demand. However, with an uneven distribution around an average, a range of qualities will be demanded for each type of product; there will be vertical differentiation, with better quality products being preferred to others when income is concentrated at higher levels and vice-versa. This explains our interest in introducing dispersion of income, given that it will exert an influence over trade in an aggregate form and by way of the range of varieties that are susceptible to trade, as well as in the distribution of preferences within this range for each sector.[4] Following Lyons (1984) two spatial spectrums of specialisation and trade, namely 'split' and 'interleaving'.

In the split pattern, preferences are concentrated in close varieties that are produced locally, allowing them to be exported, whilst varieties with a lower demand are imported. In the interleaving pattern, preferences overlap in the two countries, leading to an increase in two-way trade, with each local variety competing with a foreign variety that covers trading costs. An approximation to the degree of concentration of preferences can be made with the help of the median per capita income.

According to Linder, product differentiation is another trade-creating force, although this aspect was hardly developed in his work. However, it has subsequently received a great deal of attention, above all in relation to the size of the market. In Linder, size only appears as a conditioning factor in the volume of trade, given that he thought it was appropriate to work with propensities, that is to say, to regard trade as relative to the size of the trading partners. In subsequent literature, size also conditions the possibilities of diversification and manifests itself in volume and specialisation; that is to say, it has not only a quantitative but also a qualitative influence.

A number of papers maintain that a large country will present a higher volume of exports in manufactures.[5] Moreover, exports can be specialised in standardised or differentiated products. The empirical works are usually based on Helpman (1981), considering that similar sizes means a similar capacity to differentiate products, fostering interindustry trade. Thus, similarity in size could be considered as a trade-creating force. However, Hufbauer (1970) or Kindleberger (1970) have paid attention to the way scale economies are taken advantage of in different ways according to size, as well as to the specialisation of the rich and small countries in differentiated products and of large countries in standardised goods.

The possible influence of size in specialisation leads us to propose the hypothesis that, with respect to each level of per capita income, size causes the country of reference to export standardised goods to and import differentiated goods from its small sized trading partners, and to export differentiated goods to and imports standardised goods from its large sized trading partners. As the size of the trading partner grows, so exports are stimulated and imports inhibited in the differentiated product sectors of the reference county, while the opposite occurs with standardised products. Thus, differences in size can also represent a trade-creating force, especially if product differentiation is not relevant.

The Trade-braking Forces

Brakes on trade are considered as those factors that cause real trade to deviate from potential trade. The three factors explicitly recognised by Linder are the use of scarce factors in the demanded goods, distance and human-made trade obstacles. The use of scarce factors is the main connecting point with the Heckscher–Ohlin theorem; Linder argued that the intensive use of a scarce factor in a variety included within the overlapping of demand is a source of cost disadvantage. So far as distance is concerned, this implies that firms cannot extend their trading horizons without costs, given that they have to face transport and organisation costs, amongst others. For their part, the obstacles imposed by people, such as tariffs, also have a trade-braking effect on trade above and beyond any geographical factor.

Subsequent developments of Linder's work have similarly placed emphasis on the role played by information flows and limits on potential trade. Vahlne and

Wiedersheim-Paul (1977) have attempted to reflect this with the concept of "psychological distance", which takes the form of differences in the level of development, the number of local languages or firms, the different levels of general or technical education and the absence of earlier trading channels as different sources of transaction costs.

A final brake on the potential trade of a country could take the form of its economic isolation, the result of a divergence in its growth path from that of its neighbouring countries. A country that finds itself isolated for this reason will have limited trading horizons, although the opposite will be the case for a country that is converging with a group of more advanced countries; in this latter case, the process of growth and drawing together will act as a trade-creating force. Linder spoke of the relevance of the acting or reacting position of a country, although he did not refer to it expressly as a trade creating or braking force. However, Hufbauer (1970) subsequently considered isolation as a brake on trade, a position that we adopt in this paper.

The Test: Proposal, Sources and Model

The test we propose tries to explain Spanish bilateral foreign trade in manufactures during the period of economic transition, 1959–1986, on the basis of a set of variables that approximate the determinants included in the theoretical structure described in the previous section. The model has been tested by way of the panel data econometric technique; at least to the best of our knowledge, it has not been previously employed for that purpose.[6] Similarly, the panel data technique has been combined with the SURE method in order to simultaneously test Linder's thesis in both imports and exports and in two-way trade, and taking into account the existence of fixed or random effects in each case.

The sample of OECD countries makes up the income scope, in the sense used by Linder (1961) and also Hufbauer (1970), with the Spanish position as an intermediate developed country. In the function of the available statistics, we have constructed a panel of data with a sample of 18 countries,[7] and which divides the period under study into five cross-sections, namely 1966, 1970, 1975, 1980 and 1985.[8] The type of goods considered are manufactures, which Linder himself concentrated on in his theory. This has required that we draw the equivalence between the International Standard Industrial Classification (ISIC) and the Standard International Trade Classification (SITC), in order to be able to relate the internal demand for manufactures with the foreign trade by reference to products and to construct all the necessary variables under this condition. The data sources are detailed for each of these variables. The general model to be tested has the following expression:

$$T_{jtm} = \Phi(TH_{jtm}, M_{jt}, CM_{jt}, D_{jt}, DIV_{jt}, H_{jtm}, CH_{jtm}, h_{jtm}, SD_{jtm}, O_{jt}) \quad (1)$$

where variables refer to partner j, year t and manufactures m. T_{jtm} is the bilateral trade in manufactures between Spain and partner j at time t; TH_{jtm} are the trade horizons (the expected sign is '–', as indicated in brackets for the rest of the variables); M_{jt} is the median per capita income in partner j (+); CM_{jt} is the comparison between medians (+/–); D_{jt} is the dispersion of per capita income in partner j (+/–); DIV_{jt} is the divergence from average development (–); H_{jtm} is the

Hufbauer index for technological product differentiation in manufactures (+); CH*jtm*, comparison between technological differentiation (+/–); h*jtm* is the horizontal differentiation (+); SD*jtm* is the market size difference (+/–); O*jt*, is the trade orientation (+).

*Endogenous Variables: Bilateral Trade (*T*jtm)*

The model tries to explain Spanish imports, exports and intra-industry trade in both directions. These aspects are reflected in the following three endogenous variables, where $X^S jtm$ are the exports of manufactures from Spain to country *j*; $M^S jtm$ are the imports of manufactures into Spain from country *j*; Y*jt* is the GDP for country *j* and year *t*, expressed in US dollars using the PPP exchange rate in accordance with OECD (1991) data; $Y^S t$, ditto for Spain.

$$\mathrm{T}jtm = \begin{cases} X^S jtm / \mathrm{Y}jt & \text{Export propensity or partner's propensity to import manufactures from Spain} \\ M^S jtm / Y^S t & \text{Import propensity or Spain's propensity to import manufactures} \\ \{1 - |X^S jtm - M^S jtm| / (X^S jtm + M^S jtm)\} * 100 & \text{Aggregate intra-industry trade, or two-way trade, measured by the Grubel and Lloyd Index (IIT } jtm) \end{cases} \quad (2)$$

Exports and imports are expressed in US dollars using the current exchange rate, with the data being taken from the Foreign Trade Statistics of the Spanish Directorate General of Customs (*Estadísticas de Comercio Exterior de la Dirección General de Aduanas de España*).

Exogenous Variables

They are presented in four separate blocks, in which we try to reflect the main types of trade determinants according to the theoretical structure considered in Section 2, namely demand, the dynamic of convergence or economic isolation, monopolistic competition and barriers to trade. The characteristics of demand are the hallmark of Linder's theory and illustrate the role of demand structures in trade, with these being approximated by the level and distribution of income. In this paper we reflect these characteristics in the following four variables:

Trade horizons (TH*jtm*)

$$\mathrm{TH}jtm = \mathrm{L1}jtm / \mathrm{g}j^S \quad (3)$$

where

$$\mathrm{L1}jtm = |\mathrm{E}jtm - \mathrm{E}^S tm| \quad (4)$$

E*jtm* is the internal demand structure in manufactures *m* for *j* and year *t* ($E^S tm$ is the same for Spain), where $\mathrm{E}jtm = \varepsilon jm * \Psi jt / \mathrm{Y}jt$; Ψjt is the per capita income for

country j (GDPj) and year t; εjm is the per capita income elasticity for internal demand in manufactures and country j, estimated from time series 1970–85:

$$\log \mathrm{ID}jtm = \alpha jtm + \varepsilon jm * \log \Psi jt \tag{5}$$

IDjtm: internal demand in manufactures for country j and year t, measured by apparent consumption—Production (Pjtm) plus Imports (Ijtm) minus Exports (Xjtm). ID, Y and Ψ are expressed in US dollars using PPP exchange rates, in order to take into account national inflation rates and make purchasing power internationally comparable. All these data are taken from OECD (1995), and g_j^S is the geographical distance between country j and Spain, expressed in nautical miles between the main trading cities in each country. Distance data taken from *Concepts Computerized Atlas* (1985).

Trade horizons depend upon distance and also upon the existence of non-homothetic preferences that will give rise to different internal demand structures for identical per capita incomes.[9] Evaluating this has obliged us to estimate the elasticity of internal demand in function of per capita GDP (εjm) with time series, and all this in PPP dollars[10] (the values are presented in Table 1). Internal demand (IDjtm) is approximated by multiplying the per capita GDP by the corresponding elasticity. This is a proxy that uses the forecast of internal demand obtained from the estimation of its tendency over the level of development; in this way, it is an indicator of the internal demand of a country as this grows in GDPpc and allows for the evolution of demand to be different in each country.

Table 1. Per capita income elasticities of internal demand (1970–1985) (εjm)

		t-ratio	adj. R^2
Austria	0.872	51.250	0.99
Belgium–Luxemburg	0.812	25.039	0.98
Canada	0.992	30.615	0.98
Denmark	0.878	23.740	0.98
F.R. Germany	0.879	53.656	0.99
Finland	0.863	20.125	0.97
France	0.875	25.109	0.98
Greece	1.027	19.701	0.96
Italy	0.851	24.306	0.98
Japan	0.000	20.433	0.97
Netherlands	0.820	26.718	0.98
New Zealand	1.160	14.581	0.94
Norway	0.806	23.551	0.97
Portugal	1.122	26.182	0.98
Spain	0.810	16.073	0.95
Sweden	0.807	16.075	0.95
USA	1.069	41.619	0.99
UK	0.717	15.978	0.95

Where: log IDjtm = ajtm + εjm * log Yjt; IDjtm, internal demand in manufactures for country j and year t, measured by apparent consumption; Ψjt, per capita income (GDP) for country j and year t.
Sources: IDjtm, production, exports and imports from OECD (1995); Yjt and Njt, GDP and population from OECD (1991).

The demand structure (E*jtm*)is approximated as its proportion in the GDP of each year, while the bilateral comparisons are made with the absolute differences between the structure of each trading partner and that of Spain. Once having calculated the data, we construct the variable TH*jtm*, which can be interpreted as an *interaction* variable between the difference of the internal demand structure and the distance. Specifically, given a determined geographical distance, trade will be more intense between partners with a similar demand structure, while for a given degree of similarity, trade will be more intense between partners who are closer to one another. This variable can also be interpreted as a weighted difference of the internal demand structures; in this way, a lower weighted difference provides broader commercial horizons, while a larger difference limits such horizons, given that markets similar to the national one imply that international trade is really the *expansion* of the national market. As a consequence, limited trade horizons are a *brake* for trade and the expected sign is negative. The variable is similar to the "psychological distance" of Vahlne and Wiedersheim (1977) and to that used in gravity models.

Median per capita income of partner j (M*jt*). This has been approximated by the per capita income of the poorest 50% of the population, given the absence of information on median per capita income.

$$Mjt = mj * Yjt / 0.5\ Njt \qquad (6)$$

where m*j* is the percentage of income of the poorest 50% of the population in country *j* and N*jt* is the population in country *j* and year *t*. It provides information on the 'representative demand' of the country in three aspects. First, a higher median indicates a minimum income for the majority of the population and so, a greater purchasing capacity and exporting potential; second, a higher representative level of quality; third, a more uniform distribution of income and, therefore, a similar demand for each variety in the range. It is a creating force for exports, imports and intra-industry trade, and its expected sign is positive. The data used are the estimations of income distribution by quintiles made by the UN (1985)[11] (the income percentages that reflect the poorest 50% of the population and the procedures employed are presented in Table 2). The test is novel when proposed in this form, given that only Fortune (1972) has used the median in testing Linder, although in that case as an approximation of the demand structure rather than as the representative nature of demand itself.

Comparison between medians (CM*jt*). A dummy variable equal to one if the median of the trading partner is higher than that of Spain (M*jt* ≥ $M^S t$, where $M^S t$ is Spain's median) and equal to zero if it is lower (M*jt* < $M^S t$).

This indicates whether the representative qualities of the trading partner are higher or lower than those of Spain. Its interpretation, together with the sign of the variable median, allows us to identify a split or interleaving pattern. There will be a specialisation by the partner in higher qualities when the comparison between medians and the median are positive, and in lower qualities when it is negative. In other words, there will be a split pattern when the representative qualities are different and an interleaving pattern when they are similar, in which case the comparison between medians will be positive and the sign of median negative, or

Table 2. Percentages of median per capita incomes

Country	Median per capita income (%)
Austria	44.90
Belgium–Luxemburg	61.80
Canada	48.90
Denmark	50.10
FR Germany	26.95
Finland	55.20
France	42.10
Greece	na
Italy	na
Japan	63.90
Netherlands	58.10
New Zealand	48.00
Norway	51.90
Portugal	na
Spain	56.10
Sweden	51.90
USA	45.00
UK	51.20

Notes: na=not available.
Subsequently, the variable introduced into the model as M*jt* or median is calculated according to the formula:
M*jt* = m*j* * Y*jt* / 0.5 * N*jt* = 2 * m*j* * Ψ*jt*
where Y*jt* is the GDP expressed in PPP, N*jt* is the population and Ψ*jt* is the per capita income per country *j* and year *t*. m*j* is the percentage of income for the poorest 50% of the population in country *j*, estimated by interpolation between the income distribution quintiles.
Sources: Y*jt* and N*jt* from OECD (1991) Income distribution quintiles: UN (1985)

vice-versa. Once again, we cannot find examples of this variable being employed in empirical work. The closest reflection can be found in Davies (1975), Forstner and Ballance (1990) and Ballance *et al*. (1992), who approximate the level of quality of the traded products by way of their unit values.

Dispersion of per capita income in partner (Djt)

$$D_{jt} = (\Psi_{jt_{max}} - \Psi_{jt_{min}}) / \Psi_{jt} \quad (7)$$

$$\Psi_{jt_{max}} = Q5 * Y_{jt} / 0.2 * N_{jt} \quad (8)$$

$$\Psi_{jt_{min}} = Q1 * Y_{jt} / 0.2 * N_{jt} \quad (9)$$

where Ψ*jt* is the per capita income in partner *j* and year *t*. Q5 is the percentage of total income in the superior quintile of the income distribution, and Q1 that one in the inferior quintile, data given by UN (1985). N*jt* is the population in *j* and year *t*. So, $\Psi_{jt_{max}}$ and $\Psi_{jt_{min}}$ are the per capita income corresponding to the top and lowest quintile, respectively (see Table 3).

Table 3. Spread of per capita incomes (D*jt*)

1966	Minimum per capita GDP	Maximum per capita GDP	1970	Minimum per capita GDP	Maximum per capita GDP	1975	Minimum per capita GDP	Maximum per capita GDP
Austria	380.09	4285.57	Austria	547.16	6169.24	Austria	916.08	10,328.79
Belgium–Lux.	812.60	3703.00	Belgium–Lux.	1175.83	5358.21	Belgium–Lux.	1927.16	8781.99
Canada	675.50	6108.88	Canada	891.73	8064.32	Canada	1523.45	13,777.25
Denmark	543.06	5077.02	Denmark	739.20	6910.65	Denmark	1115.14	10,425.25
FR Germany	727.85	4803.78	FR Germany	1015.28	6700.82	FR Germany	1547.40	10,212.81
Finland	615.46	3673.20	Finland	901.53	5380.58	Finland	1512.35	9026.07
France	458.92	5725.04	France	659.45	8226.69	France	1051.10	13,112.46
Greece	na	na	Greece	na	na	Greece	na	na
Italy	na	na	Italy	na	na	Italy	na	na
Japan	705.37	2860.23	Japan	1256.84	5096.41	Japan	2030.79	8234.75
Netherlands	847.01	4640.66	Netherlands	1226.49	6719.76	Netherlands	1923.86	10,540.60
New Zealand	717.33	6287.22	New Zealand	850.00	7450.00	New Zealand	1338.19	11,728.86
Norway	568.71	4549.67	Norway	766.09	6128.70	Norway	1306.71	10,453.68
Portugal	na	na	Portugal	na	na	Portugal	na	na
Spain	531.27	3079.81	Spain	767.75	4450.72	Spain	1326.56	7690.18
Sweden	767.32	5617.90	Sweden	1069.45	7829.92	Sweden	1676.26	12,272.63
UK	715.38	5057.03	UK	940.62	6649.24	UK	1441.15	10,187.45
USA	820.85	8775.29	USA	1032.95	11,042.76	USA	1538.66	16,449.01

Table 3. *Continued*

1980	Minimum per capita GDP	Maximum per capita GDP	1985	Minimum per capita GDP	Maximum per capita GDP
Austria	1568.64	17,686.42	Austria	2149.51	24,235.77
Belgium–Lux.	3210.19	14,628.71	Belgium–Lux.	4288.08	19,540.62
Canada	2513.25	22,728.52	Canada	3551.27	32,115.85
Denmark	1804.46	16,869.63	Denmark	2638.62	24,668.07
F.R. of Germany	2649.49	17,486.62	FR Germany	3628.58	23,948.60
Finland	2498.54	14,911.93	Finland	3605.70	21,519.73
France	1737.38	21,673.77	France	2343.71	29,237.77
Greece	na	na	Greece	na	na
Italy	na	na	Italy	na	na
Japan	3571.07	14,480.50	Japan	5368.77	21,770.08
Netherlands	3060.96	16,770.61	Netherlands	4017.47	22,011.23
New Zealand	1841.13	16,136.93	New Zealand	2571.82	22,541.26
Norway	2346.72	18,773.77	Norway	3489.07	27,912.59
Portugal	na	na	Portugal	na	na
Spain	1990.46	11,538.92	Spain	2651.38	15,370.32
Sweden	2553.38	18,694.40	Sweden	3562.26	26,080.83
UK	2290.75	16,193.26	UK	3201.68	22,632.53
USA	2476.73	26,477.40	USA	3477.39	37,174.95

Notes: na=not available. The per capita GDP are expressed in thousands of PPP dollars. The spread of range of per capita income is calculated according to the following formula: Djt = (Ψjt max– Ψjt min)/Ψjt, where Ψjt max = Q5 * Yjt/0.2 * Njt, Ψjt min = Q1 * Yjt / 0.2 * Njt, Yjt is income of partner j in year t, Q5 is upper quintile in income distribution, Q1 is lower quintile in income distribution and Njt is population of country j in year t.
Sources: Yjt and Njt from OECD (1991). Q1 and Q5 from UN (1985).

This variable approximates the distribution of preferences around the average demand structure and it has not been used in any earlier empirical test. Kolhagen (1977) used the same procedure, but to calculate the overlapping demand, while Fortune (1972, 1979) used the variance in per capita incomes in a country to study the effects of the distribution over the volume of trade. The expected sign is positive for exports and intra-industry trade, in that more qualities will be traded when the number of varieties demanded in the domestic market is higher and, in this sense, it is a creating force for trade. With respect to imports, the expected sign is indeterminate, in that a wider range coming from the exporter could imply greater trade, but could also reduce the representative nature of its demand and become a brake for trade.

As regards the second block, that is to say, economic isolation or divergence in development and demand structures, the following variable can be used:

Divergence from average development (DIV*jt*)

$$\mathrm{DIV}jt = \left|\Psi jt - \Psi t\right| / \Psi t \tag{10}$$

Ψt is the sample average per capita income for every year t (t = 1966, 1970, 1975, 1980, 1985). This variable reflects the distance of the trading partner with respect to all the other markets and gives an idea of its position as an acting or reacting country. It tries to capture the changing configuration of the countries which results from their growth trajectories and demand structures: more particularly, how a pattern of behaviour characterised by a rate of economic development different from the average can limit trade horizons, given that this reduces the economic proximity to all the other markets. Furthermore, this proxy for international development and demand divergence seeks to qualify the bilateral comparisons between countries, in that being a country that is different from the majority will condition specialisation and, therefore, trade. This variable does not appear to have been introduced in earlier tests reported in the literature.

Turning now to the third block of determinants, the existence of monopolistic competition and its role in trade is specified in the following four variables:

Technological differentiation (H*jtm*) *and disparity within it* (HXM*jtm*). This is the significant differentiation in Linder's theory. H*jtm* is the Hufbauer index for technological product differentiation:

$$\mathrm{H}jtm = \mu jtm / \sigma jtm \tag{11}$$

where μjtm is the average of unit values of manufactures exports to partner j and year t, and σjtm is the typical deviation of unit values of exports to partner j. Unit values have been computed from the Foreign Trade Statistics of the Spanish Directorate General of Customs (*Estadísticas de Comercio Exterior de la Dirección General de Aduanas de España*). When this index is applied to exports and imports, it provides two different variables: H*jtm* = HX*jtm*, for exports and H*jtm* = HM*jtm*, for imports.

In the case of intra-industry trade, what is relevant is the similarity or difference between the strategies of both partners, and for this reason we have introduced a variable called disparity of technological differentiation (HXM*jt*).

This is the absolute value of the difference between the Hufbauer Index for imports and exports:

$$\mathrm{HXM}jtm = \left|\mathrm{HX}jtm - \mathrm{HM}jtm\right| \tag{12}$$

Its expected sign is negative, because a larger difference may result in a source of comparative advantage, and thus in lower intra-industry trade. Previously, Balassa (1986a, 1986b), amongst others, has used technological differentiation in the study of intra-industry trade.

Comparison between the Spanish technological differentiation strategies and those of its partners (CH*jtm*). A dummy variable that compares the Hufbauer indexes of exports and imports. It takes a value equal to one if the differentiation of Spanish exports is larger (HX*jtm*≥HM*jtm*) and equal to zero if the trading partner differentiates to a greater extent (HX*jtm*<HM*jtm*). Given that its formulation represents the possibility of an advantageous strategy for Spain, a positive sign is to be expected in the propensity to export, while we should expect a negative sign with respect to the propensity to import and an indeterminate sign with respect to intra-industry trade.

Horizontal differentiation (h*jtm*). This type of differentiation, which is usual in intra-industry trade studies, has been included in the intra-industry trade model. It has been approximated by way of the number of tariff positions in which there is bilateral trade, with each position being considered as a variety. The expected sign is positive, given that it indicates heterogeneity, which could be understood as variety. This measure is similar to that used by Tharakan (1984) or Loertscher and Wolter (1980). Data on the tariff position have been taken from the Foreign Trade Statistics of the Spanish Directorate General of Customs.

Difference in the size of the market (SD*jtm*)

$$\mathrm{SD}jtm = \left|\mathrm{ID}jtm - \mathrm{ID}^{\mathrm{S}}tm\right| \tag{13}$$

A larger market size is supposed to generate scale economies. A larger absolute difference between market size (internal demand) may result in a source of comparative advantage and so of import and/or export trade; a similar market size may result in monopolistic competition and intra-industry trade. This variable is similar to that used by various authors[12] based on Helpman (1981), who introduced absolute differences in GDP, but in this paper we consider industry market size. Similarities in size can generate trade in differentiated products, while differences in size can generate trade in differentiated products exchanged for standardised products, so both signs can be expected for this variable.

The fourth and final block refers to the barriers imposed by trade policy can be summarised in the trade orientation variable, as follows:

Trade orientation of the partner (O*jt*). A dummy variable equal to 1 if the country has a trade orientation greater than the average and equal to 0 if its orientation is smaller. O*jt* are the residuals of a cross-section analysis for each year; per capita trade (ρjt) regressed on per capita income and population.

Table 4. Average estimations of trade orientations (O*jt*)

1966:	$(Xjt+Mjt)/Njt = -0.009 + 0.538 * Yjt - 8.956 * 10^{-6} * Njt$
1970:	$(Xjt+Mjt)/Njt = -0.475 + 0.706 * Yjt - 1.247 * 10^{-5} * Njt$
1975:	$(Xjt+Mjt)/Njt = -1.336 + 1.085 * Yjt - 2.598 * 10^{-5} * Njt$
1980:	$(Xjt+Mjt)/Njt = -3.058 + 1.528 * Yjt - 5.930 * 10^{-5} * Njt$
1985:	$(Xjt+Mjt)/Njt = -2.648 + 0.957 * Yjt - 4.769 * 10^{-5} * Njt$

Note: X*jt* = total exports of country *j* in year *t*, M*jt* = total imports of country *j* in year *t*, N*jt* = population of country *j* in year *t*, Ψ*jt* = per capita GDP (PPP).
Sources: X*jt* and M*jt* from OECD (1995). Y*jt* and N*jt*: GDP and population from OECD (1991).

$$(Xjtm + Mjtm) / Njt = \alpha jt + \beta t * \Psi jt + \gamma * Njt \qquad (14)$$

This variable, used by Balassa (1986a, 1986b), can be considered as a synthesis of all the trade barriers imposed by man, as well as all the economic practices that affect trade and are not incorporated into the model, which are summarised in a greater or lesser openness. The expected sign is positive and it can be considered as a trade-creating force. We have developed an average model of trade orientation for all the countries in the sample and measured the deviations with respect to it. The calculation has been made for each year, given that we are considering the short-term trade strategies and not the long-term trend. (The average estimations of trade orientation are presented in Table 4.)

Estimation and Results

The panel estimations for the propensity to export, propensity to import and intra-industry trade are presented in Tables 5–7. In all cases we have tested for the presence of fixed or random effects: fixed effects are accepted for exports and intra-industry trade, and random effects are suggested for imports. In general, the three estimated models show a good fit in the light of their coefficients of determination.

The variables of the specified model have been introduced sequentially in order to test the robustness of the results. First, we have introduced only the trade horizons (TH*jtm*) as a Linder variable, as against the habitual approach by way of the absolute differences in per capita income, with this leading to a very marked difference in results (see Table 5). The absolute differences in per capita income are clearly insufficient as a proxy for the Linder effect, given that they do not reflect either the composition of the internal demand that corresponds to a determined per capita income, or the interaction with the geographical distance, as this is reflected in the trade horizons variable. Thus, the trade horizons (TH*jtm*), which summarise both the bilateral convergence or divergence in the internal demand structures, in their role as determinants of potential trade, in addition to geographical distance, in its role as a brake, reveal a more intense trade in exports, imports and intra-industry trade when the economic proximity so defined is closer. The exports model allows us to confirm that it has been the economic approximation

Table 5. Development and demand similarity. Panel data estimation

		$X^E jtm/Yjt$ Propensity to export		$M^E jtm/Yjt$ Propensity to import		IITjtm Intraindustry trade	
	∣ per capita GDPjt – per capita GDP Spain t ∣	0.72*		0.20*		0.30*	
		[7.74]		[3.60]		[5.18]	
THjtm	Trade horizons		–7.57		–0.80*		–2.74*
			[–8.30]		[–3.05]		[–4.12]
c	intercept	6.26*		6.58*	3.95*	–0.80*	
		[25.32]		[14.77]	[4.10]	[–13.42]	
	No. of observations	85	85	85	85	85	85
	R^2	0.72	0.79	0.95	0.95	0.26	0.41
	Adjusted R^2	0.65	0.74	0.94	0.93	0.07	0.26
		F(16,67):11.22	F(16,67):12.25	F(16,67):107.70	F(16,67):69.36	F(16,67):1.07	F(16,67):2.89
		TH(1):0.84	TH(2):74.16	TH(1):0.14	TH(1):0.22	TH(1):1.32	TH(1):17.44

Note: Exports ($X^E jtm$) and imports ($M^E jtm$) always referred to Spain. *Variable significant at the 5% level. ** Variable significant at the 10% level. $F(,)$ is the value of the F-statistic of the test of homogeneity of the individual effects. TH is the value of the Hausman test statistic. (1) The random effects are accepted at the 1% level of significance the fixed effects are accepted at the 5% level of significance. IITjtm = 1 – ∣ $X^E jtm - M^E jtm$ ∣ /($X^E jtm$+$M^E jtm$). Double-logarithmic function. t-statistic in brackets.

of Spain to the more advanced countries, which has determined the importance of these countries as the destination of Spanish exports in manufactures, not only in total, but also in bilateral terms. In summary, the main markets of destination are those that are more similar to the Spanish market. The imports model shows that the suppliers also appear as extensions of their own economies, given that it is the partners with a market similar to the Spanish that stand out. The variable is similarly significant for intra-industry trade.

Table 6 compares the block corresponding to the demand determinants, both the trade horizons as well as the median of the trade partner, the comparison of medians and the dispersion of incomes. Its final specification includes the international divergence of per capita incomes.

With respect to the median per capita income of the partner (M*jt*), exports are more intense when this is higher, in such a way that a greater purchasing power on the part of a high proportion of its poorest population is translated into a demand for Spanish manufactures. The median income of the partner is an approximation to its representative level of quality, with this being higher for practically all the countries considered.[13] Spain specialised in varieties which had a lower quality than those of its partners and those differences in quality, within some limits fixed by the trade horizons, stimulated the export potential of Spanish manufactures. The imports model suggests that those partners with a more representative demand, approximated by their median, achieve higher levels of efficiency and that this determines their choice as supplier; and also means that the chosen countries are those which offer a higher level of quality. Intra-industry trade is also more intense with those partners that have a higher acquisitive capacity and a more representative demand.[14]

The comparison of medians (CM*jt*) is not significant. This could be due to the fact that we only have data on countries with medians that are similar to, or higher than, the Spanish, so the only relevant magnitude is the level of the median of the partner: a country with a higher median will present a more marked difference with respect to the Spanish median. In the intra-industry model, the joint interpretation of both the comparison of medians variable together with the median variable should offer information on the split or interleaving pattern. However, in this case it is again not significant and, given its empirical irrelevance in this test, it has been omitted in the second specification of Table 6, as well as in the subsequent specifications.

The dispersion of per capita income (D*jt*) is determinant in imports and intra-industry trade, but not significant in exports. In the first case it has a negative sign, indicating that a broad range of qualities in the demand of a country reduces the Spanish propensity to import. With respect to intra-industry trade the sign is positive, because the breadth of the range of qualities acts as an impulse for trade in this type of good in both directions. Thus, support is given to the hypothesis of the concentration of demand in a lower number of varieties as a source of comparative advantage. From this we can deduce a specialisation in interindustry exports towards partners with a broad range of demand, an interindustry trade in imports coming from countries with concentrated demands, and another of an intraindustry type with those countries that have disperse preferences.

The final specification of Table 6 includes the international divergence of incomes. The economic divergence from the average (DIV*jtm*) is significant in all three types of bilateral trade, that is to say, imports, exports and intra-industry,

Table 6. Demand determinants, international divergence, monopolistic competition and trade barriers. Panel data estimation and PANEL-SURE estimation

		$X^E jtm/Yjt$ Propensity to export			$M^E jtm/Yjt$ Propensity to import (1)			IITjtm Intra-industry trade		
			PANEL-SURE			***PANEL-SURE***			***PANEL-SURE***	
THjtm	Trade horizons	–4.27*	–4.27*	–3.40*	–0.45**	–0.45**	–0.45**	–1.67*	–1.76*	–1.39**
		[–4.10]	[–4.21]	[–3.41]	[1.70]	[–1.69]	[–1.78]	[–2.18]	[–2.37]	[–1.82]
Mjt	Median	1.01*	1.01*	0.89*	1.18*	0.173*	0.13**	0.86*	0.82*	0.77*
		[4.54]	[5.07]	[4.62]	[2.06]	[2.06]	[1.57]	[5.32]	[5.59]	[5.19]
CMjt	Comprarison medians	0.09			–0.03			–0.27		
		[0.02]			[–0.07]			[–0,66]		
Djt	Dispersion per capita income	3.72	3.73	2.46	–0.39*	–0.38*	–0.36*	8.38*	8.05*	7.50*
		[1.45]	[1.52]	[1.04]	[–2.15]	[–2.09]	[–2.06]	[4.45]	[4.46]	[4.15]
DIVjt	Divergence from average development			–0.23*			–0.11*			–0.10**
				[–3.01]			[–1.93]			[1.69]
c	intercept				6.73*	6.66*	6.30*			
					[4.44]	[4.68]	[4.66]			
	No. of observations	85	85	85	85	85	85	85	85	85
	R^2	0.86	0.86	0.88	0.95	0.95	0.94	0.61	0.61	0.62
	Adjusted R^2	0.82	0.82	0.84	0.93	0.93	0.93	0.49	0.49	0.51
		F(16,64):	F(16,65):	F(16,64):	F(16,64):	F(16,65):	F(16,64):	F(16,64):	F(16,65):	F(16,64):
		14.65	51,46	14.63	44.01	48.53	43,20	5.25	5.54	5.74
		TH(4):	TH(3):	TH(4):	TH(4):	TH(3):	TH(4):	TH(4):	TH(3):	TH(4):
		50.95	51.46	37.00	7.27	4.86	11.40	38.19	38.70	33.56

Note: Exports ($X^E jtm$) and imports ($M^E jtm$) always referred to Spain. *Variable significant at the 5% level. **Variable significant at the 10% level. $F(,)$ is the F-statistic of the test of homogeneity of the individual effects. TH is the value of the Hausman test statistic. (1) The random effects are accepted at the 1% level of significance; the fixed effects are accepted at the 5% level of significance. IITjtm = 1 – | $X^E jtm - M^E jtm$ | /($X^E jtm + M^E jtm$). Double-logarithmic function. t-statistic in brackets.

indicating that the most appropriate markets for manufactures are countries with a level of development similar to the average and a less isolated character. The partner that is economically close to the average has more possibilities of being considered a mere extension of the internal market by a larger number of countries. Closeness implies a certain substitutability, given that a falling off in trade with one neighbouring country can be corrected by trade with a similar one. This is clear in the period under study, when Spain enjoyed an increasing level of development, although one that was always lower than the average, and where the countries located in the middle of the defined income ranking appeared over the Spanish trading horizons before those located at its head.

In the case of imports, the same substitutability is found for supplies, but not as significant as in the case of exports,[15] possibly because of the complementary rather than substitutability character of imports in an accelerated process of development. As regards intra-industry trade, the results show that a Spanish acting or reacting position constitutes a brake.

Table 7 first includes the determinants related to monopolistic competition and, subsequently, the trade barriers. The panel-data estimation demonstrates that the monopolistic competition variables are, in general, of only limited significance. In the case of exports, technological differentiation (H*jtm*) is not relevant as a competitive strategy, because there was a gap between the low quality levels of Spanish manufactures and those of other countries, in the context studied. However, in the case of imports, this variable is significant and the degree of differentiation of the partners is greater than that of Spain, although not excessively so. This circumstance tends to support the explanation that Spanish imports are complements of production, rather than substitutes, in nature, and that the supplying partners are not necessarily central countries in the income area or with a higher median, as occurs, by contrast, in the case of exports.

The limited importance of technological differentiation is maintained in intra-industry trade; and the remaining variables are not significant, save, in the case intra-industry trade, for horizontal differentiation (h*jtm*) and market size differences (SD*jtm*), although both with a sign contrary to that expected. These results indicate that horizontal differentiation makes trade difficult, while differences in size stimulate it. There are two explanations that may lie behind this apparent paradox. First, a statistical aggregation problem, in that the measure used does not allow us to distinguish whether all the items are imports, or all exports, or the degree to which there is a trade in varieties in both directions. Second, size represents the capacity to differentiate between products if such production takes place on a small scale but, according to Kindleberger (1970) and Hufbauer (1970), differences in size stimulate intra-industry trade in goods with heterogeneous degrees of standardisation or differentiation, as Leamer and Levinsohn (1995, p. 1378) confirm. Given its size, Spain may have taken advantage of scale economies without practising horizontal differentiation but producing homogeneous products.

Finally, low trade barriers do not have any effect on trade and, for this reason, the variable can be omitted. The limited significance shown by the behaviour of trade orientation (O*jt*) could be due to the fact that the countries in the sample did not introduce important changes in their trading strategy during the period under study. They entered this period with a degree of trading openness greater than that of Spain and formed part of liberalisation agreements such as the GATT, those made under the auspices of the EEC, or the EFTA. In the absence of significant

Table 7. Demand determinants, international divergence, monopolistic competition and trade barriers. Panel data estimation and PANEL-SURE estimation

		$X^E jtm/Yjt$ Propensity of export			$M^E jtm/Yjt$ Propensity to import (1)		
			PANEL-SURE			***PANEL-SURE(2)***	
THjtm	Trade horizons	–3.55*	–3.23*	–3.61*	–0.39**	–0.37**	–0.33*
		[–3.43]	[–3.02]	[–4.19]	[–1.74]	[–1.65]	[–2.34]
Mjt	Median	0.80*	0.81*	0.79*	0.25*	0.25*	0.32*
		[3.14]	[3.19]	[3.71]	[2.05]	[2.02]	[2.80]
Djt	Dispersion per capita income	2.14	1.91	1.67	–0.44*	–0.45*	–0.48*
		[0.89]	[0.79]	[0.83]	[–2.44]	[–2.50]	[–3.10]
DIVjt	Divergence from average development	–0.23*	–0.24*	–0.24*	–0.11**	–0.10**	–0.20*
		[–3.01]	[–3.07]	[–3.79]	[–1.83]	[–1.82]	[–2.11]
SDjtm	Market size differences	0.04	0.04	0.05	–0.15	–0.14	–2.24
		[0.31]	[0.27]	[0.41]	[–1.44]	[–1.39]	[–1.54]
Hjtm	Technological differentiation	–0.05	–0.01	–0.09	0.17**	0.18*	0.98
		[–0.38]	[–0.04]	[–0.79]	[1.81]	[1.94]	[6.12]
CHjtm	Comparison technological differentiation	0.19	0.16	0.19	–0.09	–0.08	0.25
		[1.19]	[1.00]	[1.43]	[–0.70]	[–0.62]	[1.27]
Ojt	Trade orientation		0.33			0.26	
			[1.12]			[1.25]	
c	intercept				6.60*	6.59*	
					[4.76]	[4.76]	
	No. of observations	85	85	85	85	85	85
	R^2	0.88	0.88	0.88	0.95	0.95	0.67
	Adjusted R^2	0.84	0.84		0.93	0.93	
		F(16,61):10.08	F(16,60):10.18		F(16,61):30.57	F(16,69):29.35	
		TH(7):42.01	TH(8):41.71		TH(7):18.16	TH(8):18.08	

Table 7. Continued

		IIT*jtm*		
		PANEL-SURE		
TH*jtm*	Trade horizons	–2.32*	–2.30*	–2.51*
		[–2.98]	[–2.83]	[–3.92]
M*jt*	Median	0.68*	0.68*	0.74*
		[3.48]	[3.44]	[4.59]
D*jt*	Dispersion per capita income	6.67*	6.65*	6.42*
		[3.88]	[3.82]	[4.49]
DIV*jt*	Divergence from average development	–0.10**	–0.10**	–0.11*
		[–1.87]	[–1.86]	[–2.39]
SD*jtm*	Market size differences	0.24*	0.23*	0.22*
		[2.34]	[2.32]	[2.64]
HXM*jtm*	Disparity of technological differentiation	0.00	0.00	0.00
		[0.38]	[0.37]	[0.50]
CH*jtm*	Comparison technological differentiation	0.04	0.04	0.04
		[0.37]	[0.36]	[0.44]
h*jtm*	Horizontal differentiation	–0.53*	–0.53*	0.66*
		[2.90]	[–2.80]	[–4.79]
O*jt*	Trade orientation		0.02	
			[0.08]	
	No. of observations	85	85	85
	R^2	0.71	0.71	0.71
	Adjusted R^2	0.59	0.58	
		F(16,60):5.57	F(16,59):5.48	
		TH(8): 31.29	TH(9):30.82	

Note: Exports ($X^E jtm$) and imports ($M^E jtm$) always referred to Spain. *Variable significant at the 5% level. **Variable significant at the 10% level. $F(,)$ is the value of the F-statistic of the test of homogeneity of the individual effects. TH is the value of the Hausman test statistic. (1) The random effects are accepted at the 1% level of significance; the fixed effects are accepted at the 5% level of significance. IITjtm = 1 – | $X^E jtm - M^E jtm$ | /($X^E jtm$+$M^E jtm$). Double-logarithmic function. t-statistic in brackets.
(2) Panel-sure estimation: Imports: σ within: 0.17486; σ between: 1.0743. Trace of matrix: 252.542; R^2 sure: 0.99.

restrictions to the circulation of products, it is to be expected that other types of factors will be determinants of trade, as is confirmed in the model.

In order to offer more robust results, and considering that both exports and imports and two-way trade are simultaneously determined, panel and SURE methods are combined in a joint estimation for testing Linder's thesis. In any of the former specifications used in this paper, we have found that exports and intra-industry trade have fixed effects, while imports show random effects. This circumstance has been taken into account in the SURE method, and the result is also shown in Table 7, together with the superior estimation obtained by panel-data. Indeed, the GLS estimators are more efficient when the three equations are simultaneously considered, and the behaviour of the determinants are the same in both sign and significance, with only very slight changes in coefficients. The panel-SURE method strengthens the results for the demand model, thereby providing support for Linder's thesis.

Conclusions

The aim of this paper has been to propose a test for the determinants of Spanish foreign trade during the period of economic transition, an epoch characterised by progressive opening and structural change, precisely the circumstances contemplated by Linder when he formulated his theory. These intense transformations were reflected in increasing levels of foreign trade with a group of industrial countries, namely the members of the OECD. When interpreting these phenomena, the explanation of trade offered by Linder shows itself to be a fruitful one, and indeed we have been able to model a process using variables constructed on the basis of his arguments.

With respect to the results, attention should particularly be drawn to the explanatory capacity of certain of the demand characteristics and of the closeness in levels of development as determinants of trade in manufactures, both in the bilateral and multilateral direction. The similarity of the demand structures, considering the non-homothetic nature of the preferences and weighted by the geographical distance, is shown as a decisive trade-creating force. This suggests that the foreign market acquires importance, in the sense that it can be considered as an extension of the national market. This idea is reinforced by the significant behaviour of another variable, the economic distance from the average, which is an expression of the greater or lesser proximity of a country, in terms of income, to its trading partners.

When trade is analysed in just one direction, that is to say, Spanish exports to another partner or imports from it, we find that income distribution is important by virtue of its role in the configuration of demand. The median, which approximates the representative nature of the demand, is relevant for exports, whilst dispersion, which illustrates the degree of concentration of preferences, is relevant for imports. The joint consideration of the median and the dispersion allows us to introduce some qualifications concerning the relationships between distribution and trade. Thus, with respect to exports, each of these two aspects exerts an influence in the opposite direction, while as regards imports and intra-industry trade, they unite their promoting effects in favour of trade. Our results for exports are almost certainly related to the relative low level of development of the Spanish economy during the period under study and its specialisation in manufactures of an inferior quality. While its sales were favoured in this sector,

they could nevertheless not increase when a broader range and higher qualities were required.

The increasing similarity of demand with that of its trading partners, together with continual advances towards the average in terms of levels of development and certain income distribution characteristics that shaped the demands of its interlocutors, provide a good explanation of Spanish foreign trade following the opening-up process which began in 1959. The role of some factors, such as the monopolistic competition variables, were limited to intra-industry trade or imports, while others, such as the orientation of trade, lacked any significance whatsoever, undoubtedly because of the fact that we are dealing with a period characterised by an open and relatively homogenous trade policy in the reference area. The results are in line with Linder's ideas on the reasons for trade and the selection of markets and suppliers. Although this does not mean that his theory provides a better explanation of trade than those of his rivals in all circumstances, it does illustrate its relevance when applied in a context of increasing openness and structural change, such as that considered in this paper.

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Notes

1. From amongst the papers which have adopted this approach, attention should particularly be drawn to those of Hufbauer (1970), Fortune (1971), Sailors *et al*. (1973), Hoftyzer (1975), Rabenau (1976), Loertscher & Wolter (1980), Sharma (1982), Culem & Lundberg (1986), Thursby & Thursby (1987), Linnemann & van Beers (1988), Tuchinda (1988), Hanink (1988, 1990), Becuwe (1989), Bergstrand (1990), Fortsner & Ballance (1990), Greytak & Tuchinda (1990), Ballance *et al*. (1992), Lundberg (1992), and Greenway *et al*. (1994). Other tests use different approximations for the similarity of per capita income, such as, for example, those used in Kohlhagen (1977), Arad & Hirsch (1981), Shelburne (1984), Balassa (1986a, 1986b), Balassa & Bauwens (1987, 1988a, 1988b) and Ramezzana (2000).
2. According to this author, although average per capita income is less representative, particularly in countries with an unequal distribution of income, it can nevertheless be useful given that its data are easier to find (Linder, 1961, p. 94)
3. Non-homothetic preferences, which in Markusen's analysis take the form of an assumption, are formalised and empirically tested in Hunter & Markusen (1988).
4. The works by Fortune (1972, 1979) considered the effects of income dispersion at the aggregate level and conclude, following testing, that uniform distribution of income leads to a higher average propensity to import. The final effect over total trade is ambiguous. A greater dispersion of income increases the overlapping of demands and would favour trade, in both imports and exports, although it would also reduce the representative nature of the varieties demanded, acting as a brake on exports and providing an incentive to imports.
5. Keesing (1968) noted how the larger size of a country translated into higher exports and lower imports, per capita, of manufactures, whilst both depended positively on income. Balassa (1969) confirmed the need for large internal markets for the export of manufactures, due to scale economies, as a result of which large countries find themselves in an advantageous situation. He distinguished the size effect from the specialisation effect in trade, with the latter depending on the degree of development, although for each level larger countries will present a higher per capita proportion of exports in manufactures. Chenery & Syrquin (1978) argued that, given the higher income-elasticity of industrial goods, the exports of large countries at any level of per capita income will be systematically biased towards industry in comparison with the average of small countries. Furthermore, Perkins & Syrquin (1989) observed that large countries present exports which specialise in manufactures, whilst the exports of small countries are specialised in

minerals, with higher income reducing the specialisation in the former case and intensifying it in the latter.

6. It is only been used by Hummels & Levinsohn (1995) to analyse the changes in intra-industrial trade because of changes in the differences in per capita incomes, as a proxy for the size of the countries as well as for the characteristics of both supply and demand. Similarly, McPherson *et al*. (2001) present evidence favourable to Linder's thesis for five African countries.
7. The countries are: Austria, Belgium-Luxembourg, Canada, Denmark, the Federal Republic of Germany, Finland, France, Greece, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Sweden, the United Kingdom and the United States.
8. The reason for beginning in 1966 lies in the fact that a computer treatment of the Spanish Foreign Trade Statistics could only be carried out from that moment.
9. Habitually, the variable identified with Linder's theory is approximated by the absolute differences in per capita income. This is the case in Hufbauer (1970), Fortune (1971), Sailors *et al*. (1973) and a long list of other papers.
10. The OECD *Stan Data Base* provides information from 1970 onwards. However, we have proceeded in this way for three reasons; first, to extend the series to all the period; secondly, so as not to lose the perspective of a long-term tendency and to avoid possible punctual situations; and finally, because Linder expressly cites income-elasticity and national income as determinants of internal demand.
11. Three countries lack this information: Greece, Italy and Portugal. Only these data are missing in the sample, but the corresponding observations are kept in the estimation because it is of crucial importance to maintain the range of per capita income in the sample for testing a theory oriented towards intermediate countries. In order to use all the available information for the regressions, and to minimise the impact of the determinants based on the income distribution, we have assumed values close to 0—but different from 0 in order to keep the logarithms. If we exclude these observations, the conclusions referring to income distribution variables as determinants of trade remain the same, and the revealed trade pattern is biased towards a more traditional one, Spain playing the role of a large and less developed country in the reduced sample.
12. For example, Balassa (1986a, 1986b), Balassa & Bauwens (1987, 1988a, 1988b), Lee & Lee (1993), and Somma (1994). Others, including Balassa (1986a, 1986b) have used an inequality index and not absolute differences of GDP.
13. Save for Austria.
14. This interpretation reminds some supply theoretical alternatives, like the one derived by the neo-Hecksher–Ohlin of Falvey (1981), which predicts a similar pattern of specialisation within the two-way trade. In the case of Falvey, it depends on the limit quality α that defines the qualities exported by each country, while in the case of Linder, it would depend on the median income, with both being related to the extent that there is correspondence between the qualities produced and demanded. It is important to point that, with non-homothetic demands, the income-consumption path deviates from the income-factorial endowments vector, as Hunter & Markusen (1987) indicate, and the qualities demanded deviate from those produced. Thus, according to the degree of deviation, there can be an area of uncertainty in the forecasts produced by both models that could alter the conclusions.
15. Attention should be drawn to the lower significance of the MEDIAN variable when introducing the divergence of per capita incomes. This is the consequence of the multicolinearity problem present in the model, once having confirmed the high correlation between MEDIAN and the other regressors, in particular with the divergence of per capita income, with a partial determination coefficient of 99% when the endogenous variable is MEDIAN.

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