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MARKET, CORPORATION AND BUSINESS UNIT EFFECTS: WHAT DO THEY ACCOUNT FOR?*

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ABSTRACT

Using a variance decomposition analysis the empirical literature on strategic management has determined the percentages of total rates of return's variance due to corporation, market and business-unit effects. However, we still do not know what specific characteristics of corporations and markets cause the observed persistent differences in the returns of business units. In summary, the analysis of variance puts names to our ignorance.

The main purpose of this paper is to show that the variance decomposition analysis is limited in its ability to explain the determinants of business unit performance. Our results show that the relative importance of corporation, industry and business unit effects change depending upon the estimation procedure and the model specification used. In particular, we find that part of the business unit effect may, in fact, be related to industry characteristics. We also show that firm diversification and market concentration tend to improve business unit performance.

Keywords: Business Unit Performance, Diversification, Market Concentration.
JEL Classification: M21, L10

RESUMEN

La literatura empírica en estrategia ha usado el método de descomposición de varianzas para determinar los porcentajes de la varianza total observada en los retornos de las empresas que se explican por efectos corporativos, de mercado y de unidad de negocios. Sin embargo, no ha podido indicar qué características de los mercados y las empresas son las que causan las diferencias persistentes en los retornos de los diferentes negocios. En otras palabras, el análisis de varianza sólo pone nombre a nuestra ignorancia.

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El propósito de este trabajo es mostrar que el análisis de descomposición de varianza tiene un poder limitado en explicar los determinantes del desempeño de las unidades de negocio. Los resultados que se presentan en este artículo muestran que la importancia relativa de los efectos empresa, mercado y unidad de negocio dependen de la especificación del modelo y del método de estimación empleado. En particular, este trabajo muestra que parte de lo que se ha llamado efecto unidad de negocios reflejaría en realidad características de los mercados donde estas unidades de negocios operan. El trabajo también muestra que el grado de diversificación de la firma y el grado de concentración del mercado mejoran el desempeño de la unidad de negocios.

There is by now an abundant literature looking for explanations and measures of the differences in profitability across firms and industries. The main empirical finding along this line of research are persistent differences in the rates of return of business units. Despite the presence of industry and corporation effects, most of these differences remain largely unexplained, and are solely attributable to persistent differences in business unit conditions. As a result of these findings, the research agenda in industrial organization and strategic management has replaced the former industry level analysis by the business-unit level analysis.

In any case, the interest in explaining persistent differences in rates of return stems from recognizing that in a world of economic competition for rents, resources will move towards those uses yielding the highest returns. As a consequence of this process, differences in returns across firms and industries will tend to disappear. The fields of industrial organization and strategic management provide alternatives to the hypothesis that competition wipes out economic rents, and therefore provide a rationale for the existence of persistent differences in profitability rates. On the one hand, industrial organization claims that firms can position themselves in markets and industries generating monopolistic rents based on specific industry characteristics, regulations, first mover advantages and the like. Under this approach, the existence of such conditions will effectively avoid the free flow of resources among firms and markets, explaining why different profitability rates across industries persist. On the other hand, the field of strategic management postulates the resource-based view. Different firms possess different resources and capabilities, that being hard to imitate, make competitive advantages sustainable. In this case the economic rents are Ricardian, and persistent differences in

rates of return across corporations and business units should be expected.

There are other economic and managerial views of the firm that may help to explain differences in profits among firms. Some arrangements of corporate finance and corporate governance may prove more convenient than others, enhancing profitability and explaining the observed differences in rates of return across corporations. The challenge in this case is to explain why corporations do not imitate each other, allowing differences in rates of return to persist and not disappear as resources freely move towards the most profitable economic activities.

In particular, the variance decomposition analysis can help determine what percentage of the total variance observed among the rates of return of the different business units is due to variation across corporations, across industries or neither of them. This last effect is what has been called the business-unit effect, and basically means that the observed variance does not result from persistent differences among units belonging to particular classes. In summary, the analysis of variance puts names to our ignorance. We do not know what causes the persistent differences in the returns of units that belong to particular corporations and/or operate in specific sectors of the economy.

The purpose of this study is twofold. On the one hand, we replicate existing variance decomposition analyses to a more recent sample of business units operating in the U.S. manufacturing sector. On the other hand, we modify the standard model specification estimating some of the class effects as fixed effects and including additional explanatory variables in the model. This way, we are aiming to determine which specific characteristics of markets, corporations and business units explain the observed differences in profitability rates across U.S. business units.

I. THE LITERATURE

The debate in strategic management has become vivid in recent years at both the theoretical and the empirical level. The relevance of such a debate is obvious because its result will shape the future formulation of business strategies. The theories of strategic management look for answers to three main questions: (i) why are firms so different?; (ii) which factors explain the decisions made by firms?; and (iii) what drives profitability?

The tools traditionally used by strategic management researchers have been provided by the standard theory of the firm. The main challenges of the strategic management theories are to explain diversity and heterogeneity across firms, and to give a role to the formulation of specific business strategies in determining profitability. In the world of neoclassical economics and perfect competition there is no room for diversity, and therefore economic rents tend to be wiped out by the free flow of resources.

Two main streams of research try to provide alternative models of the firm. An important line of thought was built upon the industrial organization view of the firm, and articulated by Porter (1980). He proposes the structure-conduct-performance view of the competitive advantages of the firm. In this view, the main determinants determinants of corporate performance are related to the market structure of the industry in which the firm operates. The causality of performance runs from market structure to strategic behavior to performance. In Porter's view of the firm, developing a successful business strategy involves selecting industrial sectors prone to generate economic rents that will be sustainable in the long run. Once the industrial sector has been chosen, the business strategy consists in determining the market position of the firm that enhances its competitive advantage. Under Porter's view of the firm, economic rents arise because certain market structures allow some firms to retain a competitive advantage over their competitors, and therefore the rents generated are monopolistic. The sustainability of the economic rents depends on the existence of barriers to the free flow of resources towards the more profitable uses. In particular, first mover advantage and other barriers to entry are necessary for those rents to last over the years.

A second approach to the strategic management of the firm is known as the resource-based view.[1] This model emphasizes the existence of differences in the endowments of resources and capabilities that different firms possess. In the resource-based view the source of competitive advantage and economic rents rests in the specific resources and capabilities owned by the firm. Therefore, the economic rents are Ricardian. Peteraf (1993) identifies four conditions for these rents to be sustainable, namely: (i) superior resources; (ii) ex-post limits to competition; (iii) imperfect resource mobility; and (iv) ex-ante limits to competition.

[1] See Andrews (1971) and Peteraf (1993).

The existence of superior resources generates heterogeneity among firms, and explains sustainable competitive advantage. Firms that posses superior resources and capabilities are able to produce at a lower average cost and more efficiently than competitors, obtaining higher rates of return than other firms. The differences in profitability will be sustainable if the competitive advantages are sustainable. For that to happen, it is required that the superior resources have limited supply, be difficult to imitate, and can not be moved freely towards different uses in the economy.[2] In other words, ex-post limits to competition are required.

For heterogeneity across firms to persist, it is necessary for such heterogeneity to exist in the first place. The question is, why is it that some firms have the resources and capabilities to generate economic rents and others do not? For that to happen, there have to be limits to *ex-ante* competition. Conversely, competition in the acquisition of those valuable resources and capabilities will eliminate the potential economic rents.

The two views of the firm presented above have implications from a business strategy stand point. If the structure-conduct-performance view is true, then managers should look for sectors offering competitive advantages to their firms, and try to exploit them. In such a world, it would be possible for persistent differences in profitability across industries to exist, but little heterogeneity should be expected among firms operating in the same industry.

On the contrary, under the resource-based view, firms possessing different endowments of the unique resources and capabilities that allow the creation of competitive advantages should also display persistent differences in profitability rates, regardless of industry.

In parallel to the theoretical debate a rich body of empirical literature has been developed trying to explain and describe the nature of the differences in profitability rates across corporations and industries. The modern empirical literature in strategic management probably started with the seminal work of Schmalensee (1985). Therein Schmalensee used FTC data on U.S. large manufacturing firms with a large number of business units for the year 1975. He performed a variance decomposition analysis of business unit rates of return, decomposing the total variance into corporation and industry effects. The business unit effect was attempted

[2] See Tarziján (1998).

to be captured by including the market share of firm *i* in industry *j*. Schmalensee's main finding was that the only significant effects were the industry effects accounting for a 20 percent of the total variance of business unit returns, while 80 percent remained unexplained. The market-share effects were statistically significant but economically negligible. His results supported the structure-conduct-performance view of the firm.

Several problems of Schamlensee's empirical analysis have been brought up in later papers. A keystone piece on the way to explain the differences in profitability rates is Rumelt (1991). Using FTC data for the period 1974-1977, Rumelt was able to isolate the business unit effect without using the market share proxy. Rumelt considered an expanded data base in which he included small firms. More importantly, by including the time dimension in the analysis, Rumelt estimated a stable business unit effect of almost 50 percent of the total variance. Like Schmalensee, Rumelt found that corporation effects were negligible. In contrast, Rumelt only found a very small industry effect between 4 and 8 percent of total variance.

After Rumelt, there have been several attempts to improve upon the empirical analysis of the differences in firm returns. An important paper by Roquebert *et al.* (1996) applied Rumelt's model to COMPUSTAT data for the 1985-1991 period. The main findings were the confirmation that stable business unit effects account for a large fraction of total variance (around 37 percent), and the existence of a large firm or corporation effect of almost 20 percent. This last finding was opposed to Rumelt's results. Three possible explanations could account for that difference: (i) the world could have changed between 1977 and 1985; (ii) the estimation procedure was slightly different; and (iii) different data base characteristics. The COMPUSTAT data contain a wider sample of firms, that are on average less diversified that the firms included in the FTC line of business data.

In any case, the results presented in Roquebert's paper confirm Rumelt's evidence that a major fraction of the variance across business unit rates of returns is explained by stable effects associated to specific characteristics of firms and business units. The most recent evidence, then, supports the resource-based view of strategic management. Table 1 summarizes the findings.

TABLE 1
INDUSTRY, CORPORATION AND BUSINESS UNIT EFFECTS
VARIANCE DECOMPOSITION ANALYSIS
SELECTED RESULTS

Effects	Schmalensee (1985)	Rumelt (1996)		Roquebert et al. (1997)
		A	B	
Industry	19,6%	8,3%	4,0%	10,2%
Corporation	-	0,8%	1,6%	17,9%
Business Unit	-	46,4%	44,1%	37,1%
Year-Industry	-	7,8%	5,4%	2,3%
Error	80,4%	36,9%	44,8%	32,0%

Some other important papers related to this line of research have attempted to explain differences in profitability across firms using Tobin's q as a measure of firm performance instead of accounting measures. Wernerfelt and Montgomery (1988) provide an excellent example of this literature. They try to measure the relative importance of industry, concentration and share effects. Unfortunately the use of Tobin's q precludes the analysis at the business unit level, and therefore their results are not strictly comparable. Their main findings are that industry effects contribute the largest fraction of the explained variance, explaining almost 20 percent of total variance. Market concentration explains an additional 2.5 percent.

II. ESTIMATION ISSUES

After Schmalensee (1985) the empirical literature regarding the identification of persistent differences in returns across business units has followed a variance decomposition approach, without attempting to perform structural analysis of the data. In a variance decomposition analysis, the researcher assumes that the rate of return on a business unit is a random variable drawn from a distribution whose main characteristics depend exclusively upon the class that unit is in. The different classes to which an observation can belong are defined by one or more factors. In the standard studies on cross-section differences in accounting profitability the

factors that define the classes are: (i) industrial sector in which the business unit operates; and (ii) corporation to which the business unit belongs. Since Rumelt (1991) the time dimension has been incorporated into the analysis in order to increase the number of observations available, but more importantly, in order to identify the stable components of the business unit, industry and firm effects.

The model estimated since Rumelt (1991) is the following:

$$r_{ikt} = m + a_i + b_k + g_t + d_{it} + f_{ik} + e_{ikt} \qquad (1)$$

Where r_{ikt} represents the accounting return on assets of a business unit (ik) belonging to corporation i, operating in sector k in period t. As mentioned before, in a variance component estimation the researcher assumes that the large number of factors that may affect a business unit's rate of return over time can be summarized by a random variable. The unobserved factors are grouped into few categories that define the dimensions of the panel data. In particular, those factors affecting a particular group of business units belonging to a specific corporation are grouped under the name "corporation or firm effect" and are represented in equation (1) by α_i. Those factors affecting business units operating in a specific sector are called "industry effect" and termed β_k in equation (1), and those affecting all business units in a particular time period are "time effects" (γ_t in equation (1)). Equation (1) also includes interaction effects, the most important one being the "business unit effect", termed ϕ_{ik} in the equation, that represents all unobserved factors that explain persistent differences in returns among different business units regardless of firm and industry affiliation.

To estimate a variance components model we consider each component of the random variable r_{ikt} as a random variable in its own right, and assume all expected means and cross-effects are equal to zero:

$$\begin{aligned}
&Ea_i = Eb_k = Eg_t = Ed_{it} = Ef_{ik} = Ee_{ikt} = 0 \\
&Ea_i b_k = Ea_i g_t = Ea_i d_{it} = Ea_i f_{ik} = Ea_i e_{ikt} = 0 \\
&Eb_k g_t = Eb_k d_{it} = Eb_k f_{ik} = Eb_k e_{ikt} = 0 \\
&Eg_t d_{it} = Eg_t f_{ik} = Eg_t e_{ikt} = 0 \\
&Ed_{it} f_{ik} = Ed_{it} e_{ikt} = Ef_{ik} e_{ikt} = 0
\end{aligned} \qquad (2)$$

The variances of each effect are variances in their own right:

$$
\begin{aligned}
Ea_i a_j &= \begin{cases} s_a^2 & \text{if } i = j, \\ 0 & \text{if } i \neq j, \end{cases} \\
Eb_k b_l &= \begin{cases} s_b^2 & \text{if } k = l, \\ 0 & \text{if } k \neq l, \end{cases} \\
Eg_t g_s &= \begin{cases} s_g^2 & \text{if } t = s, \\ 0 & \text{if } t \neq s, \end{cases} \\
Ed_{it} d_{js} &= \begin{cases} s_d^2 & \text{if } i = j, t = s, \\ 0 & \text{otherwise} \end{cases} \\
Ef_{ik} f_{jl} &= \begin{cases} s_f^2 & \text{if } i = j, k = l, \\ 0 & \text{otherwise,} \end{cases} \\
Ee_{ikt} e_{jls} &= \begin{cases} s_e^2 & \text{if } i = j, k = l, t = s, \\ 0 & \text{otherwise,} \end{cases}
\end{aligned}
\tag{3}
$$

From (1), (2) and (3) the variance of r_{ikt} is then:

$$
s_r^2 = s_a^2 + s_b^2 + s_g^2 + s_d^2 + s_f^2 + s_e^2 \tag{4}
$$

Equation (4) shows that under the above assumptions, the variance of the business unit returns is the sum of the variances of the different factors considered in the model, also called the variance components.

Equation (4) also makes clear that a variance component estimation only provides information about the relative magnitude of the common variation attributable to the different factors. Now, these factors are only labels to our ignorance. The estimated industry effect, for instance, measures the percentage of the total variation in business unit returns attributable to the fact that the business units in the sample operate in different economic sectors. In no way does the industry effect shed any light on the specific characteristics of the different sectors that help increase profitability.

An alternative way to tackle the problem of explaining the observed

differences in profitability across business units is the analysis of covariance. This procedure simply acknowledges that we in fact observe some of the variables that may determine the rates of return of the firms under study. Therefore, under the analysis of covariance we are trying to estimate a model of the type:

$$r_{ikt} = m + \Theta' \mathbf{x}_{ikt} + v_{ikt} \tag{5}$$

Where $\mathbf{x}_{ikt}$ is a vector of explanatory variables that may or may not differ across firms, industries and time, and Q' is a vector of constants that represent the effect of the different explanatory variables on the rates of returns of the business units.

The advantage of the formulation in equation (5) is that it allows to quantify the statistical importance of the explanatory variables included in $\mathbf{x}_{ikt}$. Therefore, something more specific can be said about the determinants of the profitability of firms and business units, in order to support or reject a specific view of the firm.

The regression approach of the analysis of covariance is not antagonistic to the analysis of variance explained before. In fact, the residual v_{ikt} in equation (5) that represents the effects on r_{ikt} of omitted variables, can be modeled through a random-effects model in much the same way as the rate of return itself can in the analysis of variance estimation. That is:

$$\begin{aligned} r_{ikt} &= m + Q' x_{ikt} + v_{ikt} \\ v_{ikt} &= a_i + b_k + g_t + d_{it} + f_{ik} + e_{ikt} \end{aligned} \tag{6}$$

In this case, the main difference between both estimation procedures is that the set of explanatory variables $\mathbf{x}_{ikt}$ are excluded from the analysis of variance. Therefore, the class effects estimated through the analysis of variance procedure will not only reflect the intrinsic differences between individuals of different classes, but also the effects of any differences in the realizations of the uncontrolled variables across different classes. In other words, the specification under equation (1) is not only less useful validating a specific hypothesis, but also tends to provide biased estimates of the different class effects.

There are two other considerations regarding the estimation of a mixed model like the one in equation (6). First, the unobserved effects included in v_{ikt} can be assumed to be either fixed or random. In the first case, the class effects are treated as estimable dummies normally under the assumption that our data are comprehensive of the entire population. In

the second case, the data are considered as a random sample drawn from the population, and consequently the class effects are considered as random.

In practice, it is difficult to decide whether to consider the individual effects as fixed or random. However, the estimates obtained can be dramatically different depending upon the estimation procedure used. When a particular factor has many classes relative to the total number of observations available the number of degrees of freedom may be too small for a fixed effects estimation.

Secondly, when estimating a model of the type presented in equation (6) the unobserved effects grouped in u_{ikt} may or may not be correlated with the set of explanatory variables in x_{ikt}. If they are correlated, the estimates of Θ' under the assumption that the unobserved effects are uncorrelated and random will be biased.[3] A standard example of such a situation in the problem considered herein arises when corporations with more efficient managerial teams (high firm effect) also end up doing more R&D (included in x_{ikt}). In general, when the correlation between the unobserved effects and the explanatory variables is probable the fixed effects estimation will provide better estimates of both Θ' and the unobserved effects.[4] However, if both sets of effects are in fact uncorrelated the random effects estimator will tend to be more efficient than the fixed effects estimator.

In the rest of the paper we will analyze the differences in rates of return across business units by estimating several alternative models under the specifications in equations (1) and (6), and under different estimation techniques.

III. THE DATA

In this study we used COMPUSTAT data on accounting rates of return for all active corporations in the U.S. manufacturing sector for the 1991-1997 period. A total of 8,946 corporations were selected. These corporations have in average 2.24 business units per year, operating in a wide range of sectors (four digits SIC codes).[5, 6] The total number of

[3] See Hsiao (1986) and Mundlak (1978).

[4] An alternative way of estimating Θ' is provided by Mundlak's and Chamberlain's correlated random effects estimators. See Mundlak (1978) and Chamberlain (1982).

[5] Although the corporations selected belong to the industrial sector (SIC codes between 2000 and 3999), some of their business units operate outside the manufacturing sector of the economy.

[6] Following Roquebert et al., we eliminated extreme observations of business units with returns larger than two standard deviations from the mean (in absolute value).

observations included in the analysis is 30,385.

In order to measure business unit profitability, accounting rates of return were calculated as the ratio between "operational profits" and "identifiable assets" for each business unit-year observation. As in other studies, this approach overestimates the profits of segments with large intangible assets

In the first part of the empirical analysis we replicate the results by Roquebert *et al.* (1996) using a more recent sample. As they do, we restrict the observations to those with two business segments or more. Therefore, a sub-sample of 1,045 corporations with two or more business units was selected. These corporations have in average 3.4 business units per year, operating in 418 industrial sectors (four digits SIC codes). The total number of observations in this sample is 11,867.[7]

In the second part of the empirical analysis we introduce an arbitrary list of variables in order to use them as controls in the estimation of random effects, and for estimating fixed effects coefficients for these variables. They are the level of capital expenditures at the business unit level (CAPXS), the advertising expense at the corporate level (XAD), the R&D expense at the corporate level (XRD), and the long-term debt over total capital ratio for the corporation. All these variables were obtained from COMPUSTAT. They were selected in order to compare our results with Mauri and Michaels (1998). We also included a diversification index in the spirit of Caves *et al.* (1980), and a measure of market concentration. The exact calculation procedures will be explained later.

Because of computational constraints we generated 10 random samples of approximately 100 corporations each, out of the total 1,045 active manufacturing corporations operating two or more business units during the 1991-1997 period. This procedure makes our results more comparable to those by Roquebert *et al.* (1996).

Table 2 presents summary statistics of these variables for the full sample and the 10 random samples. The table shows means and standard deviations for the full sample and each of the ten random samples. The table includes a star when the sample mean of the random sample is stastically different from the full sample mean at the 95% confidence level.

[7] Selecting corporation with two or more business units biases the sample towards larger and more diversified firms. Rumelt showed that size did not matter in his results. On the other hand, the effect of diversification on business unit returns is still controversial, as explained before. Next section will tackle this issue.

TABLE 2
DESCRIPTIVE STATISTICS

The average return on assets is 8.2%, and only three of the random samples have statistically different means.

IV. ESTIMATION RESULTS

The empirical analysis herein has three major objectives: (i) to replicate the empirical analysis carried by Rumelt (1991) and Roquebert et al. (1996) using more recent data; (ii) to examine the robustness of the empirical results to changes in the specification of the model and the estimation procedure; and (iii) to analyze the effect of corporate diversification and market concentration on observed returns and corporate, industry and business unit effects.

The general framework for estimation purposes in this paper is given by the following general specification:

$$r_{ikt} = m + Q' x_{ikt} + G' y_{ikt} + v_{ikt} + a_i + b_k + g_t + d_{it} + f_{ik} + e_{ikt} \qquad (7)$$

The $\mathbf{x}_{ikt}$ set of explanatory variables differs from the $\mathbf{y}_{ikt}$ set, in that the first group of variables are considered fixed covariance effects, while the ones in the second set are considered random.

A. The analysis of more recent data:

In order to replicate previous studies we first consider the case in which both Θ' and Γ' are equal to zero, and the class effects are taken as random. We are, then, left with the variance components model specified in equation (1). The estimation was made using the maximum likelihood option of the MIXED procedure in SAS.

Table 3 presents the first set of results. The table shows the results for the ten random samples drawn from the population of corporations with two or more business segments and with its main line of business belonging to the manufacturing sector. The average number of observations in each sample is 1,584. The results displayed in Table 3 can be summarized in three main findings. First, industry effects are unimportant. The average industry effect explains around 4.5 percent of the total variance in business unit returns. The industry effect was statistically significant only in one of the 10 random samples. Second, firm and business unit effects are both large and statistically significant. The average firm effect accounts for

about 22.2 percent of the total variance, while the average business unit effect explains almost 38 percent. These results are not robust and they present important variations across the different random samples. The analysis of variance rejects the hypothesis that the estimated random effects are equal across samples, and the pair-wise rejection percentage is over 90% in all categories. The firm effects range widely from 2.1 to 35.3 percent, while the business unit effects range from 14.2 to 57.8 percent. However, the sum of both effects is more stable explaining between 60 and 70 percent of the total variance of business unit returns. Finally, the unexplained variation in business unit returns is about 36 percent of the total variation.

The evidence shown in Table 3 is quite consistent with Roquebert *et al*. (1996). We too find large and statistically significant firm and business unit effects, and around 30 percent of unexplained variation. Finally, the industry effect in our study is smaller than in Roquebert *et al* (1996). Recall that we are using for this study COMPUSTAT data for approximately the same number of observations, and for corporations filtered in the same way. The only difference is that our sample covers the 1991-1997 period as opposed to the 1985-1991.

The lack of robustness in the results across different samples can be partially attributed to differences in the statistical properties of the different samples. However, the dispersion observed in the results is much larger than the dispersion in ROAS across samples, indicating that this evidence must be carefully interpreted.

B. Robustness of the results to changes in estimation method and model specification:

As we mentioned earlier in the paper, the variance decomposition estimation procedure provides information only about the relative magnitude of the common variation attributable to the different factors considered. Instead, a fixed effects estimation indicates the specific nature of the effect. We also indicated that the specific variance decomposition obtained would depend, in principle, on the fixed effects included in the regression. Moreover, the random effects are generally included in order to assure that the estimated coefficients on the fixed effects are unbiased.

In this paper, we make the following experiment in order to analyze

TABLE 3
INDUSTRY, CORPORATION AND BUSINESS UNIT EFFECTS
RANDOM EFFECTS MODEL
(ML ESTIMATION)

the robustness of the standard variance decomposition effects to the estimation procedure. We run a mixed model regression using the same ten random samples as before, but now including the industry or the corporation effect as a fixed effect in the model. The results are presented in Tables 4 and 5. In Table 4 we included the industry effect as a fixed effect. The first row of the table computes an F test for the joint significance of the effect (the probability of being non-significant is presented immediately below). Table 4 shows that the industry effects that are usually unimportant in the random effects estimation now become significantly different from zero in all ten samples. This result is in sharp contrast with the evidence shown in Table 3 where the industry's random effects were statistically significant in only 2 of the 10 samples. Table 4 also shows that the random corporation effect is now three times larger, on average, than the business unit effect, which in turn is significant in only 2 of the 10 samples. As in Table 2, the random effects estimates are not robust, varying widely across samples, even when they are pair-wise compared.

Table 5 presents the same kind of results but now, with the firm effect estimated as a fixed effect, leaving the industry and business unit effects as random. The estimates resemble those presented in Table 3 and are more in accordance with Rumelt (1991) and Roquebert *et al.* (1996) results. In all but one sample the corporation effect is significantly different from zero. The business unit effect explains again about 30 percent of the remaining variance. The industry effect is only significantly different from zero in two of the ten samples.

In summary, these results show that the relative importance of the three main components of business unit returns can change substantially depending on model specification. In particular, it is worthwhile noticing that after controlling for industry dummies (fixed effects estimation), the random business unit effect falls dramatically indicating that a good part of the total variance explained by the business unit effect is probably due to industry characteristics. Notice that when firm effects were included as fixed effects in the regression, the business unit effects remained unaffected. The evidence presented in tables 4 and 5 indicates that the standard variance decomposition estimation treats industry effects unfairly, hiding them as business unit effects. Hence, this evidence gives some fresh air to the

TABLE 4
INDUSTRY, CORPORATION AND BUSINESS UNIT EFFECTS
MIXED EFFECTS MODEL 1
(ML ESTIMATION)

TABLE 5
INDUSTRY, CORPORATION AND BUSINESS UNIT EFFECTS
MIXED EFFECTS MODEL 2
(ML ESTIMATION)

structure-conduct-performance view of the firm. Finally, the results shown in tables 4 and 5 indicate that the random effects estimates are not robust to sample variation and model specification.

C. Robustness of the results to the inclusion of new explanatory variables:

The standard variance decomposition approach to explain business unit returns does not allow to identify the specific sources of profitability. The COMPUSTAT data base includes a list of variables related with industry, corporation and business unit characteristics, that could be used to tackle this problem. In a recent paper, Mauri and Michaels (1998) analyze the effect of strategic policy in corporate profits. They look at the effect of corporation expenditures in marketing and R&D on corporation profits.

In this paper, we look at the effect of including additional explanatory variables on the variance component estimation of industry and corporate effects. We have considered additional explanatory variables related to strategic management factors. They are the corporation expenditures in marketing and R&D, as in Mauri and Michaels (1998). We have also considered the business unit's capital expenditures, and the corporation ratio between long term debt and total capital, a variable related with the corporate finance literature. We also included a measure of market concentration. This variable was calculated as the ratio between business unit sales and total sales at the 3 digit SIC code where the business unit operates. Finally, we constructed an indicator of the degree of diversification achieved by the corporation. This indicator was constructed following Caves *et al.* (1980), and has been used widely in a series of papers that analyze the effect of focus on performance.[8, 9]

[8] See Wernerfelt and Montgomery (1988), and Montgomery and Wernerfelt (1988).
[9] The diversification degree indicator corresponds to:

$$DIVERS_i = \sum_j w_{ij} \sum_l w_{il} \cdot d_{jl}$$

In this equation, w_{ij} represents the percentage of total sales that corporation i generates from business unit j. d_{jl} is an indicator variable that takes the values:

$$d_{jt} = \begin{cases} 0 \text{ if } j \text{ and } l \text{ have the same three digit SIC code} \\ 1 \text{ if } j \text{ and } l \text{ have the same two digit SIC code, but different three digit code} \\ 2 \text{ if } j \text{ and } l \text{ have different two digit SIC code} \end{cases}$$

All these variables are proxies for different elements considered in the process of strategic decision making at the corporation and business unit levels, and therefore are expected to affect the profitability rates of the business units operating in the corresponding corporation. The corporation expenditures in marketing and R&D would help to generate market power and identify the most advantageous firm's resources and capabilities, affecting positively profitability rates. The business unit's capital expenditure level is presumably related to the identification of business opportunities and would also increase profits. The corporation ratio between long term debt and total capital may affect the firm cost of capital and profitability in different ways. On the one hand, in the "free-cash flow theory of debt" of Jensen (1986), more debt reduces the agency problems of equity increasing profitability. On the other hand, a highly levered firm may face a higher average cost of capital because of bankruptcy costs and the agency costs of debt. Finally, both the degree of firm diversification and the degree of market concentration are related to specific views of the competitive advantages of the firm, and therefore are expected to affect profitability. We will discuss the expected effect of these variables in next section.

Table 6 shows the results of an estimation of a mixed model like the one in equation (7), in which all the variables previously discussed are entered into the model as fixed effects. The estimation was performed using the MIXED procedure in SAS, and a maximum likelihood method. The results show that the business unit return is, in general, not significantly related to the variables included in the estimation. Only the diversification and the market concentration proxies appear to be statistically significant. However, this result is not robust to sample modification.

Table 6 also shows that after controlling for these fixed effects, the variance components of the remaining variance differ from the previous findings. That is, after controlling for an arbitrary set of variables that are not statistically significant at the individual level, the corporation effect falls to 17 percent on average, and the industry effect vanishes.

These results, however, are not strictly comparable to those in previous tables, since the available sample of business units is importantly reduced when considering the effect of advertising and R&D level of expenditures.

TABLE 6
INDUSTRY, CORPORATION AND BUSINESS UNIT EFFECTS
MIXED EFFECTS MODEL 3
(ML ESTIMATION)

	Sample Observations Number of UBS	1 - 5 1.985 2 or more	6 - 10 1.091 2 or more	Pairwise Rejections (%)
Fixed Effects				
	Divers	-7,55	14,64	100%
		0,43	0,12	
	% Sales	0,29	0,05	100%
		0,00	0,63	
	XAD	0,01	0,00	0%
		0,22	0,73	
	XRD	0,00	0,00	0%
		0,28	0,95	
	CAPXS	0,00	0,00	0%
		0,78	0,66	
	LTDCAP	0,00	-0,05	100%
		0,51	0,22	
Random Effects				
	Industry	0,0%	0,0%	
		-	-	
	Corporation	8,6%	26,6%	100%
		11,4%	0,0%	
	Business Unit	35,1%	49,0%	100%
		0,0%	0,0%	
	Year	0,0%	0,0%	
		-	-	
	Error	56,2%	24,4%	100%
		0,0%	0,0%	

Note: Fixed effects panel reports coefficient estimates for continuos variables and F-test for class variables. P-values reported below. Random effects panel reports percentages of total variance explained by the corresponding effects and p-values.

D. The effect of diversification and market concentration:

In the last part of the paper we turn our attention to two of the explanatory variables used above. They are the corporation degree of diversification and the degree of market concentration. We disregard the other explanatory variables because they did not appear statistically significant in the above analysis, and because their inclusion importantly reduces the availability of data, biasing our samples and making our results less comparable to previous studies.

The effect of market concentration on business units' profitability rates has to do with the structure-conduct-performance view of the competitive advantages of the firm. In this view, firms look for markets where restrictions to competition may generate economic rents selecting their market position in order to increase profits. Economic rents will be directly related to market concentration.

The analysis of the focus effect or degree of diversification has produced some controversy in the past. In a series of important papers Wernerfelt and Montgomery (1988) and Montgomery and Wernerfelt (1988) found evidence that industry effects were the major determinant of Tobin q's for corporations, and that focus had a positive effect on firm performance. In their words, "this result contradicts the view of diversification as a vehicle for collusion".

In a separate line of research, Roquebert *et al.* (1996) found that as they increased the average number of business units per corporation in the estimation sample, the corporate effect tended to decrease. Of course, they could not measure whether diversification had a positive or negative effect on performance. The variance decomposition analysis only allowed them to measure the importance of diversification in corporate and firm effects. In any case, their finding was at odds with previous research by Rumelt (1991) and Kessides (1987). Both of them found that as diversification increases, corporate effects become more important.

In this paper, we intend to shed some light over this controversy. There are two aspects to take into account. First, it is important to consider that in estimating the impact of focus on performance, Westerfelt and Montgomery (1988) cannot control for the existence of unobserved corporate and business unit effects that may bias their focus coefficients. That would be the case if, for instance, there were any sort of relationship between agency problems, diversification and the choice of industries.

Second, the Roquebert *et al*. (1996) and Rumelt (1991) estimation procedure cannot measure the effect of focus on performance, and moreover, they use the number of business units as an approximation for diversification. From the construction of the variable *DIVERS* it is clear that a firm with 10 business units operating in the same three-digit SIC code can be less diversified than a company with only two business segments in different two-digit codes.

Both questions are tackled herein. We first estimate a mixed model including the diversification index and the degree of market concentration as fixed continuous effects, and controlling for time dummies. We control this regression for unobserved firm, industry and business unit random effects. The results are shown in Table 7. On the one hand, the coefficient estimated for the degree of market concentration is positive and statistically significant at the 90 percent confidence level in 6 of the 10 random samples. The average estimate is 0.39. In economic terms, a one standard deviation increase in market concentration (20% of total sales) implies an increase of 8 percentage points in the rate of return on assets. On the other hand, the coefficient estimated for the firm's degree of diversification is positive and statistically significant at the 90 percent confidence level in 4 of the 10 random samples. This result tends to support the standard view that diversification has positive effects on performance, probably because of its effect on the possibility of successful collusion. The table also shows that after controlling for the degrees of market concentration and firm diversification, industry effects are importantly reduced, firm effects are partially reduced, while business unit effects seem to keep their relative importance.

In order to analyze the effect of the degree of diversification over corporate effects, we run ten standard variance decomposition regressions, each one for a different range of the diversification index. Table 8 shows the results. Although they are non-conclusive, they seem to indicate that as the degree of diversification increases, the corporation effect tends to decrease becoming statistically non-significant.

TABLE 7
INDUSTRY, CORPORATION AND BUSINESS UNIT EFFECTS
MIXED EFFECTS MODEL 4
(ML ESTIMATION)

TABLE 8
DIVERSIFICATION AND INDUSTRY, CORPORTION AND BUSINESS
UNIT EFFECTS
RANDOM EFFECTS MODEL
(ML ESTIMATION)

V. SUMMARY AND CONCLUSIONS

The main purpose of this paper was to show that the variance decomposition analysis is limited in its ability to explain the determinants of business unit performance. It does, however, label our ignorance in a way that helps to distinguish between competing theories in strategic management. That is the obvious reason for its popularity.

The results presented in this paper show that the relative importance of firm, industry and business unit effects change depending upon the estimation procedure and model specification. In particular, even though industry effects have been found to be economically unimportant in previous related literature, they are statistically significant when estimated as fixed effects. Moreover, when the firm effects are estimated as fixed effects, the relative importance of the random business unit effects was importantly reduced. This indicates that part of the explanatory power attributed to idiosyncratic characteristics of the business units may, in fact, be related to market characteristics.

The particular effect on profits of specific firm and market characteristics such as the degree of firm diversification or the degree of market concentration remains unknown when a variance decomposition analysis is used. Using a mixed model estimation procedure, this paper shows that both dimensions of firm strategy tend to improve business unit performance.

The main conclusion of the paper is, however, that one must be extremely careful when interpreting variance decomposition estimations of business unit profit rates. That is especially true when considering firm strategies for corporations operating in emerging markets. The empirical evidence does not seem to support a particular view of strategic management, and there is no indication that the general results obtained for U.S. corporations can be safely extrapolated to other less developed economies.

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