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HOW MUCH DO STRATEGIC GROUPS MATTER?

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Abstract

Understanding firm heterogeneity is the first step towards explaining the dispersion of profit rates between firms. This paper proposes a framework that distinguishes between three sources of competitiveness, related to three levels of firm heterogeneity, which give rise to industry competencies, strategy-specific competencies and firm-specific competencies. Using data from a Spanish survey we estimate the relative importance of these three sources of heterogeneity. We show that taking the group effect into account significantly differentiates our results from those obtained in previous research. We provide new evidence on the existence of a significant group effect and also an estimate of its relative importance vis à vis firm and industry effects.

Key words: strategic groups, variance components analysis, firm performance.

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1.- INTRODUCTION

Studying the sources of performance differences among firms is at the heart of the fields of industrial organization and strategic management. Given that observed performance differences would not arise under a perfect competition framework, research has focused on market imperfections and interfirm heterogeneity. Two main sources of competitiveness have been extensively analysed in the literature. First, industry drivers generate systematic differences in the performance of firms competing in different industries (Mason, 1939; Porter, 1980). Second, the firm itself may have a competitive advantage or disadvantage with respect to other firms in its industry (Barney, 1991; Peteraf, 1993).

The industrial organisation tradition emphasises industry structure as the main determinant of firm performance. The resource-based view of the firm (Wernelfelt, 1984), on the other hand, emphasises firm heterogeneity, but fails to capture the importance of the similarities between firms. Strategic group analysis provides a tool to reconcile intraindustry heterogeneity with the internal homogeneity of group member firms. Although some research has estimated the relative importance of firm and industry drivers on firm performance (Schmalensee, 1985; Rumelt, 1991; McGahan and Porter, 1997), the relative importance of the strategic group construct has not been empirically examined. This paper tries to fill this gap, providing evidence on the relative importance of industry, group, and firm effects as determinants of firm accounting profitability.

2.- INDUSTRY, GROUP, AND FIRM EFFECTS

Industrial organisation (IO) has stressed the importance of industry structure as the main determinant of performance differences among firms. The Structure-Conduct-Performance (SCP) paradigm highlights the importance of industry concentration, product differentiation, entry and exit barriers, and the growth of demand. Since Bain's (1951; 1956) pioneering work, a large body of research has empirically confirmed some of the predictions of the SCP paradigm[1]. Despite this evidence, the SCP paradigm has received numerous criticisms. Among the most prominent, Stigler (1968) and Demsetz (1973, 1974) have suggested that industry structure is the endogenous result of efficiency-seeking by competitors and stochastic events[2].

Sharing a similar perspective, the resource-based view of the firm (RBV) proposes firm heterogeneity as the main determinant of intraindustry performance differences (Barney, 1991). The internal analysis of the firm is considered to be the most important strategic issue. The RBV has focused on the identification of the conditions under which a firm can attain a sustained competitive advantage. Peteraf (1993) summarises the basic set of requirements: resource heterogeneity, ex post limits to competition, imperfect mobility, and ex ante limits to competition.

These two schools of thought (IO and RBV) point to external and internal factors as the main drivers of firm performance. Which of these is more influential has been the subject of empirical research, and this has generated a highly interesting debate about the relative importance of both industry and firm

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[1] See Weiss (1973) and Hay and Morris (1991: Ch.8) for a detailed review of the most relevant empirical findings.

effects. In general, the findings appear to suggest that firm-level drivers explain a much larger proportion of the variance in firm profitability than industry drivers. Notable exceptions include Schmalensee (1985), Wernelfelt and Montgomery (1988), Kessides (1990), and McGahan and Porter (1997). A list of the most relevant studies where the relative importance of industry and firm effects has been empirically estimated is provided in Table 1[3].

<<<<<<<<<<<<<<Table 1 about here>>>>>>>>>>>>>>>>>>

Firm and industry are the main but not the only levels of analysis that have received attention in the literature on the sources of profit dispersion. In particular, the strategic group construct has emerged as a powerful intermediate level of analysis. The explanation of the sources of within-industry profit dispersion was the central issue in the early research on strategic groups (Hunt, 1972; Caves and Porter, 1977; Newman, 1978; Porter, 1979; Hatten and Schendel, 1977). Since then, it has been recognised that some of the variance in firm performance unexplained by industry and firm factors may be attributed to “shared generic strategies, strategic group membership, other shared resources, or chance” (Powell, 1996: 331).

A strategic group is a set of firms in an industry that follow a similar strategy along the relevant strategic dimensions (Porter, 1980: 129). Firms in the best-positioned groups will obtain higher than average results. However, for these differences to be durable, firms in the worst-positioned groups must not be able to invade the other groups. The mechanisms that preclude movement between groups are called mobility barriers (Caves and Porter, 1977). The only

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[2] See also Hill and Deeds (1996) for a neoaustrian critique of the SCP paradigm.

difference from entry barriers is that mobility barriers are idiosyncratic to the group (Porter, 1979).

Given that it was developed within the field of industrial organisation, the strategic group concept has been associated with the position of firms within the product market. However, resource heterogeneity is a necessary condition for mobility barriers to exist (Mascarenhas and Aaker, 1989; Mehra, 1994). The existence of inimitable resources and the associated mobility barriers are a necessary condition for the existence of significant performance differences across strategic groups (Mehra and Floyd, 1998). Otherwise, competition through firms moving across groups would erode any occasional advantage enjoyed by a particular strategic group.

Following a resource-based perspective, Tallman and Atchison (1996) have defined a strategic group as a set of firms within an industry that possess a similar strategic configuration. That is, their products occupy similar positions in the marketplace, their internal organisation is similar, and they pursue the same economic rents with similar resources. This definition explicitly takes account of the importance of distinctive competencies as determinants of the industry's group structure. The model proposed by Tallman and Atchison (1996) distinguishes among three types of rent generating competencies:

1.- Industry Competencies (IC): those which are common to all the firms within the industry. Within the industry they are identifiable and imitable. However, they create entry barriers because potential entrants must acquire them in order to enter the industry.

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[3] Although not included in the table, a related paper by Powell (1996) also evaluates the proportion of variance in firm level performance explained by industry factors.

2.- Strategy-Specific Competencies (SSC): those which are common to all the firms within a strategic group. They are needed to implement the strategy that defines group membership and constitute the source of mobility barriers across groups.

3.- Firm-Specific Competencies (FSC): these competencies are developed internally or acquired at below actual market value. FSCs are specific to the firm in that each firm has a unique history, being subject to causal ambiguity and uncertain imitability, and they constitute the source of Rumelt's (1984) isolating mechanisms.

The former typology identifies three sources of competitiveness at three different levels of analysis: industry, strategic group, and firm. Although fully compatible, they correspond to three different research streams, namely industrial organisation, strategic group theory, and the resource-based view of the firm. The relative importance of each effect is an empirical issue, and will be examined in the following sections.

3.- METHODOLOGY

Our empirical analysis draws on the models used by Schmalensee (1985) and Rumelt (1991) to evaluate the relative importance of industry and firm effects on firm profitability. Both authors decompose the variance in firm performance into two main sources of variation—industry and firm—and obtain conflicting results. The statistical methods used by Schmalensee and Rumelt and subsequent authors have been the Analysis of Variance, the Variance Components Analysis, or both. Most of the papers that have used these methodologies have found that industry effects have a low explanatory power—

below 10% of total variance—while firm effects typically explain between 30% and 50%[4]. The central contribution of this paper is to add a third effect that accounts for the proportion of the variance explained by strategic groups. The first methodological issue that arises in this setting concerns the classification of firms within an industry into strategic groups.

3.1.- DERIVING THE STRATEGIC GROUPS

The literature on strategic groups offers little guidance on how to classify firms into strategic groups. Cluster Analysis has been the most widely used technique and would seem appropriate insofar as it classifies firms according to the magnitude of differences (distances) between the observations. However, the use of this methodology to determine the strategic groups present in an industry has been seriously criticised (Barney and Hoskisson, 1990). The main criticism relates to the fact that Cluster Analysis does not incorporate any rule or statistical test that allows the researcher to determine the correct number of groups into which the sample must be split; the clustering algorithm finds as many groups as the researcher wants to find[5]. In this paper we suggest using a heuristic procedure, which is simply based on following Porter's (1980) definition of a strategic group, to objectively determine the number of strategic groups.

First of all, we propose using a hierarchical cluster technique. There are several alternative criteria to hierarchically cluster individuals. The Ward criterion clusters individuals or groups iteratively until a unique cluster is

[4] McGahan and Porter (1997) is a notable exception. Their results show that the industry effect in the manufacturing sector, on which previous papers were based, is particularly small (10,8%). In the remaining sectors, industry effects explain more than 30% of dispersion in firm performance, being even larger than firm effects.

[5] However, several ad hoc criteria have been proposed to determine the appropriate number of groups (Hardy, 1996; Everitt, 1993)

reached, minimising in each step the loss of information caused by the aggregation. This method minimises intragroup variance while maximising intergroup variance, being thus consistent with the standard definition of strategic groups. The number of groups in a hierarchical analysis is determined by the cutting level of the hierarchical tree. For that level, we obtain the groups that are most heterogeneous while being internally homogeneous. The decision about the cutting level must be based on a knowledge of when two groups are sufficiently different as to be relevant for understanding the competitive landscape of the industry. A sound criterion for determining when two groups are sufficiently different is to check whether the differences between them with regard to the relevant strategic dimensions are statistically significant. Thus, we propose an iterative procedure to determine the number of groups, which implies following the next steps:

1.- Construct the hierarchical classification tree (we apply the Ward criterion, but other criteria may be used). Set G=2.

2.- Cut the tree at the G groups level.

3.- Test whether there are statistically significant differences between each pair of groups in at least one strategic dimension[6].

4.- If significant differences between each pair of groups in at least one variable are found, update G=G+1 and return to step 2. If not, continue to step 5.

5.- G-1 is the appropriate number of strategic groups supported by the data.

The outcome of this procedure is that each of the G-1 groups is significantly different from the rest in at least one strategic dimension[7]. This

[6] Given that, in general, we will have a small number of observations within each group, we will use the Mann-Whitney non parametric test of means on each strategy variable.

partition is consistent with Porter's (1980) definition and with the process that is followed to mentally construct the groups from a cognitive perspective (Reger and Huff, 1993).

3.2.- VARIANCE COMPONENTS ANALYSIS

Within the strategic groups literature, a major research topic has been to test whether performance differs systematically across groups. The traditional approach to this question has been based on simple Analysis of Variance, testing whether within-group dispersion is significantly smaller than inter-group dispersion. In this paper we follow a different approach, which not only tests whether significant differences exist between groups but also examines the relative importance of the group effect vis à vis industry and firm effects. The Variance Components Analysis (VCA) is a statistical technique that permits the decomposition of the variance of a variable into the sum of the variances of a number of sources of variation that have been established *a priori*. This technique has been successfully applied in most of the papers listed in Table 1, where the relative importance of firm and industry effects as determinants of firm profitability has been estimated. It is a natural extension of this literature to separate the part of the variance explained by strategic group effects.

To decompose the variance in firm performance we propose the following three main sources of variation: 1) industry effects, 2) strategic group effects, and 3) firm effects; additionally we add a year effect, being noise the residual source of variation. Note the hierarchical nested structure of the three main sources of variation. Each strategic group is defined within a specific

[7] This procedure is very similar to the approach followed by Amel and Rhoades (1988).

industry—it is not observed across industries—and each firm, in turn, belongs to a specific strategic group. The three-way nested model can be written as[8]:

$$R_{ijkt} = \mu + \alpha_i + \gamma_{ij} + \beta_{ijk} + \lambda_t + e_{ijkt} \qquad (1)$$

where R_{ijkt} is the performance (ROA, for instance) of firm k of strategic group j in industry i in year t, μ is the intercept, α_i is the effect of industry i, γ_{ij} is the effect of being in strategic group j of industry i, β_{ijk} is the effect of being firm k in strategic group j of industry i, λ_t is the year effect, and e_{ijkt} is the residual term.

The effects in expression (1) may be treated as fixed parameters or as random variables. Fixed effects models examine the specific influence of each factor and can be estimated using the Least Squares Dummy Variables (LSDV) estimator or the equivalent Analysis of Variance (ANOVA). However, given the nested structure of the data, it is not possible to introduce all the effects in the model at the same time and, therefore, a separate estimation must be carried out for each of the nested effects. Thus, *in a fixed effects ANOVA model* it is not possible to assess the relative importance of each effect, holding the other nested effects constant. However, a sequential fixed effects ANOVA can provide an evaluation of the relative importance of each effect by computing the increase in the coefficient of determination when the effect is introduced in the specification of the model.

The effects are random when the data at hand is a sample from a larger population, and the effects are thus a random sample of a larger population of effects. "....the situation to which a model applies is the deciding factor in

[8] This is not a 3-way model strictly speaking, because of the year effect. We use this expression to indicate that it includes the 3 nested factors of interest (industry-group-firm) in contrast with the 2-way nested model, which includes just the industry and firm effects.

determining whether the effects of a factor are fixed or random" (Searle, 1971: 382). In our case, the effects must be considered random because we are interested in measuring the relative importance of each factor in a wider population, not the (fixed) factors actually present in the sample. In a random effects model, each effect is a random variable with mean and variance. We model all the effects as realisations of stochastic distributions with mean zero and constant variances given by σ^2_α, σ^2_γ, σ^2_β, σ^2_λ.

The linearity of model (1) allows the variance of the dependent variable to be decomposed into the sum of the variances of the random effects: $\sigma^2_R=\sigma^2_\alpha+\sigma^2_\gamma+\sigma^2_\beta+\sigma^2_\lambda+\sigma^2_e$. The estimates of these components have been interpreted as reflecting the relative importance of each factor, *ceteris paribus*. The most common estimator in an unbalanced design is Henderson's (1953) Method 1, also known as the Analogous Analysis of Variance estimator[9]. However, in an unbalanced design many different estimators can be used to perform the variance decomposition (see Searle, 1971; Ch. 10)[10]. Given that there is no objective way of choosing between these different estimators, we decided to report the results obtained from applying three different estimators to our data set: the Analogous Analysis of Variance Estimator (Henderson's Method 1), the Fitting Constants Method (Henderson's Method 3) and the Best Quadratic Unbiased Estimator (BQUE)[11].

The relative contribution of each effect can be approximated by the ratio of the estimated component to the variance of the dependent variable

[9] Notice that we will deal with an unbalanced design, because each strategic group will have a different number of member firms and within each industry there will be a different number of strategic groups.
[10] All of these collapse to the Analysis of Variance estimator in balanced designs.

(Schmalensee, 1985; Rumelt, 1991). These indicators are useful for determining whether dispersion is higher between industries or within industries, between strategic groups in an industry or within strategic groups, and so on. However, Brush and Bromiley (1997) and Brush, Bromiley, and Hendrickx (1999) have recently challenged this interpretation of variance components as indicators of the relative importance of the effects. Basically, the estimation of the components involves equating observed values of quadratic forms with their expected values and solving the resulting equations. Thus, the estimates represent the squares of the relative importance and not the relative importance itself[12]. Brush, Bromiley, and Hendrickx (1999: 522) suggest using the square roots of the variance components estimates instead of the variance components estimates to obtain a more accurate measure of the relative importance of the smallest effects. Our results will include the BBH index of relative importance along with the traditional index of relative importance.

4.- DATA

The analysis is based on Spanish firm-level data from the *Encuesta Sobre Estrategias Empresariales* (ESEE) covering the period 1991-1994. ESEE is a survey carried out by the *Fundación Empresa Pública* and the Spanish Ministry of Industry and Energy since 1990. It collects accounting and activity data from a sample of Spanish manufacturing firms in different industries. Sample selection has tried to ensure the participation of the largest firms in each industry, with the remaining firms being randomly sampled. The sample size of the survey is 2059 firms in 1991, 1977 firms in 1992, 1869 in 1993, and 1877 in

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[11] See Searle (1971; Ch. 10) for details.
[12] Brush and Bromiley (1997) have confirmed this by means of a Monte Carlo experiment.

1994 (for further details about the ESEE survey, see Fariñas and Jaumandreu, 1994, 1999).

In order to select an appropriate subsample of firms, we first classified all the firms included in the survey into industries using the 3-digit CNAE-93 code[13]. CNAE stands for *Clasificación Nacional de Actividades Económicas* and is the Spanish equivalent to the SIC codes. However, ESEE only reports the CNAE-74[14] code[15]. The conversion to CNAE-93 was carried out using the codes of the *Clasificación Nacional de Bienes y Servicios* associated with the CNAE-74 codes[16]. Official correspondence tables were used to recover the 3-digit CNAE-93 codes. In some cases 3-digit codes were deemed inappropriate because the resulting industry did not have any meaningful interpretation in competitive terms. Such was the case of code 159 (Beverages) which includes wine, beer, tapered water and carbonate drinks, or code 158 (Other food products) which includes producers of goods as diverse as cookies and coffee, which would be better interpreted as complements. We excluded from our sample all the firms whose 3-digit code did not correspond to an industry, i.e. a set of firms producing close substitutes[17].

The selection of the sample was also conditioned by the choice of the variables used to construct the groups and to measure firm performance. Four strategy variables were used to empirically derive the strategic groups within each industry. Three of these variables—advertising over sales (MKT), R&D

[13] Real Decreto 1560/1992, December 18, 1992.
[14] Decreto 2518/1974, August 9, 1974.
[15] This is because the first year covered by the survey is 1990.
[16] This classification adds three digits to the four digit CNAE-74 codes.
[17] Unfortunately, the information provided by ESEE does not allow for a finer 4-digit codification for those firms.

over sales (R&D), and capital intensity as measured by the ratio of fixed assets to the number of employees (CAPI)—represent Khandwalla's (1981) typology of competitive strategies, and have been frequently used in the study of strategic groups and industry variety (Miles, Snow, and Sharfman, 1993). In addition, we use a geographic span variable (GS), because of its crucial importance in delimiting the effective competitive area of the firm[18].

The sequential procedure presented in the previous section to construct the groups was implemented for each industry in the sample. To determine the groups, we first computed the temporal average for the period 1991-1994 of the four strategy variables for each firm and then ran the clustering algorithm. The groups obtained were cross-validated by repeating the same procedure separately using the data for the period 1991-1992 and 1993-1994. The results show a high degree of consistency between the groupings obtained, with exactly the same number of strategic groups being obtained for each temporal subsample and for the entire sample. A 71% of the firms are classified in the same groups using the data from the two temporal subsamples. When comparing the results of each subsample with those of the entire sample, 69% of the firms are classified correctly in the 1991-1992 subsample, and 72% in the 1993-1994 subsample.

We believe that the discrepancies (firms inconsistently classified) are due to variations in the strategy variables. In particular, many firms do not invest every year in R&D and annual data cannot provide a correct evaluation of the

[18] The selection of these variables is based on previous research, but also on the necessity to consider variables that are common to different industries and that account for most of the generic strategic dimensions. This allows us to follow a systematic procedure to construct the groups within the different industries of the sample.

R&D position of the firm. We are confident that our 1991-1994 average can produce a better approximation to R&D effort (and also to the other three strategy variables) as it takes a longer perspective. Given the nature of the data we are using (accounting data) we think that a 70% match across the three strategic groupings derived provides sufficient support for the procedure used to construct the groups.

Return on assets (ROA) was used to approximate firm performance. A preliminary inspection of the accounting data shows that they may be somewhat distorted by the quality of accounting practices. To limit the impact of such distortions, we rejected the data from all firms in which ROA was larger than 100% in absolute value in any of the 4 years of the sample[19]. Also, no sector with less than 5 representing firms entered the sample and each firm should be present in the sample in each of the 4 years. After these filters were imposed, the final sample contains data from 304 firms observed from 1991 to 1994. These firms belong to 27 industries, with an average of 11.2 firms per industry. The total size of the sample is 304·4=1216 observations.

Table 2 presents descriptive statistics of both strategy and performance variables in the selected sample. On average, there has not been much variation in strategy variables across the period 1991-1994. The most important variations are observed in capital intensity (CAPI) and R&D from 1991 to 1992 and from 1992 to 1993. The standard deviations of CAPI, MKT and R&D reflect the underlying degree of strategic variety within the industries of the sample, although this indicator also incorporates variation across time and across

[19] Our fine-grained inspection of the data showed that these numbers were generally due to undervaluation of assets in the reported data.

industries. The return on assets (ROA) has declined from 0.21 in 1991 to 0.18 in 1994. The table also shows considerable dispersion with regard to firm performance. In the next section we attempt to explain the sources of this dispersion.

<<<<<<<<<<<take in table 2>>>>>>>>>>>>>

4.3.3.- RESULTS

Previous work on the measurement of industry and firm effects has not relied entirely on VCA. Instead, many of the papers have also implemented a set of sequential Analyses of Variance to estimate the incremental proportion of variance explained by each factor in a fixed effects model (e.g., Rumelt, 1991; McGahan and Porter, 1997; McGahan, 1999). To further link our work to the previous literature we decided to estimate a fixed effects model through sequential Analyses of Variance along with the VCA.

As we discussed in the previous section, in a nested fixed effects model the separate effect of each factor cannot be directly assessed. Thus, the effects were introduced sequentially in the model, where the increase in the coefficient of determination was computed as a first approach to the evaluation of the relative importance of each effect. The year and the industry effects were introduced first, then the group effects, and finally the firm effects. Table 3 summarises the results, showing the degrees of freedom of each effect (DF), the percentage of total variance explained by each effect (R^2), the increase in the percentage of total variance explained over the immediately higher order effect (ΔR^2), the value of the F test, and serial correlation.

<<<<<<<<<<<<<<<<<<Take in Table 3>>>>>>>>>>>>>>>>>>

The results of the Analysis of Variance reject the hypothesis that average profitability is equal across industries (F=5.57). Industry dummies explain about 11% of variation in firm performance, while firm dummies apparently explain 60.7%, although they implicitly include the industry and group effects. Both effects are significantly different from zero. In turn, group dummies explain almost 23% of the variance in firm ROA. Although the partial contribution of each effect to the total variation in firm performance cannot be assessed in a fixed effects model, the incremental variation in the coefficient of determination (ΔR^2) shows that introducing the group dummies improves the fit achieved with the *industry-year model* by 11.5%. Similarly, the variation in the coefficient of determination shows that the firm effects explain an additional 38% of variance that remained unexplained in the *group-year model*. The time effect explains a modest 0.8%, but its influence is statistically significant. Given that this effect should capture the impact of the last Spanish economic crisis, it was expected to be higher[20]. The table also shows that the introduction of each additional effect diminishes serial correlation, because the effect is accounted for by the systematic part of the specification and not by the error term.

This exploratory analysis confirms our expectations about the relative importance of the industry-group-firm effects. The results are similar to those reported by previous research, i.e. a larger importance of firm versus industry effects. However, it must be noted that if the group effect had not been

[20] Year effects reflect the impact of macroeconomic fluctuations that are invariant across firms, i.e. events that affect all the firms equally during each year. Our data correspond to the first half of the decade of 1990. The beginning of the 1990s, with the Iraqi invasion of Kuwait, started an

included, an explanatory power of 50% would have been attributed to firm effects. Including the group effect shows that the group dummies can capture part of that variation. This evidence moderates the conclusions about the large difference between the explanatory power of the firm itself compared to that of more aggregated units of analysis. In fact, taken together, group and industry effects explain 22% of total variance, i.e. more than half as much as firm effects.

To corroborate the former results, we performed a Variance Components Analysis, which treats the factors as uncorrelated random variables. Table 4 shows the results obtained with the three estimators mentioned in the previous section—Analogous Analysis of Variance (ANOVA), Fitting Constants Method (FITTING), and the Best Quadratic Unbiased Estimator (BQUE)—along with the F value, which tests the statistical significance of the corresponding estimate in the case of the ANOVA and the FITTING estimators. We also include the BBH index of relative importance.

<<<<<<<<<<<<<Table 4 about here>>>>>>>>>>>>>

The ANOVA estimator shows an estimate of the Industry effect that accounts for 2.9% of total variance in firm performance, with a BBH index of relative importance of 9.1%. The Firm effect reaches 36.6% with a BBH index of 32.3%. In turn, the Group effect explains 8.5% of the variance, with a BBH index of relative importance of 15.5%. The time effect is not substantially different from that obtained in the fixed effects model, explaining 0.9% of total variance. However, the BBH index takes a value of 5% for this temporal effect, which is more in line with the expected importance of the effect—the data refer

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economic recession in Spain, which was at its worst in 1992 and 1993, making a sharp recovery in 1994.

to a period (1991-1994) which includes three years of depression (1990-1993) and one year of fast recovery (1994). This result shows the importance of the BBH interpretation of the variance components estimates in the case of small effects. All the effects are significantly different from zero at conventional levels.

The results are similar when we use the FITTING and the BQUE estimators, except for the industry effect. The ANOVA estimator suggests that this effect explains just 2.9% of firm performance variability, while the other two estimators show a much larger share for the industry effect: 7% and 6.5%, respectively. The BBH indexes of relative importance take values of 13.7% and 13.2%, as opposed to the 9.1% suggested by the ANOVA estimates. The unexplained variance (noise) shrinks from 51% to about 49%.

This lack of congruence between the estimates of the ANOVA and the estimates of the FITTING and the BQUE estimators complicates the assessment of the industry effect. To further check the discrepancy among the estimators, we also used the Maximum Likelihood Estimator (see Searle, 1971). The results are highly similar to those obtained using the FITTING and the BQUE estimators.

Following the traditional interpretation of the variance components as indicators of relative importance, the FITTING and BQUE estimates show that the strategic group can explain about 8% of the variance in firm performance. Industry and firm effects would explain 7% and 35%, respectively. However, the BBH indexes of relative importance suggest a very different picture. The most important effect is the firm effect—between 30% and 31%—followed by the group effect—between 14.3% and 14.7%—, and, finally, the industry effect—

between 13.2% and 13.7%. Taken together, the industry and group effects are almost as important as the firm effect in determining firm level performance. Given the magnitude of the group effect, the results confirm the main hypothesis of the paper[21].

5.- CONCLUSION

Explaining dispersion in firm performance is a fundamental goal of research in industrial organisation and strategic management. Conceptually, differences in firm profitability are due to firm heterogeneity in basic competencies. Following Tallman and Atchinson (1996), this paper has distinguished among three sources of firm heterogeneity which give rise to observed dispersion in profit rates: Industry Competencies—those required to compete in a given industry—Strategy-Specific Competencies—those required to implement the strategy that distinguishes a given strategic group—and Firm-Specific Competencies—firm-specific, rare, and hard to imitate. Industry competencies—heterogeneity across firms in different industries—explain interindustry differences in firm performance, as they raise entry and exit barriers. Strategy-specific competencies—strategic group heterogeneity—raise mobility barriers between groups, which sustain intergroup dispersion in firm performance. Firm-specific competencies—pure firm heterogeneity—give rise to isolating mechanisms, capable of sustaining the competitive advantages of some firms within the industry and within the strategic group.

[21] We have also compared these results with those obtained in a 2-way nested model that includes only firm and industry effects (González, 2000). When the strategic group is not included in the model we would assign a much larger share of the variance to firm effects (38%), while the industry effect would be almost identical (13%). Including information about the strategic group of the firm results in a smaller share of the firm effect and also in a smaller

Most of the papers that have analysed the relative importance of industry and firm effects report a much larger relative explanatory power of firm effects, but they did not consider the existence of a moderating group effect. In fact, we are not aware of any empirical evidence on the relative importance of strategic group effects. The traditional approach adopted in order to test the existence of a group effect has been to determine the strategic groups present in a well-known industry and then to test whether average profitability significantly differs across groups. This methodology has produced mixed evidence, which has called into question the very existence of strategic groups (Barney and Hoskisson, 1990). Dranove, Peteraf, and Shanley (1998) argued that a strategic group exists only if the performance of member firms is an outcome of group characteristics, after controlling for firm and industry characteristics. This paper has examined firm level data from a wider range of industries and estimated group effects after controlling for firm and industry effects.

Using Variance Components Analysis—a technique that has been previously used by Schmalensee (1985), Rumelt (1991), and others to evaluate the relative importance of industry versus firm effects—we have been able to incorporate the group effect into the analysis in a straightforward manner. To evaluate the relative importance of the group effect, we estimated the variance components in a 3-way nested model. The BBH index of relative importance takes a value between 14% and 15% for the group effect, while industry and firm effects attain indexes of 13% and 31%, respectively.

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error—the relative importance of the error (i.e., unexplained variance) goes from 42.9% to 36.5%, a difference which is explained by the group effect (14.3%).

The incorporation of the group effect enriches the debate on the relative importance of industry and firm effects. The results reported in this paper have some important implications for industrial economics and management strategy. In particular, they show that it is possible to identify relatively homogeneous strategic groups within an industry and, more importantly, that the strategic group construct is useful for explaining dispersion in firm performance. The results suggest that there exist more commonalities between firms' resources and capabilities than resource-based theory usually acknowledges. The findings of large firm effects in previous research may be due to underspecification of the models that cannot capture these commonalities (Eisenhardt and Martin, 2000: 1110).

We hope that this research would be complemented by similar studies using data from different countries to further establish the relative importance of the three effects.

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Table 1.- Industry *versus* firm effects. Empirical evidence

Author	Profitability measure	Dominant effect
Schmalensee (1985)	ROA	Industry
Wernerfelt and Montgomery (1988)	Tobin’s q	Industry
Hansen and Wernerfelt (1989)	ROA	Firm
Kessides (1990)	Income/sales	(—)*
Rumelt (1991)	ROA	Firm
Amel and Froeb (1991)	ROA	Firm
Roquebert, Phillips, and Westfall (1996)	ROA	Firm
Fernández, Montes, and Vázquez (1997)	ROA	Firm
Galán and Vecino (1997)	ROA	Firm
McGahan and Porter (1997)	Income/assets	(—)**
Mauri and Michaels (1998)	ROA	Firm
McGahan (1999)	ROA/Tobin's q	Firm
Claver, Molina, and Quer (1999)	ROA	Firm
Chang and Singh (2000)	Market share	Firm

* This paper finds that both firm and industry effects are important, but neither of them appears to be dominant.

** The dominant effect in this paper depends on the sector being analysed. Firm effects are dominant in manufacturing industries, but industry effects are dominant in the rest of the sectors (transportation, services, lodging & entertainment, agriculture and mining).

Table 2.- Descriptive Statistics

	Strategy				Performance
VARIABLE	**CAPI**[a]	**MKT**[b]	**R&D**[b]	**GS**[c]	**ROA**[d]
1991	7667.6	1.81	0.81	3.82	0.213
1992	5769.2	1.86	0.75	3.92	0.196
1993	6660.0	1.94	0.85	4.04	0.176
1994	6634.8	1.89	0.84	3.99	0.178
Mean	6682.9	1.87	0.81	3.94	0.191
S.D.	9249.16	3.53	2.04	1.39	0.168

[a] Thousands of pesetas.
[b] % over sales.
[c] Geographic span: local (1), province (2), regional (3), national (4), abroad (5), national and abroad (6).
d Ratio of earnings before interest and taxes to the book value of assets.

Table 3.- Fixed Effects Model

VARIABLE	DF	R^2	ΔR^2	F-test	Ser. Corr.
YEAR	3	0.008	0.008	3.24**	0.511
INDUSTRY	26	0.112	0.104	5.77***	0.453
GROUP	71	0.227	0.115	4.73***	0.380
FIRM	303	0.607	0.380	4.64***	0.247
GLOBAL MODEL (FIRM+YEAR)	306	0.615		4.74***	0.247
ERROR	909	0.385			
TOTAL	1215				

** Significance level 0.05 *** Significance level 0.01

Table 4.- Variance Components Analysis (VCA)

ANOVA	Var	% Var	BBH	F-test
Industry effect	0.00083	2.9	9.1	1.69*
Group effect	0.00240	8.5	15.5	1.56**
Firm effect	0.01044	36.6	32.3	3.86***
Temporal effect	0.00025	0.9	5.0	6.25***
Error	0.01459	51.1	38.1	
Total Variance	0.02851			

FITTING	Var	% Var	BBH	F-test
Industry effect	0.00208	7.0	13.7	1.87**
Group effect	0.00241	8.1	14.7	1.56**
Firm effect	0.01044	35.1	30.6	3.86***
Temporal effect	0.00025	0.8	4.8	6.25***
Error	0.01459	49.0	36.2	
Total Variance	0.02977			

BQUE	Var	% Var	BBH
Industry effect	0.00192	6.5	13.2
Group effect	0.00225	7.6	14.3
Firm effect	0.01066	35.9	31.2
Temporal effect	0.00025	0.8	4.8
Error	0.01459	49.2	36.5
Total Variance	0.02967		

* Significance level 0.1   ** Significance level 0.05   *** Significance level 0.01