CONGLOMERATE FIRMS

AND INTERNAL CAPITAL MARKETS

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Abstract

The large literature on conglomerate firms began with the documentation of the conglomerate discount. Given conglomerate firm production represents more than 50 percent of production in the United States, this discount has represented a large economically important puzzle for the U.S. economy. For corporate finance, the primary question about diversification is "When does corporate diversification affect firm value?" And, "When it does, how does it do so?" Early literature came to the conclusion that the conglomerate discount was the result of problems with resource allocation and internal capital markets. Recent literature has found that self-selection by firms with different and changing investment opportunities can explain the discount and also explain resource allocation.

Conglomerate Firms and Internal Capital Markets

I. Introduction

In this chapter we survey the large literature on corporate diversification in corporate finance. For corporate finance, the primary question about diversification is "When does corporate diversification affect firm value?" And, "When it does, how does it do so?" By a diversified firm in corporate finance, we usually mean a firm that operates in more than one industry, as classified by the Standard Industrial Code (SIC).[1]

This question arises naturally as part of the larger problem of determining how the boundaries of firms should be set. Coase (1937) argues that they are set at the point at which the costs of carrying out transactions within a firm equal those of carrying them out in the open market or in another firm. Thus, for corporate diversification to be of interest, it must be that the cost of carrying out transactions within the firm are affected if it contains more than one industry within its boundaries. Implicit in this belief is that industries differ materially in the skills and resources which are required to operate efficiently in, and that this *diversity* of operating environments affects the cost of performing transactions within the firm. These costs could be due to financial externalities across industries, such as improved risk sharing within the firm, or real externalities that could arise due to the use of a shared factor of production, such as the attention of the firm's decision makers.

Diversification is also of interest to researchers because data on most intra-firm decisions is in general hard to acquire. By contrast, some data on how firm revenues and capital expenditures are distributed across the industries is available, which makes the research on diversification a good starting point for studying the more general problem of setting firm boundaries.

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[1] In practice, researchers usually define firms as diversified if they generate less then 90% of their revenues in a single SIC code industry. Industries are commonly defined at the 3-digit level, although some studies use the 2-digt or 4-digit levels. Scharfstein (1998) is an exception in using a more qualitative criterion for diversification.

A more pragmatic reason for studying corporate diversification is that corporate managers face decisions about diversifying and refocusing their firms. In addition, managers face decisions about investing across multiple businesses they operate. Companies such as Berkshire Hathaway and General Electric generate large amounts of cash that can be invested in different business or returns to shareholders via dividends. Empirical data about how such decisions worked in the past may be useful in strategic planning. Estimates of specific of costs and benefits might also be useful to investors and to regulators.

The corporate finance literature on diversification took off with the discovery of the conglomerate discount by Lang and Stulz (1994) and Berger and Ofek (1995). Our review therefore begins with a discussion of these papers and of subsequent work that has extended and reinterpreted their results. We then briefly discuss the theoretical approaches that have been developed to explain the conglomerate discount and its investment decisions in Section 3. The empirical research motivated by these studies is reviewed in Section 4 .Section 5 concludes.[2]

2. The Conglomerate Discount

2.1 Documenting the Discount: Early Research

In contemporary corporate finance the seminal papers on conglomerates are Lang and Stulz (1994) and Berger and Ofek (1995). Essentially, these papers decomposed conglomerate firms into their constituent industry segments and then valued these segments using the "comparables" approach to valuation.[3] These papers found that the typical conglomerate is undervalued and

[2] By its nature, this type of review inevitably omits many significant papers. Interested readers may want to consult other summaries of the literature, such as Martin and Sayrak (2003).
[3] For practical applications of the comparables approach, see the Marriott Cost of Capital HBS case study.

selling at a discount compared to a collection of comparable single-segment firms. The existence of this conglomerate discount presents a puzzle. While Lang and Stulz (1994) do not take a position on the provenance of the discount, the early literature on conglomerates sought to explain this puzzle by arguing that conglomerates are subject to greater agency problems than single-segment firms. As a result, managers of conglomerate firms destroy value. By implication stockholder value would be maximized if most firms were organized as a single segment firms.

Since Lang and Stulz (1994) and Berger and Ofek (1995) are the seminal papers in the study of conglomerates it is worth examining their methodology in some detail. Preceding work on conglomerates in the industrial organization and strategy literatures had examined differences in ex-post performance between conglomerates and single-segment firms. By contrast, Lang and Stulz (1994) and Berger and Ofek (1995) start from the question: "When do shareholders gain from diversification?" where gain is measured by the relative value of the diversified firm compared to single-segment firms in the same industry. To adjust for scale, firm value is in the first instance proxied by Tobin's q, the market value of the firm (equity and debt) divided by an estimate of the replacement value of the firm's assets.[4] To obtain the comparables, for each division of a conglomerate Lang and Stulz (1994) compute mean Tobin's q of single-segment firms operating in the same 3-digit SIC code. The conglomerate's comparable q is then found by the weighed average of the divisional qs. While the weights used can be derived in several ways, Lang and Stulz show that to obtain an unbiased estimate of the comparable, a division's weight should be computed as the ratio of the replacement cost of a division's assets to the replacement cost of the whole conglomerate's assets. However, as replacement values are generally unavailable, Lang and Stulz use book values in their place. The conglomerate discount is defined

[4] In some of their tests Lang and Stulz (1994) use the ratio of market to book values of a firm. The results are essentially identical.

to be the difference between a conglomerate's Tobin's q and its comparable q computed in the manner described above.

Lang and Stulz measure diversification in two ways. As their principal measure they count the number of the business segments that each firm reports in the Business Information File of Compustat. They use segment information from the Business Information File to compute two Herfindahl indices of diversification for each firm: an index computed from by using segment sales data and a second index computed from data on assets per segment.

Lang and Stulz main statistical tests consist of annual cross-sectional regressions for the period 1978 to 1990. They first regress firms' Tobin's qs on a constant and four dummy variables, D(j), j=2,...,5. The j-th dummy variable takes on the value 1 if the conglomerate has more than j segments in different SIC codes. Thus, D(j) can be interpreted as the marginal contribution to q of diversifying from j-1 to j segments. In a second round of tests they replace Tobin's q as the dependent variable by the conglomerate discount, computed using comparables as above.

Across the annual cross-sectional regressions, Lang and Stulz consistently find that the coefficient of D(2) is significant, indicating that a two-segment firm sells at a discount both to single-segment firms in general, and to "comparable" single-segment firms, as defined above. There is much less evidence that there exists a marginal effect of diversification on the discount for a larger number of segments. Lang and Stulz then show that a substantial portion of the discount remains even after controlling for differences in size and in the extent to which the firm faces financial constraints, as proxied, following Fazzari, Hubbard and Petersen (1988), by whether or not it pays dividends.

In addition, Lang and Stulz investigate whether the discount can be explained by differences in the propensity of single-segment and diversified firms to invest in research and development. Since the firm's balance sheet does not fully capture investment in R&D, the Tobin's *q*s of firms that engage in a great deal of R&D are going to be overstated relative to those of firms that engage in less R&D. If it were the case that single-segment firms were relatively R&D intensive, this relative valuation effect could explain the conglomerate discount. Lang and Stulz find that this is not the case. Thus, Lang and Stulz conclude that the diversification discount that they find cannot be explained by " reporting biases or subtle advantages of diversified firms."

The existence of a relation between the conglomerate discount naturally leads to the question: Are multi-segment firms worth less than single-segment firms because they diversify, or do less valuable firms choose to diversify? The evidence from summary statistics is not clear-cut. Lang and Stulz find that single-segment firms that diversify have lower *q*s than single-segment firms that do not choose to diversify. However, the industry-adjusted *q* of diversifiers prior to diversification is not lower than that of non-diversifiers. Thus, the conglomerate discount is not explained by the low performance of firms that choose to become diversifiers.[5] However, not all findings they report are statistically significant or point in the same direction.

Thus, Lang and Stulz show the existence of a conglomerate discount. However, they judge their evidence to be "less definitive on the question of the extent to which diversification hurts performance." They find that the evidence is consistent with notion that firms diversify because they face diminishing returns in their industries. Lang and Stulz argue that to establish whether this is the case requires a more detailed disaggregated analysis and an explicit model.

Berger and Ofek (1995) confirm the Stulz and Lang result that there exists a conglomerate discount in the range of 13-15% of firm value for the period 1986-1991. They also investigate further potential causes of the discount. They find that the discount is smaller when the firm is not too diversified and all the segments are in the same 2-digit SIC code. They also find evidence that

[5] Graham Lemmon and Wolf (2002) reach the opposite conclusion. Their study is discussed below.

cross-subsidization and overinvestment contribute to the discount, and more limited evidence that diversified firms obtain tax benefits.

Berger and Ofek compute the estimated value of each segment in three related ways using a valuation approach similar to the multiples approach of Lang and Stulz. Berger and Ofek by multiply each segment's assets, sales or earnings, reported in the Compustat industry segment database, by the corresponding median valuation multiple. The industry median is obtained by matching the segment to all the single-segment firms with sales above $20m in the most refined SIC code that contains at least five such firms. The valuation multiples are the ratios of the single-segment firms' total value (as proxied by the market value of equity and book value of debt) to the its reported assets, sales or earnings.[6]

Berger and Ofek also investigate whether diversified firms destroy value by overinvesting in unprofitable industries. Their measure of over-investment is the ratio of the sum of a conglomerate's capital expenditures and depreciation in 3-digit SIC code industries whose median Tobin's q in the bottom quartile, to the conglomerate's total sales . They find that overinvestment so defined is associated with a loss of excess value.

Next, Berger and Ofek investigate whether cross-subsidization can explain the conglomerate discount. They regress the firm's excess value on an indicator which takes a value of one if the firm has a segment with a negative cash flow and zero otherwise.[7] The coefficient of this negative cash flow dummy is negative for diversified firms and indistinguishable from zero for single-segment firms. They thus conclude that having a segment with negative cash flows reduces the value of diversified firms by a greater amount than it reduces the value of focused firms.

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[6] Berger and Ofek do not use the conglomerate discount directly as their dependent variable, but the natural logarithm of the ratio of the actual firm value to the imputed value obtained by multiplying the reported accounting value by the appropriate multiplier. This number they term excess value.
[7] To compute excess value they estimate separate multiples in each industry for segments that have positive cash flows and those that do not.

Berger and Ofek also compare the long-term debt of diversified firms with the total debt level that would be predicted by summing the debt levels of a collection of single-segment firms that match the diversified firm's segments in size, profitability and investment opportunities. They find that while diversified firms borrow more than predicted, this effect is minor.

In sum, Berger and Ofek argue that their results provide evidence of a "significant loss of value in corporations that followed a diversification strategy in the 1980s." They also supply potential explanations for this loss. First, they find that conglomerate firms invest more in low-q industries. Thus high investment in low-q industries by conglomerate firms is associated with lower value.[8] Second, they find that having a negative cash flow division lowers the value of a conglomerate. They interpret this loss in value as arising from "the subsidization of poorly performing segments contributing to the value loss from diversification."

Using a different methodology, Comment and Jarrell (1995) provide complementary evidence about the valuation of conglomerate firms during the 1978-89 period. They find that increases in focus, subsequent to asset sales, are associated with increases in value. Their results are summarized in Figure 1 below. On average, increases (decreases) in focus are associated with positive (negative) abnormal stock returns in the year in which focus increases.[9]

They also show that some of the presumed economies of scope, such as the ability to support more debt and the ability to reduce transactions in the capital markets, are not exploited more by diversified firms.

[8] Using Census data, Maksimovic and Phillips (2004) find that conglomerate segments have lower plant-level capital expenditures than single-segment firms. They find that conglomerates acquire more.
[9] For a discussion of some of the difficulties in interpreting long-run event studies, see the chapter by Kothari and Warner (2005).

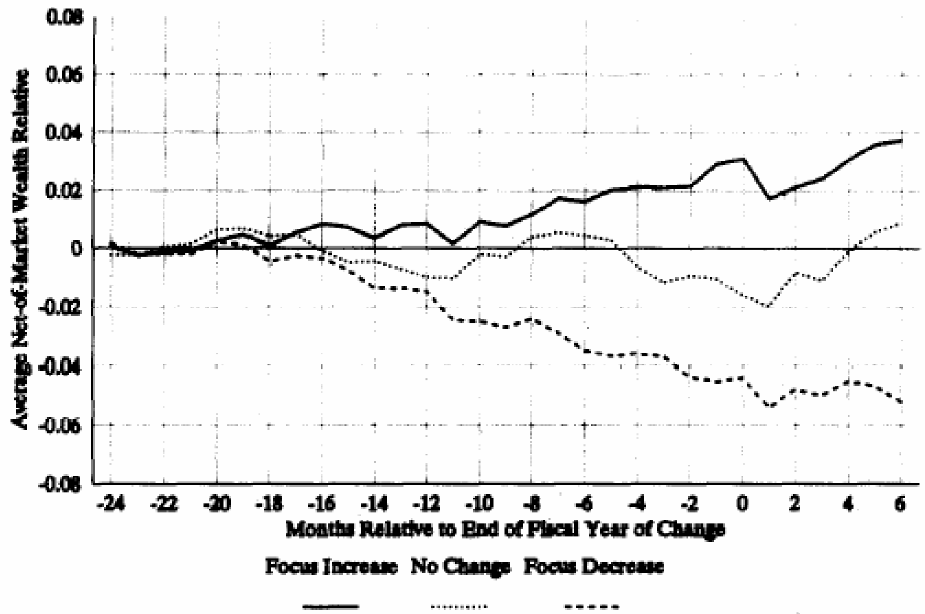

Fig. 1. Event-study showing the average wealth effect of focus changes for three groups of firms segmented by the direction of focus change. The sample consists of fiscal years in the period 1978–1989 for exchange-listed firms. Plotted points represent, for each group of firms, the average month-by-month value of a $1 initial investment in the firm less the corresponding month-by-month value of a $1 initial investment in the CRSP equally-weighted market portfolio. Month zero is defined as the last month of the fiscal year of the change in focus. Focus is measured by a Herfindahl index defined on revenue. There are 5,088 fiscal-years with increases in the Herfindahl index, 4,469 with decreases, and 7,056 with no change.

Source: Comment and Jarrell (1995), Journal of Financial Economics.

The early evidence in Lang and Stulz, and Berger and Ofek shows convincingly that conglomerates sell at a discount when compared to benchmark industry single-segment firms. It is also consistent with the notion that the discount is caused by inefficient operations and that, as Comment and Jarrell argue, the presumed economies of scope do not appear to be exploited. However, both Lang and Stulz and Berger and Ofek draw the reader's attention to potential deficiencies with the data. These potential problems raise several questions:

- To what extent are the well known difficulties with the data material to the estimates of the discount?

- Do the comparables used fully take into account the differences between single-segment and diversified firms? Clearly firms choose their organizational form and this choice may be related to firm and industry characteristics.
- Can the differences in valuation be explained? Do conglomerate firms and single segment firms invest differently?

We will be reviewing how the literature has addressed these issues in the remainder of this chapter.

2.2 Initial Caveats: The Data

Research in firm organization is particularly tricky because researchers specifically have to look inside the corporation to assess the efficiency of resource allocation between various subunits. Such data is not readily available, and much of the data that is available is subject to potential manipulation and reporting biases. The data problems mean that researchers in this area must pay special attention to data issues and the potential for measurement error.

The principal data source for the early research on conglomerates is the Compustat Industry Segment (CIS) database. Pursuant to the Statement of Financial Standards (SFAS) No. 14 and SEC Regulation S-K, after 1977 firms were required to report certain audited segment information on segments whose assets, sales or profits are deemed material by exceeding 10% of the firms' consolidated totals.[10] The CIS database contains information for such segments on net sales, earnings before interest and taxes (EBIT), depreciation, capital expenditures, and assets, as well as the total number of reported segments for the firm. This data is available for all active Compustat firms except utility subsidiaries and is easy for most researchers to access.

There are, however, several well-known problems with CIS data. Firms self-report segment data and changes in the number of reported segments may reflect changes in reporting practice. Hyland (1997) finds that up to a quarter of reported changes in the number of segments stem from changes in reporting policy, not changes in the level of diversification.[11] The reporting requirement also only applies to segments that meet a 10% materiality condition. Thus, segments reported by

[10]Revised disclosure requirements, SFAS 131, superseded SFAS 14 in 1997. Most of the studies that use Compustat data discussed in this review rely on pre-1997 data. Under SFAS 131 firms do not have to report line of business data unless they are organized that way for performance evaluation (Berger and Hahn (2003)).
[11] See also Denis, Denis and Sarin (1997), Pacter (1993) and Hayes and Lundholm (1996).

large firms may be span several industries.[12] Moreover, there is no presumption that a self-reported segment approximates a single industry. According to SFAS 14, a segment is distinguished by the fact that its constituents "are engaged in providing a product service or a group of related products and services … to unaffiliated customers." Thus, segments may be vertically integrated. The 4-digit SIC in which they are classified by CIS are assigned by COMPUSTAT, not by the firms themselves. This last problem is quite severe: using Census data Villalonga (2004) shows that in over 80% of cases the SIC code assigned by COMPUSTAT is not the code of the segment's largest industry. Taken together, these problems raise the possibility that a substantial number of segments are misclassified into 4-digit SIC codes and that a substantial number of firms that report only one segment in fact operate in related or vertically integrated industries.[13]

Several researchers have used alternative data sources from the US Bureau of Census which do not rely on data which is aggregated up to segment level by firms. Maksimovic and Phillips (1998, 2001, 2002, 2004) and Schoar (2002) use the Longitudinal Research Database (LRD), maintained by the Center for Economic Studies at the Bureau of the Census.[14] The LRD database contains detailed plant-level data on the value of shipments produced by each plant, investments broken down by equipment and buildings, and the number of employees. The LRD tracks approximately 50,000 manufacturing plants every year in the Annual Survey of Manufactures (ASM) from 1974 to 2003. The ASM covers all plants with more than 250 employees. Smaller plants are randomly selected every fifth year to complete a rotating five-year panel. Note that while the annual data is called the Annual Survey of Manufactures, reporting is

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[12] Villalonga (2004) notes that the maximum number of 4-digit segments belonging to a single-firm for her sample of firms drawn from the BITS database of the US Bureau of Census is 133.
[13] Note that the definition of relatedness according to SFAS 14 does not correspond to the SIC classification. Thus, divisions from different 2-digit SIC codes may be related according to SFAS 14.
[14] For a more detailed description of the Longitudinal Research Database (LRD) see McGuckin and Pascoe (1988).

not voluntary for large plants and is not voluntary once a smaller firm is selected to participate in a rotating panel. All data has to be reported to the government by law and fines are levied for misreporting.

Annual Survey of Manufactures offers several advantages over Compustat: First, it is comprehensive and covers both public and private firms in manufacturing industries. Second, coverage is at the plant level, and output is assigned by plants at the four-digit SIC code level. Thus, firms that produce under multiple SIC codes are not assigned to just one industry. Third, plant-level coverage means that plants can be tracked even when they change owners.

Villalonga (2004) uses the Business Information Tracking Series (BITS) database, also from the Bureau of the Census. BITS provides data between 1989 and 1996 for all U.S. business establishments, private and public, in all some 50 million establishment-year observations. [15] For each establishment, the BITS database contains data on the number of employees, the payroll and on the identity and revenue of the firm that owns it. Each establishment is assigned to a 4-digit SIC code.

Because the BITS database covers all sectors of the economy and is not limited to the manufacturing sector like the LRD, it is more comprehensive. However, since the available data for each establishment is limited BITS cannot be used to determine an establishment's productivity.

Villalonga (2004) links the BITS dataset with COMPUSTAT, enabling her to determine the composition of a Compustat firm without relying on SFAS 14 disclosures. She then recomputes the conglomerate discounts of the COMPUSTAT firms that she has linked, using as comparables those COMPUSTAT firms that BITS data identifies as being single-segment firms.

[15] An establishment is a location where a firm conducts business, such as a plant, a store or a warehouse.

The results are startling. Villalonga finds that diversified firms trade at a significant *premium* over single-segment firms, as so classified using BITS. When COMPUSTAT segment data is used to classify firms, Villalonga obtains the standard conglomerate discount obtained in the earlier literature.

Villalonga explores several possible explanations for this discrepancy. A fundamental difference between BITS and COMPUSTAT is that former treats vertical integration as a form of corporate diversification, whereas the latter does not. However, when Villalonga reconstitutes BITS segments to group together vertically integrated businesses and recomputes the discount she still obtains a conglomerate premium.

These results highlight the fact that COMPUSTAT segments are related by construction, at least in the eyes of the firms. Thus, measures of diversification based on COMPUSTAT data may implicitly be measures of unrelated diversification. It is possible that diversification, measured by COMPUSTAT is a measure of inefficient diversification (hence the discount). Villalonga also raises the possibility that Compustat segments are lumped together to avoid disclosing which segments are most lucrative.[16]

Finally, several interesting results showing that alternative measures of diversification may affect the interpretation of current results are obtained by Denis, Denis and Yost (2002). They examine global diversification over time. These firms are not necessarily diversified industrially. They document that global diversification results in average valuation discounts of the same magnitude as those for industrial diversification. Analysis of the changes in excess value associated with changes in diversification status reveals that increases in global diversification

[16] The firms classified as single segment in BITS are smaller than the firms classified as single segment in COMPUSTAT. If as, suggested by Maksimovic and Phillips (2002) size is positively correlated with productivity, then the premium that Villalonga finds using BITS data may be occuring because she is comparing conglomerates with unproductive small single-segment firms.

reduce excess value. One possible implication of their results is that as firms expand they take on less profitable projects but ones that still may have positive NPV, thus reducing *ratio* measures of excess value.

They also find that firms that are both globally and industrially diversified do not suffer a diversification discount on average, suggesting that global diversification may benefit firm value. This result is driven by the latter half of the sample period, in which firms that are both globally and industrially diversified are valued at a premium relative to single segment, domestic firms. Their results imply that the value and costs of diversification may change over time.

2.3 Self-selection and the endogeneity of the decision to become a conglomerate

The early research on the conglomerate discount relied on the comparison of conglomerates' divisions with a control sample of comparables using single-segment firms chosen using heuristic criteria described above. The implicit assumption was that conglomerate and single-segment firms faced the same investment opportunities and were of similar ability.

This way of selecting comparables raises issues on two grounds. First, it ignores potentially observable differences between the divisions and the matching single-segment firms that might affect valuation. Second, the heuristic matching procedures implicitly assume that firms become conglomerates randomly, and not as argued by Maksimovic and Phillips (MP) (2002), because they differ in material ways from firms that remain single-segment. If the decision to diversify is not random, and is instead based on information observed by the firm but not by the researcher, then the estimation procedure must take into account the endogeneity of the decision.[17]

[17] For early discussions of this endogeneity in the context of corporate finance decisions, see Eckbo, Maksimovic and Williams (1991) and Prabhala (1997). The chapter by Li and Prabhala (2005) contains a much more comprehensive discussion of selection issues in this type of research.

The underlying hypothesis in the discount literature is that the value of firm *i* at time t relative to its comparables, V_{it} is a linear function of a set of control variables X_{it} and on whether the firm is a conglomerate, denoted by the indicator variables D_{it} which takes on the value 1 if the firm is a conglomerate and 0 if it is not.

$$V_{it} = \beta_1 + \beta_2 X_{it} + \beta_3 D_{it} + e_{it}, \tag{1}$$

where u_{it} is an error term.

A necessary condition for the OLS estimate of coefficient β_3 to be unbiased is D_{it} independent from the error term e_{it} in equation (1). The earlier literature, such as Lang and Stulz, implicitly assume that this condition holds and that conglomerate status can be treated as being exogenous in the estimation. But suppose instead that the firm's decision to operate in more than one industry depends on a set of characteristics W_{it} and a stochastic error term u_{it}. Specifically assume that $D_{it} =1$ when $\lambda W_{it} + u_{it} >0$ and $D_{it} = 0$ when $\lambda W_{it} + u_{it} <0$. Then, the coefficient of in equation (1) will be biased if, as seems plausible, a common determinant of both the value V_{it} and the decision to become conglomerate is omitted from estimated equation (1).

Several recent empirical papers on the conglomerate discount, by Campa and Kedia (2002), Graham, Lemmon and Wolf (2002), Lamont and Polk (2002) and Villalonga (2003, 2004) address these issues. Maksimovic and Phillips (2002) also gives an equilibrium justification for the endogeneity of the discount and also empirically shows that there is a size-efficiency relationship that holds for conglomerate and single-segment firms.

The most direct evidence on the importance of self-selection in the determination of conglomerate discounts is provided by Graham, Lemmon and Wolfe (2002).[18] They show directly that diversification through acquisitions creates a measured discount in the sense of Berger and

[18] See Chevalier (2000) for a related argument.

Ofek (1995) even when the diversification is value increasing. Using a sample of 356 mergers that occurred between 1978 and 1995 and (i) which met the Berger and Ofek criteria of inclusion in a the sample of diversifiers and (ii) for which they had data on both the bidder and the target, Graham et. al. show that acquirers register a discount computed in the sense of Berger and Ofek in a two-year window surrounding the acquisition. However, the greater part of this discount can be explained by the fact that the targets are selling at a discount relative to single-segment firms prior to the merger. Thus, much of the discount associated with corporate diversification by acquisition cannot be attributed to the costs associated with operating more diversified firms but can be attributed to the fact that diversifying firms are on average acquiring assets already valued at a discount relative to the industry benchmarks. To the extent that conglomerate firms engage in more acquisition activity than single-segment firms (as shown in Maksimovic and Phillips (2004)), it is possible that their growth pattern might induce a discount even when they are value maximizing.

Campa and Kedia (2002) argue that the documented discount on diversified firms is not by itself evidence that diversification destroys value. They use three alternative econometric techniques in an attempt to control for the endogeneity of the diversification decision --- firm fixed effects, simultaneous-equation estimation using instrumental variables and Heckman's two-step procedure. Their data is from COMPUSTAT and their choice of firms to include in their sample and the measurement of excess value follows the earlier literature. Segments of multiple-segment firms are valued using median sales and asset multipliers of single-segment firms in that industry. The imputed value of a segment is obtained by multiplying segment sales (asset) with the median sales (asset) multiplier of all single-segment firm-years in that SIC. The imputed value of the firm is the sum of the segment values.

Campa and Kedia find a strong negative relation between a firm's choice to be diversified and its value. Firms that are diversified have a lower value than firms that do not. However, once the endogeneity between the decision to be diversified and firm value is taken into account, the diversification discount always drops, and sometimes turns into a premium.

The statistical modeling of the endogeneity of conglomerate status, in turn, raises questions about the nature of the decision to become conglomerate. In their statistical specification, Campa and Kedia implicitly assume that the decision to remain diversified is itself endogenous in each period. This is appropriate if the decision to diversify is easily reversible. However, if the decision is costly to reverse, then it is natural to focus attention on the endogeneity of the decision to diversify (as opposed to the endogeneity of the decision to maintain conglomerate status), or more generally on changes in the level of diversification.

Villalonga (2004) focuses on the decision to become diversified. Using a Compustat for the years 1978-1997 she identifies 167 firm years in which single-segment firms diversified. Her control sample consists of 40,757 single-segment firm years. She adopts a two-stage procedure. In the first stage, she uses a probit model to obtain the probability that a firm becomes diversified, which she terms the propensity to diversify. For the probits Villalonga tries several specifications, including one that uses the same explanatory variables as Campa and Kedia (2002).

In the second stage Villalonga controls for the estimated propensity to diversify in determining whether becoming diversification destroys value. She uses two types of matching estimators (the methods proposed by Deheija and Wahba (1999) and Abadie and Imbens (2002)) and Heckman's (1979) correction for selection bias. As in Campa and Kedia's (2002) tests, Heckman's method directly corrects for biases due to unobserved characteristics of firms that choose to diversify. The matching estimators use the estimate of the propensity to merge as one of the characteristics for finding matching non-diversifying single-segment firms that are comparable to the diversifying single-segment firms. Consistent with Campa and Kedia (2002), Villalonga finds that the decision to diversify did not affect the value of the 167 firms that she identifies as having diversified during her sample period.

Lamont and Polk (2002) adopt a different approach and a difference definition of the extent of diversification in their study of the relation between diversification and value. They argue that a key characteristic of an industry is the ratio of investment to capital stock. In their view a firm that operates in industries that have a greater disparity of investment to capital stock ratios is more diversified than a firm that operates in industries that have similar investment to capital stock ratios. Thus, for each 2-digit SIC code industry to which COMPUSTAT assigns the firm's segments, Lamont and Polk calculate the median investment to capital ratio among the single-segment firms. The measure of a firm's diversity in year t is then computed as σ, the weighted standard deviation of these median ratios for all segments.

Lamont and Polk argue that changes in σ over time can be decomposed into endogenous and exogenous components. The exogenous change in diversity, $\Delta\sigma_X$, is the change in diversity between t – 1 that would have occurred if COMUSTAT had assigned the firm in the current year to precisely the same 2-digit SIC codes as in the previous year. The endogenous change in diversity, $\Delta\sigma_N$, is the change in diversity that occurs because the 2-digit SIC codes assigned to the firm have changed between years t – 1 and t.

Lamont and Polk use COMPUSTAT data for 1,987 diversified firms during the period 1980-1997. They find that 80% of the variation in firms' diversity is due to exogenous industry shocks. In their regressions they regress the change in excess value on $\Delta\sigma_{X\ \mathrm{and}}\ \Delta\sigma_N$ alone and with control variables such as lagged σ. They find that increases in both $\Delta\sigma_X$ and $\Delta\sigma_N$ reduce firm's excess value. They interpret the negative coefficient of $\Delta\sigma_X$ as evidence that diversification reduces firm value.[19] This finding persists even when plausible measurement error is taken into account.

Lamont and Polk's results are in sharp contrast to Campa and Kedia (2002) and Villalonga (2004) and have not been fully reconciled with these studies. Villalonga (2003) argues that Lamont and Polk's measure does not pick up "diversification" as traditionally measured in the literature --- the presence of the firm's operations in more than one industry --- but "diversity" which is the within firm dispersion of some industry characteristics. Indeed, she reports tests that show that measures of diversification, such as the number of two digit industries that the firm operates in are uncorrelated with Lamont and Polk's measure of exogenous cash flow diversity $\Delta\sigma_X$. However, this observation raises the question of which measure better captures economic differences between firms.

[19] Lamont and Polk (2002) also analyze similarly defined changes in diversity of leverage, cash flows and sales growth one at a time. They do not find that "exogenous" changes in diversity of these variables have a significant negative effect by themselves.

3. Theory Explaining the Conglomerate Discount and Organizational Form

The literature on the conglomerate discount leaves several questions unanswered. Perhaps the most fundamental of them is why theoretically is there a conglomerate discount? Is the existence of a discount evidence of bad investment choices or is the discount an endogenous outcome given different types of firms select different types of investment given different investment opportunities? If there is evidence of inefficient investment choices, why do they occur?

Conceptually, the conglomerate discount is an unlikely subject for academic research. In most introductory corporate finance classes MBA students are painstakingly taught that firms should maximize the net present value of their investments, not the ratio of market value to replacement cost. In fact, they are explicitly warned that maximizing the latter, which is equivalent to maximizing the profitability index, leads to inefficient investment choices.[20] Yet when we evaluate the performance of conglomerates we do so using the conglomerate discount, which is equivalent to comparing the profitability indices of conglomerate and single-segment firms. We do this because of the practical difficulties of obtaining properly scaled measures of value, and because the literature has shown that it is a measure of a relevant concept.

In this section we review the theoretical frameworks that have been used to motivate the recent empirical literature on diversification and the investment of diversified firms. We begin with the literature which assumes there is a “bright” side of conglomerates - that conglomerates internal allocation of financial capital has benefits. This literature assumes that firms would not become

[20] See, for example, Brealey and Myers (2003) and Ross, Westerfield and Ross (2005, p 164).

conglomerates unless there is some benefit of doing so in terms of allocating financial capital within the firm. However, this literature does not explain why there is a discount. Implicitly the literature on the bright side of conglomerates assumes that the discount would be larger if these particular segments were stand alone single-segment firms, which prompts questions about the appropriate comparables to use in determining the discount. We illustrate this line of research with Stein's (1997) model of how diversified firms' internal capital markets lead to a different selection of investment projects than when firms operate in a single industry. Second, we discuss Matsasuka's (2001) model of how organizational competencies may drive the diversification decision.

Third, we then discuss the literature which takes the opposite perspective - modeling how conflicts of interest between the firm's managers and the firm's owners may lead to inefficient diversification. Fourth, several models taking the same perspective of inefficient diversification have argued that intra-firm bargaining in firms operating in several different environments leads to poor investment choices (Rajan, Servaes, and Zingales (2000), Scharfstein and Stein (2000)).

Finally we end with discussion of equilibrium models of the conglomerate firm which show that the conglomerate discount can arise endogenously and that conglomerate investment is a profit-maximizing approach to differential investment opportunities.

The papers that we review are only a small portion of the theoretical literature on the conglomerate firm. They are important for our purposes because they have motivated several of the empirical studies we examine below. The models are all highly stylized and rather informally presented. In part, this is because data constraints make it very hard to test complex structural models of intra-firm dynamics. Thus, in this chapter we do not review several interesting models, including Berkovitch, Israel and Tolkowsky (2005), Faure-Grimaud and Inderest, (2005), Fluck and Lynch (1999) and Inderst and Meuller (2003).

3.1 Efficient Internal Capital Markets

Stein (1997) analyzes how internal capital markets create value and the optimal size and scope of such markets. In Stein's model firms consist of either a single stand-alone project or of several projects overseen by a headquarters. Stein assumes that each project's managers obtain private benefits from managing their project. These benefits are higher for better projects. The private benefits give managers an incentive to overstate their project's prospects. This is known to potential investors, who therefore supply less capital than the managers request. Thus, good projects are capital rationed if they operate as individual firms.

Stein assumes that the headquarters has the ability to monitor the projects it oversees. It uses its information in two ways. First, it can transfer capital from one project to another. Second, it can appropriate for itself some of the private benefits of the project managers, albeit at the cost of diluting the incentives of the managers.

Because the headquarters can extract private benefits from several projects simultaneously it has the incentive to allocate capital to the better projects. The ability to transfer funds across projects, allocating some more funds than they would be able to raise as stand-alone firms, and others less, makes the better allocation possible.

A key assumption in Stein (1997) is that as the number of projects overseen by the headquarters increases, the quality of monitoring provided by the headquarters declines.[21] However, as the number of projects the quarters oversees increases, the headquarters in Stein's

[21] This assumption is analogous to decreasing returns of scale in the neoclassical models.

model also gains in two ways. First, the value of its ability to transfer funds from the worst to the best projects increases. Second, if the project payoffs are not perfectly correlated the volatility of the firm's payoffs declines and it becomes able to raise more funds from the capital market, thereby reducing credit rationing and increasing value. The firm reaches its optimal size when the marginal decline in value due to declining monitoring ability is equal to the marginal increase resulting from the relaxation of financing constraints and the funding of good projects.

The theory also has implications for the optimal scope of the firm. Stein addresses two effects which work in opposite directions. To the extent that the returns of different divisions of a conglomerate are uncorrelated diversification increases the value of the headquarters' ability to direct investment funds and raise capital externally. However, there may be another effect at work. Because headquarters' allocation decisions are dependent on the *ranking* of investment projects rather than their absolute values, and to the extent that accurate rankings are more likely to be made if all projects are within the same industry (because valuation errors are likely to be correlated), diversification is costly.

Thus, Stein suggests that diversification is value increasing when valuation errors are small and when the returns of projects within an industry are highly correlated, Diversification is value reducing when valuation errors are likely to be large and when the payoffs of projects within industries are likely to have a low correlation.[22]

[22] The model does not analyze the possibility that a focused firm may rank projects correctly but over or under-invest in the aggregate because the valuation errors it makes are correlated across projects.

3.2 Conglomerates and Organizational Competencies

Matsasuka (2001) develops a matching model to explain why conglomerate firms exist. In his model firms have different organizational competencies. The organizational competencies are somewhat transferable across industries. When sales decline in an industry it is not optimal for firm to go out of business. Instead it should diversify into new lines of business in order to find a good match between their organizational competence and the line of business. If they find a good match they may transit into the new industry and exit their original industry.

Matsasuka's (2001) elegant framework generates several predictions. Diversified firms trade at a discount because the match between their organizational competence and their existing main divisions is bad. Because the match in the new industry may also turn out to be bad, many diversification attempts are in fact reversed. However, the announcement of a diversification is a signal that the firm is worth maintaining, resulting in a positive announcement effect. The theory also predicts that successful diversifiers quit their original industry. Thus the theory is quite consistent with the early evidence on the diversification discount (e.g., Lang and Stulz (1994) and Berger and Ofek (1995)), as diversification results from a poor match between industries and firm's organizational competence, and on announcement returns (e.g., Schipper and Thompson (1983), Hubbard and Palia (1998)) which document positive or non-negative returns to changes in the level of diversification.

3.3 Diversification and the failure of corporate governance

Given the finding in the early literature that diversification destroys value, the obvious question is why we observe so many diversified firms. One plausible answer is that while diversification destroys investor value it benefits the managers of corporations. Thus diversification might arise as a result of a failure of corporate governance which should be penalizing managers who diversify inappropriately.

Jensen (1986) and Stulz (1990) argue that managers may obtain increased status and perquisites when they diversify their firms. Diversification allows managers to act on a broader stage, and in particular may allow them to participate in "hot" and exciting industries. It may also be easier to skim from a diversified firm (Bertrand and Mullainathan (2001)).

Diversification may also yield concrete career benefits, because experience running a complex diversified firm might provide experience that the increases the value of the manager's future employment prospects (Gibbons and Murphy,1992) . On the other side of the coin, diversification may entrench the manager because it may be harder to find a replacement who has a demonstrated ability in managing the firm's particular mix of businesses (Shleifer and Vishny, 1989).

Taken together, the literature on agency makes a powerful prima fasciae case that agency conflicts may drive unprofitable diversification. An issue in determining the extent to which this is the case is that most of the contributions are set in a partial equilibrium framework. Thus, it is not clear why the incentives are not set in ways that penalize unprofitable diversification. Moreover, it is not clear why diversification is inefficient. A rational empire-building CEO of a diversified firm can in principle decentralize its operations and provide incentives to the managers running its divisions so that firm value is not destroyed. Thus, it must either be the case that increasing the firm's scope the firm itself destroys value or that managers of firms that diversify are irrational and have a hubristic belief in their ability to run acquired businesses (Roll (1986)).

There have been only a few attempts to analyze the manager's incentive to diversify in a more general model of the trade-offs. This is in part because the incentives of, and the constraints faced by, the board of directors, the party that formally employs the manager, are not well understood.[23]

Aggarwal and Samwick (2003) model this process by assuming that the board maximizes the value of the firm. The key assumption is that diversification, which is assumed to be value destroying, is not contractible and cannot be forbidden by the board. The CEO benefits from diversification, because it enables him to diversify his risk and because he has private gains from diversification. The board can attempt to motivate the manager to work harder by tying his compensation to firm value. However, this type of compensation has a byproduct of increasing the manager's risk, making value destroying diversification more attractive. In equilibrium, managerial compensation is set as a result of contracting in a standard principal agent problem where managerial effort is costly.

In Aggarwal and Samwick (2003) the manager's compensation w is given by $w = w_0 + \alpha\pi + \gamma n$, where α and γ are constants chosen by the firm, n is the amount of diversification and π is the firm value. Firm value is given by $\pi = x - n + \varepsilon(n)$, where x is the costly managerial effort and $\varepsilon(n)$ is a normally distributed shock to firm value with zero mean and variance σ^2 / n. For the manager, diversification has three consequences. First, it affects the value of the corporation and thereby the manager's compensation through the α term. Second, it enables the manager to diversify risks since it reduces the risk of the corporation σ^2 / n. Third,

[23] See Hermalin and Weisbach (1991) for a theoretical model in which the relationship between the board of directors and the CEO evolves over time.

diversification enters directly in to the manager's utility function because it affects the value of his proprietary benefits. Given the assumed relation between diversification and value, and the assumed compensation contract, the firm's directors can affect the manager's actions by tying his rewards to performance.

The board of directors offer the CEO a linear contract based on π and n. The CEO chooses the level of diversification n and effort x. The π is realized and the CEO is compensated on π and n.

This framework leads to some interesting predictions, which differ from those that would be derived by intuition alone. For example, suppose that there is an exogenous increase in the amount of private benefits that the manager can gain from diversification that is value destroying for the firm. In equilibrium it would be optimal to increase his performance pay in order to reduce his incentive to diversify. However, in an interior equilibrium this increase will not be enough to totally negate the effect of the exogenous increase in private benefits from diversification. As a result, empirically we would observe contemporaneous increases in incentive based pay and in diversification. However, the positive correlation would not be an indication of a causal relation. More generally, the empirical relation between incentives and diversification shows that the interpretation of simple correlations between incentive based compensation and diversification is not straightforward.

Aggarwal and Samwick (2003) derive testable relations regarding changes in firm value, incentive compensation and level of diversification in response to changes in exogenous parameters, such as managerial risk aversion or the ability to gain private benefits from diversification. They estimate this relation on about 1600 firms in the 1990s using COMPUSTAT, CRSP and ExecuComp data. The pattern of relations they find is consistent with their predictions in the case where diversification decisions are driven by increases in managers' private benefits from diversifying.

The advantage of an explicit modeling approach as in Aggarwal and Samwick (2003) is that it yields a set of transparent cross relation predictions that can be taken to data and checked for consistency. For this clarity to be attained the researcher has to take a point of view about the underlying relation. Other initial structures, in which, for example, the board can monitor and approve diversification or where not all diversification reduces value – may yield different predictions on the value of diversification.

3.4 Diversification and the Power within the Firm

Another strand in the literature argues that investment decisions within diversified firms are driven by the need to moderate conflicts of interests between different divisions and different levels of the hierarchy within the firm. The starting point for this research are the observations by Lamont (1997) and Shin and Stulz (1998) that diversified firms capital expenditures are not as sensitive to proxies of industry opportunities as focused firms. Such distortions would be unlikely to occur in the standard agency framework where the CEO has an incentive to maximize firm value so as to maximize his ability to expropriate investors. While such distortions might occur in more complex agency models, where top management diversifies out of career concerns or to reduce risk, it is also plausible that the distortions be caused by intra-firm conflicts.

In the classic influence cost model of intra-firm conflict, Meyer, Milgrom, and Roberts (1992) model a resource process where lower-level managers of a firm attempt to lobby top management to increase the investment flows available to their firm. The lobbying is costly, but in equilibrium top managers infer the true value of investment opportunities by observing the costly lobbying. Thus, the lobbying leads to inefficiency but does not lead to misallocation of resources.

In Scharfstein and Stein (2000), managers of divisions which lack investment opportunities have a low opportunity cost of their time and therefore engage lobbying which is creates costs for the firm as a whole. An efficient response to such lobbying might be for the firm's owners to bribe the managers of weaker divisions to desist. However, the top managers of firms are themselves the agents of the firm's owners and this affects how they pay off the divisional managers. Scharfstein and Stein (2000) derive conditions under which top management finds it optimal to bribe troublesome divisional managers by giving them too large a share of the investment budget rather than with cash. This occurs because top managers cannot directly expropriate the firm's capital budget whereas they can extract benefits from any operating funds that they would have used to pay divisional managers. Thus, to reduce the cost of lobbying, top management overinvests in the divisions with poor growth opportunities.[24]

A central assumption of this approach is that the top management has limited power over the divisional managers. An alternative response by top managers who do have such power might be to change the reporting structure within these divisions or add extraneous task which can be easily monitored to the divisional managers' workload so as to increase the opportunity cost of their time and thereby reduce their propensity to lobby. Another possibility might be for the firm to sell or spin off its weaker divisions.

Rajan, Servaes and Zingales (2000) explore another implication of limited head office power over divisions. They argue that while top management can direct capital expenditures across divisions it cannot commit to a future distribution out of the value created by the investment. The distribution of the surplus is determined through negotiations between divisions after the surplus has been realized. The inability of top management to commit to a distribution means that a division's investment choices may be distorted.

A key assumption about the ex-post bargaining process between divisions is that the divisions' bargaining power is influenced by their initial investment decisions. As a result, it might be in the top management's interest to initially allocate initial investment capital in a way that will influence the outcomes of future bargaining between divisions over the distribution of the surplus rather than to maximize value. Given a distribution of capital across divisions, divisional managers will update their predictions about the likely outcomes of bargaining over the surplus and make investment choices accordingly. It is in the top management's interest to allocate initial

[24] See also Fulghieri and Hodrick (1997).

investment funds in ways that induce the divisional managers to choose projects that maximize the firm's value.

Hence, in RSZ top management uses the initial allocation of investment to divisions as a commitment device to substitute for its inability to commit to a distribution of surplus. This form commitment is clearly not as efficient as a first-best case in which top management can commit to the distribution of profits that the divisions realize. Empirically, the capital expenditures of conglomerates might seem, and are, less efficient than those of single-segment firms. However, they are value maximizing given the constraints that top managers face.

RSZ make specific assumptions about the way the bargaining between divisions works and obtain predictions about the distortions that arise. Specifically they assume that each division can choose to invest in two types of investment projects. "Efficient" projects are value maximizing. "Defensive" projects produce less value, but the value generated can be better defended against redistribution to other divisions. The top management's problem is to allocate the right amount of capital to each division and to motivate the divisional management to invest the capital in the efficient project.

The divisional manager's incentive to choose a defensive project is higher when the surplus generated by the efficient project, which he has to partially give up in ex-post bargaining with other divisions, is high relative to the manager's share of the other divisions' surplus that he expects to gain in bargaining. Under plausible assumptions, this occurs when the manager's division has better investment opportunities than the other divisions. As a result, perverse investment incentives are more likely to occur in firms with divisions facing diverse investment opportunities.

The RSZ model predicts that the value of diversified firms is inversely related to the diversity in their investment opportunities. The model also predicts that capital transfers will occur from large high-value divisions to small low-value divisions. Both of these predictions are testable. We discuss these tests later.

A central feature of most theoretical models of the conglomerate firm is that they are partial equilibrium in the sense that they do not analyze the firm's internal allocation of capital in the context of the market for whole firms and partial-firm assets. As Maksimovic and Phillips (MP) (2001) show, there is a large market for assets in which conglomerates are important players. Thus, as an alternative to distorting the firm's investment expenditures, a firm facing the problems modeled by RSZ might trade divisions to obtain a portfolio of assets that faces comparable investment opportunities. Thus, a generalized RSZ framework might suggest that the firm can operate on an alternative margin, yielding the prediction that at times when the market for firms' assets is active, firms are less likely to distort investment flows.

3.5 Neoclassical Model of Conglomerates and Resource Allocation

The case in which firms maximize value and there are no unresolved agency problems provides the simplest starting point for an analysis of conglomerate growth and diversification. Maksimovic and Phillips (MP) (2002) consider a neoclassical model where firms differ because managerial and organizational talent or some other fixed resource varies across firms. Interestingly, the neoclassical model for conglomerate firms was introduced after the initial models of power within the firm. It has motivated empirical models of investment within the conglomerate firm and also endogeneity and sample selection models.

In MP (2002) the firm decides endogenously whether to produce in one or in several industries. As in Coase (1937) and Lucas (1978), it is assumed that there are diseconomies of scale within firms. Firms exhibit neoclassical decreasing returns-to-scale, so that their marginal costs increase with output. Specifically, firms use the variable inputs of labor, and capacity units to produce output.

In each industry, firms with higher organizational ability or talent can produce more output with the same amount of input, and thus have higher productivity, than firms with lower ability or talent. Thus, differences in talent have greater economic significance when output prices are high. The productivity with which any given firm operates plants can differ across industries in which it operates. For a given output price and a given talent level, there are decreasing returns to scale in each industry in which the firm operates and at the level of the whole firm.

For concreteness, consider a population of firms that can operate in a maximum of two industries, which we denote as industry 1 and industry 2, respectively. The productivity of each firm can be modeled by a vector (d_1, d_2), where the firm's talent in industry *i* is d_i. Firms that have a higher productivity, d_i, produce more output for a given level of inputs if they choose to operate in industry *i*. All firms are assumed to be price-takers and to produce a homogeneous output. Firms use two inputs: industry-specific homogeneous production capacity *k* and labor *l*. Further assume that firms can trade capacity with other firms in the same industry or build capacity at price *r* per unit. For tractability, we assume that each unit of capacity produces one unit of output. For each firm, the profit function is

$$d_1 p_1 k_1 + d_2 p_2 k_2 - r_1 k_1 - r_2 k_2 - \alpha l_1^2 - \alpha l_2^2 - \beta\left(l_1 + l_2\right)^2 \qquad (2)$$

where p_i and r_i are the prices of output and capacity in industry *i*=1 or 2, α and β are positive cost parameters, and k_i is the capacity the firm maintains in industry *i*. The profit function embodies the assumption of neoclassical diminishing returns within each industry (the αl_i^2 terms) and the assumption that when organizational talent is a scarce resource, costs depend on the firm's total size (the $\beta\left(l_1 + l_2\right)^2$ term). A firm is diversified if k_1>0 and k_2>0 and single segment if capacity in only one of the two industries is greater than 0.

The model can be solved at the firm level to give the firm's optimal capacity $\left(k_1, k_2\right)$ in each of the industries as a function of its own productivity vector $\left(d_1, d_2\right)$, and industry-level variables, demand $\left(p_1, p_2\right)$ and the cost of capacity $\left(r_1, r_2\right)$. Optimal outputs by the firms in each industry can be obtained by direct optimization. Dropping the firm subscripts and defining $v_i = d_i p_i - r_i$, it is easily shown that the optimum output for a firm, assuming conglomerate production, is given by

$$k_1 = \frac{(\alpha+\beta)(d_1 p_1 - r_1) - \beta(d_2 p_2 - r_2)}{2\alpha(\alpha+2\beta)} = \frac{(\alpha+\beta)v_1 - \beta v_2}{2\alpha(\alpha+2\beta)} \qquad \text{and}$$

$$k_2 = \frac{(\alpha+\beta)(d_2 p_2 - r_2) - \beta(d_1 p_1 - r_1)}{2\alpha(\alpha+2\beta)} = \frac{(\alpha+\beta)v_2 - \beta v_1}{2\alpha(\alpha+2\beta)}$$

for $v_2 > \beta v_1/(\alpha+\beta)$ and $v_2 < (\alpha+\beta)v_1/\beta$. For values of v_1, v_2 outside of this range, a firm will choose to be a single-segment firm.

Figure 2 illustrates which firms choose to be either conglomerates or single-segment firms. Letting $\theta = (\alpha+\beta)/\beta$, we can illustrate optimal organizational form across industries.[25] If $v_2 > \theta v_1$, then the firm will produce only in industry 1, so that $k_2(v_1, v_2) = \frac{v_2}{2(\alpha+\beta)}$ and $k_1(v_1, v_2) = 0$. Similarly, if $v_1 > \theta v_2$, then $k_1(v_1, v_2) = \frac{v_1}{2(\alpha+\beta)}$ and $k_2(v_1, v_2) = 0$.

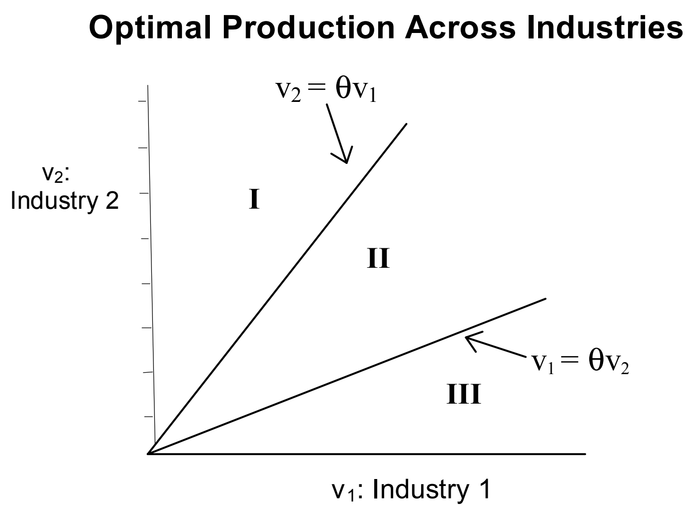

Figure 2
Optimal Production with Differing Ability across Industries

[25] The figure assumes that $r_1 = r_2$. More general cases are discussed in MP (2002).

Firms in region II optimally choose to be conglomerates, whereas firms in regions I and III choose to produce in a single segment. Specialization is optimal if the firm is much more productive in one industry than the other; diversification is optimal if the productivities are similar. Thus, the decision to diversify depends in part on the firm's comparative productivity in the two industries. An implication of this result is that, all else being equal, a conglomerate's large segment is more productive than its small segment.

The relation between productivity and focus in a population of firms depends both on the distribution of ability within these firms and on the distribution of ability across firms. If organizational talent is industry-specific, firms that are highly productive in one industry are likely to be relatively less productive in the other industries and thus are more likely to operate in a single industry. Firms whose organizations are not highly adapted to any one industry are less focused. By contrast, if organizational talent is not industry-specific, so that $d_1 = d_2$, all firms divide their production equally between the industries. In this case, there is no relation between productivity and focus, and there are no differences in productivity across segments. Larger firms, however, are more productive than smaller firms across all segments.

We can show this relation between the productivity in industry 1 (d_1) and productivity in industry 2 (d_2) graphically. In Figure 3 below, we plot "iso-valuation" lines, plotting a firm's Market Value to Book Value (replacement cost of assets) ratio as a function of its productivity in industry 1(d_1) and 2 (d_2).[26] We can define a firm's market over book as follows:

$$MV / BOOK = \frac{d_1 p_1 k_1 + d_2 p_2 k_2 - \alpha l_1^2 - \alpha l_2^2 - \beta\left(l_1 + l_2\right)^2}{r_1 k_1 + r_2 k_2} \quad (3)$$

[26] In this simple context the Market to Book ratio is equivalent to Tobin's Q.

The axis of Figure 3 below are a firm's productivity in productivity in industry 1(d_1) and 2 (d_2). If you choose the productivity in each industry, the band (the height if the graph were 3-D) of the graph below tells us the amount produced in each industry and equivalently the average market value to book value of the firm. Each band in the figure represents firms with equal market value to book value ratios.

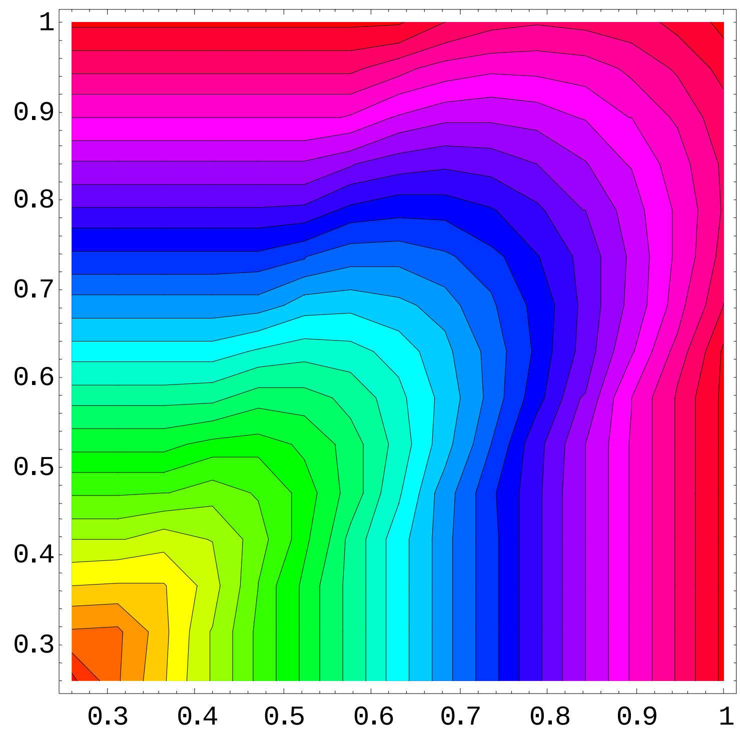

Figure 3: Market to Book Value Contour Plot

We can observe that for a firm to produce in two distinct industries near a 45 degree line in the center of the graph, it has to have *higher* productivity than firms with equivalent market value to book value ratios. Equivalently, if we match by productivity (or size) single segment firms in two industries to a conglomerate firm producing in both industries, the conglomerate firm will have a *lower* market value to book value ratio than the weighted average of the single segment firms. Thus one cannot in general conclude that multi-segment firms with lower market to book ratios are allocating resources inefficiently.

We now illustrate the effect when we generalize the model allowing firms to produce across ten different industries. We illustrate this using two numerical examples that show how differences in organizational talent across industries causes firms to choose to operate segments of different sizes and different observed productivities.

In each example we take the number of industries to be ten. We assume there are 25,000 potential firms, each of which is assigned firm-specific ability for each of the ten industries. In terms of the previous discussion and the empirical work, high ability is the same as high productivity. We draw the ability assignment d from a normal distribution with a mean ability of 1 and a standard deviation of 0.5. The output and input prices and the cost parameters in all industries are held constant, (in this case we set the parameters from equation (1) as follows: $p=200$, $r=200$, $\alpha=5$,$\beta=2$). In the first example, firm ability is industry-specific. Firms' ability to manage in one industry is independent of their ability to manage in the other industries. Thus, the draws are independent and identically distributed both within firms and across firms. In the second example, there is a firm-specific effect: The draws within a firm for each of the ten industries are correlated. We draw the common ability from a normal distribution with a mean equal to 0 and standard deviation equal to 0.25. We add this common ability to the random industry ability drawn earlier. Thus, part of a firm's ability can be applied equally to all industries. In each case we determine the industries in which it is optimal for each firm to produce and also the amount of each firms' production in each industry, given the price of output and the prices of inputs. We keep track separately of firms that choose to produce in one industry only, two industries only, etc., up to firms that choose to produce in all the industries (if such firms exist). Thus, we have simulated data on one-segment firms, two-segment firms, etc. For all firms with a given number of segments, we rank the segments by size, and we compute the mean firm ability d for that segment.

In Figure 4 below we allow the draws of firm ability in each of the 10 industries to be independent. We call the industry in which the firm produces its "segments". We label the segment in which the firm produces the most its segment #1, the industry in which produces its second most, its "Segment #2" , increasing this for each of the firm's remaining segments. The height of the graph (z-axis) gives the managerial ability *and* equivalently the size of the firm in that industry in which the firm produces. Each row of the figure thus contains the average of productivity by segment number (x-axis) for firms with a given number of segments (y-axis).

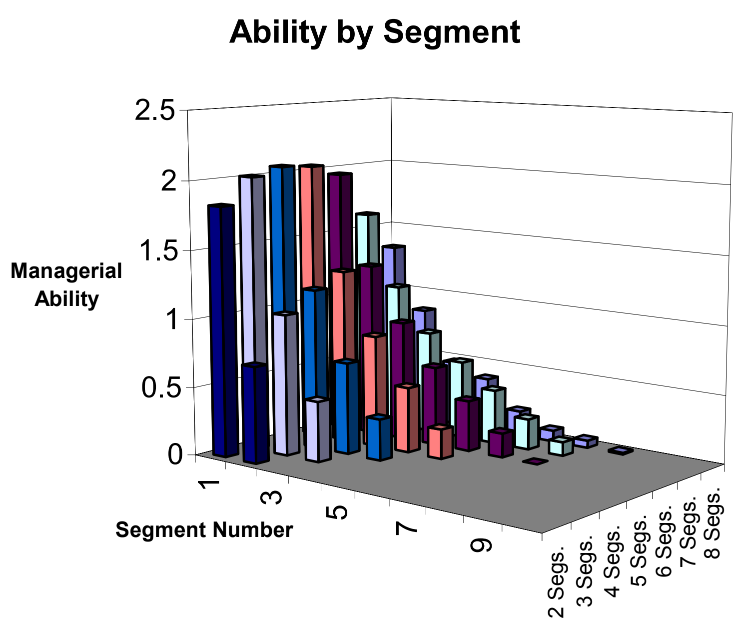

Figure 4

Model with No Common Managerial Ability Across Industries

Figure 4 thus illustrates the case in which the assignment of firm ability is independent across industries in which the firm produces. The figure shows how average firm talent in the economy varies by the number of segments a firm operates in and by segment rank. As predicted, the figure shows that within firms the main segments of conglomerates have higher productivity than peripheral segments. As we go across the number of segments in which a firm operates equally ranked segments at first become more productive and then less productive. The drop-off in productivity occurs because it is very unlikely that any single firm is productive in all ten industries. Thus, firms that choose to produce in many industries are likely to have mediocre ability in all of them. In this simulated example, no firms in the sample produce in all the industries. A simple OLS regression on the simulated data shows that firms' mean productivity is positively and significantly related to their focus, measured by the Herfindahl index, and size. These relations between focus and productivity are obtained even without assuming the existence of agency costs.

In Figure 5, we allow ability in each segment to have a firm-specific component, so that a firm which highly productive in one industry is likely to be highly productive in other segments. As in Figure 4, the height of the graph (z-axis) gives the managerial ability *and* equivalently the size of the firm in that industry in which the firm produces. Each row of the figure contains the average of productivity by segment number (x-axis) for firms with a given number of segments (y-axis).

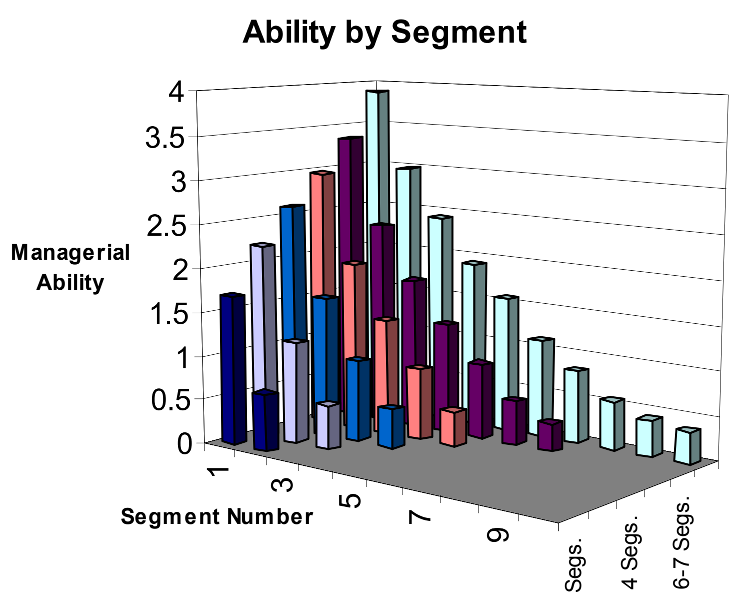

Figure 5
Model with Common Managerial Ability Across Industries

Looking at Figure 5, we still see that the main segments are more productive than the peripherals. However, now equally ranked segments are more productive in firms that operate in more segments. Firms that choose to operate in many segments are more productive in general. Interestingly, a simple OLS regression shows that firms' mean productivity is again positively and significantly related to their focus, measured by the herfindahl index, and size, albeit less so than with no common firm talent.

While the simple model makes predictions about the distribution of firms' production, this distribution of production across industries depends on the distribution of ability. However, ability is hard to measure. As a result, the predictions on the distribution of segment size and productivity industries do not directly differentiate the model from other models considered below which predict that firms inefficiently expand into industries outside their core competence. To differentiate the neo-classical from other views, it is necessary to obtain predictions about the firm's responses to exogenous shocks to the industry environment. We discuss this below.

More recently, Gomes and Livdan (2004) embed and calibrate the model in Maksimovic and Phillips (2002) in a dynamic setting.[27] They show explicitly that for the parameter values they select the calibrated model is consistent with Lang and Stulz's (1994) findings on the diversification discount. They can also reproduce Schoar's (2002) finding that expanding focused firms are less productive after diversification than nonexpanding focused firms.

[27] Gomes and Livdan (2004) argue that the models differ in certain respects. However, these differences do not affect any of the main intuitions. In essence, the differences come down to technical assumptions that ensure the existence of an equilibrium in which some firms specialize and others do not. Maksimovic and Phillips' implicitly assumes that a firm that chooses to produce in two industries has higher costs than would two identical firms that together produce the same output as the diversified firm but that are *constrained* to specialize in one industry each. By contrast, Gomes and Livdan assume that there is a fixed cost to producing in any industry. Both assumptions serve to counterbalance the assumption of diminishing returns to scale in each industry which both papers make, and which would otherwise make diversification more attractive.

4. Investment Decisions of Conglomerate Firms

We review the recent evidence on the conglomerate discount and conglomerate firms' investment decisions by examining first the investment and resource allocation decision of existing conglomerate firms. We then review the literature on spinoffs and divestitures of conglomerate firms.

There have been four major ways that the literature has addressed how conglomerate firms may invest differentially. First, there has been a branch that has examined whether conglomerate firms have differential investment – cash flow sensitivity. Second, there have been studies examining investment allocation across projects by firms within a single industry. The advantage of the single-industry studies is that in controls for differences investment opportunities that might be hard to measure. Third, several studies have examined how firms should invest when faced with differential opportunities based on the neoclassical investment model. Fourth, studies have examined divestitures and spin-off for evidence of decreased agency costs after the divestiture. We review each of these areas in turn.

4.1 Investment – cash flow sensitivity

The models of conglomerate investment relate the conglomerate firm's investment expenditures in each segment to the segment's investment opportunities and to the state of the firm's internal capital market.

Neoclassical theory suggests that the firm's level of investment should depend only on its perceived investment opportunities measured by the firm's marginal Tobin's q, where marginal

Tobin's q is the value of the investment opportunity divided by the cost of the required investment.[28]

Shin and Stulz (1998) and Scharfstein (1998) use this relation between Tobin's q and investment to examine how a firm's internal capital market allocates investment. If the internal capital market is as efficient as the public market for capital we would expect to see a similar relation between investment and Tobin's q for the segments of conglomerates and for single-segment firms.

One set of tests estimates an investment equation on single-segment firms and conglomerates' segments. Consider equation (4)

$$i_j = z_j\gamma + q_j\beta + \zeta_j \quad (4)$$

where *i* is the firm's capital expenditures, *q* is the marginal Tobin's q and z is a vector of exogenous explanatory variables. For single segment firms the marginal Tobin's q is usually proxied by the firm's average Tobin's q.[29] For conglomerate segments we cannot observe the segment's average *q* directly, but must use a proxy. The usual proxies in the diversification literature are based on the average or median Tobin's *q*s of single-segment firms operating in segment *j*'s industry.

When equation (4) is run via OLS, the coefficient β is higher in single-segment firms than in conglomerates, suggesting that conglomerates' segments are insufficiently responsive to

[28] Tobin's q is usually defined as the value of the firm (equity and debt claims) scaled by the replacement value of the firm's assets. In the corporate finance literature this quantity is often approximated by the ratio of the market value of a firm's assets (market value of equity + book value of assets – book value of equity-deferred taxes) to the book value of assets. See Whited (2001) .

[29] See Hayashi (1982) and Abel and Eberly (1994) for the conditions under which the marginal Tobin's q is well proxied by the average Tobin's q.

differences in investment opportunities. This implies that conglomerates overinvest when opportunities are low and underinvest when they are better (Scharfstein (1998)).

A second set of tests recognizes that in an imperfect financial market the firm's investment expenditures may depend on its cash flow as well as on its marginal Tobin's q. For a conglomerate, a segment's investment may depend both on its own cash flows and on the cash flows of the whole firm. Thus, we can augment the investment equation by putting in the cash flows of the segment and that of the whole firm in the investment equation,

$$i_j = z_j\gamma + q_j\beta + \delta CF_j + \phi CF_{-j} + \zeta_j \quad (5)$$

where CF_j is the cash flow of segment j and CF_{-j} is the cash flow of entire conglomerate less segment j.

Shin and Stulz (1998) argue that if the internal capital market is working efficiently investment will not depend on a segment's cash flow but on that of the firm as a whole and $\phi >> \delta$.

It is reasonable to suppose that in an efficient internal capital market the level of investment in one segment will be affected by the level of investment opportunities in other segments. Thus, as further test of the efficiency of the internal capital market equation (5) can be augmented by estimates of Tobin's q for the firm's other segments *–j*.

Using COMPUSTAT Shin and Stulz (1998) examine the workings of internal capital markets of about 14,000 conglomerates for the period 1980 to 1992, paying careful attention to data issues (see the Appendix to their paper). They find that (a) The investment of a conglomerate segment depends more on its own cash flows than on the cash flows of the firm's other segments (δ exceeds ϕ); (b) in highly diversified firms, a segment's cash flow is less sensitive to its cash flow than in comparable single-segment firms, (c) a segment's investment increases with its q but is not related to the other segments' qs, and (d) the segments with the highest qs have the same cash flow sensitivity δ as other segments.

In sum, Shin and Stulz (1998) find that the internal capital market does not equalize the effect of cash shortfalls across segments. At the same time, a segment's investment is affected by the cash flows of the other segments, notwithstanding differences in Tobin's q across segments. They conclude that conglomerates internal capital markets do not meet their standard of efficiency.

Shin and Stulz's results suggest that conglomerates may invest less efficiently than single-segment firms, and that, while firm's internal financial markets are integrated, the integration is partial so that the markets are not allocatively efficient. These studies, based on COMPUSTAT data, stand in marked contrast to the findings of MP (2002) using LRD data, who find that conglomerate investment is, on the whole, efficient.

More recent work has tried to reconcile the findings of these papers. As is often the case in research on conglomerates, the issues center on the thorny issue of measurement of the within firm quantities, in this case investment and Tobin's q.

A key variable which is difficult to measure at the conglomerate-segment level is Tobin's q. As discussed above, the COMPUSTAT based literature attempts to proxy Tobin's q for a segment by using observed qs of "comparable" firms. MP (2002) argue that this is problematical since (a) the decision to become a conglomerate is endogenous and there is likely to be selection bias and (b) the investment of a conglomerate segment does not depend in the same way on investment opportunities as that of a conglomerate firm which maximizes value across different segments. Thus, the estimate of growth opportunities derived from a single-firm Tobin's qs may be an inappropriate for the study of investment by conglomerate segments.

Whited (2001) directly tests whether the findings of the COMPUSTAT based literature can be attributed to measurement error caused by the use of segments' *q*s based on estimated derived from "comparable" single-segment firms.

Whited's arguments can be illustrated with equation (1). As noted above, we cannot observe *q* directly, but must use a proxy, perhaps based on the average Tobin's *q*s of single segment firms operating in segment *j*'s industry. Whited (2001) models the consequences of the use of a noisy proxy on the estimates of coefficients of β in equation (1) and β, δ and ϕ in equation (2) above. Suppose that the relation between the proxy, *p* and the Tobin's q takes the following form

$$p_j = \alpha + q_j + \varepsilon_j .$$

We can eliminate *z* from this system by regressing all the variables on *z* and using the residuals. For simplicity we can also initially fold the variables CF_j and CF_{-j} with the other exogenous variables into *z*. Doing so we obtain

$$\tilde{i}_j = \tilde{q}_j \beta + \tilde{\zeta}_j \text{ and } (6)$$

$$\tilde{p}_j = \tilde{q}_j + \tilde{\varepsilon}_j . (7)$$

These equations can be used to generate a set of eight moments such as, $E(\tilde{i}_j^2) = \beta^2 E(\tilde{q}_j^2) + E(\tilde{\zeta}_j^2)$; $E(\tilde{i}_j \, \tilde{p}_j) = \beta E(\tilde{q}_j^2)$, $E(\tilde{p}_j^2) = E(\tilde{q}_j^2) + E(\tilde{\varepsilon}_j^2)$, $E(\tilde{i}_j \, \tilde{p}_j^2) = \beta E(\tilde{q}_j^3)$; $E(\tilde{i}_j^2 \tilde{p}_j) = \beta^2 E(\tilde{q}_j^3)$ etc.

The estimation technique consists of replacing the eight left-hand side moments with their sample estimates and then using GMM to find a vector of six right-hand side unobservable quantities $\left(\beta, E(\tilde{q}_j^2), E(\varepsilon_j^2), E(\zeta_j^2), E(\tilde{q}_j^3), E(\tilde{q}_j^4)\right)$. This vector is one that comes closest to minimizing the distance between the left-hand and right-hand sides of equations, when evaluated using the minimum variance GMM weighting matrix derived by Erickson and Whited (2000).

The estimate of sensitivity of investment β is obtained from $\beta = E(\tilde{i}_j^2 \tilde{p}_j) / E(\tilde{i}_j \tilde{p}_j^2)$. Given the estimate of β, the remaining moment conditions can then be solved to give the remaining unknowns. Because the estimator provides estimates of $E(\tilde{q}_j^2), E(\varepsilon_j^2)$ and $E(\zeta_j^2)$, Whited (2001) also obtains estimates of the R^2 of the first equation, that is the proportion of the variation of capital investment explained by the true Tobin's q, as well as the R^2 of the second equation, the proportion of the variation of *p*'s (the proxy for Tobin's *q*) variation explained by the true *q*.

Whited (2001) reestimates equations (4) and (5) correcting for the possible error measurement error in the estimates of Tobin's q. She finds that the corrected estimate of β in equation (4) when estimated over conglomerate segments is insignificantly different from the estimate of β for single-segment firms. Thus, she finds that the previous findings of inefficient investment by conglomerates segments may be due to measurement error. She also finds that the corrected estimates of ϕ and δ in equation (5) are insignificantly different from zero, suggesting that the previous finding that the firm's internal capital market is at least partially inefficient might also have been caused by measurement error.

While the formal tests in Whited (2001) are specific to the model she investigates, they raise a serious concern about the use of segment Tobin's qs derived from COMPUSTAT data in all studies of intra-firm investment efficiency.

Maksimovic and Phillips (MP) (2004) argue that previous studies of investment using Compustat data are subject to another form of measurement error: They exclude a major type of investment expenditure by conglomerates. MP show that single-segment and conglomerate firms differ both in the level of total investment and the *type* of investment. The overall level of capital expenditures on existing plants by conglomerates and single-segment firms in US manufacturing industries is similar. However, conglomerates and single-segment firms differ markedly in their rates of purchases of new plants, even when controlling for segment size. Thus, the COMPUSTAT based studies, which use segment capital expenditures as a proxy for investment and do not include acquisitions, exclude a major category of investment by conglomerates. Using LRD data, for each single-segment firm and conglomerate segment MP predict the probability that the segment will be run a financial deficit if it invests at the level predicted by its productivity and industry conditions not taking account whether it is a conglomerate segment or not , $\overline{FD_j}$. They then run the regressions of the following form:[30]

$$acq_j(\text{or } i_j) = z_j\gamma + \overline{FD_j}\,\beta + \delta cong \times \overline{FD_j} + \phi cong_j + \varphi TFP_j + \zeta_j,$$

Where acq_j is a measure of segment *j*'s acquisition activity, i_j is a measure of segment *j*'s capital expenditures, TFP_j is the segment's industry standardized productivity and $cong_j$ is a dummy that takes a value of 1 if the segment belongs to a conglomerate and 0 otherwise. MP (2004) finds that $\beta < 0$, so that a predicted financing deficit leads to a reduction of acquisition and capital expenditure. However, $\delta > 0$, indicating that belonging to conglomerate segments reduces a segment's financing constraints. The effect is particularly striking for the rate of acquisitions, which is considerably higher for conglomerates segments, even the ones predicted to run a financing deficit. In further analysis MP show that this effect is greater for the more efficient conglomerate segments and that subsequent to acquisition the acquired plants either maintain or improve their productivity on average. Thus, using LRD data and using TFP together with industry

[30] The regressions in Maksimovic and Phillips (2004) allow for differences across types of industries, but these differences suppressed in this exposition.

conditions as a measure of investment opportunities MP find no evidence for a negative effect of the internal financial market on resource allocation.[31]

4.2 Industry Studies

Another form of evidence on the workings of internal capital markets is provided by three case-studies exploring the workings of internal capital markets in specific industries. Lamont (1997) studies investment decisions of diversified oil companies following the oil price shock of 1986 when oil prices plunged by over 50%. Khanna and Tice (2001) study the responses of diversified in response to Wal-Mart's entry into their market. Guedj and Scharfstein (2004) analyze the effect of organizational scope on the development strategies and performance of biopharmaceutical firms.

The oil price drop of 1986 provides a natural experiment for the effect of external demand shocks on a conglomerates internal capital market. Lamont identifies approximately 40 non-oil segments owned by 26 oil companies. He tests whether the investment of these non-oil segments of oil firms segments depends on the firm's internal capital market by comparing their capital expenditures with the capital expenditures of similar segments owned by firms less-dependent on the price of oil. Lamont shows that following a significant negative oil price shock, non-oil segments owned by oil companies significantly cut their investment in 1986 compared to the control group of segments not owned by oil companies. Thus, firm-level adverse shock in the oil segment was transmitted to the other segments. Moreover, Lamont finds evidence that the oil companies overinvested in their non-oil segments in prior to the oil price drop.

[31] MP (2004) do not have data on prices paid for the acquisitions. Thus, they cannot determine if the observed increases in productivity are enough to compensate the acquiring firms for the costs of the acquisitions.

Lamont's (1997) interpretation has been queried by Schnure (1997). Schnure examines the cash positions of the 26 oil companies over the period 1985-6 and finds little evidence that they faced cash constraints. For example, more than half the oil companies in the sample repurchased stock in 1986, many increased dividends and the cash holdings of the sample increased substantially in 1986. This suggests that the relation between the oil price shock and the investment by non-oil segments of oil companies is more complex than the simple transmission of a negative shock via internal capital markets.[32]

Khanna and Tice (2001) examine the responses of discount retailers in response to Wal-Mart's entry into their local markets in the period between 1975 and 1996. Prior to Wal-Marts entry most markets had several incumbent discount retailers. Khanna and Tice identify 24 stand-alone incumbent discount retailers and 25 incumbent discount divisions of diversified firms. They examine the effect of organizational form by studying the incumbents' responses to Wal-Mart's entry while controlling for factors such as productivity and size.

Khanna and Tice find that conditional on staying in a market following Wal-Mart's entry, diversified firms invest more than focused firms and their investment in more sensitive to their own productivity levels than that of focused firms. They find evidence that diversified firms transfer funds away from failing discount divisions. Moreover, diversified firms appear to be quicker in deciding whether to stay and compete with Wal-Mart or to exit the market.

Some caveats are in order. The diversified firms in Khanna and Tice are for the most part retailers, albeit with non-discount divisions. Thus, their study addresses the effect of capital markets in related diversification. The discount retailing divisions of diversified firms tend to be more productive than the stand-alone firms with which they are compared, raising the possibility

[32] The model in Rajan, Servaes and Zingales (2000) suggests that the relative decline in the investment opportunities in oil have made the oil segment less willing to acquiesce to uneconomic transfers to other segments.

of self-selection in the decision to become diversified. However, overall Khanna and Tice conclude that internal capital markets work well for these firms and that the competitive responses of diversified firms are more efficient than those of focused retailers.

Campello (2002) examines the internal capital markets in financial conglomerates (bank holding companies) by comparing the responses of small subsidiary and independent banks to monetary policy. These conglomerates are not diversified across different industries, but have the advantage that it is easier to control for differences in their investment opportunities. Campello finds that internal capital markets in financial conglomerates relax the credit constraints faced by smaller bank affiliates and that internal capital markets lessen the impact of Fed policies on bank lending activity.

Guedj and Scharfstein (2004) contrast the research and development strategies and subsequent performance of small biopharmaceutical firms with those of more mature firms. The former have no history of successful drug development and are typically focused on one stand-alone project, such as the development of a specific drug, whereas the latter usually have the option of picking among several projects to develop. To the extent that the projects are discrete, the large firms closely resemble the theoretical model of internal capital markets in Stein (1997).

Guedj and Scharfstein analyze a sample of 235 cancer drugs that entered clinical trials in the period 1990-2002. In order to be marketed in the US a drug has to undergo three separate phases of clinical trials. In each phase more information is revealed about the drug's prospects. These trials are expensive, and after each phase is completed the sponsoring firm must determine whether to proceed onto the next stage or whether to curtail the development of the particular drug.

Guedj and Scharfstein find that standalone firms are more likely to push drugs that have completed Phase I trials into Phase II trials. However, standalone firms also have much worse results at Phase II. This pattern especially evident for those early standalone firms that have large cash reserves. Thus, as in Stein (1997), single-product firms do not abandon projects optimally, whereas managers of multi-project firms shift resources in response to new information. In that light firm diversification can be viewed as a response to an agency conflict between the managers of single-product firms and shareholders.

Khanna and Tice (2001), Campello (2002), and Guedj and Scharfstein (2003) identify several specific advantages of internal capital markets. Lamont (1997) identifies a potentially countervailing disadvantage: a tendency to transmit investment shocks to the firm's main division to unrelated projects.[33] We next look at attempts to analyze the effect of internal capital markets on a broader scale.

4.3 Efficient Internal Capital Markets

Stein's (1997) model suggests that that there is a positive relation between the internal market's efficiency and the amount of external capital a diversified firm raises. Moreover, the efficiency of external capital markets is greater when a firm has more divisions and when the investment opportunities across divisions are not correlated.

Peyer (2001) and also Billet and Mauer (2003) test predictions on how conglomerate firms allocate firms across divisions. For diversified firms Payer estimates the firm's excess external capital raised as the difference between the firm's use of external capital compares and an estimate of how much a matching portfolio of single-segment firms would have used.

[33] MP (2002) also find that the operations of peripheral units of conglomerates are cut back much more severely in recessions than their main units. It is unclear whether these cuts occur because of a reduction of the resources available to the firm's internal capital market or because a shock triggers off a re-evaluation of the firm's long-term strategy. Schnure's (1997) results suggests that it might be the latter.

For each diversified firm Peyer obtains the amount of external capital used as the difference between the external capital raised from outside investors and the external capital returned to outside investors.

He also computes the firm's imputed use of external capital: for each of the diversified firms' divisions he computes the external capital that would have been had it been the median single-segment firm in the same 3-digit SIC code as the division. These estimates are then weighted by divisional sales to obtain the firm's imputed net external capital need. The firm's excess net external capital (EEC) raised by the diversified firm is then computed as

$$EEC = \frac{\text{Net external capital used - Imputed net external capital used}}{\text{Lagged Book Value of Assets}}.$$

Peyer estimates the following regression:

$$\begin{aligned}&\text{EEC=}\alpha_{\mathrm{i}} + \beta_i + \gamma_1 \left(ICM\ size\right)_{i,t} + \gamma_2 \left(ICM\ efficiency\right)_{i,t-1}\\&\gamma_3 \left(Informational\ asymmetry\right)_{i,t-1} + \gamma_4 \left(Informational\ asymmetry \times ICM\ efficiency\right)_{i,t-1} +\\&\gamma_5 \left(Capital\ need\right)_{i,t} + \gamma_6 \left(Relative Value\right)_{i,t-1} + \gamma_7 \left(Firm\ Size\right)_{i,t-1}\end{aligned}$$

Motivated by Stein (1997), Peyer uses the inverse of the Herfindahl index and the coefficient of variation in q across the firm's divisions as measures of Internal Capital Market (ICM) size.[34]

As a measure of ICM efficiency use RSZ's Relative Value Added by Allocation (RVA), where RVA is defined as

$$RVA_j = \sum_{k=1}^{n} \frac{BA_{jk}}{BA_j} \left(q_{jk} - \overline{q}_j\right) \times IAI_{jk}$$

[34] Peyer also uses diversity as a measure in one of his runs. Following Rajan, Servaes and Zingales (2000) diversity is defined as the standard deviation of the segment asset-weighted imputed q divided by the equally weighted average imputed segment q. As noted above, RSZ predict a negative relation between diversity and ICM efficiency.

where BA_j is the book value of assets of firm j, BA_{jk} is the book value of assets of segment *k and IAI* is a measure of the excess investment in segment *k.*[35]

RVA has the following interpretation: *IAI* is given a positive weight when the division has relatively good investment opportunities ($q_j - \overline{q} > 0$) and a negative weight when the firm has relatively bad investment opportunities ($q_j - \overline{q} < 0$). Thus a positive RVA indicates that the ICM is efficient because additional investment in being channeled into segments with better than average (for the firm) investment opportunities.

Peyer uses several measures of informational asymmetry: the ratio of intangible to tangible assets, residual variance of daily stock returns and the dispersion in analysts' forecasts. He also computes two additional variables. Excess capital need is measured by Excess internal cash flow = (internal cash flow - imputed internal cash flow) / lagged book value of assets. Relative firm valuation (to control for the propensity of firms to issue equities after a run-up) is measures using the Lang and Stulz (1994) and Berger and Ofek (1995) measures. Firm size is measured using market valuations.

Peyer finds that firms with efficient ICMs and diversified firms use more net external capital than comparable standalone firms. Measures of information asymmetry are negatively correlated with the use of external capital. The relation is attenuated for firms with efficient ICMs.

EEC is positively related to excess value, especially for firms that have efficient ICMs and firms with larger ICMs. Peyer interprets the positive correlation between the use of external capital and firm value supports the notion that diversified firms are raising external capital to invest in a firm-value-increasing manner.

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[35] We discuss the IAI below. Other measures of excess investment used by Peyer perform similarly.

For robustness, Peyer examines changes in EEC in response to changes in the explanatory variables. He finds that increases in ICM efficiency and increases in the size of the ICM are positively related to changes in EEC. Increases in information asymmetry have a smaller negative effect on EEC if the firm has an efficient ICM. Moreover, there exists an association between the increased use of external capital and firm valuations, measured as in Ofek and Berger (1995).

In all, the Peyer (2001) findings that more efficient ICM firms and firms with larger ICMs use more external capital makes and have a higher firm provides empirical support for Stein (1997).

Billet and Mauer (2003) construct an index of the diversified firm's internal capital market that includes the amount of subsidies and transfers and the efficiency of these flows. Subsidies to division *i* of firm *j* are calculated as:

$$Subsidy_{ij} = Max(Capital\ expenditures_{ij} - After\ tax\ cash\ flow_{ij},\ 0).$$

They calculate the potential transfer from division *i* to other divisions as:

$$Potential\ Transfer_{ij} = Max(After\ tax\ cash\ flow_{ij} - w_{ij}*dividends_j - CAPX_{ij},\ 0).$$

Dividends are determined at the firm level. The firm-level dividends are weighted by w_{ij}, the share of assets division *i* represents of the firm *j's* assets in the calculation of potential transfers.

Billet and Mauer demonstrate that funds flow toward financially constrained efficient divisions of conglomerates and that these types of transfers to constrained segments with good investment opportunities increase firm value. They show that the higher the transfers to financially constrained segments with good investment opportunities, the higher the overall valuation of the conglomerate. They thus provide evidence that financing constraints are important to the relation between internal capital markets and excess value of the conglomerate relative to single-segment firms.

4.4 Bargaining Power within the Firm and Differential Investment Opportunities:

Rajan, Servaes and Zingales (2000) (RSZ) examine how differential investment opportunities within the firm affect investment efficiency. The empirical tests in RSZ are of two kinds. First, they test whether conglomerates distort their investment expenditures by underinvesting in divisions with better growth opportunities and overinvesting in divisions with worse opportunities. Second, they test their model's predictions about the relation been distortions and the diversity of the firm's operations.

RSZ find that diversified firms invest more in segments with good opportunities than in segments with poor opportunities. However, conglomerates might still misallocate investment flows relative to comparable single-segment firms. Specifically, their theoretical model predicts that segments with good investment opportunities and above average resources will transfer assets to segments with poorer investment opportunities and below average resources. The purpose of the transfer is to reduce the threat that segment with poorer investment opportunities and resources will expropriate the better segments ex-post, thereby improving the better segments' investment incentives.

RSZ cannot directly observe resource transfers between a diversified firm's segments. Instead, they have to infer those transfers for each segment by comparing the segment's investment to the investment of comparable single-segment firms. They attribute differences between the actual investment and the investment of comparable single-segment firms to transfers across divisions. However, RSZ also allow for the possibility that conglomerates may systematically over-invest relative to single-segment firms because they have better access to capital. Thus RSZ measure of the extent to which a segment deviates from its benchmark, the Industry-Adjusted

Investment (IAI), subtracts out the weighted average industry-adjusted investment across all the segments of a firm. Thus,

$$IAI_{jkt} = \frac{I_k}{BA_k} - \frac{I_k^{ss}}{BA_k^{ss}} - \sum_{k=1}^{n} w_k \left(\frac{I_k}{BA_k} - \frac{I_k^{ss}}{BA_k^{ss}} \right),$$

where I_k is the investment in segment *k*, BA_k is the book value of assets in segment *k*, is the (asset-weighted) ratio of the capital expenditures to assets of comparable single-segment firms, and w_k is the ratio of segment *k*'s assets to the firm's assets.

In the econometric model they take to data, RSZ predict that a segment's investment depends on the magnitude of its asset-weighted investment opportunities relative to those of the rest. In particular, their model predicts that an increase in diversity should decrease investment in segments that have asset-weighted investment opportunities above the firm average, and increase investment in segments below the firm average.[36]

To test their model, RSZ divide up the segments of each diversified firm in each year along two dimensions (above v. below average investment opportunities, above v. below average resources) to obtain a 2X2 classification matrix of all the segments in their sample. Then for each firm in each year they sum up the IAIs for the firm's segments that fall into each cell receive (thus, in each year each firm will have four observations for the transfers, one for each cell, although some may be missing).

RSZ run the following regression equation separately for the segments in each cell of the classification matrix:

$$\sum_{k=1}^{m(j,t)} IAI_{jkt} = \alpha + \beta \frac{1}{q_{jt}} + \gamma (\text{Diversity})_{jt} + \delta \ (\text{Firm Sales})_{jt} + \text{controls} + \varepsilon_{jt},$$

[36] The RSZ model is discussed above in 3.3.

where $\sum_{k=1}^{m(j,t)} IAI_{jkt}$ is the sum of the IAI across the *m(j,t)* segments belonging to firm *j* at time *t* in the cell, and q_{jt} is the equally weighted average *q*s of firm *j* segments at time *t* and the firm's diversity is measured as the standard deviation of the firm's weighted segment *q*s divided by the mean *q*, or

$$Diversity_{jt} = \frac{\sqrt{\sum_{k=1}^{m(j,t)} \frac{\left(w_{jkt} q_{jkt} - \frac{\left(\sum_{k=1}^{m(j,t)} w_{jkt} q_{jkt} \right)}{m(j,t)} \right)^2}{m(j,t)-1}}}{\frac{\left(\sum_{k=1}^{m(j,t)} q_{jkt} \right)}{m(j,t)}}.$$

The control variables include firm fixed effects and calendar year dummies.[37]

The predictions of the RSZ model are summarized in Table 1.

	Segments with Resources > Firm Avg. Resources	Segments with Resources <Firm Avg. Resources
Segments with Q > Firm Average Q	(1) $\gamma < 0$	(2) $\gamma > 0$
Segments with Q < Firm Average Q	(3) $\gamma < 0$	(4) $\gamma > 0$

Table 1

Predictions of the RSZ Model

Investment falls in high opportunity segments with high resources as the firm's diversity increases (cell (1)). Investment increases in low opportunity segments with low resources as diversity

[37] The inclusion of the inverse of t

increases (cell(4)). Investment increases with diversity in high opportunity resource segments (cell(2)). Investment falls with diversity in large unprofitable segments (cell (1)).

These predictions contrast this with Efficient Internal Market models that emphasize the positive aspects of internal capital markets: top management has the option to reallocate resources from divisions with low investment opportunities to divisions with high investment opportunities. An increase in the diversity increases the value of this option and, thus, should increase the amount of resources transferred to segments with better investment opportunities. Thus, if firms' internal capital markets are efficient, we would observe $\gamma > 0$ in cells (1) and (2) and $\gamma < 0$ as increases in diversity make transfers between segments more valuable.

By contrast, Scharfstein and Stein's (2000) model of intra-firm bargaining would imply that the least productive divisions receive transfers from the most productive divisions. Again, an increase in diversity will lead to an increase in this transfer. That model would predict $\gamma < 0$ in cells (1) and (2) and $\gamma > 0$ in cells (3) and (4).

RSZ test their model on 13,947 firm-years in the sample data is obtained from COMPUSTAT for the period 1980-93. They separate regressions for each cell of Table 1 and obtain parameter estimates that accord with the predictions in the table.

RSZ perform extensive robustness checks. They also verify that (a) investment deviations that they that they classify as value increasing actually are positively related with to diversified firms' value and (b) that diversity itself is negatively related to firm value.

To summarize, even though some transfers in the right direction increase with diversity (cells (2) and (3) in the table above), RSZ find that on average as diversity increases, investment in segments with above-average opportunities becomes too small and investment in segments with below average opportunities becomes too large. This leads reduces the value of the firm of diverse firms.

4.5 Investment under a profit – maximizing neoclassical model

The Maksimovic and Phillips'(MP) (2002) model differs form the preceding literature in several regards. First, the tests are motivated by the neoclassical profit maximizing model. The model assumes that each firm has a corporate ability or talent, a fixed resource. It chooses the industries in which it operates so as to extract the maximum value from its ability, diversifying and focusing in response to demand shocks, and the consequent changes in the opportunity cost of assets, across industries. Thus, the focus of the model is not specifically on how well the internal capital market works, but on whether the diversified firms expand in segments in which they have a comparative advantage.

An implication of the MP model is that the decision to diversify is endogenous and depends on segment productivity and industry demand shocks. This implies that the use of single-segment firms as benchmarks for the values of conglomerates' segments is subject to selection bias.

Second, in empirical tests MP use plant-level Survey of Manufactures LRD data to classify each firm's plants into 3-digit SIC code industries. Thus, their classification of firms' assets in not subject to the same discretion that characterizes COMPUSTAT segment data. Moreover, their sample is larger than that of comparable studies, however, the survey of manufactures only covers manufacturing industries, so MP, cannot separately identify manufacturers who also operate outside manufacturing.

Third, instead of analyzing capital expenditures at the segment level, MP analyzes the growth in value added. Thus, their measure takes into account growth through whole and partial firm acquisitions as well as through direct capital expenditures.[38]

Fourth, MP do not use Tobin's *q*s of single-segment firms to proxy for a segment's growth options. Instead, they use the industry growth in real total value added to obtain industry level measures of investment opportunities. To provide a measure of segment productivity at the micro level, they benchmark each plant in an industry against every other plant in the industry to obtain each plant's predicted real value added in each year given the inputs (capital, energy, labor and materials) the plant used in that year. They use the difference between the plant's actual value added and the predicted value as a measure of the plant's relative productivity. They aggregate up their measure plant productivity to derive the segment-level Total Factor Productivity (TFP) for each year.[39]

Using LRD data, MP can directly observe how the productivity of diversified firms' segments varies by the number of segments and the segment's relative size within the firm. Figure 6 below summarizes the data. Controlling for the number of segments in a diversified firm, TFP decreases as the segment's relative size within the firm falls.

[38] Maksimovic and Phillips (2004) show that diversified firms are more likely to grow through acquisitions than single-segment firms.
[39] Schoar (2002) shows that TFP at the firm level predicts the conglomerate discount for diversified firms.

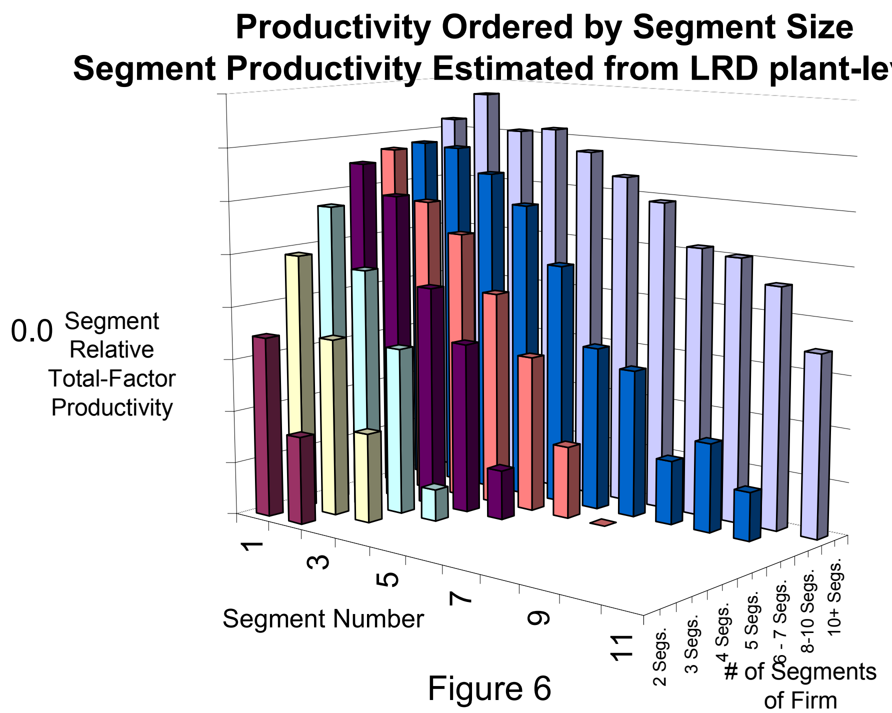

Figure 6

The pattern of productivity in Figure 6 is consistent with a neoclassical model in which firms spread their operations across a range of industries in which they have a comparative advantage and in which they have decreasing returns to scale.[40] Consistent with the model, larger firms are more productive on average than smaller firms. However, Figure 6 can also be given an agency interpretation: large productive firms may waste resources by diversifying into industries in which they do not have a comparative advantage.

To distinguish between these interpretations, MP (2002) examine how firms respond to industry demand shocks. According to their model, firms should grow the segments in which they are particularly productive and that have received a positive demand shock. They should reduce the growth of segments in which they are not efficient and which have received a negative demand shock.

[40] Decreasing returns to scale may arise from the production technology. More broadly, a firm may perceive itself as having decreasing returns to scale because expansion may provoke a competitive response by rival firms.

To see this, recall from Section 3.5 that the output of a conglomerate firm *i* in industry 1 depends on $v_{1i} = d_{1i} p_1 - r_1$. Suppose that there is positive demand shock in industry 1. First, output prices increase, $\Delta p_1 > 0$. Second, the price of capacity in the industry also increases, $\Delta r_1 > 0$. Productive firms in the industry increase output in industry 1. More formally, they experience an increase in their v_{1i} because the marginal positive effect of a price rise, $d_{1i} \times \Delta p_1$, outweighs the effect of an increase in the cost of capacity Δr_1. The higher the ability d_{1i}, the more capacity a firm adds in response to a positive price shock.

The effect of a price shock in industry 1 on the marginal producers not is more complex. If the effect of the expansion by the productive firms on Δr_1 is minor, then the marginal firms also expand in industry, although at a slower rate than the more productive producers. However, if the price of capacity is bid up sufficiently high so that for some firms with small d_{1i}, $d_{1i} \times \Delta p_1 - \Delta r_1 < 0$, then these marginal producers will sell some capacity to more productive producers and focus instead in industry 1. These firms' operations in industry 1 decline not only relative to those of more productive firms, but in absolute size as well.[41]

The MP model also generates another testable prediction regarding cross-segment effects. When managerial capacity is a fixed factor of production, investment decisions by conglomerate firms in one segment create opportunity costs for investments in other industries in which they operate. Thus, segments' investment decisions will depend on the relative demand growth across all the industries in which the conglomerate operates. Specifically, suppose that there is a large positive demand shock in one of the industries in which a conglomerate operates. If the

[41] Here we assume that the effect of a demand increase in industry 1 affects v_1 only and does not affect v_2. The Appendix discusses both effects.

conglomerate's segment in that industry is highly productive, it will grow relatively fast. This growth increases the conglomerate's costs in other segments, thus decreasing the other segments' optimal size. Thus, a conglomerate which has a productive segment in an industry that has received a positive demand shock will grow more slowly than it otherwise would have in its *other* segments.

Suppose, instead, that the conglomerate had an unproductive segment in a fast growing industry. Then the conglomerate may find it optimal to divest or reduce operations in the high growth industry for two reasons. The positive demand shock in the industry will have increased the value of its capacity, increasing a low productivity conglomerate's opportunity cost of staying in the industry rather than selling out to a high productivity producer. This effect is amplified because any reductions in growth or divestitures in a segment in which the conglomerate is less productive will produce positive externalities in its segments. Hence, a conglomerate which is a relatively unproductive producer and therefore divests or grows more slowly in an industry that has received a positive demand shock will grow faster than it otherwise would have in its *other* segments.

The predictions concerning cross-segment effects are derived in MP (1999, 2002) and briefly reviewed in the Appendix. They differ from predictions of models that stress influence costs, which suggest that resources are transferred to unproductive segments, and empire-building models, such as Lamont (1986) that suggest that wealth generated by positive shocks is dispersed throughout the firm.

To test their model MP (2002) run the following regression on a sample of 270 thousand segment years over the period 1977-1992.

$$\begin{aligned} GROWTH = \alpha + \beta \text{ Industry Shock} + \gamma \text{ Segment TFP} + \delta \text{ Industry Shock} \times \text{ Segment TFP} \\ + \phi \text{ Other Segments' TFP} + \theta \text{ Relative Demand} \times \text{Other Segments' TFP} + \text{controls} \end{aligned}$$

MP use Total Factor Productivity (TFP) as measure of each segment's productivity. The TFP takes the actual amount of output produced for a given amount of inputs and compares it to a predicted amount of output. The measure is computed at the plant level and aggregated up to segment level. "Predicted output" is what a plant should have produced, given the amount of inputs it used. A plant that produces more than the predicted amount of output has a greater-than-average TFP. This measure is more flexible than a cash flow measure, and does not impose the restrictions of constant returns to scale and constant elasticity of scale that a "dollar in, dollar out" cash flow measure requires. Demand shocks are measured by changes in the industry real shipments.[42]

Consistent with the model, MP find that productive segments grow faster ($\gamma > 0$), especially in industries which have experienced a positive demand shock ($\delta > 0$). Most importantly, a segment's growth rate is lower if the firm has more productive operations in other industries ($\phi < 0$). The segment's growth is further reduced if these more productive operations are in industries which have received a positive demand shock ($\theta < 0$). The last two finding are consistent with the cross-segment predictions of MP's neoclassical model but difficult to reconcile with an agency model in which the firm invests inefficiently.

As a robustness check MP identify a subsample of "failed conglomerates" (diversified firms which restructure by decreasing the number of segments by at least a quarter) and a control subsample of "regular" conglomerates that do not reduce the number of segments so substantially. They run their regression separately on the two subsamples. For the failed conglomerates the coefficients ϕ and θ are not significantly different from zero for the period prior to restructuring. The subsample of "regular" conglomerates these coefficients are negative and significant, as predicted by the model. Thus, MP find evidence that there is subset of "failed" conglomerates that

[42] MP show that their results also hold for several other measures of productivity and demand shocks.

grow inefficiently, and are subsequently broken up. However, even for these failed conglomerates MP do not find a positive significant relation the segments' growth rates and other segments productivity. Thus, they find no evidence that even these failed conglomerates systematically grow their unproductive segments at the expense of productive segments.[43]

MP also find that a segment's relative size in the firm does affect its growth, even controlling for productivity. Main segments of firms (i.e. segments that produce at least a quarter of its value added) grow faster in response to positive demand shocks than peripheral segments. In part this is because main segments are on average more productive. However, a substantial growth differential remains even after controlling for productivity.

The growth differential is especially pronounced in recessions. Rather than being cushioned in recessions as predicted by models that stress bargaining within the firm, peripheral segments of conglomerates are cut sharply in response to negative demand shocks. These cuts are greater than predicted by MP's simple neoclassical model. They suggest that a more complex mechanism is at work. Thus, negative demand shocks may cause diversified firms to reassess the prospects of their peripheral segments and to shift resources into more promising ventures, as modeled by Stein (1997).

The decline in peripheral divisions is also reflected in aggregate Census data. In the beginning of the 1980s main divisions of diversified firms produced about half of the value added by US manufacturing and this share was maintained through the end of the 1990ies. By contrast, the share of peripheral segments of diversified firms fell from 27.5% to 23.5% over that period.

In sum, MP (2002) find that a simple profit maximizing neoclassical model of firm growth across segments is consistent with plant-level data and that there is little evidence of systematic

[43] MP perform robustness tests using several alternative measures of productivity and investment. Their model predicts, for example, predicts that segment size is a proxy for segment productivity. The results using segments size yield the qualitative results.

resource misallocation by diversified firms. There is some evidence that failed conglomerates that are subsequently broken up do not allocate resources model efficiently. However, even these firms do not systematically grow unproductive segments at the expense of productive segments. Instead, there is evidence that smaller, less productive units of conglomerates grow more slowly than their main divisions or similarly productive stand alone firms.

4.6 Mergers and Acquisitions, Divestitures and Spinoffs,

4.6.1 Diversified Firms and the Market for Assets

The early theoretical literature on internal capital markets, such as Stein (1997), explicitly recognizes the importance of the size of the internal market for its efficiency. Thus, while the importance setting the firm's boundaries for the quality of the internal capital market was recognized early, much of the literature takes a partial equilibrium approach and assumes that the firm's boundaries as given. This is potentially important since many of the hypothesized conflicts within the firm can be solved or mitigated by selling assets that do not fit well with the firm's total portfolio. Thus, if the market for firms' assets is efficient, the magnitude of the investment distortions that can be created by conflicts within the firm is likely to be tightly bounded. Of course, there may still be conflicts of interest between top management and shareholders. However, top managers have clear incentives to maximize firm value.[44]

An objection to this might be that the market for corporate assets is insufficiently liquid so that firms which attempt to readjust their portfolio by selling segments face a capital loss. This is unlikely. Table 2, from Maksimovic and Phillips (MP) (2001) shows that there exists a large, procyclical market for segments and individual plants.

[44] For a contrary view, see Aggarwal and Samwick (2003).

	Total	Mergers and Acquisitions	Asset Sales	
			Full Segment	Partial Segment
Panel A: Reallocation rates across and within industries				
Full period: 1974 to 1992				
Number of plants reallocated	35,291	17,720	8,556	9,015
Average annual % of plants reallocated	3.89%	1.95%[a,c]	0.95%	0.99%
% Plants sold to buyer inside industry				
Same three-digit SIC code	56.8%	54.1%[b,c]	55.5%	63.1%
Same four-digit SIC code	47.7%	44.9%[a,c]	47.9%	53.0%
Average plant size (Real $ in thousands, value of shipments)	$30,332	$28,435	$30,916	$33,506
Average industry plant size (Real $ in thousands, value of shipments)	$35,790	$34,569	$36,440	$37,574

	Sample of Firms			
	Total	Mergers and Takeovers	Asset Sales	
			Full Division	Partial Division
Transactions by aggregate economy conditions				
Recession years (1981, 1982, 1991)				
Average % reallocated (total number)	3.57% (5,148)	2.16% (3,112)	0.70% (1,003)	0.72% (1,033)
Expansion years (1986, 1987, 1988)				
Average % reallocated (total number)	6.19% (8,989)	2.69% (3,904)	1.73% (2,509)	1.77% (2,576)
Indeterminate Years	3.21%	1.73%	0.70%	0.78%
Transactions by industry capacity utilization				
Low industry capacity utilization (bottom quartile)				
Average % reallocated (total number)	3.86% (8,618)	1.90% (4,244)	0.99% (2,210)	0.97% (2,164)
High industry capacity utilization (top quartile)				
Average % reallocated (total number)	3.69% (8,413)	1.92% (4,375)	0.87% (1,977)	0.90% (2,061)
Transactions by long-run industry growth/decline				
Quartile 1: Declining industry growth				
Average % reallocated (total number)	4.01% (6,290)	1.95% (3,058)	1.09% (1,707)	0.97% (1,525)
Quartile 2				
Average % reallocated (total number)	3.86% (5,250)	1.96% (2,666)	1.05% (1,425)	0.85% (1,160)
Quartile 3				
Average % reallocated (total number)	3.52% (10,008)	1.80% (5,131)	0.88% (2,505)	0.83% (2,372)
Quartile 4: High industry growth				
Average % reallocated (total number)	4.03% (15,746)	2.01% (7,870)	0.87% (3,405)	1.14% (4,471)

Table 2

Source: Maksimovic and Phillips (2001), Journal of Finance.

Using Census, data MP (2001) show that in the period 1974-1992, 1.94% of all manufacturing plants change ownership annually in partial-firm transactions.[45] This is comparable to the total rate at which manufacturing plants change ownership in all-firm mergers and takeovers over this period, 1.95% annually. Similar rates of partial firm sales occur in both growing and

[45] See MP (2001) for a detailed description of the sample. See also Schlingemann, Stulz and Walking (2002) for a discussion of liquidity in the market for assets on the rate of sales.

declining industries. The market for divisions and plants is a market dominated by conglomerates. MP report that the sellers operate in an average of 10 4-digit SIC industries and the buyers in an average of 8 such industries.

MP test whether diversified firm's decision to sell a manufacturing plant can be explained by their neoclassical model. They run a probit regression on a panel of plants 1979-1992 from the LRD, where the dependent variable, *PLANT SALE*, takes on the value of 1 if the plant is sold and the value of 0 if the plant is not sold in a given year.

$$\begin{aligned} PLANT\ SALE = \alpha + \beta &\text{ Industry Shock} + \gamma \text{ Segment TFP} + \delta \text{ Industry Shock} \times \text{ Segment TFP} \\ &+ \phi \text{ Other Segments' TFP} + \theta \text{ Relative Demand} \times \text{Other Segments' TFP} + \text{controls} \end{aligned}$$

Consistent with the profit maximizing model, MP find that plants in productive segments are less likely to be sold ($\gamma < 0$), especially in industries which have experienced a positive demand shock ($\delta > 0$). Most importantly, a plant's probability of being sold is higher if the firm has more productive operations in other industries ($\phi > 0$). The probability of being sold further increased if these more productive operations are in industries which have received a positive demand shock ($\theta < 0$). The last two finding are consistent with the simple neoclassical model but and do not suggest an agency model in which the firm retains and subsidizes inefficient plants using resources generated by more successful divisions.

MP also find that there is negative relation between the probability that a plant is sold and the share of the firm's output produced by the segment to which the plant belongs. The finding is consistent with the notion that diversified firms divest from their smallest and least productive divisions and redeploy their assets.

MP also examine who purchases plants and firms and find that the probability of a purchase goes up with the buyer's productivity. When they examine the productivity of the plants after the purchase, MP find that the change in productivity increases with difference between the buyer's productivity and purchased plant's productivity. In sum, the evidence is consistent with transfers of assets going from less to more productive firms – especially when industries receive positive demand shocks.

More recently, Maksimovic, Prabhala and Phillips (MPP) (2005) show that acquirers sell about 40% of the target's plants in the four years after the acquisition. The sold plants tend to be those in the target's peripheral divisions. The plants that are kept increase in productivity after the acquisition, the plants that are sold do not. This pattern is consistent with the hypothesis that acquirers keep the assets which they can exploit efficiently and that they economize on managerial attention by selling or closing the assets that they cannot exploit efficiently.

Taken together, plant-level evidence suggests that the direction and timing of sales of corporate assets is consistent with an efficient allocation of resources within the firm. On average, the good assets are kept and the assets that cannot be exploited efficiently are sold. When the opportunity cost of retaining marginal assets is higher because other segments are more productive and growing faster, the rate at which marginal assets are disposed off is higher.

Schoar (2002) also used the LRD plant-level data to examine productivity of conglomerate firms and changes in productivity following plant acquisitions. Schoar (2002) establishes that market valuations of single-segment and conglomerate firms track estimates of productivity derived from LRD data. The tracking is equally strong for single-segment and conglomerate firms. This suggests that the conglomerate discount, if it exists, is unlikely to be caused by investors' inability to evaluate diversified firms' operations as efficiently as those of single-segment firms.

Schoar also finds no evidence that conglomerates' plants are less efficient than those of single-segment firms. Specifically, using plant-level data she runs the following regression

$$TFP = a + b * DIV + c * \text{plant size} + \text{d*plant age}$$

where *TFP* is total factor productivity on and *DIV* is a dummy that takes on a value of 1 if the plant belongs to a diversified firm and zero otherwise. The coefficient of *DIV* is positive and significant and remains so when the equation is augmented by segment-level control variables.

Like MP (2001), Schoar finds that acquired plants on average increase in productivity while the acquirer's own plants decline in productivity. She calls this the "new toy" effect, and argues that post-acquisition productivity of the acquirer is on balance negative. However, as Schoar points out this time-series effect does not cancel out the cross-sectional finding that diversified firms' plants have a higher TFP.

An intriguing possibility raised by Schoar's work is that a diversification discount may arise because conglomerates pay out a higher proportion of their revenues in salaries and benefits than standalone firms. She finds that diversified firms pay higher hourly wage rates than similar standalone firms. Assuming that these differences do not reflect differences in the educational level or quality of their respective workforces, the wage difference is enough to explain a 2-3% discount for diversified firms.

4.6.2 Spinoffs

Several studies, including Gertner, Powers, and Scharfstein (2002), Dittmar and Shivdasani (2003), Burch and Nanda (2003), Ahn and Denis (2004), and Colak and Whited (2005), examine spinoff and divestiture decisions that reduce the number of divisions that a conglomerate firm operates. These papers examine the investment efficiency of firms before and after the refocusing decision. This approach has potential advantages over studies that examine a sample of firms, some of which refocus and some which do not. If it can be assumed that the severity of measurement error does not change over time, measurement error bias that in the comparison of before and after refocusing performance, is mitigated. These papers further argue that they have reduced omitted variables bias by focusing on changes in value and efficiency in a single sample of firms.

Gertner, Powers, and Scharfstein (2002) examine sensitivity of segment investment to the median Tobin's q of the single-segment firms in that segment's industry. The sensitivity of Tobin's q captures the idea that the more efficient a firm is, the more it should respond to changes in investment opportunities by altering its investment policy. In order to get around the problem that the median industry Tobin's q is an imperfectly measure of investment opportunities for an individual firm, Gertner, Powers, and Scharfstein paper examines the same firm's sensitivity of investment to Tobin's q before and after the spinoff. They find that segment sensitivity to industry Tobin's q increases after the segment spinoff and that changes are related to the stock market's reaction to the spinoff decision.

Dittmar and Shivdasani (2003) find that the announcement returns for divestitures are significantly correlated with the change in the diversification discount. Larger decreases in diversification are associated with higher announcement returns. Dittmar and Shivdasani also find that RSZ measures of the efficiency of segment investment increase substantially following the divestiture and that this improvement is associated with a decrease in the diversification discount. One can interpret this evidence in several ways. The evidence is consistent with the firm divesting divisions will now be run more efficiently. Alternatively, the evidence is also consistent with changes in investment opportunities for the divesting firm or its divisions and thus the market responds positively as firms change their investment.

Burch and Nanda (2003) examine whether changes in value following spinoffs are related to measures of investment diversity by reconstructing the diversified firm after the spinoff. They construct changes in value using both industry multiples and also using firm-specific measures. To avoid the measurement error problem of assessing opportunities using industry measures, they also use an ex post, direct measure of excess value based on the post-spinoff market-to-book values of the divested division(s)and remaining parent firm. As they note, using ex-post data implicitly assumes that diversity in post-spinoff investment opportunities is a reasonable proxy for the diversity prior to the spinoff. Using these measures, they find that improvements in aggregate excess value (changes in the implicit discount less the actual pre-spinoff discount) depends significantly on direct measures of diversity and changes in measures of diversity based on industry proxies.

Ahn and Denis (2004) also examine the changes in measure of investment efficiency from RSZ pre- and post-spinoff. They find that post-spinoff, measures of investment efficiency increase for the hypothetical combined firm - combining the post-spinoff divisions with the parent in order to examine the total impact of the spinoff decision. They also find that the measures of investment efficiency increase the most for firms with the highest dispersion in the segment Tobin's qs from single-segment firms. They do note two caveats to their analysis. First, they note that by focusing just on firms that choose to spinoff divisions, they may be focusing on the set of firms with more severe investment inefficiencies. Second, they note that other changes in the investment opportunity set may be driving firms to spinoff and also contributing to the observed changes in investment efficiency.

Colak and Whited (2005) show the caveats noted in these papers are important. Their results challenge the view that these spinoffs and divestitures provide evidence that firms were misallocating resources prior to the spinoff. Using three-different approaches to control for endogeneity they show that refocusing decisions does not necessarily cause improvements in efficiency. In particular, firms that choose to spin-off and divest divisions are larger, more diversified, and subject to more serious problems of asymmetric information. Further, the spun-off segments tend to be in fast growing industries with a great deal of IPO and corporate control activity. Finally, they appear to have experienced recent unanticipated shocks to profit. They find that although spin-offs and divestitures may be associated with improvements in investment efficiency, they do not cause these improvements. When they control for measurement error, they also show that the sensitivity of investment to both industry Tobin's q does not significantly change following the refocusing decision.

5. Conclusions: What Have We Learned?

There have been a substantial number of careful empirical papers on internal financial markets in the last few years. Any summary of what has been learned is bound to be subjective and reflect the interests of the authors. With that caveat in mind, we can summarize the existing evidence about internal capital markets.

- The early work established clearly that, using single-segment firms as benchmarks, there exists a conglomerate discount.
- Initial attempts to explanation the discount focused on agency conflicts and conflicts among divisions that led to overinvestment in divisions with poor prospects and underinvestment in divisions with high *q*s.
- Conclusions drawn from econometric studies of segment capital expenditures, which use the Tobin's *q*s of single-segment firms to proxy for segment investment opportunities, are subject to measurement error and may not be valid.

- Diversified firms rely more on acquisitions than single-segment firms. Thus, studies that focus on capital expenditures may miss important components of investment by diversified firms.
- A conglomerate discount is not, by itself, evidence of agency or inefficiency --- it may be due to the fact that single segment and diversified firms operate on different regions of the production function.
- A simple neoclassical model that recognizes that the decision to diversify is endogenous and that firms grow fastest in industries where they have a comparative advantage in response to positive demand shocks in those industries is consistent with the growth patterns of diversified firms.
- The sales of plants by firms are also consistent with a simple neoclassical profit-maximizing model.
- Much of conglomerate discount can be explained by sample selection. Firms that choose to diversify, or to stay diversified or to be acquired by diversifiers inherently differ from single-segment firms.
- On balance, industry case studies and econometric analyses of firm growth suggest that internal capital markets are efficient in reallocating resources.
- Even controlling for productivity, main and peripheral segments of diversified firms are treated differently. Main divisions grow faster, are less likely to be cut back in recessions, and less likely to be sold.

In our reviewing of the evidence and econometric results, we have come to the conclusion that diversified firms predominantly behave like value maximizers given their productivity and internal capital markets facilitate the efficient transfer of resources. The evidence is broadly consistent with firms making endogenous value-maximizing choice of organizational form and allocating resources across industries consistent with a neoclassical model of resource allocation.

However, there is a large part of the literature that reaches different a conclusion, that conglomerate firms usually misallocate resources. Given the latest evidence, we are unable to reach this conclusion *for the majority* of conglomerate firms. However, there is some evidence that conglomerate firms that are busted up had investment patterns that varied from the neoclassical model. In addition, other puzzles do remain. In particular, the differences in growth patterns of main and peripheral divisions of diversified firms still have to be explained.

The conclusion that internal capital markets do not, on average, promote resource misallocation does not imply that firms are not subject to agency problems. Managers may allocate resources efficiently, but then expropriate the shareholder value created using those resources. Similarly, diversified firms may overpay for acquisitions that increase the firm's total value added from manufacturing activities.

More generally, the empirical literature on internal capital markets is an excellent case study of the importance of specifying the underlying benchmark model, paying attention to strengths and weaknesses of alternative data sources, and addressing econometric issues such as sample selection and measurement error. Seemingly reasonable choices at any of these steps are fully capable of leading to different results. As a result, the area remains of active interest to researchers.

6.0 Appendix: Neoclassical Model of Resource Allocation across Industries

In this appendix we illustrate how demand shocks affect the relative resource allocation and output of efficient and inefficient producers in an industry and also efficient and inefficient segments within a multi-industry setting. The exposition is based on the working paper version of MP (2002) and complements the discussion in Section 3.5.

We begin by analyzing how firms change capacity in response to demand shocks in a single industry and then generalize the model to multiple industries. We also discuss how these predictions differ from those of agency models in the literature.

1. Shocks and Growth in a Single Industry

We first analyze the relative growth rates and the flow of assets between differing productivity over the business cycle in a single industry. Accordingly, in this subsection we assume that all firms in the industry are single-segment firms that produce only in one industry.

We start by simplifying the firm's profit function given in equation (2) in the text to the one industry case

$$pd^j k^j - rk^j - \beta\left(k^j\right)^2,$$

where, for simplicity, we have abstracted from labor costs (so that $\alpha = 0$ in equation (2) in the text). The subscript *j* refers to Firm *j*. Recall that *r* is the market price of a unit of capacity and β is the standard neoclassical diseconomy of scale. To reduce notation, we further assume without loss of generality that d^j can take one of only two values. Let high productivity, or H firms, produce one unit of that industry's output per unit of capacity so that for those firms $d^j = d^H = 1$. Let low productivity, or L firms, produce only $d^j = d < 1$ units of output per unit of capacity. Thus, the profit functions specialize to $pk^H - rk^H - \beta\left(k^H\right)^2$ for H firms and $pdk^L - rk^L - \beta\left(k^L\right)^2$

for L firms, after adjusting the notation to reflect the fact that all the *H (L)* firms are identical, and where and the number of capacity units operated by H and L firms is k^H and k^L, respectively. Assume that total amount of capacity available to the industry is $K = \sigma + \rho r, \quad \sigma, \rho > 0$. Thus, we assume that the supply of capacity is not perfectly elastic, reflecting the addition of new capacity (for high levels of *r*) and sales for scrap (for low levels of *r*).

Assume that there is an exogenously determined number, *n,* of entrepreneurs and that the proportion of entrepreneurs that can operate H firms is λ. To avoid discussion of firm entry and exit which would require more notation, also assume that the opportunity cost of capacity outside the industry is sufficiently low so that it is optimal for all high- and low-quality firms to operate at the level of demand we are considering.

The time sequence is as follows: There is one period and two dates: *t=1,2*. At time *t=1,* the entrepreneurs learn the actual realization of the next period's level of demand in the industry. A market for capacity opens in which firms can purchase capacity units at a price *r*. The price of capacity, r, adjusts so that supply equals demand for capacity. Finally, at time *t=2,* the firm realizes the cash flows. For simplicity, we assume that capacity has no salvage value at *t=2*.

To make explicit the role of demand shocks and the distribution of capacity units on firm growth, we describe the equilibrium in the market for output. The market price that the customers pay in industry for the output is determined as $p = a - bn\left(\lambda k^H + (1-\lambda)k^L\right)$, where $n\left(\lambda k^H + (1-\lambda)k^L\right)$ is the aggregate output and a, b are positive constants.

Remark 1:

A positive demand shock causes, productive profit maximizing firms increase in size relative to less productive profit maximizing firms.

Proof of Remark 1

We obtain the output of type H firms by maximizing the firm's operating profit, $pk^H - rk^H - \beta\left(k^H\right)^2$. Solving for k^H, we obtain $\frac{p-r}{2\beta}$ as the optimal capacity that Type H firms operate at the given opportunity cost, *r*. The capacity at which the low-quality firms operate is similarly obtained as $k^L = \frac{pd-r}{2\beta}$. Notice that $k^H > k^L$, so that a Type H firm uses more capacity than the low-quality firm at every price level.

If both H and L firms are active in the industry and the price of capacity exceeds its salvage value, the market price of the output is $p = a - bn(\lambda k^H + d(1-\lambda)k^L)$. We determine the price of capacity by equating the demand for capacity by each type of firm to the total number of capacity units available, either on the secondary market or as supplied by manufacturers, so that

$$\sigma + \rho r = \lambda n \frac{p-r}{2\beta} + (1-\lambda) n \frac{pd-r}{2\beta},$$

where the total amount of capacity employed by the industry is $K = \sigma + \rho r$. The first term on the right hand side of the equation is the demand for capacity by the λn high-quality firms. The second term is the demand for capacity by the $(1-\lambda)n$ low-quality firms. Solving equation (1) for the opportunity cost of capacity yields

$$r = \frac{p\left(\lambda + d\left(1-\lambda\right)\right)}{n + 2\beta\rho} - \frac{2\beta\sigma}{n+2\beta\rho}. \tag{A2}$$

Substituting the expression for the rental cost of capital (A2) into the expressions for the desired capacity by high- and low-quality firms, we obtain

$$k^H = \frac{\sigma}{n+2\beta\rho} + \frac{(1-d)(1-\lambda)n+2\beta\rho}{2w(n+2\beta\rho)} p \text{ and } k^L = \frac{\sigma}{n+\beta\rho} - \frac{(1-d)\lambda n - 2\beta\rho d}{2w(n+2\beta\rho)} p \ .$$

The derivative of the ratio (k^H / k^L) with respect to the output price, p, is

$$\frac{2(1-d)(n+2\rho)\beta K}{\left(2w\sigma + (2\beta d\rho - (1-d)\lambda n)p\right)^2} > 0.$$

The last expression shows that a positive price shock (increase in p) increases the ratio k^H / k^L. Thus, positive price shocks are associated with higher growth of high-quality firms relative to low-quality firms. Since positive demand shocks to a at time $t=1$ translate into increases in p, it is straightforward, but messy, to show that the same relation obtains for the ratio k^H / k^L and a.[46]

Remark 2

Consider a multiperiod generalization of the above industry equilibrium in which the model is repeated over a sequence of dates, with the demand intercept a *changing over time. Positive (negative) innovations in* a *will cause more productive firms to engage in purchases of new capacity and purchases from other firms (divest) and less productive firms to divest (acquire) capacity.*

[46] The analysis presented here assumes an interior equilibrium. A full analysis would take into account the exit and entry of entrepreneurs.

In a multi-period setting firms don't need to acquire all their capacity in each period. After the first period, they have an endowment of capacity form the previous period. Thus, they need only make marginal adjustments to capacity in response to changes in a. Firms can choose to use all their capacity to produce, to sell some capacity and use the remainder to produce, or to buy more capacity and produce. Capacity may be purchased from and sold to other firms operating in the same industry, or from sources outside the industry. The net capacity adjustments they make follow from Remark 1.

2. Cross-segment Effects and the Growth of Conglomerates

As discussed above, when a positive demand shock occurs in industry 1 more productive producers increase their market share. When the productive producer is a conglomerate which operates both in industry 1 and industry 2 this increase in production in industry 1 creates a negative externality for this producer in industry 2. Thus, the conglomerate producer becomes a relatively less aggressive competitor in industry 2. By contrast, producers in industry 1 that are sufficiently less productive reduce capacity in industry 1 by selling capacity to the more productive firms.[47] This reduction in capacity reduces their control costs and creates a positive externality for the producers in industry 2. As a result, the less productive producers in industry 1 that also operate in industry 2 become more aggressive competitors in industry 2 and grow faster than they otherwise would in that industry. Thus, we can observe that:

[47] Note that ``sufficiently" depends on the elasticity of supply of capacity into the industry. If supply is fixed ($\beta=0$), then it is sufficient that d<1. In a more general model it would not be necessary for the sale of capacity to occur in industry 1 in order for the less productive firms to become more aggressive competitors in industry 2. It would be sufficient for the less productive producers to grow more slowly in industry 1 than the more productive producers following a positive price shock.

Remark 3

Given a distribution of managerial talent, a positive price shock in industry 1 provides incentives for: (a) Conglomerates that are more productive producers in industry 1 relative to industry competitors to reduce their focus on industry 2 and increase their focus on industry 1 (b) Conglomerates that are marginally productive producers in industry 1 to reduce their focus on industry 1 and increase their focus on industry 2 .

We illustrate case (b). This is easiest to show if we assume that there exist some firms in each industry which are single-segment. We use the suffix *ss* to indicate that the firm is single-segment.[48] For simplicity, all single-segment firms in both industries have the same technology.

We assume that of the total number of firms n a fraction, λ_c, are conglomerates and operate in both industries. Assume that all conglomerates have identical abilities d_1^c and d_2^c. An equal number of single-segment firms operates in both industries, so that the fraction of the n firms operating in each industry as single-segment firms is λ_{ss}, where $\lambda_{ss} = (1-\lambda_c)/2$. We assume that the capacity in each industry is fixed at K_i for *i=1,2.*

The profit function of a single-segment firm that operates only in industry i is, as before

$$p_i k_i^{ss} - r_i k^{ss} - \beta_i \left(k_i^{ss}\right)^2,$$

Maximizing profits yield an expression for optimal output analogous to that in the single industry case above, so that $k_i^{ss} = \frac{p_i - r_i}{2\beta}$.

[48]The proportion of these firms in each industry can be made very small without affecting the results derived below.

A conglomerate's profit function is given in equation (2) in the text. For the special case discussed here it can be rewritten as

$$d_1^c p_1 k_1^c + d_2^c p_2 k_2^c - r_1 k_1^c - r_2 k_2^c - \beta(k_1^c + k_2^c)^2$$

We want to show that following a positive price shock in industry 2, conglomerate segments that are less efficient than the competing single segment firms in industry 1 become smaller relative to the single segment firms in industry 1, so that the ratio (k_1^c / k_1^{ss}) declines with increases in p_2. We thus assume that $d_1^c < 1$ and, without loss of generality, $d_2^c = 1$,

By solving for k_i^c and k_i^{ss} and substituting into the industry equilibrium conditions $\sigma + \rho r_i = (\lambda_c k_i^c + \lambda_{ss} k_i^{ss})n$ where $i = 1,2$, we can solve for the price of capital in each industry r_1 and r_2. Substituting r_1 and r_2 back into the expressions for k_i^c and k_i^{ss}, we obtain

$$\frac{\delta(k_2^c / k_1^{ss})}{\delta p_1} = -\mathrm{A}\left(\frac{n\lambda_{ss}}{n\lambda_{ss} + 2\beta(\nu + w_j)} - d_1^c\right).$$

It can be shown that A is positive feasible for λ_{ss} $(\lambda_{ss} < 0.5)$. Thus, for all sufficiently low d_1^c ($d_1^c < \frac{n\lambda_{ss}}{n\lambda_{ss} + 2\beta\rho}$) the result follows. Note that if the supply of capacity is fixed in each industry so that $\rho = 0$, it is sufficient that $d_1^c < 1$.

Case (a) can be shown similarly. We can also show that:

Remark 4

The greater the productivity of a conglomerate's operations in an industry, the greater the effect of price shocks in that industry on the optimal size of operations of the conglomerate in other industries.

Thus, we would expect that shocks in a conglomerate's main segment (which, all else being equal, has a higher relative productivity) would produce greater effects on the industries in which it has its peripheral segments than if the opposite were true.

Note that we do not predict this pattern of growth across conglomerates business units because the conglomerate firms have an internal capital markets that are superior to those of single-industry firms. Rather, they result from the comparative advantage of conglomerates and single-segment firms over different ranges of demand. Moreover, the predictions of model differ from the agency or empire building models in the literature. The agency and empire building models predict that if a conglomerate receives a positive shock in industry 1 it grows faster in industry 2. By contrast, by Remark 3 the model here predicts that that if a conglomerate receives a positive shock in industry 1 and is very productive in industry 1 it grows more slowly in industry 2. Only when a conglomerate that receives a positive shock in industry 1 and is relatively unproductive in industry 1 does it grow faster in industry 2. Thus these predictions differ from agency and empire building models.

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