THE HOME MARKET EFFECT IN SPANISH INDUSTRY: AN EMPIRICAL ANALYSIS, 1965-1995

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ABSTRACT

This study was intended to identify empirically the existence of the "Home Market Effect" in Spanish manufacturing industry, i.e., we have attempted to analyse the presence and importance of these effects in production location in Spain. In order to do this we have used the theoretical model of Krugman (1980) and the subsequent empirical analyses of Davis and Weinstein (1996, 1997, 1998, 1999 and 2003). The empirical test carried out for 17 autonomous regions and 9 sectors of activity between 1965 and 1995 lend support to the hypothesis of the existence of the Home Market Effect. This evidence exists in a significant number of sectors of production, specifically, HME is detected in 5 of the 9 sectors analysed: Food, Drink and Tobacco (S1), Paper and Graphics (S4), Products of Various Industries (S5), Non-Metallic Mineral Products (S6) and Metal Products (S7). These results were obtained using a new specification proposed in the present paper, more intuitive as a definition of HME as a mechanism of agglomerating productive activity and which also presents conceptual advantages.

Keywords: home market effect, economic geography, autonomous regions.

JEL Classification Number: R12, R30

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1. Introduction

This study is defined by and refers to the New Economic Geography (NEG) as a discipline intended to explain why certain places are chosen for some economic activities, thus defining an organisation of the economy in spatial terms.

Any self-respecting theoretical system, and the NEG is no exception, generates a series of propositions. What are the principal characteristics of the theory which make the NEG different to other paradigms? Inspired by Baldwin et al (2003) we may cite the following (the first of which is also part of the New International Trade Theory):

- **Home Market Effect** (hereafter HME) or effect of increased demand, according to which a change in the demand in a country or region provokes more than a proportional change in the output of those sectors with increasing returns and transportation costs.

- **Circular effect**: the agglomerating forces reinforce themselves.

- **Endogenous and catastrophic asymmetry**: changes in the relevant parameters can cause two regions which were identical to diverge. These changes can be arbitrarily small, while their consequences can be significant (catastrophe).

- **Hysteresis**: where there are multiple equilibria, which is common in these models, the path which led to them should be considered, given that it affects the final result (path dependence). In other words, history matters.
It is true that the last three propositions are not easily subjected to empirical testing and indeed, there is little relevant literature. The magnification effect or HME is more interesting for our purposes, even more so given that there is no known case study for Spain. Thus, in this study we intended to carry out a rigorous and in some ways, novel test of HME in data for Spain from 1965 to 1995.

We can defend the value of this exercise with four arguments. First, the Spanish case has been studied by Rosés (2003), but using a historical database from 1797 to 1910 and a corresponding updating is needed if one thinks, as we ourselves believe, that the mechanisms of NEG could have been active during the industrial revolution as well as in modern times. Second, tackling an empirical test of HME, far from being redundant, will always shed new light on the phenomenon, and so there is no clear consensus in the literature as to its existence; thus, the results in the classic papers on the subject (Davis and Weinstein, 1996, 1999 and 2003) do not always coincide. Following this reasoning, consider that we owe the theoretical model introducing the magnification effect to Krugman (1980), and sixteen years went by before the first empirical test was carried out on it, that of Davis and Weinstein, in a paper which curiously, has been extensively quoted without ever having been published. In other words, testing of HME is not a task to be hurried.

Third, it is especially appropriate to carry out the empirical application with regional rather than international data, which is the position adopted in this study. Davis and Weinstein (1999) themselves put forward the principal motives for choosing this option. Briefly, their main thesis is that it is easier to detect strong effects of Economic
Geography in regional data than in international data due to lower transportation costs in the movement of goods and the greater mobility of factors found at the regional level.

Finally, in fourth place, the specification of the model proposed in this chapter is not only the traditional one. As we will explain in the specification of the empirical model, we have opted to analyse percentage changes in demand and production in a panel of autonomous regions. The advantages of this approach are twofold. On one hand, the specification is in much greater agreement with the real concept of HME (an increase of X per cent in the demand for a good produces an increase greater than X per cent in its production) and thus both more intuitive and more rigorous. On the other hand, estimations based on the panel of autonomous regions, in which some variables are defined with reference to the national average, mean the introduction of an additional geographical element, where the location of demand and production in some autonomous regions goes hand-in-hand with their de-location in others.

The rest of the paper is set out as follows. In the second section a conceptual explanation of HME and its theoretical foundations is presented, along with a summary of the most relevant empirical applications. The third section concerns the specification of the empirical model for Spanish manufacturing industry and the description of the database used. The fourth section offers an estimation of the model and the results of econometric analysis. The fifth section, titled Heckscher-Ohlin (HO) versus HME, is a joint analysis of the pattern of production from both the neoclassical and the NEG perspective. Finally, the conclusions close the study.
2. HME: concept, theoretical bases and principal empirical tests

The two indispensable works in the theoretical foundations of HME are Krugman (1980) and Weder (1995) which in turn have inspired later empirical tests and consequently the present work.

The principal, groundbreaking innovation of Krugman is to show how the introduction of transportation costs alongside the presence of increasing returns produces the Home Market Effect. Krugman himself propounds this clearly:

"In a world characterized both by increasing returns and by transportation costs, there will obviously be an incentive to concentrate production of a good near its largest market, even if there is some demand for the good elsewhere. The reason is simply that by concentrating production in one place one can realize the scale economies, while by locating near the larger market, one minimizes transportation costs. This point ... is the basis for the common argument that countries will tend to export those kinds of product for which they have relatively large domestic demand." (Krugman, 1980, p.955)

This implies that an increased demand for a certain product within a country will drive a more-than-proportional increase in production of that product in that country, a phenomenon known as HME.

Also, Weder (1995) introduces different sizes of countries, seeking thus to distinguish between absolute and relative differences in the dimensions of domestic demand of nations. He considers two countries as completely identical except for the absolute and relative size of their domestic demand for each type of differentiated product. Market size does not affect the scale of production, only the number of varieties of the
product such that, when international transportation costs are reduced, competition between national and foreign companies increases, which implies that small differences in market sizes can have a great effect on the relative number of varieties produced in the two countries. In a nutshell, one country may be smaller than another and yet be a net exporter when its relative demand is greater. To sum up, the principal contribution of Weder (1995) is the introduction of the idea of a greater relative demand and the study of its consequences on production.

Taking the microfoundations referred to in previous paragraphs as a basis, the principal empirical investigations of this "magnification effect" are described below.

We can point to Davis and Weinstein as the most outstanding authors in the investigation of HME. They have developed an empirical methodology which centres on answering the following question: are idiosyncratic changes in demand associated with more-than-proportional changes in output? If the answer is affirmative the existence of HME is possible.

Davis and Weinstein (1996) carried out this analysis for OECD countries. Its objective is to explore the part played by idiosyncratic elements of demand in the determination of patterns of production via models of economic geography and comparative advantage. It is the first empirical test to nest trade models of Economic Geography with others of the Heckscher-Ohlin-Vanek type. To sum up, they find that factor endowments are a crucial element in understanding the manufacturing structure of the countries in the sample, given that they constitute 90 percent of explanatory power, whereas Economic Geography, via the Home Market Effect, constitutes only 10 percent.
In the construction of variables they follow closely the theoretical model of Krugman (1980). This means that the variable which reflects HME (called IDIODEM) initially lacks geographical input, as it supposes that the relative location of countries does not matter, and this implies that links of demand between neighbouring countries are not a priori stronger than links with countries on the other side of the world, which is not very realistic and which has an effect on the results. For example, in Davis and Weinstein (1997) the parameter $\beta_2$ (coefficient of IDIODEM) is greater than 1 for only 9 industrial activities in a sample of 22 OECD countries and 26 sectors of industry. Two strategies were employed to improve these results. The first, in Davis and Weinstein (1998) and (2003), where the same group of countries is analysed, but IDIODEM is measured differently. They conclude that the key to identifying Home Market Effects is to introduce more realism in their models of production and commerce. Specifically, the main difference to Davis and Weinstein (1996) is the construction of a new IDIODEM variable which weighs demand against the distance between countries, such that the size of the economy, bilateral distance and the characteristics of a particular industry are brought together in an equation of gravity, which determines how demand is dissipated by distance. They find that the sectors which present a Home Market Effect are those where the majority of manufactured output is concentrated.

A second strategy to improve their earlier results is used in Davis and Weinstein (1999). The fundamental difference is that IDIODEM is now applied to regions within a single country, in this case, Japan. The IDIODEM coefficient is greater than one in the

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1 In the third section, on the specification of the empirical model, we explain how the demonstration of HME happens because $\beta_2$ is greater than one.
aggregate level estimates, therefore there is evidence of Home Market Effect. Davis and Weinstein interpret this result as "clearly in the range of economic geography", in contrast to the result obtained in Davis and Weinstein (1996) with international data, which revealed the nonexistence of the Economic Geography effect. They explain this divergence of results with two reasons: one, the different costs of trade between regions and between countries; and the other, the greater mobility of factors between regions compared to this mobility between countries. Nevertheless, when factor endowments are included, $\beta_2$ is less than 1, therefore there is no evidence of Home Market Effect. In conclusion, breaking down the data to the level of goods indicates that for 8 out of the 19 goods $\beta_2$ is greater than 1.

Definitively, the contributions of Davis and Weinstein on the Home Market Effect constitute the principal nucleus of empirical investigation, even if the conclusions obtained are susceptible to the specification, desaggregation and geographical context adopted.

As far as Spain is concerned, the only known research is that of Rosés (2003), who also combines the Heschker-Ohlin and Economic Geography models à la Davis and Weinstein in order to study the causes of regional differences in industrial development in the 19th century. Spanish manufacturing industry became concentrated in a few regions due to reduced transportation costs and internal trade barriers. He concludes that the comparative advantage and the effects of increasing returns were economically very significant and explain practically all the differences in industrialisation levels in Spanish provinces, and more importantly for our purposes, the deficits of some regions in terms of industrialisation seem to be attributable to their factor endowments, combined with an apparent absence of Home Market Effects (no HME).
3. Specification of the empirical model of HME for Spanish manufacturing

3.1 - Database

Autonomous regions were taken as the geographical units of reference, as the regional ambit is better suited than the international for quantitative testing of HME, as seen in the better results obtained by Davis and Weinstein in a reduced ambit (the regions of Japan as opposed to OECD countries).

The main source of statistics was the publication *Renta Nacional de España y su Distribución Provincial*, years 1999 and 2000, by the Fundación BBVA. The data provided on Spanish manufacturing industry are: production of communities by sectors (value of total production and gross value added to factor cost) and total employment in the communities by sectors.

The productive capital factor data also came from the Fundación BBVA, specifically their publication *El Stock de Capital en España y su Distribución Territorial* (1964-2000). Data on land productive factors were obtained from the statistical service of the Ministry of Agriculture and correspond to productive land area.

The productive manufacturing sectors in the sample are the following: Food, Drink and Tobacco (S1), Transportation Material (S2), Basic Metallics (S3), Paper and Graphics (S4), Products of Various Industries (S5), Products of Non-Metallic Minerals (S6), Metal Products (S7), Chemical Products (S8) and Textile, Leather and Footwear (S9).
The total sample comprises a panel of 2448 observations, as there is information on 17 autonomous regions, 9 productive manufacturing activities and 16 years (odd years from 1965 to 1995).

3.2 - Econometric Specification

Adopting the habitual notation of empirical literature, we start with the following specification:

\[ X_g^{nc} = f(SHARE_g^{nc}, IDIODEM_g^{nc}) \]  

Where \( X_g^{nc} \) is the output of the activity \( g \) included in total manufacture \( n \) and autonomous region \( c \). \( SHARE_g^{nc} \) attempts to capture the tendency, in the absence of idiosyncratic demand, for each Autonomous region to produce activity \( g \) in total manufacture \( n \) in the same proportion as the national average of autonomous regions. It is therefore expressed thus:

\[ SHARE_g^{nc} = \frac{X_g^{nE}}{X^{nE}} X^{nc} \]  

where \( e \) represents the totality of Spain and the term \( X_g^{nc} \) is a scalar reflecting the total production of industry in the Autonomous region, i.e., an indicator of its size. \( IDIODEM_g^{nc} \) collates idiosyncratic demand. Based on this we can detect the existence or
otherwise of the Home Market Effect and it is by definition the crucial variable in the test of HME:

\[
IDIODEM_{g}^{nc} = \left( \frac{D_{g}^{nc}}{D_{nc}} - \frac{D_{g}^{nE}}{D_{nE}} \right) X^{nc}
\]  

(3)

where D is internal absorption.

The coefficient associated with this variable captures the impact of idiosyncratic demand on production, and so the key point is its interpretation. Three possible scenarios are identified:

- in a context of comparative advantage without transportation costs, the geographical structure of demand should have no effect on production behaviours, and so \( \beta_2 \) would be equal to zero.

- in a world of comparative advantage with transportation costs and without increasing returns, demand deviation affects production location, but in a lesser proportion, so that \( \beta_2 \) would be between zero and one. Thus a comparatively high demand for a product in a country will generally lead to net imports of this good.

- if the typical characteristics of Economic Geography prevail, \( \beta_2 \) will be greater than one, so an increase in demand for good g in industry n in autonomous region c leads to a more-than-proportional increase in output \( X_{g}^{nc} \). Therefore a comparatively high demand for a product in a country will generally lead to net exports of this good. Thus we conclude that the associated Home Market Effect plays some part in production location.
Consequently, the empirical model for estimation would be given by

\[ \ln X_g^{nc} = \alpha_g^n + \beta_1 \ln \text{SHARE}_g^{nc} + \beta_2 \ln \text{IDIODEM}_g^{nc} + \delta_g^{nc} \]  

(4)

where \( \alpha_g^n \) is the independent term and \( \delta_g^{nc} \) represents random perturbation. Before proceeding to present the results of the estimation we should take into account the following considerations:

The IDIODEM variable may take negative values given that it is a deviation from the national average. As we take logarithms the variable is normalised (the most negative value is given a value of zero and the rest of the values are rescaled), so it is always positive, and an increase of the variable is unequivocally associated with an increase in the idiosyncratic demand of the autonomous region in the subsector in question.

On the other hand, equation (4) measures the volume of production in levels, which is equivalent to the original specification of Davis and Weinstein. We feel an alternative presentation of the model in percentage variations is relevant and useful, given that the same determinants express not only that an Autonomous region increases production as an effect of increased demand, but also that it includes the element of specialisation or lack of it, because it indicates the position or relative weight of each sector of production in the set of sectors. Definitively, our proposed specification of proportions which in our opinion represents a more intuitive and direct approach to the concept of HME, is:
\[
\ln \left( \frac{X_{g}^{nc}}{X^{nc}} \right) = \beta_0 + \beta_1 \ln \left( \frac{SHARE}{X^{nc}} \right) + \beta_2 \ln \left( \frac{IDIODEM}{X^{nc}} \right) + \delta_{g}^{nc} = \\
\beta_0 + \beta_1 \ln \frac{X_{g}^{nE}}{X^{nE}} + \beta_2 \ln \left( \frac{D_{g}^{nc}}{D^{nc}} - \frac{D_{g}^{nE}}{D^{nE}} \right) + \delta_{g}^{nc} \quad (5)
\]

We would like to examine further the effects of a formula like (5). The specification given in (4), in levels, derives from the supposition adopted by Davis and Weinstein that demand deviation is transmitted to production proportional to the size of the Autonomous region through the scale variable \(X_{nc}^{nc}\). However, in the model in proportions suggested in (5) this hypothesis of proportionality according to size or scale of the region is completely unnecessary due to the specification itself, already relativized by size. Also, and this is very important, it is not always demonstrable, and in fact is not demonstrated in our findings: we find that it is precisely the smallest autonomous regions that have the greatest demand deviation. In this sense estimation in proportions is conceptually superior to estimation in levels, and therefore, having discounted the effect of size there is no need to impose a hypothesis which is not necessarily demonstrable. Because of this also, we consider these results more reliable.

Last, in order to make estimations on the model of the equation (5), and following Conniffe (1993), a logistical transformation was carried out on the endogenous variable, as is usual if this is a proportion. Definitively, the model to estimate is expressed in equation (6), where our interest centres on the part played by demand deviation, i.e., the sign and magnitude of \(\beta_2\):
\[
\ln \left( \frac{X^{nc}}{X^{nc}} \right) = \beta_0 + \beta_1 \ln \left( \frac{\text{SHARE}}{X^{nc}} \right) + \beta_2 \ln \left( \frac{\text{IDIODEM}}{X^{nc}} \right) + \delta_g^{nc} \quad (6)
\]

4. Empirical Estimation and Results on the Existence of HME

Empirical estimation of (6) presents a problem of simultaneity, which was confirmed by the specification test of Hausman (1976). In this case the two sets of instruments which allow us to correct endogeneity are factor endowments: on one hand, the contemporary $K/L$ (capital-labour) and $K/T$ (capital-land) ratios and on the other, the contemporary and delayed $K/L$ and $K/T$ ratios. Tables 1 and 2 respectively display the results obtained:
Table 1: EXISTENTE OF HME. CONTEMPORARY INSTRUMENTS

<table>
<thead>
<tr>
<th>Sector</th>
<th>SHARE&lt;sup&gt;nc&lt;/sup&gt;&lt;sub&gt;_g&lt;/sub&gt;</th>
<th>IDIODEM&lt;sup&gt;nc&lt;/sup&gt;&lt;sub&gt;_g&lt;/sub&gt;</th>
<th>R² Aj</th>
<th>F (degrees of freedom)</th>
<th>CHISQ(n)</th>
<th>SARG</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: Food, Drink and Tobacco</td>
<td>0.79* (7.76)</td>
<td>1.40* (12.06)</td>
<td>0.93</td>
<td>3,86</td>
<td>14.46</td>
<td></td>
</tr>
<tr>
<td>S2: Transportation Material</td>
<td>6.02* (5.73)</td>
<td>2.44** (1.87)</td>
<td>0.71</td>
<td>244.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S3: Basic Metallics</td>
<td>1.68* (21.74)</td>
<td>2.29* (10.66)</td>
<td>0.94</td>
<td>63.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S4: Paper and Graphics</td>
<td>1.15* (19.02)</td>
<td>2.73* (8.85)</td>
<td>0.92</td>
<td>5.60&lt;sup&gt;CORR&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S5: Products of Various Industries</td>
<td>0.64* (3.05)</td>
<td>2.08* (11.26)</td>
<td>0.89</td>
<td>1.52&lt;sup&gt;CORR&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S6: Products of Non-Metallic Minerals</td>
<td>0.98* (16.62)</td>
<td>2.35* (14.50)</td>
<td>0.93</td>
<td>0.14&lt;sup&gt;CORR&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S7: Metal Products</td>
<td>1.04* (2.45)</td>
<td>1.08* (24.10)</td>
<td>0.94</td>
<td>0.02&lt;sup&gt;CORR&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S8: Chemical Products</td>
<td>3.92* (5.16)</td>
<td>0.01 (1.37)</td>
<td>0.75</td>
<td>37.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S9: Textile, Leather and Footwear</td>
<td>1.70* (22.41)</td>
<td>0.74* (6.48)</td>
<td>0.93</td>
<td>2.81&lt;sup&gt;CORR&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>28.75* (8.99)</td>
<td>0.24* (2.05)</td>
<td>0.13</td>
<td>8.76</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. The t-statistics are in parentheses. *Indicates significance level of 5%. ** Indicates significance level of 10%. [CORR] indicates the endogeneity problem has been corrected by the validity of the instruments used. CHISQ(n) indicates the value of the ji squared $\chi^2$ and SARG the corresponding value of the Sargan test (1964). F (degrees of freedom) is the value of distribution f.

The results of Table 1 demonstrate that endogeneity exists in the set of sectors (last row of the table) and that the instruments used are not valid. Carrying out the analysis of each activity, there is endogeneity in Transportation Material (S2), Basic Metallics (S3),
Paper and Graphics (S4), Products of Various Industries (S5), Products of Non-Metallic Minerals (S6) Metal Products (S7), Chemical Products (S8) and Textiles, Leather and Footwear (S9). It is corrected in sectors 4, 5, 6, 7 and 9, so these will be commented on, together with Food, Drink and Tobacco (S1), where no problems were detected.

Table 2: EXISTENCE OF HME. CONTEMPORARY AND LAGGED ONE PERIOD INSTRUMENTS

<table>
<thead>
<tr>
<th>Sector</th>
<th>(SHARE_{nc}^g)</th>
<th>(IDIODEM_{nc}^g)</th>
<th>(R^2)</th>
<th>(Aj= 0.94)</th>
<th>SARG</th>
<th>Nobs= 272</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: Food, Drink and Tobacco</td>
<td>0.61* (4.91)</td>
<td>1.33* (8.68)</td>
<td>R(^2)</td>
<td>Aj= 0.94</td>
<td>SARG=2, 87(^{[\text{CORR}]})</td>
<td></td>
</tr>
<tr>
<td>S2: Transportation Material</td>
<td>6.55* (5.48)</td>
<td>2.48** (1.79)</td>
<td>R(^2)</td>
<td>Aj= 0.70</td>
<td>SARG=226.98</td>
<td></td>
</tr>
<tr>
<td>S3: Basic Metallics</td>
<td>1.68* (22.39)</td>
<td>2.13* (9.16)</td>
<td>R(^2)</td>
<td>Aj= 0.94</td>
<td>SARG=68.44</td>
<td></td>
</tr>
<tr>
<td>S4: Paper and Graphics</td>
<td>1.01* (16.69)</td>
<td>2.52* (8.42)</td>
<td>R(^2)</td>
<td>Aj= 0.93</td>
<td>SARG=4.56(^{[\text{CORR}]})</td>
<td></td>
</tr>
<tr>
<td>S5: Products of Various</td>
<td>0.45* (1.98)</td>
<td>1.87* (9.76)</td>
<td>R(^2)</td>
<td>Aj= 0.88</td>
<td>SARG=9.05(^{[\text{CORR}]})</td>
<td></td>
</tr>
<tr>
<td>Industries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S6: Products of Non-Metallic</td>
<td>1.06* (17.58)</td>
<td>2.40* (14.35)</td>
<td>R(^2)</td>
<td>Aj= 0.93</td>
<td>SARG=11.40(^{[\text{CORR}]})</td>
<td></td>
</tr>
<tr>
<td>Minerals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S7: Metal Products</td>
<td>1.94* (17.91)</td>
<td>1.11* (38.24)</td>
<td>R(^2)</td>
<td>Aj= 0.96</td>
<td>F(16,253) = 5.81</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CHISQ(1) = 0.04</td>
<td></td>
</tr>
<tr>
<td>S8: Chemical Products</td>
<td>2.95* (8.21)</td>
<td>0.06 (0.92)</td>
<td>R(^2)</td>
<td>Aj= 0.84</td>
<td>SARG=46.07</td>
<td></td>
</tr>
<tr>
<td>S9: Textile, Leather and</td>
<td>1.76 (21.05)</td>
<td>0.81 (6.12)</td>
<td>R(^2)</td>
<td>Aj= 0.94</td>
<td>SARG=17.62</td>
<td></td>
</tr>
<tr>
<td>Footwear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>32.92* (8.44)</td>
<td>0.25* (1.91)</td>
<td>R(^2)</td>
<td>Aj= 0.10</td>
<td>SARG=1.68(^{[\text{CORR}]})</td>
<td></td>
</tr>
</tbody>
</table>

NOTA: To see note Table 1.
Table 2 presents results with contemporary instrumental variables and one period lagged. In the sectors of Transportation Material (S2), Basic Metallics (S3), Chemical Products (S8) and Textiles, Leather and Footwear (S9) there is endogeneity and it cannot be corrected with the available instruments. This problem is corrected in the set, as in Food, Drink and Tobacco (S1), Paper and Graphics (S4), Products of Various Industries (S5), Products of Non-Metallic Minerals (S6), which will be considered, along with Metal Products (S7), which does not present this problem.

Summing up, the results obtained coincide, with both sets of instruments, respecting the sectors where HME exists, which are: Food, Drink and Tobacco (S1), Paper and Graphics (S4), Products of Various Industries (S5), Products of Non-Metallic Minerals (S6) and Metal Products (S7). We will proceed to comment on these results.

The application of the specified model to Spanish manufacturing takes the period 1965-1995 (odd years only) as reference. The conclusions obtained reflect the changes and impulses which arose starting with the 1960s, with the opening up of the Spanish economy to the outside world, the stabilisation plan of 1959 and greater flexibility in its internal markets. These were the boom years of the ’60s and later, integration into and getting in step with Europe.

In the decade of the 1960s there was a very marked specialisation of Spanish manufacturing industries in traditional activities with internal demand and relatively low technological content, corresponding to sectors 1, 3, 4, 6 and 9. This period marked the beginning of certain changes in interindustrial specialisation, reducing the weight of the more labour intensive activities (sectors 5 and 9) and producing an increase in capital-
intensive industries, i.e., the more advanced or with higher demand and technological content (sectors 7 and 8, which include office equipment and other machinery, electric materials and accessories and chemical products). The greater weight is still with the traditional activities, but less markedly, as the advanced industries have grown at a faster rate.

We have seen that HME exists in industries 1, 4, 5, 6 and 7. Sectors 1, 4 and 7 have a higher percentage of gross added value than the others. 1 and 4 are also traditional sectors, of low productivity and high labour costs, but they have increased their internal production, concealing competitiveness problems, because they have taken advantage of cultural characteristics of the population, such as gastronomic culture or language, and thus have enjoyed an expanding internal demand derived from modifications in consumer habits. 7 is a sector which has become more important in production due to an increase in productivity levels, as is also the case with 6, despite being a traditional activity. Regarding sectors 5 and 7, they are industries of intermediate and end products of intensive processes and strong increasing returns, these last being the most important determinants of location of economic activity in Spain between 1979 and 1992, according to Paluzie et al. (2001)

This abundant evidence of HME since the 1960s contrasts with the scanty evidence obtained by Rosés (2003) for the period before 1910. His conclusions attribute the process of industrialisation exclusively to factor endowments (HO) and remark on the absence of HME in Spanish industry. Because of this, it appears that over time the mechanisms of agglomeration propounded by the NEG have acquired a certain relative importance. However, factor endowments have not necessarily lost their importance in industry location in Spain, but rather can coexist as determinants along with the importance of the internal
market. The explicit analysis of the joint effect of factor endowment and demand elements is examined in the following epigraph.

5. Heckscher-Ohlin (HO) versus Home Market Effect (HME)

The fact that factor endowments are an essential determinant of output assures a potentially relevant role for the neoclassical trade theory. Depending on the degree to which regions specialise in the more intensive factor-abundant industries, endowments are important elements when explaining industrial specialisation.

Rosés (2003), investigating the impact of the HO model on production location in Spanish provinces of the 19th century, concludes that endowments account for nearly 85% of the variation in manufacturing output. At the same time he emphasises that his estimations of the HO model do not necessarily reject an interpretation of differences in regional levels of industrialisation based on forces of Economic Geography. The development of a region does not depend solely on its own factor endowments, but also on the effects of market size, i.e., endowments alone may not be enough to explain the whole story.

In this context, the specification of the model now includes two new variables representing HO, such as the factor endowments measured by the ratios of capital-labour (K/L) and capital-land (K/T). We do not include the SHARE variable due to the endogeneity problems it generates, taking into account also that the literature does not offer
a clear interpretation. On the other hand, it has been possible to correct this endogeneity using endowments as instruments, making the inclusion of SHARE redundant.

Definitively, the specified equation is intended to analyse the capacity for explanation of idiosyncratic demand (via IDIODEM) as a mechanism of specialisation of the NEG, as opposed to factor endowment as a mechanism of specialisation in neoclassical theory:

$$\ln \left( \frac{X_{nc}}{X_{nc}} \right) = \beta_0 + \beta_1 \ln \left( \frac{\text{IDIODEM}}{X_{nc}} \right) + \beta_2 \ln \left( \frac{K}{L} \right)_g + \delta_{g}^{nc} \quad (7)$$

$$\ln \left( \frac{X_{nc}}{X_{nc}} \right) = \beta_0 + \beta_1 \ln \left( \frac{\text{IDIODEM}}{X_{nc}} \right) + \beta_2 \ln \left( \frac{K}{L} \right)_g + \beta_3 \ln \left( \frac{T}{L} \right)_g + \delta_{g}^{nc} \quad (8)$$

More interesting than the estimation of (7) and (8) is the analysis of the relative importance of both theories (HO and NEG) in the determination of patterns of location in Spanish manufacture. The results of the estimation of (7) and (8) are very similar to those of (6)\(^2\) and corroborate the presence of HME in the same sectors, and so in order to avoid repetitiveness they are not presented.

Consequently, the emphasis in this section is placed on very different aspects than in the last section. In the previous study we have tried to determine statistically if the mechanism reflected in the IDIODEM variable has a qualitative impact on the pattern of

\(^2\) The reason is that (6) uses endowments as instruments of the share variable, which, as we have noted, is omitted in (7) and (8).
production. Our objective now is to quantify the importance of HME as opposed to factor endowments. To this end, we use the appropriate technique, to wit, that of β-coefficients, as proposed by Leamer (1984). For this, we use a statistic which permits investigation of which independent variables are more important in explaining movements in the dependent variable. In order to calculate this statistic we take $Z$ as the matrix of observations for the independent variables and $Z^M$ the same matrix with the entries of the variable(s) $M$ equal to its sample average. $β^M$ is defined as follows:

$$β^M = \sqrt{\frac{1}{1-n} \left( βZ - βZ^M \right) \left( βZ - βZ^M \right)}$$

(9)

where $n$ is the number of observations and $σ^2_X$ the variance of the dependent variable.

In other words, $β^M$ explains how the standard deviation of the dependent variables can be explained by a movement of the standard deviation in the variable(s) $M$. The results of this calculation for the set and the 9 productive sectors appear in Table 3.

The $β^{IDIODEM}$ indicate how a movement in the standard deviation of idiosyncratic demand modifies the standard deviation in production by a certain percentage. The $β^{ENDOWMENT \text{ FACTORS}}$ indicate how a movement in the standard deviation of endowment factors (measured by the K/L ratio) modifies the standard deviation in production by a certain percentage.

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3 $M$ is the IDIODEM variable or endowment factors grouped by the K/L ratio.
Table 3: β-COEFFICIENTS OF LEAMER

<table>
<thead>
<tr>
<th>SECTORS</th>
<th>β^IDIODEM</th>
<th>β^ENDOWMENT FACTORS(K/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: Food, Drink and Tobacco</td>
<td>0.26</td>
<td>0.01</td>
</tr>
<tr>
<td>S2: Transportation Material</td>
<td>0.02</td>
<td>0.35</td>
</tr>
<tr>
<td>S3: Basic Metallics</td>
<td>0.08</td>
<td>0.23</td>
</tr>
<tr>
<td>S4: Paper and Graphics</td>
<td>0.19</td>
<td>0.35</td>
</tr>
<tr>
<td>S5: Products of Various Industries</td>
<td>0.26</td>
<td>0.02</td>
</tr>
<tr>
<td>S6: Products of Non-Metallic Minerals</td>
<td>0.27</td>
<td>0.16</td>
</tr>
<tr>
<td>S7: Metal Products</td>
<td>0.29</td>
<td>0.01</td>
</tr>
<tr>
<td>S8: Chemical Products</td>
<td>0.01</td>
<td>0.21</td>
</tr>
<tr>
<td>S9: Textile, Leather and Footwear</td>
<td>0.08</td>
<td>0.26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.008</td>
<td>0.92</td>
</tr>
</tbody>
</table>

In four of the sectors (sectors 1, 5, 6 and 7), a movement in the standard deviation of idiosyncratic demand modifies the standard deviation of production by an average of 27%. This suggests that Economic Geography is more important for these industries at a regional level for two reasons: first, because HME appears in them (this occurs in sectors 1, 4, 5, 6 and 7) and second, because it is proven that in these sectors, and only there, $\beta^\text{IDIODEM} > \beta^\text{ENDOWMENT FACTORS}$. 
Regarding the weight of factor endowments (K/L ratio), we observe that in sectors 2, 3, 4, 8 and 9, this is the element with the most power of explanation, and a movement in the standard deviation in factor endowment, modifies, in an average of 28% the standard deviation in production. This effect is stronger in absolute terms in Transportation Material (S2) and in Paper and Graphics (S4). The relative abundance of K/L is very important (17.5 times more) in sector 2. In Paper and Graphics (S4), despite the existence of HME (see previous section), endowments explain 1.8 times more than the HME mechanism, i.e., the variation in idiosyncratic demand provides less information than factor endowments when explaining variations in the weight of production. In any case, there is evidence in this sector that both mechanisms, HO and HME, coexist and complement each other as explaining factors in production location.

Definitely, although for total manufacturing, endowment factors explain the greatest variation in production location, in a non-agglomerated analysis the internal market mechanism plays a greater part than the factors in sectors such as Food, Drink and Tobacco (S1), Products of Various Industries (S5), Products of Non-Metallic Minerals (S6) and Metal Products (S7), which also present evidence of HME, which is perfectly coherent. In other words, the results obtained in sections 4 and 5 can be seen to be systematic.

6. Conclusions

The purpose of the study was to identify empirically the existence of the Home Market Effect in Spanish manufactures, i.e., we have tried to analyse the presence and
importance of these effects in the determination of production location in Spain. For this, we have used as a basis the theoretical models of Krugman (1980) and Weder (1995) and the successive empirical analyses of Davis and Weinstein (1996, 1997, 1998, 1999 and 2003).

The empirical test carried out for 17 autonomous regions and 9 sectors of activity from 1965 to 1995 lends support to the hypothesis of the existence of the Home Market Effect. This evidence exists in an important number of productive sectors, specifically HME is found in 5 of the 9 sectors: Food, Drink and Tobacco (S1), Paper and Graphics (S4), Products of Various Industries (S5), Products of Non-Metallic Minerals (S6) and Metal Products (S7). These results were obtained with a new specification proposed here, a more intuitive definition of HME as a mechanism of agglomeration of productive activity and which also presents conceptual advantages.

At the same time there is a remarkable contrast between the widespread existence of HME in recent Spanish industry compared to earlier periods, when HME was mainly notable for its absence, HO predominating in our manufactures (Rosés 2003). This demonstrates that the cumulative factors proposed by the NEG have now become more relevant.

At the same time, we have found that factor endowments are still relevant in industrial location in Spain, being especially predominant in sectors 2 (Transportation Material), 3 (Basic Metals), 4 (Paper and Graphics) 8 (Chemical Products) and 9 (Textile, Leather and Footwear). In any case, HO and the NEG coexist, in different intensities according to sector, as determinants of the industrial geography of Spain.
Throughout the article we have been especially careful to follow the recommended methodology ("estimate, don't test") which according to Leamer and Levinsohn (1995) should inform all those who seek to test a theory empirically. Specifically, as indicated by Head and Mayer (2004), the models of comparative advantage with constant returns are inconsistent with the magnification effect of domestic market size (HME) which represents a confirmation of increasing returns models.

Finally, we should refer to the limitations of the results obtained through this work. Principally, absorption of demand through gross value added to factor costs is approximate, due to the absence of data on intermediate consumption, imports and exports for our sample. Not allowing for intermediate demand, which represents a fundamental mechanism of agglomeration through backward and forward linkages, could be the reason that, for example, in sectors such as Chemical Products HME is never found, skewing the results, essentially because this sector is fed by intermediate consumption of other industrial activities. Second, the instruments used to correct the problem of endogeneity in the specification of the model are not always valid, although other instrumental variables cannot be used, due once again to the lack of data.

7. Bibliographic references


