THE PERSISTENCE OF PROFITS IN THE LONG TERM FOR THE MANUFACTURING SECTOR: AN INTERNATIONAL COMPARISON, 1985-1999

Nuria ALCALDE-FRADEJAS

Marisa RAMÍREZ-ALESÓN

Manuel ESPITIA-ESCUER

Department of Business Management

University of Zaragoza (SPAIN)

Contact address

Marisa Ramírez-Alesón

Dpto. de Economía y Dirección de Empresas

Facultad de CC. EE. y EE.

Universidad de Zaragoza

Gran Vía 2

50005-ZARAGOZA (SPAIN)

Tfno: 34 976 76 10 00 ext. 4693

Fax: 34 976 76 17 67

e-mail: mramirez@posta.unizar.es

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Abstract:

It is foreseeable that the integration of domestic economies into a single market (globalisation) will have a direct consequence upon firm profits. Firms, if they cannot design strategic barriers that protect their relevant markets, will see their returns converge in the long term towards an equilibrium value that is identical to that of the rest of the firms coming from other economies. By using the aggregate business data corresponding to the manufacturing sector from eight countries, the results herein obtained suggest that even though the competitive forces that operate at an international level will cause a convergence among the respective returns of firms in the long term, the convergence process is only partial.

Key words: Long term profits, firm convergence, Bach database, international comparison.

[1] This work has been financed by the CICYT-FEDER Research Project SEC2002-00835

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1. INTRODUCTION

One of the basic propositions of Economic Theory sets forth that, under conditions of perfect competition, the excess profits of firms are transitory by nature, such that all firms and industries of an economy tend towards a common return in the long term. Thus, if a firm earns excess profits, new competitor firms will enter their market, and they will offer similar products at lower prices, thereby causing a decrease in the excess profits of the first firm. The competitive process will continue as long as the profits that are being earned in that market are greater than the average profit in the economy. Alternatively, a profit that is less than the normal profit causes disinvestments and capital movements towards markets with more attractive incomes. In this way, the competitive process makes positive or negative excess profits disappear in the long term.

A wide number of papers in international literature have verified this hypothesis of competitive markets. Some of the more prominent papers are, among others, those by Mueller (1986) in the case of the United States, by Odagiri and Yamawaki (1986) as regards Japan, by Goddard and Wilson (1996) for Great Britain, by Schohl (1990) for the German case and by Espitia and Salas (1989) for Spain. They all reach similar conclusions, thereby observing in each one of these countries a certain process of convergence, which tends to bring the returns of the various firms closer together in the long term, even though this process is incomplete, given that the excess profits are not eliminated in their entirety.

In these studies, the analyses centre on a single country, without thereby taking into account the inter-relationships existing with other countries. Some authors have made international comparisons, but not in an integrated manner, given that they limit themselves to comment on the results obtained in one country or another. Thus, Geroski and Jacquemin (1998), starting with a sample of large European firms (in France, Germany and Great Britain) analyse the competitive forces between firms, industries and countries; and Jacquemin and Sáez (1976), even though they use a methodology different from previous studies, analyse the persistence of profits in a sample with firms from the old EEC, Great Britain and Japan. Recently, Geroski and Gugler (2001) presented a work that studies the convergence of the corporate growth of various industries from a group of 14 European countries.

Nevertheless, since the end of the 20th century, firms have been facing a new economic environment that is evolving towards the globalisation of markets, and therefore towards the integration of the various domestic economies. It is foreseeable that the integration of the various domestic economies into a single market will have a direct consequence on firm profits due to an easing of the barriers that protect the markets in which the domestic firms operate. This is driven by the new information technologies that allow reducing the distances between countries and obtaining greater knowledge about the same or homogenising consumer needs. This process of integration, by giving rise to broader markets, will generate competitive dynamics to which firms will progressively adapt. A shift has been made from sectors of local or multi-domestic competition, in which the competition in one country is essentially independent from the competition in other countries (Porter 1986a and b), to sectors of global competition where there is growing interdependence among the various domestic markets (Ghoshal, 1987).

As a result of the competitive mechanism, of the international mobility of capital and firms and of the homogenisation of demand, domestic economies will tend towards homogenisation, and therefore the final result of this process will be the convergence of the domestic economies towards a global economy. Firms, if they cannot design strategic barriers of protection for their relevant markets, will see their returns converge towards a long-term equilibrium value or return. Therefore, it could be inferred that a homogeneous, long-term convergence return is going to be derived from this process of integration for all of the firms that would form a part of a single economy after the process of integration.

Therefore, in this study, starting with the aggregate business data of the manufacturing sector corresponding to eight developed countries (six members of the European Union, the United States and Japan), it is herein analysed if convergence exists and if this value tends towards the average global return. In other words, it endeavours to detect the evolution of the competitive process in the manufacturing sector at an international level. To do so, a methodology has been used, by which it is endeavoured to infer the degree of competition existing in the markets, starting from an analysis of the evolution of firm profits over time.

In order to carry out the objective of this study, the following section presents the models that are applied, as well as information on the database used. The third section sets forth the methodology used and the main results obtained with respect to the operation of the competitive process at an international scale. Finally, the main conclusions of the paper are presented in the last section.

2. MODELS AND SAMPLE USED

2.1 Convergence Models

In accordance with authors such as Mueller (1977), Odagiri and Yamawaki (1986), Schohl (1990) and Goddard and Wilson (1996), in order to verify the effectiveness of the competitive process, *ad hoc* models have been used, which allow making inferences starting with a modelling and study of the behaviour of the returns variable. Through these models, an estimate can be obtained of the value at which the firm returns in the various countries converge in the long term.

As a measure of the returns, the Return on Assets (ROA) is calculated, which is measured as the Profit before interest and taxes/Total net assets[2].

Nevertheless, and given that the competitive process is motivated by the existence of profits that are greater than or less than the average profit, the ROA of the manufacturing firm representative of each country has been standardised. For this purpose, we have calculated its deviation with respect to the average ROA of the group of manufacturing firms of all the countries of the sample[3]. Moreover, this standardisation of the measure, as Goddard and Wilson (1996) point out, allows eliminating the effects on profitability by the cyclical factors that operate in the aggregate scope.

$$\Pi_{jt} = ROA_{jt} - \overline{ROA_t} \qquad (1)$$

Π_{jt}: The standardised ROA of the representative firm of the manufacturing sector of the country j in the period t.

ROA_{jt}: The ROA of the representative firm of the manufacturing sector of the country j in the period t.

$$\overline{ROA_t} = \frac{\sum_{j=1}^{n} ROA_{jt}}{n} \qquad (2)$$

As Odagiri and Yamawaki (1986) point out, in order to obtain a measure of the long term returns, a time series model is needed that fulfils the condition that the limit of Π_{jt} be finite when t tends towards infinity. A simple model that fulfils this condition is the following:

[2] The data have been obtained from the Aggregate Financial Statements (by country and by sub-sector).

[3] Other authors, such as Mueller (1977) and Odagiri and Yamawaki (1986), have standardised the variable, thereby subtracting and dividing by the total average.

MODEL 1: $\Pi_{jt} = a_{j1} + \frac{b_{j1}}{t} + \varepsilon'_{jt}$ $t=1,2,\ldots n$ (3)

This model, presented by Mueller (1977) and subsequently used by Odagiri and Yamawaki (1986) and Schohl (1990), among others, assumes the existence of a process of monotonous convergence by Π_{jt} towards a_{j1}.

a_{j1}: Permanent advantage or disadvantage of the representative firm of the manufacturing sector of the country j with respect to the average of all countries.

b_{j1}: Convergence speed of the profitability of the representative firm of the manufacturing sector of the country j.

This model implies that the greatest difference between the current return and the long-term return occurs in the first period. Thus, the standardised ROA of the country j, which in the first period is $\Pi_{j1} = a_{j1} + b_{j1}$, converges in the long term towards the value $\hat{a}_{j1}$. Given that under conditions of perfect competition, profitabilities above or below the average profitability can only exist in the short term, a positive or negative value of a_{j1} indicates permanent excess profits or losses in the manufacturing sector of the country j, and it therefore reveals deficiencies in the competitive process. For its part, an estimated value of the coefficient $b_{j1} > 0$ indicates that the estimated value of Π_{j1} is above the value of the long-term standardised profitability (a_{j1}), and it is the opposite in the case of $b_{j1} < 0$. It is thereby derived that a necessary, although not sufficient, condition for convergence to occur between countries is that those countries that enjoyed an excess of profitability over the average at the start of the period considered should show an estimated value of the coefficient $b_{j1} > 0$, and those that were below the average in the initial situation should present an estimated value of $b_{j1} < 0$. The model represented by the equation (3) is known in specialised literature as the Standard Model.

By presupposing that the greatest deviation between the current return and the long-term return occurs in the first period, the estimated value of a_{j1} will vary, depending on which is the first period selected. In order to overcome this difficulty, an alternative specification is hereby proposed (model 2), which allows the greatest difference between the current return and the long term return to occur at any time, meaning that the current returns can fluctuate around their long term value:

MODEL 2: $$\Pi_{jt} = a_{j2} + \frac{b_{j2}}{t} + \frac{c_{j2}}{t^2} + \varepsilon''_{jt} \qquad t=1,2,.....n \qquad (4)$$

The estimate corresponding to the regression (3 or 4) that obtains a higher value of the adjusted R^2 will be presented for each case as a second estimate. This means that the regression that best fits the available data is presented, which is called the Best Fit Model, thereby in accordance with the studies of Odagiri and Yamawaki (1986) and Schohl (1990).

As Odagiri and Yamawaki (1986) and Mueller (1986) point out, the problem with these models is that they are sensitive to the form in which the time variable is measured, meaning that the results will be different if the time sequence t=1971, 1972, ... is chosen or if the time sequence t=1, 2,... is chosen. Most authors [see Mueller (1977), Odagiri and Yamawaki (1986) and Schohl (1990)] choose the second option, and it has also been used in this study, meaning that t = 1, 2, ... has been used.

The third proposed model, known in international literature as the "Partial Adjustment Model," starts from the basic presumption that the entry and departure of firms from a market influences the excess profits obtained by the firms that operate in the same[4].

Thus, $\Pi_{jt} = f(E_t)$ (5)

As Geroski (1990) indicates, E_t must be interpreted in the broad sense, thereby including

[4] A detailed derivation of the model can be consulted in Geroski (1985) and Geroski and Jacquemin (1988).

both the threat of new entries by firms as well as the real entries and departures by firms. These movements are motivated by the returns obtained by the firms that currently operate in the market, such that if these returns are greater than the average, there will be other firms that, attracted by them, will attempt to enter or will enter the market in question. If, conversely, the returns obtained by the firms are less than the average, a departure of firms will occur.

Given that these processes require a certain amount of time, it is assumed that the entries and departures in the sector during the period t are a function of the excess profits (positive or negative) obtained in the said sector during the period t-1.

$E_t = h\ (\Pi_{jt-1})$ (6)

By plugging (6) into (5), we get

$\Pi_{jt} = f\ (h\ (\Pi_{jt-1}))$ (7)

Assuming that functions f and h are linear first-order polynomial, the model 3 to be estimated is obtained:

MODEL 3: $\Pi_{jt} = d_{j3} + b_{j3}\ \Pi_{jt-1} + \varepsilon'''_{jt}$ (8)

The long-term convergence in this model would imply that the estimated value of the coefficient b_{j3} is encompassed between -1 and 1. If this condition is fulfilled, the measure of long-term excess profits could be obtained by the following quotient: $\hat{a}_{j3} = \hat{d}_{j3} \big/ (1 - \hat{b}_{j3})$.

In addition to the level of long-term profit, the competitive dynamics are also characterised by the speed at which the current profits converge upon those returns. The speed of convergence can be evaluated starting from the estimated values of the coefficient b_j. A greater absolute value of these parameters is interpreted as a greater slowness in the convergence process.

Starting with the long term convergence values obtained, it can be determined up to what point the long term profits of the countries tend to become equal over time or, on the contrary, if they remain at levels that substantially differ from some countries to others. In this sense, if the convergence value of the excess profitability of the manufacturing sector of the various countries is close to zero, this indicates that no country maintains in the long term a significant advantage or disadvantage with respect to the others.

In order to obtain additional evidence about the convergence between the various countries, in addition to attempting to draw conclusions starting with an estimation of the *ad hoc* models that have just been presented, the methodology proposed by Sala-i-Martín (1995, 1996) has been applied to the available data in order to analyse the existence of convergence between such country economies. Sala-i-Martín distinguishes between β convergence and σ convergence. He indicates that β convergence exists when poor economies tend to grow quicker than rich ones. Applying this concept to the specific case analysed in this paper, we can say that β convergence exists when the countries whose representative manufacturing firm starts with a lower ROA tend to grow more quickly. In order to verify this hypothesis, the following equation is estimated:

$$g_{j\ (t1,\ tn)} = \alpha + \beta \log (ROA_{j,t1}) + \varepsilon^{iv}_{jt} \qquad (9)$$

Here, $g_{j\ (t1,\ tn)}$ is the annual growth ratio between the year t_1 and the year t_n of the country j, calculated as $g_{j\ (t1,\ tn)} = 1/n \log (ROA_{jtn}/ROA_{jt1})$. Therefore, if the estimated β coefficient is less than zero, there is β convergence.

The σ convergence between a group of countries occurs when the spread between their wealth levels tends to decrease over time. Thus, for the specific case herein analysed, we can say that σ convergence exists if $\sigma_{tn} < \sigma_{t1}$, where σ_t is the standard deviation of log (ROA_{jt}).

In accordance with Sala-i-Martín, the existence of β convergence is a necessary condition for σ convergence to exist, but it is not a sufficient condition. Thus, it could occur that, while β convergence exists, the difference between the growth rates of the ROA in the various countries were so large that the same spread existed at the end of the period considered as at the beginning of the period, but in the opposite sense. This means that the countries that presented a lower ROA at the beginning hold the position of those that presented the higher ROA, and vice versa.

2.2 Sample selection

For the study and measurement of the long-term profits of the firms of various countries, the BACH database (Bank for the Accounts of Companies Harmonised) has been used. The BACH project was put forth by the European Commission, and it includes the participation of countries of the European Union (except for Greece, Ireland and Luxembourg), the United States and Japan. The central balance sheet data offices of these countries send to the Directorate General II of the European Commission the information from their databases (which include the financial statements of the firms), aggregated by business activity sectors. Even though the information coming from the various countries is homogenised, the information sources present differences that affect the data comparison. Thus, there are large differences between countries as regards the number of co-operating firms, in addition to the fact that in some countries only a part of their database is sent in. The group of manufacturing industries is nevertheless well covered by all of the central balance sheet data offices that participate in the project (BACH, 2001), wherefore this paper is centred exclusively on this sector (see Table 1).

Insert Table 1

Nevertheless, the historical information of the aggregate financial statements available for some countries is not sufficient in order to carry out this kind of study, and therefore all countries have been selected for which information on the manufacturing sector is available as a whole and by sub-sectors from 1985 to 1999[5] (United States, the Netherlands, France, Spain, Italy, Austria, Denmark and Japan). The sub-sectors analysed correspond to the 3-digit disaggregation established by the BACH database, and they correspond to the following: S1: Extraction of Metalliferous ores and preliminary processing of metal; S2: Extraction of non-ferrous metalliferous ores and manufacture of non-metallic mineral products; S3: Chemicals and man-made fibres; S4: Manufacture of metal articles, mechanical and instrument engineering; S5: Electrical and electronic equipment including office and computing equipment; S6: Manufacture of transport equipment; S7: Food, drink and tobacco; S8: Textiles, leather and clothing; S9: Timber and paper manufacture, printing; and S10: Other manufacturing industries not elsewhere specified.

Even though the sample considered leads to an interpretation of the results with caution, it should be highlighted that the unavailability of firm information for a numerous group of economies means that this study, which includes information from the three economic blocks, contributes certain evidence that allows us to approach a state-of-the-art report.

3. METHODOLOGY AND ANALYSIS OF THE RESULTS

3.1 Methodology

The endogenous variable in each one of the estimated equations for each model is the standardised ROA in the period t of the representative firm of the corresponding sector-country.

[5] The econometric methodology used requires balanced data, and therefore the information available for the year 2000 could not be used for some of the countries.

These endogenous variables are therefore variables of the same nature, which hold a certain relationship between each other[6], such that the convenience of simultaneously processing their various equations is hereby proposed. This means that it so happens that the variables to be analysed are related to each other at every instant of time through their stochastic components, such that each variable contains relevant information about the evolution of the other, and therefore the joint estimation of their respective equations is more effective than individually processing each one of them.

In accordance with these considerations, the SURE estimation procedure (Seemingly Unrelated Regressions Equations Model) has been applied. The GLS estimators, from the system of equations that are obtained by applying this method, are more efficient than the OLS estimators obtained by individually processing each equation, given the existence of a contemporaneous correlation between the error terms of the various equations. Nevertheless, it should be pointed out that when the matrices of observations of the independent variables corresponding to each sample are equal to each other, which is the case for the models 1 and 2 herein presented, the GLS estimation of the system of equations is equivalent to the OLS estimation, equation by equation.

3.2 Results for the Total Manufacturing Sector

The results of the estimations of the equations corresponding to the *ad hoc* models for the Total Manufacturing Sector of each one of the eight countries considered appear in Table 2. In it, the standardised ROA for each country is presented in the first period considered (1985), in addition to the main results obtained using each one of the three specifications proposed in the previous section: the Standard Model, the Best Fit Model and the Partial Adjusted Model. The results of the estimations made according to the methodology

[6] Which is derived from the inter-dependence existing between the various countries.

proposed by Sala-i-Martín in order to determine the existence of β and σ convergence between countries are included in the last rows.

Insert Table 2

Nevertheless, it should be pointed out that in the row corresponding to the Best Fit Model, numerical data are not shown, given that for all countries, model 1 (the Standard Model) shows a better fit than model 2. Finally, it should be noted that the countries are shown in order by growth according to their initial standardised profitability.

Various questions emerge from the results presented. In the first place, the calculated F statistics clearly show the overall significance of all models estimated for each country, except for the Netherlands and Italy. In the case of Italy, only the Partial Adjusted Model is significant, while for the Netherlands, none of the models fit. This suggests that in the Netherlands the modelled competitive process does not concur with the evolution of the profitability of its manufacturing sector. Therefore, no conclusion can be made about that country.

Second of all, it is observed that the ordering that the countries maintain in accordance with their initial standardised profitability does not correspond with the ordering that is derived from their convergence values. Even though this result does not allow affirming that an approximation between the various countries occurs in the long term, it could be the case. One result in line with this possibility is the one that is inferred from the values obtained for the b_{j1} coefficients in the Standard Model. This coefficient is positive for those countries that start with a ROA greater than the average, and it is negative for those countries in which the opposite situation occurs, which suggests a certain process of approximation between the countries. For their part, the b_{j3} coefficients corresponding to the Partial Adjusted Model vary between –1 and 1 in all cases, thereby showing values between 0.39 and 0.63.

As regards the convergence values obtained, they are significantly different from 0 in the cases of France and Italy (with the Standard Model) and in the case of Austria (with both models). Therefore, the results obtained indicate that in the long term only these countries have a significant advantage (in the case of France) and a significant disadvantage (in the case of Austria and Italy) with respect to the rest of the countries considered, while the rest (except for the Netherlands) have a profitability close to the average in the long term.

Moreover, it is observed that the pattern of behaviour followed by the countries differs. Thus, the Standard Model (which depends on the time sequence) fits better in France, Italy and Japan. Conversely, the Partial Adjusted Model (which depends on the standardised profitability of the preceding period) includes the competitive behaviour better in Austria, Spain, the United States and Denmark.

The application of the methodology proposed by Sala-i-Martín [equation (9)] using the data corresponding to the ROA of the representative manufacturing firms of the various countries yields a β coefficient = -0.0742 (p-value < 0.05), which suggests the existence of β convergence in the group of 8 countries considered.

Conversely, the spread among the ROA of the representative manufacturing firms of the various countries has decreased in the period considered, although only slightly, going from a value of 0.21 in 1985 to a value of 0.18 in 1999[7].

Therefore, it seems to be confirmed that the differences between these countries do not persist over time. On the contrary, there is a certain process of convergence that is bringing the manufacturing firms of the various countries closer to similar values of ROA, such that the hypothesis that the competitive process in the manufacturing sector is operating at an international scale cannot be rejected. Nevertheless, the process of convergence between

[7] Nevertheless, it should be pointed out that an analysis if the standard deviations throughout the period considered does not show a clearly decreasing trend of the same.

countries is not total, given that, on the one hand, there are countries in which the evolution of the results does not fit the pattern of the models that include the operation of the competitive process at an international scale, and on the other, some countries in the long term have significant differences with respect to the average result.

The process of partial approximation between the various economies considered is reflected in Figure 1, thereby representing the equation for each country that best fits the available data.

Insert Figure 1

3.3 Results for the Manufacturing Sub-sectors

In order to analyse if this competitive behaviour of the representative manufacturing firm of each country is also reflected when analysed by sub-sectors, the models are again applied to each sub-sector. The most relevant results of the three proposed models (Standard Model -SM-, the Best Fit Model -BF[8]- and the Partial Adjusted Model -PAM-) are included in Table 3.

Insert Table 3

It should be pointed out that, upon analysing the sub-sectors, the models do not fit in a broad number of cases, and therefore conclusions cannot be reached about the same. It could only be noted that, in these cases, the competitive behaviour does not fit the convergence models commonly used in the literature.

As regards the convergence values obtained, given the large quantity of information included in the table[9], they will be summarised for each one of the countries.

Thus, Japan is prominent, with convergence values that are not significantly different from zero for each one of the ten sub-sectors analysed. This means that the long-term results in

[8] When the Best Fit Model coincides with the Standard Model, the results are shown in a single quadrant.
[9] The results of the model that fits the best are shaded.

these sub-sectors have a profitability close to the average in the long term. This trend observed in the sub-sectors would determine the result obtained for the total manufacturing sector. In the case of Denmark, the convergence value obtained in most cases is not significant, except for sub-sectors S5 and S6, in which the models do not fit. Again, these results would confirm those obtained in the case of the total manufacturing sector. The results obtained for Spain show that the majority of the sub-sectors do not follow a competitive process like the one modelled. Thus, convergence values have only been obtained for sub-sectors S3, S6, S8 and S10, and the values were not statistically significant in all cases. The Dutch case is prominent for presenting a convergence value significantly different than zero (positive) in sub-sectors S7 and S9 and a null value in S10; the models do not fit in the rest of the sub-sectors. Therefore, the representative firms of sub-sectors S7 and S9 show a comparative advantage over the other countries. It should be noted that in the analysis made of the sector as a whole, results were not obtained, given that the models applied did not fit. In sub-sectors S2 and S7 in France, a statistically significant positive convergence value is also obtained. Nevertheless, S9 shows a statistically significant negative long-term result. In the rest of the sub-sectors, either a value that does not differ significantly from 0 is obtained (S3, S4, S5, and S8) or the model does not fit (S1, S6 and S10). Therefore, it could be inferred that the advantage observed in the total sector would be generated mainly by the two sub-sectors that show a result greater than the average in the long term. In the United States, only S1 stands out with a positive value of 1.56 (p-value < 0.1). The models for sub-sectors S3, S8 and S10 are not significant, and insignificant convergence values are obtained for the rest of the sub-sectors. Nevertheless, the positive result obtained is not reflected in a joint analysis of the sector. In Italy, three sub-sectors (S5, S6 and S7) show negative convergence values (p-value < 0.01), meaning that they bear a comparative disadvantage with respect to the other countries, which would determine the result obtained at an overall level. Conversely, S10 shows a positive value, and sub-sectors S2 and S8 show insignificant values. Finally, the negative convergence values (S2, S4 and S7) or the insignificant values (S1 and S6) are prominent, whereby the negative values would be influencing the joint negative result of this sector.

By analysing the most relevant results by sub-sectors, it is observed that in sub-sectors S3 and S8, no country stands out over the others. Either the models are not significant or it turns out that the long-term profitability in the countries tends towards the average. In S1, it could only be highlighted that the U.S. has a comparative advantage, and in S10, the same occurs in the case of Italy. Conversely, Italy also stands out in S5 and S6, but because it is the only country that shows a comparative disadvantage than the rest. In S4, this disadvantage falls upon Austria, a disadvantage that is also apparent in S2. Conversely, France shows an advantage in this sub-sector. Nevertheless, in S9, France stands out for showing a convergence value below the rest of the countries, and the Netherlands for obtaining an advantage. Finally, in S7, three countries stand out: Austria, Italy and the Netherlands. The first two because they support long-term results less than the average and the last because it shows a positive convergence value.

As regards the behaviour model followed in the various countries, a single model is not obtained for all sub-sectors, meaning that the model that the firms of the sample follow sometimes corresponds to the Standard Model, other times to the Partial Adjustment Model and also to the Best Fit Model. Nevertheless, even though this is the behavioural guideline when analysing by sector, it should be pointed out that in the sub-sectors S1 and S2, when they are significant, the model that fits the best corresponds to the one that depends on the time sequence (the Standard Model).

Together with these analyses, the Sala-i-Martín methodology has been applied, thereby adapted to our object of study, for each one of the ten sub-sectors (see Table 4). For all sub-sectors, except for S2 and S10, a β convergence has been obtained, such that the coefficients vary between values of –0.004 and –0.106. When the σ convergence is analysed, it is observed that the spread between the ROA of the representative firms of each sub-sector in the various countries has only decreased in S1[10], S4, S5, S6 and S9.

Insert Table 4

4. CONCLUSIONS

The analysis of the convergence of firm profits has been the object of study in numerous articles. These papers are based mainly on samples from a single country and, when international comparisons are made, their conclusions are independently centred on the results obtained for each country.

Nevertheless, the process of globalisation that firms currently face causes the existence of strong interdependencies between sectors and countries. Therefore, the Manufacturing Sector (total and by sub-sectors) is analysed jointly in this paper through a sample of 8 industrial countries for the 1985-1999 period in order to obtain evidence about the operation of the competitive process between countries.

As regards the total manufacturing sector, the application of the *ad hoc* models typically used in literature indicates the existence of a convergence process that, except for the case of the Netherlands, tends to approximate the ROA of the manufacturing sector of the various countries considered. An analysis of the standard deviation of the ROA differential between the countries also points towards the same result. Nevertheless, it does not seem that the competitive forces that operate at an international level are strong enough so as to

[10] It should be pointed out that, due to the high standard deviation obtained for the initial period, we are led to analyse this result with caution.

place the manufacturing sector of the various countries considered within the same value of ROA. Thus, in the long term and in accordance with the estimations obtained, France holds a significant advantage with respect to the rest of the countries, while Austria and Italy show the opposite situation.

The analysis by sub-sectors shows very different results according to the sub-sector considered. Moreover, it is noteworthy that there are various countries for which a good fit of the estimated models is not obtained, and it is therefore risky to reach conclusions about the degree of internationalisation of the same. Nevertheless, it could be inferred from the analysis broken down by sub-sectors that the advantage of the French manufacturing sector in the long term will be generated mainly by the sub-sectors S2 (Extraction of non-ferrous metal ores and manufacture of non-metallic mineral products) and S7 (Food, drink and tobacco). In the Italian case, sub-sectors S5 (Electrical and electronic equipment including office and computing equipment), S6 (Manufacture of transport equipment) and S7 (Food, drink and tobacco) are the ones that show results that are significantly less than the average of the countries, which therefore are the ones that would determine the result of the analysis of the Total Sector. Likewise, Austria shows comparative disadvantages in sub-sectors S2 (Extraction of non-ferrous metal ores and manufacture of non-metallic mineral products), S4 (Manufacture of metal articles, mechanical and instrument engineering) and S7 (Food, drink and tobacco), which would influence the joint negative result of this sector.

In addition, it has been observed that the models of competitive behaviour mainly differ between both countries and sectors, such that in some cases this behaviour would be determined by the time sequence (Standard Model) and in other cases by the results of the preceding period (Partial Adjustment Model).

Finally, it should be pointed out that in spite of the necessary caution with which the results obtained must be considered, and given the scarcity of the available data and the nature of the same, the analysis presented in this paper, which contributes new evidence about the state of the art, is justified by the interest in and the currentness of the subject at hand, as well as the absence of literature about the same.

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THE PERSISTENCE OF PROFITS IN THE LONG TERM FOR THE MANUFACTURING SECTOR: AN INTERNATIONAL COMPARISON, 1985-1999

Table 1: Coverage over the Added Value[a] of the Manufacturing Sector (by percentage). 1997

AUSTRIA	SPAIN	FRANCE	ITALY	U.S.A.	DENMARK	NETHERLANDS	JAPAN
48.1[b]	36.9	45.7	58.9	66.1[c]	89.2[b]	76.1	98.4[d]

a: The Added Value is defined by the BACH (2001) as the Total Operating Income minus Costs of materials and consumables minus Other operating charges and taxes. b: Coverage over Gross Added Value at market prices. c: Coverage over Gross Economic Return. Year 1996. d: approximation.
Source: Spanish Bank (2000)

Table 2: Results for the Total Manufacturing Sector

		AUSTRIA	SPAIN	FRANCE	ITALY	U.S.A	DENMARK	NETHERLANDS	JAPAN
Π_{j85}		-2.764	-2.744	-2.469	0.375	1.169	1.222	1.243	3.443
Standard Model	$\hat{a}_{j1}$ (%)	-1.91***	0.31	0.82**	-0.78***	0.03	0.99	0.68	-0.69
	Adj. R^2(%)	**23.45****	**33.14****	**53.21*****	**24.59****	**42.09*****	**61.95*****	-2.77	**73.39*****
Best Fit		Standard Model							
Partial Adjustment Model	$\hat{d}_{j3}$	-0.0095***	-0.0015	0.0019	-0.0029*	-0.0012	0.0058	0.0039	0.0022
	$\hat{b}_{j3}$	0.5544***	0.5857***	0.3938***	0.4487***	0.4317***	0.5229***	0.6208***	0.6293***
	$\hat{a}_{j3}$ (%)	-2.13	-0.36	0.31	-0.53	-0.21	1.22	1.03	0.59
	Adj. R^2(%)	**25.79****	**34.16****	**30.18****	0.45	**45.07*****	**65.48*****	-25.86	**64.10*****
Sala-i-Martín	β Convergence	$g_{j(1985,\ 1999)} = -0.176^{**} - 0.074^{**} \log(ROA_{j,\ 1985})$ **Adj. R^2(%) = 5.71****							
	σ Convergence	$\sigma_{1985} = 0.217$ $\sigma_{1999} = 0.186$							

(*) p-value < 0.10; (**) p-value < 0.05; (***) p-value < 0.01. The model with the best fit is shaded.

Table 3: Convergence Values by Manufacturing Sub-sectors (by percentage)

		AUSTRIA	SPAIN	FRANCE	ITALY	U.S.A.	DENMARK	NETHERLANDS	JAPAN
S1	SM (Adj.R^2)	1.55 (23.22**)	-5.76*** (6.98)	2.26** (-3.66)	-4.01* (6.43)	1.56* (13.73*)	1.05 (41.64***)	0.74 (3.65)	0.79 (56.81***)
	BF (Adj.R^2)								
	PAM (Adj.R^2)	-3.04[a] (-33.96)	0.54[d] (-44.26)	10.98[d] (-108.68)	-7.87[d] (-14.41)	-1.35[d] (-31.42)	-0.61[d] (39.99***)	2.77[b] (-16.33)	1.93[d] (53.50***)
S2	SM (Adj.R^2)	-2.32*** (14.39*)	1.09 (3.22)	3.14*** (33.33**)	-1.35 (66.59***)	0.05 (57.25***)	0.91 (36.21**)	0.50 (-3.48)	-2.36 (64.91***)
	BF (Adj.R^2)								
	PAM (Adj.R^2)	-1.88[a] (2.25)	2.94[a] (-92.37)	2.18[a] (8.63)	-3.35[a] (-181.09)	1.73[b] (-4.05)	1.51[b] (27.53**)	-0.39[d] (-28.99)	-3.96 (-46.89)
S3	SM (Adj.R^2)	-3.39*** (9.336)	-0.98 (1.40)	1.57 (46.41***)	-0.26 (-96.71)	-0.91* (-52.61)	1.16 (62.65***)	2.45** (-213.25)	-0.11 (49.88***)
	BF (Adj.R^2)	-5.21*** (9.73)	0.88 (28.02*)		-2.59*** (8.77)	-1.46** (-7.92)		-1.10 (-0.05)	
	PAM (Adj.R^2)	-0.70[d] (-33.31)	0.59[d] (44.21***)	1.88[a] (0.55)	-0.94[a] (-8.88)	-0.28[d] (-23.30)	-0.41[d] (67.68***)	1.87[d] (-81.13)	-0.30[d] (26.24**)
S4	SM (Adj.R^2)	-2.85*** (32.37**)	-0.57 (19.90*)	0.06 (17.25*)	1.56*** (11.48)	0.06 (45.15***)	0.57 (54.10***)	0.29 (4.87)	-0.02 (71.36***)
	BF (Adj.R^2)								
	PAM (Adj.R^2)	-3.48[a] (37.78**)	-1.40[d] (11.87)	-0.08[d] (-4.98)	1.19[c] (8.81)	-0.03[d] (42.67***)	-0.03[d] (56.08***)	4.10[d] (-61.90)	0.99[d] (73.07***)
S5	SM (Adj.R^2)	-2.97*** (5.45)	3.93** (1.95)	0.57 (58.81***)	-1.24 (65.02***)	1.38 (18.53*)	-0.77 (5.79)	0.47 (1.46)	-0.47 (57.07***)
	BF (Adj.R^2)	-3.85*** (8.72)		0.16 (60.68***)	-3.21***(67.46***)				
	PAM (Adj.R^2)	-2.35[b] (-4.37)	9.87[a] (-35.52)	1.99[d] (48.59***)	2.37 [d] (50.48***)	2.67[b] (9.87)	-3.61[c] (-23.97)	-5.87[b] (-31.41)	1.39[c] (16.15*)
S6	SM (Adj.R^2)	1.10 (5.20)	1.34 (20.39*)	1.27 (27.89**)	-1.28* (18.66*)	0.56 (51.58***)	-2.14 (-8.21)	-2.31** (-4.43)	1.35 (43.83***)
	BF (Adj.R^2)	4.62 (28.87*)			-3.94*** (35.78**)				-0.01 (45.85***)
	PAM (Adj.R^2)	20.24[a] (-60.21)	2.20[d] (-11.84)	0.61[d] (-3.38)	-1.72[d] (-1.57)	1.25[d] (55.61***)	-5.12[d] (-39.23)	12.13[d] (-86.07)	1.54[d] (35.69**)
S7	SM (Adj.R^2)	-3.22***(37.79***)	0.47 (-2.10)	0.54** (15.22*)	-1.56*** (17.17*)	0.68 (56.02***)	0.78 (36.22**)	3.37*** (35.22**)	-0.84 (39.74***)
	BF (Adj.R^2)	-6.20***(52.74***)	0.43 (10.92)	0.08 (17.58)				6.06*** (39.47**)	
	PAM (Adj.R^2)	-5.86[a] (25.52**)	0.39[d] (-28.27)	0.60[c] (-23.27)	-1.42[a] (-5.38)	1.54[a] (47.00***)	2.75[a] (15.71*)	0.68[d] (18.26*)	0.69[d] (20.04*)
S8	SM (Adj.R^2)	-2.43*** (0.75)	0.74 (30.53**)	0.35 (23.47**)	0.72 (25.26**)	0.22 (-12.12)	2.12* (60.50***)	-0.30 (20.03*)	-0.63 (48.69***)
	BF (Adj.R^2)	-1.64*** (10.11)		-0.18 (35.48**)		-1.56 (15.22)		-1.02 (25.17*)	
	PAM (Adj.R^2)	-2.20[a] (-29.94)	-2.88[a] (-48.79)	2.16[a] (-17.18)	1.61[b] (-47.33)	3.47[a] (-130.06)	1.64[d] (63.56***)	-2.05[a] (-20.74)	-0.04[d] (36.04**)
S9	SM (Adj.R^2)	-1.40** (3.83)	-0.12 (-16.08)	-1.33*** (19.92*)	-0.58 (-4.12)	0.04 (57.18***)	-0.26 (62.68***)	2.35** (32.22**)	1.23 (31.46**)
	BF (Adj.R^2)		-0.11 (-11.53)	-2.36***(46.88***)					
	PAM (Adj.R^2)	-2.02[b] (-2.43)	0.62[d] (-37.35)	-0.96[d] (3.68)	-0.62[d] (-59.72)	-0.41[d] (57.07***)	-0.27[d] (62.98***)	1.66[d] (-51.91)	0.78[d] (37.16**)
S10	SM (Adj.R^2)	-3.95*** (3.31)	1.19 (25.00**)	0.55 (-2.08)	0.53 (16.60*)	0.64 (8.61)	0.76 (54.16***)	0.39 (46.81***)	0.30 (53.59***)
	BF (Adj.R^2)	-5.44*** (7.98)		-0.05 (4.44)	1.72*** (29.53**)				
	PAM (Adj.R^2)	-4.29[a] (-1.34)	2.41[d] (6.99)	0.85[a](-83.20)	0.56[c] (3.53)	1.85[a] (-25.75)	1.37[c] (50.75***)	-2.92[a] (-4.46)	-0.28[d] (-1.77)

SM: Standard Model; **PAM:** Partial Adjustment Model; **BF**: Best fit between Models 1 and 2. (*) p-value < 0.10; (**) p-value < 0.05; (***) p-value < 0.01. (a) a_{j1} and b_{j1} significant at 99%; (b) a_{j1} significant at 95% and b_{j1} significant at 99%; (c) a_{j1} significant at 90% and b_{j1} significant at 99%; (d) a_{j1} not significant and b_{j1} significant at 99%. The model with the best fit is shaded.

Table 4: Sala-i-Martín Convergence Models

		AUSTRIA, SPAIN, FRANCE, ITALY, U.S.A., DENMARK, NETHERLANDS, JAPAN	
S1: Extraction of Metal ores and preliminary processing of metal	β Convergence	$g_{j(1985, 1999)}$ = -0.194* - 0.006* log ($ROA_{j, 1985}$)	**Adj. R^2(%) = 36.0***
	σ Convergence	**σ_{1985} = 960.07%**	**σ_{1999} = 50.59%**
S2: Extraction of non-ferrous metal ores and manufacture of non-metallic mineral products	β Convergence	$g_{j(1985, 1999)}$ = -0.130 - 0.005 log ($ROA_{j, 1985}$)	Adj. R^2(%) = -0.8
	σ Convergence	σ_{1985} = 17.73%	σ_{1999} = 36.63%
S3: Chemicals and man-made fibres	β Convergence	$g_{j(1985, 1999)}$ = -0.200** - 0.009* log ($ROA_{j, 1985}$)	**Adj. R^2(%) = 36.5***
	σ Convergence	σ_{1985} = 11.47%	σ_{1999} = 17.50%
S4: Manufacture of metal articles, mechanical and instrument engineering	β Convergence	$g_{j(1985, 1999)}$ = -0.184*** -0.008*** log ($ROA_{j, 1985}$)	**Adj. R^2(%)= 70.4*****
	σ Convergence	**σ_{1985} = 34.74%**	**σ_{1999} = 23.73%**
S5: Electrical and electronic equipment including office and computing equipment	β Convergence	$g_{j(1985, 1999)}$ = -0.112* -0.004* log ($ROA_{j, 1985}$)	**Adj. R^2(%)= 27.6***
	σ Convergence	**σ_{1985} = 46.78%**	**σ_{1999} = 42.74%**
S6: Manufacture of transport equipment	β Convergence	$g_{j(1985, 1999)}$ = -0.195** -0.007** log ($ROA_{j, 1985}$)	**Adj. R^2(%)= 47.5****
	σ Convergence	**σ_{1985} = 70.39%**	**σ_{1999} = 67.44%**
S7: Food, drink and tobacco	β Convergence	$g_{j(1985, 1999)}$ = -0.178** -0.008** log ($ROA_{j, 1985}$)	**Adj. R^2(%)= 42.3****
	σ Convergence	σ_{1985} = 18.29%	σ_{1999} = 21.64%
S8: Textiles, leather and clothing	β Convergence	$g_{j(1985, 1999)}$ = -0.250*** -0.106** log ($ROA_{j, 1985}$)	**Adj. R^2(%)= 60.7****
	σ Convergence	σ_{1985} = 23.95%	σ_{1999} = 30.48%
S9: Timber and paper manufacture, printing	β Convergence	$g_{j(1985, 1999)}$ = -0.105** -0.004** log ($ROA_{j, 1985}$)	**Adj. R^2(%)= 47.7****
	σ Convergence	**σ_{1985} = 20.40%**	**σ_{1999} = 13.78%**
S10: Other manufacturing industries not elsewhere specified	β Convergence	$g_{j(1985, 1999)}$ = -0.171 -0.008 log ($ROA_{j, 1985}$)	Adj. R^2(%)= 22.7
	σ Convergence	σ_{1985} = 23.51%	σ_{1999} = 37.60%

(*) p-value < 0.10; (**) p-value < 0.05; (***) p-value < 0.01.

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Figure 1: Convergence models that show the best fit for each country.