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

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ABSTRACT

We examine the effect of financial dependence on the acquisition and investment of single-segment and conglomerate firms at different stages of the industry life cycle. Conglomerates and single-segment firms differ in acquisition activity more than in the level of capital expenditure across all stages. Financial dependence, a deficit in a segment's internal financing, decreases the likelihood of acquisitions and opening new plants, especially for single-segment firms. In growth industries, these effects are mitigated for conglomerates and public firms. 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 public status, 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 conclusion that the comparative advantages of different firm organizations differ across the industry life cycle.

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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 little is known about how the type of firm organization is associated with a firm's performance in different stages of the industry life cycle.

In this paper we examine whether long-term differences 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 a firm's organizational structure form affect acquisitions, plant births and deaths?
- Does the effect of organizational structure depend on the stage of the industry life cycle?
- Do these differences occur because the effect of financial dependence depends on access to public capital markets and/or organizational form?
- Are capital expenditures less sensitive to differences in organizational structure than acquisitions, plant births and deaths?

In studying firm organization, we distinguish between single-segment producers and divisions of firms 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 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.

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 the stages in the industry's life cycle . 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 (SIC codes 2000 - 3999). 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.

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 influences whether a segment's investment exceeds internally generates cash

[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.

flows. 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.

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 most single-segment firms or single segments of multi-industry firms do not invest more than their segment cash flow. Small segments are more likely to be financially dependent then large ones. Conglomerates' segments are more likely to fund capital expenditures from cash flow than single-segment firms.

We find that predicted financial dependence affect plant acquisitions by conglomerate 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. While financial dependence decreases the probability of that a single-segment firm acquires plants, it has a much smaller or no effect on the probability that a conglomerate's segment acquires plants. For conglomerates most productivity segments there is very little effect of financial dependence on acquisitions. These findings for conglomerates' most productive segments are consistent with this relaxation of financial dependence helping productive segments.

We find that public firm status and conglomerate form have additional effects on acquisitions in Growth industries. In these industries, financial dependence has a smaller effect on the acquisitions by public firms than by private firms. 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. 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.

In most industries, segments that are predicted to be financially dependent and invest more than their cash flows have lower capital expenditures than segments that are not financially dependent. Once we control for predicted financial dependence, we find that divisions of conglomerates have somewhat lower capital expenditures at the plant level than single-segment firms. However, conglomerate segments that are predicted to be financially dependent have higher capital expenditures than financially dependent single-

[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.

segment firms, particularly in Consolidation and Growth industries. This finding, together with the result that conglomerates that are not financially dependent invest less than stand-alone firms, suggests that conglomerates relax the financing constraints for their financially dependent segments.

We also find large differences in the effect of organizational form and public firm status on plant birth and death across industry categories. Both public firm status and whether or not a segment belongs to a conglomerate 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

By contrast, we find that in Growth industries conglomerates' segments close plants with the same probability as single-segment firms. Similarly the probability that a plant is closed is unaffected by public firms status. However, in Declining industries, the effects of predicted financial dependence are different for conglomerate and public status. 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.

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, shows that many industries go through life-cycle stages. These stages are characterized by differences in the growth rates of the industry and by sometimes dramatic changes in the numbers of producers in the industry. 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)). .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.

The way a firm is legally constituted may 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.

The most direct explanation of the relation between organizational form and the ability to exploit structural changes within industries posits that organizational form is a proxy for the firm's underlying expertise and ability to exploit opportunities. Maksimovic and Phillips (2002) argue that heterogeneity in organizational effectiveness, and the ability to exploit different types of investment opportunities, causes some firms to select to become conglomerates. They advance a neo-classical model of firm size, based on Lucas (1978). Lucas posits that management teams of firms differ in their ability to operate plants efficiently. Given that it is more difficult to manage a large firm than a small firm, firm size and scope of operations adjust to economize on the abilities of managers. In this view both conglomerates' and single firms' alter their investment in response to short-run shocks or long term life cycle changes. As these changes occur comparative advantage shifts, firms exit and enter industries and investment patterns change so as to maximize value.[5]

Existing literature also maintains that firms' organizational form directly affects access to capital. Conglomerates have internal capital markets that can transfer capital across industries and, by virtue of their size, may have better access to external capital markets than would be available to their constituent divisions if they had remained independent. Better access to capital can give the divisions of conglomerates a competitive advantage not available to stand alone firms (Bolton and Scharfstein (1991), Khanna and Tice (2001), Stein (1997), Peyer (2001)).

Conglomerates may also have an advantage over financial markets in monitoring projects and providing organizational inputs. Venture capitalists perform such functions for firms at initial stages of their development, offering guidance as capital. An important task of the venture capitalist is to build a management team and, when appropriate, provide for the transition of the firm to professional management. A conglomerate structure may allow senior management to provide analogous oversight over divisions. Such oversight may be particularly valuable at times of industry transition when the competitive advantage among firms is changing.

However, 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

[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.

possibilities are suggested by prior work by Lamont (1997), Shin and Stulz (1998), Rajan, Servaes and Zingales (2000), and Scharfstein and Stein (2000). Recently, however, the contention that conglomerates misallocate resources has been challenged by Khanna and Tice (2001), Maksimovic and Phillips (2001, 2002), Whited (2001), Chevalier (2002), Graham, Lemmon and Wolf (2002), Campa and Kedia (2003) and Villalonga (2003).

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 at different stages of the industry life cycle . Below, we test that conjecture.

Our paper differs from the literature on conglomerates in taking a broader view of investment and fundamental industry conditions. In assessing the effects of the conglomerate form on investment, the conglomerate literature, except for Maksimovic and Phillips (2001) and Schoar (2002), generally focuses on differences in capital expenditures, as defined by COMPUSTAT, of conglomerates and single-segment firms.[6] 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 we consider both capital expenditures and purchases of plants. We examine acquisitions, different types of investment including purchases, capital expenditures, and plant birth and closure and examine these decisions over different stages in the industry life cycle.

3 Methodology

We classify industries based on whether they have experienced significant long-run exogenous demand shifts. Our objective is twofold. First, to identify industries that provide producers with different incentives to, and resources with which to diversify. Second, to identify a range of exogenous demand shifts that may require different financial and organizational capabilities of firms, and that may therefore enable us to identify the advantages of different organizational forms.

To classify industry changes, we use data from 1972 to 1997. These years are used because they are census years and span 25 years of industry experience. We classify industries according to the growth of shipments over this period and over 10 year subperiods. This procedure yields industry samples in which firms face very different competitive environments and changes in industry structures. Below, in Figure 1, we present histograms for industries based on the highest and lowest quartiles sorted by the real value of firm shipment growth. The histograms show that in growing industries it is not uncommon to see a

[6]Maksimovic and Phillips (2002) is also an exception. They consider firm growth from all sources, including acquisistions.

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.

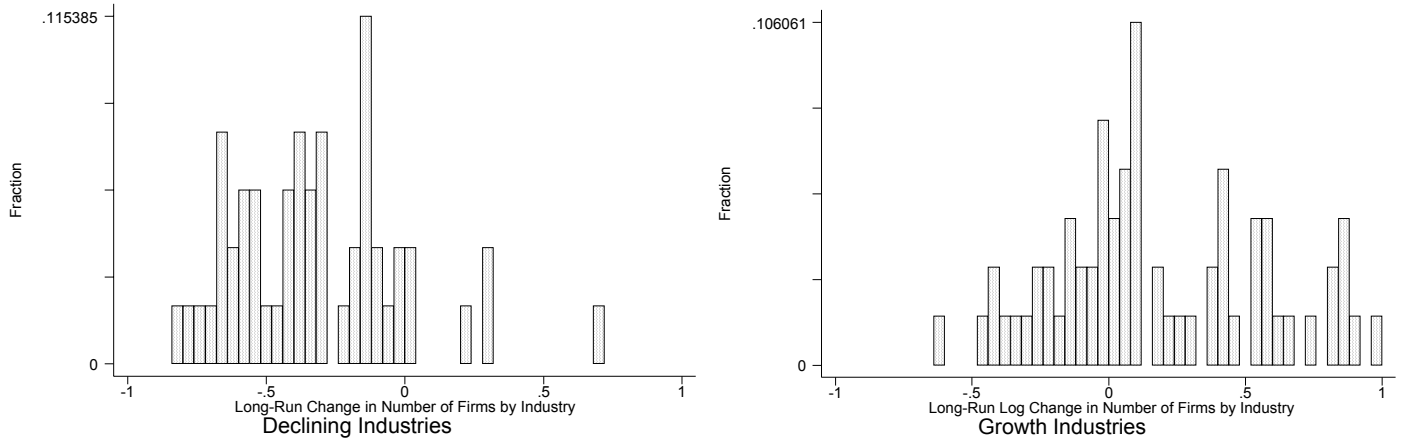

Figure 1

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 Census 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. When we classify over 10 year periods, industries can change industry classifications. Thus to classify an industry 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 1992 we would use 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.

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.

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.

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 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.

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 births and deaths.

4 Data and the Estimation of Productivity

A. Data

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.

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.[7]

[7]For a more detailed description of the Longitudinal Research Database (LRD) see McGuckin and Pascoe (1988) and also

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.

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 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 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.

The database also identifies plants that change ownership. For ownership change we rely on this

Maksomovic and Phillips (2002).

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.[8] 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 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).

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. We industry and year adjust all capital expenditure and productivity data.

B1. Productivity of Industry Segments

We calculate productivity for all firm segments at the plant level. 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

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

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.[9]

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 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.

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

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

excess returns in event studies.[10] 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 growth. 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 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 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

Table 1 presents summary statistics for our sample, broken down 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 36% in Growth Industries and decrease by 54% in Declining industries. Real shipments in Consolidating industries change little (a two percent increase). Shipments fall by 33% in Technological Change industries. As expected, the number of producers increases in Growth industries and decreases in Declining industries. At 61%, the increase in the number of producers in Growth industries exceeds the increase in real shipments, whereas the decrease, 43%, in the number of firms in the Declining industries is smaller than the fall in real output. Technological Change and Consolidating industries present a contrast. Despite a large drop in real output, the number of producers in the former increases by 34%. In the latter, despite a stationary output level, there is a drop of 11% in the number of producers.

[10] 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.

The percentage of segments (stand-alone firms or segments of conglomerate firms) operated by conglomerate firms is lower in Growth industries than in Consolidating industries and Declining and Technological change industries.

Insert Table 1 here

The proportion of segments that are financially dependent is highest in declining industries. The difference in the percentage of financially dependent segments in Growth industries, 40.3%, and the proportion of financially dependent segments in Declining industries, 43.12%, is statistically significant at the one percent level. Thus, financially dependent segments are more likely to be found in industries that have fallen on hard times than in industries that are growing fast.

Comparing stand-alone firms with segments of conglomerates, it is clear that the latter are less likely to be financially dependent in every industry category. In Growth and Technological change industries the differences are striking. In Growth industries 34% of conglomerate segments are financially dependent, whereas 44% of the stand-alone firms are financially dependent. In Technological Change industries the corresponding percentages are 37% and 46%. The difference is much smaller in Declining industries. Thus, segments of conglomerates are more likely to finance capital expenditures out of their own cash flow than single-segment firms, especially so in industries where the number of firms is growing. This finding suggests that the prevailing conglomerates role as providers of internal capital for segments may have to be qualified.

We next examine the relation between segment size and financial deficit in each industry category. For each year, we define as large those segments whose real shipments exceed the segment median for their industry in a and as small those segments whose real shipments fall below the median. The percentage of financially dependent small segments is somewhat higher in industries with falling shipments than in industries with growing shipments. The percentage of financially dependent large segments is substantially lower than the percentage of financially dependent small segments in every industry category. The differences are particularly large in Growth and Technological change industries. Thus, for example, 35% of large and 46% of small segment observations in Growth industries are financially dependent over the sample period. For Declining industries the corresponding percentages are 37% and 49%.

The percentage of financially dependent small conglomerate segments varies significantly by industry type. In Declining industries 51% of such segments are financially dependent, whereas the corresponding

percentage for Growth industries is only 41%. The variation for stand-alone firms is much smaller. The percentage of financially dependent stand-alone firms is smallest in Growth industries (at 47%) and highest in Technological Change industries (50%). It is 48% in Declining industries. Thus, small stand-alone segments are more likely to be financially dependent than small conglomerate segments, except in the case of Declining industries where conglomerate segments are more likely to be dependent.

In sum, Table 1 shows that there are substantial differences in the growth rate of real shipments and the number of producers across industries. A lower percentage of segments in high growth industries are financially dependent than in low growth industries Stand-alone segments are more likely to be financially dependent than conglomerate segments. Large segments are substantially less likely to be financially dependent than small segments.[11] Comparing small segments only, stand-alone segments are more likely to be financially dependent than conglomerate segments, except in Declining industries where a larger proportion of small conglomerate segments than stand-alone firms is financially dependent.

We next investigate 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 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% 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-

[11] Maksimovic and Phillips (2002) argue that large segments are on average more productive than small segments. Thus, size may be proxying for productivity. We investigate this possibility below.

segment firms' capital expenditure to lagged capital stock ratio exceeds that of the mean segment of multi-segment firms in all industry categories. This result suggest that the finding in Table 1 that single-segment firms are more financially dependent than conglomerates' segments is in part driven by the fact that single-segment firms have higher capital expenditures.

In Table 2 we also report the annual average percentage of firm-segments acquiring plants from other firms.[12] 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.

We can draw several pointers for further analysis from the summary statistics presented in Tables 1 and 2. Financial deficit is a function of industry type, segment size and firm organization. Inspection of Table 1 does not lend support to the hypothesis that conglomerate segments are more likely to be financially dependent than stand-alone firms, with the possible exception of small segments in Declining industries. Small segments are substantially more likely to have lower cash flows, invest slightly more and be financially dependent than large segments. Cash flows are higher in growing industries and in multi-segment firms. Whereas capital expenditure rates are fairly stable across industries, segment size and firm organization, purchases of plants depend on firm size and organizational form.

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, the tables suggest that capital expenditures at the plant level are not very sensitive to organizational form. Furthermore, there is little evidence that the financial deficit of conglomerate segments exceeds capital dependence of stand-alone firms. On the other hand there is evidence from the summary statistics 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.

In subsequent analysis of the relation of capital expenditures and plant acquisitions and firm organization we control for the expected financial deficit of segments. We recognize that financial deficit is endogenous and thus run a first-stage regression where we predict the financial deficit of a firm's segment.

[12]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.

We present this analysis of financial dependence in Table 3. Our dependent variable takes on the value one if a segment's cash flow exceeds the segment's capital expenditures, and zero otherwise. 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 Tables 1 and 2 that financial deficit and 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

Consistent with the results in Table 2, Column 1 of Table 3 shows that a segment in a fast growing industry is less likely to have be financially dependent than a segment in a slow growing industry. More productive segments are also less likely to have be financially dependent than less productive segments. The relation between the probability of financial deficit and a segment's productivity is convex. Segments in capital intensive industries are more likely to be financially dependent. Large segments and firms in growing industries are also less likely to have a financial deficit and 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 changes in real shipments. 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 becomes negative, albeit insignificant, in 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.

5.1 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. 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. 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 log of firm size as a control variable.[13]

Insert Table 4A here

Table 4A presents the basic results for all life cycle categories using both 10 year 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] 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 conglomerate times predicted dependence.

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 Technological Change and Growth industries and is statistically greater in these industries than the effect in Declining industries.

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 con-

[13] We also checked whether the results are robust to including the number of existing plants in addition to, or as a substitute for, firm size. In either case results were similar and conclusions unaffected by these changes.

[14] Census years are every five years beginning with 1972. To classify an industry in a particular year, we use the census year ahead of that year and calcuate the change from the census year 10 year prior to that census year. Thus for 1992 we would use the change from 1987 to 1997.

glomerates which 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, increases the probability of acquisitions over both 10- and 25-year windows.

Table 4B examines the probability of acquisition using continuous measures of changes in industry conditions. We include the change in the number of firms and the change in industry shipments in separate specifications - both over 10 and 25 year periods. For each year, we include the change using surrounding census years. e.g. in 1992 these variables measure the change from 1987 to 1997. We do not include both of these variables in the same specification, as we wish to ascertain the relative importance of each one.

Insert Table 4B here

Table 4B shows that the effect of financial dependence is present overall and is particularly strong in industries where the number of firms is increasing - as evident by the negative significant coefficient on the interaction variable predicted financial dependence times the change in the number of firms. The results also show an positive effect of conglomerate status. Conglomerate firms mitigate the effect of predicted financial dependence. This mitigation also increases with both the change in the number of firms and the change in industry shipments using both the 10 and 25 year windows - as is evident by the positive significant interaction for conglomerate times predicted dependence times the change in either industry shipments or number of firms. As also shown in Table 4A, the results show that our measure of diversity, the standard deviation of industry growth across a multi-segment firm's segments, increases the probability of acquisitions over all windows.

Tables 5A investigates further the effects of organizational form in Growth industries. We examine this quadrants in detail given our previous results that suggest that the effect of organizational form is likely to be most significant in industries where shipments and the number of firms are growing. Growing industries are also the industries 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. We also did this split for the other quadrants (unreported) and found either weak or nonsignificant differences between the splits.

Insert Table 5A here

Table 5A 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 5A 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 5B here

Table 5B 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. In the third and forth panel, we report the predicted probabilities for segments above and below the 50th percentile of industry productivity. Predicted probabilities for low and high productivity segments use coefficients from Table 5A, columns 5 and 6 respectively. 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.

Given financial dependence may occur either because a segment is losing money or because it is investing heavily relative to its cash flow, we examine these same effects for high (above the industry median) and low (below the industry median) productivity using the specifications from Table 5A, columns 5 and 6. The results in the third and fourth panels, show that the highly productive segments of conglomerate firms have about a .8 percentage point higher probability of acquiring a plant in their own segment compared to less productive segments at the median level of financial dependence. Highly productive public conglomerate firms have almost a 1 (1.46) percentage point higher probability of acquiring a plant versus less productive segments at the median (90th percentile) level of financial dependence.

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

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 is the 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 create value, we next examine the ex post changes in productivity for the acquired plants. We compute the changes in productivity over a four-year window. We industry and year adjust these changes in productivity.

Insert Table 6 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 severely 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 significantly increase in productivity post-acquisition.

5.2 Capital Expenditures

We examine the plant-level capital expenditures and the impact of predicted financial dependence, organizational form and also plant-level productivity on these expenditures. For predicted financial dependence, we use the specification presented in Table 3. 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 status affects capital expenditures and influences the effect of financial dependence, we interact the conglomerate dummy with predicted financial dependence. In Table 7, we estimate our capital expenditures regression for the four different industry categories.

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 7 here

Table 7 shows that the effects of financial dependence and conglomerate structure depend on industry life-cycle categories. Predicted financial dependence negatively affects capital expenditures in Consolidating and Growth industries. However, the negative effect of financial dependence is greater for single segment firms than for conglomerate segments, as the interaction term, conglomerate status times predicted dependence, is positive and significant in all industry categories except for declining industries.

In Consolidating and Technological Change industries, the conglomerates' level of investment is little affected by predicted dependence, being higher than that of single-segment firms that are predicted to be financially dependent and lower than that of the financially independent single-segment firms.

In two of the industry categories, Growth and Technical Change, whether a segment is predicted to be financially dependent appears to be more important for investment than the segment's organizational structure (segments that are predicted to be financially dependent invest considerably less than those not predicted to be dependent, regardless of organizational structure).

Finally, the productivity of a segment is significant 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 from Table 4 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 (which are available from the authors) 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, smaller firms and, in conglomerates, smaller segments 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. There is some evidence that investment in Declining and Technical Change industries are less affected by organizational form than in Consolidation industries.

5.3 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 that firm organization and whether a firm is public.

Insert Table 8 here

Table 8 shows that the conglomerate firm organization and public firm status variables only affect firms in growing industries, with the only exception being the segment rank variable which has a negative effect in all industries. We also find that large firms are more likely to open plants in all industry categories. In growing 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.

Insert Table 9 here

Table 9 examines plant exit over the different life cycle stages. The results in the table show that single-segment firms are less likely to close plants when they are predicted to invest more than their cash flow in all life cycle stages. 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, with the exception of consolidating industries where they are less likely to close plants that are predicted to be financially dependent. Given that public firms are also larger the net effect is more muted. 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 but offsetting this effect is a positive coefficient on the conglomerate indicator variable itself. These two offsetting effects reduce the effect of conglomerate firm status.

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 largely offset by a higher overall probability of closing plants.

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 the stage of its life cycle. Industries in different stages of their life cycle differ in the opportunities for profitable restructuring and in exploitable growth opportunities. These differences in 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.

Using plant-level data we classify U.S. manufacturing corporations into four different life-cycle stages 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 the industry life cycle. 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.

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 not as important component of single-industry firms' investment. As a result, the conclusions drawn from this literature need to be reassessed.

Our evidence suggests that a conglomerate firm's internal capital market reduce or break the link between a segment's financial dependency and capital expenditures. In addition to demonstrating a conglomerate effect on capital expenditures we find a conglomerate effect on plant purchases and new plant openings 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.

Since the conglomerate effect on acquisition and investment is stronger for segments of high productivity there does not appear to be a subsidy of conglomerate's less efficient segments.

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." We also document that plants acquired by conglomerate firms' existing segments also experience productivity gains post-acquisition, particularly in growth industries. 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.

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 but not in declining industries. Conglom-

erate 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 findings document important effects of firm organization and public firms that vary over long-run 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 capital expenditure decisions. They do not suggest that conglomerates' capital expenditures on acquisitions, new plants or their existing plants are excessive.

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Table 1
Financial Dependence and Industry Conditions

Table presents summary statistics by long-run industry changes and firm organization.
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.

	Industry classifications			
	Declining	Technological Change	Consolidation	Growth
Long-run (25 year) change in industry shipments	-54.38%	-33.42%	1.73%	35.76% [d]
Long-run (25 year) change in number of firms	-42.53%	37.13%	-10.78%	60.73% [d]
Percent firm segments operated by: multiple-industry firms (last year)	31.95%	33.78%	31.08%	29.61% [d]
Percent all firm segments with investment > internal cash flow	43.12%	42.84%	38.46%	40.30% [d]
Percent single-industry firm segments with investment > internal cash flow	43.78%	46.48%	39.73%	43.69%
Percent of segments of multi-industry firms investment > internal cash flow	41.45%	37.10%	35.18%	33.99% [d]
Percent segments of small firms (bottom 50%) with investment > internal cash flow	48.80%	48.74%	45.06%	45.96% [d]
Segments of small multi-segment firms	51.48%	43.36%	44.75%	40.82% [d]
Segments of small single-segment firms	48.27%	50.48%	45.13%	47.30%
Percent large firm segments (top 50%) with investment > internal cash flow	37.49%	37.21%	31.88%	34.65% [d]

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

In all cases, the means of all numbers are significantly different from zero at the one-percent level.

Table 2

Cash flow, Investment and Industry Conditions

Table presents cash flow and investment statistics by long-run industry changes and firm organization. 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.

	Industry classifications			
	Declining	Technological Change	Consolidation	Growth
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%

[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 odds ratios are the change in the relative likelihood of financial dependence from a one unit increase in the variable. (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	-0.841 [a]	-0.657 [a]	-0.670 [a]
standard error	(.039)	(.063)	(.053)
relative odds ratio	0.431	0.519	0.512
Industry Capital Intensity	3.689 [a]	4.943 [a]	3.933 [a]
standard error	(.179)	(.345)	(.213)
relative odds ratio	40.005	140.190	51.050
Firm-Industry Productivity: Fixed Effect (lagged)	-0.684 [a]	-0.669 [a]	-0.698 [a]
standard error	(.004)	(.007)	(.006)
relative odds ratio	0.504	0.512	0.498
(Firm-Industry Productivity)^2 (lagged)	0.038 [a]	0.003	0.051 [a]
standard error	(.002)	(.005)	(.003)
relative odds ratio	1.038	1.003	1.053
log(firm size)	-0.110 [a]	-0.097 [a]	-0.120 [a]
standard error	(.001)	(.002)	(.002)
relative odds ratio	0.896	0.908	0.887
Constant	0.592 [a]	0.512 [a]	3.115 [a]
standard error	(.016)	(.026)	(.086)
Number of Observations	409,815	159,382	250,433
Psuedo R-squared	0.063	0.058	0.066

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

Table 4A: Plant Acquisition

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. 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 is an indicator variable that indicates that the firm produces in at least two different three-digit industries. Public indicates that firm is publicly traded. 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 quadrants			
Dependent Variable: Plant Acquisition	10 Year Window		25 Year Window	
Variables:	coefficient	standard error	coefficient	standard error
Predicted financial dependence (base level)	-0.247	(.243)	-0.619 [a]	(.153)
* Quadrant 2 Indicator: Tech. Change	-0.594 [b]	(.305)	-0.427 [c]	(.231)
* Quadrant 3 Indicator: Consolidating	-0.425	(.265)	-0.046	(.212)
* Quadrant 4 Indicator: Growth	-0.800 [a]	(.251)	-0.811 [a]	(.175)
Conglomerate multi-industry indicator	0.259 [a]	(.066)	0.238 [a]	(.066)
Segment rank within firm (1=largest)	-0.066 [a]	(.005)	-0.065 [a]	(.005)
Conglomerate*predicted dependence (base level)	-0.032	(.295)	0.250	(.201)
* Quadrant 2 Indicator: Tech. Change	0.811 [c]	(.480)	0.710 [a]	(.238)
* Quadrant 3 Indicator: Consolidating	0.485 [c]	(.298)	0.452 [b]	(.229)
* Quadrant 4 Indicator: Growth	1.089 [a]	(.282)	0.853 [a]	(.188)
Public firm indicator variable	-0.021	(.058)	0.000	(.057)
Public*predicted dependence	0.541 [c]	(.326)	-0.029	(.300)
* Quadrant 2 Indicator: Tech. Change	0.093	(.593)	0.034	(.256)
* Quadrant 3 Indicator: Consolidating	0.611	(.335)	0.179	(.262)
* Quadrant 4 Indicator: Growth	0.419	(.312)	0.356 [c]	(.212)
Productivity of segment (lagged)	0.085	(.087)	0.080	(.087)
Diversity: standard deviation of growth across segments	0.469 [a]	(.101)	0.308 [a]	(.056)
Number of Plants in Segment (lagged)	0.036 [a]	(.002)	0.035 [a]	(.002)
log(lagged firm size)	0.313 [a]	(.008)	0.312 [a]	(.008)
Quadrant 2 Indicator: Tech. Change	0.029	(.163)	-0.019	(.080)
Quadrant 3 Indicator: Consolidating	0.313 [a]	(.107)	-0.009	(.078)
Quadrant 4 Indicator: Growth	0.167 [c]	(.101)	-0.122 [b]	(.064)
Constant	-7.668 [a]	(.132)	-7.401 [a]	(.102)
Number of segment-years	409,815		409,815	
Psuedo R-squared	10.10%		10.10%	

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

Table 4B: Long-run Industry Effects and Plant Acquisitions

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. For industry level 25 year changes in the number of firms and shipments, we use the change from 1972 to 1997. For 10 year changes, we use changes over 10 year census periods for all years within that 10 year period. Conglomerate is an indicator variable that indicates that the firm produces in at least two different three-digit industries. Public indicates that firm is publicly traded. 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. (Robust standard errors in parentheses).

Dependent Variable: Plant Acquisition	Change in Number of Firms		Change in Industry Shipments	
	10 Year	25 Year	10 Year	25 Year
Variables:				
Change in number of firms (Columns 1, 2)	-0.125	-0.037	0.084	0.060 [b]
Change in industry shipments (Columns 3, 4)	(.108)	(.048)	(.060)	(.030)
Predicted financial dependence	-0.763 [a]	-0.740 [a]	-0.800 [a]	-0.855 [a]
	(.102)	(.106)	(.116)	(.103)
* Change in number of firms (Columns 1,2)	-0.742 [a]	-0.268 [b]	-0.090	-0.038
* Change in industry shipments (Columns 3,4)	(.297)	(.139)	(.171)	(.091)
Conglomerate multi-industry indicator	0.297 [a]	0.285 [a]	0.284 [a]	0.274 [a]
	(.066)	(.066)	(.066)	(.066)
Segment rank within firm (1=largest)	-0.067 [a]	-0.067 [a]	-0.068 [a]	-0.068 [a]
	(.005)	(.005)	(.005)	(.005)
Conglomerate*predicted dependence	0.555 [a]	0.495 [a]	0.601 [a]	0.775 [a]
	(.146)	(.148)	(.149)	(.146)
* Change in number of firms (1,2) / shipments (3,4)	1.600 [a]	0.641 [a]	0.458 [a]	0.262 [a]
	(.309)	(.141)	(.168)	(.085)
Public firm indicator variable	-0.004	0.005	-0.009	-0.006
	(.057)	(.057)	0.057	(.057)
Public*predicted dependence	0.074	0.051	0.053	0.058
	(.153)	(.160)	(.158)	(.150)
* Change in number of firms (1,2) / shipments (3,4)	0.206	0.019	-0.001	-0.058
	(.337)	(.141)	(.162)	(.078)
Productivity residual for segment (lagged)	0.077	0.078	0.108	0.116
	(.087)	(.087)	(.087)	(.087)
Diversity: std. deviation of growth across segments	0.420 [a]	0.248 [a]	0.257 [b]	0.153 [a]
	(.103)	(.006)	(.108)	(.061)
Number of Plants in Segment (lagged)	0.036 [a]	0.036 [a]	0.036 [a]	0.036 [a]
	(.002)	(.002)	(.002)	(.002)
log(lagged firm size)	0.314 [a]	0.314 [a]	0.316 [a]	0.314 [a]
	(.008)	(.008)	(.008)	(.008)
Constant	-7.501 [a]	-7.510 [a]	-7.540 [a]	-7.481 [a]
	(.092)	(.093)	(.093)	(.092)
Number of segment-years	409,815	409,815	409,815	409,815
Psuedo R-squared	10.00%	9.99%	10.10%	10.10%

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

Table 5A: 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 is an indicator variable that indicates that the firm produces in at least two different three-digit industries. Public indicates that firm is publicly traded. Productivity of segment is the weighted average of plant-specific productivity (residual plus firm-segment fixed effect) for that segment. All independent variables represent values prior to the year of the acquisition. (Robust standard errors in parentheses).

	Growth Industries					
Dependent Variable: Plant Acquisition					Productivity-Split	
					Bottom 50%	Top 50%
Variables:						
Predicted financial dependence	-0.451 [a]	1.510 [a]	-1.550 [a]	-1.563 [a]	-1.538 [a]	-1.612 [a]
	(.084)	(.237)	(.236)	(.236)	(.343)	(.331)
Conglomerate multi-industry indicator	1.785 [a]	1.344 [a]	1.367 [a]	1.362 [a]	1.336 [a]	1.368 [a]
	(.061)	(.105)	(.110)	(.110)	(.167)	(.145)
Segment rank within firm (1=largest)	0.032 [a]	0.032 [a]	0.034 [a]	0.034 [a]	0.037 [a]	0.030 [a]
	(.003)	(.003)	(.003)	(.003)	(.004)	(.004)
Conglomerate*predicted dependence		1.213 [a]	1.056 [a]	1.067 [a]	0.865 [b]	1.560 [a]
		(.252)	(.394)	(.271)	(.392)	(.381)
Public firm indicator variable			0.097	0.010	0.139	0.061
			(.062)	(.063)	(.098)	(.083)
Public*predicted dependence			0.362 [b]	0.360 [b]	0.224	0.522 [b]
			(.173)	(.173)	(.248)	(.252)
Relative productivity versus declining division				0.134 [c]	0.010	0.256 [b]
				(.080)	(.104)	(.117)
Productivity for segment (lagged)	0.077	0.085 [c]	0.089 [c]	0.042	-0.050	0.009
	(.047)	(.047)	(.047)	(.053)	(.096)	(.085)
log(firm size)	0.253 [a]	0.251 [a]	0.235 [a]	0.236 [a]	0.229 [a]	0.240 [a]
	(.008)	(.008)	(.009)	(.009)	(.013)	(.012)
Constant	-7.650 [a]	-7.235 [a]	-7.093 [a]	-7.091 [a]	-7.042 [a]	-7.118 [a]
	(.122)	(.125)	(.126)	(.126)	(.190)	(.171)
Number of segment-years	185,332	185,332	185,332	185,332	92,134	93,198
Psuedo R-squared	0.19	0.2	0.20	0.20	0.19	0.2

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

Table 5B: 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 5A, 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 5A, 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 6: 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 7: 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 is an indicator variable that indicates that the firm produces in at least two different three-digit industries. Public is an indicator variable that indicates 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).

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

Industry Category	Declining	Tech. Change	Consolidation	Growth
Variables:				
Predicted financial dependence	0.030	-0.053	-0.090 [b]	-0.062 [b]
	(.037)	(.038)	(.046)	(.028)
Conglomerate multi-industry indicator	-0.020 [c]	-0.051 [a]	-0.057 [a]	-0.063 [a]
	(.011)	(.011)	(.013)	(.006)
Conglomerate*predicted dependence	0.016	0.067 [a]	0.120 [a]	0.112 [a]
	(.023)	(.023)	(.031)	(.015)
Segment rank within firm (1=largest)	-0.002 [a]	-0.001 [a]	-0.0015 [b]	-0.001 [a]
	(.0004)	(.0004)	(.0006)	(.0003)
Public firm indicator	-0.043 [a]	-0.053 [a]	-0.045 [a]	-0.013 [b]
	(.011)	(.009)	(.013)	(.0060)
Public*predicted dependence	0.051 [c]	0.080 [a]	0.068 [c]	0.008
	(.028)	(.025)	(.037)	(.017)
Productivity for segment (lagged)	0.040 [b]	0.047 [a]	0.037 [b]	0.069 [a]
	(.016)	(.016)	(.018)	(.012)
Number of industry plants	-0.001 [b]	-0.0003	0.0000	-0.0005 [c]
	(.0003)	(.0002)	(.0003)	(.0003)
log(firm size)	0.034 [a]	0.028 [a]	0.019 [a]	-0.002 [c]
	(.002)	(.002)	(.002)	(.001)
Constant	-0.284	-0.190 [a]	-0.083 [b]	0.132 [a]
	(.032)	(.035)	(.039)	(.020)
Observations	92,713	74,823	70,369	196,707
Number of firm-industry segments	18,210	14,322	14,473	39,891
Adj. R-squared	0.21	0.20	0.22	0.26

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

Table 8: 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 is an indicator variable that indicates that the firm produces in at least two different three-digit industries. Public is an indicator variable that indicates 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.

Dependent Variable: New Plant Opening

Industry Category	Declining	Tech. Change	Consolidation	Growth
Variables:				
Predicted financial dependence	0.252	-0.393	-1.665 [a]	-1.146 [a]
standard error	(.282)	(.405)	(.373)	(.202)
relative odds ratio	1.286	0.675	0.189	0.318
Conglomerate multi-industry indicator	0.027	0.119	-0.320	-0.368 [a]
standard error	(.192)	(.223)	(.210)	(.106)
relative odds ratio	1.027	1.126	0.726	0.692
Conglomerate*predicted dependence	0.357	0.638	1.208 [b]	1.496 [a]
standard error	(.458)	(.519)	(.568)	(.273)
relative odds ratio	1.429	1.893	3.347	4.462
Segment rank within firm (1=largest)	-0.189 [a]	-0.168 [a]	-0.202 [a]	-0.176 [a]
standard error	(.013)	(.010)	(.016)	(.007)
relative odds ratio	0.828	0.846	0.817	0.839
Public firm indicator variable	0.310	0.126	0.043 [c]	-0.051
standard error	(.205)	(.194)	(.202)	(.097)
relative odds ratio	1.363	1.134	1.044	0.951
Public*predicted dependence	-0.466	0.273	0.931	0.584 [a]
standard error	(.555)	(.525)	(.628)	(.290)
relative odds ratio	0.628	1.314	2.537	1.793
Productivity of segment (lagged)	0.123	-0.124	0.163 [c]	0.025
standard error	(.076)	(.085)	(.086)	(.050)
relative odds ratio	1.131	0.883	1.177	1.025
log(firm size)	0.330 [a]	0.381 [a]	0.394 [a]	0.382 [a]
standard error	(.015)	(.017)	(.019)	(.010)
relative odds ratio	1.391	1.464	1.483	1.465
Constant	-7.120 [a]	-7.762 [a]	-7.230 [a]	-7.220 [a]
	(.219)	(.278)	(.265)	(.147)
Number of segment-years	92,713	74,823	70,369	196,707
Number of firm-industry segments	18,210	14,322	14,473	39,891
Psuedo R-squared	0.052	0.0886	0.092	0.082

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

Table 9: 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 is an indicator variable that indicates that the firm produces in at least two different three-digit industries. Public is an indicator variable that indicates 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.

Dependent Variable: Plant Exit

Industry Category	Declining	Tech. Change	Consolidation	Growth
Variables:				
Predicted financial dependence	-1.149 [a]	-0.648 [b]	-1.611 [a]	-1.464 [a]
standard error	(.191)	(.259)	(.201)	(.137)
relative odds ratio	0.317	0.523	0.200	0.231
Conglomerate multi-industry indicator	0.852 [a]	0.318 [c]	0.427 [a]	0.104
standard error	(.133)	(.171)	(.144)	(.089)
relative odds ratio	2.344	1.374	1.533	1.110
Conglomerate*predicted dependence	-1.072 [a]	-0.234	-0.437	0.348
standard error	(.380)	(.380)	(.375)	(.212)
relative odds ratio	0.342	0.791	0.646	1.416
Segment rank within firm (1=largest)	0.054 [a]	0.037 [a]	0.071 [a]	0.048 [a]
standard error	(.004)	(.005)	(.005)	(.003)
relative odds ratio	1.055	1.038	1.074	1.049
Public firm indicator variable	0.149 [a]	0.293 [c]	0.495 [a]	0.158 [c]
standard error	(.143)	(.162)	(.153)	(.081)
relative odds ratio	1.161	1.340	1.640	1.171
Public*predicted dependence	0.361 [a]	0.114	-1.342 [a]	0.321
standard error	(.389)	(.421)	(.484)	(.234)
relative odds ratio	1.435	1.121	0.261	1.379
Productivity of Plant (lagged)	-0.387 [a]	-0.444 [a]	-0.415 [a]	-0.464
standard error	(.014)	(.015)	(.016)	(.011)
relative odds ratio	0.679	0.642	0.661	0.629
Number of plants in segment	0.010 [a]	0.005 [a]	0.005 [a]	0.024 [a]
standard error	(.001)	(.001)	(.001)	(.002)
relative odds ratio	1.010	1.005	1.005	1.024
log(firm size)	-0.234 [a]	-0.128 [a]	-0.273 [a]	-0.205 [a]
standard error	(.011)	(.013)	(.012)	(.009)
relative odds ratio	0.792	0.880	0.761	0.815
Constant	-0.742 [a]	-2.199 [a]	0.076	-0.971 [a]
	(.153)	(.197)	(.163)	(.113)
Number of plant-years	151,451	115,656	128,578	277,248
Number of firm-industry segments	18,209	14,322	14,472	38,891
Psuedo R-squared	0.052	0.033	0.036	0.031

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