DOCUMENTS DE TREBALL

DE LA DIVISIÓ DE CIÈNCIES JURÍDIQUES ECONÒMIQUES I SOCIALS

Col·lecció d'Economia

Geographical determinants of the creation of manufacturing firms: The regions of Spain[§]

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[§] This research is supported by a grant of the Plan Nacional de I+D+I of the Ministerio de Ciencia y Tecnología reference SEC 2000-0882.

ABSTRACT

The complexity of the mechanisms determining the entry and exit of firms increases when geographical differences in production structure, human capital and unemployment are considered. Inter-regional variations in the rate of the new firm start-ups within each industrial activity persist through long periods of time, a circumstance that indicates that there are non-conjunctural determinants to the capacity of regions to create new industrial projects. This study is concerned with establishing the influence of geographical variables on the setting up of new manufacturing establishments. The manufacturing industries (NACE R-25) in the Spanish regions (NUTS-2) have been taken as the units of analysis for the period 1980-1992.

KEY WORDS:

Firm start-ups, industrial dynamics, geographical determinants, Spanish regions

1.- INTRODUCTION.

Differences in regional economic well-being has been traditionally associated with, among other variables, strong business dynamics and, in particular, with high rates of new business formation. In the last ten to fifteen years new empirical studies have contributed to a better understanding of the relationship between regional development and the rate of birth of new firms. In general, the results tend to confirm the expected positive relationship - with some interesting nuances - but the task of identifying the spatial factors that foster entrepreneurship, especially successful entrepreneurship, has proved to be rather difficult. This paper adds some more information on the determinants of new business formation in the case of the Spanish regions.

The geographical approach to the study of business dynamics differs from non-geographical analysis in several basic aspects. By non-geographical analysis we mean a plurality of approaches where space is not taken into consideration. Most non-geographical models are rooted into the Industrial Organization field, which provides conceptual rigour to the analysis of the entry behaviour of firms. The work of Orr (1974) is usually referred to as the first stylised formulation of a model of entry rooted in the IO tradition. According to Orr's model, entry rates in a given industry will have a positive relationship with the expected profits of potential entrants, and a negative relationship with the height of entry barriers specific to the industry. The size of the profit rate in the long term serves as a measure of the barriers to entry. The model takes the form:

$$ENT_{it} = f(p_{it} - p^{*}_{i})$$

where ENT_{it} is the gross rate of entry, π_{it} is the industry expected rate of profits, and π_i* represents the rate of long term profits of the industry. The higher the difference among expected profits and long term normal profits, the higher the incentive to enter.

It has been argued that Orr's model is only a partial explanation of entry behaviour, given that empirical evidence shows that entry rates are fairly high even in periods where no extraordinary profits are expected. Baldwin (1995) argues that entry may occur even in a zero profit industry if entrants expect to displace less efficient incumbents. Geroski (1991) has produced further developments of the basic model of entry induced by expected profits.

In the traditional IO approach, the rates of entry depend on the characteristics of the industry, and space does not play a role. Other non-spatial approaches use more dynamic settings. This is the case with the *schumpeterian hypothesis* of innovative entrepreneurship (Malerba and Orsenigo, 1995), the evolutionary models (Nelson and Winter, 1982), the innovation models (Audretsch, 1995), the product cycle models (Klepper, 1996), the embodied technology models (Campbell,

1998), and learning models (Jovanovich, 1982; Hopenhayn, 1992; Pakes and Ericson, 1998).

The geographical analysis of new business formation confronts more difficulties in finding a conceptual framework than do industry approaches. In spite of the interesting developments of the "New Economic Geography" (Fujita, Krugman and Venables, 1999), the spatial analysis of firms births remains less linked to tight conceptual models, and more guided by insight. Geographical models are generally more open with respect to the selection of explanatory variables. One consequence of this openness is heterogeneity among studies and reduced possibilities for comparisons among them. Given that context, the set of co-ordinated studies carried out under the OECD initiative (Reynolds, Storey, Westead, 1994) represents one of the most valuable efforts that have been made to identify regional variables that influence the rate of birth of new firms.

The OECD study allowed the comparison of the results of testing the same group of explanatory variables in seven countries. The adopted regional variables were: demand conditions (population growth and immigration); urbanization/agglomeration (population density, proportion of skilled labour); unemployment; personal wealth (income, home ownership); small firms/specialization (share of small firms, specialization index); local political conditions (socialist voting); and government policies (expenditure on local infrastructure, support programmes for new and small firms). The most complete studies were made for Italy (Garofoly, 1994), Germany (Audretsch and Fritsch, 1994), Sweden (Davidsson, Lindmark, Olofsson, 1994) United Kingdom (Keeble and Walker, 1994) and United States (Reynolds, 1994).

Population density, interpreted as a measure of agglomeration economies, emerges in most cases as a positive influence on the rate of firm start-ups[1]. Audretsch and Fritsch find that a high density of population spurs start-ups in manufacturing. Reynolds and Davidsson et al find that agglomeration is more important to the service sector than to manufacturing. Only Garofoli concludes that this variable has no significant impact on the rate of start-ups in the case of Italy.

In most of the countries and regions studied it was found that those environments dominated by small firms present higher rates of firm formation. But when Audretsch and Fritsch differentiated between manufacturing and service industries they found that while the predominance of small firms had no effect on the rate of manufacturing start-ups - presumably due to the relevance of economies of scale in manufacturing activities - it had a positive influence on the rate of start-ups in the service sector. Keeble and Walker argued that the positive impact of the variable representing the share of small firms on the rate of creation of new firms confirms the idea that small firms are incubators of new firm

[1] The effect of external economies on industrial location has been studied by Glaeser et al. (1992) and Henderson et al. (1995), among others. For Spanish local productive systems, see Callejón and Costa (1996) and Costa and Viladecans (1999).

founders, while large firms perform as incubators of professional services.

The role of unemployment on firm start-ups was controversial. Audretsch and Fritsch found a positive relationship, but the rest of studies did not. Only Davidsson et al. discovered a positive influence, although that was restricted to the service sector.

All the reviewed studies support the hypothesis that human capital fosters the formation of new firms[2]. Only Reynolds departed partially from this result when he found a negative relationship between the share of population with college education and the rate of firm start-ups in manufacturing.

Only Garofoli includes an index of specialization/diversity in his study. He finds a strong positive impact of industry specialization on the rate of firm birth, that is, new firms seems to benefit from localization economies. It could be argued that this result is specific to Italian conditions, given the profusion of very specialized local districts in that country.

In parallel to the co-ordinated testing of regional variables, the participating experts at the OECD initiative developed models that linked the appearance of new companies to specific regional aspects. Audretsch and Fritsch (1994) proceeded to test the validity of Krugman's propositions about "the New Economic Geography" (Krugman, 1991), according to which production convexities of local scope arise from pecuniary, technological and labour market externalities. Since convexities are linked to agglomeration, the rate of new firm formation in Audretsch and Frisch's model also captured the size of the external forces or agglomeration forces. On his side, Garofoli (1994), looking at Italy, advanced the hypothesis that regional differences in business formation could be explained by the local "milieu" or socio-economic environment.

Although it is possible to identify some underlying spatial factors that seem to operate in the same way in most regions, the results of the combined study are far from being consistent. In another paper Audretsch and Fritsch have argued that the ambiguous results derived from the test of geographic variables is due to the fact of ignoring the industrial organization factors that affect the behaviour of firm demography. According to both authors it is not correct to assume that all firms respond in the same way to geographical stimulus or, in other words, it is wrong to assume that "the response of start-up activity to changes in geographic specific factors is neutral across industries". Therefore, the correct question to ask is not 'How do territorial variables influence the rate of new firm creations?'; nor is it is, 'To what extent do entry rates differ between the different sectors?'; but rather `Given a certain entry rate in an industry or sector, where will new businesses tend to locate

[2] The role of human capital in the creation of new businesses at a local level is discussed in Duranton and Puga (2000), and the positive incidence of human capital on local productivity local is discussed in Rauch (1993).

themselves?' (Audretsch and Frisch,1995).

This paper is intended as a contribution to the task of identifying those spatial factors that influence firm creation considering at the same time that, as Audretsch and Fritsch have stressed, the behaviour of firms depends on the industrial organization characteristics of each industry.

This paper is organized as follows: Section 2 presents some basic and informative statistics on firm demography at the regional-industrial level in Spain for the period 1980-92. Section 3 contains an empirical model of the determinants of start-ups with, industry and geographic explanatory variables. Section 4 comments the data set used. Section 5 presents the empirical results. Finally, Section 6 gives the main conclusions of this study.

2.- REGIONAL DISTRIBUTION OF THE NEW MANUFACTURING ESTABLISHMENTS.

During the period between 1981 and 1992 the average annual gross rate of creation of establishments - ratio of the number of entrants to the total population of firms - in Spanish manufacturing was 6,33% (Table A-1). The regions of Spain (17 administrative units at NUTS-2 level) show wide differences in the rhythm of creation of new centres of production.

The region of Extremadura registered a gross rate of entry of 2,87%, the lowest of the regions of Spain. At the opposite extreme, the Community of Madrid reached a rate of 9,72% (Callejón and Segarra, 1999). Even after the adjustment of these indicators to the industry-mix of each region, inter-regional rates of entry differ widely (Table 1) and the disparities persist all along the diverse phases of the business cycle. Entry and exit rates present a procyclical behaviour, with less startup and more exit during recessions (1981-1985) and higher rates of birth and less exit during expansive periods (1986-92) (Table A-2).

After Italy and Japan, Spain is the OECD country with the highest proportion of firms with less than 10 employees (Table A-3). Since the 1970's, the share of small enterprises has been rising in many developed countries. This is a general phenomenon related to a multiplicity of factors (Acs and Audretsch, 1990). Some explanatory hypotheses frequently used say that: *i)* the use of new technologies in the process of handling information reduces the size of the minimum efficient scale; *ii)* growing openness to the international economy increases market competition and firms respond with the adoption of flatter and more flexible profiles; *iii)* the improvement in the skills of the workforce favours the emergence of new entrepreneurs; *iv)* production batches tend to become smaller as demand turns more specific and sophisticated; and *v)* the introduction of new products facilitates the entry of innovative firms that generate a process of destructive creation in the market.

The data presented in Table 1 also show that birth rates of firms not only differ regionally but also differ across industries or, in other words, within the same industry, and the ability of the regions to attract new firms varies considerably.

Table 1
Distribution of the gross entry rate in Spanish regions by industries.

	Period 1980-85		Period 1986-92	
Industries	Regional Average	Coefficient of variation	Regional Average	Coefficient of variation
Ores and metals	0,43	1,97	1,03	1,68
Mineral Products	3,02	0,31	4,81	0,37
Chemical Products	6,51	0,25	7,67	0,38
Metal Products	5,88	0,33	7,64	0,24
Ag./Ind. Machinery	7,35	0,32	11,04	0,51
Office Machinery	0,46	1,33	1,95	1,23
Electrical Goods	16,36	0,59	15,58	0,59
Transport Equipment	12,58	1,70	31,87	1,01
Food/Beverages/Tobacco	2,99	0,46	3,65	0,56
Textiles	5,44	0,59	9,15	0,45
Paper/Printing	5,05	0,21	7,90	0,23
Rubber/Plastic	13,18	0,45	12,98	0,35
Other Manufacturing	6,36	0,38	8,62	0,49
Total Manufacturing	4,80	0,25	6,61	0,29

Source: Registry of Industrial Establishments and Industrial Survey.

The observed dispersion of the regional rates of firm start-ups depending of the type of industry indicates that geographical variables are of great importance for a good understanding of the determinants of firm turnover. Activities with low rates of entry of firms (mineral and metal products, office machinery) together with industries with a high firm turnover (transport equipment) present wide ranges of inter-regional variation. Among the thirteen industrial sectors, the lowest coefficients of regional dispersion are found in the metal products industries and in paper manufacturing and printing.

For manufacturing as a whole the average gross rate of regional entry, between 1980 and 1985, was 4.80%, with a coefficient of variation among regions of 25%, while between 1986 and 1992, the average gross rate of entry rose to 6.61%, with a coefficient of inter-regional variation of 29%. The value of the coefficient of variation remains very similar in the recession phase and in the expansive phase of the business cycle, suggesting the fact that local and regional factors play a significant role in the ability of regions to generate new manufacturing establishments.

3.- GEOGRAPHICAL DETERMINANTS OF NEW FIRMS: A MODEL.

In this paper we estimate the impact of two groups of explanatory variables on the rates of gross entry of new firms in the Spanish regions (*GER*). One group is composed of industry variables, and

the other group is formed of geographical explanatory variables. It is hypothesised that the rate of entry in an industry depends on the type and importance of the barriers to entry to that industry. The empirical variables that capture those barriers in our equation are: R&D intensity of the industry (technological barriers to entry), advertising costs (A, barriers to entry due to product differentiation and customer information), price-cost margin (PCM, a measure of the height of the barriers to entry). The business cycle has also a short term effect on the perception of new potential entrepreneurs about current market conditions; the rates of entry are usually larger during periods of high demand and growing sales. This oscillating effect of the business cycle is captured by the rate of growth of the industry output, which acts as a control variable. The vector of geographic variables includes six elements that supposedly have an impact on the rate of firm start-ups: population density (DEN); average firm size in the region (SIZE), regional specialization (SPE), regional diversity (DIV), the availability of human capital (HK), and the rate of unemployment (U).

The econometric equation estimated, with fixed regional effects, is as follows,

$$\ln GER_{ijt} = a_i + b_1 R\&D_{it} + b_2 A_{it} + b_3 PCM_{it} + b_4 Growth_{it} + b_5 DEN_{jt} + b_6 SIZE_{jt} + b_7 SPE_{jt} + b_8 DIV_{jt} + b_9 HK_{jt} + b_{10} U_{jt} + v_j + m_{ijt}$$

where $lnGER_{ijt}$ is the logarithm of the gross rate of entries in industry i and region j, v_j captures fixed regional effects and m_{ijt} is random term.

4.- THE NATURE OF THE DATA: STATISTICAL SOURCES AND VARIABLES.

The explanatory variables included in the econometric equation fulfill two requirements. First of all, they are available for the seventeen regions of Spain and for thirteen manufacturing industries (classification NACE R-25). Secondly, they are available for a period of thirteen years from 1980 to 1992).

The official Encuesta Industrial (EI) provides, for the period under study, data segregated by industries and regions on production, employment, and the distribution of establishments by ranges of size. Statistical information about entry of establishments comes from the Registro de Establecimientos Industriales (REI). It constitutes an exhaustive and very detailed source at an industry and local level. Data on population numbers come from the demographic census and its periodical updates. Unemployment information is supplied by the Encuesta de Población Activa (EPA). Finally, the human capital index has been estimated by the Instituto Valenciano de Investigación Económica (IVIE).

The statistical data base used provides a panel for each of the thirteen manufacturing industries and allows the estimation of an econometric model of fixed effects, which presents better reliability than

the estimation by OLS. The individual effects of the estimations capture the differential behaviour of the geographical factors among the regions of Spain.

The explanatory variables have been specified in the following way:

Industry explanatory variables:

$R+D_i$ Expenditures in R+D as a percentage of sales. The intensity of innovation in an industry captures the technological opportunities open to new firms, but also the higher risk associated to a dynamic market. Very innovative markets attract new ventures, but survival is hard and new firms present high rates of turnover.

A_i The advertisement intensity of the industry is measured as the ratio of advertisement expenditures to sales. This variable is interpreted as a measure of barriers to entry due to product differentiation and information costs for the customers.

PCM_i The price-cost margin in the industry captures the market power of incumbent firms. A high price-cost margin may imply that incumbents are able to earn supernormal profits in the long run because the entry of competitors is difficult. The barriers to entry may be technical (large sunk costs) or strategic (entry deterrence behaviour of the incumbents). The PCM variable is calculated empirically as the ratio of sales minus intermediate inputs and minus the amount of payroll, divided by sales.

Control variable:

$Growth_i$ It has been observed that entry rates behave procyclically, the rate of growth the industry's value added, acts as a control variable given that we use a panel of data.

Geographical variables:

DEN_j. The population density in a region is measured as the number of inhabitants per square kilometre. This variable is often employed to capture the influence of the economies of agglomeration on the creation of new industrial establishments. According to the new models of economic geography, the agglomeration of activity produces centripetal forces based on pecuniary and technological externalities (Krugman, 1991), that lower the barriers for new firms.

$SIZE_j$. Represents the mean size of the manufacturing establishments at regional level. This regressor reflects the effects of the market structure on business dynamics. The empirical literature has found that in geographical areas where small and medium-sized firms predominate, there are higher rates of entry of new entrepreneurs. The hypothesis behind this observed fact is that small firms are the seedbeds where employees of active firms learn how to run their own business.

DIV_j Is an indicator of how diversified the economic structure of a region is. According to some

geographic models, the regions that host a greater diversity of industries are also more likely to be preferred by new firms due the operation of inter-industry knowledge spillovers, also known as Jacob's externalities (Glaeser et al. 1992). Other factors linked to diversity that favour entrepreneurship are to the availability of specialized and advanced suppliers, and also to the higher probability of finding niche markets. This indicator is constructed as the inverse of the concentration index of Hirshman-Herfindahl. Values near to 1 imply low variety of activities, the degree of diversification grows with the value of the indicator.

SPE_j In some industries, firms may benefit from locating in a specialized area. This happens because proximity allows them to benefit from knowledge spillovers (Henderson, et al. 1995) or other types of Marshallian externalities, like availability of skilled labour or specialized suppliers. The regressor that captures the degree of regional specializacion in a given industry is constructed as the share of value added of industry i in region j with respect to the total manufacturing value added of the region j.

U_j The rate of regional unemployment reflects the pressure on the unemployed to enter into self-employment activities. Some studies have found a positive link between unemployment and firm creation (Storey, 1991), and other studies reveal ambiguous results depending on the country studied (Reynolds, Storey, Westhead, 1994)

HK_j Constitutes an indicator of the regional human capital endowment as the proportion of workers with secondary or higher education degrees over the total workforce. It is supposed that a greater proportion of educated people should favour entrepreneurship initiatives.

5.- RESULTS OF THE ESTIMATION

In all the regressions estimated the unity of analysis is the industry-region, and the results appear to be are reasonably meaningful with most of the parameters presenting the expected sign. The fixed effects model improves the closeness of the econometric fit, showing the presence of specific geographical factors.

Table 2 presents a first estimation of the determinants of the entry of firms into the aggregate industries during the period 1980-1992. The three explanatory variables linked to the characteristics of the industry are significant at the one percent level and present the expected sign. Gross entry rates are positively related to the innovative intensity of the industry, and negatively correlated to the variables that represent entry barriers, that is, advertising intensity and the price-cost margin. The parameter of the control variable, GROWTH, is positive and significant, confirming once again the procyclical behaviour of the rates of firm births.

The result that DEN is not a significant regressor implies, according to our hypothesis, that agglomeration forces do not manifest themselves clearly in the regional rates of new firm formation.

This result should not be interpreted as a rejection of the theories of the "new economic geography" because we are testing with rather large spatial units (NUTS 2), and before rejecting the effect of agglomeration economies it would be very convenient to repeat the test with smaller NUTS 3 areas where spatial externalities are more likely to be internalized.

The dimension of the establishments in the region SIZE takes the expected negative sign that can be interpreted as meaning that small business tend to adopt the role of seedbeds where new entrepreneurs acquire the abilities and the incentives to develop their own business. The negative sign of the index of industrial diversity, DIV, in the fixed effects regression indicates that regions that have a diversified industrial-mix present lower entry rates. This result does not confirm the hypothesis that the presence of Jacobs' externalities at the regional level stimulates the creation of manufacturing firms.

The explanatory variable proxied by human capital presents significant positive values in all estimations. That is, the education of the active population favours the creation of business. Finally, the rate of unemployment presents significant positive values. High unemployment rates in the region put pressure on the unemployed to decide upon self-employment strategies.

The above regression pools together all manufacturing industries and the parameters are supposed to be valid across industries. To know the differences of the behaviour of the different industries with respect to the geographical variables we have been testing, we should perform separate regressions for each industry. Given that the number of observations would be small for certain sectors, we have grouped the thirteen industries into four groups. The four groups are: industries intensive in natural resources, labour intensive, with economies of scale, and industries with product differentiation and R+D intensive. This grouping is an adaptation of the typology proposed by the OECD based on the factors of competitiveness of the industries.

Table 2

Geographical determinants for new firm entries in industries and regions
Dependent variable: Gross entry rate by industry-region
Period: 1980-1992
Fixed effects method

Industry variables	**Regional Industry (NACE R-25)**
R&D	0.1799 (10.289)*
ADVERTISING	-0.1841 (-8.132)*
PRICE-COST MARGIN	-4.2634 (-11.257) *
Geographical variables	
DEN	0.0008 (0.498)
SIZE	-0.0444 (-3.332)*
DIVERSITY	-0.1117 (-3.709)*
HUMAN CAPITAL	1.0785 (5.125)*
UNEMPLOYMENT	1.6523 (3.448)*
Control variables	
INDUSTRY GROWTH	1.2699 (6.007)*
Individual effects	
Andalusia	3.44
Aragón	3.78
Asturias	3.35
Balearic Islands	3.28
Canary Islands	2.87
Cantabria	3.76
Castile-Leon	3.28
Castile-La Mancha	3.38
Catalonia	3.60
Valencia	3.78
Estremadura	2.76
Galicia	3.57
Madrid	3.84
Murcia	3.59
Navarre	3.87
Basque Country	3.72
La Rioja	3.14
Nº, of observations	2460
R^2	0.393
R^2 Adjusted	0.386
Durbin-Watson	0.977
F-statistic	174.923

Note: *significance at 1%, ** significance at 10%, Statistic t-student in brackets.
Source: Registry of Industrial Establishments and Industrial Survey

The results of the estimations with the fixed effects model for the four groups of manufacturing industries are presented in Table 3. The results indicate that the effect of territorial factors on the creation of new firms varies considerably according to the characteristics of the industry. But, in general, the results are more ambiguous and difficult to interpret in this case than with the aggregate manufacturing industries.

The parameter corresponding to the R&D regressor is always positive and significant, with reasonable differences among groups. The results confirm that innovative intensity increases firm turbulence (Audrestch and Mahmood, 1994). The advertising/sales ratio parameter presents now less clear results

than in the case of the total manufacturing sectors. Surprisingly, it carries a positive sign in the group of differentiated industries, although the parameter is significative only at the ten percent level. Trying to differentiate among groups of industries does not seem to improve the perception on the role of advertisement expenditures as a barrier to entry.

The price-cost margin also presents an ambiguous result. In the case of industries intensive in differentiated products and science-based industries the existence of a greater market power limits the entry of new firms. On the other hand, in the sectors intensive in economies of scale the existence of market power do not represent impediments to the entry of new competitors.

Even the control variable for the business cycle ceases to present a clear picture when applied to four groups of industries. It is only significant in the case of industries intensive in economies of scale. If we interpret this variable as a proxy for variations in demand, our result is similar to the findings of Kangasharju (2000) for Finland. In the estimation performed by Kangasharju the conditions of demand do not have a significant influence on regional entry.

The results of the geographical variables follow a similar pattern. Instead of highly significant parameters with the expected signs, we find much more ambiguous results. In spite of this fact, some results harmonize well with the conceptual framework.

With the regressor SIZE the negative sign of the parameter predominates, but only in two industries is it significant. As in the estimations carried out for the aggregated levels of regional manufacturing, the presence of business networks where small-sized establishments predominate favours the creation of firms.

The parameter of SPE is negative in three groups of industries, but significant in two: natural resources and product differentiated and science based. Regional specialisation does not encourage the opening of centres of production, with the exception of the labour intensive industries. The parameters estimated for the regressors DIV, which are mostly negative, do not change the picture seen in Table 2. Diversification of the economic structure in the region does not directly influence the entry rate of establishments.

Table 3

Industry and Geographical determinants for firm entries
Dependent variable: Gross entry rate
Period: 1980-1992
Fixed effects method

Industry variables	**Natural Resources**	**Labour Intensive**	**Scale economies-based**	**Product differentiated and Science-based**
R&D	0.9307 (3.089)*	0.1501 (1.657)**	0.1505 (2.357)*	0.6181 (15.161)*
ADVERTISING	0.0624 (0.479)	-0.8311 (-2.223)*	-0.6730 (-6.239)*	0.1488 (1.944)**
PRICE-COST MARGIN	-1.4154 (-0.728)	1.3055 (0.671)	5.1647 (5.189)*	-5.7273 (-10.288)*
Geographical variables				
DEN	-0.0006 (-0.253)	0.0002 (0.071)	0.0001 (0.040)	0.0028 (1.288)
SIZE	-0.0199 (-0.834)	-0.0376 (-1.793)**	0.0237 (0.946)	-0.0791 (-4.678)*
ESP	-0.7304 (-2.101)*	07171 (1.205)	-0.8489 (-1.374)	-2.1933 (-5.721)*
DIVERSITY	-0.1011 (-2.215)*	-.1068 (-3.154)*	-0.0600 (-0.992)	-0.1240 (-2.978)*
HUMAN CAPITAL	-0.4241 (-0.465)	2.9517 (8.639)*	1.4296 (3.468)*	0.5855 (1.150)
UNEMPLOYMENT	2.5408 (2.897)*	-1.4246 (-1.438)	1.6440 (1.734)**	1.6794 (2.534)*
Control variables				
INDUSTRY GROWTH	-.3771 (-0.643)	0.0495 (0.150)	1.0679 (3.261)*	0.3850 (1.112)
Individual effects				
Andalusia	6.08	0.69	-0.32	6.53
Aragón	6.34	0.53	-0.45	7.26
Asturias	6.31	-0.49	-0.93	6.94
Balearic Islands	6.23	-0.87	0.35	6.12
Canary Islands	6.13	-0.67	-0.29	5.60
Cantabria	6.63	-0.01	-0.88	7.45
Castile-Leon	6.03	-0.08	-0.43	6.44
Castile-La Mancha	5.92	0.48	0.03	6.23
Catalonia	6.58	0.21	-0.84	6.92
Valencia	6.69	0.70	-0.18	6.79
Estremadura	5.27	-0.34	0.06	5.52
Galicia	6.26	-0.11	-0.23	6.81
Madrid	7.80	0.92	-1.14	6.67
Murcia	6.49	0.55	0.00	6.38
Navarre	6.45	0.34	-0.87	7.59
Basque Country	6.90	0.48	-1.70	7.35
La Rioja	5.80	-0.01	-0.73	6.20
Nº, of observations	433	438	662	927
R^2	0.785	0.887	0.443	0.574
R^2 Adjusted	0.772	0.879	0.420	0.562
Durbin-Watson	1.392	1.267	1.241	1.253
F-statistic	165.122	358.291	560.160	134.821

Note: *significance at 1%, ** significance at 10%, Statistic t-student in brackets.

The variable representing the level of education of the regional population adopts a positive value in all the estimations, being significant in three groups of industries. The presence of skilled labour resources favourably influences the capacity of the areas to found firms. These results are compatible with the fact that labour is less mobile than capital, and many entrepreneurs locate their new firms in the region in which they live and know well. Gains in the levels of skills of the new generations constitute one of the principal correcting mechanisms of geographical imbalance, in the sense that the regions with an initial small industrial tradition can prosper with the improvement of the education of the population.

The regional rate of unemployment is, again, positively correlated with the rates of firm birth. Only in the case of labour intensive industries the sign of the parameter is negative, that is, more unemployment does not translate into a higher rate of firm births. A possible explanation is that the unemployed of labour intensive industries are mainly non-skilled, and therefore less prone to start a business.

6.- CONCLUSIONS.

Regional differences in the rate of entry of new firms has been generally considered an indicator of differences in economic dynamism. Regions compete among themselves to attract existing firms as well as encouraging the birth of new entrepreneurs. Several international studies have tried to find out the main regional factors that determine the entry of new firms (Reynolds et al. 1994). The results of these studies have been rather inconclusive, and Audretsch and Fritsch (1995) have argued that the rate of new firm births depends not only on regional characteristics, but also on industry characteristics, especially those that form entry barriers. In this paper we have looked for more evidence on the geographic and industry determinants of the formation of new firms.

Our study finds quite consistent results when the dependent variable is regional entry in all the manufacturing industries. Our results confirm that R+D intensity fosters entry, and that the existence of entry barriers limits the proportion of new ventures. Demand growth also favours the birth of new firms.

In the geographical group of variables, most of them present coefficients consistent with the conceptual framework used and with findings elsewhere in other studies. One exception is the variable that proxies the agglomeration effects which in our regression emerges with the wrong sign, implying that agglomeration economies do not affect firm creation. With the expected sign and highly significant parameters we find that both the availability of human capital and the presence of unemployment stimulate the creation of firms. Regions were small firms dominate have also higher rates of firm births, whereas regional diversity of the portfolio of industries does not favour new entries.

The results appear less consistent when we try to estimate regressions for four groups of industries: intensive in natural resources, labour intensive, with economies of scale, and product differentiated and science-based. The general results obtained for the determinants of the rate of entry in the aggregate regional manufacturing industry still apply when splitting activities in four types of industries, but now both the level of significance and the sign show inter-group variations that are difficult to interpret.

One main conclusion is that geographic characteristics matter, industry factors also matter, but there are probably influences not captured by the models we have used. It is also worthwhile noting that the contradictory results associated to the variables that proxy external technological and pecuniary economies, deserve to continue with the effort in order to improve the panel of data used for the estimation, especially to look for a more appropriate delimitation of the regional areas included in the estimation. The NUTS 2 is possibly too large an area to test externalities.

DATA APPENDIX

Table A-1
Regional entry and exit rates (1981-1992)

	Entry and exit rates					Cyclical componen	
Regions	Gross entry rate	Gross exit rate	Net entry rate	Rate of turnover	Rate of volatility	Entries	Exits
Andalusia	6,91	7,98	-1,07	14,89	13,83	25,20	52,18
Aragon	5,95	7,58	-1,63	13,52	11,89	24,26	46,31
Asturias	5,21	6,34	-1,12	11,55	10,43	30,54	91,66
Balearic Islands	5,36	7,51	-2,15	12,87	10,72	33,11	97,81
Canary Islands	6,88	6,65	0,23	13,52	13,30	33,03	116,84
Cantabria	5,50	7,18	-1,68	12,68	11,00	26,08	106,95
Castile-Leon	4,59	7,16	-2,57	11,74	9,18	19,73	24,30
Castile-la Mancha	4,86	6,75	-1,89	11,61	9,72	40,60	36,73
Catalonia	6,29	7,91	-1,63	14,20	12,57	31,99	65,83
Valencia,	8,27	8,75	-0,48	17,02	16,54	26,25	33,77
Estremadura	2,87	5,97	-3,11	8,84	5,73	54,42	11,,21
Galicia	4,76	6,96	-2,21	11,72	9,51	25,64	51,80
Madrid	9,72	11,09	-1,38	20,81	19,43	22,82	60,14
Murcia	7,40	8,19	-0,80	15,59	14,79	32,89	92,31
Navarre	4,72	5,13	-0,41	9,85	9,44	27,16	85,42
Basque Country	5,96	6,71	-0,75	12,67	11,92	39,17	105,34
La Rioja	4,80	7,33	-2,53	12,13	9,60	17,13	92,14
Spain	6,33	7,89	-1,56	14,22	12,67	21,67	17,15

Note: The cyclical component expresses the normal standard deviation for the average of the period 1980-1992,
Source: Registry of Industrial Establishments and Industrial Survey

Table A-2
Regional entry and exit rates for periods.

	Period 1981-85				Period 1986-92			
	Gross rates		Cyclical component		Gross rates		Cyclical component	
Regions	Entries	Exits	Entries	Exits	Entries	Exits	Entries	Exits
Andalusia	5,37	7,10	21,1	67,9	8,12	7,54	11,0	46,4
Aragon	5,10	7,75	11,1	56,2	6,83	7,44	14,4	48,6
Asturias	3,97	9,35	18,1	89,0	6,16	5,93	22,1	46,2
Balearic Islands	4,79	7,43	39,6	102,6	6,01	8,92	25,9	51,6
Canary Islands	5,96	5,45	15,3	85,3	7,30	8,40	39,2	71,2
Cantabria	4,74	7,83	19,1	121,7	5,97	7,16	27,6	83,5
Castile-Leon	3,74	7,53	9,7	28,0	5,25	6,80	8,7	25,1
Castile-la Mancha	4,65	7,59	32,3	35,9	5,05	5,75	48,1	33,5
Catalonia	5,60	8,97	19,0	73,1	7,39	8,07	13,5	44,9
Valencia,	7,34	9,39	33,3	41,8	9,17	8,59	18,9	32,2
Estremadura	2,75	8,53	21,7	101,6	2,98	5,61	62,9	85,4
Galicia	4,34	10,60	29,0	32,6	5,31	4,71	14,7	35,8
Madrid	8,60	9,34	11,4	73,1	10,84	11,89	19,2	58,8
Murcia	5,12	9,01	30,9	91,4	9,08	7,85	14,3	58,6
Navarre	4,36	7,87	29,0	38,3	5,19	3,89	21,9	123,2
Basque Country	5,27	7,38	18,3	115,0	7,06	7,96	27,1	50,9
La Rioja	4,85	7,31	15,0	92,0	4,87	7,08	19,4	92,1
Spain	5,44	8,00	14,9	22,2	7,22	7,64	9,5	15,7

Note: The cyclical component expresses the normal standard deviation for the average of the period 1980-1992,
Source: Registry of Industrial Establishments and Industrial Survey

Table A-3
Turnover of industrial establishments according to size (1981-1992)

	Establishments		Entries			Exits		
1981	**Number**	**%**	**Number**	**%**	**GER**	**Number**	**%**	**GXR**
Less than 10 workers	126.480	76,00	5.223	88,30	4,0	10.370	66,89	7,9
10-19 workers	17.218	11,31	421	7,12	2,3	2.797	18,04	14,3
20-49 workers	13.126	8,60	226	3,82	1,6	1.998	12,89	13,4
50-99 workers	3.339	2,01	24	0,41	1,3	170	1,10	4,9
100-500 workers	3.024	1,82	17	0,29	0,7	142	0,92	4,5
More than 500 workers	412	0,25	4	0,07	0,5	25	0,16	5,8
Industry total	163.599	100,00	5.915	100,00	3,5	15.502	100,00	9,0
1992								
Less than 10 workers	109.918	77,11	7.445	87,30	6,6	10.344	81,31	9,2
10-19 workers	15.036	10,55	671	7,87	4,3	1.081	8,50	7,0
20-49 workers	11.537	8,09	317	3,72	2,6	1.077	8,47	8,8
50-99 workers	3.168	2,22	55	0,64	1,7	131	1,03	4,0
100-500 workers	2.618	1,84	39	0,46	1,5	66	0,52	2,5
More than 500 workers	276	0,19	1	0,01	0,3	22	0,17	7,4
Industry total	142.553	100,00	8.528	100,00	5,8	12.721	100,00	8,7

Note: GER is the gross entry rate and GXR is the gross exit rate.
Source: Registry of Industrial Establishments and Industrial Survey.

REFERENCES.

Acs, Z,J, and Audretsch, D,B, (1990): *Innovation and Small Firms*, The MIT Press.

Audretsch, D and Mahmood, T (1994), "Firm Selection and Industry Evolution: The Post-entry performance of New Firms", *Journal of Evolutionary Economics*, 4 (3): 243-260.

Audretsch, D, and M, Fritsch (1994): "The Geography of Firm Births in Germany", *Regional Studies*, 28 (4): 359-365.

Audretsch, D,B, (1995): *Innovation and Industry Evolution*, Cambridge, Mass, The MIT Press.

Audretsch, D,B, and Fritsch, M, (1995): *The Geographic and Industry Components of New Firm Startups in Germany*, Discussion Paper FS IV 95-16, Wissenschaftszentrum Berlin für Sozialforschung.

Baldwin, J,R, (1995): *The Dynamics of Industrial Competition*, Cambridge University Press,

Callejón, M. and Costa, MT (1996) "Economías Externas y Localización Industrial", *Economía Industrial* n. 305, 1995/V, pp: 75-86

Callejón, M. and Segarra, A.(1999): "Business Dynamics and Efficiency in Industries and Regions. The case of Spain", *Small Business Economics* ,13, 253-271.

Campbell, J,R, (1998) "Entry, Exit, Embodied Technology, and Business Cycles", *Review of Economic Dynamics*, 1: 371-408.

Costa, M.T. and Viladecans, E, (1999): "The district effect and the competitiveness of manufacturing companies in local productive systems", *Urban Studies*, 36:2085-2098.

Davidsson, P., Lindmark, L., Olofsson, C. (1994) New firm formation and regional development in Sweden, *Regional Studies*, 28 (4): 395-410.

Duranton, G, and Puga, D, (2000): *"Nursery Cities: Urban diversity, process innovation, and the life-cycle of products"*, Discussion Paper 445, Centre for Economic Performance

Fujita, M., Krugman, P. and Venables, A. (1999): The Spatial Economy. Cities, regions and International Trade, MIT press, Cambridge, Massachusetts.

Garofoli, G, (1994): "New Firm Formation and Regional Development: The Italian Case", *Regional Studies* 28 (4): 381-393.

Geroski, P (1995): "What do we know about entry?", *International Journal of Industrial Organization*, 13 (4): 421-440.

Geroski, P, (1991a): *Market dynamics and entry*, Oxford: Blackwell.

Glaeser, E,, Kallal, H,, Scheinkman, J, and Shleifer, A, (1992): "Growth in Cities", *Journal of Political Economy*, vol, 100: 1126-1152.

Henderson, V,, Kundoro, A, and Turner, M, (1995): "Industrial Development in Cities", *Journal of Political Economiy*, 103: 1067-1090.

Hopenhayn H, (1992): "Entry, exit and firm dynamics in long run equilibrium", *Econometrica*, vol, 60, Nº 5.

Jovanovic, B, (1982): "Selection and the Evolution of Industry", *Econometrica* 50 (3): 649-670.

Kangasharju, A (2000), Regional variations in firm formation: Panel and cross-section data evidence from Finland, *Papers in Regional Science*, 79, 355-373.

Keeble, D, and Walker, S, (1994): "New Firms, Small Firms and Dead Firms: Spatial Patterns and Determinants in the United Kingdom", *Regional Studies* 28 (4): 411-427.

Klepper, S, (1996): "Entry, Exit, Growth and Innovation over the Product Cycle", *American Economic Review* 86 (3): 562-583.

Krugman, P, (1991): "Increasing Returns and Economic Geography", *Journal of Political Economy* 99 (3): 483-99.

Malerba F, and Orsenigo L, (1995): "Schumpeterian patterns of innovation", *Cambridge Journal of Economics*, vol, 19.

Nelson, R,R, and S,G, Winter (1982): *An Evolutionary Theory of Economic Change*, Cambridge, Mass,: Harvard University Press.

Orr, D, (1974): "The Determinants of Entry: A Study of the Canadian Manufacturing Industries", *Review of Economics and Stadistics*, 56 (1), pp, 58-66.

Pakes, A, and Ericson, R, (1998): "Empirical Implications of Alternative Models of Firm Dynamics", *Journal of Economic Theory*, (79): 1-45.

Rauch, J,E, (1993): "Productivity gains from geographic concentration of human capital: Evidence from the cities, *Journal of Urban Economics*, 34: 380-400.

Reynolds, P, (1994): "Autonomous Firm Dynamics and Economic Growth in the United States, 1986-1990", *Regional Studies* 28 (4): 429-442.

Reynolds, P,, D,J, Storey and P, Westhead (1994): "Cross-national Comparisons of the Variation in New Firm Formation Rates", *Regional Studies* 28 (4): 443-456.

Storey, D J (1991) The birth of new firms - does unemployment matter?. A review of the evidence, *Small Business Economics* 3: 167-178.