Explaining the Diversification Discount

by

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EC-99-06

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First Draft: November 1998
Current Draft: April 1999

[1] We thank Bill Greene, Charles Himmelberg, Scott Mayfield, Myles Shaver and seminar participants at Harvard Business School for helpful comments. We thank Sarah Woolverton for help with the data. Simi Kedia gratefully acknowledges financial support from the Division of Research at Harvard Business School. All errors remain our responsibility.

ABSTRACT

Diversified firms trade at a discount relatively to similar single-segment firms. We argue in this paper that this observed discount is not per se evidence that diversification destroys value. Firms choose to diversify. Firm characteristics, which make firms diversify, might also cause them to be discounted. Not taking into account these firm characteristics might wrongly attribute the observed discount to diversification. Data from the Compustat Industry Segment File from 1978 to 1996 is used to select a sample of single segment and diversifying firms. We use three alternative econometric techniques to control for the endogeneity of the diversification decision. All three methods suggest the presence of self-selection in the decision to diversify and that a negative correlation exists between firm's choice to diversify and firm value. We do a similar analysis in a sample of refocusing firms. Again, some evidence of self-selection by firms exists and we now find a positive correlation between firm's choice to refocus and firm value. These results consistently suggest the importance of taking the endogeneity of the diversification status into account in analyzing its effect on firm value.

Prior studies by Lang and Stulz (1994), Berger and Ofek (1995) and Servaes (1996) show unambiguously that diversified firms trade at a discount relative to non- diversified firms in their industries. Subsequent papers have confirmed the existence of this discount on diversified firms and this result seems to be robust to different time periods and different countries.[2] There is a growing consensus that the discount on diversified firms implies a destruction of value on account of diversification i.e. on account of firms operating in multiple divisions.

However, before we interpret this discount as evidence that diversification destroys value, we need to fully control for the decision of firms to diversify. Firms choose to diversify. They choose to diversify when the benefits of diversification outweigh the costs of diversification and stay focused when it does not. It is possible that firm characteristics, which cause firms to diversify i.e. which make the benefits of diversification greater than the costs of diversification, also cause firms to be discounted. Not controlling for these firm characteristics will wrongly attribute the discount to diversification.

For example, if a firm decides to diversify in reaction to a technological change that leads it to a loss of competitive advantage in its industry, we will still observe a correlation between the low value of this poorly performing firm and its decision to diversify. This negative correlation will exist even if the diversification was value enhancing. The observed negative correlation in this case exist not because the firm decided to diversify but despite this decision. The discount on multiple segment years may, once again, be less on account of it being diversified and more on account of the fact that the technological change adversely affected the firm.

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[2] Servaes (1996) finds a discount for conglomerates during the 1960's while Matsusaka (1993) documents gains to diversifying acquisitions in the late 1960's, in the United States. Lins and Servaes (1999) document a significant discount in Japan and UK, though none exists for Germany. The evidence from emerging economies is mixed. While Khanna and Palepu (1999), Fauver, Houston and Naranjo (1998) find little evidence of a diversification

This does not imply, that we think that there are no agency costs associated with firms operating in multiple divisions. But rather that for firms which diversify, these costs should be dominated by the benefits of diversification. A proper evaluation of the effect of diversification on firm value should take into account the firm-specific characteristics that may increase or decrease the benefits and costs arising from diversification. This endogeneity of the firm's decision to diversify has to be controlled for before evaluating the effect of diversification on firm value.[3]

In this paper, we attempt to control for this endogeneity of firm's decision to diversify in evaluating the effect of diversification on firm value. The main findings of our paper are the following. We first reproduce the results existing in the literature and identify a diversification discount in our sample. Preliminary data analysis shows that conglomerates differ from single segment firms in their underlying characteristics. We find that diversified firms were discounted even when they operated as single segment firms. These firms were not average performers even prior to diversification.

We build on the methodology of Berger and Ofek (1995) and the insights of Lang and Stulz (1994) to control for the endogeneity of the diversification decision. As Berger and Ofek (1995), we value firms relative to the median single segment firm in the industry. This measure has the advantage of being neutral to industry and time shocks that affect all firms in a similar way. However, Lang and Stulz (1994) show that industry characteristics are likely to be

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discount in emerging markets, Lins and Servaes (1998) report a diversification discount in a sample of firms from seven emerging markets.

[3] This is in the spirit of recent work by Himmelberg, Hubbard and Palia (1998), Agrawal and Knoeber (1996) and Holthausen and Larcker (1993) which controls for the endogeneity of managerial ownership, in evaluating the relationship between managerial ownership and performance. These papers follow the insight of Demsetz and Lehn (1985) and model managerial ownership as optimally determined by firms, in the presence of heterogeneity in the firm's contracting environment, to maximize firm value. Shaver (1998) controls for endogeneity in assessing the effect of choice of entry mode on survival of foreign direct investment.

important in firm's decision to diversify.[4] As industry differences predict the probability of a firm being diversified while, by construction, do not affect a firm's relative value, they make good instruments for the diversification status.

We control for the endogeneity of the diversification decision in three ways. Firstly, we control for unobservable firm characteristics, which affect the diversification decision by introducing fixed firm effects. Secondly, we model the firm's decision to diversify as a function of industry, firm and macroeconomic characteristics. We use the probability to diversify as an instrument for the diversification status, in evaluating the effect of multiple segment operations on firm value. Lastly, we model an endogenous self-selection model and use Heckman's correction to control for the self-selection bias induced on account of firm's choosing to diversify.

The diversification discount drops, and sometimes disappears, when we control for the endogeneity of the diversification decision. The evidence in all three methods indicates that the discount on multiple segment years is partly due to endogeneity. The coefficient of the correction for self-selection is negative. This is indicative of a negative correlation between firm's choice to diversify and firm value and supports the view that firm characteristics which cause firms to diversify, also cause them to be discounted.

Finally, we do a similar analysis in a sample of refocusing firms. Much like the decision to diversify, the decision to refocus is also endogenous. Firms choose to refocus when the benefits to refocusing outweigh the costs of refocusing. Controlling for firm characteristics, multi segment firm years of refocusing firms should be discounted i.e. reflect the potential for value enhancing refocusing. We find some evidence that firm characteristics which make firm's

[4] Lang and Stulz (1994) find that firms that diversify tend to be in slow growing industries. They also report that diversified firms have lower Tobin's q than focused firms, but this difference was driven by differences among firms

refocus are positively correlated with firm value. Controlling for these firm characteristics increases the estimated multi-segment discount of refocusing firms. Overall, the evidence suggests the importance of taking the endogeneity of the diversification status into account, in analyzing its effect on firm value.

The rest of the paper is organized as follows. In the next section we provide a framework for analyzing the diversification decision, and explain why it is difficult to interpret the observed diversification discount estimated in the literature. Section III describes the data, sample selection criteria and preliminary analysis. Section IV discusses the estimation methodology, Section V presents the evidence for diversifying firms, Section VI for refocusing firms and Section VII concludes.

II. ENDOGENOUS DIVERSIFICATION

A large literature exists on the benefits of diversification. The gains from diversification can arise from (1) managerial economies of scale[5] (2) the presence of firm specific assets with the characteristics of public good that could be exploited in other industries[6] (3) the coinsurance effect from combining businesses with imperfectly correlated earning[7] (4) more efficient resource allocation in internal capital markets[8] (5) the ability of firms to search through various

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across industries rather than within an industry.

[5] See Chandler (1977)

[6] Matsusaka and Nanda (1994) propose a model in which benefits of diversification arise from the ability of multi segment firms to allocate a fungible asset between its divisions in response to stochastic profit opportunities. Also see Montgomery and Wernerfelt (1988) and Bodnar, Tang and Weintrop (1998).

[7] Lewellen (1971) argues that this coinsurance effect gives diversified firms greater debt capacity than single segment firms.

[8] Weston (1970) argues that the larger internal capital markets in diversified firms help them allocate resources more efficiently. Stulz (1990) argues that larger internal capital markers help diversified firms reduce the under investment problem described by Myers (1977). Stein (1997) argues that the winner picking ability of head quarters may allow internal capital markets in diversified firms to work more efficiently than external capital markets.

industries for the best match of its organizational ability[9] (6) mitigation of failures in product, labor and financial markets[10] (7) alleviating information asymmetries when raising equity[11]

There are costs to diversification as well. The costs can arise from (1) inefficient allocation of capital among divisions of a diversified firm[12] (2) the difficulty of motivating divisional managers by giving them equity participation in the firm[13] (3) increased incentive for rent seeking by managers within the firm[14] (4) information asymmetries between central management and divisional managers[15] (5) opportunities for managers of firms with free cash flow to engage in value destroying investments.[16]

Firms are likely to choose diversification when the benefits of diversification are greater than the costs of diversification. Most importantly for us, the arguments suggest that the decision to diversify depends on the presence of some firm-specific characteristics that lead some firms to generate more value from diversification than others. Depending on firm characteristics, firms should endogenously choose to diversify when the benefits of diversification outweigh the costs of diversification and stay in single segments when it does not. Choice of organization structure should therefore be treated as an endogenous outcome that maximizes firm value, given a set of exogenous determinants of diversification i.e. the set of

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[9] Matsusaka (1995) develops a model where the firm gives up the benefits of specialization to search for a better fit of its organization capital.

[10] Khanna and Palepu (1999) document gains to business group affiliation in India. They propose the role of diversified groups in replicating the functions of institutions that are missing in emerging markets.

[11] Hadlock, Ryngaert and Thomas (1998) argue that the adverse selection problem facing equity issuers is less for diversified firms in comparison to focused firms. They find that equity issues of diversified firms are viewed less negatively by the market than are equity issues of comparable focused firms.

[12] Stulz (1990) and Scharfstein (1998) show that diversified firms invest more than the single segment firms in the poor lines of business or business with low Tokin's q. Lamont (1997), Rajan, Servaes and Zingales (1997) also report evidence on inefficient allocation of capital within conglomerates. Meyer, Milgrom and Roberts (1992) make a related argument of cross subsidization of failing business segments.

[13] See Aron (1988, 1989), Rotemberg and Saloner (1994) and Hermalin and Katz (1994) for models of incentive problems of managers in diversified and focused firms.

[14] See Scharfstein and Stein (1997).

[15] See Myerson (1982) and Harris, Kriebel and Raviv (1982).

[16] See Jensen (1986), (1988)

firms characteristics. The relation between firm value and diversification therefore requires taking into account the endogeneity of the diversification decision.

Viewed in this context, the documented diversification discount need not be due to the value destruction resulting from diversification but might be a result of firm characteristics which cause firms to diversify and also account for the observed discount. If these underlying firm characteristics explain the discount and also cause the firm to diversify, not taking into account the endogenous decision of firms to diversify, will erroneously attribute the discount to diversification. Below we give a few examples were such a situation is likely to occur.

Innovation, changes in industry structure and competitive advantage can reduce the expected payoff for a firm in its existing industry. A firm with lower expected profitability will trade at a discount relative to other firms in its industry. Such a firm will also have a lower opportunity cost of assigning its scarce resources to alternate opportunities in other industries. If poor performing firms tend to diversify, then not taking into account past performance and its affect on the decision to diversify will result in attributing the discount to diversification activity rather than the underlying characteristics of the firm.

Secondly, consider the case of a firm that possesses some unique organizational capability that it wants to exploit.[17] Incomplete information may force this firm to enter into costly search through diversification, to find industries with a match to its organizational capital. Matsusaka (1994) proposes a model in which a value maximizing firm forgoes the benefits of specialization to search for a better match. During the search period the market value of the firm will be lower than the value of a comparable single segment firm. Not taking into account firm

[17] Maksimovic and Philips (1998) develop a model where the optimal number of segments in which a firm operates depends on its comparative advantage. If managerial skill is industry specific, profit maximizing conglomerates will be discounted in equilibrium.

characteristics, which make diversification optimal, in this case searching for a match, may again attribute the discount wrongly to value destruction arising from diversification.

Finally, consider the impact of cross sectional variation in private benefits of managers. A firm with a manager who has high private benefits will undertake activities, which are at conflict with shareholder value maximization. Such a firm will be discounted relative to other firms in its industry. Such a manager is also more likely to undertake value-destroying diversification. However, even in this case the observed discount on multi segment firms years is partially accounted for by the ex ante discount at which the firm is trading, on account of high private benefits, before diversification. Not taking into account firm characteristics, in this case high agency costs, leads to an over estimation of the value destruction arising from diversification.

The decision to refocus, much like the decision to diversify is endogenous. Firms choose to refocus when the presence of firm-specific characteristics, make the benefits of refocusing greater than the costs of refocusing. In this case, the multi-segment years prior to refocusing should be discounted i.e. reflect the potential for value enhancing refocusing as has been documented by Comment and Jarrell (1995), John and Ofek (1995) and Berger and Ofek (1996).[18]

Consider the case when changes in industry conditions generate higher than expected growth opportunities in one segment. This might increase the cost of an inefficient internal capital markets, increasing the cost of operating in multiple divisions and making refocusing

[18] In a static model, the above arguments would suggest that when the net benefit to operating in multiple segments is negative, the firm should immediately refocus. In practice, the decision to diversify and refocus involve large amounts of sunk and irreversible costs that lead to a lot of persistence in diversification status. There is yet, no clear understanding of the dynamic theory of firm's diversification status but one can draw an analog from recent theory on irreversible investment decisions (see Dixit and Pindyck (1994). This literature has emphasized that temporary shocks can have permanent effects due to hysteresis, which is consistent with an observed discount of multiple segment firms prior to refocusing.

optimal. In this case firm characteristics which make the refocusing decision optimal, i.e. growth opportunities, also cause the firms to be more highly valued. Unlike the diversification decision, the refocusing decision is positively correlated with firm value. Not taking into account firm characteristics, in this case growth opportunities, may erroneously attribute the premium to multi-segment operations of firms, causing the discount on multi-segment years to be underestimated. Controlling for firm characteristics, which make the refocusing decision optimal, may further increase the discount associated with multiple segments.

We separately examine diversifying and refocusing firms and control for the endogeniety of the diversification/ refocusing decision.[19] We try to control for firm characteristics which make firm's diversify, before interpreting the observed discount as evidence of value destroying diversification. Similarly, we control for firm characteristics which make firm's choose to refocus, before estimating the effect of multiple segment operations on firm value.

III. DATA

3.1 Sample Selection

The sample consists of all firms with data reported on the Compustat Industry Segment database from 1978 to 1996. We exclude all firms, which had any segments in the financial services industry (6000-6999), for any year in this period, as financial segments of firms are difficult to value with the methodology being used. To prevent distortions caused by small firms we exclude firms whose average sales are below $20 million for this period.[20] We also exclude firm years in which the sum of segment sales deviated from total sales by more than 1%. The final sample consists of 4152 firms with a total of 37113 firm years.

[19] Given our lack of understanding of the full dynamics of diversification and refocusing by firms, we condition the sample based on whether firm's choose to diversify or to refocus.

[20] This is different from the criterion used by Berger and Ofek (1995). They exclude all *firm years* with sales less than $ 20 million. We change the sample selection criteria because removing years in which sales drop below 20

3.2 Measure of Excess Value

To examine whether diversification increases or decreases value, we use the excess value measure developed by Berger and Ofek (1995), which compares a firm's value to its imputed value if each of its segments operated as single segment firms. Each segment of a multiple-segment firm is valued using median industry sales and asset multipliers of single segment firms. The imputed value of the firm is the sum of the segment values. Excess value is defined as the log of the ratio of firm value to imputed value. Negative excess value implies that the firm trades at a discount while positive excess values are indicative of a premium.[21]

We differ from Berger and Ofek (1995) methodology in two ways. Firstly, we require the firm to be a single segment firm over the entire time period for which it has data available, to be categorized as a single segment firm. This is in contrast to Berger and Ofek, who treat as single segment firms any firm year in which the firm operated in a single segment. If firms which diversify differ from firms which never diversify, inclusion of single segment years of diversifying firms in the estimation of median single segment multipliers confounds the issue. Secondly, as we examine a much longer time period, 1978 to 1996, we use only single segment firms operating in a given year to estimate the median multiplier for that year. Both these lead to a smaller number of single segment firms from which the multipliers have to be estimated. This results in fewer matches at the four-digit SIC level.[22]

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million gives rise to discontinuities in the data for a firm and might remove the initial and pre diversification years, precisely the years we are interested in.

[21] The imputed value of a segment is obtained by multiplying segment sales (asset) with the median sales (asset) multiplier of single segment firms in that SIC. The sales (asset) multipliers are the median value of the ratio of total capital over sales (assets). Total capital is the sum of market value of equity, long and short term debt and preferred stock. The industry definitions are based on the narrowest SIC grouping that includes at least 5 firms. Extreme excess values, where the natural log of the ratio of actual to imputed value is greater than 1.386 or less than –1.386 are excluded. See Berger and Ofek (1995) for futher details.

[22] The imputed value of about 27% of all segments of diversified firms were based on matches at the four-digit SIC code, 22% were based on matches at the three-digit SIC code, 42% were based on matches at the two-digit SIC code and 9% were based on matches at the one-digit SIC code. This is lower than the 44.6% matches at the four-digit level, 25.4% matches at the three-digit level and the 30% matches at the two-digit level reported by Berger and

3.3 Documenting the Discount

In this section we document the existence of a discount in line with prior work. We find that median discount on multiple segment firms years is 14% (13%) using sales (asset) multipliers. This is comparable to the median discounts of 10% (16%) reported by Berger and Ofek (1995). We begin by estimating a model of excess value as specified by Berger and Ofek (1995). They model excess value as a function of firm size, proxied by log of total assets, profitability (EBIT/SALES), investment (CAPX / SALES) and diversification, proxied by *D*, a dummy which takes the value 1 for years when the firm operates in multi segments and zero otherwise. As seen in Table 1 the coefficient of *D* is –0.14 and significant at the 1% level when sales multipliers are used. This result is comparable to the –0.144 reported by Berger and Ofek. The estimated diversification discount using asset multipliers is –0.13 and is also significant at the 1% level . However the R square for the regression with asset multipliers is only 0.006 in contrast to the 0.086 reported by Berger and Ofek due to our inclusion of smaller firms in the sample. Our sample therefore, provides similar results despite the decrease in explanatory power due to the inclusion of smaller firms.[23]

We also include other variables, which might explain firm's excess value. Firm value depends on the growth opportunities available to firms in their industries. If all firms in an industry grow at the industry growth rate, relative firm value is independent of growth rates. However changes in the industries in which firm's operate, entry of new firms and acquisition of characteristics in high/low growth periods may cause relative firm value to be a function of past

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Ofek. The error induced in the imputed value due to a greater fraction of coarser matches could be of either sign and on average may be zero in the sample. However, to be sure that a higher fraction of firms matched at smaller SIC levels does not influence our results, we included the fraction of matches at the 1 digit level in our analysis as a robustness check and found it made no difference to the results. The correlation between the level at which the firm is matched and excess value is small.

[23] The R^2 increases to 0.058 when the model was estimated with years between 1986 and 1991 and with sales greater than $ 20 million consistent with the sample selection criteria of Berger and Ofek (1995).

growth rates faced. We include growth in total industry sales at the two digit SIC level (INDGROW) in the prior year and its lagged value.[24] One factor, which causes firms to differentially respond to growth opportunities is whether or not they were capital constrained. We also include the ratio of long term debt to total assets to capture the degree of financial slack available to the firm. To control for the possibility of a non linear effect of firm size on firm value, we include log of total assets, squared. The results are reported in Table 1 (columns 3 and 7) and show that firms in industries with high growth rates have higher values. High leverage has a negative effect on relative firm value. The coefficient of the square of firm size, is negative suggesting that the positive effect of firm size on excess value diminishes as firm size increases.

We also include lagged values of the firm size, profitability and investment. Past profitability and investment may control for firm characteristics, which affect firm value. The results reported in columns 4 and 8 of Table 1 show that firms which were profitable in the past (high EBIT/ SALES) and had higher investments (high CAPX/ SALES) are valued higher that the median single segment firm in the industry. Summarizing, multiple segment firms show a significant discount and the additional variables increase the fit of the model without affecting the estimated diversification discount.

3.4 Are multi-segment firms different?

Our argument states that firms, which diversify are different from single segment firms i.e. they posses characteristics which makes diversification the value maximizing decision for them. In this section we explore whether conglomerates differ from single segment firms.

[24] The industry sales are the sum of all sales reported by single segment firms as well as segments of conglomerates, operating in the given two digit SIC. For conglomerates we calculate a weighted average growth rate faced by all its segments, the weights being segment sales. The model was also estimated with current growth rates with the same qualitative results.

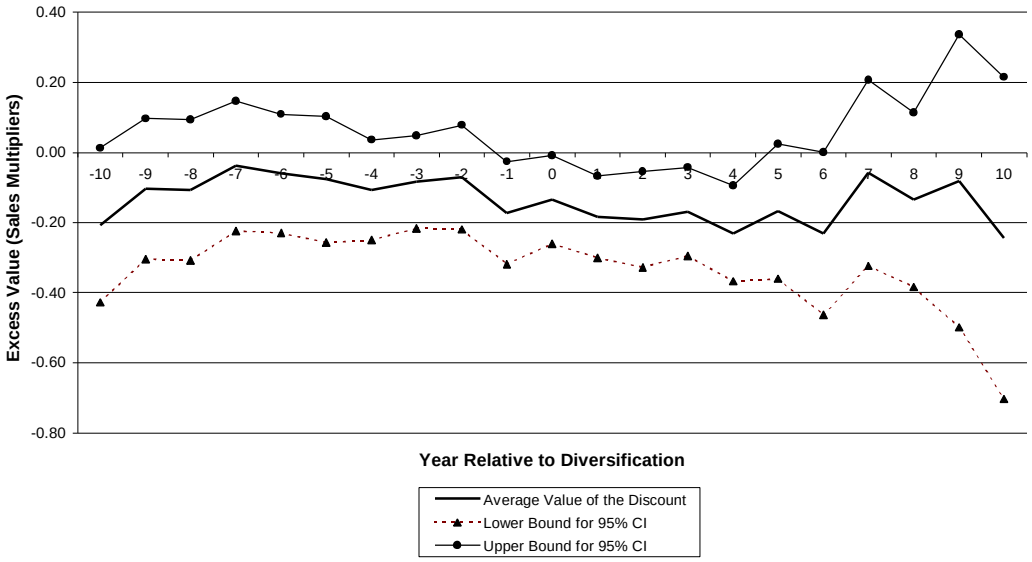
The 4152 firms in our sample, differ in their diversification profiles. The largest group consists of 2853 single segment firms, which accounted for 21051 firm years. The rest are firms which report operating in multiple segment at some point in the time period under consideration. These firms will be referred to as multiple segment firms or conglomerates in the paper. Among these multiple segment firms, there were broadly four kinds: Firms which diversify, those that refocus, those that do both and lastly conglomerate firms which do not change the number of segments in which they operate. The largest group consists of 459 firms (6975 firm years) which both report increasing and decreasing the number of segments in this time period. The next largest group consists of 353 firms (4646 firm years) who refocused. There are 227 firms (2448) which report diversifying in this period. The details of the breakdown of the sample are reported in Table 2.

Next we examine if firms belonging to the different diversification profiles exhibit different firm characteristics. Table 3 shows summary statistics of firm characteristics by diversification profile. Conglomerates are bigger, have higher leverage and lower RND /SALES than single segment firms. There are also differences within conglomerates. On average, diversifying firms have higher CAPX/SALES and higher EBIT/SALES than refocusing firms and firms that both increase and decrease diversification. Conglomerates that do not change diversification have higher CAPX/SALES, higher EBIT/SALES and lower RND/ SALES than the other groups but seem to be in industries with lower growth rates. This provides preliminary evidence that not only do conglomerates differ from single segment firms but that there are also considerable differences among conglomerates, with different diversification profiles.

Do average discounts vary with the diversification profile? Table 4 reports summary statistics for excess value across different diversification profiles. What is striking is that the

single segment firm years of all conglomerate firms are discounted (except for firms, which refocus once to single segment firms). Single segment firm years of firms which diversified once from single segment to multiple segments, trade at a median discount of 7% while that of firms which diversify multiple times trade at a discount of 17%. On average, the single segment years of conglomerates have a discount of 6%.[25] These descriptive statistics suggest that in assessing whether diversification is value enhancing or not, we need to control for firm performance and characteristics in the years prior to the change in diversification status.

Figure 1
Average Discount For Diversifying Firms Over Time



To further examine the impact of diversification on firm value, we look at changes in the discount before and after the diversification decision. The average discount of diversified firms, 10 years before and after the diversification decision are plotted in Figure 1. We find no evidence of a sharp increase in the discount at the time of diversification as predicted by the hypothesis

[25] We formally test for whether conglomerates were different from single segment firms even when they were single segment firms. The F test (not reported) rejects the null that single segment years of conglomerates are similar to single segment firms.

that diversification destroys value. There is at best, a weak trend of declining value from year t-2 to year t+2.[26]

Figure 2 plots the average discount for 10 years before and after the refocusing decision. There is a weak trend of increasing value in the years prior to refocusing, which continues after refocusing.[27] The figures are consistent with the view that diversification may be a response to declining value rather than the cause of it and refocusing a response to increases in underlying profitability rather than the cause of it. [28]

If the discount on multi segment firm years was entirely on account of value destruction incurred with this organization structure, there should be on average no difference in the multi segment years of firms with different diversification profiles.

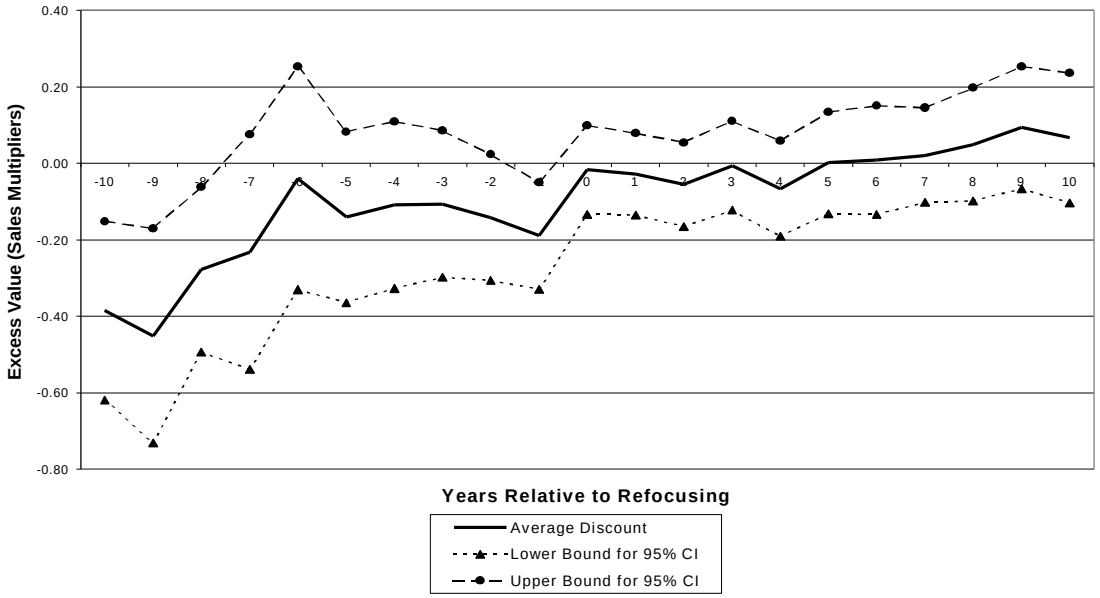
Strikingly, significant differences exist in the excess value across the different diversification profiles (Table 4). The single segment and multiple segment firms years, of

[26] Firms included in the sample for Figure 1 are firms which diversify once from single to multiple segments. For these firms, the year of diversification is clearly identified. As the years move away from zero the number of firms in the sample decreases due to missing observations resulting in larger confidence intervals.

[27] This is in line with the evidence presented in Comment and Jarrel (1995) who show that average net of market wealth relative to two years prior to a change in diversification status have a downward trend for diversifying firms and an upward trend for refocusing firms.

[28] The firms included in the sample for Figure 2 are firms which focus once from multiple to single segments. For these firms the year of refocusing is clearly identified. A similar pattern is also observed when we plot the discount associated with the years before and after diversification, controlling for the variation in the other exogenous variables. This is done by introducing dummies for the years relative to the diversification decision, in the regression reported in Table 1 and plotting the estimated coefficients. Similar pattern is also observed when we use asset multipliers instead of sales multipliers.

Figure 2
Average Discount For Refocusing Firms over Time



conglomerate firms with different diversification profiles, significantly differ from each other in their average discounts.[29]

IV. ESTIMATION METHODOLOGY

We will examine the effect that diversification has on firm value by modeling firm value as a function of firm characteristics. We can define our measure of relative firm value to be equal to V_{it}:

$$V_{it} = d_0 + d_1 X_{it} + d_2 D_{it} + e_{it} \qquad (1)$$

where, X_{it} is a set of exogenous observable characteristics of the firm, D_{it} is a dummy variable that takes the value of 1 if the firm operates in more than one segment and 0 otherwise, $\delta=\{\delta_0,\delta_1,\delta_2\}$ is a vector of parameters to be estimated, and e_{it} is an error term.

[29] The difference in the mean excess values of single segment firm years, for conglomerate firms, is significant at the 5% level in 7 out of 10 pairs. The difference in the mean excess values of multiple segment firm years, of conglomerate firms with different diversification profiles, is significant at the 5% level, for 19 out of 28 pairs.

The question of interest is whether the coefficient on δ_2 measures the effect of diversification on firm value. The answer is not if we think that the firms that choose to diversify are not a random sample of firms and their decision to diversify is correlated with the relative value of the firm. Then D_{it} will be correlated with the error term and the OLS coefficient estimate of δ_2 is biased. Specifically, lets assume that a firm's decision to diversify its operations is determined by

$$D_{it}^{*} = bZ_{it} + m_{it} \qquad (2)$$

$$D_{it} = 1 \quad if \quad D_{it}^{*} > 0$$

$$D_{it} = 0 \quad if \quad D_{it}^{*} < 0$$

where D_{it}^{*} is an unobserved latent variable, Z_{it} is a set of firm variables that affect the decision to diversify, and μ_{it} is an error term. The correlation between D_{it} and e_{it} in equation (1), will be non zero when either: (i) some of the exogenous variables in the diversification equation, Z_{it}, affect the firm's relative value but are not included as regressors in the value equation; or (ii) the error terms e_{it} and m_{it} are correlated. In either case the estimation of δ_2 using ordinary least squares will be biased.

There are several econometric strategies available to proceed at this point. First, one can take advantage of the availability of a panel dataset and use a fixed-effect estimator in equation (1), assuming that all the unobserved heterogeneity is constant over time.

Secondly, one can attempt to jointly estimate the simultaneous equation system of equations (1) and (2). In general, the estimation of such a system of simultaneous equations is not easy because the natural instruments for D_{it}, the observed firm characteristics, are already

included in the firm valuation (equation (1)) causing the system to be unidentified.[30] In our case, panel data will help us again in devising an estimation strategy. Notice that V_{it} is computed as the firm's *relative value* to the median firm in the industry in a given year. V_{it} is, by construction, independent of any observable characteristics affecting the value of all firms in a given industry and year in the same manner.[31] Any exogenous characteristic that enters a firm's probability of diversification can affect the firm's value, but as long as it does not affect the firm's value relative to the median firm in its industry and year, it will not enter into equation (1), and will be uncorrelated with $e_{it.}$ Such variables will be good candidates for use as instruments for D_{it} in equation (1). The appropriateness of such industry and time characteristics as instruments for the diversification equation will depend on their ability to predict the firm's decision to diversify. [32]

We identify four such variables. The first variable captures industry effects on the decision to diversify. To capture overall attractiveness of a given industry to conglomerates, we use the fraction of all firms in the industry, which are conglomerates (PNDIV).[33] The higher the fraction of multi-segment firms (PNDIV) the more attractive the industry factors are to diversification.[34] We also include for each firm the fraction of sales by other firms in the industry accounted for by diversified firms (PSDIV). As both these variables are highly correlated, we evaluate them jointly to determine the effect of industry factors on the diversification decision. The third variable captures the effect of time trends on the

[30] Strictly speaking identification could be obtained only from the non-linearity of D_{it} in equation (2) but exclusively relying on the functional form will lead to very weak identification.
[31] Notice that the estimation of equation (1) where V_{it} is defined as firm value relative to the median firm in an industry is almost analogous to the estimation of an industry fixed-effect estimator.
[32] As stated in the introduction, Lang and Stulz (1994) notice that diversified firms have on average lower Tobin's q than single-segment firms, and that the q for diversifying firms was not significantly lower than the q for the median firm in their industry. This observation led them to the conclusion that diversification might be strongly related to industry characteristics which supports the use of industry characteristics as instruments for the decision to diversify. Wernerfelt and Montgomery (1988) also find significant industry effects.
[33] The industry specific factors which influence the decision to diversify may range from changes in industry regulation, introduction of new technology, market structure and business risk.

diversification decision, as evidenced by the existence of merger waves. We include the number of merger/acquisition announcements in a given year (MNUM). The more active the market for mergers/acquisitions, the higher is the probability that a firm will diversify. We also include the annual value of announced merger/acquisitions, in billions of US $, (MVOL).

Thirdly , one can directly estimate (1) and (2) taking into account the self-selection of firms that diversify in equation (2) using Heckman's (1979) two-stage procedure. Expected firm value conditional on the firm being diversified is

$E(V_{it} \mid D_{it} = 1) = \delta_0 + \delta_1 X_{it} + \delta_2 + E(e_{it} \mid D_{it} = 1)$. Assuming that e_{it} and m_{it} have a bivariate normal distribution with means zero, standard deviation σ_e and 1 and with correlation ρ, we have $E(V_{it} \mid D_{it} = 1) = \delta_0 + \delta_1 X_{it} + \delta_2 + \rho \sigma_e \lambda_1$ where $\lambda_1(\beta Z_{it}) = \dfrac{f(\beta Z_{it})}{\Phi(\beta Z_{it})}$, $\phi(.)$ and $\Phi(.)$ are respectively the density and cumulative distribution functions of the standard normal. Similarly, expected firm value conditional on the firm being focused is

$E(V_{it} \mid D_{it} = 0) = \delta_0 + \delta_1 X_{it} + \rho \sigma_e \lambda_2$ where $\lambda_2(\beta Z_{it}) = \dfrac{-f(\beta Z_{it})}{1-\Phi(\beta Z_{it})}$.

The difference in value of single segment and diversified firms, is given by

$$E(V_{it} \mid D_{it} = 1) - E(V_{it} \mid D_{it} = 0) = \delta_2 + \rho \sigma_e \frac{f(\beta Z_{it})}{\Phi(\beta Z_{it})(1-\Phi(\beta Z_{it}))}. \qquad (3)$$

The right hand side of the equation (3) is what is estimated by the OLS coefficient of D_{it} in equation (1). This estimated discount using OLS will therefore be biased downward if ρ, the correlation of the error terms, is negative as hypothesized for diversifying firms. This estimated discount, will be biased upward if ρ is positive as hypothesized for refocusing firms.

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[34] We use two digit SIC codes for industry classification. Firm's were classified into industries based on their primary SIC.

Heckman proposes a two-step procedure to consistently estimate δ_2 as follows: (a) Estimate equation (2) using a probit model to get consistent estimates of b, denote these by $\hat{b}$, and use these estimates to get estimates of l_1 and l_2, the correction for self-selection; and, (b) estimate δ by the following least square regression

$$\begin{aligned} V_{it} &= d_0 + d_1 X_{it} + d_2 D_{it} + d_l[\, l_1(\hat{b}Z_{it}) * D_{it} + l_2(\hat{b}Z_{it}) * (1 - D_{i)})] + h_{it} \\ &= d_0 + d_1 X_{it} + d_2 D_{it} + d_l\, l + h_{it} \end{aligned} \qquad (4)$$

where $\delta_\lambda = \rho\sigma_e$. The sign of δ_λ in the above regression is determined by the sign of ρ the correlation between the error terms in equations (1) and (2). We will pursue all these three different estimation approaches below and compare the results.

V. DIVERSIFYING FIRMS

We select a sample of single segment firms and all diversifying firms.[35] In this sample we examine whether or not there is any loss of value associated with operating in multi segments. We first estimate the basic model by least squares in this sample of firms. Column 2 and 6 of Table 5 reports the results of this estimation.[36] The coefficient of *D* is –0.127 (-0.104) when sales (asset) multipliers are used and is significant at the 1% (1%) level. All the other variables behave in a way similar to the results reported in Table 1.

5.1 Fixed-effect estimation

As discussed in the previous section, we introduce fixed firm effects to control for time invariant unobservable firm characteristics, which affect the diversification decision. The results of this estimation are reported in Columns 3 and 6 of Table 5. The multi-segment discount

[35] Diversifying firms included in the sample are those that diversify once from single to multiple segments, those that diversify once from multiple to multiple segments and those that diversify multiple times

reduces to 4% using sales multipliers and is not significant. However, when asset multipliers are used the estimated discount of 5% is significant at the 5% level. The introduction of firm fixed effects reduces the interfirm variability in the data and might increase the noise-to-signal ratio in the estimation. However, the signs and significance of the coefficients on all other variables in the estimation remain practically identical to the OLS estimation. The only coefficient that significantly changes in the regression is the coefficient on *D*. This results support our prior that diversification is correlated with unobserved firm characteristics.

Ideally, we would have also liked to control for all observable characteristics in the pre-diversification years. However as the sample includes firms which diversify multiple times and those that enter the sample as diversified firms, identification and control for the pre-diversification years becomes difficult in this sample. We also run the model in a restricted sample that includes, out of all multiple segment firms, only the subset of firms which diversify once from single to multiple segments, and pre-diversification observable characteristics were controlled for. The estimated discount was 6% (8%) with sales (asset) multipliers and never significant.[37]

5.2 Estimating the probability to diversify: Probit Estimation

As both the two stage least squares and the selection model require the knowledge of variables in equation (2) i.e. the decision to diversify, in this section, we discuss the estimation of the probability of diversifying. Firms with low profitability in their current operations may diversify into other segments in search of more lucrative opportunities. To control for current and past profitability, we include EBIT/ SALES and its lagged values. We include (INDGROW)

[36] To keep the number of observations constant across the various methods, firms which have only one year of observation after removal of missing values have been deleted. These observations will be removed in the estimation of the fixed effects model.

and its lagged values to control for industry sales growth. We also include CAPX/ SALES and its lagged values as firms with a high level of investment in current operations are less likely to diversify. R&D/ SALES can also be used to control for firm level growth opportunities. However as this reduces our sample substantially, we discuss the results with the inclusion of R&D/ SALES in a separate section. We also control for firm size by including log of total assets and its lagged values.

As discussed earlier industry and time shocks affect firms' decision to diversify. We use the fraction of all firms in the industry which are multi-segment (PNDIV) and sales by other firms in the industry accounted for by diversified firms (PSDIV), to control for industry effects in the diversification decision. The number of merger/ acquisition announcements in a given year (MNUM) and the annual value of announced merger/ acquisitions, in billions of US $, (MVOL) are included to control for time effects in the decision to diversify.

The maximum likelihood estimates of the probit coefficients are reported in Table 6.[38] As probit coefficients are difficult to interpret, the table also reports the marginal effects of the change in each explanatory variable calculated at its sample mean. We find that firms with low profitbaility in the current year are more likely to diversify. A decrease in EBIT/SALES of 0.002, from it mean of 0.084 leads to a increase in the probability of diversifying by 1%. We find little evidence that firm size, past profitability, and industry growth rates are significant in explaining multi-segment operations. The coefficient of PNDIV and PSDIV are however, both significant. Though the coefficients of PNDIV is positive and that of PSDIV is negative, the

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[37] We used lagged values of EBIT/SALES, CAPX/SALES and Log of total assets in the pre-diversification years to control for observable characteristics which might affect the diversification decision.

[38] The estimates reported in Table 6 are for the sample of firms included when sales multipliers were used to calculate the excess value. The probit model was also estimated for the sample of firms included when asset multipliers were used to calculate excess values. These estimates were qualitatively similar and have not been reported in the paper. Though they have not been reported, the estimates were used to calculate the fitted

overall impact of these coefficients, evaluated at their means, is positive. An increase in the proportion of diversified firms in the industry, increases the probability of multiple segment operation for firms operating in the industry. An increase in the percentage of conglomerates by 3.3%, from its mean of 26.2 %, increase the probability of operating in multiple segments by 1%. A decrease in the percentage of sales of conglomerates by 20.8%, from its mean of 42.8%, leads to an increase in the probability of operating in multiple segments by 1%.

Similarly, we find that the coefficient of MNUM and MVOL are both significant. Once again, these variables should be examined jointly due to their high correlation. The overall impact of these variables, evaluated at their means, is positive. An increase in merger/acquisition activity leads to an increase in the probability of operating in multiple segments i.e. increases the probability of diversifying. An increase in the number of deals announced by 0.36 thousands, from its mean of 2.208 thousand, leads to an increase of 1% in the probability of multi-segment firm operations. A decrease in the total value of deals announced by 166 billion, from its mean of 168.5 billion dollars, leads to an increase of 1% in the probability of operating in multiple segments.

5.3 2SLS estimation

We use the estimated probability of operating in multiple segments from the probit models reported in Table 6, as a generated instrument for the diversification status. We then estimate the effect of diversification on firm value by a two stage least squares estimation. In the first stage we use all the exogenous variables along with the probability to diversify to calculate the estimated value of the endogenous variable i.e. *D*.[39] In the second stage, we use the

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probabilities and selectivity correction for the corresponding estimation of 2SLS model and self-selection model using asset multipliers.

[39] We also included PNDIV, PSDIV, MNUM and MVOL as exogenous variables instead of the generated probability of diversifying in the first stage, to instrument the diversification status. This tests the significance of the

fitted value from the first stage, as an instrument for *D*. Column 4 and 8 in Table 5, report the results of the two stage least squares estimation. We find that the coefficient of the instrumented *D* is 0.03 and is not significant when sales multipliers are used. The estimated discount was an insignificant 1% when asset multipliers were used.

To test for the existence of endogeneity, we use Hausman's test. Hausman test is based on the difference between the OLS estimator (which is consistent and efficient under the null hypothesis of no endogeneity and inconsistent under the alternative) and the IV estimator (which is consistent under both but inefficient under the null). Though the estimated coefficients of *D* are not significant, the Hausman test can reject the null of no endogeneity only at using sales(asset) multipliers. This arises because the coefficients in the two stage least squares have been estimated with large standard errors. This indicates the possibility of weak instruments, which introduce noise in the estimation procedure. This is also worrisome, because as Bound, Jaeger and Baker (1995) show that when instruments are weakly correlated with the endogenous explanatory variable, then even a small correlation between the instruments and the error can seriously bias estimates and lead to a large inconsistency in the IV estimates. They suggest reporting partial R^2 and F statistics on the instruments in the first stage regression as useful guides. We find that the probability of diversifying is highly significant, with a t statistic of 16, with the partial R^2 being 0.028.[40] This alleviates the concern that our estimation suffers from biases introduced on account of having weak instruments.

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non-linear functional form imposed in the probit estimation. We found that the estimated R^2 in the first stage in this case was always less than the R^2 when the fitted probability of operating in multiple segments was used. We therefore report all results using the estimated probability of diversification to instrument the diversification status.

[40] The R^2 of the regression without including probability of diversification was 0.006 (0.005) and increases to 0.028 (0.025) when the fitted probabilities are included in the regression with sales (asset multipliers).

5.4 Selection Model

Lastly, we report the results of a two-stage estimation of the endogenous self- selection model. The estimated parameters of the OLS estimation of equation (1) are reported in Columns 5 and 9 of Table 5. The estimated coefficient of *D* is + 0.159 (+0.024) with t-statistics of 1.5 (0.2) when using sales (asset) multipliers. There is no evidence of a significant discount associated with multi-segment years. The coefficient of l, is -0.144 (-0.06) with t-statistics of 2.8 (1.3) when sales (asset) multiplier are used. The estimated coefficient of l is negative as expected. This indicates the prevalence of self-selection and suggests that characteristics which make firms choose to diversify are negatively correlated with firm value i.e. firms with a higher probability of diversifying, also tend to be discounted.

In summary, there is little evidence in all three methods, that multiple segment years are discounted. There exists weak evidence of endogeneity when two stage least squares was used and significant evidence of negative correlation between the decision to diversify and firm value.

5.5 Including R&D

In this section we control for firm's growth opportunities by including the ratio R&D / SALES. Though including R&D might significantly explain differences in firm value, it leads to a substantial reduction in the sample. This raises the concern that selecting the sample based on firms that reported R&D may bias our results. To address this concern, we first examine the nature of biases created in our sample by selecting on R&D. Keeping this in mind, we then discuss the results of the three methods with the inclusion of R&D/SALES.

Sample selection Bias:

Table A1 (in the appendix) reports the difference between the full sample and the restricted sample of firms, which report R&D expenditure. On average firms in the R&D sample

are smaller in size, have lower profitability (EBIT /SALES), lower investment (CAPX / SALES) and lower leverage and in industries with slower sales growth.

The two samples differ in the representation of firms with different diversification profiles. The R&D sample has a smaller percentage of diversifying firms and has a higher percentage of refocusing firms.[41] There is no difference between the two samples in the average excess values, both as measured by sales multipliers and asset multipliers. There is no difference in excess values, between the two samples, for diversifying firms and refocusing firms as subgroups.

Results after controlling for R&D:

Table 7 reports the results of the estimation of firm value with the inclusion of R&D. We find that the discount in the basic model is 11%, with t statistics of 3.9, with both sales and asset multipliers. The coefficient of R&D is 0.93 (0.52) with a t-statistic of 10(8.4) when sales (asset) multipliers are used. Firms with higher research expenditures trade at a premium relative to median single segment firms in the industry. Including R&D also increases the fit of the model, with the R^2 increasing from 0.183 to 0.194 for sales multiplier.[42]

The results from the fixed effect estimations are displayed in Columns 3 and 7 of Table 7. The estimated discount when sales multipliers are used is 7% and significant at the 5% level. The discount of 3% estimated with asset multipliers is not significant. We estimate the probability of diversifying in this sample and include R&D/ SALES as an exogenous variable. The results displayed in Columns 5 to 8 of Table 6, show that R&D is significant in explaining the probability of operating in multiple segments. Firms with higher R&D are less likely to

[41] The R&D sample also has a smaller percentage of conglomerates who did not change their diversification status and firms that both increase and decrease their segments.

[42] The model was estimated in the restricted sample but without including R&D. The R^2 was 0.183. The results of the estimation are not reported in the paper in the interest of brevity.

diversify. An increase in the ratio of R&D to sales by 0.0006, from its mean of 0.048, decreases the probability of operating in multiple divisions by 1%. In this sample of firms, we find that firms with low profitability (EBIT / SALES) and low past investment (lagged CAPX/SALES) have a higher probability of operating in multiple segments i.e. of diversifying. However, these changes in the significance of profitability and past investment in this sample are on account of sample selection. The probit model estimated in this restricted sample, without including R&D gives the same results. We find that there is weak evidence that, both on account of sample selection and the inclusion of R&D, the probit model is better at predicting the probability of operating in multiple segments in this sample.

When we instrument the diversification status, the estimated discount associated with multiple segments turns into a premium of 45% (36%) which is significant at the 5% (10%) level using sales (asset) multipliers (Columns 4 and 7 in Table 7). The Hausman test rejected the null hypothesis of no endogeneity at the 1% level. Similar results are obtained from the self selection model. There is a premium of 43% (25%) significant at the 1% (not significant) level for sales (asset) multipliers. The coefficient of l is –0.27 (-0.17) significant at the 1% (5%) level for sales (asset) multipliers. The significance of both the estimated premium associated with multiple segment operations and the selectivity correction can be attributed to the inclusion of R&D / SALES rather than sample selection. When the two stage least squares and self selection models were estimated in the smaller sample but without R&D, none of the estimated premiums were significant.

Overall, there is little evidence that multi-segment years of diversifying firms are discounted. When controlling for R&D, there is a significant premium associated with multi-segment years. This supports the view that for these firms, diversification was a value-enhancing

decision. There is also significant evidence of endogeneity and a negative correlation between firm's decision to diversify and firm value.

VI. REFOCUSING FIRMS

Evidence on the value destruction associated with multiple segment firms also comes from observed gains achieved by refocusing firms. These gains have been documented by Comment and Jarrell (1995), John and Ofek (1995) and Berger and Ofek (1996). In this section, we examine the firm's decision to refocus in a sample of single segment firms and all refocusing firms.[43] Like before, the results with R&D/ SALES are reported in a separate section.

As shown in Columns 2 and 5, of Table 8, in the basic model estimated by OLS, multi-segment years are associated with a 14% (10%) discount when using sales (asset) multipliers which is significant at the 1% (1%) level. The results from the fixed effects estimations are reported in Columns 3 and 6 of Table 8 and show no change in the estimated discounts from the basic model.[44]

For this sample of refocusing firms, a probit model is used to estimate the probability of operating in multiple segments. The results from the probit estimation are displayed in Columns 2 to 5 of Table 9. The probit model better explains the probability of multiple segment operations for refocusing firms than diversifying firms, with the likelihood ratio index of 0.19 instead of

[43] This sample includes firms that refocus once to single segments, refocus once to multiple segments and refocus multiple times along with all single segment firms.

[44] For firms which refocus controlling for observable firm characteristics in the pre focus years is very important. Observable firm characteristics were significant when the model was estimated in a sample of single segment firms and firms which refocus once to single segment firms. Inclusion of observable characteristics like firm size, profitability (EBIT/ SALES) and investment (CAPX/ SALES) in the pre focus years significantly reduces the estimated discount. Inability of method 1 to control for these pre-focus characteristics in this sample results in a weak correction for endogeneity. The importance of observable characteristics is also manifest in the pre focus trend seen in Figure 2. We do not report the results of this estimation in the sample of single segment firms and multi-segment firms which refocus once to single segment. This is because the results are qualitatively similar to the full sample (all refocusing firms) results reported. Besides, multiple segment firm years account for 11% of all observations in the full sample and only 2.7% in the smaller sample of refocusing firms.

0.056. This is also manifest in t-statistics of individual variables. The coefficient of log of total assets and its lagged value are significant. The overall impact of firm size, evaluated at the means is positive. Larger firms have a higher probability of operating in multiple segments.

Firms with high profitability (EBIT/ SALES) in the current and past years are less likely to operate in multiple segments or more likely to refocus. An increase in EBIT/ SALES of 0.003 from its mean of 0.084, decreases the probability of operating in multi-segments by 1%. Similarly, an increase in lagged EBIT/SALES of 0.004, from its mean of 0.09, decreases the probability of operating in multiple segments by 1%.

We also find that firms with low investments (CAPX / SALES) in the last two years are more likely to refocus. An increase in lagged (1 lags) CAPX / SALES by 0.001, from its mean of 0.099, decreases the probability of operating in multiple segments by 1%. An increase in lagged (2 lags) CAPX / SALES by 0.0005, from its mean of 0.107, decreases the probability of operating in multiple segments by 1%. Past profitability, investment and size are better at explaining the decision to refocus than the decision to diversify.

Like diversifying firm, industry characteristics are significant. An increase in the percentage of conglomerates by 2.4%, from it mean of 27.3%, increases the probability of operating in multiple segments by 1%. Not surprisingly, years of high merger activity, captured by MNUM leads to a higher probability of refocusing i.e. operating in single segments. An increase of the number of announced deals by 0.45 thousand, from its mean of 2.178 thousand, leads to a decrease in the probability of operating in multiple segments by 1%. This effect of merger activity on probability of operating in multiple segments in refocusing firms is of the opposite sign in comparison to diversifying firms. Favorable markets for mergers/acquisitions

increase the probability of changes in diversification status, i.e. increases the probability of diversifying for single segment firms and of refocusing for diversified firms.

The fitted probability of operating in multiple segments is used to instrument for multiple segments years in the two stage estimation. A better fit of the probit model is also reflected in the significance of the fitted probabilities in the first stage, with the t statistic being 47 and the partial R^2 being 0.129.[45] The results shown in Column 4 and 8 of Table 8 show that the discount associated with multi segment years increases to 23% (15%) when using sales (asset) multipliers and is significant at the 1% (1%) level. There also exists evidence of endogeneity as the Hausman test rejects the null hypothesis of no endogeneity when using sales (asset) multipliers.

Similar results are obtained with the self-selection model. The estimated discount increases to 21% (12%) when using sales (asset) multipliers and is significant at the 1% (1%) level. The coefficient of l, the selectivity correction is 0.04 (0.012) with t statistics of 2(0.6) when using sales (asset) multipliers. In contrast to diversifying firms, the coefficient of selectivity bias is positive i.e. characteristics which make firms choose to refocus are positively correlated with excess value. After controlling for firm characteristics, which cause firms to refocus, the estimated discount on multi-segment years increases and is significant. These firms consequently, increase value when they refocus

Including R&D

Next we examine, the effect of controlling for R&D in this sample of single segment and refocusing firms. We find that the estimated discount in the basic model is 16% (10%) with t statistics of 9(5) using sales (asset) multipliers as shown in Column 2 and 6 of Table 10. Once

[45] Though this high significance may merely be a manifestation of a good instrument, it has to be interpreted carefully. If the instrument is very highly correlated with the endogenous variable, it may also be correlated with the

again the coefficient of R&D is highly significant. Firms with high research and development have higher excess values i.e. trade at a premium.

Columns 3 and 7 report the results when fixed firm effects are introduced. The estimated discount increases to 19.5% (22.4%) when sales (asset) multipliers are used, and is significant at the 1% (1%) level. Table 9, Columns 5 to 7 report the results of the probit estimation for this sample. We find that the coefficient of R&D / SALES is significant. An increase in R&D/ SALES by 0.0003 from its mean value of 0.046, decreases the probability of operating in multiple segments by 1%. The results for the remaining variables are qualitatively similar to the probit model estimated in the full sample of refocusing firms and is discussed earlier.

When the two stage least squares was estimated, the discount associated with multiple segment increases to 18% (11%) and significant at the 1% (5%) level for sales (asset) multipliers. With the selection model, the estimated discount was 20% (10%) and significant at the 1% (5%) level. The coefficient for the selectivity correction was not significant in the R&D sample. When the model was estimated in this restricted sample but without including R&D/ SALES the estimated discount was higher. The coefficient of the selectivity correction was also higher and significant at the 10% level. Controlling for R&D/ SALES reduces the prevalence of self-selection for focusing firms, in contrast to the results seen in the sample of diversifying firms.

R&D/ SALES is significant in explaining the decision of firms to operate in multiple segments, as well as, in explaining relative firm value. We find that including R&D / SALES reduces the evidence of self-selection in the sample of refocusing firms. This suggests that R&D / SALES is a good proxy for firm characteristics, which cause firm's to refocus as well as affect

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error making it an unfit instrument to control for endogeneity. The relatively low R^2 in the first-stage regression suggests this is not a problem in this case.

firm value. For diversifying firm we find that including R&D, increases the prevalence of self-selection. This suggests the existence of other unobservable and observable characteristics, which cause firms to diversify and to be discounted.[46] This greater explanatory power of R&D/SALES for refocusing firms in comparison to diversifying firms is also evident in the marginal effect of R&D /SALES in the probit estimation. The marginal effect of R&D/SALES for the sample with refocusing firms (-0.347) is twice that of diversifying firms (-0.173).

VII. CONCLUSION

Firms choose the extent of their operations and decide whether to operate in a single industry, diversify into multiple industries or refocus their operations. A firm's choice to diversify its likely to be a response to exogenous changes in the firm's environment that are also affecting the firm's value. In this case, the observed correlation between diversification and firm value is not causal.

We model the effect that this endogeneity problem might have in the observed correlation between diversification and firm value. We use panel data and instrumental variables to control for the exogenous characteristics that predict the decision to diversify. Once these observed firm characteristics and firm fixed effects are controlled for, the evidence on the existence of a diversification discount is substantially weaker. When a firm's decision to diversify its operations and its value are jointly estimated, the diversification discount is more likely to be a

[46] Variation in R&D/SALES, accounts for some of the variation in the error terms in both the value as well as the diversification equation. Controlling for R&D/ SALES explains some of the variation in the error terms. As there is no evidence of endogeneity in the sample or refocusing firms, this suggests that the residual errors are pure noise. Inclusion of R&D / SALES therefore serves as a control for endogeneity of the refocusing decision, in the sample of refocusing firms. However, as the evidence of endogeneity for diversifying firms increases, this suggests that controlling for R&D /SALES explains some of the noise, leaving the residual errors more highly correlated. This is indicative of the existence of other observable and unobservable firm characteristics which cause firms both to diversify as well as be discounted.

premium, suggesting that diversification is a value enhancing strategy for those firms that actually pursue it.

We follow a similar strategy to evaluate the correlation between value and the decision to refocus. The results are remarkably similar for this case. Firms that refocus their operations would have suffered a significant decrease in value if they had remained as diversified firms. This evidence suggests that the observed correlation between diversification and firm value need not be causal but rather the outcome of actions by profit maximizing firms reacting to shocks to their environments.

Our results highlight the value of constructing more complete models of the interaction between firm strategies and firm value. We view more work in this area as desirable. The development of a dynamic model that will jointly allow for both diversification and focus by firms in response to changes in their economic environment and that could also be structurally estimated with the available data seems to us to be the long-run objective. Some of the recent work is already pointing in that direction (Maksimovic and Phillips 1998) with promising results. Short of a full dynamic structural model, the evidence in this paper highlights the importance of identifying large exogenous shocks to firms to adequately evaluate the relationship between firm choices and equilibrium outcomes.

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TABLE 1
Estimation of the Diversification Discount

The dependent variable is excess value, defined as the log of the ratio of total market value to imputed value using median industry multipliers. The first three columns report the results using sales multiplier and the last four columns report the results using asset multipliers. Column 5 reports the results of the estimation when the sample consists of all firms years between 1986 and 1991 and with sales greater than $20 million. The t statistics are reported in the parenthesis below.

	Sales	Sales	Sales	Asset	Asset Sales>20	Asset	Asset
Constant	-0.28 (28)	-0.68 (22)	-0.63 (21)	-0.08 (9)	-0.13 (8)	-0.46 (16)	-0.38 (14)
D	-0.14 (19)	-0.13 (16)	-0.12 (14)	-0.13 (19)	-0.12 (9.7)	-0.12 (16)	-0.11 (14)
Log of Total Assets	0.033 (17)	0.16 (14)	0.48 (25)	0.012 (7)	0.015 (4.8)	0.13 (13)	0.39 (25)
EBIT / SALES	0.57 (30)	0.55 (25)	0.48 (19)	0.035 (8)	0.52 (19)	0.20 (17)	0.30 (18)
CAPX / SALES	0.43 (26)	0.47 (22)	0.24 (9)	0.053 (7)	0.04 (1.62)	0.02 (2.2)	-0.06 (5)
INDGROW		0.047 (3.1)	0.035 (2.3)			-0.01 (0.9)	-0.02 (1.3)
INDGROW (Lag)		0.05 (3.8)	0.048 (3.5)			0.02 (1.79)	0.014 (1.1)
DEBT/ TOTAL ASSETS		-0.046 (2.3)	-0.01 (0.5)			-0.11 (5.7)	-0.08 (4.2)
(Log of Total assets)^2		-0.01 (9.8)	-0.007 (6.8)			-0.008 (9.6)	-0.005 (6)
Log of Total Assets (1 lag)			-0.19 (8)				-0.15 (7.3)
EBIT / SALES (1 lag)			0.05 (3.2)				0.04 (3.5)
CAPX / SALES (1 lag)			0.11 (8)				0.06 (6.2)
Log of Total Assets (2 lag)			-0.17 (11)				-0.16 (12)
EBIT / SALES (2 lag)			0.01 (1.3)				-0.01 (2)
CAPX / SALES (2 lag)			0.01 (2.2)				0.004 (1.3)
# of obs R^2	29129 0.084	21301 0.103	21011 0.14	29037 0.016	8569 .058	21111 0.043	20805 0.093

TABLE 2

Distribution of Firms by Diversification Profiles

This table reports the breakdown of firms in our sample by different diversification profiles. The sample consists of all firms reporte to 1996, with no financial segments and with average sales for the period greater than 20 million dollars.

	Number of Firms	Firm
Firms which were always in single segments	*2853*	
Firms which diversify	*227*	
Firms that diversified once from 1 segment to more	146	
Firms that diversified once from multiple segment to more	49	
Firms that diversified multiple times	32	
Firms which Refocus	*353*	
Firms that refocus once from multiple to single	178	
Firms that refocus once from multiple to multiple	76	
Firm that refocus multiple times	99	
Firms that both focused and diversified	*459*	
Multi segment firms which did not change the number of segments	*260*	

TABLE 3
Summary Statistics by Diversification Profile

The table displays descriptive statistics for firms classified according to their diversification profile. Total assets are measured in mil
CAPX/SALES is the ratio of capital expenditures to total sales, EBIT/ SALES is the ratio of EBIT to total sales, DEBT/TA is the r
assets. INDGROW is the growth rate in industry sales, and R&D/SALES is the ratio of R&D expenditure to sales.

	Total Asset		CAPX/ SALES		EBIT/SALES		DEBT / TA	
	Median	Mean	Median	Mean	Median	Mean	Median	Mean
Were always single segment firms	106	711	0.05	0.13	0.083	0.06	0.13	0.18
Firms which diversify	150[a]	1269[a]	0.058[a]	0.134	0.096[a]	0.092[a1]	0.177[a]	0.21[a]
Firms that diversify once from 1 to more	100	1005	0.056	0.12	0.095	0.08	0.17	0.21
Firms that diversify once from multi	246	1943	0.062	0.12	0.10	0.10	0.20	0.22
Firms that diversify more than once	557	1554	0.062	0.20	0.09	0.11	0.16	0.19
Firms which Refocus	190.6[a,b]	1298[a]	0.046[a,b]	0.08[a,b]	0.086[b]	0.093[a]	0.18[a]	0.21[a]
Firms that refocus once from to single	120	1282	0.044	0.09	0.085	0.08	0.17	0.21
Firms that refocus once to multiple	442	1684	0.05	0.08	0.098	0.12	0.17	0.19
Firm that refocus multiple times	231	1082	0.047	0.06	0.08	0.09	0.19	0.21
Firms that both focused and diversified	237[a]	1626[a,b,c]	0.045[a,b]	0.10[a,b,c]	0.08[a,b,c]	0.04[b,c]	0.19[a]	0.22[a,b,c]
Multi segment firms with no change	321[a]	1679[a,b,c]	0.059[a,c]	0.1[a1,b,c]	0.10[a,b,c]	0.11[a,c1]	0.2[a]	0.21[a]

a. The difference with single segment firms is significant at 1%
b. The difference with diversifing firm s is significant at the 1%
c. The difference with refocusing firms is significant at 1%
1. The difference is significant at 5%.

TABLE 4
Summary Statistics of Excess Value by Diversification Profiles

The following table reports summary statistics for excess value for firms with different diversification profiles. Excess value is the l market value to imputed value of the firm. Columns 2 to 5, display results when sales multipliers were used to calculate imputed va results when asset multipliers were used to calculate the results.

	SALES MULTIPLIERS				ASSET MULT	
	Median	Mean	Std	Obs.	Median	Mean
Single Segment Firms	0	-0.008	0.57	17714	0	0.007
Firms which diversify once from one to more segments	-0.10	-0.12	0.56	1308	-0.06	-0.064
Single segment firm years	-0.07	-0.08	0.57	783	-0.02	-0.021
Multiple Segment firm years	-0.14	-0.17	0.54	525	-0.125	-0.14
Firms which diversify once from multiple segments						
Multiple Segment firm years	-0.06	-0.09	0.59	366	-0.03	-0.025
Firms which diversify more than once	-0.13	-0.16	0.53	307	-0.17	-0.227
Single segment firm years	-0.17	-0.22	0.61	100	-0.19	-0.247
Multiple segment firm years	-0.07	-0.13	0.48	207	-0.16	-0.212
Firms which refocus once from to single segments	-0.01	-0.04	0.58	1717	-0.03	-0.04
Single Segment Firms years	0.03	-0.01	0.57	1065	0	-0.01
Multiple segment firm years	-0.07	-0.10	0.58	652	-0.09	-0.079
Firms which refocus once to multiple segments						
Multiple segment firm years	-0.13	-0.11	.051	731	-0.06	-0.06
Firms which refocus more than once	-0.22	-0.18	0.56	1205	-0.16	-0.14
Single segment firm years	-0.11	-0.09	0.61	330	-0.075	-0.084
Multiple segment firm years	-0.25	-0.21	0.54	875	-0.175	-0.169
Conglomerate which had no change of status						
Multiple segment firm years	-0.05	-0.07	0.55	1520	-0.04	-0.053
Firms which both increased and decreased segments	-0.16	-0.14	0.58	5236	-0.16	-0.14
Single segment firm years	-0.10	-0.1	0.64	1719	-0.09	-0.085
Multiple segment firm years	-0.18	-0.17	0.54	3517	-0.19	-0.174

TABLE 5

Effect of Multiple Segment Operations on Firm Value of Diversifying Firms

The sample consists of single segment firms and all diversifying firms. The dependent variable is excess value, which is the ratio of firm value to its imputed value. Columns 2 to 5 (Columns 6 to 9) report results when sales (asset) multipliers are used to calculate imputed value. The basic model does not make any correction for endogeneity. Method 1 introduces fixed firm effects, Method 2 reports results of a two stage least squares estimation and Method 3 estimates a self-selection model. T-statistics are given in parenthesis below

	SALES MULITPLIERS				**ASSET MULTIPLIERS**			
		Method 1	Method 2	Method 3		Method 1	Method 2	Method 3
	Basic	Fixed	2SLS	Selection	Basic	Fixed	2SLS	Selection
Constant	-0.71		-0.72	-0.719	-0.39		-0.404	-0.404
	(18.4)		(18.2)	(18.6)	(11.9)		(11.9)	(12.0)
D	-0.127	-0.039	0.031	0.159	-0.104	-0.054	-0.008	0.024
	(6.9)	(1.4)	(0.3)	(1.5)	(6.0)	(2.0)	(0.1)	(0.2)
Log of Total Assets	0.575	0.233	0.576	0.573	0.452	0.088	0.452	0.452
	(24.0)	(8.8)	(23.8)	(23.6)	(22.0)	(3.7)	(22.0)	(22.0)
EBIT / SALES	0.477	0.166	0.47	0.473	0.282	0.175	0.282	0.282
	(14.5)	(5.7)	(14.5)	(14.5)	(13.9)	(10.1)	(13.9)	(13.9)
CAPX / SALES	0.178	0.231	0.179	0.179	-0.071	-0.048	-0.072	-0.072
	(5.6)	(8.2)	(5.6)	(5.6)	(6.0)	(5.1)	(6.1)	(6.1)
INDGROW	0.001	0.014	0.003	0.005	-0.032	-0.001	-0.03	-0.029
	(0.03)	(1.1)	(0.2)	(0.3)	(1.91)	(0.1)	(1.8)	(1.76)
INDGROW (lag)	0.031	0.028	0.034	0.035	0.004	0.013	0.005	0.005
	(1.9)	(2.3)	(2.1)	(2.1)	(0.3)	(1.2)	(0.4)	(0.4)
Log of TA (1lag)	-0.229	-0.237	-0.227	-0.225	-0.17	-0.127	-0.169	-0.168
	(7.2)	(11.0)	(7.2)	(7.0)	(6.3)	(6.4)	(6.3)	(6.2)
EBIT / SALES (1 lag)	0.047	0.017	0.046	0.045	0.038	0.02	0.039	0.039
	(2.5)	(1.2)	(2.4)	(2.4)	(2.75)	(1.7)	(2.8)	(2.8)
CAPX / SALES (1 lag)	0.143	0.064	0.145	0.145	0.067	0.04	0.067	0.067
	(8.4)	(4.8)	(8.4)	(8.4)	(5.5)	(4.0)	(5.5)	(5.5)
Log of TA (2 lag)	-0.194	-0.127	-0.195	-0.197	-0.19	-0.114	-0.191	-0.192
	(10.0)	(8.9)	(10.0)	(10.0)	(11.4)	(8.4)	(11.4)	(11.5)
EBIT / SALES (2 lag)	0.003	-0.003	0.003	0.004	-0.009	0.004	-0.009	-0.009
	(0.3)	(0.4)	(0.3)	(0.4)	(1.77)	(1.1)	(1.8)	(1.74)
CAPX / SALES (2 lag)	0.008	0.005	0.008	0.007	0.004	0.002	0.004	0.004
	(2.0)	(1.88)	(2.0)	(2.0)	(1.2)	(0.8)	(1.2)	(1.2)
DEBT / TA	-0.089	0.2	-0.09	-0.089	-0.149	-0.013	-0.152	-0.15
	(3.4)	(6)	(3.5)	(3.4)	(6.4)	(0.4)	(6.5)	(6.5)
Log of TA^2	-0.009	0.016	-0.009	-0.009	-0.006	0.01	-0.006	-0.006
	(7.1)	(7.7)	(7.2)	(7.3)	(5.3)	(6)	(5.3)	(5.3)
l				-0.144				-0.06
				(2.8)				(1.3)
Hausman Test			1.67				0.63	
(P-Value)			(0.19)				(0.420	
T statistics: first stage			16.9				16.5	
Partial R^2 of first stage			0.022				0.02	
No. of Observations	12821	12821	12821	12821	13232	13232	13232	13232
Adjusted R square	0.159	0.629	0.154	0.159	0.105	0.557	0.102	0.105
F statistic	174	12.8	168	163	111	9.8	109	104

TABLE 6

Probit Estimates for Diversifying Firms

The dependent variable takes the value 1 when the firm operates in multiple segments and zero otherwise. Model 1 results, reported probit estimation for a sample of single segment firms and all diversifying firms. Model 2 results reported in columns 5 to 7 display t sample of single segment firms and all diversifying firms which have R&D expenditures on Compustat. All probit estimates displ the sales multiplier samples. The results for the asset multiplier sample are qualitatively the same and have not been reported. PNDI in the industry, which are conglomerates and PSDIV is the fraction of sales by other firms in the industry accounted for by conglom of announced mergers/ acquisitions in the year and MVOL is the value of announced mergers/ acquisitions in the year. Columns 3 a columns 4 and 7 report marginal effects estimated at the mean values of the variables.

	MODEL 1			**MODEL 2**		
	Coefficient	T-stat	Marginal effect	Coefficient	T-stat	Marg
CONSTANT	-2.98	-29.4	-0.343	-2.96	-19.4	
LOG OF TOTAL ASSETS	0.123	1.5	0.014	0.113	0.91	
EBIT / SALES	-0.319	-2.5	-0.037	-0.667	-2.7	
CAPX/ SALES	0.066	0.5	0.008	0.002	0.004	
GROWTH RATE	0.031	0.4	0.004	0.018	0.1	
GROWTH RATE (LAG)	0.017	0.2	0.002	0.024	0.19	
R&D / SALES				-1.88	-3.5	
PNDIV	0.027	14.1	0.003	0.025	9.2	
PSDIV	-0.004	-4	-0.0005	-0.003	-2.1	
MVOL	-0.0005	-1.86	-0.00006	-0.0009	-1.96	
MNUM	0.245	6.8	0.028	0.281	5.0	
LOG OF TA (1 Lag)	-0.108	-0.9	-0.013	-0.104	-0.6	
EBIT / SALES (1 Lag)	0.034	0.4	0.004	-0.081	-0.5	
CAPX/ SALES (1 Lag)	-0.073	-0.96	-0.008	-0.341	-0.6	
LOG OF TA (2 Lag)	0.07	0.9	0.008	0.103	0.8	
EBIT / SALES (2 Lag)	-0.029	-1	-0.003	-0.016	-0.09	
CAPX/ SALES (2 Lag)	-0.034	-0.4	-0.004	-1.461	-2.7	
Number of observations	12821			6843		
Maximized likelihood	-2988			-1366.2		
Likelihood Ratio Index	0.056			0.073		
% of positive observations	6.74			5.6		

TABLE 7
Effect of Multiple Segment Operations on Firm Value of Diversifying Firms (II)

The sample consists of single segment firms and all diversifying firms which report R&D expenditures on Compustat. The dependent variable is excess value, which is the ratio of firm value to its imputed value. Columns 2 to 5 (Columns 6 to 9) report results when sales (asset) multipliers are used to calculate imputed value. The basic model does not make any correction for endogeneity. Method 1 introduces fixed firm effects, Method 2 reports results of a two stage least squares estimation and Method 3 estimates a self-selection model. T-statistics are given in parenthesis below.

	SALES MULTIPLIERS				**ASSET MULTIPLIERS**			
		Method 1	Method 2	Method 3		Method 1	Method 2	Method 3
	Basic	Fixed	2SLS	Selection	Basic	Fixed	2SLS	Selection
Constant	-0.652		-0.729	-0.673	-0.289		-0.329	-0.302
	(12.5)		(12.2)	(12.8)	(6.1)		(6.4)	(6.3)
D	-0.108	-0.074	0.449	0.429	-0.11	-0.029	0.359	0.245
	(3.9)	(1.79)	(2.39)	(2.9)	(3.87)	(0.7)	(1.72)	(1.5)
Log of Total Assets	0.54	0.176	0.551	0.531	0.446	0.07	0.453	0.445
	(15.5)	(4.7)	(15.3)	(15.1)	(14.8)	(2)	(14.7)	(14.7)
EBIT / SALES	0.724	0.331	0.76	0.756	0.479	0.28	0.5	0.494
	(12.6)	(6.2)	(12.6)	(12.7)	(12.4)	(7.9)	(12.4)	(12.5)
CAPX / SALES	0.29	0.316	0.3	0.302	-0.068	-0.052	-0.066	-0.066
	(4.5)	(5.8)	(4.5)	(4.5)	(1.2)	(1)	(1.0)	(1.1)
INDGROW	-0.015	0.005	-0.004	-0.004	-0.004	-0.022	-0.035	-0.037
	(0.5)	(0.2)	(0.1)	(0.1)	(1.5)	(1)	(1.2)	(1.2)
INDGROW (lag)	0.024	0.027	0.03	0.03	0.009	0.009	0.016	0.014
	(0.8)	(1.3)	(1.0)	(1.1)	(0.3)	(0.4)	(0.6)	(0.5)
R&D / SALES	0.929	1.07	1.03	1.02	0.52	0.26	0.563	0.55
	(9.6)	(6.3)	(9.8)	(10.0)	(8.4)	(3.4)	(8.6)	(8.6)
Log of TA (1lag)	-0.256	-0.27	-0.25	-0.25	-0.22	-0.168	-0.218	-0.22
	(5.8)	(8.5)	(5.5)	(5.5)	(5.7)	(5.7)	(5.5)	(5.5)
EBIT / SALES (1 lag)	0.091	0.067	0.094	0.09	0.035	0.003	0.036	0.036
	(3.7)	(3.1)	(3.7)	(3.7)	(1.68)	(0.2)	(1.7)	(1.7)
CAPX / SALES (1 lag)	0.169	0.156	0.194	0.19	0.118	0.092	0.136	0.13
	(2.0)	(2.2)	(2.3)	(2.3)	(1.64)	(1.5)	(1.8)	(1.8)
Log of TA (2 lag)	-0.185	-0.09	-0.19	-0.19	-0.20	-0.107	-0.207	-0.20
	(7.0)	(4.3)	(6.9)	(7.0)	(8.4)	(5.2)	(8.4)	(8.5)
EBIT / SALES (2 lag)	-0.005	0.004	-0.003	-0.003	-0.013	-0.014	-0.01	-0.011
	(0.4)	(0.4)	(0.3)	(0.3)	(1.0)	(1.4)	(0.9)	(0.9)
CAPX / SALES (2 lag)	0.057	0.075	0.076	0.076	-0.034	-0.074	-0.018	-0.02
	(1.2)	(1.7)	(1.5)	(1.5)	(0.6)	(1.5)	(0.3)	(0.4)
DEBT / TA	-0.05	0.063	-0.031	-0.04	-0.196	-0.135	-0.187	-0.196
	(1.2)	(1.2)	(0.7)	(1.0)	(5.0)	(2.8)	(4.7)	(5.0)
Log of Total Asset^2	-0.003	0.02	-0.005	-0.003	0.002	0.018	0.001	0.002
	(1.4)	(7.3)	(2.4)	(1.6)	(1.0)	(6.5)	(0.4)	(1.0)
l				-0.265				-0.169
				(3.7)				(2.2)
Hausman test			8.97				5.17	
(P-Value)			(0.00)				(0.02)	
T statistics- first stage			12.6				11.8	
Partial R^2 of first stage			0.023				0.019	
No. of Observations	6843	6843	6843	6843	7024	7024	7024	7024
Adjusted R square	0.192	0.62	0.144	0.193	0.139	0.55	0.106	0.139
F statistic	109	11.8	78	104	77	9.2	57	72.4

TABLE 8
Effect of Multiple Segment Operations on Firm Value of Refocusing Firms

The sample consists of single segment firms and all refocusing firms. The dependent variable is excess value, which is the ratio of firm value to its imputed value. Columns 2 to 5 (Columns 6 to 9) report results when sales (asset) multipliers are used to calculate imputed value. The Basic model does not make any correction for endogeneity. Method 1 introduces fixed firm effects, Method 2 reports the results of a two stage least squares estimation and Method 3 estimates a self-selection model. T-statistics are given in parenthesis below

	SALES MULTIPLIERS				**ASSET MULTIPLIERS**			
		Method 1	Method 2	Method 3		Method 1	Method 2	Method 3
	Basic	Fixed	2SLS	Selection	Basic	Fixed	2SLS	Selection
Constant	-0.71		-0.709	-0.706	-0.413		-0.413	-0.412
	(19.0)		(19.3)	(19.2)	(12.8)		(12.8)	(12.8)
D	-0.139	-0.137	-0.234	-0.209	-0.096	-0.126	-0.148	-0.116
	(9.8)	(6.2)	(6)	(5.6)	(7.0)	(5.6)	(3.9)	(3.2)
Log of Total Assets	-0.559	0.259	0.557	0.556	0.435	0.089	0.434	0.434
	(24.0)	(10.2)	(24)	(24.0)	(22.0)	(3.9)	(22.0)	(21.9)
EBIT / SALES	0.424	0.185	0.426	-0.425	0.295	0.226	0.295	0.295
	(12.0)	(6)	(12.5)	(12.5)	(14.1)	(12.1)	(14.0)	(14.0)
CAPX / SALES	0.201	0.262	0.195	0.196	-0.066	-0.083	-0.066	-0.066
	(6.0)	(9.2)	(5.8)	(5.9)	(2.8)	(4.2)	(2.9)	(2.86)
INDGROW	0.031	0.037	0.03	0.03	-0.013	0.009	-0.014	-0.013
	(1.76)	(2.9)	(1.7)	(1.72)	(0.8)	(0.7)	(0.9)	(0.8)
INDGROW (lag)	0.044	0.036	0.043	0.044	0.017	0.02	0.017	0.017
	(2.9)	(3.2)	(2.8)	(2.86)	(1.3)	(1.9)	(1.3)	(1.3)
Log of TA (1lag)	-0.229	-0.237	-0.23	-0.231	-0.165	-0.124	-0.166	-0.166
	(7.4)	(10.8)	(7.4)	(7.4)	(6.3)	(6.4)	(6.3)	(6.3)
EBIT / SALES (1 lag)	0.059	0.035	0.061	0.061	0.01	0.024	0.011	0.011
	(1.77)	(1.4)	(1.8)	(1.81)	(0.5)	(1.5)	(0.5)	(0.5)
CAPX / SALES (1 lag)	0.043	0.061	0.04	0.041	0.03	-0.007	0.029	0.03
	(1.4)	(2.6)	(1.3)	(13.0)	(1.1)	(0.3)	(1.1)	(1.1)
Log of TA (2 lag)	-0.183	-0.109	-0.176	-0.178	-0.175	-0.099	-0.172	-0.174
	(9.5)	(7.1)	(9.0)	(9.2)	(10.6)	(7.3)	(10.4)	(10.5)
EBIT / SALES (2 lag)	0.155	0.1	0.153	0.154	0.05	0.023	0.049	0.049
	(6.2)	(5.1)	(6.1)	(6.2)	(2.4)	(1.3)	(2.3)	(2.4)
CAPX / SALES (2 lag)	0.057	0.043	0.05	0.05	0.026	-0.02	0.022	0.024
	(2.5)	(2.3)	(2.0)	(2.3)	(1.3)	(1.2)	(1.1)	(1.2)
DEBT / TA	-0.049	0.19	-0.05	-0.05	-0.15	0.028	-0.151	-0.152
	(1.96)	(6.1)	(7.1)	(2.0)	(6.7)	(1.0)	(6.7)	(6.8)
Log of Total Asset^2	-0.008	0.012	-0.008	-0.008	-0.006	0.01	-0.006	-0.006
	(7.2)	(6.2)	(6.0)	(7.0)	(5.6)	(5.4)	(5.5)	(5.5)
l				0.04				0.012
				(2.0)				(0.6)
Hausman test			6.9				2.08	
(P- Value)			(0.01)				(0.15)	
T statistics : first stage			47				45.8	
Partial R^2 of first stage			0.129				0.121	
No. of Observations	14151	14151	14151	14151	14432	14432	14432	14432
Adjusted R square	0.16	0.624	0.158	0.161	0.1	0.557	0.1	0.1
F statistic	194	12.9	190	181	115	10.1	114	107

TABLE 9

Probit Estimates for Refocusing Firms

The dependent variable takes the value 1 when the firm operates in multiple segments and zero otherwise. Model 1 results, reported probit estimation for a sample of single segment firms and all refocusing firms. Model 2 results reported in columns 5 to 7 display th of single segment firms and all refocusing firms which have R&D expenditures on Compustat. All probit estimates displayed are f multiplier samples. The results for the asset multiplier sample are qualitatively the same and have not been reported. PNDIV is the f industry, which are conglomerates and PSDIV is the fraction of sales by other firms in the industry accounted for by conglomerates. announced mergers/ acquisitions in the year and MVOL is the value of announced mergers/ acquisitions in the year. Columns 3 and columns 4 and 7 report marginal effects estimated at the mean values of the variables.

	MODEL 1			**MODEL 2**		
	Coefficient	T-stat	Marginal effect	Coefficient	T-stat	Mar
CONSTANT	-2.64	-31.7	-0.332	-2.78	-24.3	
LOG OF TOTAL ASSETS	-0.17	-1.95	-0.021	-0.415	-3.2	
EBIT / SALES	-0.271	-2.2	-0.034	-0.177	-0.6	
CAPEX/ SALES	-0.244	-1.2	-0.031	-0.782	-1.4	
GROWTH RATE	0.002	0.03	0.0002	-0.093	-0.9	
GROWTH RATE (Lag)	0.031	0.5	0.004	-0.128	-1.2	
R&D / SALES				-2.78	-4.9	
PNDIV	0.033	20.5	0.004	0.032	14.2	
PSDIV	-0.0015	-1.73	-0.0002	0.0005	0.45	
MVOL	0.0003	1.1	0.00004	0.00032	0.8	
MNUM	-0.177	-5.7	-0.022	-0.183	-4.2	
LOG OF TA (1 Lag)	-0.132	-0.9	-0.017	-0.061	-0.3	
EBIT / SALES (1 Lag)	0.067	0.5	0.008	0.199	0.7	
CAPEX/ SALES (1 Lag)	-0.550	-2.2	-0.069	-0.681	-1.2	
LOG OF TA (2 Lag)	0.495	5.6	0.062	0.730	5.6	
EBIT / SALES (2 Lag)	-0.193	-1.73	-0.024	-0.318	-1.4	
CAPEX/ SALES (2 Lag)	-1.74	-7.5	-0.219	-1.78	-3.6	
Number of observations	14151			7816		
Maximized likelihood	-3937.2			-2152.28		
Likelihood Ratio Index	0.192			0.245		
% of Positive observations	10.9			11.9		

Table 10
Effect of Multiple Segment Operations on Firm Value of Refocusing Firms (II)

The sample consists of single segment firms and all refocusing firms with R&D expenditures reported on Compustat. The dependent variable is excess value, which is the ratio of firm value to its imputed value. Columns 2 to 5 (Columns 6 to 9) report results when sales (asset) multipliers are used to calculate imputed value. The basic model does not make any correction for endogeneity. Method 1 introduces fixed firm effects, Method 2 reports results of a two stage least squares estimation and Method 3 estimates a self-selection model. T-statistics are given in parenthesis below

	SALES MULTIPLIERS				**ASSET MULTIPLIERS**			
	Basic	Method 1 Fixed	Method 2 2SLS	Method 3 Selection	Basic	Method 1 Fixed	Method 2 2SLS	Method 3 Selection
Constant	-0.694		-0.692	-0.692	-0.356		-0.356	-0.356
	(14.3)		(14.3)	(14.3)	(8.2)		(8.2)	(8.2)
D	-0.164	-0.195	-0.184	-0.195	-0.099	-0.224	-0.108	-0.096
	(8.7)	(6.1)	(3.9)	(4.3)	(5.3)	(6.9)	(2.3)	(2.0)
Log of Total Assets	0.513	0.227	0.511	0.509	0.439	0.084	0.439	0.44
	(15.7)	(6.4)	(15.6)	(15.5)	(15.7)	(2.6)	(15.5)	(15.6)
EBIT / SALES	0.814	0.441	0.817	0.817	0.578	0.424	0.579	0.58
	(14.1)	(8.6)	(14.2)	(14.2)	(15.4)	(11.5)	(15.4)	(15.4)
CAPX / SALES	0.341	0.348	0.339	0.339	-0.078	-0.044	-0.078	-0.078
	(5.6)	(6.3)	(5.6)	(5.6)	(1.4)	(0.9)	(1.4)	(1.4)
INDGROW	0.036	0.049	0.036	0.035	-0.002	0.009	-0.001	-0.001
	(1.3)	(2.4)	(1.2)	(1.2)	(0.06)	(0.5)	(0.04)	(0.02)
INDGROW (lag)	0.059	0.056	0.058	0.058	0.026	0.032	0.026	0.026
	(2.3)	(3)	(2.2)	(2.2)	(1.1)	(1.8)	(1.1)	(1.1)
R&D / SALES	1.05	1.33	1.04	1.04	0.645	0.388	0.645	0.646
	(11.2)	(7.8)	(11.0)	(11.0)	(10.9)	(5.1)	(10.9)	(10.9)
Log of TA (1lag)	-0.247	-0.26	-0.248	-0.248	-0.217	-0.159	-0.217	-0.217
	(5.8)	(8.6)	(5.8)	(5.86)	(5.9)	(5.7)	(5.9)	(5.9)
EBIT / SALES (1 lag)	0.105	0.074	0.107	0.107	0.043	0.077	0.045	0.045
	(1.99)	(1.8)	(2.0)	(2.0)	(1.2)	(2.5)	(1.2)	(1.2)
CAPX / SALES (1 lag)	0.024	0.013	0.025	0.025	0.025	0.018	0.027	0.027
	(0.5)	(0.4)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.6)
Log of TA (2 lag)	-0.163	-0.099	-0.16	-0.159	-0.181	-0.077	-0.179	-0.18
	(6.3)	(4.3)	(6.1)	(6.1)	(7.9)	(4)	(7.8)	(7.8)
EBIT / SALES (2 lag)	0.128	0.098	0.127	0.126	0.089	0.047	0.09	0.09
	(3.6)	(3.5)	(3.6)	(3.6)	(3.0)	(1.8)	(2.96)	(3.0)
CAPX / SALES (2 lag)	0.033	0.035	0.032	0.031	-0.012	-0.05	-0.01	-0.01
	(0.9)	(1)	(0.8)	(0.8)	(0.3)	(1.5)	(0.3)	(0.3)
DEBT / TA	0.041	0.113	0.042	0.04	-0.109	0.007	-0.108	-0.11
	(1.1)	(2.5)	(1.1)	(1.0)	(3.2)	(0.2)	(3.2)	(3.2)
Log of Total Asset^2	-0.004	0.016	-0.004	-0.004	-0.0006	0.013	-0.001	-0.001
	(2.4)	(5.9)	(2.3)	(2.3)	(0.4)	(5.2)	(0.4)	(0.4)
l				0.019				-0.002
				(0.7)				(0.1)
Hausman test			0.21				0.03	
(P-Value)			(0.65)				(0.86)	
T statistics: first stage			38				38	
Partial R^2 of first stage			0.147				0.146	
No. of Observations	7816	7816	7816	7816	7925	7925	7925	7925
Adjusted R square	0.192	0.617	0.192	0.192	0.142	0.556	0.142	0.142
F statistic	125	12.1	125	117	89	9.6	88.5	83

TABLE A1.

Documenting Bias on Account of selecting based on R&D

The table reports summary statistics for the full sample and the sample of firms which report R&D expenditure on Compustat. Th
difference in the means of the two samples and the associated t statistics.

	FULL SAMPLE		RND SAMPLE	
	Mean	Std. Dev	Mean	Std. Dev.
Log of Total Assets	5.14	1.79	5.04	1.8
EBIT / SALES	0.06	1.09	0.05	0.63
CAPX / SALES	0.11	0.79	0.07	0.14
DEBT / TA	0.20	0.19	0.16	0.17
INDGORW (Industry Growth Rate)	0.132	0.36	0.126	0.2
Excess Values (Sales)	-0.052	0.57	-0.056	0.59
Excess Values (Asset)	-0.034	0.49	-0.038	0.52
Fraction of multi-segment firms	0.43	0.49	0.42	0.49
Fraction of Diversifying firms	0.07	0.25	0.06	0.24
Fraction of Refocusing firms	0.13	0.33	0.14	0.35