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Diversification, Refocusing and Firm Value

Abstract

At any point in time a firm faces three restructuring choices: diversify, refocus, or do nothing. This study analyzes the causes and the consequences of these actions in a unified framework using the appropriate methodologies. Various factors, such as firm's characteristics and multinational nature, its industry's characteristics, its exchange and index inclusion, and divested (or acquired) segment(s)' industry conditions, are considered as the determinants of the diversifying and the refocusing decisions. The estimation results from the corresponding multinomial logit model suggest that refocusing occurs generally due to firm-specific reasons, and diversification due to outside factors, such as industry and economic conditions. Added or dropped segment's industry profitability, its relationship to the core business of the firm, and its relatedness to the businesses of the conglomerate's other segments have a nontrivial effect on either decision. In a related analysis, the paper explicitly models and estimates the valuation consequences that are sustained by the firm after it undertakes a refocusing or a diversification action. To isolate the changes in firm's value that are due to these decisions only, a 2SLS estimation is used to control for endogeneity that arises because the factors that affect a firm's value are likely to have also induced the firm to make the corresponding decision. The novelty of my approach is in its inclusion of variables measuring the consequences due to both actions, the diversification and the refocusing, in the same valuation equation. Contrary to some earlier findings, I find no evidence of 'diversification discount' or 'refocusing premium.' The choice of this paper to analyze all corporate restructuring decisions in a unified framework yields valuable business insights into the reasons for undertaking such corporate events.

Key words*: diversification discount; refocusing; excess value; simultaneity bias.*

JEL classification*: G*10*, G*30*, G*34*, G*39

1. Introduction

Diversification and refocusing (i.e., divesting) are among the major activities in which firms engage during their life cycle. They are both parts of the dynamic process through which firms seek to increase market value. However, many valuation estimations in the 'diversification discount' literature treat these closely related activities as separate, which has lead to inherently puzzling conclusions. For example, there are many studies suggesting that diversification destroys value (Lang and Stulz, 1994; Berger and Ofek, 1995; Servaes, 1996) or that refocusing creates value (Comment and Jarrell, 1995; John and Ofek, 1995; Daley *et al.*, 1997; Berger and Ofek, 1999). These findings imply that firms should always favor refocusing over diversification. Yet, every year there are many firms who decide to diversify.

This paradox has attracted many researchers. Hyland and Diltz (2002) are interested in characteristics causing diversification in general. Others try to justify the relatively lower market valuation of diversified firms by showing that they have inefficient internal capital markets (Shin and Stulz, 1998; Rajan *et al.*, 2000; Scharfstein and Stein, 2000) and/or higher agency costs (Amihud and Lev, 1981; Jensen, 1986; Jensen and Murphy, 1990). Maksimovic and Phillips (2002) explain the diversification discount with the equilibrium distribution of comparative advantage across firms in an industry. Doukas *et al.* (2002), on the other hand, distinguish between diversification into related and unrelated industries, finding that the former adds value, while the later destroys it.

A significant part of the literature, however, concentrates on issues that cast doubt on the various explanations, or on the very existence, of the diversification discount. The first group of these studies finds that there are sample selection and measurement error problems associated with the papers explaining the diversification discount. Whited (2001), for example,

demonstrates that there is a serious measurement error in Tobin's *q*, and that the investment-*q* regressions lead to the erroneous conclusion that inefficient internal capital markets are to blame. Mansi and Reeb (2002) find no value loss due to diversification; there is only a value transfer from shareholders to bondholders. Alternatively, the diversification discount may not be a result of diversification, but instead it exists because the merging occurred between 'discounted' firms (Chevalier, 2000; Graham *et al.*, 2002). This discount may have induced the firms to diversify in the first place, and thus the direction of causality is unclear (Matsusaka, 2001). Similarly, the evidence in Hubbard and Palia (1999) shows that most conglomerate mergers in the 1960s involved financially distressed firms. Lastly, Billett and Mauer (2003) find that firm's value depends on specific components of its internal capital market, not on the overall value of that market.

Other empirical works have emphasized the endogenous relationship between a firm's decision to diversify and the factors affecting its market valuation. Campa and Kedia (2002) control for this endogeneity of the diversification decision by simultaneously estimating a probit model, with firm and industry characteristics as determinants of its diversification status, and a valuation equation, which includes the predicted values from a probit estimation as a regressor. Villalonga (2004), on the other hand, resolves this issue by matching each diversified firm with a single segment counterpart, that has the same size, industry, and propensity score. Again, the propensity score is obtained from a simple probit estimation.

Motivated by the desire to explain the diversification discount, most of these studies concentrate on the valuation differences between diversified and non-diversified firms. However, diversification is only one of the many strategies a firm can pursue to increase its market valuation. It is a strategic action selected among several alternatives. This paper points out that

all the relevant choices available to a firm, namely diversification, refocusing, and taking no action, should be considered when estimating their valuation consequences.

A theoretical work by Fluck and Lynch (1999) supports this argument by demonstrating how diversifying and divesting actions can both be reconciled with a firm's value-maximizing objective. In their model diversification and refocusing are both endogenous, and thus neither action in itself is a 'one-way street' to value maximisation. Matsusaka and Nanda (2002) also show how both diversification and refocusing actions can be useful to a firm in the context of internal capital markets. Again, their model's implication is that both actions can be value enhancing depending on the firm's conditions. Morck and Yeung (2001) make the same point in an empirical setting. Finally, Matsusaka (2001) claims that diversification is part of a firm's 'search process' for better matching subsidiary, and thus diversification can be valuable even if specialization is generally more desired.

Studies such as Kaplan and Weisbach (1992) and Mitchell and Lehn (1990) further document that many recently acquired businesses are subsequently divested, not necessarily always because of a wrong acquisition decision from an ex post perspective. Thus, both of these actions were thought to create value at the time when they were undertaken. This value creation was likely dependent on the firm's characteristics and needs at the time of each action.

This study builds on these arguments, and contributes towards resolving the aforementioned puzzle by empirically demonstrating that when the diversification and refocusing decisions are analyzed together, there is no value creation or destruction originating from the type of the action itself. Rather, the causes of a specific decision can also lead to a lower valuation of the firm (i.e., the firm's diversification or refocusing decision and its value are endogenous). Villalonga (2004) and Campa and Kedia (2002) show this endogeneity problem for the diversification decision, and

Çolak and Whited (2007) demonstrate the endogeneity of the refocusing decision.[1] The current study demonstrates the effect of the endogeneity of both of these decisions when they are in the same valuation equation.

A more interesting and more practical contribution of this paper, however, is in its investigation of the types of factors affecting the diversification decision versus the types of factors affecting the refocusing decision. That is, the question of 'Why do firms refocus?' is answered together with the related question of 'Why do firms diversify?' using a multinomial logit estimation. I find that diversification is carried out primarily due to reasons related to industry and general economic conditions. Refocusing, on the other hand, is undertaken for firm-specific reasons. A firm is less likely to do either when it has high profit margins. Furthermore, the acquired or divested segment's industry conditions have a significant influence on such restructuring decisions. Firms tend to diversify into more profitable industries, and divest away from less profitable ones. Also, conglomerates are reluctant to add or shed a segment in their core business area, but they are more likely to acquire or divest a segment if it is related to their other less important segments.

By comparatively analyzing the diversification and the refocusing actions in a single framework, this paper yields significant business implications. The results can enhance investors' and business leaders' understanding of the diversification and restructuring processes by pointing to the main causes (internal versus external) of each action, and by revealing that any value creation or destruction is due to these factors, and not the diversification or refocusing action itself.

[1] More specifically, Çolak and Whited (2007) show how the endogeneity of divestiture and spin-off decisions can result in misleading conclusions about the effect these actions have on a firm's investment efficiency and value.

The rest of the paper is organized as follows. Section 2 explains the methodological background utilized in this study. Section 3 describes the data and the sample selection criteria. The results are presented in Section 4 and Section 5 concludes. The variables are described in the Appendix.

2. Estimation Methodology

One of the contributions of this study is in applying better methodologies than prior studies to estimate the causes and the consequences of diversification and refocusing actions. This section first presents the advantages of applying the right methodology in the context of diversification discount literature. Then, it explains in detail the techniques used to 1) measure the diversification and refocusing effects, 2) estimate the factors affecting a firm's restructuring decisions, and 3) determine the valuation effects of these decisions.

2.1. *Relationship to methodologies used by other studies*

The main advantage of the methodologies used in this study begins with the observation that all of the restructuring actions taken by a firm and their valuation consequences are related to each other, and thus should be analyzed in a unified framework. This allows for utilization of all the firmyears – diversifying, refocusing, and no-action – in the sample. Some prior studies use two different samples – a sample comprising only diversifying and single segment firms, and a separate sample of refocusing firms with single-segment firms – to determine the factors affecting a firm's decision to diversify (Hyland and Diltz, 2002), or to estimate the changes in excess value due to this decision only (Berger and Ofek 1995; Campa and Kedia, 2002).

There are a couple of problems with these approaches, however. First, earlier studies drop the observations of refocusing firms from their sample when estimating the diversification discount. Thus, in effect they are choosing a sample of firms on the basis of an endogenous variable (in this case, the refocusing action). This biases their sample towards diversifying firms, and induces a bias in the parameter estimates due to incidental truncation of the true distribution. Truncation occurs when the sample used to estimate characteristics of a population is drawn from a subset of this population. The sample used in this study does not suffer from such biases since, it includes all firms: diversifying, refocusing, and no-action; single segment and multi-segment.

Second, papers by Berger and Ofek (1995) and Campa and Kedia (2002) find that diversification is significant in determining firm's value. However, neither study includes a variable to account for the effect of the refocusing decision, which means that they implicitly assume it does not have any impact on the firm's valuation. It is difficult to believe that diversification will significantly affect a conglomerate's value while reversing it, i.e., refocusing, will not. Either both of these actions can single-handedly change a firm's value, or both of them have indirect valuation consequences that depend on each firm's conditions. If indeed both diversification and refocusing affect the firm's market value, then not including dummy variables to account for both of these decisions would lead to a significant missing variable problem. The present study measures the effects that both of these decisions have on firm value, therefore providing a more complete description of the impact of that restructuring activities have on firm valuation.[2] It is more informative to estimate a regression equation with multiple explanatory variables rather than excluding some of the most relevant variables from it.

[2]In this study, the value effects of refocusing and diversification are estimated by obtaining the propensities to be refocused and to be diversified from two separate simple logit models, and then including them as regressors in the

2.2. *Diversification and refocusing decisions and their valuation consequences*

At any point in time, a firm faces three choices that will alter its level of diversification: to add segments, to shed segments, or to continue as is. Accordingly, at any point in time, one can observe firms making each choice. There must be certain identifiable factors that induce the firm to choose that particular action over the other two. Moreover, each decision has its own consequences.

To properly estimate the causes of a given restructuring action and the valuation changes due only to this action, one needs to differentiate between the decision of the firm, which is being made at a specific time, and the consequences of that decision, which will last for many years. An easy way of achieving this is through creation of some dummy and choice variables. *Table 1* shows several such variables and describes how each one behaves when the number of segments changes from year to year.

The variables *Dchange* and *Rchange* are dummy variables indicating whether the firm increased, decreased, or made no changes in its number of segments in a given year. *Dchange* (*Rchange*) is 1 for years in which the number of segments increased (decreased). For years when there was no change, both variables are zero. Although these two dummy variables are capable of fully describing a firm's decision in a given year, they are not useful in multinomial logit

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same valuation equation. A 2SLS estimation procedure with three equations – valuation, diversified, and refocused – is used to control for the endogeneity of the diversified and the refocused status of the firm. This approach builds on the methodology of Campa and Kedia (2002), but is more general, because it explicitly accounts for the effect that refocusing has on firm value. See Section 2.4 for more details.

model estimation.[3] Instead, a new choice variable is developed for this study, *Y*, which takes the value 1 if the firm increased its number of segments, 2 if it decreased its number of segments, and 3 if it did not change its number of segments.

On the other hand, variables *Dstatus* and *Rstatus* characterize the current status of the firm – diversified or refocused. Thus, in our regressions they will capture the valuation implications of the decisions to diversify and to refocus. The consequences of the diversification decision will last as long as the firm stays diversified, even if the firm changes its number of segments (for example, from three to four, or from three to two). If the firm has multiple segments, then the effects of diversification are present.

Similarly, a refocusing firm will be affected by its decision as long as it has fewer segments relative to the past. A multi-segment firm does not need to become a single-segment firm to be considered in the refocused status. If it has fewer segments than the maximum number of segments it ever had, then it is 'benefiting' from its more focused status. Although it did not decrease its segment number all the way to one, it still 'learned' that it is not efficient to operate

[3] They are included in the table for expositional purposes and to help distinguish between 'change' variables, like *Dchange* and *Rchange*, and 'status' variables, like *Dstatus* and *Rstatus*. It is possible to create 'level' variables that will show the level or the magnitude of the firm's diversification or refocusing action, that is, by how much the number of segments increased or decreased in a given year. Using such level variables, one can estimate the marginal impact that each diversification (or refocusing) decision has on firm value (when the number of segments are increasing from one to two, from two to three, and so on). Such an analysis is beyond the scope of the current paper.

with as many segments as before. Therefore, the variable *Rstatus* describes this 'past experience' of the firm, and will be used to capture the effect that the refocusing decision has on firm value.[4]

2.3. *Multinomial logit model*

To find the factors influencing the decisions to diversify, to refocus, or to do nothing, I use a multinomial logit model. It is one of the most convenient estimation techniques for this kind of analysis. It allows an individual firm to face multiple decision choices, and each set of firms to have different individual-specific characteristics. Namely, the firm *i* faces *J* choices (in this case *J=3*). P_j is firm *i*'s probability of picking choice *j*, and z_i represents individual-specific characteristics. The multinomial logit model boils down to estimating *J–1* equations or logits (see McFadden, 1973). The *j* logit can be computed as

$$\ln \frac{P_j}{P_J} = \boldsymbol{\beta}_j' \boldsymbol{z}_i \qquad \text{for } j = 1,2,\ldots, J\text{-}1. \tag{1}$$

Unlike the OLS estimation, here the estimated coefficients' vector, $\boldsymbol{\beta}_j$, does not represent the marginal effects of the regressors. Instead, one has to find the marginal effects of the independent variables on the probabilities through

$$\frac{\partial P_j}{\partial \mathbf{z}_i} = P_j[\boldsymbol{\beta}_j - \sum_{k=1}^{J} P_k \boldsymbol{\beta}_k] \tag{2}$$

Note that the above equation does not guarantee that the signs of estimated coefficients and marginal effects will be the same; however, in most cases, they are.

[4] A simple test rejects at the 5% level the hypothesis that the mean excess values of firms that have such 'past experience' and firms that do not are equal.

To test for significance of the coefficients I rely on the standard errors of the estimated coefficients since, calculation of standard errors for marginal effects is quite cumbersome and thus, very few studies use them. In addition, the *t*-statistics of the coefficients are very similar to the *t*-statistics of the marginal effects, and almost all of the information about the significance of a marginal effect can be conveyed by the former.

2.4. *Two stage least squares (2SLS) estimation model*

To accurately estimate the valuation effects of diversification or refocusing, there is a need for a procedure that allows for simultaneous estimation of the parameters of three linear equations. A set of firm characteristics determine a firm's diversification profile: a diversifying firm or a refocusing firm. Some of these characteristics, along with diversified and refocused status of the firm, also affect its excess value. Therefore, this is a case where certain variables simultaneously determine three endogenous variables (valuation measure, diversified status dummy, and refocused status dummy). A common procedure for estimating simultaneous equations is 2SLS.

The first equation, and the one of primary interest to this study, is the valuation equation:

(*Valuation Equation*) $$V_{it} = \boldsymbol{X_{it}}\boldsymbol{\beta} + \alpha_D Dstatus_{it} + \alpha_R Rstatus_{it} + \varepsilon_{it} \quad (3)$$

where V_{it} measures firm value, $\boldsymbol{X_{it}}$ has the firm characteristics as its columns, $\boldsymbol{\beta}$, α_D, and α_R are parameters to be estimated, ε_{it} is the equation error, and $Dstatus_{it}$ and $Rstatus_{it}$ have been described above.

The second equation specifies the firm's propensity to be in a diversified status in terms of its characteristics. It is a simple logit model.

(Diversified) $$Dstatus_{it}^{*} = \boldsymbol{W_{it}}\boldsymbol{\gamma} + u_{it} \quad (4)$$

$$Dstatus_{it} = 1 \quad if \quad Dstatus_{it}^{*} > 0; \qquad Dstatus_{it} = 0 \quad if \quad Dstatus_{it}^{*} < 0$$

where $Dstatus_{it}^{*}$ is a latent variable, $\boldsymbol{W_{it}}$ is a matrix with columns containing the variables affecting a firm's decision to be in a diversified status, $\boldsymbol{\gamma}$ are parameters to be estimated, and u_{it} is the error term.

Similarly, the firm's decision to stay more focused relative to its past is determined by

$$\textit{(Refocused)} \qquad Rstatus_{it}^{*} = \boldsymbol{S_{it}}\boldsymbol{\eta} + v_{it} \qquad (5)$$

$$Rstatus_{it} = 1 \quad if \quad Rstatus_{it}^{*} > 0; \qquad Rstatus_{it} = 0 \quad if \quad Rstatus_{it}^{*} < 0$$

where $Rstatus_{it}^{*}$ is a latent variable, $\boldsymbol{S_{it}}$ is the matrix of variables affecting a firm's decision to be in a refocused status,[5] $\boldsymbol{\eta}$ is the parameters vector, and v_{it} is the residual error.

If the firm's decision to be diversified or to be refocused affects its value, then the valuation equation cannot be estimated using OLS, because the error term ε_{it} will be correlated with $Dstatus_{it}$ and $Rstatus_{it}$. To see this more clearly, notice that $Dstatus_{it}^{*}$ and $Rstatus_{it}^{*}$ are latent variables that are determined by $Dstatus_{it}$ and $Rstatus_{it}$ respectively, but with an error. This measurement error causes u_{it} and v_{it} to be correlated with ε_{it}, which means that $Dstatus_{it}$ and $Rstatus_{it}$ are also correlated with ε_{it}.[6] This correlation violates one of the assumptions of OLS and will lead to biased coefficient estimates. Thus, V_{it}, $Dstatus_{it}$, and $Rstatus_{it}$ should be treated as endogenous variables in the above system of three equations, and the parameters β, α_D, α_R, γ, and $\boldsymbol{\eta}$ should be estimated using 2SLS estimation.

The natural instrument for $Dstatus_{it}$ and $Rstatus_{it}$ would be any exogenous variable, such as a variable related to the firm's industry or the general economy, or any lagged values of firm characteristics. Since excess value measures a firm's value relative to the valuation of the median single segment firm in the industry, it is not affected by events that have the same impact on all

[5] In this estimation, $\boldsymbol{S_{it}}$ is taken to be identical to $\boldsymbol{W_{it}}$.

[6] See *Appendix II* for a detailed proof.

firms in the economy or in an industry. Industry characteristics and general economic conditions do, however, influence the firm's decision to diversify or to refocus, as shown in Section 4 of this study (see also Lang and Stulz, 1994). The exact instruments set used in my 2SLS estimation is described in the next section.

3. Data and Variables

3.1. *The sample*

Using COMPUSTAT industry segment and research files I select a sample of diversifying and refocusing firms between the years 1989 and 1998[7]. A firm that increased (decreased) its diversification level by adding (dropping) segment(s) is classified as *diversifying (refocusing)* firm. The firm years when there was no change in the number of segments are also included in the sample. To obtain information about the firm's characteristics at the time of the decision the COMPUSTAT Company and CRSP files are used. The time of the decision is assumed to be the year when the change in the number of segments appears in the segment files.

Following Lang and Stulz (1994), Berger and Ofek (1995), and Comment and Jarrell (1995), the following sample selection criteria is applied: 1) the firm should have data in both the company and segment COMPUSTAT files; 2) for any given year, the firm should not have a

[7] In 1998, there was a major change in the regulations associated with segment reporting, so we decided to take our sample only till that year. Starting with fiscal year ending December 15, 1977, SEC regulation S-K and FASB-SFAS No. 14 required firms to report segment information for segments that represent 10% or more of consolidated sales. In 1998 a new regulation, SFAS 131, was enacted. It gives more leeway to managers for reporting purposes. A 'segment' is not strictly defined under GAAP, while a 'reportable segment,' as defined in SFAS 131, is a component of an enterprise that has at least 10% of (i) revenues, (ii) operating profit or loss, or (iii) combined identifiable assets of the enterprise as a whole along with some measure of profitability and identifiable assets.

segment in financial sector (SIC 6000-6999), utilities (SIC 4900-4999), government (SIC 9100-9199), and 'non-classified establishments' (SIC 9900-9999); 3) firm years with sales less than $20 million are dropped; 4) firm years with missing value of total assets or sales are excluded from the sample. Some additional criteria will be imposed after the description of the excess value variable.

3.2. *Excess value*

The excess value measure suggested by Berger and Ofek (1995) is calculated by taking the logarithm of the ratio of firm's total capital[8] to its imputed value. The imputed value of the firm is the sum of its segments' values. To put a separate value on each segment, the median industry sales (or asset) multiplier of single segment firms is used. *ExVal* (*ExValS*) will denote the excess value calculated using asset (sales) multiplier.

As suggested by Berger and Ofek (1995), I drop all the firmyears for which the sum of the segment asset figures deviates from the firm's assets by more than 25%. If this deviation is less than that, I gross up or down the imputed value of a firm calculated with asset multiplier to adjust for the difference. I exclude from the sample all the observations for which the sum of the segment sales is not within 1% of total sales for the firm. Finally, I drop the extreme observations for which the excess values calculated with either sales or asset multiplier are above 1.386 or below -1.386.

[8] Firm's total capital is calculated as *Total Capital = Market Value of Common Equity + Long-term Debt + Short-term Debt + Preferred Stock.*

3.3. *Sample statistics*

The above selection criteria leave a total of 6,233 different firms and 29,902 firm years. *Table 2* contains detailed information about the distribution of firms across the different diversification profiles. There are 1,219 (651) firms that diversify (refocus), making up 1,336 (800) firm years. In the same table, the characteristics of firms with different diversification profiles are also examined. The table reports the two excess value measures, average firm size, age, profitability, leverage, growth, investment, number of segments, and R&D for firms in each diversification profile. A comparison of the means and medians of these characteristics suggests that refocusing firms are larger, older, slow growing, and less innovative (measured by R&D intensity) relative to other firms. On the other hand, firms that are satisfied with their current condition (firms that do not change their number of segments) are smaller, younger, and research intensive. The diversifying firms have mean characteristics that are, generally in between the means of the two groups' characteristics. Moreover, firms that chose to maintain a single segment throughout the period are smaller, younger, research intensive, and less leveraged relative to the ones that engaged in diversification and/or refocusing activities. The mean and median of excess value measures for no-change firms are closer to zero relative to those for diversifying and refocusing firms.

The differences in the above variables suggest that a firm's diversification and refocusing decisions might be driven by its characteristics. However, these characteristics are also likely to affect its value, which implies that the firm value and the decisions are determined simultaneously by the firm features.

3.4. *Variables*

As mentioned earlier, we estimate two separate regressions to analyze the diversification and the refocusing actions of the firms in our sample: multinomial logit and 2SLS regressions.

In the multinomial logit estimation we use several types of regressors: firm-specific characteristics, the conglomerate's industry characteristics, exchange-related characteristics, variables describing the general economic conditions, variables indicating the geographic diversification of the conglomerate, and variables related to the divested or acquired segment(s). Firm characteristics are aimed at capturing the factors from within the conglomerate that might have triggered the diversification or refocusing decision. They include the firm's *Size*, *Profitability*, *Investment*, *Age*, *Leverage*, and *Growth* for each firmyear. Industry characteristics depict the conditions of the conglomerate's industry at the time of the decision: how competitive the industry is (*IndHerf*), how fast it grows (*IndGr*), how research intensive it is (*IndRND*), how profitable the firms in the industry are (*IndProf*), and how pervasive the conglomeration is in the industry (*NMUL*). *MAJOREX* and *SNP* are the exchange-related characteristics indicating whether the firm is listed on a major exchange and/or is part of the S&P500 index, respectively. General economic conditions are measured by current (*GDP*) and lagged (*GDP1*) growth rate of real U.S. Gross Domestic Product. The multinational nature of the firm[9] is captured by two dummy variables that indicate the prior (one year before the event) global diversification status

[9] We control for global diversification, because Denis *et. al.,* (2002) show that industrial diversification is closely related to global diversification, and because global diversification has been shown to have its own valuation consequences (see Christophe, 1997; Denis *et. al.*, 2002; Click and Harrison, 2000; Bodnar *et. al.*, 2003; Mathur *et. al.*, 2004; and Doukas and Kan, 2006). Consequently, in our analysis we control for geographic diversification to obtain a clearer picture of the effects on firm's excess value attributable only to business diversification.

of the firm (once lagged *GStatus*),[10] and whether the acquired or divested business segment also causes changes in the firm's geographical diversification (*GEO*). The last set of variables that might affect the firm's decision describe whether the added or dropped segment is in the same industry as the firm's core business (*Core*), whether it is in the same industry as the other segments of the conglomerate (*Related*),[11] and whether the acquired or divested business segment belongs to an industry that is more (or less) profitable than the average profitability of the other industries the firm operates in (*RSIP*). The detailed definitions of these variables appear in Appendix I.

In the 2SLS estimation, the variables that determine the excess value are the firm's characteristics (*Size*, *Profitability*, *Investment*, *RND*,[12] *Age*, *Leverage*, and *Growth*), global diversification conditions of the firm (*GEO* and *LagGStatus*), its exchange listing and index coverage (*MAJOREX* and *SNP*), and whether or not the business of the segment involved in the restructuring event is in a familiar industry (*Related* and *Core*) and/or in a more profitable industry (*RSIP*). Once- and twice-lagged values of *Size*, *Profitability*, and *Investment* are also used as regressors because the past performance of a firm is also found to be relevant factor in excess value estimations (Campa and Kedia, 2002).

[10] The use of contemporaneous values of geographic diversification status indicator, *GStatus*, in the valuation equation would cause endogeneity problems between *GStatus* and *ExVal* similar to the ones we observe in this study between *DStatus*, *RStatus*, and *ExVal* (see Doukas and Kan, 2006).

[11] About 14.5% (33.1%) of the diversification events in COMPUSTAT involved adding new segments related to the existing segments using 3-digit (2-digit) SICs. Similarly, 11.1% (or 32.3%) of the refocusing events involved divesting segments that are related to the remaining segments of the firm.

[12] I drop all the observations that have missing *RND*. However, the qualitative results do not change when I assume *RND* is zero for the missing observations.

The rest of the variables mentioned earlier are exogenous to the firm, and affect all firms in a similar fashion. Since excess value is calculated relative to the industry median values, they should be unrelated to it. However, they can serve as instruments in the 2SLS estimation. Thus, the instruments used include: the intercept, *IndHerf*, *IndGr*, *IndProf*, *NMUL*, *GDP*, *GDP1*, *MAJOREX*, *SNP*, *Leverage*, *Profitability*, *LagGStatus* (lagged), *GEO*, *Core*, *Related*, and *RSIP*; and once- and twice-lagged values of *Size*, *Profitability*, *Investment*, and *Leverage*.

4. Results

4.1. *Multinomial logit estimation*

The sample consists of diversifying, refocusing, and no-decision firmyears. The estimation method is a multinomial logit model with three choices available to the firm. The variable *Y*, which is described earlier, represents the choice (decision) variable. The regressors are as described in Section 3.4.[13] The model is equivalent to estimating the two logits described in *Eqn. (1)* – one for diversifying and one for refocusing firms. *Table 3* reports the estimates of the coefficients, their *t*-statistics, and the corresponding marginal effects.[14] The propensities to

[13] In this estimation setting, instead of using separate sets of variables for each restructuring decision, a single set of factors was used to determine the diversification and the refocusing decisions. This allows for a comparative analysis of the same group of variables to see which ones are better in explaining which restructuring action. However, this can also create some limitations. It is possible to choose a different set of explanatory variables for different decisions. However, I assumed that we have no prior knowledge or theoretical prediction that would suggest such a separation of explanatory variables.

[14] The estimated test statistics for the *Independence of Irrelevant Alternatives* (*IIR*) test (as suggested by Hausman and McFadden, 1984) is 2.29 (7.94) in the case when the refocusing (diversification) decision is omitted from the choice set. The corresponding critical value for χ^2 distribution with 22 degrees of freedom is 40.29. Thus, the multinomial logit model is an appropriate estimation technique in this context.

diversify, to refocus, and to make no changes are also calculated. As expected, the propensity to make no segment changes is very high relative to the other two propensities, because firms do not make changes in their segment structure very often. The propensity to diversify (0.0661) is larger than the propensity to refocus (0.0431); i.e., firms diversify more often than they refocus.

What factors influence a firm's propensity to diversify?

1) Significant firm attributes causing a firm to diversify are its size and its profitability. The sign on the marginal effect of size variable suggests that larger firms are more likely to diversify. Current profitability of a firm reduces its willingness to diversify its business activities.
2) Among the industry-related variables, an industry's profitability and growth, and the fractions of multi-segment firms in the industry are significant at the 1% level. Firms operating in profitable and fast growing industries will be less likely to seek profits elsewhere, indicated by the negative marginal effect of *IndProf*. Not surprisingly, the number of diversified firms in an industry increases the propensity of a firm in that industry to diversify.
3) Growth in the economy encourages diversification activities, indicated by the positive sign of *GDP* and *GDP1*.[15] The *SNP* variable appears to have a negative effect on the propensity to diversify.
4) An interesting result is related to the acquired segment(s): if the segment is not in the main industry of the firm, but is in a familiar and highly profitable one, it is more likely to be acquired, as implied by the significantly negative sign of *Core* and significantly positive signs of *Related* and *RSIP*. This is consistent with the theoretical implications of Maksimovic and Phillips (2002). Furthermore, if the segment provides geographic diversification along

[15] Maksimovic and Phillips (2001) reach similar conclusions.

with the business diversification, it is more likely to be acquired (the *GEO*'s coefficient is significantly positive).

The factors affecting the refocusing propensity are different from those causing the diversification:

1) Almost all of the firm characteristics considered in this study have a highly significant influence on the decision to refocus. While size and age have a positive effect, high profitability, investment, R&D spending, and growth rates reduce the likelihood that a focus increasing restructuring.[16]
2) Among the firm's industry characteristics, only the industry's R&D intensity and the prevalence of conglomeration in the industry are highly significant – both are likely to encourage refocusing.
3) As in the diversification decision, the sign of *Core* is negative, suggesting that if a segment is in the main industry of the firm, it is less likely that it will be divested (Schlingemann *et. al.* (2002) reach similar conclusions). However, if a segment is in a related industry to the other segments of the firm, it is more likely that it will be sold (see the coefficient estimate of *Related*). Furthermore, unlike diversification choice, refocusing choice is less likely to be made if the segment operates in a profitable industry (coefficient estimate of *RSIP* is negative). This suggests that the nature of the acquired or divested segment is a very important factor in understanding the diversification and refocusing decisions of firms. Conglomerates do not randomly diversify or refocus, but rather move in and out of industries in search of more profits (see also Matsusaka, 2001). This suggests that neither the

[16] These results support Schlingemann *et al.*'s (2002) finding that focusing firms are less profitable, slow growing, and investing less than firms with same number of segments that do not focus.

diversification nor the refocusing decision is the default optimal choice. It all depends on the conditions that each firm is in.

In summary, the above results suggest that, in general, refocusing is done primarily due to firm-specific reasons and diversification primarily due to industry or general economic conditions. Also, firms tend to add (drop) segments from more (less) profitable industries. Familiarity with an industry makes it easier on the firm to make the diversification or the refocusing decision, provided that the new or discontinued segment(s) do not operate in its main industry.

4.2. *Estimating the valuation effects of diversification and refocusing decisions*

Next, I estimate the changes in the two excess value measures due to the diversified or more focused status of the firm, as captured by the coefficients of the two dummy variables *Dstatus* and *Rstatus*. The regressors and the instruments in the 2SLS estimation are as described in Section 3.4.

To show that the 'diversification discount' is not an artifact of a particular OLS estimation setup, but rather due to simultaneity bias, I first estimate the parameters using ordinary least squares regression.[17] Then, using a system of three simultaneous equations described earlier, the simultaneity bias is eliminated by applying the 2SLS method.

I run two OLS regressions using my sample of diversifying, refocusing, and no-change firms during the period between 1989 and 1998. First, the variable *Rstatus* is excluded from the valuation equation, then the variable *Dstatus*. The column under OLS(1) in Table 4 shows that

[17] In unreported results, the findings of Berger and Ofek (1995), with the same regression set up as theirs, but using this study's sample, are confirmed. Results are available upon request.

the 'diversification discount' is still present, even when all firms are included in the sample. Its value of 7% (or 13% for the sales multiplier) is close to the previously documented estimations of Berger and Ofek (1995), Campa and Kedia (2002), and Villalonga (2004). The least squares estimate of the coefficient of *Rstatus* in column OLS(2) indicates no significant gain or loss due to refocusing.

Next, I simultaneously estimate *Eqns. (3), (4),* and *(5)* with the endogenous variables being the corresponding excess value measure, *Dstatus*, and *Rstatus*. The results are shown in Table 4 (second-stage) and Table 5 (first-stage). A total of 24 instruments are used in the 2SLS estimation. Most of them are independent of excess value and thus, are not included in *Eqn. (3),* but they do affect the propensities of being diversified or refocused. Because of the reasons described earlier, variables such as *IndHerf*, *IndGr*, *IndProf*, *NMUL*, *MAJOREX*, *GDP*, and *GDP1,* do not have any effect on the excess value measure. The variables that will instrument themselves are *Intercept, Leverage, SNP, Profitability, LagGStatus, GEO, Core, Related, RSIP,* and lagged values of *Size, Profitability,* and *Investment*. To ensure a sufficient number of instruments for the *J*-Test, the lagged values of *Leverage* variable are also instrumented. Thus, a total of M=24 instruments and K=23 coefficients are used to estimate the valuation equation.[18]

[18] When choosing this instrument set, I aimed to include as many exogenous-to-the-firm variables as possible, since they are independent from the endogenously chosen decisions of the firm and thus more appropriate for instrumenting. However, as the Nagelkerke R^2s in Table 5 show these instruments are not as good at predicting refocusing as they are in predicting diversification – from our multinomial logit results we know that refocusing has more to do with firm-specific factors than with external factors. Thus, as a robustness check, I chose a different set of instruments – I replaced four industry related instruments (*IndHerf, IndGr, IndProf,* and *NMUL*) with four firm-specific ones (*Size, Investment, Age,* and *Growth*). The qualitative conclusions from the 2SLS estimation are

The estimated 2SLS coefficients of *Dstatus* and *Rstatus* are not significant for both measures of excess value. The previously observed significant negative coefficient of *Dstatus* is due to simultaneity bias. Therefore, my results do not support the existence of a 'diversification discount' or a 'diversification premium.' Refocusing, in itself, does not have a substantial long-term impact on the firm's excess value.

Except for the significant change in the coefficient of *Dstatus*, all other independent variables preserve their sign and significance. If their coefficient estimates are compared across the different estimation methodologies, the size of the firm, as well as its profitability and investment, have significant positive effects on excess value. Among the lagged values of these variables, the most notable result is the significance of the positive effects that the past profitability has on the firm's valuation. The estimates of growth and *RND* coefficients are positive and significant – the market rewards companies that have higher growth rate and higher R&D expenditure. The effect of leverage varies according to which measure of excess value measures is used.[19] Being included in an S&P index leads to a roughly 20% valuation premium. The valuation of the firm decreases with its age and prior geographic diversification status. While they significantly affect the firm's diversification or refocusing decision, two of the segment related variables, *Related* and *RSIP*, appear not to have any direct valuation consequences. *Core*, however, is significantly negative – firms lose value if they restructure their core businesses.

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unaffected, and the Nagelkerke R^2 of the refocusing equation increased to 0.06, but the instrument appropriateness tests (*J*-test, partial R^2 of Godfrey (1998), and the test suggested by Poskitt and Skeels (2002)) have deteriorated.

[19] One possible source of this inconsistency is the way in which the leverage variable is calculated – it is being scaled by *Total Asset* instead of *Sales*. This measure is the one commonly used in the literature.

4.3. *Tests*

To formally test for the existence of simultaneity bias, I use the Hausman test. Its test statistics, with 23 coefficients to estimate, is 85.93 (or 96.86 for the sales multiplier). Since the critical value at 1% level for χ^2 (23) is ±41.64, I conclude that simultaneity bias does exist when OLS estimation is used.

Next, I assess whether there is evidence of misspecification in the 2SLS model by using two different measures: the *J*-Test statistics and a measure of the relevance of the instruments in a linear multiple regression model as suggested by Shea (1997).[20] The *J*-Test is borrowed from Generalized Method of Moments (GMM) estimation. Since there are enough instruments (i.e., overidentification), the 2SLS estimator can be thought as a special case of the GMM estimator, with orthogonality conditions being $E[\boldsymbol{Z}\varepsilon] = 0$. $\boldsymbol{Z}_{\mathbf{nxM}}$ is the matrix containing the instruments used and ε is the vector of residuals from *Eqn.(3)*. The test statistic for the overidentifying restrictions is

$$J = \frac{(\boldsymbol{\varepsilon}'\boldsymbol{Z})(\boldsymbol{Z}'\boldsymbol{Z})^{-1}(\boldsymbol{Z}'\boldsymbol{\varepsilon})}{\hat{\sigma}^2} \sim \chi^2(M-K) \qquad (6)$$

where σ^2 is the estimated variance of $\boldsymbol{\varepsilon}$. The critical value for χ^2 (1) at the 5% level is 3.84, and *J* is 2.15 (or 2.89 for the sales multiplier). Therefore, I cannot find any evidence of misspecification in my 2SLS model when the *J*-Test is used.

The second measure, *partial* R^2, is denoted as R_p^2, and is interpreted in a similar way as R^2 and is calculated separately for each endogenous explanatory variable. The formula for R_p^2 suggested by Godfrey (1998) is

[20] I use the version of this measure suggested by Godfrey (1998), because it is easier to calculate. It requires only conventional output-statistics, such as coefficient standard errors and R^2 index, from OLS and 2SLS estimations.

$$R_P^2 = \left(\frac{v^{OLS}}{v^{2SLS}} \right) \left[\frac{\left(1 - R_{2SLS}^2\right)}{\left(1 - R_{OLS}^2\right)} \right] \tag{7}$$

where v^{OLS} and v^{2SLS} denote the squared values of the standard errors of the estimated coefficients of the endogenous variables from OLS and 2SLS estimations, respectively. R^2_{OLS} and R^2_{2SLS} are R^2 indexes from the OLS and 2SLS estimation of *Eqn.(3)*, respectively. I calculate that for *Dstatus* R_p^2 is 0.032 (or 0.031 for the sales multiplier), and for *Rstatus* it is 0.008 with both asset and sales multipliers.[21]

Poskitt and Skeels (2002) suggest an alternative measure of instrument variable relevance (A_p^2).[22] It has two advantages over partial R^2: first, it is the more appropriate, and thus more accurate, measure when there are two endogenous variables on the right-hand side of *Eqn. (3)*; and second, it allows for a formal hypothesis testing of the instrumental variable relevance. I find that A_p^2 (given by *Eqn. (9)*) is 0.94, ρ is 24, and *Fstat* (given by *Eqn. (10)*) is 21.03. Since the 1% critical value of F distribution with 48 numerator degrees of freedom and 19,872 denominator degrees of freedom is equal to 1.54, the hypothesis is easily rejected. Thus, based on the above tests I find no indication of instrument irrelevance.

4.4. *Different diversification measures*

The firm's number of segments is the most commonly used measure of its diversification level, but it is heavily dependent on reporting by the managers. This reporting discretion may lead to

[21] To put it in perspective, the partial R^2 in the 2SLS estimation of Campa and Kedia (2002) is 0.018 for diversifying firms, suggesting that my instruments are more relevant than theirs.

[22] See Appendix III for a simple procedure to calculate this measure.

some inaccuracies in the classification of the firms as more diversified and less diversified.[23] Therefore, I use alternative, less reporting dependent, diversification measures, such as the number of different SIC codes (*NSIC*), asset-based Herfindahl index (*SegHerfA*), and sales-based Herfindahl index (*SegHerfS*).[24]

With the same sample, explanatory variables, and instruments as in Tables 4 and 5, I estimate the coefficients of *SegHerfS, SegHerfA,* and *NSIC* using both OLS and 2SLS estimations. For the sake of brevity I do not report the results, but the qualitative conclusions reached in Section 4.2 are robust to these alternative definitions of diversification level.[25]

5. Conclusion

This study extends the literature by 1) explicitly estimating the reasons behind a firm's decision to diversify and to refocus using a comparative and unifying model of multiple choices; 2) analyzing the effects of the added or dropped segment's industry profitability and the effects of

[23] Hyland and Diltz (2002) finds that as much as 28% of the changes in number of reported segments are not actually economically meaningful events, but rather accounting/reporting changes.

[24] *SegHerfA* (*SegHerfA*) is a continuous variable indicating the degree to which the sales (assets) are concentrated in just a few of the company's business segments (i.e. less diversified). *NSIC* is calculated by counting the number of different primary and secondary 4-digit SIC codes assigned to the segments of the firm. It shows that the firm has a substantial presence in all of the assigned SIC areas of business. The higher the number, the less focused the firm is.

[25] Kahle and Walkling (1996) show that for each conglomerate, consolidation of its business segments with similar 2-digit SIC into one big segment yields a better measure of its diversification level. In unreported analysis, I thus combine all the similar 2-digit SIC segments of a conglomerate into one big segment, with its sales (assets) as the sum of the sales (assets) of the combined segments. Then, I redefine *ExVal*, *Dstatus*, *Rstatus, Y,* and all the industry-related variables using these new segments, and I re-run the regressions in Tables 3 and 4. My qualitative conclusions remain unchanged. Results are available upon request.

global diversification on the restructuring decisions of the firm;[26] 3) modeling refocusing and diversification effects in the same valuation equation; and 4) including all firms – diversifying, refocusing, and no-change – in the sample to avoid possible sample selection bias.

There is no evidence of a 'diversification discount' or 'refocusing premium' in my sample. This conclusion is easier to reconcile with the behavior of a typical firm because it suggests that the diversification and the refocusing actions themselves, do not substantially change a firm's excess value, and the actual causes of any such change should be found elsewhere. For this reason, we can observe both of these activities in the marketplace.

It is possible that there are firms gaining or losing some of their valuation due to diversification or refocusing, but I find no evidence that this is a systematic phenomenon. Even though the ultimate goal of a firm is to increase its value, the actual reasons for its diversification level changing behavior can be explained by other factors, such as poor performance, lack of innovations, and industry and economic conditions. It could also be that some firms are making the right merger and acquisitions or the right sell-off and spin-off of segments, and are consequently adding value, but these gains are offset by other firms that are less successful in their transformation.

Appendix I: Variable construction

The variables used in this study are defined follows:

Current and past real GDP growth: The time series for GDP rate (*GDP*) and once-lagged GDP rate (*GDP1*) are directly obtained from Bureau of Economic Statistics' Website.

[26] Denis *et. al.* (2002) focus solely on the interaction between global and industrial diversification from the firm's valuation perspective. We extend this analysis by controlling for the effects of global diversification on the firm's

Global diversification change indicator: if the considered industrial diversification (refocusing) also increases (decreases) the firm's global diversification, *GEO* takes a value of +1 (-1), otherwise it is 0.

Firm's age*: Age* = the number of years the firm has been included in the CRSP files.

Firm's inclusion in the S&P index: *SNP* is a dummy variable that takes a value of 1 if the firm is included in S&P Industrial or S&P Transportation Index.

Firm's investment: *Investment* = CAPX/Sales; CAPX = DATA128.

Firm's leverage**:** *Leverage* = Long-term Debt / TA, where Long-term Debt = DATA9.

Firm's prior global diversification status: If for the year before the event at least 10% of the firm's sales are from non-domestic geographic segment(s), *LagGStatus* is 1, otherwise it is 0.

Firm's profitability: *Profitability* = EBIT/Sales; EBIT = DATA170 + DATA15.

Firm's R&D intensity: *RND* = R&D/Sales; R&D = DATA46.

Firm's sales growth: *Growth* = (FGr1+FGr2+FGr3)/3, where FGr1, FGr2, and FGr3 are the growth of the firm during the past one, two, and three years, respectively.

Firm's size: *Size* = log (TA), where TA is DATA6 in the COMPUSTAT Company file.

Industry growth: *IndGr* is obtained by averaging *Growth* for all firms in the industry.

Industry's Herfindahl index: *IndHerf* is calculated as below: *n* = number of firms in the industry.[27]

$$Herfindahl \quad Index = \sum_{j=1}^{n} \left(\frac{Sales_j}{\sum_{j=1}^{n} Sales_j} \right)^2 \tag{8}$$

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decision to diversify or to refocus.

[27] Unless otherwise specified, throughout this Appendix firms are sorted into industries using 3-digit SIC (as indicated by the DNUM variable in the COMPUSTAT files).

Industry's profitability: *IndProf* is the average *Profitability* of all firms in the industry.

Industry's R&D: *IndRND* is obtained by averaging *RND* for all firms in the industry.

Listing on a major exchange: *MAJOREX* is a dummy variable that takes a value of 1 if the firm's stock is traded on NYSE, AMEX, or NASDAQ and 0 otherwise.

Number of multisegment firms in an industry: For each firm year, the number of multisegment firms in each industry (defined by 2-digit SIC) is counted to form *NMUL*.

Relative performance of the added (dropped) segment's industry: if the acquired (divested) segment's industry is more profitable than the average industry profitabilities of the other segments of the conglomerate, then the relative segment's industry profitability (*RSIP*) is +1; if it is less, *RSIP* is -1; for the years when there is no change in the segment structure, *RSIP* is 0. Industry profitability is defined as the median profitability of the single-segment firms in the industry.

Segment's relatedness: *Related* is 1 when the acquired (divested) segment is in the same industry as one or more of the other segments of the conglomerate. *Core*, on the other hand, is 1 only when the acquired (divested) segment is in the same industry (2-digit SIC level) as the firm's main business, as indicated by its DNUM variable in the COMPUSTAT files. Otherwise, *Core* and *Related* are 0.

Appendix II: Source of simultaneity bias

To see why $Dstatus_{it}$ and $Rstatus_{it}$ are correlated with ε_{it}, observe that $Dstatus_{it}^{*}$ and $Rstatus_{it}^{*}$ are latent variables that are determined by $Dstatus_{it}$ and $Rstatus_{it}$, respectively, but with an error:

$$Dstatus_{it}^{*} = Dstatus_{it} + \mu_{it}\,, \qquad E[\mu_{it}\, Dstatus_{it}] = 0$$

$$Rstatus_{it}^{*} = Rstatus_{it} + \phi_{it}\,, \qquad E[\phi_{it}\, Rstatus_{it}] = 0$$

$V_{it} = \boldsymbol{X_{it}}\,\boldsymbol{\beta} + \alpha_D\, Dstatus_{it} + \alpha_R\, Rstatus_{it} + \varepsilon_{it}$ can then be rewritten as

$V_{it} = \boldsymbol{X_{it}}\,\boldsymbol{\beta} + \alpha_D\,(Dstatus_{it}^{*} - \mu_{it}) + \alpha_R\,(Rstatus_{it}^{*} - \phi_{it}) + \varepsilon_{it}$

or $V_{it} = \boldsymbol{X_{it}}\,\boldsymbol{\beta} + \alpha_D\, Dstatus_{it}^{*} + \alpha_R\, Rstatus_{it}^{*} + (\varepsilon_{it} - \alpha_D\,\mu_{it} - \alpha_R\,\phi_{it})$

or $V_{it} = \boldsymbol{X_{it}}\,\boldsymbol{\beta} + \alpha_D\, Dstatus_{it}^{*} + \alpha_R\, Rstatus_{it}^{*} + e_{it}$

Thus, $E[e_{it}\, Dstatus_{it}^{*}] \neq 0$ and $E[e_{it}\, Rstatus_{it}^{*}] \neq 0$

Appendix III: Simple procedure to calculate an alternative measure of instrument relevance

$V = \boldsymbol{X}\,\boldsymbol{\beta} + \alpha_D\, Dstatus + \alpha_R\, Rstatus + \varepsilon$ is the equation estimated in the second stage of 2SLS. Let $\boldsymbol{X}_1$(NxG) = [*Dstatus Rstatus*] denote the matrix of endogenous explanatory variables. $\boldsymbol{X}$ (NxK) is the matrix containing all the exogenous explanatory variables and $\boldsymbol{Z}$ (NxM) is the instrument set. A simple procedure to calculate A^2_p is as follows:

Step 1: Regress $\boldsymbol{X}_1$ on $\boldsymbol{X}$. Denote the residuals as $\tilde{\mathbf{X}}_1(Nx2)$.

Step 2: Regress $\boldsymbol{Z}$ on $\boldsymbol{X}$. Denote the residuals as $\tilde{\mathbf{Z}}(NxM)$.

Step 3: Regress the residuals from Step 1, $\tilde{\mathbf{X}}_1(Nx2)$, on the residuals from Step 2, $\tilde{\mathbf{Z}}(NxM)$. Denote the residuals as $\tilde{\mathbf{R}}(Nx2)$.

Step 4: Calculate A^2_p using

$$A_P^2 = \frac{\det\left[\tilde{\boldsymbol{R}}'\tilde{\boldsymbol{R}}\right]}{\det\left[\tilde{\boldsymbol{X}}_1'\tilde{\boldsymbol{X}}_1\right]} \qquad (9)$$

The formula in *Eqn. (9)* is suggested by Poskitt and Skeels (2002). A^2_p can be viewed as a measure of the perpendicularity between $\boldsymbol{X}_1$ and $\boldsymbol{Z}$ after adjusting for the effects of $\boldsymbol{X}$.

When there are two endogenous explanatory variables, the test statistics is (ρ is the rank of $\mathbf{Z}$):

$$Fstat = \left[\frac{N-\rho-1}{\rho}\right]\left[\frac{1-A_P}{A_P}\right] \sim F\{2\rho, 2(N-\rho-1)\} \qquad (10)$$

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Table 1

Dummy Variables Describing Change, Status, or Choice

The table describes the behavior of change, status, and choice variables when the number of segments changes year-over-year. It is useful in differentiating between the decision of the firm, which is made at a specific time, and the consequences of that decision, which last for many years. The change variables, *Dchange* and *Rchange*, indicate whether in a given year the firm increased, decreased, or made no changes in its number of segments. *Dchange* (*Rchange*) is 1 for years when the number of segments increased (decreased). For years when there were no structural change with the firm, both of them are zero. Variables *Dstatus* and *Rstatus* specify the current status of the firm - diversified or refocused - and thus, capture the valuation consequences of the diversification and refocusing decisions. The choice variable *Y* is 1 if the firm increased its number of segments, 2 if it decreased its number of segments, and 3 if it did not change its number of segments. *Y* is used in multinomial logit estimation.

Year	Number of Segments	Dchange	Rchange	Dstatus	Rstatus	Y
89	1	0	0	0	0	3
90	4	1	0	1	0	1
91	5	1	0	1	0	1
92	3	0	1	1	1	2
93	3	0	0	1	1	3
94	5	1	0	1	0	1
95	2	0	1	1	1	2
96	1	0	1	0	1	2
97	2	1	0	1	1	1
98	1	0	1	0	1	2

Table 2

Summary Statistics of the Sample

The table displays descriptive statistics for firms with different diversification statuses. The sample covers the firms in the period of 1989-1998 included in Compustat Segment files that satisfy the screening criteria described in the text. The variables are *Size* (log of TA), *Profitability* (EBIT/Sales), *Investment* (CAPX/Sales), *RND* (R&D/Sales), *Age* (the number of years since the firm first was includeed in CRSP files), *Leverage* (Long Term Debt/Sales), *Growth* (avg. Sales growth for the last three years), *SEGN* (number of segments of the firm), *ExValS* (log of the ratio of firm value to imputed value using Sales multipliers), *ExVal* (log of the ratio of firm value to imputed value using Asset multipliers). Median is displayed below the mean for the corresponding firm group. Sample size for each diversification status is also proivided (number of firms and the corresponding firmyears).

Diversification Status	Sample Size		Size	Profitability	Investment	RND	Age	Leverage	Growth	SEGN	ExValS	ExVal
TOTAL	6,233 firms	Mean	5.21	0.06	0.09	0.06	21.63	0.26	0.20	1.45	-0.03	-0.01
	29,902 firmyears	Median	4.96	0.07	0.04	0.02	17	0.10	0.19	1	0.00	0.00
Diversifying Firms	1,219 firms	Mean	5.83	0.04	0.10	0.06	23.59	0.37	0.28	3.12	-0.07	-0.08
	1,336 firmyears	Median	5.69	0.07	0.05	0.02	17	0.17	0.14	3	-0.03	-0.11
that were single segment before their decision	909 firms	Mean	5.50	0.03	0.10	0.07	20.36	0.34	0.30	2.68	-0.08	-0.07
	917 firmyears	Median	5.36	0.06	0.04	0.02	15	0.14	0.15	2	-0.05	-0.09
that had multiple segments before their decision	310 firms	Mean	6.55	0.06	0.09	0.03	30.64	0.42	0.24	4.08	-0.03	-0.11
	419 firmyears	Median	6.57	0.08	0.05	0.02	24	0.22	0.11	4	0.04	-0.12
Refocusing Firms	651 firms	Mean	5.96	0.04	0.09	0.04	29.79	0.34	0.08	1.98	-0.07	-0.08
	800 firmyears	Median	5.83	0.07	0.04	0.02	26	0.18	0.02	2	0.00	-0.05
Firms not changing their number of segments	6,133 firms	Mean	5.16	0.06	0.09	0.06	21.30	0.25	0.18	1.35	-0.03	0.00
	27,766 firmyears	Median	4.91	0.07	0.04	0.02	16	0.10	0.11	1	0.00	0.00
that were single segment before their decision	4,928 firms	Mean	4.95	0.05	0.10	0.07	18.74	0.25	0.20	1.00	-0.01	0.01
	22,053 firmyears	Median	4.74	0.07	0.04	0.03	15	0.08	0.13	1	0.00	0.00
that had multiple segments before their decision	1,205 firms	Mean	6.00	0.07	0.08	0.03	31.09	0.27	0.12	2.71	-0.15	-0.07
	5,713 firmyears	Median	5.86	0.08	0.04	0.02	29	0.14	0.08	2	-0.15	-0.10
Firms that were always single segment	4,186 firms	Mean	4.87	0.05	0.10	0.07	18.08	0.25	0.21	1.00	-0.01	0.01
	18,111 firmyears	Median	4.67	0.07	0.04	0.03	15	0.08	0.13	1	0.00	0.00
Multisegment firms not changing their segments	587 firms	Mean	5.74	0.08	0.09	0.03	28.49	0.26	0.12	2.57	-0.17	-0.08
	2,288 firmyears	Median	5.60	0.08	0.05	0.02	28	0.13	0.08	2	-0.16	-0.11
Firms that both diversified and refocused	1,460 firms	Mean	5.75	0.06	0.08	0.05	26.63	0.29	0.16	2.03	-0.06	-0.03
	9,503 firmyears	Median	5.58	0.07	0.04	0.02	21	0.14	0.09	2	-0.01	-0.01

Table 3

Multinomial Logit Estimation Results

The dependant variable Y takes the value of 1 when the firm increases its number of segments, 2 if the firm decreases its number of segments, and 3 if the firm does not change its number of segments. The sample covers all diversifying, refocusing and single segment firms in the period of 1989-1998 that satisfy the selection criteria. Coefficients' t-stats are displayed in the parentheses below. The marginal effects are calculated using the coefficients. The probabilities are calculated using sample means. *Size* is log of Total Assets, *Age* is measured by the number of years since the firm was included in CRSP files, *Profitability* is EBIT / Sales, *Leverage* is Long-term Debt / Sales, *Growth* is avg. of the last three years growth of Sales, *Investment* is CAPX / Sales, *RND* is R&D / Sales, *MAJOREX* takes a value of 1 if the firm is listed in NYSE, NASDAQ, or AMEX and 0 otherwise, *SNP* takes a value of 1 if the firm is included in the S&P Transportation or S&P Industrial Index and 0 otherwise, *NMUL* is the fraction of multi-segment firms in an industry, *GDP* is the real annual growth of GDP, *GDP1* is lagged value of GDP, *IndHerf* is the industry's Herfindahl index, other industry variables (*IndGr, IndRND, IndProf)* are obtained by averaging the corresponding variables for the firms in the specific industry. *LagGStatus* is 1 if the firm was globally diversified the year before the event and 0 otherwise, *GEO* is 1 (-1) if the diversification (refocusing) event also involves a global diversification (refocusing) and 0 otherwise, *Core* is 1 if the added or dropped segment is in the main industry (using 2-digit SICs) of the firm and 0 otherwise, *Related* is 1 if the added or divested segment is in the same 3-digit SIC with one of the other segments of the firm and 0 otherwise, and *RSIP* indicates whether the dropped or added segment's industry is more (=+1) or less (=-1) profitable than the average profitability of the other segments' industries; when there is no event it is 0.

	ln(P1/P3) - Diversify		**ln(P2/P3) - Refocus**	
	Coeffic.	Marg. Eff.	Coeffic.	Marg. Eff.
Constant	-7.79	-0.4699	-3.89	-0.1383
	(-14.85)***		(-7.51)***	
Size	0.16	0.0096	0.20	0.0078
	(5.03)***		(5.25)***	
Profitability	-0.57	-0.0328	-0.90	-0.0354
	(-2.24)***		(-2.64)***	
Investment	-0.98	-0.0555	-1.81	-0.0717
	(-1.59)		(-1.99)**	
RND	-0.83	-0.0413	-3.56	-0.1445
	(-1.59)		(-2.69)***	
Age	0.0001	0.0000	0.01	0.0005
	(0.03)		(3.64)***	
Leverage	0.18	0.0105	0.31	0.0123
	(1.30)		(1.67)*	
Growth	0.16	0.0205	-3.64	-0.1505
	(1.43)		(-8.85)***	
IndHerf	0.35	0.0214	0.11	0.0035
	(1.46)		(0.40)	
IndGr	0.57	0.0339	0.53	0.0203
	(2.11)***		(1.78)*	
IndRND	0.31	0.0115	2.62	0.1071
	(0.41)		(2.18)***	
IndProf	-2.23	-0.1425	1.60	0.0726
	(-3.16)***		(1.43)	
MAJOREX	0.10	0.0060	0.10	0.0036
	(0.93)		(0.69)	
SNP	-0.32	-0.0188	-0.27	-0.0103
	(-1.82)*		(-1.48)	
NMUL	4.46	0.2725	1.01	0.0288
	(13.64)***		(2.40)***	
GDP	0.73	0.0453	-0.04	-0.0036
	(10.94)***		(-0.83)	
GDP1	0.28	0.0173	0.0022	-0.0007
	(5.31)***		(0.05)	
LagGStatus	0.05	0.0026	0.18	0.0073
	(0.50)		(1.46)	

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	ln(P1/P3) - Diversify		**ln(P2/P3) - Refocus**	
	Coeffic.	Marg. Effe.	Coeffic.	Marg. Effe.
GEO	0.14	0.0097	-0.30	-0.0126
	(2.46)***		(-1.19)	
Core	-1.26	-0.0739	-1.28	-0.0494
	(-3.04)***		(-2.94)***	
Related	2.10	0.1216	2.94	0.1151
	(3.05)***		(4.06)***	
RSIP	0.71	0.0463	-0.90	-0.0392
	(5.10)***		(-4.95)***	
Total Obs.	29,902	Probabilities:		
Diversifying	1,336	P1 =	0.0661	
Refocusing	800	P2 =	0.0431	
NoChange	27,766	P3 =	0.8908	

***,**,* indicates statistical significance at the 1, 5, and 10 percent levels (standard normal critical values are used).

Table 4

Do Diversification and Refocusing Decisions Affect Firm Value?

This table presents OLS estimation of the "diversification discount" and 2SLS estimation of the effects of diversification and refocusing on firm value. The sample includes all firms: diversifying, refocusing, and single segment. Excess Value, the dependent variable, is calculated for two different multipliers: Asset and Sales. The independent variables are *Dstatus* (a dummy that takes the value of 1 when the firm operates in multiple segments and 0 otherwise), *Rstatus* (a dummy that takes the value of 1 if the firm has fewer segments than anytime in the past and 0 otherwise), *Size* (log of Total Assets) and lagged values, *Profitability* (EBIT / Sales) and lagged values, *Investment* (CAPX / Sales) and lagged values, *RND* (RND/Sales) and lagged values, *Age* (years since the firm is included in CRSP), *Leverage* (long-term debt / TA), *Growth* (avg. Sales growth for the last three years), *SNP* (a dummy that takes a value of 1 when the firm is in the S&P Index and 0 otherwise), *LagGStatus* is 1 if the firm was globally diversified the year before the event and 0 otherwise, *GEO* is 1 (-1) if the diversification (refocusing) event also involves a global diversification (refocusing) and 0 otherwise, *Related* (*Core*) is 1 if the added or divested segment has the same 3-digit SIC (2-digit SIC) with one of the other segments (with the main segment) of the firm and 0 otherwise, and *RSIP* indicates whether the dropped or added segment's industry is more (1) or less (-1) profitable than the average profitability of the other segments' industries; when there is no event it is 0. OLS(1) is with *Dstatus* only, OLS(2) is with *Rstatus* only. The t-statistic of the estimated coefficient is given in the parentheses below.

	ASSET Multiplier			**SALES Multiplier**		
	OLS (1)	**OLS (2)**	**2SLS**	**OLS (1)**	**OLS (2)**	**2SLS**
Constant	-0.22	-0.21	-0.20	-0.52	-0.50	-0.49
	(-12.54)	(-11.87)	(-10.44)	(-26.32)	(-25.27)	(-22.86)
Dstatus	-0.07		0.12	-0.13		0.11
	(-6.29)		(1.17)	(-9.74)		(1.46)
Rstatus		0.01	-0.25		0.004	-0.35
		(0.83)	(-0.99)		(0.19)	(-1.22)
Size	0.14	0.14	0.14	0.37	0.37	0.37
	(6.34)	(6.37)	(6.21)	(14.85)	(14.80)	(14.35)
Size (1 lag)	-0.14	-0.14	-0.14	-0.32	-0.32	-0.32
	(-6.22)	(-6.30)	(-6.17)	(-12.80)	(-12.84)	(-12.39)
Size (2 lag)	0.01	0.008	0.01	0.006	0.005	0.004
	(1.47)	(1.34)	(1.09)	(0.99)	(0.79)	(0.61)
Profitability	0.68	0.69	0.69	0.64	0.66	0.66
	(18.00)	(18.14)	(17.74)	(14.90)	(15.09)	(14.68)
Profitability (1 lag)	0.05	0.05	0.04	0.19	0.20	0.19
	(1.44)	(1.51)	(1.28)	(5.07)	(5.15)	(4.68)
Profitability (2 lag)	0.07	0.08	0.07	0.21	0.21	0.21
	(2.30)	(2.40)	(2.24)	(5.83)	(5.95)	(5.50)
Investment	0.26	0.27	0.27	0.43	0.45	0.44
	(3.47)	(3.67)	(3.47)	(5.06)	(5.32)	(5.02)
Investment (1 lag)	-0.08	-0.08	-0.07	-0.07	-0.07	-0.06
	(-1.62)	(-1.61)	(-1.40)	(-1.23)	(-1.19)	(-1.06)
Investment (2 lag)	-0.02	-0.02	0.00	0.01	0.01	0.03
	(-0.71)	(-0.60)	(-0.21)	(0.19)	(0.37)	(0.67)
RND	0.54	0.57	0.57	1.12	1.18	1.18
	(8.83)	(9.38)	(9.24)	(16.28)	(17.06)	(16.63)
Age	-0.0001	-0.001	-0.001	-0.002	-0.003	-0.003
	(-0.38)	(-2.52)	(-2.67)	(-3.71)	(-6.96)	(-6.87)
Growth	0.27	0.27	0.20	0.15	0.15	0.16
	(12.86)	(12.85)	(12.63)	(6.53)	(6.51)	(6.42)
Leverage	-0.11	-0.12	-0.11	0.17	0.16	0.17
	(-5.49)	(-5.77)	(-5.30)	(7.59)	(7.16)	(6.93)
SNP	0.23	0.23	0.23	0.19	0.19	0.18
	(13.16)	(13.10)	(12.22)	(9.44)	(9.34)	(8.71)
MAJOREX	0.04	0.03	0.03	0.04	0.03	0.04
	(3.83)	(3.46)	(2.85)	(3.46)	(2.91)	(2.67)
LagGStatus	-0.04	-0.04	-0.05	-0.05	-0.06	-0.06
	(-4.27)	(-4.56)	(-4.71)	(-4.88)	(-5.31)	(-5.31)
GEO	0.02	0.02	0.020	0.03	0.02	0.03
	(1.45)	(1.16)	(1.09)	(1.66)	(1.23)	(1.28)
Core	-0.22	-0.22	-0.21	-0.33	-0.33	-0.32
	(-1.65)	(-1.65)	(-1.53)	(-2.14)	(-2.13)	(-2.01)
Related	0.11	0.07	0.06	0.23	0.16	0.17
	(0.91)	(0.59)	(0.43)	(1.67)	(1.19)	(1.17)
RSIP	0.02	0.02	-0.001	0.01	0.01	-0.01
	(0.71)	(0.77)	(-0.05)	(0.55)	(0.58)	(-0.32)
F Value	83.20	81.03	74.07	129.90	124.20	112.22
Adjusted R^2	0.15	0.14	0.14	0.21	0.21	0.20
Hausman Test			85.93			96.86
J-Test			2.19			2.89
Total obs / Used obs.	29902/9961	29902/9961	29902/9961	29902/9961	29902/9961	29902/9961
	For Dstatus	For Rstatus		For Dstatus	For Rstatus	
R^2_p (Shea/Godfrey)	0.032	0.008		0.031	0.008	

Table 5

First Stage Estimation Results

The results presented in this table are from the first-stage regression in the 2SLS estimation. The estimated equations are Diversified and Refocused logistic equations (Eqns. (8) and (9)). The dependant variables in the regressions are *Dstatus and Rstatus* , respectively. The independent variables are the instruments: the intercept, industry's Herfindahl index (*IndHerf*), industry's growth (*IndGr*), industry's profitabiliy (*IndProf*), fraction of multisegment firms in the industry (*NMUL*), net growth of the GDP for the current (*GDP*) and past year (*GDP1*), dummy variables indicating whether the firm is listed in a major exchange (*MAJOREX*) or is a part of an S&P Index (*SNP*), firm's leverage (*Leverage*), firm's profitability (*Profitability*), once-lagged prior global diversification status (*GStatus*), indicator of whether or not the event involves a change in geographic diversification as well (*GEO*), indicator of whether the added or dropped segment is in a related (*Related* and *Core*) or more profitable industry (*RSIP*), once- and twice-lagged values of *Leverage* , *Size* , *Profitability* , and *Investment* . The results for asset multiplier are not presented, because they are identical. P-values of the coefficient estimates of each equation are presented in the column next to the coefficients. Negelkerke R2 is also reported for each logistic equation.

	Diversified Eqn.		**Refocused Eqn.**	
	Coefficient	P-value	Coefficient	P-value
Intercept	-0.3333	0.0001	-0.0860	0.0001
IndHerf	0.1356	0.0001	0.0259	0.0550
IndGr	-0.0321	0.2046	-0.0041	0.8195
IndProf	0.4606	0.0001	0.0677	0.1942
NMUL	0.8370	0.0001	0.1847	0.0001
GDP	0.0034	0.2655	0.0136	0.0001
GDP1	-0.0002	0.9415	-0.0022	0.2971
MAJOREX	0.0668	0.0001	0.0342	0.0001
SNP	0.0954	0.0001	0.0234	0.0270
Leverage	-0.0485	0.0534	-0.0204	0.2508
Profitability	-0.0762	0.0156	-0.0265	0.2350
LagGStatus	0.0100	0.2158	-0.0002	0.9761
GEO	0.0267	0.0723	0.0217	0.1166
Core	-0.0971	0.4082	-0.0085	0.9190
Related	0.5420	0.0001	0.1996	0.0066
RSIP	-0.0059	0.7593	-0.0742	0.0001
Leverage (1 lag)	0.0622	0.0380	0.0328	0.1220
Leverage (2 lag)	0.0388	0.0467	0.0393	0.0045
Size (1 lag)	0.0329	0.0001	0.0103	0.0070
Size (2 lag)	0.0137	0.0073	-0.0005	0.8949
Profitability (1 lag)	-0.0199	0.4918	-0.0256	0.2135
Profitability (2 lag)	-0.0863	0.0015	-0.0362	0.0606
Investment (1 lag)	-0.1580	0.0001	-0.0546	0.0627
Investment (2 lag)	-0.1510	0.0001	-0.0372	0.1441
Negelkerke R^2		0.2007		0.0377
Total / Used obs		29902 / 9961		29902 / 9961