THE INDUSTRY LIFE CYCLE AND ACQUISITIONS AND INVESTMENT:

DOES FIRM ORGANIZATION MATTER?

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CES 05-29 **December, 2005**

Abstract

We examine the effect of financial dependence on the acquisition and investment of single segment and conglomerate firms for different long-run changes in industry conditions. Conglomerates and single-segment firms differ in the investments they make. The main differences are in the investment in acquisitions rather than in the level of capital expenditure. Financial dependence, a deficit in a segment's internal financing, decreases the likelihood of acquisitions and opening new plants, especially for single-segment firms. These effects are mitigated for conglomerates in growth industries and also for firms that are publicly traded. In declining industries, plants of segments that are financially dependent are less likely to be closed by conglomerate firms. These findings persist after controlling for firm size and segment productivity. We also find that plants acquired by conglomerate firms in growth industries increase in productivity post-acquisition. The results are consistent with the comparative advantages of different firm organizations differing across long-run industry conditions.

* This research was supported by the NSF. We would like to thank Mike Lemmon, Harold Mulherin, Sheri Tice, Bernie Yeung, CES staff and seminar participants at the American Finance Association meetings, Duke-UNC corporate finance conference, Financial Economics and Accounting conference at USC, 2005 Frontiers in Finance Conference, HKUST, Minnesota, NYU, Pittsburg, Tanaka School, Texas, UBC, UCLA andWharton. The research in this paper was conducted while the authors were Special Sworn Status researchers of the U.S. Census Bureau at the Center for Economic Studies. Research results and conclusions expressed are those of the authors and do not necessarily reflect the views of the Census Bureau. This paper has been screened to insure that no confidential data are revealed.

The Industry Life Cycle, Acquisitions and Investment: Does Firm Organization Matter?

1 Introduction

An influential body of research has argued that industries go through life-cycle stages and that these stages are characterized by marked differences in investment and restructuring (Gort and Klepper (1982), Jovanovic (1982), Klepper and Grady (1990), Klepper (1996)). The evidence suggests that changes in the number of firms in an industry often occur at times of transition in an industry's life cycle when the competitive advantage among firms is changing. However it is unknown whether and how firm organization may be associated with firm performance for industries that experience different changes in long-run conditions.

In this paper we examine whether long-term changes in industry conditions affect investment by single-industry firms and divisions of conglomerate (multi-segment) firms differently. We focus on two factors that have been identified in the literature as giving multi-division firms an advantage in some competitive environments: access to internal capital markets and the ability to restructure stemming from a greater propensity to participate in the market for mergers and acquisitions. Specifically we ask:

- Does the effect of organizational structure depend on changes in long-run industry conditions?
- Does a firm's organizational structure affect acquisitions, plant births and deaths differentially?
- Do these differences occur because the effect of financial dependence depends on access to public capital markets and/or organizational form?

In studying firm organization, we distinguish between single-segment firms and conglomerate firms with divisions operating in multiple industries. These two types of firms are likely to have different access to financial resources (public markets and internal capital markets) and different types of monitoring (within firm hierarchies versus monitoring by external providers of capital). Moreover, the categorization builds on previous theoretical and empirical work that has established the importance of a division's position within

its firm on its investment policy, efficiency, extent of internal monitoring, and access to internal capital markets.[2]

We classify industries into four different long-run categories: (1.) Growth industries in which long-run demand and the long run number of firms are both increasing, (2.) Consolidating industries in which long-run demand is increasing but the number of firms is decreasing, (3.) Technological change industries in which long-run demand is decreasing but the number of firms is increasing, (4.) Declining industries in which long-run demand and the long-run number of firms are both decreasing. The industry categories differ in the amount of restructuring (closings and acquisitions of business segments) and growth opportunities.

Overall we find the acquisition behavior of conglomerate segments versus that of single-segment firms is much more different than the differences in the capital expenditures across organizational forms. Segments of conglomerate firms are two to three times more likely to acquire plants while investment in the form of capital expenditures - which is what is typically studied by the prior research - is fairly similar across organizational types and industry conditions. Acquisition rates also significantly differ across long-run industry conditions. Acquisitions by conglomerate segments in growth industries represent a much higher percentage (ten percentage points higher) of total firm growth versus acquisitions in Declining industries.

We examine whether the differences in acquisition rates and investment by different types of firm organizations are related to financial dependence. We define as financially dependent those business segments (single-segment firms or segments of conglomerates) that spend more than their cash flow from operations on capital expenditures.[3] We test whether organizational form and whether a firm is publicly traded impacts the effect of financial dependence on acquisitions and investment. We control for the endogeneity of organizational and public firm status and for the endogeneity of financial dependence. To control for endogeneity between capital expenditures and realized cash flow from operations, in our empirical tests we examine how segments respond to predicted financial dependence rather than observed financial dependence.

We find financially dependent segments tend to fall into two categories: segments that are less productive compared to other segments in their industries and very productive segments in high growth industries.[4]. We find that predicted financial dependence affect plant acquisitions and investment by con-

[2]Early authors include Lang and Stulz (1994) and Berger and Ofek (1995). We discuss the many additional papers in this literature and how they are related to this paper in Section 2.

[3]Thus, a segment that has an internal financial deficit in a year must rely on cash flows from outside the segment or on the liquidation of its assets to fund capital expenditures at the plants it owns.

[4]The term productive is defined below and refers to firms ability to produce revenue from inputs at the segment level. It does not necessarily mean that conglomerate firms sell at a premium or discount in the market relative to single-segment firms.

glomerate segments and single-segment firms very differently. Conglomerate segments are significantly more likely to acquire plants, even controlling for the productivity, public firm status, and the size of the purchaser. In Growth and Consolidation industries, financial dependence has little or no effect on conglomerate firms. Our results show that public firm status also has differential effects for firm segments based on long-run industry conditions. In particular financial dependence has a smaller effect on acquisitions by public firms in Growth industries than in other industries.

The positive effects of firm organization on financial dependence in Growth industries are concentrated on conglomerate firm's most productive segments. For conglomerates most productive segments there is very little effect of financial dependence on acquisitions. Moreover, in Growth industries, business segments of conglomerates have a significantly higher probability of acquiring plants if the conglomerate also has a less productive main division in a declining industry. . We find that plants acquired by conglomerate firms - in particular in Growth industries - significantly increase in productivity post-acquisition. These results are consistent with Stein's (1997) model of the benefits of internal capital markets and the predictions about the reallocations of assets within conglomerates in Maksimovic and Phillips (2002).

We also find large differences in the effect of organizational form and public firm status on plant birth and exit across industry categories. Both public firm status and whether or not a segment belongs to a conglomerate firm influences plant births in growing industries. In Growth industries, a segment's financial deficit reduces the probability that the firm will open a new plant in that segment by a smaller amount if the segment belongs to a conglomerate or if it is (a part of) a public firm. However, we do not find similar effects on plant births in declining industries.

We find **that** plant exit differs across industry categories. Conglomerates, and in particular, private conglomerate firms are the least likely to close plants when their current segment is predicted to have a financial deficit in Declining industries. In Growth industries the relation between predicted financial dependence and plant exit is similar for conglomerate and single-segment firms - in contrast to the positive effect of conglomerate firms on acquisitions and plant birth. Given that acquisition and plant birth are likely to use firm resources, unlike plant exit, these findings are consistent with conglomerate firms relaxing mitigating the effects of financial dependence in Growth industries - where the value of financial resources is likely to be the highest.

There are several key differences between our approach and the existing literature on investment and internal capital markets. We relate the firm's investment and financing needs to long-run changes in industry conditions. We define investment more generally than the existing literature to encompass

acquisitions of plants and assets. Thus, we can examine whether firm organization affects investment through acquisition and plant openings differently than regular investment. We are also able to obtain direct estimates of the productivity of each business unit, whether it is independent or part of a larger firm. Thus, we can determine whether the relation between firms' investment and their organizational structure depends on their productivity.

We use data from the Longitudinal Research Database (LRD), maintained by the Center for Economic Studies at the Bureau of the Census. The LRD database contains detailed plant-level data for manufacturing plants. There are several advantages to this database: First, it 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 we can track plants even as they change owners. In addition to a plant-level identifier the database contains a code that identifies which plants change ownership. These two features are key to our study as they allow us to identify plants that have changed hands from year-to-year.

The rest of the paper is organized as follows. Section two describes the prior literature and why firm organization may have a differential impact over the industry life cycle. Section three introduces our methodology and Section four describes the data. The results are discussed in Section five. Section six concludes.

2 Industry Conditions and Firm Organization

Studies of industry evolution, by Gort and Klepper (1982) and Klepper and Grady (1990) among others, show that many industries go through life-cycle stages. These stages are characterized by differences in the growth rates of the industry and by dramatic changes in the numbers of producers in the industry. As the nature of competition and the comparative advantage of firms may shift across stages many industries undergo periods of intensified competition and consolidation when many, perhaps the majority, of the producers are weeded out. Firm strategies that work in times of expansion, such as preemptively acquiring large capital intensive plants, may lead to a competitive disadvantage in decline (Ghemawat (1984), Ghemawat and Nalebuff (1985)). Thus these articles emphasize the importance of industry conditions to firm survival.

Numerous studies suggest that the firm's organizational structure affects the way it invests, grows, and sells assets. Conglomerates have internal capital markets that can transfer capital across industries

and may have better access to external capital markets than would be available to their constituent divisions if they had remained independent (Bolton and Scharfstein (1991), Khanna and Tice (2001), Stein (1997)). In particular, Stein (1997) suggests that conglomerate firms can efficiently transfer resources from unprofitable to profitable projects. Moreover, as Peyer (2001) argues, conglomerates have superior ability to obtain external financing, giving divisions of conglomerates a competitive advantage when internally generated funds are not sufficient to finance desired investment. Thus, we would expect the investment by segments of conglomerates to be less affected by the level of internal financing than equivalent single segment firms.

The effect of conglomerate structure on investment need not be benign. One strand of the literature posits that the firm's investment policy is driven by opportunistic agents (usually the managers or the owners of a subset of the firm's securities), who attempt to distort the policy for their private benefit (see, Jensen and Meckling (1976) and Jensen (1986)). Thus, for example, managers may have a private benefit from investment in capacity (Jensen (1986) and Matsusaka and Nanda (2001)). Opportunistic behavior by agents may cause the firms to misallocate resources across industry segments. These possibilities are suggested by Lamont (1997), Shin and Stulz (1998), Rajan, Servaes and Zingales (2000), and Scharfstein and Stein (2000).

The way a firm is legally constituted may also affect its ability to raise capital and thereby its competitive advantage. Thus, for example, if a firm is publicly traded it may find it easier to raise capital for investment, and in particular, to pay for acquisitions with its own stock. These differences would be of more significance in industries where investment opportunities were large relative to the cash flow from operations.

More generally, the relation between organizational form may be endogenously determined by a firm's expertise and its ability to exploit opportunities as argued by Campa and Kedia (2003), Maksimovic and Phillips (2002) and Villalonga (2004). Conglomerates may differ because from single-segment firms because their organizational skills are not industry specific and because of this they find it optimal to operate in several industries. These differences in organizational skills may also have implications for the type of investment conglomerates and single-segment firms engage in. Because conglomerate firms operate in more than one market they are likely to have expertise in managing disparate business units. This may give them an advantage over single-segment firms in investment by acquisition, which may require integrating the acquired plants into the buying firms.

Maksimovic and Phillips (2002) argue that firm size and scope of operations adjust to economize

on the firms' organizational talent. In this view as industries experience demand and technology shocks, firms' comparative advantage shifts and firms build, acquire or close plants to maximize value.[5] Investment decisions by conglomerate firms may also differ from those of single-segment firms because their investment in one industry creates opportunity costs for investments in other industries in which they operate. In particular, a firm operating in multiple industries may experience different demand shocks across the industry they operate and thus their decision will depend on industry characteristics.

Consider a growth industry in which firms encounter repeated expansion opportunities. All firms would find it optimal to take advantage of the growth opportunities. However, conglomerate segments would face a trade-off. They would have to trade-off the benefits of expanding their operations in the growth industry against the externalities to its operations in other industries. The trade-off would be of greater consequence for less productive conglomerate segments. As a result, we would expect to observe greater investment, relative to similar single-segment firms, by productive conglomerate segments than by less productive segments. Moreover, conglomerate segments are more likely to exploit investment opportunities in growth industries if the other segments are in declining industries.

While literature on how the number of firms change in declining and consolidating industries is extensive (Gort and Klepper, Klepper and Grady, Ghemawat, Ghemawat and Nalebuff), the effect of organizational form on who survives and who buys who in these industries has not been modeled. Empirically, consistent with a benefit of internal capital markets, Guedj and Scharfstein (2003) find in a study of the biopharmaceutical industry that single-product firms do not abandon projects optimally, whereas managers of multi-project firms shift resources in response to new information. Thus our goal is to explore the interaction of long-term shocks, organizational form and financial dependence empirically in declining, consolidating and growth industries.

Given that acquisitions are a particularly large form of investment and requires extensive financial resources, we focus on the differences between the effect of organizational form on acquisitions and capital expenditures and whether these differences vary by long-run industry conditions. Whether conglomerate firms differ from single-segment firms because of underlying expertise or agency costs, we expect their comparative advantage to change as the nature and intensity of competition changes with changes in long-run industry conditions. The central hypothesis we investigate is whether organizational form and financial dependence affect acquisition and investment for different changes in long-run industry conditions.

Our paper differs from the literature on conglomerates in taking a broader view of investment and

[5] While not focusing on the industry life cycle, Bernardo and Chowdhry (2002) model how differential skills and opportunities over the firm's life endogenously causes a conglomerate discount given that as the firm matures it exercises its growth options.

fundamental industry conditions. In assessing the effects of the conglomerate form on investment, the conglomerate literature, except for Maksimovic and Phillips (2002) and Schoar (2002), generally focuses on differences in capital expenditures, as defined by COMPUSTAT, of conglomerates and single-segment firms. However, as Maksimovic and Phillips (2001) show, there exists a large secondary market for manufacturing capacity and firms can invest by acquiring capacity. Thus, in our analysis of conglomerate investment and financial dependence we examine acquisitions, capital expenditures, and plant birth and closure and examine these decisions over different long-run industry conditions.

3 Data and Long-Run Industry Conditions

We classify industries on the basis of exogenous shifts in their operating environments that may require different financial and organizational capabilities of firms, and that may therefore enable us to identify the advantages of different organizational forms.

We use data from the Longitudinal Research Database (LRD), maintained by the Center for Economic Studies at the Bureau of the Census. 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.[6]

The LRD tracks approximately 50,000 manufacturing plants every year in the Annual Survey of Manufactures (ASM). 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 not voluntary for large plants and is not voluntary once a smaller firm is selected to participate. All data has to be reported to the government by law and fines are levied for misreporting.

The database also identifies plants that change ownership. For ownership change we rely on this identification which was available for all years but 1978 (for an unknown reason coverage codes did not identify ownership change in this year). Plant birth and death were identified by John Haltiwanger using payroll records from the Longitudinal Business Database.[7] We also used an indication that the firm is publicly traded using a linkage provided to COMPUSTAT in each year for firms in the LRD.

There are several advantages to LRD data: First, it 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

[6]For a more detailed description of the Longitudinal Research Database (LRD) see McGuckin and Pascoe (1988) and also Maksimovic and Phillips (2002).

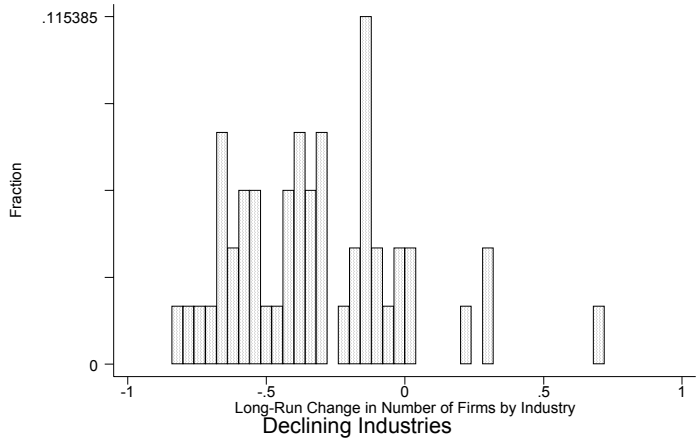
[7]We thank John Haltiwanger for providing us with these linkages.

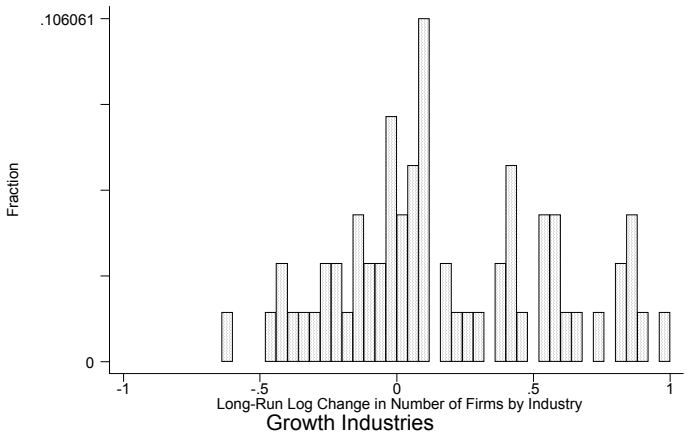
SIC code level. Thus, firms that produce under multiple SIC codes are not assigned to just one industry. Third, plant-level coverage means that we can track plants even as they change owners. One of the biggest advantages for this study is that the coverage accurately represents the industries in which a multi-segment firm operates. However, our segment cash flows do not capture any headquarters or divisional level costs that are not reported at the plant-level (i.e. overhead, research and development).

To classify industries we use CES data for the years 1972 and 1997. These years are used because they span 25 years of industry experience and are census years covering all firms. We classify industries according to the growth in the real value of shipments and the change in the number of producers over this period.[8] This procedure yields industry samples in which firms are likely to face very different competitive environments and changes in industry structures.

Below, in Figure 1, we first examine changes in the number of firms splitting industries by the highest and lowest quartiles of real value of firm shipment growth. We examine how long-run changes in demand affect the number of firms given the previous literature by Gort and Klepper (1982), Jovanovic (1982) and Klepper and Grady (1990). These papers have shown how changes in the number of producers vary greatly with changes in demand, with large increases in the number of firms in Growth industries and decreases in Consolidating industries, and firm exit in declining industries. Our goal is to examine whether the purchasing and closing decisions, and thus changes in the number of firms, vary with industry organization as well as industry demand and we thus begin with these simple graphs.

The histograms show that in growing industries it is not uncommon to see a net increase of 30% in the number of producers and also for some industries a decline in the number of producers over the sample period, whereas in declining industries a 30% decrease is common.





[8]Below we also report classifications based on 10-year intervals.

Figure 1

Given these results, we capture the stages in an industry life cycle by classifying 3-digit SIC manufacturing industries into four categories using both shipments growth and changes in the number of firms. The first cut divides industries into those in which the growth of the real value of shipments during our sample period, 1972-1997 exceeds the median of all manufacturing industries and the into those in which the growth of shipments fell below the median. Many industries in the latter category experience an actual decline in shipments. Our second cut divides industries into those in which the growth of the number of producers exceeds the median growth in the number of producers for a manufacturing industry and those industries in which the number of producers is lower than the median. A firm is classified as a producer in a particular industry if it is listed as having a manufacturing plant of at least $1 million in real 1982 dollars in that industry.

We also explore whether taking a longer window and beginning from 1963, the first year available, affects our results and also examine subperiods, specifically the 1980s and 1990s. Finally we also classify industries using ten-year "floating windows" - so that an industry can switch between life-cycle classifications over time (for example, from growth to decline). We use Census year data to do these industry classifications as we can get an accurate count of the number of firms in these years. Census years are every five years beginning with 1972. To classify an industry in a particular year using "floating windows" we use the census year ahead of that year and calculate the change to that census year from the year 10 years prior. Thus for 1993 we would calculate the change from 1987 to 1997.

We denote as "Growth industries" those industries which experience an above median growth in both real output and the number of producers. Industries that experience above median growth in the real value of output but below median growth in the number of producers are denoted as "Consolidating industries." "Declining industries" are those with both below-median growth rates of real output and in the number of producers. Industries in which output growth is below the median, but in which the number of firms is increasing at a higher than median rate are denoted as "Technological Change" industries. In the Technological Change category, industries are likely be slow growing or declining industries in which the dominant technology or traditional products are being supplanted by new ways of doing business.

Table 1 presents summary statistics by industry category. The table shows that the industries in our four categories differ significantly. Over the period 1972-1987 real shipments increase by an average of 43% in Growth Industries and decrease by 42% in Declining industries. Real shipments in Consolidating industries change little (a two percent increase). Shipments fall by 28% in Technological Change industries.

As expected, the number of producers increases *(+83.6%)* in Growth industries and decreases (-34.6%) in Declining industries. Technological Change and Consolidating industries present a contrast. Despite a large drop in real output, the number of producers in the former increases by 45%. In the latter, despite a stationary output level, there is a drop of 10.2% in the number of producers.

We also present long-run statistics for the 5 industries surrounding the average change to give a more detailed description of which industries are in each category. Declining industries include iron and steel foundries, rubber and plastics footwear. Technologic change industries include metalworking machinery and equipment. Consolidation industries include paper mills and carpet and rugs. Growth industries include plastics, drugs and communications equipment.

Insert Table 1 here

In a declining industry both the number of firms and real shipments are growing more slowly than in a median industry. In many such industries the number of producers is falling and firms face the task of managing decline or optimally exiting. In such industries cash flow may be low or negative and firms belonging to a conglomerate may be able to use its greater resources to obtain a competitive advantage. By examining differences in investment and acquisition activity of conglomerates and single-segment firms in these industries we can tell whether conglomerates shift resources into industries with declining shipments.

Real shipments are also declining or growing slowly in Technological Change industries. However, the high rate of growth of new producers in those industries implies that there exist growth opportunities. Thus, by comparing the differences in investment patterns of conglomerates and single-segment firms in declining and Technological change industries we can examine whether conglomerate firms' response to decline in shipments depends on the existence of growth opportunities in an industry.

The resources and skills a firm requires to prosper in these four types of industries are likely to differ. In a growing industry, new producers are entering at high rates. Given that entrants are often high cost producers (Jovanovic (1982)), established firms in this industry type are less likely to face hard competition. Success in this type of industry is likely to depend on the ability to marshal resources to take advantage of growth opportunities. In a Consolidating industry, the shipments are also growing rapidly but the competitive pressure is likely to be stronger. In these industries new producers are less likely to be entering and some existing producers might be forced out. We would expect that competitive advantages

from belonging to a larger organization is likely to be most valuable in a fast growing consolidating industry.

To obtain a measure of the extent to which stand-alone firms and conglomerate segments can finance their investment internally we define a segment to be financially dependent (independent) in particular year if the sum of the capital expenditures reported by all its plants exceeds (is less than) the total cash flow reported by these same plants. Cash flow is defined as the gross margin adjusted for inventory changes. A conglomerate segment or stand-alone firm that is financially independent is able to fund its plant-level capital expenditures directly from cash flow, without obtaining resources from head-office, other divisions, or from the financial markets.

We use the concept of financial dependence descriptively. A firm or conglomerate division is financially dependent if it has negative cash flows or if it has positive cash flows and its investment opportunities are sufficiently large. In either case it has to fund its capital expenditure with funds it obtains from another party, from another division, or from selling assets. Below we investigate whether conglomerate status affects acquisitions and investment at the segment level given financial dependence.

To control for endogeneity, we use predicted financial dependence in our regressions below. For each segments in each year, predicted financial deficit is estimated using data on industry adjusted productivity of each segment's and stand-alone firm's plants. We then examine how the relation between investment and predicted financial deficit is affected by its ownership status (conglomerate or stand-alone), size, productivity, industry type and by whether the firm is publicly listed.[9] We also predict whether a division is part of a conglomerate or public firm and to control for endogeneity of this decision in our regressions use the predicted firm status in our regressions.[10]

We consider several measures of investment. Our first measure, the probability of acquisition, takes on the value of one if the conglomerate segment or stand-alone firm purchases one or more plants in its industry, and the value of zero otherwise. Our second measure, capital expenditures, measures plant-level capital expenditures at the plants owned by each firm at the beginning of each year and not sold during the year. Lastly we examine plant birth and plant exit.

4 Organizational Structure and Productivity

A. Organizational Structure of Firms

[9] A division can be public and also be a conglomerate and our specifications allow for this possibility.

[10] Results in a previous draft, available from the authors, used actual firm status in the regressions. The actual firm status indicator variables (not instrumented) were more significant for acquisitions and significant for plant exit. The signicance of key interaction variables were similar in all cases. Thus we view the results reported here as more conservative.

We examine both multiple-segment conglomerate firms and single-segment firms by using an unbalanced panel for the period 1974 to 2000. To be in our sample, firms must have manufacturing operations producing products in SIC codes 2000-3999. We require firms to meet these criteria because of the unique nature of the micro-level data that we use to calculate plant-level productivity and industry growth.

Our data extends from 1974 through 2000. Given we construct measures of productivity (described in the next section) using 5 years of data, our regressions cover the period 1979-2000. We require each plant to have a minimum of two years of data. For each firm, we also exclude all its plants in an industry (at the three-digit SIC code) if the firm's total value of shipments in the industry is less than $1 million in real dollars.

We aggregate each firm's plant-level data into firm industry segments at the three-digit SIC code. We call these industry firm-level portfolios of plants "segments." Segments, defined this way, capture all the plant-level operations of a firm in an industry.

The segments we construct do not correspond to those reported by COMPUSTAT. However, segment data reported by COMPUSTAT are subject to reporting biases. Firms have considerable flexibility in how they report segments as shown by Pacter (1993). Firms may also have strategic reasons for the specific segments they choose or choose not to report, as Hayes and Lundholm (1996) shows. Hyland (1999) finds that only 72 percent of firms that report under the FASB standards that they go from one segment to more than one segment actually increase their number of segments. One advantage of the data that we use is that the segments we construct actually do represent the industries in which a firm operates.

We classify firms as single segment or multiple segment, based on the three-digit SIC code. We classify a firm as a multi-segment firm if it produces more than 10 percent of its sales in a second SIC code outside its principal three-digit SIC code. Using the 10 percent cut-off facilitates comparison with previous studies as 10 percent is the cut-off that public firms report. For multiple-segment firms, we also classify each segment as either a main segment or a peripheral segment. Main segments are segments whose value of shipments is at least 25% of the firm's total shipments. Given we calculate growth rates and also divide capital expenditures by lagged capital stock, we also lose the initial year of firms that enter the database or a new segment. This primarily affects smaller firms as new firms are likely to begin operation on a smaller scale. We also lose observations that are non-contiguous.

B. Variable Selection

In this section we describe the variables used to test our model and how we calculate these variables. The

primary dependent variables we investigate are a firm's acquisitions of other plants and its segment level capital expenditures and plant births. The primary independent variables we use to test the predictions of our model are segment and plant productivity, and the long-run change in aggregate industry shipments. We include a firm's lagged size and the lagged number of plants in the segment as control variables. We also include the industry capital intensity, calculated as the sum of all capital expenditures divided by the sum of all industry shipments. We industry and year adjust all capital expenditure and productivity data. We calculate all variables at the three-digit SIC code - aggregating up from individual plant-level data.

B1. Productivity of Industry Segments

We calculate productivity for all firm segments at the plant level and aggregate this data into segments using weighted averages. Our primary measure of performance is total factor productivity (TFP). TFP takes the actual amount of output a plant produces with a given amount of inputs and compares it to a predicted amount of output. "Predicted output" is what the 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 productivity. This measure 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. For robustness and comparability with prior studies, we also explore how segment growth is related to segment operating margin, both of the segment in question and of the conglomerates other segments. However, this operating margin differs from a typical cash flow number because our plant-level data does not measure indirect segmental level costs, such as advertising and research and development

In calculating the predicted output of each plant, we assume that for each industry there exists a production function that defines the relation between a plant's inputs and outputs. Then, for each industry we estimate this production function using an unbalanced panel with plant-level fixed effects, using all plants in the industry within our 1974 to 2000 time frame. In estimating the production function we use the last five years of data for each plant - thus the first year of our data for which we have calculated productivity is 1979.[11]

To calculate a plant's predicted output, we assume that the plants in each industry have a translog production function. This functional form is a second-degree approximation to any arbitrary production function, and therefore takes into account interactions between inputs. To estimate predicted outputs, we take the translog production function and run a regression of log of the total value of shipments on the log

[11] A previous version estimated the production function using all years of data and found similar results.

of inputs, including cross-product and squared terms:

$$\ln Q_{it} = A + f_i + \sum_{j=1}^{N} c_j \ln L_{jit} + \sum_{j=1}^{N} \sum_{k=j}^{N} c_{jk} \ln L_{jit} \ln L_{kit}, \tag{1}$$

where Q_{it} represents output of plant i in year t, and L_{jit} is the quantity of input j used in production for plant i for time period t. A is a technology shift parameter, assumed to be constant by industry, f_i is a plant-firm specific fixed effect (if a plant changes owners a new fixed effect is estimated. We leave off the firm subscript for tractability), and $c_j = \sum_{i=1}^{N} c_{ji}$ indexes returns-to-scale. We deflate for industry price at the four digit level.

We obtain two measures of plant-level TFP from equation (1). First we have a firm-industry segment fixed effect, $f_i, ,$ which we use in the regression to predict segment financial dependence. The segment fixed effect captures persistent productivity effects, such as those arising from managerial quality (Griliches (1957) and Mundlak (1961, 1978)). It also captures a segment's ability to price higher than the industry average. Second, we obtain a firm-plant residual that we aggregate up into segments using predicted output to construct a segment weighted productivity that we use in our regressions examining acquisitions, investment and plant birth.

In each case we standardize plant-level TFP by subtracting out industry average TFP in each year and dividing by the standard deviation of TFP for each industry. We standardize to control for differences in precision with which productivity is estimated within industries. This correction is analogous to a simple measurement error correction and is similar to the procedure used to produce standardized cumulative excess returns in event studies.[12] In computing the segment-level productivity in our regressions we construct a weighted average of the individual plant productivities, with weights equal to the predicted output of each plant.

We also include other firm and segment-level variables in our regressions to provide additional control for unmeasured productivity differences and other factors, such as size, that can influence firm investment. We include the log of firm size and the number of plants operated by a firm at the beginning of the year. We define firm size as the total deflated (using industry price deflators) value of shipments.

In estimating the TFPs in our sample, we use data for over 1,000,000 plant years, and for approximately 50,000 plants each year. In the productivity regression for each industry, we include three different types of inputs, capital, labor, and materials, as explanatory variables. All these data exist at the plant level. However, the ASM does not state the actual quantity shipped by each plant, but shows only the value

[12]This standardization does not affect the results we report. The results have similar levels of significance when we do not standardize productivity in this manner.

of shipments. As a result, we take the difference between actual and predicted value of shipments as our measure of TFP. For all inputs and outputs measured in dollars, we adjust for inflation by using four-digit SIC code data from the Bartelsman and Gray (1994) database. Each input has to have a non-zero reported value. We also require that each plant have at least two years of data. Kovenock and Phillips (1997) describe these inputs and the method for accounting for inflation and depreciation of capital stock in more detail.

5 Results

5.1 Summary Statistics

We first present summary statistics by both across industry classification and also across organization type. In particular we examine the relation between industry type and three variables of interest, cash flows, capital expenditures and investment through plant acquisition.

Insert Table 2 here

Table 2 shows the number of single-segment firms is far greater than the number of conglomerate firms, however, the number of segments operated by conglomerate firms and the percent of industry output produced by conglomerate firms is greater than that produced by single-segment firms. Interestingly, in Growth industries conglomerate firms operate 38 percent of the industry segments but produce a far greater percentage, 63.2 percent, of industry output. Thus, segment sizes of conglomerate firms relative to single segment firms are the largest in Growth industries.

Examining cash flow statistics, Table 2 shows that for segments as a whole the ratio of average annual cash flow to sales is positively related to the real rate of shipments growth. The ratio is highest in Growth industries at 7.30% and lowest in Declining industries at 4.13%. The difference in these two ratios is statistically significant at the five percent level. Plants of conglomerate segments consistently realize substantially higher cash flows than those of stand-alone firms. The differences in cash flows between segments of single- and multiple-segment firms are substantially due to segment size. Large segments also consistently realize substantially higher cash flows than small segments. The difference is approximately five to seven percentage points, and is particularly striking in declining industries, where small segments are barely breaking even at the plant level. When we focus on large segments only and vary the organizational

form, it is clear that plants of conglomerate segments consistently realize cash flows that are 1.5-3 percentage points higher.

Next, we examine the ratio of average annual plant-level capital expenditures to lagged capital stock. This ratio is highest in Growth industries and lowest in Declining industries. Interestingly, the single-segment firms' capital expenditure to lagged capital stock ratio exceeds that of the mean segment of multi-segment firms in all industry categories. However, overall, the capital expenditure rates look fairly similar across organizational forms.

In Table 2 we also report the annual average percentage of firm-segments acquiring plants from other firms.[13] The percentage of producers that acquire plants is higher in the Technological Change and Growth industries, than Declining and Consolidating industries. Thus, plant acquisition is more common in industries with a growing number of producers and less common in industries where the number of producers is falling (perhaps because of firm exit). Firm organization appears to be an important determinant of plant acquisition: multi-segment firms are two to three times more likely to acquire plants than stand-alone firms. Large segments are two to three times more likely to acquire plants from other firms than small firms.

The last block of numbers in Table 2 shows the percentage of total firm growth accounted for by acquisitions. The results show that growth via acquisition for multiple-segment firms is substantially higher than that for single-segment firms. In Declining industries growth by acquisition for single-segment firms is only 5.31 percent of firm growth, while for multiple-segment firms it is 26.07 percent. In Growth industries the difference is even larger. In Growth industries the growth via acquisition by multiple-segment firms is 36.08 percent and is 25 percentage points higher than growth of single-segment firms via acquisition. Across industry categories, we see that growth via acquisition for multiple-segment firms in Growth industries is also 10 percentage points higher than the corresponding number for multiple-segment firms in Declining industries.

These summary statistics show that differences in acquisition rates between multiple- and single-segment firms are substantial. Cash flows are higher in growing industries and for multi-segment firms. Whereas capital expenditure rates are fairly stable across industries, segment size and firm organization, acquisition rates vary sharply across different firm sizes and organizational forms. In particular, Growth via acquisition is very important for multiple-segment firms in Growth industries, representing over 36 percent of firm growth on average.

[13]We also calculated these statistics for acquisition percentage as a percent of the number of total segment plants. The numbers were within one percentage point of these numbers. The conclusions using these numbers are thus unaffected.

The literature on conglomerates has focussed on whether conglomerates' capital expenditures are efficient or whether they are driven by agency issues. Although the data sources are not directly comparable, these initial results show that capital expenditures at the plant level are not very different for single- and multiple-segment firms. However, these summary statistics show that cash flows and plant acquisition are sensitive to industry conditions, segment size and firm organization. We next investigate segments' capital expenditures and plant acquisitions in a multivariate framework and examine how financial dependence of industry segments impacts acquisition and investment.

5.2 Financial Dependence and Firm Organizational Status

We begin our analysis of financial dependence in Table 3. Our overall goal is to analyze how financial dependence and industry factors affect a firm's investment and acquisition decisions. However given that firm-segments financial deficit may be endogenous, we first run a first-stage regression where we predict the financial dependence of a firm's segment. We will use predicted dependence in our later regressions that examine investment and acquisitions.

Our dependent variable takes on the value one if a segment is classified as financially dependent, and zero otherwise. A segment is classified as financially dependent when its capital expenditures exceeds the segment's cash flow. Our independent variable are the change in industry real shipments, a segment fixed effect from a production function estimated using five years of lagged data from the segment's industry at the three-digit SIC code level, the log of firm size, and the industry capital intensity. The change in industry shipments is motivated by the findings in Table 2 that a segment's cash flows depend on industry characteristics, in particular shipment-growth. We include segment productivity because of the findings in Table 2 that cash flow is a function of segment size and the result in Maksimovic and Phillips (2002) that segment size is positively related to productivity. The square of segment productivity is added to the specification to allow for the possibility that highly productive firms invest more than their cash flows. We also include log of firm size as an additional proxy for productivity and as a determinant of financial dependence.

Insert Table 3 here

Column 1 of Table 3 shows that a segment in a fast growing industry is less likely to be financially dependent than a segment in a slow growing industry. More productive segments are also less likely to be financially dependent than less productive segments. However, the relation between the probability of

financial deficit and a segment's productivity is convex increasing the likelihood of financial dependence for highly productive segments. Segments in capital intensive industries are more likely to be financially dependent. Lastly, large firms are less likely to be financially dependent.

In Table 2, Columns 2 and 3, we estimate our specification on two sub-samples: segments in industries with above median and below median change in real shipments over our long-run 25 year period. The results are similar to those for the whole sample with one exception. The squared productivity term remains positive and highly significant in high-growth industries but is basically zero for slow-growth industries. Thus, in slow-growth industries there is no partial offsetting effect that makes highly productive firms more likely to become financially dependent. In these industries, productive segments are less likely to financially dependent than in high growth industries. The results are consistent with productive firm segments producing cash flows that reduce financial dependence for moderate levels of productivity. As productivity increases to a high level, firms demand more capital to invest increasing financial dependence.

In Table 4 we examine whether individual segments are more likely to be part of conglomerate and public firms. We undertake this analysis for two reasons. First, we recognize that firm status is endogenous and thus wish to instrument firm status in subsequent regressions that examine investment and acquisitions. Second, it is of independent interest how industry factors influence whether segments are part of conglomerate and/or public firms.

The first column of Table 4 examines whether firm segments are likely to be part of conglomerate firms. The second column examines whether firm segments are likely to be part of public firms. In each case we estimate a logistic regression where the dependent variable is equal to one if the segment is part of a conglomerate firm in column one and if the segment is part of a public firm in column two. Given that we do not split the sample by long-run changes in industry shipments, we include this variable in both specifications.

Insert Table 4 here

The results show that segments are less likely to be part of a conglomerate firm and less likely to be public if the short-run change in industry shipments is high - but more likely in each case if the change is high over the long run. Industry capital intensity is a particularly important in predicting whether a segment is part of a conglomerate firm. The relative-odds ratio is 176 for this decision. While industry capital intensity is also important for predicting whether a segment is part of a public firm, it is much less so as the odds ratio is a lower 10.9. Productivity also has a significant impact on the status of a firm

segment. The relation is U shaped for conglomerate status. Low productive and very highly productive firm segments are relatively more likely to be part of a conglomerate firm. Highly productive segments are also more likely to be part of a public firm. Both of these results are consistent with highly productive firm segments that demand capital in excess of their cash flows being more likely to be part of a conglomerate firm and more likely to be publicly traded.

5.3 Plant Acquisitions

This section examines the effect of predicted financial dependence and firm organization on plant acquisitions by firms inside of their current industry segments. We examine the effect of our different long-run industry categories using both 10 and 25-year windows. The 25 year window captures long run trends in the industry. The 10 year window has the advantage that an industry can switch categories over time. For any given year, the industry category for the 10 year window is calculated using the change from surrounding census years.[14]

To estimate predicted financial dependence we use the specification presented in Table 3. We aggregate a firm's plants up into three-digit industries to examine whether a particular firm-segment acquires an additional plant. For firm organization we include both conglomerate and public firm status, instrumenting both of these variables with the specification of Table 4. We interact both measures of firm organization with predicted financial dependence. As a measure of segment productivity we construct a weighted average of each plants productivity with weights equal to plant predicted shipments. We include the lagged number of firm plants in each segment as a control variable.[15]

Insert Table 5A here

Table 5A presents the basic results for all life cycle categories using both 10 year and 25 year windows. In order to capture whether effects are statistically different from each other, we include the conglomerate indicator times the predicted dependence and then interact quadrant indicator variables with the conglom-

[14]We also estimate this specification using continuous measures of the changes in industry conditions - instead of the 4 separate quadrants used here. We include the change in the number of firms and the change in industry shipments in separate specifications, over both 10- and 25-year periods to examine the effect of each of these long-run changes separately. The results are very similar and are avaible in a previous version of the paper.

[15]We also checked whether the results are robust to including firm size as a substitute for the number of firm plants. The results were similar and conclusions unaffected by this change.

erate times predicted dependence. We also do a similar exercise for public firm status. We instrument both conglomerate and public firm status using the specification of Table 4.

This table reveals several patterns. First, for all industry life-cycle categories, except for Declining industries in the 10-year window, single-segment firms that are predicted to be financially dependent have a lower probability of acquiring plants in their industry from other firms. Second, in all categories again except for declining industries, this negative effect of financial dependence on acquisitions is offset for conglomerate firms. This offsetting effect can be seen by the positive coefficient on the interaction of predicted financial dependence with conglomerate firm status and the quadrant indicator variable. This conglomerate effect is greatest in Growth industries but is statistically greater than Declining industries for all other categories.

Third, public firm status also offsets part of this effect of predicted dependence in Growth industries. The variable public interacted with predicted dependence is positive and significant in Growth industries for the 25 year period. The largest effect for mitigating predicted financial dependence is thus for conglomerates which also are public. They face little effect of predicted dependence. The results also show that our measure of diversity, the standard deviation of industry growth across a multi-segment firm's segments is insignificant both cases.

Table 5B examines whether these results are affected by whether the conglomerate firm's segments are operating in related versus unrelated industries. For the classification of relatedness we use the input-output matrix of the Department of Commerce. We use the 1987 input-output matrix for all years prior to 1990 and the 1997 input-output matrix for years in 1990. We classify two industries as related if one of the industries in question buys or sells more than 5 percent of the other industry's output. Thus auto parts and automobile production are related as the automobile industry buys more than 5 percent of the auto parts industry's output.

We estimate two regressions. In the first regression, we examine whether conglomerate unrelated segments differ from segments from single-segment firms. In the second, we examine whether related segments differ from segments of single-segment firms.

Insert Table 5B here

The results in Table 5B show that results from Table 5A do not differ much by whether the conglomerate

segments are unrelated or related. There is some evidence that the relaxation of financial dependence for Consolidation industries is greater for related segments, but except for this one case the results are not statistically different. Our conclusion is that the results from Table 5A are robust to whether or not the conglomerate segments produce in related industries.

Tables 6A further investigates the effects of organizational form in Growth industries. We examine this quadrant in detail given our previous results and given growing industries are ones where the potential value effects from allocating resources are potentially largest. Columns 1 and 2 of the tables examine the effect of conglomerate firms status by itself (column 1) when the interaction term is not included and whether the conglomerate effect still exists when public firm status is not included (column 2). The third column includes the public firm indicator variable and also interacts this variable with predicted financial dependence. In the fourth column we include a variable that captures the relative productivity of the division versus any main divisions the firm has in declining industries. We use this variable to examine whether firms transfer resources from their declining divisions to divisions in growth industries. Finally, columns 5 and 6 split each of the long-run industry categories into the high and low productivity plants.

Insert Table 6A here

Table 6A shows that the effect of conglomerate firms status is positive overall (column 1) when the interaction term with the financial deficit is not included. As shown in column 2 the coefficient of the interaction between the conglomerate dummy and the predicted financing deficit is also positive and significant. It remains positive, albeit at a lower level, when public firm status is included in column 3. Column 4 shows that conglomerates that have high relative productivity in their growth division relative to their declining main have significantly higher acquisition probabilities in Growth industries. Column 6 shows that predicted financial dependence is offset for the most productive plants of the conglomerate in Growth industries.

Columns 4 and 6 in Table 6A also show that conglomerate segments in Growth industries have a significantly higher probability of acquiring plants if the conglomerate also has a less productive main division in a declining industry

To investigate the economic significance of these effects, we compute the probability that a segment belonging to different subsamples of single-segment and multi-segment firms acquires a plant . For each

subsample we hold the segment's characteristics, with the exception of the segment's predicted probability of being financially dependent, at their subsample median levels. We then compute the probability of acquisition of a segment for different levels of the predicted probability of being financially dependent for the segment.

Insert Table 6B here

Table 6B reports the economic significance of our results. We report the probability of acquisition for conglomerate and single-segment firms using the specification in Table 5A, column 3. We also report economic effects for the Declining industry quadrant using a similar specification (unreported) for comparability. For each subsample we use the median value and several other representative quantiles of the predicted probability of being financially dependent for all segments in that subsample. The table shows that multi-segment firms have substantially higher probabilities of making an acquisition than single-segment firms. Thus, for example, in growth industries the median conglomerate segment has a 6.26% probability of making an acquisition in an any year, whereas the median single-segment firm has a 0.39% probability of making an acquisition. Similarly segments of public firms, both single-segment and multi-segment firms, have considerably higher probabilities of acquisition than private firms. Comparing across different levels of the probability of being financially dependent, it is evident that the absolute differences as the probability of being financially constrained increases from the 10th percentile to the 90th percentile the probability of acquisitions increases for multi-segment firms but decreases for single-segment firms. Thus financially dependent single-segment firms are *less* likely to acquire plants, whereas financially dependent conglomerate segments are *more* likely to acquire plants.[16]

To investigate the causes of these the difference in acquisition probabilities between single-segment firms and conglomerate segments we also recompute the probability of acquisition using sub-sample data from conglomerate segments and the coefficient estimates for single-firms obtained by setting the conglomerate dummy and segment rank to zero. The computed probabilities are estimates of the probability that conglomerate segments would have acquired plants if they had been single-segment firms. The estimates show that there a substantial proportion of the difference in estimated probabilities is explained by differences in characteristics between single-segment and conglomerate firms. Thus, in Growth Industries, the

[16]This is consistent with the notion that financial dependence may occur either because a segment is losing money or because it is investing heavily relative to its cash flow.

median conglomerate segment would have had 4.22% probability of making an acquisition if it had been a single-segment firm (as opposed to the actual median single-segment firm, which has a 0.39% probability of acquisition). The difference between the median conglomerate segment's estimated 6.26% estimated probability of making an acquisition and the 4.22% probability the same segment would have had if it had been a single-segment firm can be attributed to differences in organizational form. Organizational form makes a larger difference for segments predicted to be financially dependent than for segments not predicted to be financially dependent. Comparing across quadrants, it is striking that organizational form makes a larger difference (almost twice as large) in Growth industries than in Declining industries.

These results shows that acquisition probabilities depend on firm organizational form and being a public firm in several different ways. First, conglomerate firms do acquire more than single segment firms overall. Second, this higher acquisition probability is not decreased by predicted financial dependence for conglomerate firms, whereas it is reduced for single-segment firms. Third, being public also increases acquisition probability for divisions predicted to be financially dependent in growth industries. The acquisition activity of public conglomerates is thus least affected by predicted financial dependence. Fourth, when a conglomerate firm has a division in a declining industry, it actually raises its acquisition probability for the most efficient divisions in growing industries - a result that is consistent with the theoretical prediction in Maksimovic and Phillips (2002) and also with Boston Consulting Group's prescription for non-growth industries to help fund "shining stars."

To examine whether these acquisitions are associated with value creation, Table 7 presents the ex post changes in productivity for the acquired plants. We compute the changes in productivity over a four-year window. These changes in productivity are industry and year adjusted.

Insert Table 7 here

Table 6 shows that productivity changes for conglomerate acquisitions are significantly greater than zero in Technological Change and, in particular, in Growth industries. In all windows, -1 to +1, +2, +3 and +4 we find that industry-adjusted productivity increases. In contrast, plants purchased by single-segment firms in these industries either show no significant increase or a slight decrease in productivity.

In sum, growth by acquisition tends to occur in segments of large firms that are organized as conglomerates. Predicted financial dependence reduces the probability that a single-segment firm grows by

acquisition, but has a considerably smaller, if any, effect on conglomerate segments. Plants acquired by conglomerate firms in Technological Change and Growth industries have significant increases in productivity post-acquisition. There are no cases where purchases of plants by conglomerate firms result in declines in average productivity.

5.4 Capital Expenditures

We now examine the plant-level capital expenditures and the impact of predicted financial dependence, organizational form and also plant-level productivity on these expenditures. Thus our tests examine whether a plant is affected by the financial dependence of the segment to which it belongs and the type of firm organization of its parent - in addition to plant-level productivity. We include firm size lagged and also the number of industry plants a firm has as general firm-level control variables. The regression specification is an unbalanced panel with firm-level fixed effects.

A segment that has a operational cash flow deficit may reduce capital expenditures if it faces constraints in obtaining funds from the financial market, or in the case of the conglomerate, from its internal capital market. By including predicted dependence in the capital expenditure equation we control the existence of potential constraints. However, as shown in Table 3, there is a negative relation between financial dependence and productivity. Since less productive segments should invest less, there might exist a negative relation between capital expenditures and financial dependence even in the absence of financial constraints. We try to control for this possibility by introducing control variables that proxy for productivity in the capital expenditures equation. However, although we predict a negative relation between capital expenditures and predicted financial dependence we do not interpret the relation as evidence of financial constraints.

To test whether conglomerate and public firm status affect capital expenditures and influence the effect of financial dependence, we interact instrumented conglomerate and public firm status with predicted financial dependence. In Table 8, we estimate our capital expenditures regression for the four different industry categories separately.

In every industry category more productive firms invest more than less productive firms and larger firms invest more than smaller firms. In conglomerates, the largest divisions invest more than the smaller divisions. The larger the number of plants in a segment, the lower the segment's investment level, all other variables held constant.

Insert Table 8 here

Table 8 shows that the effects of financial dependence and conglomerate structure depend on industry life-cycle categories. Predicted financial dependence negatively affects capital expenditures in all categories. However, the negative effect of financial dependence is greatest for single segment firms than for conglomerate segments, as the interaction term, conglomerate status times predicted dependence, is positive and significant for all categories. We do find that it is significantly higher for Consolidation and Growth industries versus Declining and Technological Change categories.

Finally, the weighted average plant-level productivity of a segment is significantly related to investment in all life-cycle categories. This contrasts with the case of acquisitions where the effect was only present in growth industries. The mechanism for investment via capital expenditure seems to be differently driven than in the case of acquisitions. The relation between a segment's productivity and the probability that an acquisition occurs in that segment is less robust then the relations between productivity and capital expenditures. Thus, the effect of conglomerate organization on investment is stronger on investment by acquisition than on capital expenditures that have received the most attention by previous research.

As a robustness test, we also checked whether the same results hold when we consider only major investments by firms. Whited (2002) shows that peripheral divisions of conglomerates make large investments more frequently that similarly sized single-segment firms. We rerun the regressions taking as our dependent variable an indicator variables that takes the value 1 if the ratio of capital expenditures over lagged capital stock employed by the segment exceeds the 90th percentile of this variable, industry adjusted. These regressions are more likely to pick up major investments by smaller segments because large segments with many plants are more likely to be able to smooth their investment flows across time.

These unreported results show that our previous results are consistent across all industry categories. In each case single-segment firms not predicted to be financially dependent are most likely to invest the most, and single segment firms predicted to be financially dependent invest the least. The investment of conglomerate segments falls between these two levels, with those conglomerate segments predicted to be financially dependent investing less. We also find that in every industry category the more productive firms have a higher probability of a major investment than the less productive firms. However, firms with fewer plants have a higher probability of a major investment.

Thus taken together, these findings suggest that while investment is positively related to productivity, it is affected both by the firm's organizational form and the segment's predicted financial dependence. Single-segment firms are most affected by financial dependence. Investment in Declining and Technical Change industries is less affected by organizational form than in Consolidation and Growth industries.

5.5 New Plant Openings and Plant Exit

We next examine the effect of predicted financial dependence and firm organization on new plant openings and plant exit over our different industry life cycle categories. As before, to estimate predicted financial dependence we use the specification presented in Table 3.

For new plant openings, we aggregate a firm's plants up into three-digit industries to examine whether a particular firm-segment acquires an additional plant. As a measure of segment productivity we construct a weighted average of each plants productivity with weights equal to plant predicted shipments. As in previous tables we include variables for whether a segment is part of a conglomerate firm or public firm.

Insert Table 9 here

Table 9 shows that the key conglomerate interaction variables only affect firms in Growth industries and Consolidation industries. In Growth and Consolidating industries, we find a significant negative effect on plant openings of predicted financial dependence for single segment firms. The results also show that both public firms and conglomerate firms offset the effects of predicted financial dependence on new plant openings. Public firm status only affects firms in Growth industries with public firm status having a positive effect on the probability of opening a plant. We also find that segments with a higher number of plants are more likely to open plants in all industry categories.

Insert Table 10 here

Table 10 examines plant exit over the different life cycle stages. The results in the table show that the effect of predicted financial dependence is insignificant in all categories except for Growth industries. The effect of conglomerate firms is more limited. Plants of conglomerate firms that are predicted to invest more than their cash flow (and thus run a financial deficit) are less likely to close in Declining industries as shown by the interaction variable conglomerate*predicted dependence. In other industry categories this effect is insignificant. More efficient plants and plants of larger firms are also less likely to be closed down. Public firms are also more likely to close plants, significantly so in Consolidation and Growth industries. However the interaction effect with predicted financial dependence is insignificant for all industry categories.

Overall, the results for new plant openings and plant exit show an asymmetric effect over the industry life cycle. These results shows that new plant openings and plant exit depend on firm organizational form and being a public firm in several different ways. First, in growth industries conglomerate firms that are predicted to be financially dependent have a significantly higher probability of new plant openings compared to dependent single-segment firms. Second this effect is reinforced by being public. Segments of public firms that are predicted to be financially dependent are also more likely to open new plants than private firms. The net effect is that the probability of new plant openings by private, single-segment firms are the most adversely affected by predicted financial dependence. Third, there is a more limited effect of conglomerate organizational form on plant exit.. The results do show that in declining industries, conglomerate firms are less likely to close plants of segments predicted to be financially dependent, however this effect is insignificant in other industry categories.

6 Conclusions

A growing corporate finance literature examines how multi-industry firms allocate investment across divisions. This literature tacitly assumes industries do not differ much and that the relevant differences can be summarized by simple measures of investment opportunities, such as Tobin's q and the levels of cash flows. We argue that the competitive environment of an industry depends on changes in long-run industry conditions. Industries in different stages of their life cycle differ in the opportunities for profitable restructuring and in exploitable growth opportunities. These differences in the competitive environment have the potential to alter the comparative advantage of conglomerate multi-industry firms relative to single-industry firms. A comparative analysis of investment by segments of conglomerates and single-industry firms has to take these differences into account.

We classify U.S. manufacturing corporations into four different long-run industry categories based on the growth rates of real shipments and changes in the number of producers. We find evidence that the effects of firm organization and being public vary across these long-run industry changes. In industries where shipments are growing, acquisitions and new plant openings are significantly affected by firm organizational form and by whether the firm is publicly listed. Large firms' and conglomerates' segments are much more likely to purchase a plant than are single-industry firms. By contrast, capital expenditure rates are fairly stable across industries, segment size and firm organization. Examining acquired plants post-acquisition, we find that plants acquired by conglomerate firms in Technological Change and, in particular, in Growth industries significantly increase in productivity post-acquisition.

Our evidence suggests that a conglomerate firm's internal capital market reduces or breaks the link between a segment's financial dependency and plant purchases and new plant openings particularly in growth industries. These latter effects have not been previously identified and are even stronger than the usually studied relation between conglomerate status and capital expenditures.

We also find evidence that acquisition rates are higher for conglomerates in growth industries when these divisions have high relative productivity versus divisions in declining industries - a result that is consistent with the theoretical prediction in Maksimovic and Phillips (2002) and also with Boston Consulting Group's prescription for non-growth segments to help fund "shining stars." In particular, since the conglomerate effect on acquisitions is stronger for segments of high productivity there does not appear to be subsidization of conglomerate's less efficient segments. We also document that plants acquired by conglomerates also experience productivity gains post-acquisition, particularly in growth industries. These results and the findings that conglomerate firms reduce or break the link between a segment's financial dependence in Growth industries are consistent benefits of internal capital markets as modeled by Stein (1997) and also with the empirical results in Khanna and Tice (2001),

Lastly, for new plant openings we find that there is a significant positive effect for both being part of a conglomerate and also being a public firm in growth industries. Conglomerate firms, and in particular, public conglomerate firms offset the effects of predicted financial dependence on new plant openings in growth industries. The effects on plant exit are more limited. Overall, these results lend support to the conjecture that conglomerates relax, or do not face potential resource constraints faced by single-segment firms, particularly in growing industries.

These findings have important implications for the literature on conglomerates' allocation of investment across industries. This literature uses capital expenditures to proxy for investment by a segment. Thus, it leaves out investment through plant acquisition, which is an important component of conglomerate firm's investment but is not an important component of single-industry firms' investment. Acquisitions and large discrete openings are where we see the highest differences between conglomerate and single-segment firms and where we document large effects of organizational form on financial dependence.

Overall, these findings document important effects of firm organization and public status that vary over the long-run changes in industry conditions. The findings are consistent with conglomerate firms in growth industries providing financial resources or organizational skills that help divisions reduce or break the link between a segment's predicted financial dependence and its acquisition and new plant opening decisions.

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Table 1
Long-Run Industry Conditions

Table presents summary statistics by long-run industry changes and organization over 25 years. Declining (technological change, consolidation, growth) industries are industries that have long-run change in the real value (PPI deflated) of industry shipments over 1972-1987 in the lowest (lowest, highest, highest) fiftieth percentile and the long-run change in the number of firms in the lowest (highest, lowest, highest) fiftieth percentile.

Industry Classification / SIC code	Long-run (25 year) Change in: Industry Shipments	Number of Firms
All Declining Industries - Average Change	-41.95%	-34.64%
Industries surrounding the average change in shipments		
332 Iron and Steel Foundaries	-52.56%	-25.79%
302 Rubber And Plastics Footwear	-47.35%	-37.25%
311 Leather Tanning And Finishing	-47.15%	-47.88%
271 Newspapers: Publishing and Printing	-41.88%	-40.48%
341 Metal Cans And Shipping Containers	-37.22%	1.42%
All Technological Change Industries - Average Change	-28.41%	44.96%
Industries surrounding the average change in shipments		
281 Industrial Inorganic Chemicals	-30.53%	54.09%
329 Abrasive, Asbestos, And Miscellaneous	-28.59%	41.46%
354 Metalworking Machinery And Equipment	-25.92%	44.60%
342 Cutlery, Handtools, And General Hardware	-22.55%	28.93%
356 General Industrial Machinery And Equipment	-17.73%	54.00%
All Consolidation Industries - Average Change	1.75%	-10.22%
Industries surrounding the average change in shipments		
228 Yarn And Thread Mills	-2.20%	-28.23%
203 Canned, Frozen, And Preserved Fruits, Vegetables	-0.87%	-8.45%
201 Meat Products	4.90%	-26.62%
262 Paper Mills	6.88%	-23.46%
227 Carpets And Rugs	15.97%	-15.72%
All Growth Industries - Average Change	42.99%	83.55%
Industries surrounding the average change in shipments		
282 Plastics Materials And Synthetic Resins	17.24%	61.43%
381 Search, Detection, Navigation, Guidance	36.39%	198.89%
283 Drugs	61.89%	123.85%
308 Plastic Products	129.45%	161.42%
366 Communications Equipment	202.02%	90.84%

All average changes are significantly different across industry categories.

Table 2
Investment, Acquisitions and Industry Conditions

Table presents investment and acquisition statistics by long-run industry changes and organization over 25 years. Declining (technological change, consolidation, growth) industries are industries that have long-run change in the real value (PPI deflated) of industry shipments over 1972-1987 in the lowest (lowest, highest, highest) fiftieth percentile and the long-run change in the number of firms in the lowest (highest, lowest, highest) fiftieth percentile.

	Industry classifications				
	Technological				
	Declining	Change	Consolidation	Growth	
Summary Statistics by Organizational Form					
Number of firms: Single-segment firms	3,731	3,378	2,855	11,322	
Multiple-segment firms	675	867	577	1,463	
Average number of segments for multiple segment firm	6.53	6.17	5.62	4.81	
Percent of total segments of multiple-segment firms	54.16%	61.29%	53.18%	38.33%	
Percent of industry output produced by multiple-segment firms	64.70%	69.18%	67.18%	63.18%	
Average annual plant-level cash flow / sales					
Plants of: All firms	4.13%	4.96%	6.72%	7.30%	d
Single-segment firms	3.65%	3.11%	5.54%	5.61%	d
Multiple-segment firms	5.35%	7.87%	9.76%	10.43%	d
Small firms	0.53%	1.76%	2.60%	3.71%	d
Large firms	7.69%	8.13%	10.82%	10.87%	d
Large single-segment firms	7.48%	6.59%	9.90%	9.26%	d
Large multi-segment firms	8.02%	9.49%	12.17%	12.56%	d
Average annual plant-level capital expenditures / lagged capital stock					
Plants of: All firms	16.93%	17.31%	17.59%	19.39%	d
Single-segment firms	17.24%	18.10%	18.02%	20.09%	d
Multiple-segment firms	16.17%	16.10%	16.49%	18.14%	d
Small firms	16.14%	17.33%	16.45%	18.88%	d
Large firms	17.29%	17.30%	18.03%	19.63%	d
Average percent of firm-segments acquiring plants (annually)					
Segments of: All firms	3.07%	3.62%	3.14%	3.21%	e
Single-segment firms	2.34%	2.55%	2.05%	2.18%	
Multiple-segment firms	5.27%	5.67%	6.35%	5.60%	e
Small firms	0.96%	1.76%	0.76%	1.46%	d
Large firms	4.22%	4.30%	4.40%	4.15%	
Percent of total shipments growth accounted for by acquisitions					
Single-segment firms	5.31%	7.42%	8.85%	9.05%	e
Multiple-segment firms	26.07%	30.17%	30.71%	36.08%	d
Small firms	15.95%	21.25%	20.30%	24.61%	d
Large firms	20.08%	24.56%	24.43%	28.52%	d

[d,e] Difference between Declining and Growth industries is significantly different from zero at the one-, five-percent level.

Table 3: Financial Dependence

Panel logit regressions examining the probability a division of a firm will invest more than its divisional cash flow. Change in industry shipments is the change in industry shipments at the three-digit SIC code level deflated by industry price deflators to give the real change in industry shipments. Industry capital intensity is capital expenditures divided by industry sales at the three-digit SIC code level. Firm-industry productivity is a firm-industry fixed effect from a production equation estimated using five years of lagged data. Relative odd ratios are the change in the relative likelihood of financial dependence from a one unit increase in the variable. All regressions contain industry and year fixed effects. (Standard errors in parentheses).

Dependent Variable: Dependence = 1 if Divisional Investment > Divisional Cash Flow

		Change in Long-Run Shipments	
	All Industries	Decline (-)	Growth (+)
Variables:			
Change in Industry Shipments	-0.226 [a]	-0.213 [a]	-0.236 [a]
standard error	(.054)	(.081)	(.076)
relative odds ratio	0.798	0.808	0.790
Industry Capital Intensity	1.774 [a]	5.134 [a]	0.595
standard error	(.341)	(.687)	(.398)
relative odds ratio	5.896	169.695	1.813
Firm-Industry Productivity: Fixed Effect (lagged)	-0.779 [a]	-0.770 [a]	-0.789 [a]
standard error	(.005)	(.008)	(.006)
relative odds ratio	0.459	0.463	0.454
(Firm-Industry Productivity)^2 (lagged)	0.043 [a]	0.002	0.061 [a]
standard error	(.003)	(.005)	(.003)
relative odds ratio	1.044	1.002	1.063
log(firm size)	-0.576 [a]	-0.580 [a]	-0.576 [a]
standard error	(.013)	(.022)	(.017)
relative odds ratio	0.562	0.560	0.562
log(firm size)^2	0.022 [a]	0.022 [a]	0.022 [a]
standard error	(.001)	(.001)	(.001)
relative odds ratio	0.562	1.001	1.001
Number of Observations	409,815	159,382	250,433
Psuedo R-squared	0.13	0.132	0.128

[a,b,c] Significantly different from zero at the one-, five-, ten-percent level.

Table 4: Conglomerate and Public Firm Status

Panel logit regressions examining the probability a division of a firm will be part of a conglomerate and public firm. Change in industry shipments is the annual change in industry shipments at the three-digit SIC code level deflated by industry price deflators to give the real change in industry shipments. Long-run change is calculated over a 25-year period and is deflated by industry price deflators to give the real change. Industry capital intensity is capital expenditures divided by industry sales at the three-digit SIC code level. Firm-industry productivity is a firm-industry fixed effect from a production equation estimated using five years of lagged data. Relative odds ratios are the change in the relative likelihood of financial dependence from a one unit increase in the variable. All regressions contain industry and year fixed effects. (Standard errors in parentheses).

	Dependent Variable	
	Conglomerate Firm = 1	Public Firm = 1
Variables:		
Change in Industry Shipments	-0.619 [a]	-0.237 [a]
standard error	(.085)	(.088)
relative odds ratio	0.538	0.789
Long-run (25 year) change in industry shipments	0.243 [a]	0.584 [a]
standard error	(.019)	(.017)
relative odds ratio	1.275	1.793
Industry Capital Intensity	5.175 [a]	2.387 [a]
standard error	(.546)	(.548)
relative odds ratio	176.788	10.883
Firm-Industry Productivity: Fixed Effect (lagged)	-0.119 [a]	-0.018
standard error	(.018)	(.018)
relative odds ratio	0.888	0.982
(Firm-Industry Productivity)^2 (lagged)	0.158 [a]	0.111 [a]
standard error	(.019)	(.017)
relative odds ratio	1.171	1.117
log(firm size)	3.024 [a]	3.083 [a]
standard error	(.042)	(.033)
relative odds ratio	20.583	21.831
log(firm size)^2	-0.074 [a]	-0.095 [a]
standard error	(.002)	(.001)
relative odds ratio	0.928	0.909
Number of Observations	409,815	409,815
Psuedo R-squared	0.57	0.40

[a,b,c] Significantly different from zero at the one-, five-, ten-percent level.

Table 5A: Plant Acquisition

Regressions examine the relationship between plant acquisition, predicted financial dependence and firm organizatic Predicted dependence is the predicted probability of financial dependence using the specification of Table 3. The growth (Consolidating, Technological Change) quadrant is when the change in real value of shipments is in the upper (upper, lower) fiftieth percentile and change in the number of firms is in the upper (lower, upper) fiftieth percentile of industries over 10 and 25 year periods. Conglomerate firm and public firm status are instrumented using the specification of Table 4. Productivity of segment is the weighted average of plant-specific productivity for that segment. All right-hand-side variables represent values prior to the year of the acquisition. Relative odds ratios, which represent a change in the relative odds of acquisition, can be obtained by taking the natural exponent of reported coefficients. (Robust standard errors in parentheses).

	Length of time used to determine life-cycle quadran			
Dependent Variable: Plant Acquisition	10 Year Window		25 Year Window	
Variables:	coefficient	standard error	coefficient	standard error
Predicted financial dependenc				
* Quadrant 1 Indicator: Declining	0.370	(.250)	0.214	(.215)
* Quadrant 2 Indicator: Tech. Change	-0.343 [b]	(.137)	-0.363 [a]	(.135)
* Quadrant 3 Indicator: Consolidating	-0.290 [c]	(.162)	-0.211	(.153)
* Quadrant 4 Indicator: Growth	-0.952 [c]	(.495)	-1.065 [a]	(.454)
Conglomerate multi-industry indicator (predicted)	3.229 [a]	(.078)	3.218 [a]	(.078)
Segment rank within firm (1=largest)	-0.068 [a]	(.005)	-0.068 [a]	(.005)
Conglomerate*dependence*Quadrant 1 indicator	-0.233	(.288)	-0.248	(.290)
* Quadrant 2 Indicator: Tech. Change	0.618 [a]	(.180)	0.633 [a]	(.180)
* Quadrant 3 Indicator: Consolidating	0.699 [a]	(.208)	0.730 [a]	(.205)
* Quadrant 4 Indicator: Growth	1.214 [b]	(.512)	1.193 [b]	(.517)
Public firm indicator variable (predicted)	0.118 [b]	(.049)	0.128	(.118)
Public*dependence*Quadrant 1 indicator	0.425	(.280)	0.425	(.283)
* Quadrant 2 Indicator: Tech. Change	0.006	(.436)	0.003	(.441)
* Quadrant 3 Indicator: Consolidating	-0.294 [c]	(.169)	-0.301 [c]	(.167)
* Quadrant 4 Indicator: Growth	0.178	(.139)	0.487 [b]	(.238)
Average Plant-level Productivity of segment (lagged)	0.025	(.083)	0.026	(.083)
Diversity: standard deviation of growth across segment	-0.104	(.120)	-0.032	(.066)
Number of Plants in Segment (lagged)	0.028 [a]	(.002)	0.028 [a]	(.002)
Quadrant 2 Indicator: Tech. Change	0.026	(.166)	0.348	(.710)
Quadrant 3 Indicator: Consolidating	0.176	(.118)	2.834 [a]	(1.012)
Quadrant 4 Indicator: Growth	0.096	(.117)	-0.159	(1.425)
Constant	-4.761 [a]	(.155)	-7.588 [a]	(1.011)
Number of segment-years	408,430		408,430	
Psuedo R-squared	15.00%		15.03%	

[a,b,c] Significantly different from zero at the one-, five-, ten-percent level.

Table 5B: Plant Acquisition in Related and Unrelated Segments

Regressions examine the relationship between plant acquisition, predicted financial dependence and firm organization. We classify segments as related and unrelated using the input-output matrix. Unrelated (Related) segments are those that are upstream or downstream from the main segments of the multi-segment firm. Predicted dependence is the predicted probability of financial dependence using the specification of Table 3. The growth (Consolidating, Technological Change) quadrant is when the change in real value of shipments is in the upper (upper, lower) fiftieth percentile and change in the number of firms is in the upper (lower, upper) fiftieth percentile of industries over 25 year periods. Conglomerate firm and public firm status are instrumented using the specification of Table 4. Productivity of segment is the weighted average of plant-specific productivity for that segment. All right-hand-side variables represent values prior to the year of the acquisition. All regressions contain year and industry fixed effects. (Robust standard errors in parentheses).

	Segments classified by input - output matrix			
Dependent Variable: Plant Acquisition	Unrelated Segments and single-segment firms		Related Segments and single-segment firms	
Variables:	coefficient	standard error	coefficient	standard error
Predicted financial dependence				
* Quadrant 1 Indicator: Declining	0.208	(.221)	-0.034	(.276)
* Quadrant 2 Indicator: Tech. Change	-0.382 [b]	(.138)	-0.170 [a]	(.163)
* Quadrant 3 Indicator: Consolidating	-0.217	(.156)	-0.278	(.192)
* Quadrant 4 Indicator: Growth	-0.779	(.531)	-1.111 [b]	(.479)
Conglomerate multi-industry indicator (predicted)	3.209 [a]	(.081)	3.670 [a]	(.117)
Segment rank within firm (1=largest)	-0.068 [a]	(.005)	-0.106 [a]	(.013)
Conglomerate*dependence*Quadrant 1 indicator	-0.189	(.303)	0.302	(.442)
* Quadrant 2 Indicator: Tech. Change	0.686 [a]	(.187)	0.586 [b]	(.283)
* Quadrant 3 Indicator: Consolidating	0.710 [a]	(.213)	1.350 [a]	(.317)
* Quadrant 4 Indicator: Growth	1.090 [b]	(.676)	1.205 [c]	(.551)
Public firm indicator variable (predicted)	0.169 [a]	(.053)	0.128	(.094)
Public*dependence*Quadrant 1 indicator	0.414	(.315)	0.493	(.506)
* Quadrant 2 Indicator: Tech. Change	-0.240	(.527)	0.659	(.656)
* Quadrant 3 Indicator: Consolidating	-0.328 [c]	(.180)	-0.319	(.321)
* Quadrant 4 Indicator: Growth	0.065	(.147)	0.511 [c]	(.272)
Average Plant-level Productivity of segment (lagged)	0.041	(.087)	0.172	(.140)
Diversity: standard deviation of growth across segmen	0.001	(.068)	-0.526 [a]	(.140)
Number of Plants in Segment (lagged)	0.029 [a]	(.002)	0.027 [a]	(.004)
Quadrant 2 Indicator: Tech. Change	-0.264	(.718)	-0.055	(.583)
Quadrant 3 Indicator: Consolidating	1.618	(1.037)	0.782 [a]	(1.050)
Quadrant 4 Indicator: Growth	-1.369	(1.442)	0.326	(1.466)
Constant	-6.348 [a]	(1.036)	-5.728 [a]	(1.048)
Number of segment-years	387,915		293,753	
Psuedo R-squared	15.37%		16.4%	

[a,b,c] Significantly different from zero at the one-, five-, ten-percent level.

Table 6A: Plant Acquisition in Growth Industries

Regressions examine the relationship between plant acquisition, predicted financial dependence and firm organization. Predicted dependence is the predicted probability of financial dependence using the specification of Table 3. Conglomerate firm and public firm status are instrumented using the specification of Table 4. Productivity of segment is the weighted average of plant-specific productivity residuals for that segment. All independent variables represent values prior to the year of the acquisition. Relative odds ratios, which represent a change in the relative odds of acquisition, can be obtained by taking the natural exponent of reported coefficients. (Robust standard errors in parentheses).

Dependent Variable: Plant Acquisition	Growth Industries				Productivity-Split	
					Bottom 50%	Top 50%
Variables:						
Predicted financial dependence	-0.272 [a]	-0.661 [a]	-0.898 [a]	-0.900 [a]	-0.633 [a]	-1.210 [a]
	(.081)	(.129)	(.137)	(.137)	(.192)	(.199)
Conglomerate multi-industry indicator (predicted)	3.689 [a]	3.504 [a]	3.510 [a]	3.512 [a]	3.617 [a]	3.399 [a]
	(.063)	(.080)	(.085)	(.085)	(.123)	(.120)
Segment rank within firm (1=largest)	0.044 [a]	0.044 [a]	0.044 [a]	0.044 [a]	0.045 [a]	0.043 [a]
	(.003)	(.003)	(.003)	(.003)	(.004)	(.004)
Conglomerate*predicted dependence		0.545 [a]	0.412 [a]	0.415 [a]	0.152 [a]	0.716 [a]
		(.138)	(.141)	(.141)	(.188)	(.212)
Public firm indicator variable (predicted)			-0.191 [a]	-0.188 [a]	-0.128 [a]	-0.236 [a]
			(.055)	(.055)	(.085)	(.073)
Public*predicted dependence			0.667 [a]	0.665 [b]	0.463 [b]	0.863 [a]
			(.138)	(.138)	(.196)	(.201)
Relative productivity versus declining division				0.141 [c]	-0.021	0.339 [a]
				(.082)	(.107)	(.117)
Average Plant-level Productivity of segment (lagged)	0.090 [b]	0.093 [b]	0.093 [b]	0.045	0.065	0.061
	(.045)	(.045)	(.045)	(.051)	(.097)	(.087)
Lagged number of plants	-0.0004	-0.0001	0.0003	0.0002	-0.0077	0.0046
	(.004)	(.005)	(.004)	(.004)	(.007)	(.005)
Number of segment-years	185,281	185,281	185,281	185,281	92,106	93,175
Psuedo R-squared	21.8%	21.8%	21.9%	21.9%	21.8%	22.3%

[a,b,c] Significantly different from zero at the one-, five-, ten-percent level.

Table 6B: Economic Significance

Table presents predicted probabilities of a within-segment acquisition varying the predicted probability of financial dependence from the 10th to the 90th percentile. All other variables are held at the sample medians for the respective subset of data (public, multi- and single-segment). Predicted probabilities are calculated using coefficients from Table 6A, column 3, for growth industries and a similar specification for declining industries. High (low) productivity segments are segments above (below) the industry-year median. Predicted probabilities for low and high productivity segments use coefficients from Table 6A, columns 5 and 6 respectively. The last row for each quadrant uses the medians of the data from the multi-segment firm subset but assume the firm is single segment, thus setting the multi-segment firm indicator equal to zero.

Predicted financial dependence at the following percentiles:	10th	25th	50th	75th	90th
Declining Industries: Quadrant 1					
Multi-segment firms	4.46%	4.34%	4.32%	4.58%	5.04%
Public firms	4.77%	4.80%	4.84%	4.68%	4.54%
Public multi-segment	5.80%	5.86%	6.03%	6.60%	6.92%
Single-segment	0.38%	0.33%	0.28%	0.23%	0.20%
Public single-segment	0.98%	0.94%	0.56%	0.77%	0.69%
Single-segment using medians of data from multi-segment firms	4.02%	3.64%	3.23%	2.83%	2.46%
Growth Industries: Quadrant 4					
Multi-segment firms	6.12%	6.05%	6.26%	6.42%	7.18%
Public firms	5.19%	5.19%	5.23%	5.02%	4.86%
Public multi-segment	6.80%	6.97%	7.38%	7.75%	8.11%
Single-segment	0.56%	0.47%	0.39%	0.30%	0.24%
Public single-segment	1.12%	1.04%	0.90%	0.76%	0.63%
Single-segment using medians of data from multi-segment firms	5.36%	4.85%	4.22%	3.56%	2.92%
High Productivity Segments in Growth Industries: Quadrant 4					
Multi-segment firms	6.42%	6.37%	6.59%	6.76%	7.51%
Public firms	5.51%	5.59%	5.60%	5.34%	5.18%
Public multi-segment	7.07%	7.33%	7.82%	8.28%	8.76%
Single-segment	0.57%	0.45%	0.40%	0.31%	0.24%
Low Productivity Segments in Growth Industries: Quadrant 4					
Multi-segment firms	5.68%	5.61%	5.81%	5.96%	6.70%
Public firms	4.77%	4.73%	4.82%	4.59%	4.42%
Public multi-segment	6.44%	6.52%	6.85%	7.13%	7.30%
Single-segment	0.54%	0.46%	0.37%	0.30%	0.24%

Table 7: Productivity Changes Post Acquisition

Table presents changes in plant productivity for years after plant acquisition. Productivity is the sum of a firm fixed effect plus the residual from an estimated industry production function. Changes in productivity are industry and year adjusted. Declining (technological change, consolidation, growth) industries are industries that have long-run change in industry shipments over 1972-1987 in the lowest (lowest, highest, highest) fiftieth percentile and the long-run change in the number of firms in the lowest (highest, lowest, highest) fiftieth percentile. (Standard error of mean in parentheses).

Industry Category	Years -1 to 1	Years -1 to 2	Years -1 to 3	Years -1 to 4
Declining Industries				
Plants purchased by Conglomerate Firms				
Average Productivity Change	0.007	0.009	0.029	0.052 [b]
Standard Error	(.020)	(.023)	(.025)	(.027)
Number of Plants	1,365	1,146	1,011	888
Plants purchased by Single-Segment Firms				
Average Productivity Change	0.028	0.022	0.007	0.001
Standard Error	(.021)	(.024)	(.029)	(.034)
Number of Plants	1,057	882	690	552
Technological Change Industries				
Plants purchased by Conglomerate Firms				
Average Productivity Change	0.034 [a]	0.045 [a]	0.039 [a]	0.032 [b]
Standard Error	(.012)	(.013)	(.012)	(.016)
Number of Plants	3,681	3,305	2,980	2626
Plants purchased by Single-Segment Firms				
Average Productivity Change	-0.012	-0.029	-0.042 [c]	-0.042
Standard Error	(.018)	(.021)	(.024)	(.027)
Number of Plants	1,554	1,289	1,004	822
Consolidating Industries				
Plants purchased by Conglomerate Firms				
Average Productivity Change	0.010	0.016	0.017	0.022
Standard Error	(.012)	(.014)	(.015)	(.016)
Number of Plants	3,400	3,006	2,710	2454
Plants purchased by Single-Segment Firms				
Average Productivity Change	0.004	0.002	-0.012	-0.007
Standard Error	(.017)	(.020)	(.024)	(.025)
Number of Plants	1,829	1,458	1,167	941
Growth Industries				
Plants purchased by Conglomerate Firms				
Average Productivity Change	0.041 [a]	0.053 [a]	0.048 [a]	0.046 [a]
Standard Error	(.008)	(.009)	(.010)	(.011)
Number of Plants	8,016	6,922	6,068	5191
Plants purchased by Single-Segment Firms				
Average Productivity Change	0.005	-0.025 [b]	-0.018	0.007
Standard Error	(.011)	(.012)	(.015)	(.017)
Number of Plants	4,600	3,720	2,820	2186

[a,b,c] Significantly different from zero at the one-, five-, ten-percent level.

Table 8: Capital Expenditures

Logistic regressions examine the relationship between firm organization, predicted financial dependence and firm segment-level investment. Predicted dependence is the predicted probability of dependence using the specification of Table 3. Conglomerate firm and public firm status are instrumented using the specification of Table 4. Productivity of plant is the plant-specific productivity. Declining (technological change, consolidation, growth) industries are industries that have long-run change in industry shipments over 1972-1987 in the lowest (lowest, highest, highest) fiftieth percentile and the long-run change in the number of firms in the lowest (highest, lowest, highest) fiftieth percentile. (Robust standard errors in parentheses).

Dependent Variable: Capital Expenditures / Lagged Capital Stock (Industry-Year Adjusted)

Industry Category	Declining	Tech. Change	Consolidation	Growth
Variables:				
Predicted financial dependence	-0.027	-0.045 [b]	-0.086 [b]	-0.062 [b]
	(.050)	(.020)	(.046)	(.028)
Conglomerate multi-industry indicator (predicted)	-0.008	-0.002	0.002	-0.006
	(.008)	(.004)	(.013)	(.006)
Conglomerate*predicted dependence	0.028 [b]	0.021 [a]	0.089 [a]	0.112 [a]
	(.012)	(.004)	(.031)	(.015)
Segment rank within firm (1=largest)	-0.001 [c]	-0.002 [a]	-0.0015 [b]	0.001 [a]
	(.0004)	(.0005)	(.0006)	(.0003)
Public firm indicator variable (predicted)	-0.017 [a]	-0.005 [b]	0.007	0.012 [b]
	(.006)	(.002)	(.009)	(.0050)
Public*predicted dependence	0.014	0.000	0.004	0.008
	(.011)	(.001)	(.014)	(.017)
Average Plant-level Productivity of segment (lagged)	0.023 [a]	0.013 [a]	0.037 [b]	0.069 [a]
	(.005)	(.002)	(.018)	(.012)
Number of industry plants (lagged)	-0.003 [a]	-0.0002	0.0000	-0.0005 [c]
	(.0003)	(.0002)	(.0003)	(.0003)
Constant	0.284 [a]	0.318 [a]	0.323 [b]	0.332 [a]
	(.032)	(.008)	(.010)	(.011)
Observations	92,282	74,472	68,869	195,266
Number of firm-industry segments	18,091	14,235	14,289	39,672
Adj. R-squared	0.25	0.26	0.22	0.28

[a,b,c] Significantly different from zero at the one-, five-, ten-percent level.

Table 9: New Plants

Logistic regressions examine the relationship between firm organization, predicted financial dependence and new plant openings. Predicted dependence is the predicted probability of dependence using the specification of Table 3. Conglomerate (public) is the predicted probability that the firm produces in at least two different three-digit industries using the specification of Table 4. Public is the predicted probability that that the firm has publicly traded equity in the U.S. Productivity of plant is the plant-specific productivity. Declining (technological change, consolidation, growth) industries are industries that have long-run change in industry shipments over 1972-1987 in the lowest (lowest, highest, highest) fiftieth percentile and the long-run change in the number of firms in the lowest (highest, lowest, highest) fiftieth percentile. (Robust standard errors in parentheses). Odds ratios are the change in the relative likelihood of plant exit from a one unit increase in the variable. Year and industry fixed effects are included.

Dependent Variable: New Plant Opening

Industry Category	Declining	Tech. Change	Consolidation	Growth
Variables:				
Predicted financial dependence	-0.005	0.029	-0.591 [a]	-0.476 [a]
standard error	(.151)	(.160)	(.165)	(.113)
relative odds ratio	0.995	1.029	0.554	0.621
Conglomerate multi-industry indicator (predicted)	2.046 [a]	2.061 [a]	2.077 [a]	1.849 [a]
standard error	(.101)	(.112)	(.131)	(.080)
relative odds ratio	7.740	7.850	7.983	6.356
Conglomerate*predicted dependence	-0.262	0.383	1.364 [b]	0.738 [a]
standard error	(.255)	(.297)	(.269)	(.157)
relative odds ratio	0.769	1.467	3.913	2.093
Segment rank within firm (1=largest)	-0.087 [a]	-0.069 [a]	-0.109 [a]	-0.084 [a]
standard error	(.013)	(.011)	(.020)	(.007)
relative odds ratio	0.917	0.933	0.897	0.920
Public firm indicator variable (predicted)	-0.076	-0.063	-0.070	0.286 [a]
standard error	(.104)	(.103)	(.062)	(.109)
relative odds ratio	0.927	0.939	0.932	1.331
Public*predicted dependence	0.147	0.255	-0.385	0.113
standard error	(.226)	(.241)	(.260)	(.163)
relative odds ratio	1.159	1.291	0.680	1.119
Average Plant-level Productivity of segment (lagged)	0.154 [c]	0.115	0.129	0.063
standard error	(.088)	(.090)	(.098)	(.056)
relative odds ratio	1.167	1.122	1.137	1.065
Number of plants in segment (lagged)	0.052 [a]	0.078 [a]	0.046 [a]	0.096 [a]
standard error	(.004)	(.009)	(.004)	(.005)
relative odds ratio	1.053	1.082	1.047	1.101
Number of segment-years	86,968	71,358	66,875	189,221
Number of firm-industry segments	18,210	14,322	14,473	39,891
Psuedo R-squared	0.125	0.130	0.145	0.125

[a,b,c] Significantly different from zero at the one-, five-, ten-percent level.

Table 10: Plant Exit

Plant-level logit regressions examine the relationship between firm organization, predicted financial dependence and plant closing. Predicted dependence is the predicted probability of dependence using the specification of Table 3. Conglomerate and public firm status are instrumented using the specification of Table 4. Productivity of plant is the plant-specific productivity. Declining (technological change, consolidation, growth) industries are industries that have long-run change in industry shipments over 1972-1987 in the lowest (lowest, highest, highest) fiftieth percentile and the long-run change in the number of firms in the lowest (highest, lowest, highest) fiftieth percentile. (Robust standard errors in parentheses). Odds ratios are the change in the relative likelihood of plant exit from a one unit increase in the variable. Industry fixed effects are included.

Dependent Variable: Plant Exit

Industry Category	Declining	Tech. Change	Consolidation	Growth
Variables:				
Predicted financial dependence	0.188	0.004	-0.029	-0.205 [c]
standard error	(.166)	(.231)	(.174)	(.123)
relative odds ratio	1.207	1.004	0.971	0.815
Conglomerate multi-industry indicator (predicted)	-0.199	-0.183	-0.562 [a]	-0.571 [a]
standard error	(.158)	(.189)	(.157)	(.102)
relative odds ratio	0.820	0.833	0.570	0.565
Conglomerate*predicted dependence	-1.255 [a]	-0.515	-0.317	-0.150
standard error	(.383)	(.422)	(.424)	(.252)
relative odds ratio	0.285	0.598	0.728	0.861
Segment rank within firm (1=largest)	0.044 [a]	0.030 [a]	0.044 [a]	0.031 [a]
standard error	(.004)	(.005)	(.005)	(.003)
relative odds ratio	1.045	1.030	1.045	1.031
Public firm indicator variable (predicted)	0.215	0.045	0.317 [b]	0.093 [c]
standard error	(.142)	(.160)	(.147)	(.054)
relative odds ratio	1.240	1.046	1.373	1.097
Public*predicted dependence	0.082	0.485	0.630	0.293
standard error	(.374)	(.399)	(.441)	(.235)
relative odds ratio	1.085	1.624	1.878	1.340
Average Plant-level Productivity of segment (lagged)	-0.366 [a]	-0.439 [a]	-0.388 [a]	-0.440
standard error	(.015)	(.016)	(.016)	(.011)
relative odds ratio	0.694	0.645	0.678	0.644
Number of plants in segment (lagged)	0.009 [a]	0.008 [a]	0.003 [a]	0.017 [a]
standard error	(.001)	(.001)	(.001)	(.002)
relative odds ratio	1.009	1.008	1.003	1.017
Number of plant-years	115,247	115,495	128,408	276,658
Number of firm-industry segments	18,209	14,322	14,472	38,891
Psuedo R-squared	0.03	0.036	0.045	0.044

[a,b,c] Significantly different from zero at the one-, five-, ten-percent level.