

## **The initial corporate diversification decision: Empirical tests of dynamic models**

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This paper is the first essay of my dissertation. While I have partial results the full paper has not been finished as of this time. I submit this for consideration with the understanding that results and formatting will occur if accepted prior to the conference.

Kind Regards,

### **Abstract:**

While corporate diversification is a well research topic areas within this literature has been overlooked. Many of the dynamic theoretical models of corporate diversification in the finance literature have not been empirically tested. This paper seeks to fill in that gap by testing common themes found across models which should be tied to the choice of a firm to diversify. In particular I find that organizational capital, asset specificity, positive target (entering) industry shocks and the overall connection of the target (entering) industry are related to the initial diversification choice and support many of the predictions of the untested dynamic models.

## **Introduction:**

Why do firms diversify their business operations? This simple question relates to the very nature of a firm and is one of the core research questions in financial economics. A second question is why does management choose to enter one industry over another? Despite the vast amount of literature on the topic the answer to why firms diversify is still unclear. Furthermore, the answer to why firms select a given industry is almost completely overlooked in the empirical literature.

My research will shed additional light on the firm diversification choice by empirically testing recent dynamic theoretical models of firm diversification. These models provide possible answers to these fundamental questions, but as of yet have not been empirically tested. Additionally, many of these models go one step further and predict why firms may divest assets and refocus at a later point in time. Thus, empirical evidence on these recent models will have implications for broader literature dealing with firm boundaries.

By testing these recent dynamic models several contributions can be made to the field. First, since many of the dynamic models have not been empirically tested, doing so will allow for a comparison of the validity of the different existing theories. Second, since the models are dynamic in nature, they generally allow for more in-depth analysis of the different facets (the many costs and benefits) which may influence the diversification choice. Management attempts to balance the costs and benefits in deciding if their firm should stay focused and increase scale or diversify into new industries. Third, while each model has its own specific predictions, most of

these models do have similar general predictions. Being able to identify these similarities, and identify which common themes work may allow for practical aide to management in making well-informed choices when considering diversification; also, this investigation could aide investors in understanding what diversification means for the firm and whether this is a positive action for the firm.

A recent survey article by Maksimovic and Phillips (2013) summarizes some of the important theoretical and empirical work related to corporate diversification. Maksimovic and Phillips highlight another important question which has not been investigated as much is why a firm goes into the industry it does when diversifying. They note at time of publication only one study directly investigates this issue, and to my knowledge no other study has occurred to date. Several of the theoretical models make predictions based on the relatedness (distance) of the industries. I will use these predictions as motivation in researching industry and firm characteristics which help to explain why a firm's management elect to diversify into a given industry. Finding common industry and firm traits associated with why a firm diversifies and into which (or what type of) industry a firm diversifies into has practical (policy) implications to both management and investors.

Dynamic models despite only entering the extant literature in the past fifteen years have grown quickly in number; many of these models though have common themes and predictions. As such I will focus on those models which are related in two ways: first, I focus on models that make predictions as to how the organizational (core) skill set of the firm (also referred to as manager skill in some models) in addition to other firm characteristics impacts the choice to diversify; second, I also include in my investigation models which have predictions of how industry relatedness could affect diversification. My work investigates models with these common

criteria.<sup>1</sup> For example, two models with intuitive economic predictions are: Anjos and Fracassi (2013b) and Matsusaka (2001).

Despite being one of the earliest dynamic models Matsusaka (2001) has never been tested directly. The model links how a firm's traits (organizational capacity) may not be well matched with their current industry. Organizational capital can be thought of as an intangible asset capturing the general (flexible) component of economic productivity. This general component could be because of general skills of management, flexible knowledge or skill base (due to training) of employees or productive flexibility from current assets (capital base). In this case management has an incentive to explore through diversification in an effort to find an industry which better matches the firm's given abilities. Anjos and Fracassi (2013b) present a model which has direct implications to where (into which industry) a firm may diversify. In this model Anjos and Fracassi model technological innovation as the driver of a business unit's productivity. However, this model assumes that there are frictions in moving technological innovation between industries. Thus, if technological progress occurs in one industry that may be beneficial to a different industry a benefit to diversification is to bring these separate business units into one firm; thereby eliminating the external inefficiency. This is one of the few theoretical models linking firm traits with predictions of new industry entry.

Perhaps one of the reasons why these models have not formally been tested prior relates to the lack of research into organizational capital; this follows from the fact that until recently there were not accepted proxies to be used in empirical research. Organizational capital is a recently growing area of research in the financial literature. For example, Eisfeldt and Papanikolaou (2013)

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<sup>1</sup> (Anjos and Fracassi, 2013; Bernardo and Chowdhry, 2002; Gomes and Livdan, 2004; Habib and Mella-Barral, 2013; Maksimovic and Phillips, 2002; Matsusaka, 2001; Santalo, 2001)

present both a theoretical model as well as empirical evidence that organizational capital is a firm characteristic which has an impact upon the free cash flow to shareholders; thus, the characteristic is priced in the cross-section of stock returns. Related to this paper, is earlier work by Lev, Radhakrishnan, and Zhang (2009) who document that organizational capital is associated with strong operational performance in addition to subsequent stock price performance. Li, Qiu, and Shen (2013) investigate the impact of organizational capital upon merger and acquisition activity. The variable of interest carried both positive and significant correlation to several different measures of merger and acquisition (M&A) activity and performance measures. In this paper they also consider diversifying mergers, interestingly enough after controlling for organizational capital they found no difference for diversifying mergers in any of their tested specifications. Lustig, Syverson, and Van Nieuwerburgh (2011) document an increased importance of organizational capital over the last forty years of business; it is documented how organizational capital materially affects managerial compensation. Lastly, Falato, Kadyrzhanova, and Sim (2013) provide evidence that the increase in cash holdings which is documented in other studies, is most closely tied to an increase in organizational capital.<sup>2</sup>

Motivated by the recent theoretical models I will test whether organizational capital, as well as other theoretically motivated firm and industry characteristics, affects the diversification decision. Furthermore, I will test if these same characteristics impact which industry firm management elect to diversify into. This investigation will consider diversification resulting from both M&A as well as internal growth.

### **Literature Review:**

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<sup>2</sup>For example refer to Bates, Kahle, and Stulz, (2009); Duchin, (2010); Kahle and Stulz, (2013)

The nature and boundaries of the firm have been well researched in the extant literature. Seminal papers by Coase (1937), Gort (1969), Mueller (1969), Penrose (1955, 1959), Teece (1982), and Williamson (1973, 1979) have spurred research in the fields of Economics, Finance, Strategic Management, and Industrial Organization. I focus on firm diversification, which arises from the firm operating a division (or business unit) in a new industry. Entry into the new industry can occur as a result of organic growth or through acquisition. Both theoretical and empirical financial economics literature is predominately concerned with diversification arising through mergers, with surprisingly little attention paid to organic diversification. The following sections will serve to provide a comprehensive over view of the literature concerning corporate diversification.

### *Background*

Empirical studies on corporate diversification and refocusing go back at least a half-century. However, there still exists room for major contributions in the field. This stems from the fact that until just the last fifteen years dynamic models of corporate diversification did not exist. Diversification theory is now predicated upon these dynamic trade-off models; in these dynamic models the benefit(s) from corporate diversification (including reduction or elimination of financing or deadweight costs and synergies from complementary technology for example) are balanced against the costs (agency issues).<sup>3</sup> Prior to these models, financial theory of corporate diversification was primarily based upon static models where only a cost or benefit was considered in isolation. In these static models perhaps the biggest issue is that they took the boundary of the firm as given (i.e. the firm is either focused or diversified). Therefore, these early models did not

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<sup>3</sup> See Anjos and Fracassi (2013b), Lyandres (2007), Maksimovic and Phillips (2013), and Matsusaka (2001) for example.

take into account what would motivate management (the weighing of the costs and benefits) to diversify their firm; movement from a firm that is focused, operating in a sole industry, to a diversified firm operating in multiple industries, a dynamic decision.

Many of the models consider agency costs, a model considering possible benefits of diversification is the coinsurance model of Lewellen (1971). These static models however failed to take into account the potential benefits (costs) also associated with diversification, making dynamic models superior in their predictions and applications. Without the dynamic models researchers had been left to base their hypotheses on general intuition stemming from the static model; this often led to vague empirical predictions, which were difficult to directly test (Gomes and Livdan, 2004; Matsusaka, 2001).

A second issue with many of the early static models is that the organizational form of the firm was already set (the firm was already assumed to be diversified); thus, making it impossible to answer why firms' management would elect to diversify. While understanding optimal (dis)investment for a firm once diversified, it is arguably more important to understand why a firm moves from operating (producing) in one area and then expanding its boundaries to operate in other (multiple) industries.

### *Static Models*

Early theory focused on the benefits and costs of corporate diversification in a static setting. There are numerous theoretical reasons to believe that diversification is a value enhancing proposition. Lewellen (1971) presents a model in which diversification, generates benefits to the firm because of what is coined the co-insurance effect. Here, if two (or more) divisions of the firm do not have perfect correlation of cash flows the firm may cross-subsidize (pool cash flows); thus

lowering the default risk of the diversified firm as compared with stand-alone rivals. The benefits of diversification arising from the economies of scope is presented by Teece (1980). The model extends ideas applicable to vertical integration to more general firm diversification (reduction in transaction costs). The two areas where economies of scope are warranted occurs under the following circumstances: when the production of at least two products is dependent upon a proprietary knowledge base and recurrent exchange is needed; the second occurs if a specialized asset is required in the production of more than one product type. Stulz (1990) presents a model which explores to a fuller extent Myers' (1977) underinvestment problem. In this model one of the implications is how diversification reduces this issue; diversification across a number of different projects (projects in different industries) helps to reduce the cash flow uncertainty of the firm. This is tied to Lewellen's (1971) argument. Bolton and Scharfstein (1990) apply agency problems and imperfect financial contracting to model the effects of a diversified firm operating in an industry. This model shows how the "deep-pockets" (pooling of cash flows across divisions) of a diversified firm may allow it to engage in predatory actions against rival firms (start-ups) operating within an industry of one of their divisions.

While those models present reasons why diversification may be value enhancing, other models give reasons as to why diversification may be value destroying. Amihud and Lev (1981) argue managers have the incentive to diversify risks to personal wealth and as a result an agency costs may arise. This stems from the fact that a large percentage of the managements' wealth portfolio is tied to the performance of the firm. Management therefore has incentive to engage in value destroying firm level diversification in an effort to reduce risk to her personal portfolio. Shleifer and Vishny (1989) propose that management entrenchment may be a motivating force for firm diversification. Here, this agency cost is modeled by management's desire to grow the firm

in order to extract additional perquisites, and more directly personal compensation. Entrenchment acts in a way as to counter possible disciplinary actions. This is done by investing (diversifying) into assets that are more valuable under her control than some other individual, referred to as “manager-specific” assets. These assets however may not be value maximizing, resulting in agency cost. Rajan, Servaes, and Zingales (2000) present a model in which divisional management engage in “power struggles”, and that these interactions lead to agency costs, which are value destroying. The model has several interesting implications resulting from operating internal capital markets. As long as the differences between the divisions, in terms of investment opportunities and resources are similar, internal capital market should work in an efficient manner. With funds moving from less productive divisions to more productive divisions, however, if there are large differences in resources and investment opportunity, the model predicts funds will flow to the less productive divisions. This flow of funds, to the less productive division, is spurred by headquarters desire for the weaker division (divisions) to behave in a cooperative fashion with the other divisions of the firm. Scharfstein and Stein (2000) develop an agency model which is closely tied to the model presented by Rajan et al. (2000). In this model by Scharfstein and Stein a “two-layered” agency model is presented; agency issues between top-management and shareholders allow for the agency costs of divisional management to occur (inefficient investment in diversified firms), the so-called dark side of capital markets.

Static models assume the firm is already diversified. These early static models investigated how this organizational form could be either value enhancing or value destroying. Diversification possibly creates value for the firm in the following ways: reducing financing costs, increasing debt capacity, reducing the under-investment problem. Static models also identify a number of ways in which diversification might be value destroying e.g. agency costs.

*Dynamic Models:*

In contrast to static models, dynamic models formally analyze the diversification decision over time, focusing on the evolution of firm and industry characteristics and how they interact with the benefits and costs of diversification. Matsusaka (2001) presents a novel model focusing on the interaction of the firm's organizational capabilities (capital), and how these given capabilities fit with the current industry. This is the first model treating diversification as a search and match process, where firm management is attempting to find the optimal match between industry requirements and firm capabilities. These capabilities are specific to the firm and may or may not be an appropriate match with the capabilities required to operate within their current industry. If the match is poor management may elect to diversify the company in an effort to find a better match for the capabilities inherent to the firm.

In the model, diversification is not a permanent state. If a firm elects to diversify they test their match with the new industry and then either move into this new industry or find that their abilities are a worse match and re-focus (presumably to diversify into a new industry in the next period). Additional predictions of the model include:

- Diversification is more likely when the firm has low levels of productivity compared to industry rivals
- Diversification is more likely in highly competitive industries
- Diversification is more likely to occur into industries with high levels of uncertainty.

Maksimovic and Phillips (2002) develop a production based model (a neo-classical model) in which the firm's management behave in a profit-maximizing fashion. This model shows how a firm's management elects to either increase in scale in remain focus or diversifies into new industries in an endogenous fashion. One of the characteristics which is considered in this model,

similar to that of Matsusaka (2001) is organizational capacity. The authors then expand the model to incorporate a firm's optimal response to price shocks within a conglomerate firm. This is modeled through change in productive capacity by segments within the firm. The motivation for this extension concerning industry shocks is to aid in differentiation between this model and those motivated by agency issues. After the model is presented, they perform empirical tests using the Longitudinal Research Database (LRD) of the U.S. Census Bureau containing detailed information at the plant level to conduct their analysis. Overall, the empirical results presented support the theoretical predictions put forth in the model.

Predictions of this model include:

- Managerial talent (organizational talent) drives the observed relation between firm size, number of segments, and productivity.
- Size and productivity (for a firm or division) have a negative relationship (*ceteris paribus*). Diminishing productivity incentivizes management to diversify into (a) new (industry) industries.
- Firm skill within a given industry (after entering the industry) will be related to observed divisional size within the firm.

Matsusaka and Nanda (2002) develop a dynamic model of firm diversification and internal capital markets. The authors construct the model using a real options framework and the use of broader internal capital markets. The model assumes that the cost of external financing is the same for both diversified and standalone firms as well as the information conveyed in the security prices are equally informative; lastly, both types of firms are equally skilled at selecting projects. The avoidance of financing costs is what drives the major benefits of an active internal capital market operated by a diversified firm. In this framework Matsusaka and Nanda show assignment of

control rights over the cash flows of the firm are the primary mechanism influencing the single segment or multi-segment organization of the firm. Predictions of this model include:

- The value of internal capital markets increases as the variability of investment opportunities increases.
- If resources are available a decline in core investment opportunities makes diversification *less* attractive to managers seeking to maximize firm value; if resources are scarce however a decline in core investment opportunities makes diversification *more* attractive to managers seeking to maximize firm value.
- Diversification may make a product division more susceptible to new competition and refocusing in the main industry may be an optimal response to this type of threat.

Keeping with real options models of firm diversification we consider the model of Bernardo and Chowdhry (2002). In this model a firm is unsure about its inherent skill set; related to organizational capital of Matsusaka (2001). The firm is unsure of the extent to which a project is successful because of general organizational capabilities or a result of specific assets. A firm selects projects based on not only the predicted cash flows directly generated by the project, but also the positive value of information gained about the firm's organizational capabilities. The model has a number of empirical predictions, with many not directly tested in the extant literature; testable implications include.

- Diversification is more likely when the firm has minimal cash flow variation

Gomes and Livdan (2004) use a neo-classical dynamic production model in a similar fashion as Maksimovic and Phillips (2002) in order to model optimal diversification of the firm. Gomes and Livdan do not include within the model agency costs, nor is the paper in general motivated by agency costs. Here, the theory produces a diversification discount from management

optimally seeking to maximize firm value; diversification in this model is also efficient. The model's predictions match some of the observed empirical results observed in the extant literature. The authors also parameterize their model and show that similar results as those reported in the early empirical diversification literature [Lang and Stulz 1994]. Implications of this model include:

- Diversification is more likely to occur in order to take advantage of economies of scope (as presented by Teece, 1980), which in turn is more likely with greater levels of organizational capital
- Diversification is more likely to occur for large firms with few remaining growth options (diversification is an attempt to obtain growth options)

Santalo (2001) presents reasons as to why organizational capital may be related to both size and diversification considerations. This model shows that firms with greater amounts of organizational capital typically are larger firms. This has an interesting tie in with some of the other models. Here, Santalo shows that organization capital is tied to firm size, and other models have shown that organizational capacity and size both should relate positively with the diversification decision. The model illustrates why firms with better organizational capital will select in an optimal manner a level of production with lower profit per unit of input and output. It is stated that properly controlling for firm size should eliminate the empirically observed diversification discount. This is similar to the results reported by Hund, Monk, and Tice (2012).

Lyandres (2007) presents a model where cost and benefits produced by carrying debt as a diversified firm. The amount of debt a firm has serves a pre-commitment device and signals an aggressive strategy to the firm's industry rivals. It is theorized that this is one of the key components in the optimal capital structure within a given industry. However, the diversified firm

is not able to carry this optimal industry debt level in every given industry (firm division) as leverage is set by the headquarters for the entire firm. The author terms this sub-optimal leverage the “strategic cost of diversification”. A very interesting result of this model is that diversification of a firm has an impact not only on the value of the diversifying firm, but also, on the value of all other competing firms within the industry. Predictions of the model include:

- A diversified firm will reduce its aggressiveness in an industry with a high degree competitive interaction; a firm will increase its aggressiveness within less competitive industries.
- Due to the “strategic cost of diversification” it is implied that the combined value of the firm’s competitors may also increase in value depending upon how closely related the industries are of the merging firm.

Anjos and Fracassi (2013b) model diversifying mergers in a novel way. The model is based upon the level of technological specialization within business units, complexity of the given technology, and complements provided by interacting technologies. The authors are motivated by one of the most basic principles within economics; namely, that specialization is a long-run driver of economic growth. They argue that a business unit is the basic modular building block of the firm; with these units being the primary agent of production and focus in one technology. These units can function independently as stand-alone firms or can be incorporated into diversified firms. Efficiency gains are obtained if two different technologies are brought together within the boundaries of the firm that are unobtainable if these business units remain stand-alone entities. An important assumption in the model is that the increased efficiency is only possible to achieve within firms and not across firms. These efficiency gains are however traded off against a cost; the cost is increased organizational costs (many of these are the traditional agency costs of the

static models). This dynamic model is also a matching model, but one important feature of this model is a relatedness measure. The novel approach applied is that rather than modeling the “distance” in a linear fashion Anjos and Fracassi instead model the distance through the use of the unit circle. The model for ease assumes that diversification or re-focusing can only occur through merger or acquisition and spin-off respectively. Benefits are non-linear, if two business units are too close in their respective focused technology then the benefits of diversification through trade are small; conversely, if the technologies are too far apart then it is unlikely that trade produces any useful benefit. Testable predictions of this model include:

- Synergy gained by a diversifying merger results exogenously from combining complementary technologies
- Conglomerate businesses incur costs that are directly associated with the level of organizational complexity
- Increased technological specialization with a decrease in distance leads to more asset allocation to single-segment firms, but an increase in excess value for successful conglomerations (in this sense where a conglomerate is a diversified firm with significantly dissimilar technologies)

In a dynamic setting with broader implications than strictly diversification, Habib and Mella-Barral (2013) build a model illustrating why firms would elect to change the boundaries of the firm using either M&A, strategic alliance or asset swap. The paper is motivated by the lack of a unifying theory explaining the different motivations driving “unification” and subsequent separation of assets within firm boundaries. A firm is modeled to have assets, skills and core capabilities. A firm uses its skills to enhance the value of its underlying assets. The effectiveness of a firm in adding value to the assets is embodied in its core capabilities. The different ways in

which a firm can re-draw its boundaries (merger, strategic alliance or asset swaps) represent different fundamental combinations of these three core firm components. The model predicts that two firms will merge when they have little difference in core capabilities, but a divergent level of skill. The paper also includes a small section on empirical testing and potential proxies; furthermore they suggest several of the proxies: industry cost of capital can be used as the discount rate; an index based upon patents may be used to proxy for skills, it is suggested the core capabilities may have a suitable proxy by  $Q$ . However, they point out that rather than firm  $Q$ , for their model they actually need asset level  $Q$  for the best proxy.

Two models concerned with mergers and acquisitions (M&A) that relate to diversification are presented by Robinson and Rhodes-Kropf (2008) and Levine (2013). Robinson and Rhodes-Kropf (2008) apply a search and match model to mergers in an effort to explain irregularities found in the M&A literature. The model predicts what they call the like buys like phenomena; firms with the best opportunities merge because they have the highest synergy value. The process then repeats after the first target and bidder firms are removed from the possible merger pool the next two firms match and merge as the process continues. Another interesting point which comes from the model suggests that when search costs are low the “like-buys-like” result should be stronger. Levine (2013) generates a stylized dynamic model in which bidding firms seek targets because of a dearth of internal growth opportunities. More specifically the model predicts that acquisitions by a firm are motivated by the need to acquire productive opportunities (growth options) rather than current assets in place. The productive opportunities of the target firms are encumbered by high operating costs which can be alleviated by the bidding firm. This model yields implication similar in spirit to that of Robinson and Rhodes-Kropf; namely, good firm purchase good firms as opposed to good buys bad or high buys low. A key feature of the model is the separation between

a firm's organizational skill and a project's productive opportunity, which is defined as the ability to turn physical inputs into revenue. Revenue productivity in the model is similar to TFP used in prior studies. This paper also has a very thorough section involving empirical testing. The empirics show that target firms are highly productive at revenue generation relative to the average firm; but, these firms also have high costs associated with those above average revenue streams and as a result low profitability. The model is formulated and parameters are calibrated. Calibration of the model generates a number of interesting empirically testable predictions.

To recap, there are a number of common themes that can be observed across models. The first theme is the role played by organization capital. Organizational capital should be linked to firm management's choice to diversify. While the predictions of how organizational capital and the choice to diversify differ across the models considered, nearly all of the considered models predict a relationship to exist. A second, of these themes, is that the productivity of the firm as well as the productivity of the industry plays a part in the decision to diversify.<sup>4</sup> A third theme common with these models is that cash flows of both the current and prospective projects (industry) will impact the choice to diversify; lastly, the similarity or "distance" of the target project (industry) should also influence not only the choice to diversify, but also the which industry the company elects to enter. Testing the common themes of these dynamic models is at the heart of this essay. I seek to better explain why firms diversify as a response to these firm or industry characteristics.

*Empirical investigation of diversification: Diversification discount*

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<sup>4</sup> A proxy of productivity, total factor productivity (TFP) has been used in empirical investigations performed by both Maksimovic and Phillips (2002) and Gomes and Livdan (2004), but in these investigation only manufacturing firms were considered because of the lack of a good proxy for TFP in non-industrial firms.

The empirical diversification literature is dominated by investigation of the so-called “diversification discount” (premium). It is not possible to ignore these papers, but as these findings are tangential to the investigation of diversification for this essay I direct the reader to three literature review pieces: Erdorf et al. 2013; Martin and Sayrak 2003; Montgomery 1994. These taken together supplement omitted papers. Following the discussion of diversification discount I will outline other empirical work related to corporate diversification.

Early work concerning diversification observed that diversified firms trade at a discount to a comparable portfolio of stand-alone firms. These methods investigated firm value from implied market to book or market value (Berger & Ofek, 1995; Lang & Stulz, 1994; Servaes, 1996). Early tests of the efficiency of internal capital markets were performed by Comment and Jarrell (1995) and Scharfstein (1998), these papers also document the undoing of many conglomerate mergers. Arguments explaining the discount typically rested on the various static agency models discussed above, inefficient internal capital markets (most likely due to agency issues) or even the type of diversification a firm engaged in exacerbating the agency issues (Denis, Denis, & Sarin, 1997; Denis, Denis, & Yost, 2002; Shin & Stulz, 1998). Lamont and Polk (2001, 2002) tackle the diversification discount in different fashion. In the first paper they consider that the observed discount must be market driven; thus, the discount must hinge on either differences in future cash flows or future returns. Lamont and Polk (2001) report a large percentage of the variation observed in the cross-section of relative value can be explained by variation of future expected cash flows. Their 2002 article addresses possible endogeneity issues. They use changes in industry structure as a way to capture exogenous changes in the diversification level of the firm; these industry shocks are negatively correlated with firm value, as such they conclude the diversification does destroy value.

In contrast to these early papers a set of papers published in the early 2000s questioned the collective findings of the papers documenting a diversification discount. The arguments are varied, but can be condensed into three main points of attack: poor data, measurement error, and endogeneity bias. For example Villalonga (2004) uses the Business Information Tracking Series as opposed to the COMPUSTAT segment tapes and reports that on average there is no diversification discount present within the data. Whited (2001) argues that measurement error in Q causes the apparent inefficient diversification across segments reported. Once a correction technique is applied she finds no supporting evidence of inefficient investment. Mansi and Reeb (2002) suggest that the discount observed is an artifact of using book value of debt in the estimation as opposed to the market value of debt. Lastly, Campa and Kedia (2002) and Villalonga (2004b) argue that management's choice to diversify naturally causes endogeneity bias; failure to control for this bias would significantly impact reported results. Both Campa and Kedia (2002) and Villalonga (2004b) report that the apparent diversification discount disappears after correction for self-selection bias. Several empirical papers [for example Chevalier 2004; Graham, Lemmon, and Wolf 2002] provide evidence that the firms which elected to diversify were "discounted" or underperforming their peers prior to electing to diversify, or acquired firms which were underperforming bringing down the combined value of the firm. It is argued that this is the rational source of the diversification-discount.

Santalo and Becerra (2008) take issue with the assumption that the effect of diversification is homogenous across industries. They address some issues with how the aggregating of firms across industry (SIC code) definition can create artifacts in the data, effecting empirical investigation. In this paper they present a number of methods which can be incorporated into empirical research to better resolve the differences in industry characteristics (in relation to firm

diversification). Their analysis provides support to the notion that not all industries are equal in relation to the benefits of being a diversified firm within that industry. They present finds that the diversification discount is only present within those industries that have many specialized firms (or where specialized firms have large market share); conversely, there is a diversification premium when the industry has few specialized firms. This paper is also important because it questions the model used to control for endogeneity (Campa and Kieda, 2002; Villalonga, 2004b). The authors argue the fixed effects models may be more appropriate and have less bias.

Custódio (2014) presents another argument as to why the empirical methodologies for computing the implied value of the conglomerate firm is flawed. Here her argument is based upon how assets are valued during a merger or acquisition. Specifically, when a firm is acquired, the assets must be reported at their fair market values; since many assets' market values are under reported on their books. This creates an upwardly biased Q for the implied value of the firm as this value is based on the unmerged single segment firms. Furthermore, the author states that since diversified firms are more acquisitive by their nature they tend to have lower Q values. When goodwill is subtracted from assets she reports the bias is minimized for Q measures, but not for sales based implied value measures.

Hoberg and Phillips (2014) use text based analysis of products to determine the uniqueness of the firm's products compared to rival firms. In this paper they are motivated in comparing the value of the firm based jointly on the uniqueness of the firm's products and the organizational form of the firm (focused or diversified firm). They report finding that market value of a firm and the uniqueness of its products are positively correlated; this holds regardless of whether the firm is diversified or a pure play firm. The paper identifies aspects of the firm which can contribute to maintaining unique products. Specifically, three traits are most important for maintaining

uniqueness, increased patenting, increased branding, and lower levels of VC funding of small rival start-ups. Another contribution of this paper employs constrained optimization to generate benchmark firms for both focused and diversified firms. They report that on average using their benchmark construction the observed diversification discount disappears.

In closing with the diversification discount literature it can be observed that this debate has not ended. It is possible that the discount observed is due to measurement error, empirical design or errors within the data. However, one thing that cannot be argued is that diversification discount (premium) is not uniform within the cross-section of firms. This large variation does imply that being diversified may be a value enhancing or destroying proposition. Many of the dynamic models show that a diversification discount is endogenous, but many of the techniques to control for the endogenous nature appear to leave out important characteristics which may differ between firms and impact this choice.

*Empirical investigation of diversification: Implications of diversification*

Moving away from the diversification discount we can consider other empirical papers considering diversification, and the effects of diversification. Maksimovic and Phillips (2008) investigate if investment and acquisition is dependent upon firm organization and industry characteristics. The primary focus of the paper is to see if within-industry investment, for industries in different stages of life, is uniform for single-segment and diversified firms. They document that for growth industries 36% of the growth of a given firm segment is a result of acquisition compared to just 9% for single-segment firms. Conglomerate firms also grow more in growth industries through use of acquisition than in declining industries. Lastly, they find that

productivity growth in acquired assets is strongest for conglomerate firms operating in growth industries.

Çolak (2010) empirically explores the motivation to diversify and refocus (divest assets). He argues that researching diversification and refocusing choices separately leads to an incomplete picture. He employs a multinomial logit model as well as two-stage least square regressions to explore these choices in tandem, his data consists of firms from 1989 to 1998; reporting that there is no evidence of a discount resulting from diversification or a premium for refocusing. Çolak, states that there is no evidence of systematic value destruction (creation) for diversification (refocusing); this should be the ultimate motivation for managers, as some are successful in value creation others are not successful. Thus, on average the net result is no observed effect. Reported is evidence that firms refocus in response to firm specific reasons, and that firms tend to diversify because of industry or broader macroeconomic shocks. The paper does arguably use superior empirical methodologies than some of the prior research in this area. However, the main weakness in common with the other studies is a lack of true theoretical tests.

Arikan and Stulz (2011) motivate their research from life cycle theories of mergers and diversification, specifically those theories which state that firms acquire when internal growth options have been exhausted or theories which suggest that acquisitions are just another form of investment; thus young firms should acquire more. Taken at face-value these theories would predict a strictly linear relationship. Instead, examining cohorts of firms they find that the acquisition rates for young and mature firms is the same; this rate is greater than that of firms in their mid-life, generating a U-shape of merger activity with respect to firm age. Suggesting these different theories are not mutually exclusive. Market reactions are typically more positive to acquisitions by young firms as opposed to mature firms.

Brau, Couch, and Sutton (2012), Celikyurt, Sevilir, and Shivdasani (2010), and A. Hovakimian and Hutton (2010) conduct empirical studies on firms following their IPOs and their propensity to acquire. These studies are related to the research of Arikian and Stulz (2011). Celikyurt et al. document that firms following their IPOs are extremely active in the market for corporate control. Here they note that there is strong correlation between the industries in which firms go public and industries where there is high merger occurrence (IPO waves and merger waves are correlated). Celikyurt et al. further report that IPO firms play much larger roles as bidder rather than target firms. This activity appears to be driven by three separate capital sources: the equity capital infusion resulting from the IPO; cash raised through debt issues which occur prior to the IPO; public stock which may be overvalued giving the firm a relatively cheap acquisition currency.

Brau et al. (2012) test the long-run underperformance of IPO firms that acquire within the first year post IPO to those firms which do not. They find that the observed long-run underperformance for IPO firms is concentrated with those firms that undertake acquisitions. They employ a multivariate OLS framework to control for factors which affect IPO performance and also document that the acquiring set of firms underperform those firms that did not acquire. They control for varying investment and growth factors and the results still hold. These results could be driven by other differences in firm characteristics (see Bessembidner and Zhang, 2013). These findings can be linked to some of the diversification theory outlined above. Hovakimian and Hutton find evidence that some firms go through the IPO process in order to engage in merger activities. They report for their sample that nearly one-third of all IPO firms engage in acquisitions within three years of going public. Their finding echo those of Brau et al. and Celikyurt et al. as well as offering some new insights.

Doukas and Kan (2008) perform empirical analysis of mergers in an attempt to gain insight into why a firm may diversify. This study does not explicitly following any specific model. It is reported that cash flows of the firm in comparison to the industry in which it operates play a critical role in the diversification choice. Doukas and Kan suggest that diversified firms do not allocate resources inefficiently. Furthermore, Gopalan and Xie (2011) test if the internal capital markets of a diversified firm allow for segments operating in an industry which sustains a shock to outperform their single segment rivals. They present evidence consistent with internal capital markets allowing for divisions within the conglomerate to outperform their focused competitors. The divisions have higher sales growth, cash flow, R&D expenditure when compared to their industry rivals. These effects are amplified if the industry is very competitive, the division of the firm performed well prior to the industry shock, and the firm is financially constrained. They also document that the diversification discount is reduced during the industry shock; single segment firms increase their cash holdings, this may be done in an effort to stave off predatory actions of the diversified firm. Finally, they document that if the firm's division was performing well prior to the industry shock then the firm had a tendency to acquire rival firms within the industry. However, if the division was performing poorly prior to the shock then there is increased probability the firm will divest the division.

Maksimovic, Phillips, and Prabhala (2011) investigate how firms restructure following mergers. For this research they use the LRD and track the asset flows of the firm following acquisitions at the plant level. Following the completion of the merger, management of the acquiring firm typically engages in an aggressive restructuring program of the assets acquired through the merger. The authors report that in the three years following completion of the merger 46% of the plants purchased are either closed or sold; this level of restricting surpasses that of a

matched industry/year control group by a wide and statistically significant margin. Diversified firms capitalize on their comparative advantage across industries to increase productivity at retained assets (plants). They find that productivity at plant facilities which are retained increase in the three years following the merger, while plants that are divested show no increase in productivity. They also find evidence that firms are more likely to retain assets in non-core segments if the productivity of the firms' non-core assets are high prior to the acquisition; this supports the idea that firms are more likely to diversify if the needed organizational skills are in place to effectively manage a firm with diverse scope. Payment method has little association with the divestiture of assets following a merger. Acquirers paying with cash are marginally less likely to divest assets. Lastly, they report that changes in plant level productivity is positively and significantly associated with financial constraints, but again unrelated to the method of payment used to pay for the merger. Also considered is how acquiring firms treat their existing assets prior to merger; acquiring firms sell existing assets at a greater rate (albeit at a lower rate than acquired assets) than matched industry/year sample firms. It is important to note though, that assets sales are not at random, but instead strongly correlated to industry conditions and shocks. They report that serial acquirers also have a tendency to divest more frequently than non-serial acquirers. This finding casts a doubtful light on the role of entrenchment as motive for managers performing serial acquisitions.

As mentioned earlier, the empirical work on diversification is dominated by the investigation of the discount. However, another area of the literature is devoted to the investigation of the workings of the internal capital markets of the diversified firm. We also note that diversification is tightly connected to M&A activity. Some of the current empirical literature does present evidence consistent with some of the empirical models of diversification, but few papers

test the models directly. Even fewer test the predictions of dynamic theoretical models relating to the choice to diversify, or the “why;” none have tested the predictions of into which industries a firm would diversify, or the “where.”

### **Hypothesis Development:**

The models of Matsusaka (2001), Bernardo and Chowdry (2002), and Habib and Mella-Barral (2013) and to a lesser extent Anjos and Fracassi (2013b) all model the impact of organization capital on managements’ decision to diversify their firm. Maksimovic and Phillips (2002) present a production based model where output is in part based upon managerial talent; the model shows that a firm may not only produce in the industry with the highest level of talent. Instead, the firm will do so only until increasing marginal costs of production increase to the point that it becomes optimal to diversify into other industries that may match managerial talent, which has lower marginal costs.

Matsusaka’s model first assumes that the match quality between the firm’s organizational capabilities (capital) and those required to for optimal profitability are directly related. As such it is argued that the optimal business form is in fact specialization to a single industry where the match is unity. However, at the outset it is doubtful that the firm has a match of unity; it is more probable that the match is sub-optimal, this entices the firm’s management to diversify into some other industry in order to test if the new industry has a higher match value (this continues until a “good enough” match is found). Taken straight from the model a testable implication is that diversification is more valuable to those firms with higher general organizational capital; this is especially true for a firm with high general organizational capital which is currently in a poor match home industry. Bernardo and Chowdhry’s (2002) model is dependent upon the success of a firm (and subsequent projects) being dependent upon skills, capabilities and assets. As a firm

experiments with diversification, it is able to learn if its success is attributable to specific or general resources. The model shows that a firm with higher general organizational capital will diversify more often in an effort to maximize its value. Habib and Mella-Barral's (2013) model is also dependent upon skills (organizational capital), assets and core capabilities. They show that firms are more likely to merge if they share similar core capabilities, but there is a difference in skills.

Therefore, a broad prediction common to many of the recent dynamic models is the following:

**H1:** *As the organizational capital of the firm increases, the more likely is firm's management to choose to diversify.*<sup>5</sup>

Another important factor which could influence the diversification decision is how productive the firm is within its current industry. This motivation is found not only in the production theory of Maksimovic and Phillips (2002), but also in Gomes and Livdan (2004). In their model Gomes and Livdan tie the diversification choice directly to firm size and productivity.<sup>6</sup> First, the model allows for larger slow growth firms to diversify and increase their growth options. Second, the model allows for the fact that increasing scope allows for the elimination of redundancies in production, making all segments (divisions) relatively more productive. In Matsusaka's model a firm would seek to diversify if it is not a "good" match in its current industry. One measure of its current match is the firm's productivity compared to the rival firms in its industry. Productivity also plays important roles in other dynamic models of diversification.<sup>7</sup> As

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<sup>5</sup> For ease of discussion the hypotheses for this first essay are presented in the alternative form of the hypothesis. The hypotheses will be tested as usual with the aim to reject the null (i.e. no relationship).

<sup>6</sup> A paper which indirectly ties size and scope to organizational capabilities can be found in Mitchell (2000). While this paper does not deal directly with diversification, it shows how information learned on one project can be ported to another project. At its heart this is closely tied to the models of both Bernardo and Chowdhry and Gomes and Livadan.

<sup>7</sup> See for example Inderst and Müller (2003) and Matvos and Seru (2014)

such a firm that is less productive in its respective industry may have significant motivation to diversify into other industries.

**H2:** *Firms are more likely to diversify, the greater is the difference between the firm's and the industry's productive efficiency (e.g., total factor productivity (TFP)).*

Related to the idea of organizational capital is the idea of asset tangibility. A link between organizational capital and asset tangibility is presented by Falato et al. (2013). Fulghieri and Hodrick (2006) present a model in which managerial entrenchment is affected by the asset specificity and potential synergies created by diversifying. If asset specificity is high, there can be little done to increase value through synergies and entrenchment cost is increased. For this essay I use specificity in regards to tangible assets only. While the term can also be applied to intangible assets the intangible component is included in organizational capital. Kim and Kung (2011) constructs a measure of asset specificity based upon the salability of assets across industries. Schlingemann, Stulz, and Walkling (2002) document that liquidity, of tangible assets, plays a significant role in the divestiture decision. The Schlingeman et al. (2002) measure of asset liquidity was also based upon the salability of assets, in a similar fashion to Kim and Kung.

**H3:** *The lower is the asset specificity of the firm, the greater the likelihood of diversification.*

The competitive environment of the target industry should of course be a factor which influences the choice to enter that particular industry or not. Matsusaka (2001) outlines in his model that increased industry competition tied with differences in productivity should make firms leave the home industry, particularly if the industry has high competition. Conversely, both Lyandres (2007) and Matsusaka and Nanada (2002) provide testable predictions regarding the effects of industry competition on firm diversification stating that the effect should be a negative

relationship. Therefore the sign of this relationship provides a why in which to differentiate between these models.

**H4:** *The greater is the competition level within the firm's current industry, the greater is the probability of diversification conditional upon firm productivity.*

An implication from the Matsusaka (2001) model is that a firm should elect to go into industries with greater average risk. This is regardless of whether the synergies between the firm and new industry is high. Berkovitch et al. (2006) make a similar prediction, but also condition the choice upon the probability of success of the project.

**H5:** *The riskier is the project the greater the probability to diversify into that industry all else equal.*

Anjos and Fracassi (2013a) model a reason for diversification is to bring together technological progress in disparate industries, thereby alleviating market inefficiencies. Technological progress is (typically) accompanied by a positive industry shock; thus, positive industry shocks should be associated with greater diversification into the industry. Merger waves are accepted as a sign that an industry has experienced a positive shock or an expansion in the fundamental opportunity set of the industry.<sup>8</sup> Initial public offerings are also associated with both positive industry shocks and diversification.<sup>9</sup>

**H6:** *The greater is the positive industry shock in a potential industry, into which the firm may diversify, the greater is the probability of a diversification into the new industry.*

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<sup>8</sup> For example Ahern and Harford (2014) who document empirically that merger waves propagate along the customer supply chain into industries experiencing a positive shock.

<sup>9</sup> Refer to Brau et al. (2012) and Celikyurt et al. (2010).

The model of Bernardo and Chowdhry is a real-options model which incorporates learning. Many of the predictions of this model are not differentiable from that of other models. However, one prediction is unique coming directly from the learning aspect of the model. They predict that a firm will be more likely to diversify for the first time if the firm has a low cash flow volatility.<sup>10</sup> The reason for this prediction comes from the fact that if the volatility of the cash flow is low, it makes it easier for the management team to learn about its productive resources. If the firm is primarily successful because of its skills and organization capacity or conversely because of core assets. The more stable are the cash flows of the firm the more information can be extracted about the success of the new risky project in the new industry; thus, making the optimal choice of scaling up in the home industry or continuing to increase the scope of the firm through diversification easier.

**H7:** *Firms are more likely to diversify when their cash flow volatility is lower.*

While the hypotheses presented so far explore traits which may influence management's choice to diversify the firm, other important research questions relate to the selection of into which industry the firm should expand; the next hypotheses discussed are related to providing possible answers. Anjos and Francassi (2013a) provide models that can help to predict into which industry a firm should diversify. As already discussed in Anjos and Francassi a firm will diversify in order to gain benefits from combining technological specializations that can only occur if the two business units operate together as one firm instead of stand-alone firms. The model suggests that there is an optimal range of distance (relatedness) and that this range should be neither too close nor too far away in order to maximize the benefits. Anjos and Francassi (2013a) provide a

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<sup>10</sup> This prediction is related to, but is still unique from the implication of the model of Chang and Yu (2004). They predict a firm with high risks, but low expected return is expected to stay focused, while a low risk / high return firm should be expected to diversify.

second model which may further aid in explaining where a firm may wish to go when diversifying. It is argued that a firm which diversifies may exploit an informational advantage by bringing together various pieces of information across industries in a more efficient manner. This is because it is costly to gather information contained within firms or industries with which the firm does not normally interact. Thus, the less related these industries are the more costly it is for a single segment firm to learn about the advancements in some other unrelated industry. However, for a diversified firm information can be passed without cost between different divisions. Thus, the informational advantage of diversifying into a “close” or much related industry is minimal. Combining these two distinct theories we would expect the firm should go into an industry that is a far away as from the home industry where its technological capabilities would still be applicable. Therefore, maximizing the informational and technological advantages of diversification. This prediction runs counter to that of Lyandres (2007); he argues that diversification should be strategically optimal the closer the industries.

Investigation into this area of diversification is important and is still fairly novel. For example Hoberg and Phillips, (2013a) explore using their text based network some of the properties found within firms which are diversified. They report that firms typically operate within industries that are of similar characteristics to their home industry. They also report that diversified firms are less likely to operate in industries with distinct product language. Ahern and Harford (2014) examine mergers in a broader sense. They model the economy as a network of industries connected between customer and supplier trade flows (this is essentially a relatedness measure). They report that diversification is more likely to occur if there is strong product market connections. They also find that these connections are important in transmitting industry merger waves; these connections are also claimed to be responsible for the spread of economy wide merger

waves. Cohen and Frazzini (2008) also document that there is a level of return predictability that follows along customer and supplier chains.

**H8:** *The closer the product lines (product offerings) between two industries the more likely is the firm to diversify into the given industry.*

**H9:** *The more central is the industry in the economy (ie the more connections the industry has with other industries, through trade or product service links) all else equal the greater the probability the firm will elect to diversify into a given industry.*

## **Data and Methodological Design**

### *Data Selection*

For this essay the data to be used will come from the COMPUSTAT database, the COMPUSTAT historical segments database, for firm returns I use the CRSP database, the Hoberg and Phillips database housed at the University of Maryland, the input-output (I/O) tables prepared by the Bureau of Economic Analysis (BEA), the SDC database will also be used to collect information on asset sales and mergers, and lastly the U.S. Census Bureau and the National Bureau of Economic Research (NBER) worked jointly to develop the NBER-CES manufacturing industry database. The years to be considered for the essay will be 1982-2013. All non-financial firms (those firms with an SIC code starting with 6) will be considered for the study. Many of the empirical studies examining diversification use data which ends in 1997. This is a result of a change in accounting rules, SFAS 131, that dramatically altered the way in which a firm reports information about its segment level data. For detailed discussion outlining the accounting changes and the possible impact these changes had on diversification reporting see for example Berger and

Hann (2003), Herrmann and Thomas (2000), Street, Nichols, and Gray (2000), Anjos and Francassi (2013b).

The data selection methodologies for both this 1<sup>st</sup> and the following 2<sup>nd</sup> essay are the same for determining tested sample of firms. The identification of diversified firms will utilize the COMPUSTAT segments database. I first follow the aggregation methodology of Hund et al., (2012). The reported segments for a given firm (as identified by a unique GVKEY) will be combined at the reported four-digit SIC code. For instance if a firm reports three segments, but two of the segments for the same fiscal reported year share the same the same four digit SIC code I combine these segments. This firm would then have two separate identifiable segments (business units), a diversified firm. However, if the firm reported three segments to the COMPUSTAT database, but all three segments had the same four-digit SIC code these would be aggregated to one segment only, a focused (pure-play) firm.

For determining those firms who undergo a diversifying event I next look at the number of reported business units to the COMPUSTAT tapes in year zero ( $t_0$ ) and the year prior ( $t_{-1}$ ). If in year zero the firm reports two or more segments and in the prior year the firm reports only one segment then this firm would be classified as having undergone a diversifying event. To ensure that the event occurred and is not just an artifact of firm reporting I also require a change of at least 5% year over year in asset growth, this follows Fan and Lang (2000). This sample best matches the theoretical models being tested in essay one. For completeness I also include those firms undergoing additional diversification. If a firm reports  $n$  segments in  $t_{-1}$  and  $n+a$  (where  $a$  is a non-zero positive number) of segments in  $t_0$  then I considered this a diversified firm which undergoes additional diversification. If a diversified firm reports the same number of segments year over

year, I will also check to make sure that the industries in which the firm operates is the same. This is to make sure that the firm did not divest and diversify in the same year.

### *Empirical Proxies*

I will outline the main proxies to be used in the empirical analysis of the essay next. For operational capital I draw on two papers for this measure. Lev, Radhakrishnan, and Zhang (2009) construct a measure for a firm's operational capabilities. In a recent paper by Eisfeldt and Papanikolaou (2013) use a measure similar to that of Lev et al. in order to investigate the strong return correlation between a given firm's organizational capital and its own returns. The Eisfeldt and Papanikolaou (2013) measure is computed using a perpetual inventory method as follows:

$$OC_{i,t} = (1 - \delta_0)OC_{i,t-1} + \frac{SGA_{i,t}}{cpi_t} \quad (1)$$

$$OC_0 = \frac{SGA_1}{g + \delta_0} \quad (2)$$

Where  $\delta_0$  is the depreciation rate (15% is used for the essay following the same methodology as used in Eisfeldt and Papanikolaou, 2013); SGA is sales and general administrative and selling expense as listed in COMPUSTAT;  $g$  is the average real growth rate of SGA for the given firm.

Another possible proxy for organizational capital is found in Demerjian, Lev, and Mcvay (2012). In this paper the authors generate a way of measuring managerial ability, their methodology is unique because of the use of data envelope analysis (DEA) in building the measure. A final alternative for measurement of operational capital can be found in the decomposition of the firm's market to book ratio. This could be done following Rhodes-Kropf, Robinson, and Viswanathan (2005). Rhodes-Kropf et al. present methodology to decompose market-to-book (MTB) into three separate components. The three components are: the firm-specific pricing

deviation from short-run industry pricing; sector-wide, short-run deviations from firms' long-run pricing; and long-run pricing to book. Under this scenario the long-run pricing to book would represent the firm's core skills and organizational capital. One last step would be required to separate these two pieces from the MTB number.

A proxy for of productivity, total factor productivity (TFP), will be used for this essay. One such approximation of TFP is given by Faleye, Mehrotra, and Morck (2006), in this paper TFP is estimated within each two-digit SIC industry using a Cobb-Douglas production function and management augmentation factor equal to one. Additionally, in a more recent study Imrohoroglu and Tuzel (2013) present a process in which TFP can be estimated from COMPUSTAT data. The National Bureau of Economic Research (NBER) in coordination with the U. S. Census Bureau's Center for Economic Studies (CES) also created a data base from the LRD data calculating the TFP for approximately 470 industrial industry segments, this data may be used in robustness checks for some of the research questions.

A suitable proxy for asset tangibility to be used in this essay can be found in either Almeida and Campello (2007) and Titman and Wessels (1988). Another possible proxy for asset tangibility is found in Schlingemann et al. (2002), this paper also addresses the connection between asset tangibility and how asset tangibility may materially affect the choices management implement in the context of diversified firms. Despite the similarities between asset tangibility and organizational capital, I argue that it is important to include both as different industries will have varying levels of each trait. Here in this essay I focus on the first measure applied in Almeida and Campello (2007), and the proxy used in Schlingemann et al. (2002). The first is a simple index built from a linear regression model.

$$AT = .715 * Rec + .547 * Inv + .535 PPE \quad (3)$$

where  $AT$  is the measure of asset tangibility;  $Rec$  is accounts receivables (COMPUSTAT item #2);  $Inv$  is inventory (COMPUSTAT item #3) and  $PPE$  is Property, Plant and Equipment net (#8).

To compute the measure of Schlingemeann et al. all of the corporate level transactions for a given year are aggregated in an industry at the two-digit SIC code from the SDC database. This amount is then divided by the total book value of assets for all firms in the same two-digit SIC code; to smooth the index I use a three year rolling average.

Two possible measures of industry competition that may be used to test H4 of the essay are the Herfindahl Index and the fluidity measure. The first measure is the traditional Herfindahl Index. This measure has been used in many corporate finance studies. However, recently Ali, Klasa, and Yeung (2009) comment that measures of competition derived from only public information may lead to biased results. Hoberg et al. (2014) use the analysis of product descriptions to measure product market threats as well as barriers to entry. They accomplish this by producing what they call the fluidity measure. This measure tracks relatedness and changes in product lines of rival firms. This measure could be used to capture true market competition, as opposed to the Herfindahl index.

To measure the extent of industry shock I rely upon two possible measurements. The first measure is taken from Leary and Roberts (2014). In this paper by Leary and Roberts, they argue that idiosyncratic equity shocks to peer firms provide a reasonable measure of industry wide shocks (positive or negative). They propose a process in which one can estimate the industry average idiosyncratic return volatility. The more positive (negative) is this measure the greater the positive (negative) the industry shock. A second possible proxy is motivated by the M&A literature. Harford (2005) and Ahern and Harford (2014) argue that merger waves are driven by positive industry shocks. I use their measure of waves as a proxy for industry shock. To obtain

the measure used in Leary and Roberts the procedure is a two-step process. In the first-step the expected return of firm is computed given the following equation:

$$ER_{ijt} \equiv \widehat{r}_{ijt} = \widehat{\alpha}_{ijt} + \widehat{\beta}_{ijt}^{Mkt} * MRP_t + \widehat{\beta}_{ijt}^{IND} * IRP_t \quad (4)$$

$$Idiosyncratic\ Return \equiv \widehat{\tau}_{ijt} = r_{ijt} - \widehat{r}_{ijt} \quad (5)$$

The idiosyncratic return for each firm in the given industry is averaged in order to find the magnitude of the either positive or negative industry shock.

For the measure of project risk I propose estimating the two (five) year industry average cash flows. This measure would provide an adequate estimate of the average risk of the potential project (expansion into the new industry). If this measure of project risk is combined with the idea of co-insurance effects presented by Lewellen (1971) and Hann et al. (2013) if the entering industry is both risky and has low correlation with existing firm cash flows then the odds of entering into that industry should increase, all else equal.

In order to test both hypotheses H8 and H9 a reliable measure of relatedness (distance) is needed. For this essay I employ a number of measures, for example Fan and Lang (2000) construct a relatedness measure between firms and firm segments. As opposed to using more classic industry measures such as SIC codes the authors form measures of relatedness based upon the I/O tables constructed by the Bureau of Economic Analysis (BEA). This will be one of the measures I will employ in my investigation. They also apply a novel approach in how to label a change in segment reporting as either an accounting change or actual change in structure of the firm, they require a change in firm assets of at least 5% to conclude the change reported to the COMPUSTAT tapes reflects a change in organizational structure. I will also follow this procedure. Lien and Klein

(2009) also take issue with SIC or related industry classification schemes. Using similar arguments as those made by Fan and Lang (2000) they state the true synergy value caused by related diversification can be lost. To correct for these short-coming, the authors construct what they term a survivor-based measure of relatedness stemming from competition. This measurement is created by comparing how often actual industries combine in the economy to what one would expect if the industries were joined at random.

Hoberg and Phillips (2013) identify the need for organizational studies to define industries in a different way than the current SIC or NAICS classification systems. They create two industry classification systems, which they call the fixed industry classification (FIC) system and the text-based network industry classification (TNIC), based upon the product descriptions listed by firms in filled 10-K reports. They argue that product description will tend to cluster on certain words or descriptions in a given industry; thus, allowing for a classification system to emerge. The differences in these two classification systems is that if FIC companies are fixed together over some set time period and transitory rules are applied; for the TNIC firms are allowed to change industry classification on a yearly basis and the strict transitory rules are not required. An interesting result for multi-segment firms is that there is little variation in these new systems as opposed to the more traditional classification methods used. A series of papers address a number of issues relating to industry identification and relatedness and how this can affect merger and diversification literature (Hoberg, Phillips, and Prabhala, 2014; Hoberg and Phillips, 2010, 2011, 2014).

### *Methodology*

Probit regressions will be used to test the first seven hypotheses. In the first phase to ensure that a relationship indeed exists a basic univariate probit test will be run on each of the four firm

characteristics, and one industry characteristic to be investigated: organizational capacity (OC), productivity (TFP), standard deviations of cash flow (SDCF) asset tangibility (AT), industry competition (IC), industry shock (IS), and industry risk (IR). For all of the tests the dependent variable is a dichotomous variable equaling one if the firm diversifies in the year (from one to two segments, or  $n$  to  $n+1$  reported segments),  $DIV$ . I expect positive relationships for organizational capacity, asset tangibility, positive (entering) industry shock, and greater (entering) cash flow risk; conversely, I expect negative relationships for standard deviation of cash flow, asset tangibility, and industry competition.

$$Div_{i,t} = \alpha + \beta_1 * CI_{i,t} + \varepsilon_{i,t} \quad (6)$$

where, CI is the characteristic of interest: OC, TFP, SDCF, AT, IC, IS, and IR.

After the univariate tests, a multi-variant probit model will be used. In these regressions the basic univariate regression will be re-run with a vector of control variables which have been previously identified as influencing the choice to diversify. In order to obtain a clear picture all of the characteristics being tested will first be run with the vector of controls separately, to ensure that their initial relationships still hold with the controls.  $Div_{i,t} = \alpha + \beta_1 * CI_{i,t} + \beta_n * Vector\ of\ Controls_{i,t} + \varepsilon_{i,t}$

$$Div_{i,t} = \alpha + \beta_1 * OC_{i,t} + \beta_2 * TFP_{i,t} + \beta_3 * SDCF_{i,t} + \beta_4 * AT_{i,t} + \beta_5 * IC_{i,t} + \beta_6 * IS_{i,t} + \beta_7 * IR_{i,t} + \beta_n * Vector\ of\ Controls_{i,t} + \varepsilon_{i,t} \quad (8)$$

Interaction terms of the first two characteristics could also prove to be useful in testing the dynamic models. For example the Matsusaka (2001) model predicts that the organizational capacity of the firm should work jointly with the relative productive efficiency of the firm in

influencing the choice to diversify; therefore, the final regression model variants testing the first four hypotheses will be as follows:

$$Div_{i,t} = \alpha + \beta_1 * OC_{i,t} + \beta_2 * TFP_{i,t} + \beta_3 * (OC_{i,t} * TFP_{i,t}) + \beta_n * \\ Vector\ of\ Controls_{i,t} + \varepsilon_{i,t} \quad (9)$$

$$Div_{i,t} = \alpha + \beta_1 * OC_{i,t} + \beta_2 * TFP_{i,t} + \beta_3 * SDCF_{i,t} + \beta_4 * AT_{i,t} + \beta_5 * IC_{i,t} + \\ \beta_6 * IS_{i,t} + \beta_7 * IR_{i,t} + \beta_8 * (OC_{i,t} * TFP_{i,t}) + \beta_n * Vector\ of\ Controls_{i,t} + \\ \varepsilon_{i,t} \quad (10)$$

Most of the dynamic models considered are one period models. However, for robustness I will also check the impact on the prior period firm characteristics in the choice to diversify. Where appropriate I will use fixed effects to control for unobserved firm industry and time effects where appropriate (Gormley and Matsa, 2014).

Lastly, I discuss the control variables used in this first essay. These control variables are motivated by the work of Campa and Kedia (2002) and Villalonga (2004b) while neither of these papers directly test any theoretical work directly they both find traits which are empirically related to the diversification decision. Where possible I will relate the connection between these controls and the theoretical literature.

- *Size:* This is merely the natural log of total assets of the firm. Size is related to both the model of Maksimovic and Phillips (2002) as well as Gomes and Livdan (2004). These models predict a positive relationship as increased size should lead to lower productivity; thus, to a higher incentive to diversify. Both Campa and Kedia and Villalonga document this relationship holding as expected.

- *PNDIV*: This measure is the fraction of all firms in the industry that are currently conglomerates. This is a measure of the fraction of firms in the industry of the still focused firm which are diversified. Campa and Kedia argue that this measure picks up on factors which make the industry attractive to conglomerate operation.
- *SNP*: An indicator variable equal to one if the firm is listed on the S&P 500
- *MNUM*: The number of merger announcements within a given year.
- *MVOL*: The total dollar value of the announced mergers in a given year.
- *GDP*: Real growth rate of the gross domestic product. This is related to a hypothesis in Matsusaka (2001). It is suggested that diversification would be more likely when interest rates are low.
- *DP*: An indicator variable equally to one of the firm paid dividends in the year.

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