THE EFFECT OF DIVERSIFICATION ON PERFORMANCE REVISITED:
DIVERSIFICATION DISCOUNT, PREMIUM, OR BOTH?

IE Working Paper **DE8-112-I** **20-12-2004**

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Abstract

In this paper we argue conceptually and show empirically that the effect of diversification on performance is not homogeneous across industries, as previously assumed in the literature on diversification in strategy and finance. Some industries may be more friendly environments for diversified firms than for specialists, or vice versa. After replicating the main findings in finance and strategy, we show that the number of specialists in an industry is an important moderator of the diversification-performance relationship, which determines the existence of a diversification discount, a premium, or the curvilinear relationship frequently found in strategy research. The results are robust to the use of different specifications and control for the self-selection problem detected by recent research on the diversification discount.

Submitted for presentation at the 2005 Academy of Management Meetings in Hawaii

1. INTRODUCTION

The relationship between diversification and firm performance has been the subject of abundant research in several fields, including Strategic Management, Industrial Organization, and Corporate Finance (Berger and Ofek, 1995; Palich, Cardinal, and Miller, 2000). The main focus in this literature has been the relative performance of diversifiers versus specialized firms (i.e. non diversifiers that operate only in one industry), typically analyzing empirically large samples that include a broad number of industries. However, despite the research accumulated in the last three decades, there is no widely accepted causal relationship between diversification and performance. Though most scholars would probably agree on a somewhat negative relationship between diversification and performance based on the empirical evidence of a diversification discount, probably an inverted-U relationship, recent research shows that the diversification discount disappears when we control for the possibility of self-selection (Campa and Kedia, 2002; Villalonga, 2004a).

In this paper, we will review some of the most recent developments, especially those investigating the self-selection problem and the data limitations studied in the finance literature in the last few years (Villalonga, 2004b), which once again question whether there is a diversification discount or indeed a premium. Anticipating our main argument, we will explain conceptually and provide empirical evidence that no relationship (either positive, negative, or even quadratic) should be expected between diversification and performance *across all industries*, as it has been typically tested. We will show that the actual relationship depends on the underlying nature of the industries and firms in the sample, even after taking into consideration the self-selection problem present in most of the accumulated research. Thus, to understand whether diversification leads to improved or worse performance for firms, we should probe deeper into the characteristics of the specific industries in which the firm is involved and, more specifically, the extent to which specialized firms or diversifiers have a competitive advantage when competing in a given industry or set of industries.

We will argue that some industry characteristics may be more favorable for the relative performance of diversifiers than specialized firms, or vice versa. The previous literature has overlooked this possibility and it has focused in estimating an average effect of diversification on performance homogeneous across all industries, usually controlling for some measure of relatedness among the business units at the firm level. In this study, we investigate how the effect of diversification on performance indeed varies depending on the industries that we include in the sample and how this fact affects the interpretation of earlier literature on this topic. We will show that there is a diversification discount when the sample is comprised only by diversifiers competing against a relatively large number of specialized companies. In contrast, we find a diversification premium when the same estimation is done only in industries in which just a few specialized firms compete. Thus, no diversification premium or discount should be expected across the board.

This argument will lead us to question the inverted-U relationship proposed by some researchers in strategy (Grant, Jammine, and Thomas, 1988; Palich, Cardinal, and Miller, 2000), or any other type of relationship, as valid across the board in all industries. We will argue that the effect diversification on performance depends on the relative strength of diversifiers versus specialists in the set of industries under consideration.

The paper is structured as follows: First, we will review briefly the empirical research on the diversification-performance relationship in strategy and the diversification discount in finance. Then, we will use a simple statistical model to explain why we should not expect to find a constant relationship between diversification and performance across all industries. These ideas will be tested empirically through the analysis described in the following section. The fifth section shows the results of the analysis in which we replicated the methodologies traditionally used in each of the two fields, finance and strategy. In the last section, we present the conclusions from this study and suggest new ways to uncover the effect of diversification on firm performance.

2. Empirical research on the effect of diversification on performance

Since the early work of Rumelt (1974, 1982), most strategy scholars believe diversification eventually begins having a negative impact on firm performance, based on the notion of relatedness among the businesses in which a corporation competes. A recent meta-analysis of the literature finds evidence of this idea, supporting an inverted-U relationship between diversification and performance, though several other functional relationships have been found in the literature (Palich, Cardinal, and Miller, 2000). The main rationale is that the first few diversification steps are closely related to the core competences of the organization, which allow for the transfer of competitive advantages and knowledge in particular. However, as the firm moves to other industries further away from the core, these possibilities disappear and performance should begin to suffer. This argument presumably applies across the board to all firms regardless of the initial industry in which they emerged. In other words, this is the average effect that has been detected, obtained usually from large databases of firms and industries.

Empirical research in finance also shows that diversified firms seem to systematically perform worse than specialized firms. There is a large body of literature that has studied the so-called "diversification discount" in finance[1]. Lang and Stulz (1994), and Berger and Ofek (1995) among others provide strong evidence that conglomerates trade at a discount compared to specialized companies. The interpretation of this empirical finding has been that "diversification destroys value", fully consistent with strategy research. The results usually hold independently of the period of time, country, and financial performance measure used.

More recently, however, Campa and Kedia (2002) and Villalonga (2004a) point out that firms do not randomly become diversified, but rather they endogenously choose to do so. They provide evidence that diversified firms traded at a discount prior to becoming diversified and, once they control for this self-selection, the diversification discount either disappears or becomes a diversification premium. In the same direction, Graham, Lemmon, and Wolf (2002) show that segments acquired by diversifying firms already traded at a discount before the acquisition, thus also refuting the post acquisition

[1] See Martin and Sayrak (2003) for a recent survey.

negative relationship between diversification and performance. Furthermore, Villalonga (2004b) using a unique database is able to build more precise measures of firm diversification, and she finds that the diversification discount turns into a premium.

Despite being a central topic in the field of strategy and finance, the evidence about the effect of diversification on performance is still inconclusive. The most recent research in finance casts serious doubts into the existence of a diversification discount and the methodological limitations of the accumulated evidence. Thus, the question of whether diversification improves o worsens firm performance is still worthy of further research. However, it seems that the search for new types of general functional relationships between diversification and performance, presumably valid across all industries, has taken us as far as we could go. In the next section we will analyze statistically why we should not expect to find a functional relationship homogeneous across industries. We will argue that diversification may be good or bad depending on the industries that we are considering. We will show that, if this is true, then earlier research has estimated an "overall aggregated effect" of diversification on performance that may not be valid for the different subsamples of industries within the population of firms. In other words, we may have missed a critical moderator of the diversification-performance relationship.

3. Modeling the relationship between diversification and performance

As we will see below more rigorously, earlier research has estimated the effect of diversification on performance as if it were homogeneous across all industries. However, it is very likely that being a specialist (or a diversifier) could give a competitive advantage in some industries, but not in others. For instance, specialists could be particularly competitive in a given industry if there are no economies of scope with other possible vertical or parallel activities. If there is a large number of specialists in such an industry, diversifiers would probably be at a disadvantage because of the greater bureaucracy costs of performing activities within the hierarchy that could be done more efficiently outside of it, assuming the lack of small numbers bargaining and the associated higher transaction costs. On the other hand, under the opposite circumstances diversifiers could have a competitive advantage over specialists.

Let us assess formally the potential influence of introducing this type of heterogeneity across industries on the identifying assumptions of prior studies. Later, we will replicate the procedure used for the estimation of the diversification discount in finance, but taking into account that specialized firms may perform better or worse than diversifiers depending on the specific industry they are in.

Variations around the following model have been used in the specifications by previous studies:

$$y_{itI} = \delta_0 + \delta_1 X_{it} + \delta_2 D_{it} + \delta_3 K_{It} + e_{itI}$$

where,

y_{itI} represents a measure of performance of segment i at time t operating in industry I.
X_{it} represents observed firm characteristics of firm i at time t
D_{it} is a dummy equal to one if firm i is a multi-segment company at time t (diversifier)
K_{It} are industry characteristics, both observed and unobserved of industry I at time t
e_{itI} represents unobserved segment characteristics

δ_0 δ_1 δ_2 δ_3 are the parameters to be estimated. In this literature, the coefficient of interest is δ_2 that measures the effect of being diversified on firm performance.

If a firm is diversified and operates in N industries, its performance, $Y_{it,1..N}$, will be a weighted average of segment performance:

(1)
$$Y_{it,1..N} = \sum_{I=1}^{N} \omega_{itI} y_{itI} = \sum_{I=1}^{N} \omega_{itI} (\delta_0 + \delta_1 X_{it} + \delta_2 D_{it} + \delta_3 K_{It} + e_{itI}) =$$
$$= \delta_0 + \delta_1 X_{it} + \delta_2 D_{it} + \delta_3 \sum_{I=1}^{N} \omega_{itI} K_{It} + \sum_{I=1}^{N} \omega_{itI} e_{itI}$$

For non-diversified firms we have:

(2) $Y_{itI} = y_{itI} = \delta_0 + \delta_1 X_{it} + \delta_3 K_{It} + e_{itI}$

The specification that in general the literature has followed[2] consists in first using the sample of non-diversified firms to find an average industry performance, $\overline{y_{It}}$. Assume there are L_I specialized firms operating in industry I in our model using (2):

(3)
$$\bar{y}_{It} = \frac{\sum_{i}^{L_{It}} y_{it}}{L_{It}} = \delta_0 + \delta_1 \frac{\sum_{i}^{L_{It}} X_{it}}{L_{it}} + \delta_3 K_{It} + \frac{\sum_{i}^{L_{it}} e_{itI}}{L_{it}} =$$
$$= \delta_0 + \delta_1 \overline{X}_{It} + \delta_3 K_{It} + \bar{e}_{It}$$

From (1) and (3) we get:

(4)
$$Y_{it,1..N} - \sum_{I=1}^{N} \omega_{itI} \overline{y_{tI}} =$$
$$= \delta_0 + \delta_1 (X_{it} - \sum_{I=1}^{N} \omega_{itI} \overline{X_{It}}) + \delta_2 D_{it} + \sum_{I=1}^{N} \omega_{itI} (e_{itI} - e_{It}) =$$
$$= \delta_0 + \delta_1 X_{it} + \delta_2 D_{it} + v_{it}$$
$$v_{it} = -\delta_1 \sum_{I=1}^{N} \omega_{itI} \overline{X_{It}} + \sum_{I=1}^{N} \omega_{itI} (e_{itI} - \overline{e_{It}})$$

(4) is the equation that the traditional diversification discount literature has estimated using different measures of performance. The robust and consistent empirical finding across many different samples and time periods has been that $\delta_2<0$ and the interpretation has been that diversification destroys value. As a first caveat, note that this model can not be applied to diversified firms that operate in industries in which only diversified firms operate, since for them we are unable to construct $\overline{y_{tI}}$. Therefore, this estimation procedure selectively eliminates from the sample those industries in which only diversified firms exist, arguably when they are most likely to perform better than specialized ones. However, we will ignore this problem for now and we will use the same estimation strategy to keep our study comparable to previous ones at this stage.

The regression model as specified in (4) will give a consistent estimator of δ under the standard conditions that E[v/X] = E[v/D] = 0. However, the self-selection

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[2]E.g. see Berger-Ofek (1995) as a highly influential paper in finance, used as reference point in our study.

discount literature (Campa and Kedia, 2002; Villalonga, 2004a) has shown why E[v/D] can be expected to be different from 0. In this case, unobservable firm characteristics that are correlated with performance measures will also be correlated with the decision to diversify. For example, it may happen that firms with more organizational capital are more productive and at the same time more likely to diversify (Schoar, 2002).

This more recent branch of literature takes into account that $D_{it}=1$ iff $D_{it}^{*}=Z_{it}+\mu_{it}>0$ and that either cov(Z,v)≠0 or cov(μ,v)≠0. Therefore, the identification of δ_2 relies on finding an instrument z that belongs to Z, but does not belong to X such that E[v/z]=0. The important finding of this recent literature in finance is that once we try to control for this endogeneity problem of self-selection, the diversification discount either disappears or becomes a diversification premium, as we noted earlier.

Once we have stated the general model, we can discuss the implications of our previous analysis on the diversification discount literature are. We have seen that the effect of diversification on performance might vary across industries. We represent this fact by considering that $\delta_2=\overline{\delta_2}+\sum_I Ind_{iI}\delta_2^I$ where as before "I" represents a given industry, Ind_{iI} is an indicator function equal to one if firm i is present in industry I and zero otherwise and δ_2^I is a parameter different for every industry that represents how well diversified firms perform in that particular industry. Note that δ_2^I could be positive or negative. After we have introduced this extension, the parameter of interest is still $\overline{\delta_2}$, this is, the average effect of diversification on performance across industries.

If we rewrite the general model above taking this modification into account we get:

$$(5)\, Y_{it,1..N}-\sum_{I=1}^{N}\omega_{itI}\overline{y_{tI}}=\delta_0+\delta_1 X_{it}+\overline{\delta_2}D_{it}+v^{*}{}_{it}$$

$$v_{it}^{*}=v_{it}+\sum_{I=1}^{N}\omega_{itI}\delta_2^I D_{it}$$ [3]

where the only difference with respect to (4) is the inclusion of an extra error term: $\sum_{I=1}^{N}\omega_{itI}\delta_2^I D_{it}$ [4]

This modification has important consequences in understanding the previous literature. For the traditional diversification discount literature, even in E[v/D] = 0 now $E[v^*/D]=E[\sum_{I=1}^{N}\omega_I\delta_2^I D\,/D]\neq 0$. The sign of the bias is not clear since this $E[D\sum_{I=1}^{N}\omega_I\delta_2^I D_t]$ = Prob(D=1) $\sum_{I=1}^{N}\omega_I\delta_2^I$, which could be larger or smaller than zero. However, ω_I (segment share of sales or assets) is probably going to be larger for industries in which $\delta_2^I>0$, since companies are likely to allocate more resources to those industries or segments in which they are more productive (Maksimovic and Phillips,

[3] Note that since ω_I is equal to zero if the firm is not active in industry I the indicator function is redundant.

[4] Note also that now the diversification decision should be modeled slightly differently in the following way: $D_{it}=1$ iff there are at least two industries I,J such that $Z_{itIJ}+\mu_{itIJ}>Z_{itI}+\mu_{itI}$ and $Z_{itIJ}+\mu_{itIJ}>Z_{itJ}.+\mu_{itJ}$

1992). If this is the case, E[D $\sum_{I=1}^{N} \omega_I \delta_2^I D_t$]> 0 and the usual diversification discount regressions would likely be an upward biased estimator of the average effect of diversification on performance, if we abstract from the self-selection issue, as the ones in Berger and Ofek (1995) or Lang and Stulz (1994). The fact that this literature still finds a significant diversification discount means that the negative effect identified by the self-selection literature, E[v/D]<0 , more than compensates the positive term E[D $\sum_{I=1}^{N} \omega_I \delta_2^I D_t$] in (5). Furthermore, as we will discuss in the next section, the procedure followed to construct the industry adjusted measures of performance could downward bias the estimation of $\overline{\delta_2}$.

Note that if the effect of diversification indeed varies across industries, the instruments will likely be biased since E[kv*] =E[k $\sum_{I=1}^{N} \omega_I \delta_2^I$ D] = Prob(D=1) $\sum_{I=1}^{N} \omega_I \delta_2^I$ E[k/D=1] $\neq$0, because E[k/D=1] $\neq$0. Intuitively, unless we take into account that the effect of diversification on performance varies across industries, any instrument that is correlated with the decision to diversify will also be correlated with the regression error in (5) since it includes the diversification dummy.

What is the sign of this bias? This will depend on the sign of E[k/D=1]. For the case of the estimation strategy followed in Campa and Kedia (2002), they use the set of instruments that measures attractiveness of the industry for conglomerates, like proportion of industry activity accounted by diversified firms. If this is the case, E[k/D=1] > 0 and therefore the instrumental variable estimator will be an upward biased estimator of $\overline{\delta_2}$.

Given the important consequences of not taking into consideration the likelihood that the effect of diversification on performance varies across industries, let us study empirically how the relationship between diversification and performance would change if we adjust accordingly the models frequently used in finance and strategy.

4. Methodology

We want to analyze empirically the performance-diversification relationship taking into account that the effect of diversification on performance may vary across industries, but obviously we do not know a priori in which particular industries the performance of diversified firms will be better or worse than the performance of specialized companies. However, we could argue that the performance of diversified firms should be relatively lower in those industries in which there is greater competition from a larger number of non-diversified companies, in contrast to industries where there are only a few specialists.

This seems reasonable from an evolutionary perspective and a transaction cost approach as well. First, if specialists are more competitive in a given industry, we should observe a larger number of them in it. Second, any potential transaction between two divisions of a diversified firm has typically the alternative to be carried out through the market, but markets provide a better allocation of resources only if there are a sufficiently large number of participants that inhibits small numbers bargaining. Thus, diversification into an industry with a large number of specialists is likely to have a negative effect in firm performance, because it provides no advantage to a diversified firm, which in addition needs to absorb the greater bureaucracy costs that specialists does not suffer.

Before we test this possibility directly, we will first replicate the Berger and Ofek (1995) regression analysis taking both firm and segment information from Compustat for the period 1993-2001, for which we had available data. Table I shows the descriptive statistics. We follow exactly the same procedure that they followed to construct our sample (financial firms in SIC 6000 through 7000, and firms with sales less than $20 million were excluded), but we introduce one critical difference: Berger and Ofek (1995) exclude from their study all industries in which there are not at least five specialized firms active. We do not use this restriction because, as explained earlier, we do not want to limit the sample and leave out industries where there are very few specialized companies. These firms constitute about 12% of the total sample, where diversifiers probably have greater advantage over specialists. As explained in the previous section, leaving out these firms would bias the results, if there is an interaction of diversification with the number of specialized firms active in each industry.

For financial performance, we will use the same measure as in the previous literature on diversification: industry-adjusted market to book ratio, following the same steps than Berger and Ofek (1995). For every firm in the sample, we first compute its market value by multiplying the stock price at the end of the year by the number of outstanding shares and adding the book value of short and long-term debt. We also compute a representative industry market to book ratio as the median of the market to book ratio of companies operate exclusively in each four-digit SIC industry. Then, for every firm we compute a "would be" market to book ratio averaging the representative industry market to book using the representative industry ratios in which the firm is active and using as relative weights the percentage of segment assets over total assets of the company. Finally, the industry-adjusted market to book ratio is computed as the natural log of the real company market to book ratio divided by the "would be" market to book ratio estimated before.

In our last analysis, we conducted further subsample analysis to test the curvilinear relationship between diversification and performance following the methodology frequently used in strategy. It should be noted that for this last analysis we used a continuous measure of diversification, an entropy index computed as: $\sum P_i * \log(1/P_i)$ where P is firm sales in a given four digit SIC code over total firm sales (Palepu, 1985). In contrast, we used a dummy variable to identify the firms that are diversified in the earlier analysis. Thus, in each analysis we use the traditional way in which diversification has been measured in the studies of diversification in finance and strategy. We followed this operationalization of diversification consistent with the model in the previous section in order to make possible the comparison with the relevant literature in each case.

To check the robustness of the results to other performance measures and time, the analysis was also done using industry-adjusted market to sales ratios as a measure of performance, and very similar results were obtained. In addition, the analysis was replicated using data only for the most recent year that we had 2001, again obtaining virtually identical results. Given the large number of firms and small number of years, we considered more appropriate this pooled model and control for each firm, as it is typically done in the studies of the diversification discount, instead of reporting the results only for the last year 2001 or adjust the error term for serial correlation (introducing the potential for bias). These additional analyses were not included in this short version of the paper, but they are available from the authors upon request.

5. Results

First, we will replicate the landmark study of Berger and Ofek (1995) in finance about the diversification discount. To make possible the comparison, we conducted the analysis in two subsamples: one with industries with at least five specialized companies (like in Berger and Ofek, 1995) and another with less than five specialized companies (which were excluded in the Berger and Ofek study). With these analyses we want to test whether indeed the effect of diversification on performance depends on which sub-sample of industries we are considering. After this, we directly test the general model (5) above, introducing the additional term that captures the interaction of the diversification variable with the number of specialized firms active in the industry.

Table II shows the estimation of the effect of diversification on performance using the same specification as in Berger and Offek (1995). The results vary substantially depending on the type of industries included in the sample. If we consider only those industries in which there are more than four specialised companies, as is typically done in the studies of the diversification-performance relationship in finance, we find the usual negative effect of diversification on performance, fully consistent with the results of Berger and Ofek (1995). However, if we estimate the effect of diversification on performance only in industries in which there are less than five specialised companies, we find a significant diversification premium. Finally, if we consider all industries without any constraints in the sample, the effect of diversification on the destruction of value are similar in nature to this latter subsample analysis, but substantially less strong[5]. Thus, the frequently observed negative relationship between diversification and performance does not occur in industries where there are relatively fewer specialists, and diversifiers clearly dominate over specialists. The effect of diversification on performance seems to be moderated by the industries that we are considering, more specifically the number of specialists in each industry.

[5] The results for the full sample can be considered mixed. Though we obtained a significant negative coefficient (0.02) for the diversification indicator in the full sample for the 1993-3001 period using industry-adjusted market to book ratio as the dependent variable as shown in Table II, the additional analysis for the last year 2001 period (not shown) provided an insignificant result for this coefficient. Furthermore, the analyses the period 1993-2001 and also the last year 2001 (not shown) using now adjusted market to sales ratio as a measure of performance obtained a significant *negative* coefficient in both cases. In contrast to the full sample analysis mentioned in this footnote, the results were always the same for the different specifications used for the dependent variable and time frame in each of the two subsamples. In our opinion, these inconclusive results for the full sample analysis using another measure of performance and time frame provide additional support that the nature of the diversification-performance relationship is not constant across industries and it should be computed and interpreted across a subset of industries, taking into consideration their intrinsic structural characteristics (particularly the number of specialists in the industry) and how they may affect the competitiveness of diversifiers versus specialists in such setting.

Next, we directly introduce in the regression an interaction of the diversification dummy with the number of specialized competitors in the industry. In terms of the model described in (5) we hypothesize $\delta_2^I = \theta \log(c_I)$; where θ is a parameter to be estimated and c_I is the number of specialized companies active in industry I. We use a logarithmic function since we suspect that an increase in the number of specialized companies has a larger influence on the performance of diversified firms when there are just a few of them in the industry. With this functional form for δ_2^I, (5) now becomes:

$$(6)\, Y_{it,1..N} - \sum_{I=1}^{N} \omega_{itI} \overline{y_{tI}} = \delta_0 + \delta_1 X_{it} + \overline{\delta_2} D_{it} + \theta(\sum_{I=1}^{N} \omega_{itI} \log c_I) D_{it} + v_{it}$$

and therefore we proceed to estimate (6), that is, the standard regressions in Berger and Ofek (1995), plus the additional term $D_{it} \sum_I \omega_{itI} \log c_I$, an interaction term of the dummy for diversification with the weighted average of the number of specialized competitors by industry.

Table III shows the results of this regression. The main effect of diversification (common across industries) is positive for the two models. More important, however, the interaction of the diversification dummy with the weighted average of the number of specialized companies is negative and strongly statistically significant. This is an additional piece of evidence that the effect of diversification on performance depends crucially on the industry characteristics in which the diversified firms operate. There is a significant interaction between diversification and the number of specialized firms in the industry, which can be considered a proxy for the relative competitiveness of specialized firms (versus diversifiers). As usual, both main effect and interaction need to be taken into consideration to understand the diversification-performance relationship. The overall effect of diversification on performance is positive for industries in which there less than three specialists. For these industries the main positive effect (.26) dominates over the interaction effect (-.10); however, when there are more than three specialists in the industry in which the firm is competing, the negative interaction effect begins to dominate. Because most research in the diversification discount in finance excludes firms in these industries with very few specialists, it seriously undermines the results because it drops those cases where diversifiers are relatively more competitive.

However, our findings may suffer from the self-selection problem, because firms do not randomly become diversified or specialized, as we discussed earlier. There might be unobserved firm characteristics correlated at the same time with the diversification decision and performance, which may be driving the correlation between diversification and performance. We now replicate our analysis taking into account this possibility. Different specifications have been used to correct for this problem of endogeneity, for instance by Villalonga (2004a) or Campa and Kedia (2002). In our study, we chose a fixed-effect regression that includes firm dummies, following the Campa and Kedia (2002) paper. Since we are only interested in firms that actually changed their diversification to assess its relationship with performance (controlling for any firm-level unobservable factors), we use only those firms in Compustat that report a change in the number of segments for the period 1993-2001.

The results are depicted in Table IV. Once we control for unobserved firm characteristics as in Campa and Kedia (2002) using a dummy for every firm in the sample, we find similar results to the analysis above. We still find a significant interaction between diversification and performance, so that diversification in industries with a large number of specialized competitors affects negatively performance ratios (though not when there are few specialized firms in the industry). These coefficients are smaller than those in Table III, but they show that diversification is positively associated to performance in industries when only a few specialists firms compete (diversifiers are stronger in these industries), and the relationship becomes negative in industries where there are a relatively larger number of specialists (approximately four or more specialists). The analysis in Table III shows that this is so even after taking into account the endogeneity problem of the diversification decision, because the main and interaction effects of diversification have the appropriate sign and significance after controlling for the intrinsic characteristics of each firm through a fixed-effects regression.

The analysis provides very clear evidence that the relationship between diversification and performance depends on the nature of the industries in which this relationship is estimated. We should not expect any diversification premium or discount across the board in all industries, but it depends on the number of specialists in the industry, which moderates the diversification-performance relationship. When industries where only a few specialists compete are dropped from the analysis, as it is typically done in finance studies, we observe a diversification discount; however, we can see a diversification premium in these industries usually left out from empirical analysis.

This finding should also affect the inverted-U shape relationship widely accepted in the field of strategy[6]. If the diversification-performance relationship is not constant across all industries, the curvilinear relationship may just reflect the actual combination of industries in the sample, probably with different types of diversification-performance association in different types of industries, but not a constant relationship with a common underlying cause across all industries. To test this possibility, we estimated a quadratic model of industry-adjusted ROA for each firm using an entropy measure of diversification (Palepu, 1985) as the independent variable of interest.

The results are shown in Table V. For the full sample we obtained clear evidence in favor of the inverted-U relationship, being both the linear and the quadratic coefficients highly significant, consistent with earlier research in strategy. However, in line with the rest of the analysis and our main argument, this relationship does not hold in any of the two subsamples separately. Diversification has a significant linear positive effect for the subsample of industries with few specialized companies and it has an insignificant negative coefficient for the subsample with five or more specialized firms. The quadratic relationship seems to be the result of combining industries with different characteristics in which a different diversification-performance relationship seems to exist, but not a homogeneous effect constant across industries.

[6] For the accumulated evidence about the diversification-performance relationship, including different linear and curvilinear models, see Palich, Cardinal, and Miller (2000).

6. Conclusion

In this paper we analyzed theoretically and empirically why the effect of diversification on performance depends on the industries that we are considering. Basically, we have provided evidence that in industries where we observe less than five specialists (presumable where being a specialist is a clear disadvantage), the more diversified firms have higher performance. However, in industries in which specialists have greater presence (i.e. at least five specialists), more diversification is associated with lower performance. Thus, no homogeneous relationship between diversification and performance exists across all industries, being the number of specialists an important moderator of the relationship.

The model in section 3 explains why we could expect an interaction between diversification and the number of specialists, and the implications that this may have in the estimation of the diversification-performance relationship. Earlier research in finance and strategy has not taken into consideration the possibility that diversification within a specific set of industries may have positive consequences for performance, but negative consequences for another set of industries. Maybe for this reason we have found conflicting results in the strategy literature, and scholars in the field of finance still debate the question of whether there is a diversification premium or a discount.

In our opinion, the answer to this question is: It depends on the industries considered. We believe that the functional relationships estimated across large databases in many industries are an over-simplification of the effect of diversification on performance. Diversification may increase o decrease the performance of organizations depending on a variety of factors, of which only relatedness had been the focus of interest until now. However, the characteristics of the industries involved, like the number of specialists in them, also moderate the diversification-performance relationship. In certain industries (with very few specialists left) being a conglomerate could actually improve performance, but as the number of specialists increases in the industry, being more diversified is associated with lower performance. We prove this result robust to the use of different econometric specifications, including procedures that control for self-selection bias, and using the traditional methodologies in the fields of strategy and finance.

In this paper we have shown that some industries may be more friendly environments for diversified firms than for specialists, which has important implications for the diversification literature. Ignoring this fact can bias the estimation of a general influence of diversification on firm financial performance. In fact, we have shown that the curvilinear relationship between diversification and performance holds only for the entire sample, but not in any of the two subsamples in which we split the dataset based on the number of specialists.

This finding calls for a re-assessment of the literature on diversification. Further research is necessary to study why sometimes the diversification-performance relationship is positive, others negative, and often quadratic. We have found one explanation: the relationship is contingent on the industries considered. Thus, we can say now based on these results that it is not a question of finding the right functional form, but in fact different relationships exist depending on the industries included in the study and the relative competitiveness of specialists versus diversifiers in them.

However, we need to probe further into why certain industries are more friendly contexts for specialists and others for diversifiers. We have argued that small numbers bargaining and transactions costs in general may be part of the answer, but we have not tested directly why sometimes specialists dominate over diversifiers in a given set of industries or vice versa. Maybe industries dominated by specialists require very different kinds of knowledge or dominant logic (Prahalad and Bettis, 1986) than those dominated by diversifiers. Future research should address this issue and revive this stream of research from a fresh perspective beyond a general effect of diversification on performance across all contexts.

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TABLE I: **Descriptive Statistics, 1993-2001**

	Mean	Std	Observations
Industry adjusted market to book	0.05	0.54	24,330
Assets (in millions of dollars)	1394.8	5638	24,330
Cap. Expenditures over sales ratio	0.12	0.30	23,927
EBIT over sales ratio	0.10	0.28	24,242
Number of specialized firms[i]	2.85	1.21	24.330
Diversification Index [ii]	0.12	0.30	24,215

[i] This variable measures the natural logarithm total number of specialized (non-diversified) companies active in a given four digit SIC code. For diversified companies that operate in multiple industries this variable is computed as a weighted average of the natural logarithm of the total number of specialized competitors in each of the industries in which the diversified firm is active. The weights used are segment sales over total sales

[ii]This variable is constructed as $\sum P_i * \log(1/P_i)$ where P is firm sales in a given four digit SIC code over total firm sales (Palepu, 1985).

TABLE II: **Regression analysis in different subsamples: 1993-2001. Dependent variable is industry-adjusted market to book ratio.**

	Subsample of industries with one to four specialized companies		Subsample of industries with more than 4 specialized companies		Full Sample	
Intercept	-0.00 (0.00)	-0.08*** (0.02)	0.04*** (0.00)	-0.03** (0.01)	0.04*** (0.00)	-0.03*** (0.01)
Indicator of diversification[1]	0.19*** (0.01)	0.18*** (0.02)	-0.10*** (0.01)	-0.12*** (0.01)	0.04*** (0.00)	0.02*** (0.01)
Log of assets		0.01* (0.00)		0.01*** (0.00)		0.01*** (0.00)
Capexp/Sales		-0.05 (0.04)		0.01* (0.01)		0.01 (0.01)
EBIT/Sales		0.27*** (0.04)		0.16*** (0.01)		0.16*** (0.01)
R^2	0.03	0.04	0.00	0.01	0.00	0.01
N	2,916	2,860	19,438	19,064	24,330	23,854

[1]Dummy equal to one if the firm operates in more than one segment.

Replication of the Berger and Ofek (1995) regression analysis, including also industries with less than five specialists.

TABLE III: **Regression analysis controlling for the number of specialized companies: 1993-2001.**

Independent Variables:	Dependent variable: Adjusted Market to Book Ratio	
Constant	0.01	-0.07***
	(0.01)	(0.01)
Indicator of diversification	0.27***	0.26***
	(0.02)	(0.02)
Number of specialized firms	0.01***	0.01***
	(0.00)	(0.00)
Number of specialized firms * Indicator of diversification	-0.10***	-0.10***
	(0.00)	(0.00)
Log of assets		0.01***
		(0.00)
Cap. Expenditures/Sales		0.01*
		(0.01)
EBIT/Sales		0.16***
		(0.01)
R^2	0.00	0.01
N	24,330	23,854

Regressions computed as in Berger-Ofek (1995) for the 1993-2001 period, but controlling now for the number of specialized firm and including its interaction with diversification. Full sample analysis.

TABLE IV: Regression analysis controlling by weighted average of number of specialized companies and with firm fixed-effect: 1993-2001

Independent Variables:	Dependent variable: Adjusted Market to Book Ratio	
Constant	-0.10*** (0.22)	0.64** (0.23)
Indicator of diversification	0.10*** (0.03)	0.18*** (0.03)
Number of specialized firms	-0.03*** (0.01)	-0.05*** (0.01)
Number of specialized firms * Indicator of diversification	-0.04*** (0.01)	-0.05*** (0.01)
Log of assets		-0.12*** (0.01)
Capital Expenditures/Sales		0.04 (0.03)
EBIT/Sales		0.38*** (0.04)
R^2	0.53	0.55
N	4,571	4,447

Regressions computed as in Berger-Ofek (1995) and fixed-effects as in Campa and Kedia (2002). We use only observations from 778 firms that report a change in the number of segments during the period 1993-2001 and include a dummy variable for each firm.

TABLE V: Performance regressions in different subsamples. Dependent variable is industry-adjusted ROA: 1993-2001.

	Subsample of industries with one to four specialized companies	Subsample of industries with more than 4 specialized companies	Full Sample
Intercept	-0.04*** (0.00)	0.00 (0.00)	-0.09*** (0.00)
Log Assets	0.016*** (0.00)	0.018*** (0.00)	0.016*** (0.00)
Cap. Exp/Sales	-0.03*** (0.00)	-0.03*** (0.00)	-0.03*** (0.00)
Diversification Index [i]	0.038** (0.017)	-0.028 (0.019)	0.03*** (0.01)
Diversification Index Square	-0.016 (0.016)	0.01 (0.02)	-0.018** (0.008)
R^2	0.02	0.03	0.04
N	3,671	18,208	23,826

Test of a curvilinear effect of diversification on performance across subsamples.

[i] This variable is constructed as entropy index $\sum P_i * \log(1/P_i)$ where P is firm sales in a given four digit SIC code over total firm sales (Palepu, 1985).