Is "Leverage" Leveraging the Business Start-ups?

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Abstract

One of the reasons business start-ups face credit constraints is their lack of credibility in the financial markets. Yet, debt financing is one of the major sources of funding a new business. Although initial capital structure lays the path for the future growth trajectory, regular supply of funds is also important for firm survival, enhanced productivity, and higher innovation. Apart from financial structure, organizational practices and employee satisfaction likewise contribute to a higher level of innovation. Using a rich dataset on American business start-ups provided by the Kauffman Firm Survey, this paper examines the simultaneous relationship between firm leverage and employee well-being, and their impact on innovation. Negative binomial fixed effects are used to analyze the effect of employee well-being and leverage on count data of patents and copyrights which are used as a proxy for innovation. The paper demonstrates that employee well-being positively affects the firm's innovation while a higher leverage ratio has a negative impact on innovation. No significant relation is found between leverage and employee well-being.

JEL Classification Codes: G32, J32, M13, O34

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1 Introduction

Researchers have investigated which factors affect a firm's level of innovation and over the years various reasons have come up (firm size, market structure, cash flows). One of the important factors that has not yet been analyzed in detail is the effect of the "capital mix" on the innovation trajectory. Studies which have explored this linkage have reported results for large and established firms, overlooking the small and young business start-ups. Analyzing the effect of capital-mix, i.e. the ratio of debt to equity, studies have reported contradictory results ranging from a positive effect of leverage on innovation (Smith, 2010), to a negative (Chiao, 2002; Czarnitzki and Kraft, 2004; Singh and Faircloth, 2005), or insignificant (Mac An Bhaird and Lucey, 2006), relation between the two. Using the Kauffman Firm Survey (KFS), a survey data of 4,928 firms founded in 2004, this paper examines the effect of leverage on the level of innovation among firms that are in their fifth year of existence.

Incorporating the impact of organizational practices via an index of employee wellness, I explore the three-way linkage between a firm's leverage, its level of innovation and employee well-being, and study to what extent leverage and employee well-being affect innovation. Contrary to the results from a recent study (Smith, 2010), I find that, for young firms, higher leverage has a negative effect on innovation. I show that a firm with a higher score of total-employee well-being is more innovative, and that there is no significant effect of employee well-being on leverage ratio of the firm.

Innovation has been considered to play a crucial role in survival and growth of a firm. For established firms, innovation is a way to retain their competitive edge in the market (Christensen, 1997); and for newer firms, innovation helps them in entering the market (Cefis and Marsili, 2005). Citing the relevance of innovation, Porter (1990), mentions that one of three cornerstones of global competitiveness is innovation, other two being, continuous improvement and change. Smith (2010) reports the effect of leverage on innovation. Controlling for the initial level of patents and copyrights, she reports a positive relation between leverage and new innovation. Exploring this linkage longitudinally, in my study, I find that leverage has a negative impact on innovation. This is an important result, because a regular supply of funds can positively affect innovation, and for young firms this can be a problem because they face capital market constraints. In addition, studying the relation over a period of time yields different results.

Work place practices affect a firm's performance (Therrien, 2003; Laursen and Foss, 2003). Organizational structures and human resource practices foster newer ideas in workers which can generate innovation in the firm. Human resource practices per se might not generate innovation, but they do motivate employees to come up with newer ideas (Zoghi et al., 2010). In addition, as knowledge is stored in human beings, studying the impact of these human resource practices and employment relations on innovation is important. Following this line of reasoning, Koski et al., (2009) explore the linkage between organizational factors and innovation and find that practices that improve em-

ployee welfare affect innovation positively in small firms, whereas large firms do not show this positive effect. They conclude that large firms have a decentralized decision-making structure that does not motivate employees. I explore this linkage empirically , and find a positive impact of employee well-being on innovation. Following the same reasoning as given by Koski et al., I interpret this result as implying that, small firms can generate a close-knit environment, which helps a firm in generating a higher level of innovation.

Linking up the above two variables which affect innovation, Verwijmeren and Derwall (2009), suggest an inverse relation between employee well-being and leverage. Using the KLD STATS database for their study, they argue that the risk of bankruptcy, which is bad for employees, motivates a firm to keep lower levels of leverage. In addition, they also argue that firms with a higher employee well-being score have higher credit ratings. When I explore this reasoning using the KFS, I find that employee well-being is not associated with the level of leverage. This seems to imply that, the argument of employee welfare guiding the debt-equity ratio does not work for young firms. Even though the firms care more for their employees, and the index measuring the well-being of employees increased for both full-time and part-time employees, leverage shows an upward trend. The risk of bankruptcy pressing a firm to have lower levels of debt would be justified for large publicly traded firms, but does not seem to be justified in case of small and young firms. Moreover, I find that there is no significant relation between credit rating and leverage.

Observing the three linkages in the above mentioned studies, I examine them using the KFS. The focus of these studies is on large publicly traded companies. It is interesting to examine these questions in a dataset where firms are just five years old. Even though these firms have the maximum risk of exiting the industry and face the risk of bankruptcy, the question I ask is: will a firm formulate a policy that will be directed to lower the debt level just because it cares for its employees; or choose a capital mix ratio that will yield a higher level of innovation?

To examine the above relation, I create an index of employee well-being, which is based on a set of nine dichotomous questions asked in the survey. These questions focus on exploring, whether the firm provides fringe benefits like an employee stock-option plan or paid holidays to its employees. Responses for both full-time and part-time employees are included in creation of the index. I use the total number of patents and copyrights held by a firm at the end of each year to measure innovation. Firm leverage is scaled by total financing resources and is therefore calculated as total debt divided by the total financing resources.

Young firms cannot access financial markets with the same ease as large and established firms. Young firms generally lack market credibility and in order to take loans and debt they have to pledge their assets as collateral. Owners' personal assets like house or firms' assets like land or machinery, generally act as collateral. With a moderate amount of equity in the capital mix, debt acts as a leverage device and investments made with external borrowings amplify the firm's return to equity. With capital constraints binding

in the initial years, young firms do not target an "optimal ratio"[1] of external borrowings to owner's resources. The Small Business Administration, in its guidelines, mentions that for business start-ups

> "[M]ost banks want to see that the total liabilities or debt of a business is not more than 4 times the amount of equity. Or stated differently, when you divide total liabilities by equity, your answer should not be more than 4."[2]

In this paper I find that leverage ratio rises as firms age, whereas a fluctuating pattern is witnessed for total debt. Equity tends to decline with the age. It is interesting to observe the effect of financial turmoil in 2007 in this analysis. Innovation levels and the index of employee well-being show a decline after the crisis hit in 2007. The results of this analysis contribute to the literature in four ways. First, I document the important role played by leverage for young firms and the risk associated with higher amounts of debt and lesser equity levels. In this context, there is an evidence of fluctuating levels of debt and declining level of owner's equity in the fifth year when compared to levels of debt and equity at the time of their birth. Debt level falls in the very next year, then rises and then falls again in the fourth year, finally rising in the fifth year. Second, from the perspective of the organizations which lend and assist small and young businesses, fluctuating levels of debt imply the lack of readily available funds. Debt being the largest source of funding for the firms in the KFS, highlights the importance of liquid credit markets. But fluctuating levels of debt also point to a lack of regular flow of funds. This reasoning comes from the fact that when asked during the survey owners reported that in most cases their loan applications were denied because of lack of collateral and poor credit history. They also reported that their applications were denied because of inadequate documentation and even on the basis that it is a new business. There are some policy implications for these organizations where they should try to provide a smooth flow of funds to business start-ups. Large amounts of collateral as a requirement makes it more difficult for an entrepreneur to apply for funds. Further, there is a need to educate the entrepreneurs about the availability of loans and financial services: 18% of the entrepreneurs never applied for credit when they needed it as they were pessimistic about their loan application and thought that it would be denied.

Third, an increase in leverage should be interpreted with caution, because the increase can come from either increasing the debt or decreasing the owner's equity. Changing levels of debt do not allow firms to take advantage of the leverage which comes with using debt as part of their capital structure. Moreover, empirically, absence of a significant relation between the firm's leverage and employee well-being implies that young firms are not guided by the considerations of employee welfare when they decide their capital mix. Fourth, small and young firms lack the cushion which can support them in case of a macroeconomic shock. Therefore, results are obtained need to be interpreted

[1] There is no exact value of debt-equity ratio which can be termed as optimal; generally it varies with industries.

[2] http://www.sba.gov/smallbusinessplanner/start/financestartup/SERV_BORROW.html

in the light of financial crisis of 2007. The trend depicted by debt and equity is justified when I linked to the current economic environment.

The remainder of this paper is organized as follows. Section 2 gives a detailed analysis of the three variables and linkages involved in them. Section 3 describes the data and how the indices of employee well-being and innovation are constructed. Empirical estimation in section 4 is followed by the conclusion in section 5.

2 Literature

2.1 Importance of Small and Young Businesses

Small and young businesses have always been considered an engine of economic growth. For the past 20-25 years, research has indicated that young firms are the main generator of net employment. Birch (1981), highlights the fact that small firms create more jobs than large firms. He points out that firms with employees of 1to19 accounted for 88% of all net new jobs during 1981-1985 (also see Birch, 1987, 1989). Although researchers have debated the credibility of the statements that, "young and small businesses contribute to job creation" (Davis et al, 1993), there has been a recent line of research based on new datasets which argue that small businesses not only contribute to the creation of new paid jobs in an economy, but also add "entrepreneurial jobs"[3] to the workforce. (Hijzen et al. 2010, Ying Lowrey,[4] 2009).

Despite the growing interest in this area, little is known about the dynamics of business start-ups in the initial stages. Because of complexity involved in the data collection, there has been an informational gap in the research between "small and young" firms and "large and established" business formations. The availability of data-sets, like the KFS, makes it possible to analyze the founding conditions of the start-ups and track their performance subsequent to their birth. The KFS is the world's largest longitudinal study of new businesses and contains a detailed information on both, the entrepreneurs and the firms. The original sample consisted of 4928 firms, out of which 3361 firms made it to their fifth year. These firms are at the cusp of childhood and adolescence, which makes the study of this unique data of special interest to both researchers and policy makers alike. The data offers an opportunity to study a cohort of firms, all born in the same time period, maturing at the same pace and facing the same macro-economic shocks.

[3]Term was coined by John Tozzi, Business Week reporter in: "The Entrepreneurship Job," http://www.businessweek.com/smallbiz/running_small_business/archives/2009/04/the_entrepreneu.html

[4] In her study using Kauffman Firm Survey, she mentioned that, "4,928 new startups utilized the efforts of 6,871 entrepreneurs".

2.2 Linkage: Firm Growth and Financial Markets

Since 1931, when Gibrat in his seminal study showed that firm size and growth rates are independent (commonly referred as Gibrat's Law), there has been an extensive line of research which has explored the linkages between firm age, size, and growth. With newer datasets, researchers have obtained results in contradiction of Gibrat's law. Hall (1987), rejected Gibrat's law for smaller firms; Evans (1987) highlighted an inverse relation between firm growth and age.

Research in this area has evolved in recent years, and studies have analyzed firm size and its distribution with an industry experiencing firm entry and exit. There have been attempts to study a cohort of firms over a period of time where entry has not been incorporated into the study. Cabral and Mata (2003) looked at the firm size distribution and how firms evolve. The main feature of their study was that they empirically tested the evolution of a cohort of Portuguese firms and observed that the firm size distribution is skewed to the right in the initial years and follows a log-normal distribution over a period of time. They pointed to "financial constraints" as a factor for evolution of firm size distribution. Financial constraints are also documented in various other studies (Cooley and Quadrini, 2001; Rui Albuquerque and Hopenhayn, 2004; Cabral and Mata, 2003; Clementi and Hopenhayn 2006; Arellano et al., 2009). Cooley and Quadrini (2001), showed that financial frictions, along with shocks, explain the simultaneous dependence of firm dynamics on firm size and age. While Cabral and Mata (2003), captured finance in terms of size, where the initial size of the firm is a function of the entrepreneur's demand for funds as rationed by his wealth, Clementi and Hopenhayn (2006), presented a multi period borrowing model with information assymetries. These information asymmetries are more pronounced in the initial years and lead to firm dynamics (Astebro and Bernhardt, 2003; Huynh and Petrunia, 2010).

The informational gap between lenders and borrowers is the main cause of credit constraints for the start-ups, where lenders at best can make a judgment based on the potential of the new project (Smith and Smith, 2000). Structure of capital in the initial years is therefore based on the demand by the entrepreneur and the willingness of outside financiers to supply the required amount of funds. Despite various available resources of financing[5] to a business start-up, debt financing is one of the dominant sources to fund a venture in its initial years.

Recently Robb and Robinson (2008) indicated that external debt financing and business credit cards are the primary source of financing at a firm's inception. Cooley and Quadrini (2001) alsopointed out that small and young firms are more likely to take a higher level of debt. Astebro and Bernhardt (2003), linked up owners characterstics,

[5] These sources have a wide range: venture capital, angel investors, equity finance, loans from friends and family, micro lending, trade credit, owner's funds.

initial finances, and firm survival and found evidence of self-selection where, "highly qualified owners favor sources other than commercial loans." Studies across various countries have shown that small and young firms rely mainly on internal equity (Giudici and Paleari 2000; Manigart and Struyf 1997), and on external financing (Hughes, 1997), rarely using external equity. Furthermore, there could be variations in the debt-equity mix over a period of time as businesses expand. This expansion can take the form of innovation and there are studies which indicate that capital structure does have an impact on the level of research a firm undertakes. Supporting evidence for this is provided in the next section.

2.3 Linkage: Leverage and Innovation

Differences in intellectual property between large and small firms have been considered to follow from differences in market concentration, barriers to entry, flow of cash in the organization and firm size (Galbraith 1952; Acs and Audretsch, 1987; Cohen and Klepper, 1996; Cohen et al 1989; Himmelberg and Petersen 1994). Other sources of heterogeneity include firm's capital structure, level of technology and even the industry in which a firm operates. Despite intensive research in this area, there is no agreement on whether it is large or small firms that are more innovative and undertake more research.

Regardless of the size and the age of the firm, finance plays an important role in survival and future growth of the firm. Innovation activities are often restrained by inadequte funds for small and young firms. There is a continuing debate on the role of financial factors in firm survival, growth, investment and innovational outcomes (Huynh et al 2008). Information on entrepreneurial finance is limited to these firms which have already received some kind of capital injection in the form of angel investors, venture capital, or for the firms which are about to go public. One of the major hurdles which a start-up faces is acquisition of funds in its initial years of operations.

The literature has linked the capital-mix puzzle with the level of R&D activities a firm undertakes. Muller and Zimmerman (2009) use a representative survey of German companies and find a larger influence of equity investment for firms as they age. They show how capital-mix evolves over the age of the firm, where level of debt decreases over a period of time and firms increasingly rely on equity financing. Young firms start with higher levels of external borrowing and gradually inject their own money. There have been studies across countries analyzing the effect of equity financing. There is mixed evidence on the use of debt or internal equity for investment and the growth prospects of a firm (Berger and Udell, 1998; Brav, 2000; Cole and Wolken, 1996; Heaton and Lucas, 2001; Leland and Pyle, 1977; Petersen and Rajan, 1994).

Although, equity has some inherent advantages over debt as a source of financing, because it waives off the owner from an obligation to make fixed payments and requirement of collateral, it deprives the owner from full control over the business. Moreover, R&D activities require a continuous flow of money and exclusive reliance on internal financing is not a judicious decision. Apart from tax benefits of debt, it allows an entrepreneur to limit his liability when walking away from his business in the event of financial distress

(Chen et al. 2009). Empirically, studies have also linked the equity level with the risk behavior of an entrepreneur and reported that the higher the risk levels, the lower will be the ownership share (Bitler et al., 2005).

Examining the effect of leverage on listed firms in the US, Singh and Faircloth (2005) showed that leverage affects R&D negatively. Using a German dataset, Czarnitzki and Kraft (2004) also documented a negative influence of leverage on R&D. In a cross sectional analysis considering the R&D activities of high-technology firms, Chiao (2002) found a negative impact of debt. Yet, for non-high-technology companies, he found a positive impact. In contrast, Mac An Bhaird and Lucey (2006), using data on Irish firms, found no relation between R&D activities and leverage. There are contradictory results with different datasets and different geographical locations.

Apart from a couple of studies (Cassar 2004; Hyytinen and Pajarinen 2005, Muller and Zimmerman 2009), the effect of leverage on innovation for start-ups has not been explored. Recently, Smith (2010), analyzed the role of bank loans and debt in the initial stages of the firm and their subsequent relation to the firm's innovation outcome. She used the KFS and analyzed financing choices and its effect on innovation using logit analysis. She highlighted the importance of bank loans in the formative years of the firm. Controlling for the initial level of patents and copyrights, she reported a positive relation between leverage and new innovation. She argues that for young firms in high-technology industries, "additional amount of debt relaxes the major capital constraints faced by the entrepreneur." She points towards a decline in information asymmetry between lenders and borrowers for high-tech firms.

Researchers have focused on exploring whether debt or equity is chosen by the entrepreneurs chooses in starting a business, whether it will be debt or equity? But does the capital-mix really matter for for business start-ups? Do young businesses actually set their debt-equity mix, keeping in mind what level of innovation they want to achieve? The question is more relevant for young businesses, when they are credit constrained and do not have the backing of the "owner's wealth." Moreover, the above mentioned studies have focused primarily on the role finance on innovation. Is there a missing variable which has not been accounted for? The next section examines whether ignoring the "employee satisfaction" which affects the level of innovation and concentrating exclusively on finance may lead to biased results.

2.4 Linkage: Human Resource Practices and Innovation

Human resource practices (as measured by employee welfare schemes) have a significant and positive effect on innovation. Researchers have reported that interactive human resource practices (Black and Lynch, 2004), better employee-management communications, and decentralized decision-making (Laursen and Foss, 2003), information-sharing programs and incentive pay plans (Zoghi et al., 2010) increase innovation. Therefore, one of the underlying forces which govern a firm's innovation pattern could be its organizational set-up, which affects the way a company is run. This factor has not been incorporated in the earlier studies. The differences stem from the way employees are

taken care of. Researchers, who believe that innovation is a function of firm's ability to create, manage and maintain knowledge (Smith et al., 2005), assign all the weight to human resources and policies affecting them. Despite evidence of the significance of this relationship, there is no unique answer when it comes to identifying which organizational practices motivate workers.

Lazear and Oyer (2007) suggest that, "good performance can then be rewarded through a variety of mechanisms, including increases in base salary, subjectively determined bonus payments, or promotions." Koski et al. (2009), in their study based on 398 Finnish firms, explore which factors explain the large differences in innovation between firms. They mention that organizational practices which favor employee participation, stock options, and performance-based wages positively affect innovation in the companies. They not only identified which organizational practices affect innovation positively, but also, examined these factors separately for small and large firms as well as for high-technology and non-high-technology industries. These studies highlighted that organizational incentives do affect an employee's behavior, and these incentives can range from employee getting a share in the equity, to incentive pay, to bonus payments, to paid holidays. Following this line of research, I create an index to measure these incentives and account for employee well-being. Next section attempts to unravel the relation between these two variables (employee wellness and leverage) which affect innovation.

2.5 Linkage: Leverage and Human Resource Practices

Linking the effect of leverage and employee well-being on innovation to another study, Verwijmeren and Derwall (2009), document an inverse relation between employee well-being and firm leverage. Using the KLD STATS database, which reports data on US publicly traded companies, they argued that it is the risk of bankruptcy which motivates a firm to keep lower levels of leverage. They indicate that firms experience financial distress when they cannot fulfill their fixed financial payments in the form of debt. They mention that firms that care more about their employees will try to minimize the probability of bankruptcy, as in the event of bankruptcy, employees have to suffer monetary losses and face the risk of losing their jobs. Therefore, those firms which care more about their employees will take lower amounts of debt and inject higher amounts of equity which will reduce the probability of bankruptcy.

In addition, they also argue that firms with a higher employee well-being score have higher credit ratings. This argument is based on their belief that firms with less debt will not falter on payments of fixed obligations, which will help a firm gain credibility in the market. There has been supporting evidence in the literature that a higher level of leverage puts the employees of the company at risk (Myers et al., 1998; Berk et al., 2010; El Ghoul et al., 2010). When a company goes bankrupt, one of the most pressing issues for the liquidators is how much compensation will go to the employees. In line with the argument that there are "human costs to bankruptcy" (Berk et al., 2010), the question I examine is: will this argument stand in a data-set where firms are just five

years old and around 40% of these firms have no employees at all.

I find that the linkage between leverage, employee well-being and innovation should be held to empirical scrutiny with one coherent data-set, especially for business start-ups. Given the arguments in favor of both leverage and employee well-being, and its effect on innovation, I analyze the quaestion empirically. I include both these variables and the interaction between them while calculating the innovational prowess of start-ups. Linking up the three directions there seems to be some discrepancy between employee well-being and leverage on one hand, and innovation and leverage on the other.

I explore how, employee well-being, which is a purely subjective measure, and leverage,[6] which deals with the financial structure, affect the innovation trajectory of the start-ups. So far, research has only explored only one of the factors that affect the level of innovation. While one line of research focuses only on human capital and its impact on innovation, the other focuses on the optimal level of leverage or financial structure as a factor in assessing a firm's ability to innovate. With newer research mentioned earlier[7] incorporating financial frictions into the study of firm dynamics, it becomes useful to include the capital structure of a firm in the study of innovational outcomes.

I try to explore this linkage using the KFS. Generally data sets contain information on firm and industry-specific variables and there is a lacuna when it comes to getting information on human capital of the firms in the initial stages. There is a lack of empirical studies measuring the subjective variable of "employee wellbeing" per se and linking it to innovational outcomes in business start-ups. This is the first attempt to measure employee wellbeing using the KFS, where I create an index to measure employee well-being and relate it to the innovation trajectory of the business start-ups. The next section describes the sample and how these variables are created.

3 Data Sample and Variable Construction

3.1 Sample Description

The data used for this study is from the KFS, which is conducted by the Ewing

[6] I follow general finance literature and calculate leverage (DER) as a ratio of total debt to total financial resources, $DER = \frac{Debt}{Debt+Equity}$

[7] Cooley and Quadrini (2001) added financial frictions in the study of firm dynamics and found that leverage ratios decline with firm's age. Hopenhayn (1992), Albuquere and Hopenhayn (2004) included financial constraints into the study of firm growth and survival. Huynh and Petrunia (2010) extended the work of Hopenhayn (1992) and studied the impact of debt-to-asset ratio on firm's growth and found, a positive and non-linear relation between them. Cabral and Mata (2003) also studied the impact of financial constraints on size dynamics.

Marion Kauffman Foundation. KFS is a panel data on 4,928 firms, all of which began operation in 2004. At the end of the project, the KFS will contain detailed data spanning the period of 2004-2013. The base line survey was conducted in 2005, and since then there have been four subsequent follow-ups. The sample size has declined over these years with reasons varying from problems in locating a firm in the follow up periods, non-responses, or because of firms closing down. One of the major advantages of KFS is that it does not suffer from inherent survivor bias, because all the firms started at the same time in 2004 and were not included based on their survival to the point of financing. In the survey, for a firm to be considered as a start-up it should have satisfied any of the five criteria in 2004: (i) paid state unemployment taxes, (ii) paid Federal Insurance Contributions Act (FICA) Taxes , (iii) had a legal status, (iv) used an Employer Identification Number EIN, or (v) used schedule C to report business income. A firm is excluded from the survey if it reports any of these 5 criteria prior to 2004.

To ensure that only start-ups are included in the survey, owners were asked[8] to report whether the business (i) was started as a new business, branch or a subsidiary owned by an existing business, (ii) was inherited, (iii) was started as a new independent business, (iv) was purchased as an existing business or, (v) was purchased as a franchise, (vi) or was an organization designed for social and charitable objectives and established as "non-profit". If the responses fell under category (i), (ii) or (vi), respondents were excluded from the sample. This study focuses on data collected in the first five years of a firm's existence (calendar years 2004-2008). I account for attrition and excluded firms which went out of business during these 4 follow up years. If a business was sold to another business, got merged with another business, was temporarily out of business, or for reasons not specified stopped, the business were considered as out of business (refer to Table 1). Following this a total of 191 firms were dropped off the sample over a period of five years (see Table1). Further, 76 firms were dropped from the sample because they reported no revenue in these years. These firms did not show any sales and were not even incurring losses, so for consistency these were removed from the sample size. Moreover, I also dropped 20 firms which reported no owner[9] in all five years. I lost a total of 1,110 firms by natural attrition. Also, firms which had no funds invested in the business were taken off from the sample; a total of 55 firms were deleted for this reason. One can argue that, firms involved in the services sector may not require any funds to operate. Keeping this in mind I cross-checked their level of sales, revenue generated, and profit made, and found zero values for these variables. By the end of the fifth year, the sample size was reduced to 3,361 firms.

[8] A detailed set of questions asked during the survey that are relevant to this study has been listed in the Appendix.

[9] Owner has been defined as a person who is actively involved in running the business.

3.2 Variable Construction

3.2.1 Index of employee well-being

To measure how employees are taken care of in the firm, I construct an index for employee well-being which is based on a set of nine dichotomous questions asked during survey; these include (i) did the business offer a bonus plan to it employees, (ii) did business offer alternative work schedule, (iii) did business offer health insurance plan, (iv) did business offer other benefits, (v) did business offer paid sick days, (vi) did business offer paid vacation, (vii) did business offer a retirement plan, (viii) did business offer stock options and (ix) did business offer tuition reimbursement. Responses to these questions were coded as "yes" = 1 and "no" = 0. I add the counts of "1" and create an index for employee well-being. There is separate information for full-time and part-time employees; therefore for each set I have 9 questions. The index of well-being can have a minimum value of "zero" when the answer to all the questions is "no" or "0", and the maximum it can attain is 18, where all the questions are answered as "yes" and each get a score of "1", for both full-time and part-time employees. Figure 3 shows the pattern of employee well-being index over five years, where it is increasing for first four years and then showed a slight decline in the fifth year. Descriptive statistics of variables are provided in Table 3.

3.2.2 Level of Innovation

Technological prowess of a firm is usually assessed on three aspects: (i) the measure of input, (ii) intermediate output, and (iii) direct measure of output (Acs et al 2002). R&D expenditures are generally used as an instrument of input and number of new products added is used to record output innovation. I used total number of patents and copyrights held by a firm at the end of each year to measure innovation. This is one of the most commonly used methods to assess the level of intellectual property of a firm.

It is interesting to observe the factors influencing innovation in the KFS, because almost 50% of the firms are sole proprietorships and approximately 45% of the firms have no employees, so they have the same characteristic features of ownership. The confidential nature of the data-set does not allow me to identify the patent citations. Therefore, patent quality as an issue could not be addressed (Trajtenberg, 1990). The KFS distinctly asks the owners to report, "how many patents and copyrights does the business have at the end of the year?" I add this constructed variable for patents and copyrights to measure innovation. One of the problems with the constructed variable of patents and copyrights was that the survey does not report on how many patents and copyrights did the firm apply for and how many were obtained. So, there is no way to demarcate the patents applied for and actual patents granted. Figure 4 shows the pattern of this constructed variable measuring innovation. In the third and the fourth year there was a sharp increase in innovation followed by a sharp decline in the fifth year.

3.2.3 Financial Variables and firm-specific controls

Debt remained the dominant source of financing for start-ups, which is evident from the fact that in the first year alone, firms injected around $80,000 worth of resources in the form of debt. Firm leverage is scaled by total financing resources and is calculated as total debt divided by the total financing resources. Total debt includes: (i) total debt by the owner and, (ii) total business debt. Total debt (see Figure 6) of the owner includes: (i) personal credit cards balance, (ii) personal loans taken from bank or family members or any other creditor, (iii) business credit cards under which owner is accountable. Total business debt includes: (i) credit cards balance established for the business, (ii) bank loans for the business, (iii) credit line of business, and (iv) any other kind of loans taken under the business name (such as family, government, employees, other businesses). Total financing sources is the sum of total debt and total equity. Total equity (see Figure 8) includes total asset base of the firm: (i) total equity of the owner operator, and (ii) total equity of the non-owner operators.

To overcome the problem of non-response, the KFS used range values[10] if the respondent could not or would not provide the answer regarding the exact figure. For empirical estimation of total debt and total equity, I calculate midpoints from these ranges, a procedure supported by the literature (Kennickell, 1997; Lemieux et al, 2009). Leverage showed a sharp increase in the first follow up year. The same pattern was witnessed in the follow-up years (see Table 2). It is interesting to observe that almost 38% of the firms in five years had no debt at all.

R&D expenditure is generally considered as the primary measure of innovative activity (VanPraag & Versloot, 2007). To capture the extent to which a firm is committed to improving its technological capabilities, I include a measure of *intangible assets*, which is calculated by dividing the number of employees in research and development by the total number of employees in the firm. Initial asset base is a cause of divergence in survival and growth of the firms. Firms with a large initial asset base can provide the funds required for innovation. To capture the differences in the asset base of the firms, I include *total assets*. Following the literature, total number of employees is used to represent the firm size (Geroski et al., 2007; Mata and Portugal, 1994). Owners were excluded while calculating total number of employees. To account for the financial stability of a firm in the market, I use its credit ratings which can take a value from 1 to 5, "1" = worst and "5" = best. These credit ratings are provided by Dun & Bradstreet. I control for the legal form of firm's ownership using a dummy *sole_prop* which is equal to 1 if the firm is organized as sole proprietorship. Approximately, 36% of the firms in 2004 and 34% in 2008, operate as sole proprietorships and rest of them are established as limited liability companies, partnerships and corporations.

[10]Range definition: (Range-Value) (1-$500 or less) (2-$501 to $1,000) (3-$1,001 to $3,000) (4-$3,001 to $5,000) (5-$5,001 to $10,000) (6-$10,001 to $25,000) (7-$25,001 to $100,000) (8-$100,001 to $1,000,000) (9-$1,000,001 or more)

3.2.4 Entrepreneur-specific variables and controls

There is a detailed set of information on demographics of up to fourteen owners. "About 65% of the KFS firms had just one owner, while 26% had two and 9% had three or more owners in 2004" (Robb et al. , 2008). In case of multiple owners, rather than averaging over all owners, or averaging over weighted shares of the business, I identified the main owner using a positive sorting, where the main owner was estimated on the basis of who puts in maximum work effort, a figure calculated by using number of hours each owner worked. In case there was a tie on number of hours worked, work experience was used to resolve that tie. Further ties were resolved on the basis of maximum education and equity share. As a result of this rank ordering, I was able to clearly identify the gender, age and ethnic origin of the main owner.

The general level of human capital was assessed on the basis of main owner's *education* and prior *work experience*. Owners were asked, "how many years of working experience have you had in this industry - the one in which the business competes?" and their responses ranged from 1 to 40+ (more than 40 years).

3.2.5 Industry-specific variables

The nature of the industry in which a firm operates also affects its ability to innovate. Generally, high-technology companies are considered to infuse more number of newer technologies and products in the market as compared to non-high-technology sector firms. With oversampled high-technology firms in the data, I have classified industries as "high-tech" and "non-high-tech" industries, where *hi-tech* is a dummy variable which takes the value of 1 if a firm belongs to the high-tech sector or 0 otherwise. I use a two part strategy of matching the North American Industrial Classification System (NAICS) with the Hecker's (2005) classification of firms into high-technology and non-high-technology. For a firm to be called as a high-tech firm it should either be a "technology-employer" or a "technology-creator."[11] Detailed list of NAICS code with industries have been listed in Appendix.

4 Empirical Estimation

4.1 Research Design

Based on the discussion above, the count data on innovation which comprise of number of patents and copyrights may be specified as follows:

[11] Two sets of criterion are used to define high-technology industry, (i) Following Chapple et al. (2004), industries where employment exceeds three times the national averages of 3.33%, or 9.98% is labeled as "technology-employer" and, (ii) Based on NSF's Survey of Industrial Research and Development an industry is termed as "technology-creator" if it exceeds the U.S. average for both research and development expenditures for employee ($11,972) and the proportion of full-time-equivalent R&D scientists and engineers in the industry workforce (5.9%).

$$I = f(\beta_1 w, \beta_2 x, \beta_3 z) \tag{1}$$

Here, I is the level of innovation; β_1, β_2 and β_3 are the parameter vectors and w is a set of determinants of innovation related to the application of policies which promote employee well-being; x captures the leverage or debt-equity ratio and z is a set of other standard variables used in the literature to explain the innovative performance of firms. The operational model is:

$$y_{it} = \alpha w_{it} + \delta z_{it} + \eta v_{it} + \lambda s_i + \theta_i + \mu_{it} \tag{2}$$

$$i = 1, ..., n \qquad t = 1, ..., 5$$

where,
y_{it}= is the level of innovation of firm i at time t
w_{it}= index of employee well-being of firm i at time t
z_{it}= debt-equity ratio of firm i at time t
v_{it}= time varying characteristics at time t like age and experience
s_i = time invariant characteristics at time t like education, race, and gender
θ_i = unobserved individual effect (firm dynamics in nascent stages)
μ_{it}= residual

The firms in the data are in their initial stages, so very few patents and copyrights are generated. Approximately 80% of the observations had a count of zero patents and copyrights, and the maximum was 250. I had two options to evaluate a count model with preponderance of zeros: the negative binomial regression and zero inflated negative binomial regression. Both the Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC) favored negative binomial regression. A Hausman test was conducted to test the efficiency of fixed over random effects. To ascertain the effect of employee well-being on innovation, negative binomial fixed effect estimator is used. The estimated standard errors have been adjusted for heteroscedasticity. Further, to test the second linkage between firm's leverage and employee well-being I use firm specific fixed effects.

4.2 Empirical Results

I am particularly interested in investigating the correlation between firm's financial structure, employee well-being and innovation. This paper aims at explaining, whether young firms actually consider the debt-equity ratio and employee welfare in deciding their innovation level. Table 4 presents the estimation results of the first model exploring innovation outcome. As shown in Table 4, the sample size was reduced to 1,151 observations. The main reason for this is that almost 80% of the firms in total sample had no patents and copyrights, which led to a preponderance of zeros in the estimation model. Out of 1,151 observations, 943 observations were for high-technology firms, be-

cause the original sample was oversampled with high-technology firms. A similar result was observed while calculating the effect of employee well-being on leverage, where 1,725 observations out of a total of 2,464 observations were high-technology firms.

Table 4 shows that for all firms as well as for high-technology firms the estimated coefficient of employee well-being is positive and statistically significant. Confirming the first linkage, this estimated model documents a positive effect of employee well-being on innovation. And, the result was consistent with the sub-sample of high-technology firms. To counter the argument that non-monetary benefits act as a substitute for monetary payments, I controlled for average wages paid by the firm. Even after controlling for wages, the coefficient of employee well-being was positive and statistically significant. Results after controlling for wages are reported in Table 5.

Further examining Table 4, a surprising result here is that firm size, which is the sum total of full-time and part-time employees, is not significant. One argument could be that majority of these firms have no employees at all and are run solely by one owner, which pulls down the effect of size on innovation. In addition, the total asset base of the company has a significant and positive effect on innovation. A large asset base gives firm a leverage to exploit its resources and deploy them for R&D activities. The result holds for high-technology firms too.

Generally intangible assets are associated with a higher level of innovation. But I found no significant impact of intangible assets on innovation. Intangible assets are constructed as the proportion of employees working in research and development activities, scaled by the total number of employees in the firm. Linking this result with the size of the firm, one can interpret that the total employee base does not have a significant impact on the level of research in the company. So, the number of employees does not matter, whereas their well-being positively contributes to intellectual property.

A word of caution while interpreting the results would be that, the direction of causation can be reversed from innovation to employee well-being. Studies have always taken human resource practices and incentives as a causal variable. To justify the causality between employee well-being and innovation in my case, I employ the technique used by Watson Wyatt (2002). To see which way the relationship truly runs between employee well-being and a firm's innovation level I compare two different correlations: (i) Correlation A represents the relationship between the 2004 employee well-being score and 2005 innovation level, and (ii) Correlation B represents the relationship between 2004 innovation level and 2005 employee well-being score (see Table 6). If higher innovation level is what creates superior HR practices and a higher employee wellness, Correlation B should be larger. If, in fact, the way companies manage their human capital is what drives the innovation success, Correlation A should be larger. I report (i) Correlation A, 0.0681, is larger than (ii) Correlation B, 0.0664. Although, the difference is marginal, a higher correlation A shows "temporal precedence" of employee well-being when compared with innovation. To explore the relation longitudinally, an instrumental variable technique should be deployed. But, data limitations did not allow me to explore this causal relation over a five year period.

Further, exploring the second important variable in my three tier linkage, I found that leverage has a negative impact on the level of innovation. This result is contradictory to the result documented by Smith (2010), using the KFS. Considering the linkage between leverage and innovation, I found that debt does not act as leverage in the debt-equity ratio. It is a known fact that, with a moderate amount of equity in the capital mix, debt acts as a leverage device and investments with external borrowings amplifies the firm's return to equity. A careful perusal over Figure 5, 6 and 8 shows that, the level of total debt varies over time and total equity declines.

$$Leverage = Debt\ Equity\ Ratio\ = \frac{Debt}{Total\ Asset\ Base} \tag{3}$$

Both variables lead to a higher debt to equity ratio, but equity in the denominator part declines from its initial level in all five years. Simple reasoning of declining equity justifies an increasing debt-equity ratio. Therefore, the increase in leverage comes from the decline in equity and not from the rise in debt. To have full advantage of external borrowing, there should be a steady supply of funds for research activities. The sample of surviving firms start with a mean of \$80,000 as the total debt in 2004. From 2004 to 2005 and 2006 to 2007 there is a sharp decline in the level of total debt. The reason can be attributed to the fact that, of those firms which applied for new credit or renewed their existing credit in 2008, approximately one third had their applications denied. The most common reason cited for denial was poor credit history (Robb et al., 2010).

Despite the varying level of debt, it remained the primary source of financing for all firms (Brav, 2009; Heaton and Lucas, 2004; Petersen and Rajan, 2002). Total equity which was at a mean level of \$80,000 in 2004 declined to \$20,000 in 2008. One of the reasons for falling equity has been that very few firms received equity from non-owner spouses in the later years, which is one of the components of total equity.

Considering the effect of economic crisis, there is a sharp decline in investment by owners as well. In 2008, owners were asked to report the effect of the financial meltdown on the their businesses. Out of the surviving sample, only 21% of the firms said they were unaffected by the financial crisis, while the remaining 40% reported somewhat affected and 39% of them reported they were affected to a great extent (see Table 7). Owners were also asked to report the most challenging problem they faced in the past year, and almost 53% of the firms reported slow or lost sales (Robb et al., 2010). It should be noted that I included only those firms for analysis that made it to their fifth year. Therefore, the sample consists of all the successful firms, which shows the presence of selection bias.

Further, the age of the owner positively affects the level of innovation, but the result is not significant for the high-technology firms. One reason could be that high-technology industries are "new-age" industries and an entrepreneur's age might be relevant in case of managerial knowledge and may not be a determinant of technical knowledge.

Holmstrom (1989), suggested that firms that are concerned about their performance and reputation will not undertake risky projects. An expected adverse impact on credit

score may motivate a firm to stay away from those projects that have higher levels of risk involved. This behavior of a firm can have a negative impact on innovation in the long run. In my sample, credit ratings do not explain the level of innovation.

I also analyzed the linkage between the debt-equity ratio and employee well-being using fixed effects. Results are presented in Table 8. I find no significant relation between leverage and employee well-being. Verwijmeren and Derwall (2009), suggested an inverse relation between employee well-being and leverage, based on their theory of the risk of bankruptcy. This theory did not find support in the KFS. Further, total assets positively affect the leverage, whereas this result was not seen for high-technology firms. A larger asset base helps a company in taking more loans, because these assets can act as collateral.

5 Conclusion

This paper empirically examines the role of leverage and employee well-being on firm's innovation. I document a negative impact of leverage on innovation. I find that fluctuating debt levels do not allow a firm to exploit the benefits of debt which usually comes from debt acting as a leverage. Linking to the concept of leverage in physics, fixed cost of debt financing exerts a small force in the capital structure, which generates a large force is the variability of cash-flows to shareholders.

The sample consists of young firms, and demand for funds is limited by the capital constraints imposed by the lenders. These credit constraints lead to a disrupted supply of funds. It should be noted that innovation involves research activities which require a regular supply of funds. The economic situation has led to a decrease in equity, where owners are not willing to put in their own money into the businesses. A steady decline in equity will lead to a situation where these firms will become "all-debt" firms. In that scenario, leverage will lose its significance and firms will have to bear fixed obligations in the form of interest payment and make existing equity more risky. Use of debt allows a firm to enjoy the benefits from interest in the form of tax shield. But with declining level of equity, the additional value of the interest tax shield will be offset by the increase in the expected bankruptcy cost. This further increases the probability of bankruptcy and expected costs associated with it.

Much of our knowledge on innovation is restricted to large and established firms. Even in the studies restricted to large and established firms, effect of financial variables and human capital has not been explored simultaneously. Exploring the effect of employee welfare on innovation, I find that firms that care about their employees and have a higher score in index of employee well-being are more innovative. This result holds even after controlling for monetary benefits. Further, I find no relation between firm's leverage and employee well-being.

The asymmetry of information between lenders and borrowers is the major cause of capital constraints for young firms. It is interesting to observe that total debt for high-tech firms showed a declining pattern only in second year. This point towards the

need for more mature financial markets which are ready to lend to business start-ups. Smaller banks can play a role in having "relationship lending" to young firms who have shown good repayment track.

Tables:

Table 1: Firms Going Out of Business

Firms Going Out of Business: Description	2005	2006	2007	2008
Sold	0	0	0	23
Merged	0	0	0	14
Temporarily stopped working	18	20	41	73
Unspecified Reason	0	1	0	1
No Owner in all 5 years	-	-	-	20
No Revenue in all 5 years	-	-	-	76
No Funds invested in all 5 years	-	-	-	55
Natural Attrition	-	-	-	1,110

Table 2: Range of Debt-Equity Ratio

Debt-Equity Ratio (DER)	2004	2005	2006	2007	2008
Number of firms with zero DER	1450	1296	1178	1130	1058
Number of firms with DER = 0.5	476	235	187	129	128
Number of firms with DER = 1	329	704	796	805	811

Table 6: Correlation between Employee Well-being & Innovation

Correlation A	2004 Employee Wellbeing * 2005 Innovation	0.0681
Correlation B	2004 Innovation * 2005 Employee Wellbeing	0.0664

Table 3: Descriptive Statistics

Variables	Mean	Min	Max	S.D.
Firm Size				
Number of Employees	2.96	0	55	5.65
Full Time Employees	2.08	0	40	4.68
Part Time Employees	0.87	0	28	2.33
Revenue	247604.6	0	1000001	318339.6
Asset Structure				
Intangible Assets	.35	0	5	.48
Total Assets	219768.4	0	1000001	297111.8
Financial Structure				
Leverage (Debt/Total Financing Sources)	.41	0	1	.44
Firm-Specific Variables				
Credit Rating	2.91	1	5	.92
Innovation (Sum of patents & Copyrights)	1.71	0	250	12.90
Employee Well-Being	2.67	0	17	5.65
Entrepreneur Specific Variables				
Work Experience	13.74	0	40	10.47
Education	15.07	0	21	2.71
Age	46.81	21	79	10.71

Table 4: Results with Negative Binomial Fixed Effects Regression

Dependent Variable	Innovation	
	(1)	(2)
VARIABLES	All Firms	High-tech Firms
Employee Well Being	0.0503***	0.0420**
	(0.019)	(0.021)
Debt-Equity Ratio	-0.3095***	-0.2581**
	(0.109)	(0.118)
Total Assets	5.30e-07***	6.53e-07***
	(1.86e-07)	(2.03e-07)
Size	-0.0010	-0.007
	(0.008)	(0.008)
Intangible Assets	0.0594	0.0162
	(0.068)	(0.074)
Credit Rating	0.0156	0.0570
	(0.056)	(0.061)
Age of the Owner	0.0224**	0.0144
	(0.008)	(0.008)
Work Experience	-0.0074	-0.0106
	(0.010)	(0.010)
Constant	-1.7060***	-1.3560***
	(0.405)	(0.437)
Observations	1,151	943
Number of Firms	345	284

Standard Errors are reported in parentheses. ***, **, * denote variables statistically significant at the 1, 5 and 10% level respectively

Table 5: Results with Negative Binomial Fixed Effects Regression (After controlling for wages)

Dependent Variable	Innovation	
	(1)	(2)
VARIABLES	All Firms	High-tech Firms
Employee Well Being	0.0470**	0.0415*
	(0.020)	(0.022)
Debt-Equity Ratio	-0.3175***	-0.2539**
	(0.110)	(0.120)
Total Assets	4.28e-07**	5.89e-07***
	(1.96e-07)	(2.15e-07)
Wages	3.13e-07	2.41e-07
	(2.02e-07)	(2.12e-07)
Size	-0.0032	-0.0026
	(0.008)	(0.009)
Intangible Assets	0.0934	0.0448
	(0.069)	(0.075)
Credit Rating	0.0057	0.0442
	(0.056)	(0.062)
Age of the Owner	0.0226**	0.0138
	(0.009)	(0.010)
Work Experience	-0.0083	-0.0113
	(0.010)	(0.011)
Constant	-1.7297***	-1.3493***
	(0.406)	(0.438)
Observations	1,136	930
Number of Firms	344	283

Standard Errors are reported in parentheses. ***, **, * denote variables statistically significant at the 1, 5 and 10% level respectively

Table 7: Effect of Recent Financial Problems on the Firms

Description	Percentage of Surviving Firms
A lot	39.0%
Some	40.0%
Not at all	21.0%

Source: Robb et al., (2010): An overview of the kauffman firm survey: Results from the 2004-2008 data.

Table 8: Regression Results for Leverage with Fixed Effects

Dependent Variable	Debt-Equity Ratio	
	(1)	(2)
VARIABLES	All firms	High-tech Firms
Employee Well Being	0.0021	0.0015
	(0.003)	(0.004)
Total Assets	5.63e-08*	3.18e-08
	(3.03e-08)	(3.64e-08)
Size	0.0031*	0.0057***
	(0.002)	(0.002)
Intangible Assets	0.0125	0.0137
	(0.015)	(0.018)
Credit Rating	-0.0028	-0.0073
	(0.008)	(0.010)
Age of the Owner	0.0312***	0.0318***
	(0.004)	(0.005)
Constant	-1.0230***	-1.0629***
	(0.190)	(0.231)
Observations	6,587	4,577
R-squared	0.0201	0.0226
Number of Firms	2,464	1,725

Standard Errors are reported in parentheses. ***, **, * denote variables statistically significant at the 1, 5 and 10% level respectively

Figures:

Figure 1: Relation Between three variables, before analysis

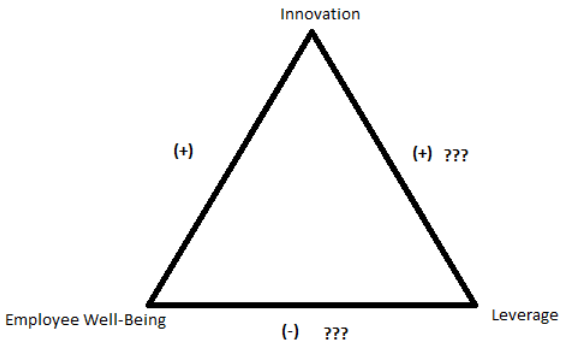


Figure 2: Relation Between three variables using the KFS

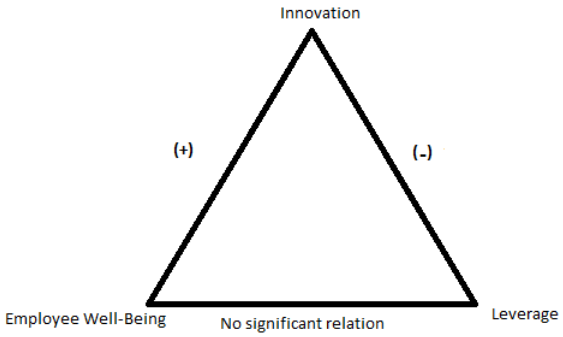


Figure 3: Employee Well Being

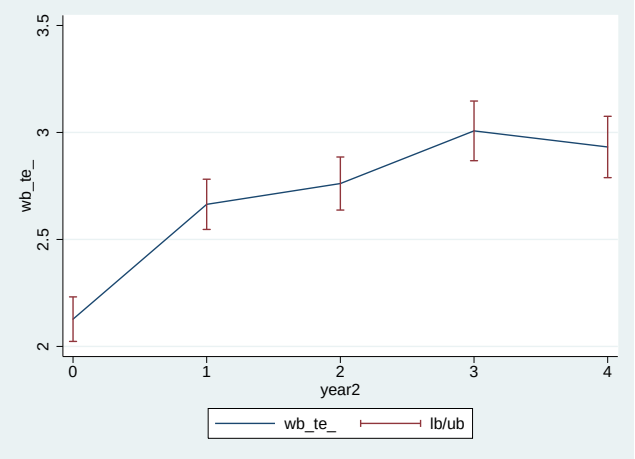


Figure 4: Innovation

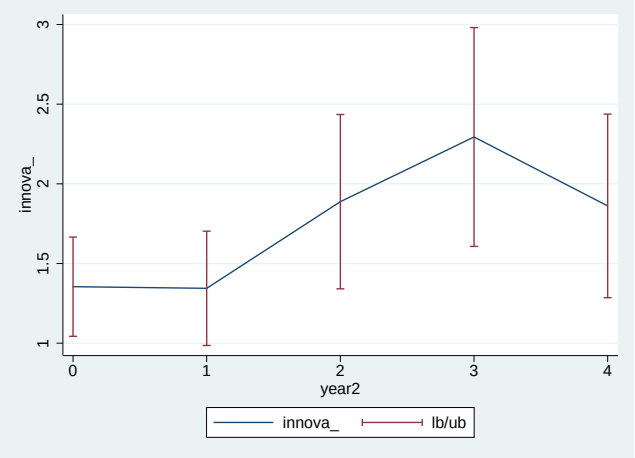


Figure 5: Debt-Equity Ratio

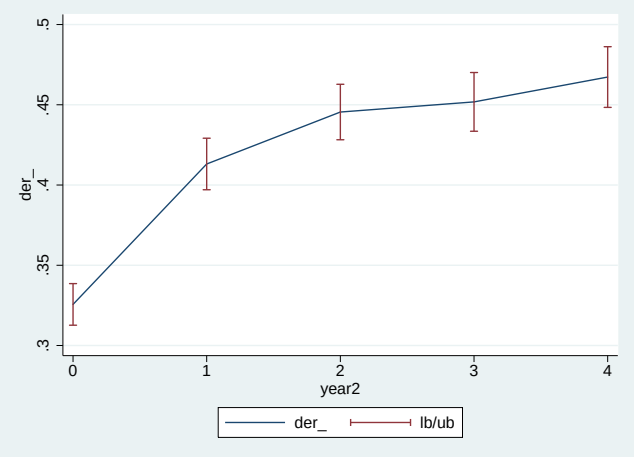


Figure 6: Total Debt

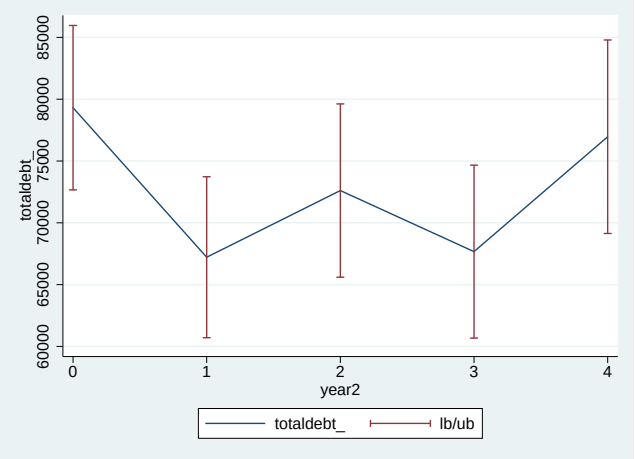


Figure 7: Total Debt: Hi-Tech

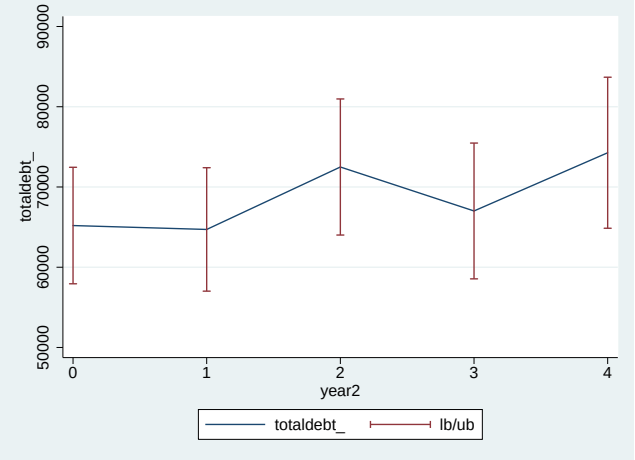
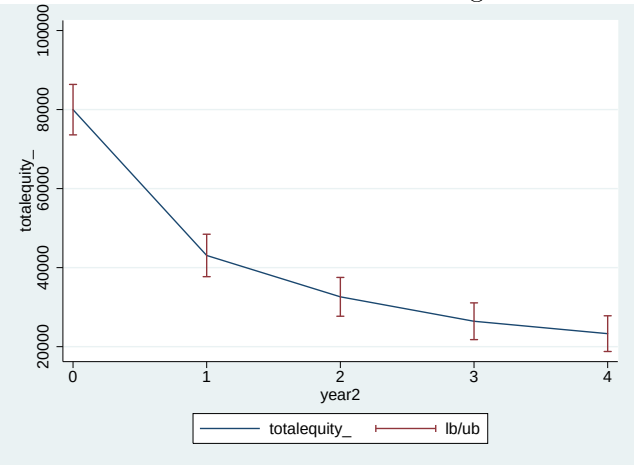


Figure 8: Total Equity



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Appendix: Selected Survey Questions:

1. Methods of starting business:

   (a) How was the business started

      i. A new business, branch or subsidiary owned by an existing business
      ii. A business inherited from someone else
      iii. A new, independent business created by a single person or a team of people
      iv. The purchase of an existing business
      v. The purchase of a franchise
      vi. An organization designed for social and charitable objectives and legally established as a —not-for-profit
      vii. Or, the business started some other way

   (b) Did you pay FICA

   (c) What is the legal status of business

   (d) Verify the NAICS Code

2. What is the main reason the (name of original business) is out of business: Five ways of going out of business were identified

   (a) Sold to Another Business Start-up
   (b) Merged with Another Business
   (c) Temporarily Stopped Operations
   (d) Permanently Out of Business
   (e) Other

3. Owner Characteristics:

   (a) How many individuals or entities owned the business? Please include all individuals or entities who owned shares in the business.
   (b) Of the total number of owners as of December 31, how many owners actively helped to run the business?

4. Ten dollar value categories are used in KFS for recording firms' revenue, profit, asset and total wages to avoid revealing KFS firms' sensitive financial information.

   (a) $0
   (b) $500 or less
   (c) $501 to $1,000
   (d) $1,001 to $3,000
   (e) $3,001 to $5,000
   (f) $5,001 to $10,000
   (g) $10,001 to $25,000
   (h) $25,001 to $100,000
   (i) $100,001 to $1 million
   (j) $1,000,001 or more

5. Total Intellectual Property Variables:

(a) These variables create a total number of patents, copyrights, or trademarks the businesses possessed at the time of each interview. For each type of intellectual property, the variables were constructed using data from the following questions:

(b) "Indicator" questions, such as Question D3a ("Does the business have any patents?")

(c) "Exact value" measures, such as Question D3b ("How many patents does the business have?")

6. Number of Employees:

   (a) Total Number of Employees: Not Counting owner(s), on December 31, how many people worked for (name of original business).

      i. Please Include all full- and part-time employees, but exclude workers who work for the business either full- or part-time but are not on the business' official payroll.

   (b) Full Time Employees: ...And of those (number reported from 6a), how many were full time?

   (c) Part Time Employees: ...And of those (number reported from 6a), how many were part time?

7. Number of Employees responsible for research and development:

   (a) On December 31, how many employees, if any, did (name business) have who are primarily responsible for Research and Development on mew products or services? Please include only full- and part-time employees, but exclude workers who work for the business either full- or part-time but are not on the business' official payroll.

8. Business Organization and HR Benefits:

   (a) As of December 31, did (name business) offer

      i. a bonus plan for full-time employees/part-time employees

ii. alternative work schedules for full-time employees/part-time employees
iii. health insurance plan for full-time employees/part-time employees
iv. other benefits for full-time employees/part-time employees
v. paid sick days for full-time employees/part-time employees
vi. paid vacation for full-time employees/part-time employees
vii. a retirement plan full-time employees/part-time employees
viii. stock options for full-time employees/part-time employees
ix. tuition reimbursement for full-time employees/part-time employees

9. To identify the main owner:

(a) Hours: During the time (name business) was in business during the year, how many hours in an average week did owner spend working at (name business)? (Specify ranges)

(b) Work Experience: How many years of work experience have you had in this industry—the one in which (name business) competes?

(c) Education: What is the highest level of education you have completed so far?

(d) Equity Percentage: What is the percentage owned by owner 1to 14?

(e) How old will you be on your next birthday? (Specify ranges)

Table 9: 2002 NAICS codes that constitute high-technology industries

3253	Pesticide, fertilizer, and other agricultural chemical manufacturing
NAICS code	Industry
1131, 32	Forestry
2111	Oil and gas extraction
2211	Electric power generation, transmission, and distribution
3241	Petroleum and coal products manufacturing
3251	Basic chemical manufacturing
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing
3254	Pharmaceutical and medicine manufacturing
3255	Paint, coating, and adhesive manufacturing
3259	Other chemical product and preparation manufacturing
3332	Industrial machinery manufacturing
3333	Commercial and service industry machinery manufacturing
3336	Engine, turbine, and power transmission equipment manufacturing
3339	Other general purpose machinery manufacturing
3341	Computer and peripheral equipment manufacturing
3342	Communications equipment manufacturing
3343	Audio and video equipment manufacturing
3344	Semiconductor and other electronic component manufacturing
3345	Navigational, measuring, electromedical, and control instruments manufacturing
3346	Manufacturing and reproducing magnetic and optical media
3353	Electrical equipment manufacturing
3364	Aerospace product and parts manufacturing
3369	Other transportation equipment manufacturing
4234	Professional and commercial equipment and supplies, merchant wholesalers
4861	Pipeline transportation of crude oil
4862	Pipeline transportation of natural gas
4869	Other pipeline transportation
5112	Software publishers
5161	Internet publishing and broadcasting
5171	Wired telecommunications carriers