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# The Evolution of Financing Structure in U.S. Startups

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## Abstract

In this article we examine how startup businesses finance their operations over time. We employ the Latent growth modeling technique to test the financial growth cycle theory developed by Berger and Udell (1998). The data used in this study is the Kauffman Firm Survey, the largest longitudinal data set comprised of a random sample of U.S. startups launched in 2004 and surveyed annually through 2011. Consistent with the predictions of financial growth cycle theory, in the startup stage, entrepreneurs rely on initial insider capital sources such as personal savings, financing offered by friends and family, quasi-equity, and personal debt. Over time, as businesses become less opaque, the proportion of business debt and trade credit financing in total capital injection volume increases significantly. Businesses with high R&D activity and those that possess intellectual property rights finance their operations predominantly with equity - particularly external equity raised from angels and venture capitalists, and business debt - particularly bank loans and credit lines. Owner's education and race have a significant impact on the type of capital injections over the business life cycle. Highly educated owners choose to inject lower proportions of personal debt and trade financing, whereas white owners inject lower proportions of personal equity and rely more on trade financing.

Keywords: startups, financing structure; financial growth cycle theory; R&D intensity; intellectual property rights; survey methodology.

JEL classifications: C83, G32, M13, O31, O32

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## 1. Introduction

Prior research has explored the capital structure decisions of large, well-established publicly-traded firms. To date, however, very few extant studies have examined the dynamics of capital structure of newly formed businesses. The dynamics of capital structure refer to ways in which a business finances its overall operations and growth over time, as needs for different sources of funds—such as debt, equity or a combination of the two—differ in progressive stages of its development. In this article, we seek to explore how newly formed businesses finance their operations from inception to the later stages of their development. To do so, we use the financial growth cycle theory developed by Berger and Udell (1998) and empirically examine whether the capital structures of newly formed firms follow the predictions of this theory. Simultaneously, we also examine whether the pecking-order and trade-off theories explain the changes in capital structure of startup firms from inception to later stages of development. Our data is sourced from the Kauffman Firm Survey<sup>2</sup> (KFS), the largest longitudinal data set comprised of 4,928 U.S. startups launched in 2004 and surveyed annually through 2011. The KFS provides a wealth of detailed information on both new firms and their owners, including performance data and information on financing sources and strategies as well as personal characteristics of the entrepreneur (Ballou et al., 2008).

According to the evidence yielded by prior research in this field, in their attempts to raise debt and equity, new and small firms face different challenges than publicly held firms do. Extant research has shown that startup capital, as well as future capital injections, are crucial to firm survival. Most studies on capital structure that employed the KFS data have focused on the determinants of capital structure or the financing choices in the startup year. Thus, their authors did not use the full panel data set (2004-2011) as it was not available at the time the work was conducted (Coleman and Robb, 2012; Robb and Robinson, 2014; Coleman, Cotei, and Farhat, 2016). While offering valuable findings, these studies largely ignore the sources of funding employed by a firm at various stages of its life cycle. Given that the full panel data and the imputed data of the KFS are now available, it is timely to examine the trajectories of small businesses' financial structures and examine the determinants of various sources of capital injections in newly formed firms. The approach we adopt in this work is evolutionary, as it aims to ascertain how newly formed firms' capital structures evolve over several years following their inception.

Our results point to a significant financial growth pattern in the use of various sources of debt and equity during the life cycle of the business. Consistent with Berger and Udell's model, we find that, at the startup stage, entrepreneurs rely on initial insider capital sources such as personal savings, financing provided by friends and family, quasi-equity, and personal debt. Over time, as businesses become less opaque, the proportion of business debt and trade credit financing in the total capital injection volume increases significantly. We further note that, although the proportion of owner's equity in total capital injections decreases over time, the annual balance of owner's equity increases, suggesting that owners use retained earnings to increase their ownership stake in the firm.

Several business and owner characteristics explain the type and magnitude of various types of capital injections. Businesses with high information asymmetry rely more on equity injections, especially owner's personal savings, whereas those undertaking innovative activities are more

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<sup>2</sup> Certain data included herein are derived from the Kauffman Firm Survey restricted-access data file. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Ewing Marion Kauffman Foundation.

likely to finance their operations with outside equity injections provided by angels and venture capitalists. A higher proportion of tangible assets explains the greater use of debt injections, both personal and business debt sources, whereas higher level of sales drives businesses to use both debt injections and trade finance and rely less on equity injections. Startups owned by two or more owners tend to inject more equity, especially outside equity and less debt into the capital structure of their business. Education and race also have a significant impact on the capital injections over the business life cycle. Highly educated owners choose to inject lower proportions of personal debt and trade financing, whereas white owners inject lower proportions of personal equity and rely more on trade financing.

In providing the aforementioned findings, we contribute to the current stream of literature in three important ways. First, our results provide insights into the ways in which financial theory explains the capital injections in startup businesses. Using a Latent growth model to examine the systematic change in the financial structure of newly formed businesses we show that there is a significant financial growth pattern in the use of various sources of debt, equity and trade finance during the life cycle of the firm. Second, this article builds upon and contributes to the existing body of work carried out on small business financing in the startup year. Finally, our research makes use of a comprehensive data set - the Kauffman Firm Survey which represents a random sample of U.S. businesses launched in 2004, proportionally weighted across specific subpopulations. Therefore, the bias that often emerges from small or under-representative samples is completely removed.

The remainder of this article is organized as follows. This brief introduction is followed by a section that presents our theoretical framework and situates our work in the context of pertinent research. Our data, including the characteristics of the Kauffman Firm Survey, methodology and results, are described in Section 3. Finally, Section 4 provides a summary of our findings and concludes the paper.

## **2. Theoretical Framework and Hypotheses**

### *2.1. Life Cycle Theory of the Firm*

The financial growth life cycle model developed by Berger and Udell (1998) is based on the idea that firms have different financial needs and options as they grow and become less informationally opaque. Therefore, when facing a “size/age/information continuum,” smaller, younger, more opaque firms should predominantly rely on insider finance, trade credit and/or angel finance. On the other hand, as firms grow and become less opaque, they should rely more on intermediated finance, both debt (bank loans) and equity (venture capital).

The financial growth life cycle model conceptualizes the fact that information opacity over the life cycle of the firm creates financial pecking order, suggesting that, in early stages of the firm’s life, the entrepreneur relies on initial insider financial sources (i.e., personal savings, loans from friends and family, quasi-equity, personal debt, and business debt), trade credit, and angel finance, whereas, at a later stage, firm gains access to external debt and equity and therefore, personal funding becomes relatively less important. The financial growth life cycle model predicts that the major capital structure variables will follow a specific trajectory over the life of the business. In line with this view, we hypothesize the following:

*H<sub>1</sub>(a): In the startup stage, owner’s personal savings and personal debt are the most important sources of financing.*

*H<sub>1</sub>(b): Over time, the relative importance of owners’ equity and personal debt in total financing will decline, while the relative importance of business debt and trade credit in total*

*financing will increase.*

## *2.2. The Entrepreneur's Personal Characteristics*

The literature on individual risk-taking behavior reveals that demographic and socioeconomic factors, such as age, gender, education, experience, and wealth, have a significant influence on individual risk tolerance. McInish (1982) and Bertrand and Schoar (2003) show that risk taking decreases with age and increases with education, income, wealth, experience, and sophistication. In addition, the entrepreneur's gender may have an impact on type and size of their startup financing sources as males tend to be more risk tolerant than females. The empirical evidence on the impact of owners' characteristics on startup financing has mixed results. Using a panel of 2,000 Dutch entrepreneurs, Verheul and Thurik (2001) show that, even though female entrepreneurs start with lower levels of startup capital, the proportion of debt and equity in total capital is similar to that of male entrepreneurs. For a sample of startups from 27 countries, Nofsinger and Wang (2011) report that experience in managing startups is the key factor in securing funding, as experienced owners are able to reduce information asymmetry and obtain financing in the first year of operations. Besides experience, education is another trait found to increase the likelihood of using credit in the startup year (Cole and Sokolyk, 2013). However, for a sample of Australian startups, Cassar (2004) reveal that owner's demographic and socioeconomic characteristics are irrelevant for capital structure decisions. The entrepreneur's personal wealth may also affect the composition of capital in small businesses. For example, Cole et al. (2004) show that the commitment of a small business owner's personal wealth is important to obtain external credit. Overall, these findings attest to the impact of owner characteristics, such as attitudes and beliefs, education, and experience, on financial decision-making. Thus, we hypothesize:

*H<sub>2</sub>: The entrepreneur's personal characteristics influence the type of capital injections in startup firms.*

## *2.3. The Pecking Order Model*

The pecking order theory (Myers and Majluf, 1984; Myers, 1984) is based on the idea of information asymmetry between the business and its potential investors. In other words, it posits that small business owners/managers know more about the true value of the firm and the firm's riskiness than do less informed suppliers of capital. Thus, to avoid the underinvestment problem inherent in firms with informational opacity, small business owners will seek to finance new projects using personal funds (internal funds, personal debt) rather than business debt or external equity. The pecking order theory also explains why small firms tend to prefer debt to equity capital if external financing is required. Thus, unlike large, publicly-traded firms, small businesses should exhibit a positive relationship between informational asymmetry and the propensity for personal debt financing. Therefore, we hypothesize:

*H<sub>3</sub>: Startups characterized by higher information opacity will rely more on internal equity and personal debt and less on business debt.*

In light of the underinvestment risk, Myers (1977, 1984) also suggested that firms with high growth options use less debt in order to preserve their debt capacity. Thus, we expect firms with higher growth options to rely less on debt financing. Hence, we hypothesize:

*H<sub>4</sub>: High growth options startups—those with extensive research and development (R&D) activity or those that possess intellectual property rights—rely more on internal and external equity and less on debt financing.*

Firms possessing greater tangible assets are expected to have a higher debt capacity and lower costs of financial distress, because they have the option of pledging those assets as collateral. Consequently, firms with greater tangible assets have the ability to secure more debt and therefore, rely more on external business debt. Similarly, larger firms are often more diversified and more profitable relative to smaller firms. These characteristics make them more attractive to lenders. In light of that, if external funding is needed, we expect a positive relationship between firm size and the use of debt financing.

#### *2.4. The Trade-off Model*

The tax benefit–bankruptcy cost trade-off models (Baxter, 1967; DeAngelo and Masulis, 1980; Kraus and Litzenberger, 1973; Robichek and Myers, 1966; Scott, 1976) predict that firms will seek to maintain an optimal capital structure by balancing the benefits and the costs of debt. The benefits include the tax shield, whereas the costs comprise of expected financial distress costs, among others. According to this model, a firm's profitability will be negatively related to the expected financial distress costs, since the probability that firms with higher and more stable profits will enter bankruptcy would be lower. In addition, larger firms typically experience lower profit volatility, and thus possess higher debt ratios relative to smaller firms.

The existing agency cost trade-off models (Jensen and Meckling, 1976; Easterbrook, 1984; Stulz, 1990; Harris and Raviv, 1990; Hart and Moore, 1995) consider the possible conflicts of interests between the parties involved in the firm, such as managers and outside investors. Overall, the trade-off and agency theories predict that firms maintain an optimum capital structure, where the marginal benefit of debt equals the marginal cost. In summary, for publicly traded firms, the trade-off models predict that higher debt will be associated with higher profitability, lower non-debt tax shields, low growth opportunities, high asset tangibility, and lower expected bankruptcy costs.

Startup businesses are less likely to take advantage of tax interest deductibility. The tax benefits are usually negligible, as some businesses generate little or no revenue in the first year of operation. In fact, prior research reveals that new, small firms are particularly susceptible to the problems of financial distress and failure. High failure rates, coupled with high monitoring costs for the suppliers of capital, make it difficult for startups to raise debt. Therefore, the trade-off theory predicts that startup firms use less debt due to high probability of failure.

### **3. Data and Methodology**

#### *3.1. Data*

The Kauffman Firm Survey (KFS) is the largest longitudinal survey of startup businesses in the United States. The survey data contain detailed information on 4,928 businesses founded in 2004 and provide annual tracking information of their business status and performance until 2011. A business started in 2004 was defined as a new, independent business that was created by a single person or a team of people, the purchase of an existing business, or the purchase of a franchise. For each establishment, the database provides information about business characteristics, strategy and innovation, business organization and HR benefits, business finances, work behavior, ownership and demographics of up to ten owners. Detailed information on the business includes sources and types of capital in the startup year and over time, intellectual property rights (patents, trademarks, copyrights), R&D activity, physical location, whether the business provides a product, service or both, revenues, asset structure, sales, employment, and industry. Owners' characteristics (up to ten active-owner-operators per business) include: years of work experience, previous startup

experience, time commitment and education, net worth, age, gender, race and ethnicity. The definitions of variables used in this study are presented in the Appendix.

In response to the Kauffman Foundation's interest in understanding the dynamics of high-technology, medium-technology, and women-owned businesses, the KFS sample is stratified based on industrial technology level (High-Tech, Medium-Tech, and Non-Tech sectors) oversampling businesses in high- and medium-tech sectors. It is a common practice in policy-making surveys to oversample a key population subgroup in response to the small size of that subgroup or for a special interest in that subgroup. It is important to notice that oversampled high-technology and medium-technology businesses in the KFS aim at increasing the precision of stand-alone and comparative analyses of these sub-groups.

Using a disproportionate stratified sampling requires a weighting scheme to make the KFS sample a representative sample of the target population. In the baseline survey and to account for oversampling, the initial weights were defined as the inverse of the probability of selection, which was calculated in each stratum. Next, the initial weights were adjusted to compensate for the businesses that did not respond or could not be located. A logistic propensity model was used to determine the probability of locating a business as well as to determine the propensity to respond in the survey. Given both probabilities and their inverses, the weights were adjusted to count for the joint conditional probability that a business was selected for sampling, was located, and responded in the survey. Finally, to make the data even more representative of the population a post-stratification was applied. Details of the use of proper weights for the KFS sample are available in Farhat (2012) and Farhat and Robb (2014). All analyses in this paper are performed using the weights and stratification.

Although the missing observations in the KFS are not significant, the Kauffman foundation has released a multiply imputed data version of the KFS data. Used by statistical agencies, multiple imputation is a very popular methodology to handle nonresponse in public use surveys and to reduce measurement errors. The imputed values are ideally independent draws from the predictive distribution of the missing values conditional on the observed values. The KFS multiply imputed data include the original data along with five complete-data imputations ( $m=5$ ). Using special procedures, analyzing multiply imputed data requires estimating the statistical model for each imputed dataset which is five in the case of KFS (Farhat and Robb, 2013). All analyses in this paper are performed on the KFS multiply imputed dataset.

### *3.2. Descriptive Statistics*

In Table 1 Panel A we report the main characteristics of businesses comprising our sample. On average, about 61 percent of firms have limited liability (S-corporations and LLC), while the remaining 39 percent are organized as proprietorships and partnerships. In addition, about 83 percent of firms operate in an urban location and half of the startups operate from owners' homes. The data also reveal that about 87 percent of startups provide services, 48 percent provide products, and 35 percent provide both services and products. Our information asymmetry proxy is very volatile during the 2004–2011 period. On average, 14 percent of startups have no available information to calculate the commercial credit score and are therefore classified as high information asymmetry firms. Startups' size, measured by  $\ln(\text{assets})$ , has a growth rate of 10 percent, whereas sales growth rate is about 53 percent for the 2004–2011 period. Credit risk score (a measure of firms' riskiness) decreased from 3.41 to 2.9 across the sample period. Data also show that less than 20 percent of firms report any form of intellectual property rights (IP) such as copyrights and patents or R&D activity. A high proportion of firms (63.35 percent) indicate that

they have a comparative advantage (something unique and distinctive) relative to their competitors in the startup year (2004). However, the proportion of firms with comparative advantages decreases to 41.39 per cent in the last year of survey (2011). On average, the number of employees increases from 1.06 individuals per firm in the first year of operation to about 2.92 in 2011. About 41 percent of firms' total assets are tangible assets. On average, firms reported about \$22,067 in annual profit during their first eight years of operation.

In Table 1 Panel B we show the distribution of our sample across industries. With respect to industry stratification, our sample consists of 1.88 percent high-tech firms, 14.20 percent medium-tech firms, and 83.92 percent non-tech firms. Using the North American Industry Classification System (NAICS), the majority of firms in our sample are in the service and retail trade sectors (71 per cent), while the lowest percentage of firms operate in the manufacturing sector (5.84 per cent).

Table 1 Panel C shows the detailed owners' characteristics. The data reveal that the average age of the entrepreneurs was forty-seven years across the sample period (2004–2011). The entrepreneurs in our sample had an average of 11.90 years of industry experience. Owners devoted about 39 hours per week to their business and, in about 47 percent of startups, the entrepreneurs are highly educated (having earned college degree or higher). With respect to gender and race, 68.22 percent of firms were owned by male entrepreneurs, about 5 percent have Hispanic owner, and 83.78 percent of the sample firms are owned by white entrepreneurs.

The KFS survey provides information on various types of debt and equity financing sources. For the purpose of our analyses, we classify the financing variables into "insider" and "outsider" debt or equity, based on the fact that insiders providing capital have more information about the business than outsiders do. Insider's personal debt consists of personal debt from family and others, whereas personal credit cards and personal bank loans are considered outsider's personal debt. In the same vein, insider's business debt comprises of business debt from family, employees, and other individuals. On the other hand, outsider's business debt consists of credit cards, bank loans, government's loans, and loans from other businesses. Owner's equity consists of equity provided by the owner(s). Insider's equity consists of equity provided by spouse and/or parents, whereas outsider's equity includes equity provided by the angels, venture capitalists, government and/or companies.

Figure 1 describes the sources of finance available to small businesses over time. In the startup stage, businesses must rely on initial insider equity, angel finance and venture capital. As startup businesses grow over time, they gain access to a broader spectrum of sources of external business debt. Over time, accumulation of trading history enables access to better sources and amounts of external financing, particularly trade credit.

Figure 1 here

Table 2 Panel A shows the annual balance for each source of financing. Consistent with financial growth life cycle theory, the portion of owner's equity financing relative to other sources of funding is the highest in the early years of the startup life cycle (53.68 in 2004). The data also indicate that the proportion of personal debt decreases steadily over time, while the proportion of business debt slightly increases before the 2008-2009 financial crisis. However, following the onset of the financial crisis in 2008, the proportion of business debt in total financing started to gradually decline over time. Insider's business debt shows a steady decrease over time, while both owners' equity and trade financing balances increased in the same period. Although the proportion



of insider and outsider equity balances decreases over time, data show that the proportion of owner's equity increases during the sample period. This change in balance could be due to the fact that startup businesses are building up owners' equity by reinvesting the profit into the business.

Figures 2, 3, 4, and 5 here

The major postulate of the financial growth life cycle is that as startups advance on the size/age/information continuum, the financial sources of capital also change. The data presented in Panel B of Table 2 along with Figures 2–5 show the trajectories of each source of annual capital injections. As can be seen, the percentage of total equity injections (owners', insiders', and outsiders' equity) decreased steadily from 59.04 percent in 2004 to 24.75 percent in 2011. On the other hand, the proportion of trade finance as a source of financing increased from 10.26 percent to 27.13 per cent during the same time period. Similarly, business debt annual injections increased steadily from 7.79 percent in 2004 to 18.39 percent in 2011. Meanwhile, personal debt annual injections increased from 22.92 percent to 29.74 percent. It is worth noting that insider's personal debt annual injections decreased from 3.41 percent in 2004 to 2.43 per cent in 2011, while personal credit card injections, the major source of personal debt financing, increased from 11.15 percent to 22.83 per cent. In addition, the annual personal bank loan injections decreased from 8.35 percent in 2004 to 4.48 percent in 2011. The majority of the increase in business debt injections stems from an increase in the use of credit lines from 1.33 percent in 2004 to 9.61 percent in 2011. Business credit card injections also show an increase from 1.73 percent to 7.06 percent in the same period. While these descriptive statistics help us summarize our variables in an efficient and easily understood manner, they do not confirm the significance of the trend noted in these variables over time. Thus, we test the significance of trajectories these variables follow via a multivariate analysis.

Table 2 here

### 3.3. Multivariate Analysis

#### 3.3.1. Trajectory of financial capital injections

The financial growth life cycle theory predicts that the major capital structure variables follow a specific trajectory over the life of the business. In this section, we test the postulates of this theory, namely hypotheses H<sub>1</sub>(a) and H<sub>1</sub>(b). For the purpose of investigating the systematic change (growth/decline) in the financial structure variables we use Latent growth modeling, employing the hierarchical linear modeling (HLM) statistical technique. Unlike standard regressions, the Latent growth model incorporates the 'time' factor explicitly. To account for information opacity across the different stages of the life cycle, we estimate the following model:

Level-1 equation (measurement model):

$$y_{it} = \pi_{0i} + \pi_{1i}Time_t + \pi_{2i}Time_t^2 + \epsilon_{it} \text{ , for } i = 1, 2, \dots, n \text{ and } t = 1, 2, \dots, T.$$

Level-2 equations (structural model):

$$\pi_{0i} = \gamma_{00} + \mu_{0i}$$

$$\pi_{1i} = \gamma_{10} + \mu_{1i}$$

$$\pi_{2i} = \gamma_{20} + \mu_{2i}$$

where  $y_{it}$  is the response variable for firm  $i$  at time  $t$ ,  $\pi_{0i}$  is a latent variable that represents the level-1 intercept (endowments "initial status"),  $\pi_{1i}$  is a latent variable that represents the change trajectory (rate of change), and  $\pi_{2i}$  captures the acceleration in the variables' growth trajectories.

In the level-2 equations,  $\gamma_{00}$ ,  $\gamma_{10}$ , and  $\gamma_{20}$  are the intercepts or the average value of  $\pi_{0i}$ ,  $\pi_{1i}$ ,  $\pi_{12}$ , respectively.

The terms  $\mu_{0i}$ ,  $\mu_{1i}$ , and  $\mu_{2i}$  are random effects representing individual deviations from the overall sample means. These terms distinguish each firm's intercept ( $\pi_{0i}$ ) and slope ( $\pi_{1i}$ ,  $\pi_{12}$ ) from the overall sample mean and intercept. Heterogeneity in the firm intercept and slope parameters is determined by examining  $\sigma_{\mu_{0i}}^2$ ,  $\sigma_{\mu_{1i}}^2$ , and  $\sigma_{\mu_{02}}^2$ . In other words, differences in firm intercepts and slopes exist if  $\sigma_{\mu_{0i}}^2$ ,  $\sigma_{\mu_{1i}}^2$ , and  $\sigma_{\mu_{02}}^2$  are different from zero.

The model possesses several important advantages. First, it allows variability [ $\mu_{1i}$ ] in the rate of change, i.e. some firms are changing more than others and have larger slopes, some are improving (positive slopes), some are declining (negative slopes), and some firms exhibit no change at all (zero slopes). Second, the model allows to introduce variance in both the slope and intercept; it measures how much firms differ at startup as well as determines the difference in their rates of change over time. Third,  $Time_t^2$  allows us to control for any non-linearity in the model.

In addition to the hierarchical linear modeling (random effect) we use the fixed effects models to estimate the trajectory of financial capital injections as a robustness test. In the fixed effects models, the model to be fitted is represented by the following set of equations:

$$y_{it} = \pi_{1i}Time_t + \pi_{2i}Time_t^2 + \epsilon_{it}, \text{ for } i = 1, 2, \dots, n \text{ and } t = 1, 2, \dots, T.$$

$$\epsilon_{it} = \mu_i + v_{it}$$

$$y_{it} = \mu_i + \pi_{1i}Time_t + \pi_{2i}Time_t^2 + v_{it}$$

In the above model, the idiosyncratic error ( $v_{it}$ ) varies time and among firms, where  $E(v_{it}) = 0$ ,  $Var(v_{it}) = \sigma_v^2$ ,  $(v_{it}, v_{jt}) = 0$  for  $i \neq j$ ,  $Cov(x_{it}, v_{is}) = 0$  for all  $t$  and  $s$  and it is allowed to have  $Cov(\mu_i, v_{it}) \neq 0$  or  $Cov(\mu_i, x_{it}) \neq 0$ . In this fixed effects approach,  $\mu_i$  is treated as a firm-specific error term in the regression model. The firm-specific error does not change over time and every firm has a fixed value on this variable. The fixed-effects model controls for all time-invariant differences among firms. Thus, we are controlling for heterogeneity among firms and any other time-invariant unobservable variables.

Table 3 here

Table 3 shows the results of estimating both the random and fixed effects models. In terms of significance, while both models produce identical results the values of coefficients they yield are slightly different. The majority of the financial capital variables exhibit a significant nonlinear relationship over time. The results show strong evidence of a significant financial growth pattern in the use of debt and equity sources during the life cycle of the firm. Consistent with the financial growth life cycle model, the entrepreneur relies on initial insider financial capital (personal savings, finance from friends and family, quasi-equity, and personal debt) and trade credit. Owner equity injections start at a high level and exhibit a decrease over time. The total personal debt injections increase in the first four years of the startup life, after which they start to decline. There is no evidence that outsiders' equity is increasing during the life of the startup businesses, as predicted by the financial growth life cycle model. On the other hand, business debt and trade credit financing variables show a strong support for financial growth life cycle model. In particular, both business credit line and business credit card start to play an increasingly significant role over time. Thus, our results strongly support the hypotheses that entrepreneurs' personal resources are most important sources of funding at the startup stage; over time, the relative importance of insider's equity (including owners' equity) in financing the firm declines. The relative importance

of owners' personal debt in financing the firm declines as well, whereas the relative importance of business debt in financing the firm increases over time. The results also show that the relative importance of trade credit in financing the firm increases over time.

### 3.3.2. Determinants of financial capital injections and its components

To gain further insight into the factors affecting the financial capital injections, we also explore the determinants of various types of business and personal debt injections in total financial capital injection volume for our sample of startup firms. Since our dependent variables are ratios that are bounded by zero we use Tobit regressions to obtain consistent estimators. Let  $y_{it}$  = the financial capital injections proportion of the  $i$ -th firm as a percentage of total financing at time  $t$  and  $X_{it}$  = the vector of independent variables of the  $i$ -th firm at time  $t$ . Since our dependent variables are ratios that are bounded by zero, the dependent variable is truncated.

$$y_i = \beta_0 + \beta_1 x_i + \varepsilon_i, \text{ where } y_i > 0 \text{ for } i = 1, \dots, N \text{ and } \varepsilon_i \rightarrow N(0, \sigma^2)$$

Neglecting the truncation can lead to biased estimates of  $\beta_0$  and  $\beta_1$ .

$$E[y_i | y_i > 0, x_i] = \beta_0 + \beta_1 x_i + \sigma \frac{\phi(-(\beta_0 + \beta_1 x_i) / \sigma)}{1 - \Phi(-(\beta_0 + \beta_1 x_i) / \sigma)}$$

The last term on the right-hand-side of the above equation is the Mills ratio.

$$\text{Latent model: } y_i^* = X_i \beta + \varepsilon_i$$

$$y_i = 0 \text{ if } y_i^* = X_i \beta + \varepsilon_i \leq 0$$

$$y_i = X_i \beta + \varepsilon_i \text{ if } y_i^* = X_i \beta + \varepsilon_i > 0$$

$E(y_i | y_i > 0, X_i)$  is given above in the truncated regression model.

The unconditional expectation of  $y$  given  $X$  can be expressed as:

$$E(y_i | X) = (1 - \Phi(-X_i \beta / \sigma)) X_i \beta + \sigma \phi(-X_i \beta / \sigma)$$

The total effect of a change in the  $k$ -th independent variable  $x_{k,i}$  on the expectation of  $y_i$  is given by:

$$\frac{\partial E[y_i | X_i]}{\partial x_{k,i}} = (1 - \Phi(-X_i \beta / \sigma)) \beta_k$$

Our independent variables are proxies that have been widely used in the finance literature to explain the determinants of capital structure in large, publicly traded firms. Titman and Wessels (1988) argued that as larger firms become more diversified they face lower probability of bankruptcy. This link suggests that the larger the firm size, the higher the firm's debt capacity. Since large firms tend to possess more collateralized assets and have more stable cash flows, the company's size is inversely related to the probability of default allowing it to carry more debt. Diamond (1991) also noted that large established firms have better reputation in the debt markets, which allows them to carry more debt. Thus the size variable, measured by the log of total sales, is expected to be positively related to debt financing.

Tangible assets (collateral) convey information to investors about the quality of a firm as well as reduce the degree of information asymmetry and opaqueness. The use of collateral is prevalent in external debt contracts as a means of mitigating informational asymmetry that may result in credit rationing or denial of credit (Bonaccorsi di Patti and Dell'Araccia, 2004). Typically, small businesses pledge assets owned by the firm, i.e. inside collateral that includes firm assets

such as inventories, receivables, or plant and equipment. Most theoretical research suggests that inside collateral helps reduce adverse selection and prevent credit rationing (Stiglitz and Weiss, 1981; Besanko and Thakor, 1987a, 1987b). Asset structure is an important predictor of the ability to raise intermediated debt. Firms possessing more tangible assets are more likely to use them as inside collateral, therefore reducing the informational asymmetry between lenders and owners. We use the ratio of the property, plant, and equipment to total book assets as our proxy for collateral (Van der Wijst and Thurik, 1993; Ang, 1992).

Myers (1977, 1984) suggested that firms with diverse growth options use less debt in order to preserve their debt capacity. Similarly, Rajan and Zingales (1995) and Titman and Wessels (1988) argued that firms with high growth options depend on equity financing more than on debt financing. Their argument suggests a negative relationship between leverage and growth options. Thus, we expect to find firms with greater growth options as measured by intellectual property rights and/or R&D activity to be less reliant on debt financing ( $H_4$ ). On the other hand, the financial growth life cycle model postulates that small firms with high growth opportunities are associated with more information asymmetry, and would thus use more internal capital and personal debt.

The adverse selection model (Myers and Majluf's (1984) implies a pecking order in financing small firms: retained earnings first, followed by debt and then external equity. To avoid the underinvestment problem owners seek to finance new projects using internal funds or riskless debt. We control for internal equity (retained earnings) by using the profit to assets ratio. It is expected that firms with high information asymmetry will exhaust their internal equity before seeking external funding. Thus, we predict a negative relationship between capital injections and profitability.

The main prediction of the life-cycle theory is that firms characterized by high information asymmetry rely more on informal capital and less on formal credit channels. Thus, small firms first seek insider finance before pursuing angel finance and trade credit and only later rely on intermediated external finance (Berger and Udell, 1998; Sahlman, 1990). In contrast, firms with less information asymmetry should rely on outside debt financing as the main source of capital ( $H_3$ ). Therefore, we expect that firms with high information asymmetry exhibit a financing behavior more consistent with the life-cycle theory model. We use the availability of credit score and financial distress score as a proxy for information asymmetry. In addition, in our analyses we employ the location of the business (home based vs. leased location) as an indicator variable which proxies for the availability of information about the business. It is expected that businesses operating from the owner's home have a more pronounced information asymmetry problem.

To control for owners' characteristics we include gender, education, and race in our analysis. In addition, since financial decision-making is strictly influenced by the ownership structure (Jensen and Meckling, 1976) and to address different levels of ownership control we include a dummy variable for small businesses that are owned by more than one owner.

Table 4 here

In Table 4 Panel A we present the coefficients of firm and owner characteristics that explain the relative size of personal debt injections and its components. The coefficients for R&D are positive and significant suggesting that the higher the growth options, the higher the proportion of personal debt injection in total capital injection volume. In addition, we show that firms with higher credit risk use more insider's personal debt and rely less on personal bank loans. The coefficients for tangible assets show a positive and significant effect across all types of personal debt, consistent

with prior results demonstrating that firms with more tangible assets have higher debt capacity. The coefficient for sales is positive and significant for all types of personal debt injections, except insider's debt suggesting that firms with a higher level of sales have the ability to acquire many types of personal debt. Although the coefficient for information asymmetry proxy is not significant in Panel A, suggesting that it has no impact on the personal debt injections, it is statistically significant in Panel B. Thus, firms with high information asymmetry have lower injections of business debt in their capital structure. Home based firms use less insider's personal debt and personal bank loan injections, but more capital injections in the form of personal credit cards. The findings also suggest that profitability lowers the need to use any type of personal debt injections. Team owned firms tend to be less reliant on insider, outsider, and personal credit card debt injections but they use more personal loans as capital injections. More educated owners and owners with longer working experience use less personal debt injections. In addition, male owners tend to use personal credit card less and rely more on personal bank loans. White owners use less insider's debt and personal credit card injections, while using more personal bank loan injections.

In Table 4 Panel B we present the coefficients of firm and owner characteristics that explain the relative size of business debt injections and its components. Given the use of business debt financing, we find that firms with high growth options use more business debt injections across all types of business debt. Moreover, firms with intellectual property rights tend to have more business debt injections relative to other firms. Credit risk shows that firms with higher risk will use fewer injections from outsiders, and are also less reliant on credit line, credit card, and bank loans. Tangible assets play a significant role as collateral in case of outsider, business credit cards, business bank loans, and other business loan injections. Large firms tend to use more business debt injections. The coefficient for our information asymmetry proxy is negative and significant, suggesting that informationally opaque firms are less likely to use outsiders' debt, credit line, credit card, and bank loan capital injections. This result is consistent with the theoretical predictions of Stiglitz and Weiss (1981) and Berger and Udell (1998) who noted that informationally opaque firms are less likely to access debt financing due to severe frictions in the debt markets. Our results also show that home based firms are less likely to use business debt injections across all types of business debt available to the firms. Profitable, less constrained firms use fewer business debt injections. We also show that several owner characteristics explain the proportion of business debt injections in startup firms. For example, gender is a significant factor in determining the proportion of business debt injections. Across all types of business debt injections, male owners use more business debt relative to female owners. With respect to race, white entrepreneurs rely less on insider's business injection and credit card financing. On the other hand, we find that owners' level of education and work experience do not affect the proportion of business debt injections.

In Table 4 Panel C we present the coefficients of firm and owner characteristics that explain the relative size of equity injections and its components. Higher growth options increase both the proportion of equity injections and trade finance. Firms with high credit risk rely more on owner's equity injections and less on debt injections or trade finance injections. Firms with higher sales use fewer owner's equity injections and rely more on debt or trade finance injections. The results also show that higher information asymmetry prompts firms to use more equity injections and less trade finance or debt injections. Home-based firms rely on using owner's equity more and insiders' and outsiders' equity injections less. Profitability reduces the use of both equity and debt capital injections. Team owned firms use more equity injections and less debt injections. Male owners use less owner's equity injections and rely more on outsiders' equity and trade finance capital injections. Finally, white owners use less equity injections while favoring trade finance injections.

#### 4. Conclusions

In this article we examine small business financing through a growth cycle paradigm in which different combinations of capital are optimal at different points in the business life cycle. Unlike publicly held firms, small businesses in the startup stage finance their operations with insiders' capital such as owners' equity, funds from family and friends. As the business grows, outsiders' sources of capital may become available. The key feature that drives the financial growth cycle is informational opacity. Early in the growth cycle, small businesses typically lack business assets that can be used as collateral, have little repayment history or record of profitability, and do not have audited financial statements. Therefore, providers of outside capital put considerable weight on the creditworthiness and reputation of the entrepreneur who may have a longer credit history and personal assets that can be used as collateral.

Our results point to a significant financial growth pattern in the use of various sources of debt and equity during the life cycle of the firm. Consistent with Berger and Udell's model, at the startup stage entrepreneurs rely on initial insider's capital sources. Over time, as firms become less opaque, the proportion of business debt and trade credit financing in total capital injections increases significantly. Although the proportion of owner's equity in total capital injections decreases over time, the annual balance of owner's equity increases suggesting that owners use retained earnings to increase their ownership stake in the firm.

Several business and owner characteristics explain the type and magnitude of various types of capital injections. Firms characterized by high information asymmetry rely more on equity injections, especially owner's personal savings, whereas those undertaking innovative activities finance their operations with outsiders' equity injections. A higher proportion of tangible assets explains greater use of debt injections (both personal and business debt sources), whereas higher level of sales drives firms to use both debt injections and trade finance, relying less on equity injections. Firms owned by two or more owners tend to inject more equity (especially outside equity) and less debt in the capital structure of their firms. Education and race have a significant impact on the capital injections over the business life cycle. Highly educated owners choose to inject lower proportions of personal debt and trade financing, whereas white owners inject lower proportions of personal equity and rely more on trade financing.

This article contributes to the current stream of literature by providing insights into the ways in which the sources and magnitude of capital injections in startup firms differ from those of large, publicly held firms. The reported findings reveal the systematic changes in the financial structure of newly formed businesses and show that there is a significant financial growth pattern in the use of various sources of debt, equity, and trade finance during the life cycle of small firms. Finally, our research results demonstrate that entrepreneurs' personal characteristics play an important role in the use and magnitude of a specific type of capital injection.

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**Appendix: Variable Description**

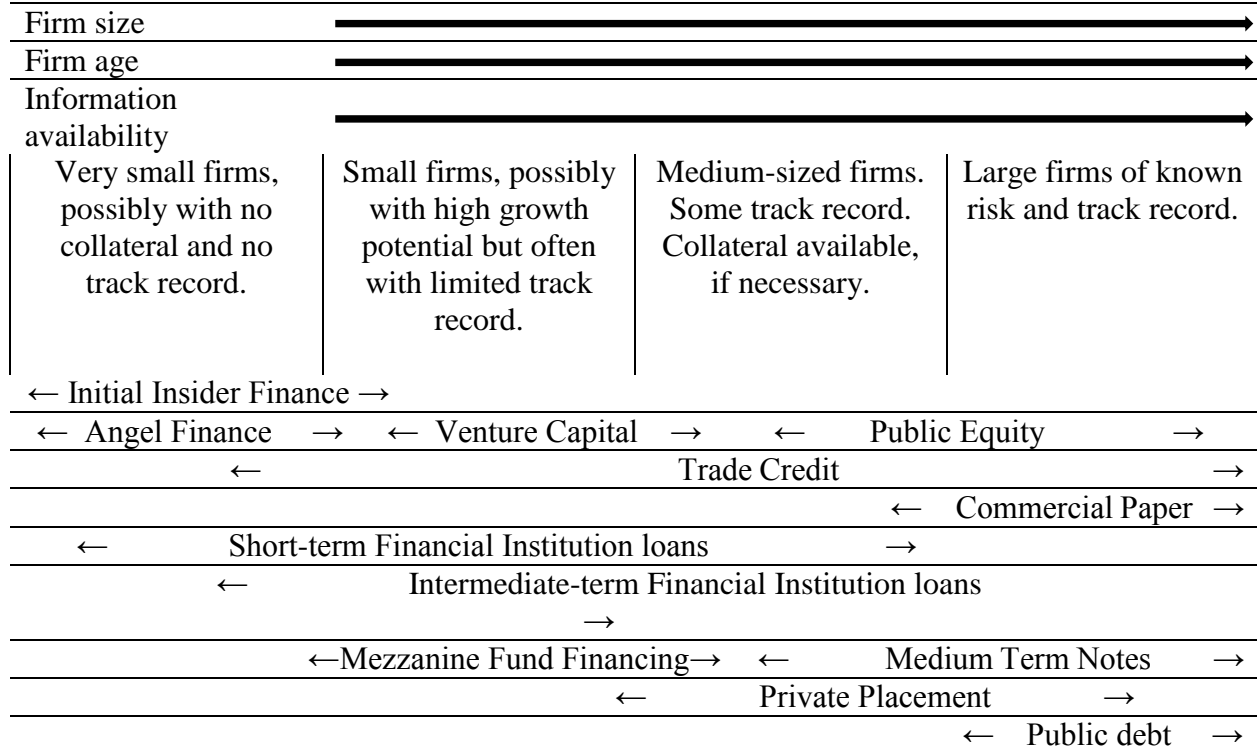
<i>Variable</i>	<i>Description</i>
Asian	Equals 1 if the majority of owners are Asian, =0 otherwise
Black	Equals 1 if the majority of owners are Black or African American (Non-Hispanic), =0 otherwise
White	Equals 1 if the majority of owners are White (Non-Hispanic) , =0 otherwise
Other	Equals 1 if owners have no predominant race as well as other races not included above (American Indian, Alaska native, Native Hawaiian , other Pacific Islander, other, unknown), =0 otherwise
Hispanic	Equals 1 if the majority of owners are Hispanic (regardless of race), =0 otherwise
Gender	Equals 1 if the majority of owners are males, =0 otherwise
Education	Equals 1 if the majority of owners have college degree or above, =0 otherwise
Age	Average age of the owners (in years)
Work Experience	Average work experience of the owners (in years)
Commitment	The sum of number of hours worked weekly by the owner(s)
Startup Experience	Equals 1 if at least one owner had started other businesses, =0 otherwise
Home Based	Equals 1 if home based business, =0 otherwise
Employees	Number of employees (for businesses with employees>0)
Comp. Adv.	Equals 1 if business has a comparative advantage, =0 otherwise
Self Employed	Percentage of owners who are paid employees in the business
R&D Activity	Equals 1 if business has at least one employee responsible for R&D, =0 otherwise
Intellectual Property	Equals 1 if business has patent or copyright or trademark, =0 otherwise
Provide Service	Equals 1 if business provides service , =0 otherwise
Provide Product	Equals 1 if business provides product, =0 otherwise
Provide Service And Product	Equals 1 if business provides service and product, =0 otherwise
Information Proxy	Equals 1 if D&B did not report a credit score for the business , =0 otherwise
Assets (Ln)	The logarithm of (total assets(\$)+1) at the start-up year (2004)

## Appendix: Variable Description- continued

<i>Variable</i>	<i>Description</i>
Sales(ln)	The logarithm of (total sales(\$)+1) at the start-up year (2004)
Tangible Assets	The logarithm of tangible assets
Credit risk	D&B Commercial Credit Score (1 very low risk,....., 5 very high risk)
Profitability	Equals 1 if business have profit in year t, =0 otherwise
Team	Equals 1 if business owned by more than one owner
Large rural city/town	The RUCA code system: 3.0, 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.2, 8.2, and 10.2
Small rural town	The RUCA code system: 7.0, 7.3, 7.4, 8.0, 8.3, 8.4, 9.0, 9.1, 9.2, and 10.3
Isolated small rural town	The RUCA code system: 10.0, 10.4, 10.5, and 10.6
High-tech	Equals 1 if business is in a high-tech industry, =0 otherwise
Medium-tech	Equals 1 if business is in a medium-tech industry, =0 otherwise
Non-tech	Equals 1 if business is in a non-tech industry, =0 otherwise
Personal Debt: Insiders	Personal debt from friends and family injections (balance) to Total capital injections (balance)
Personal Debt: Outsiders	Personal credit card & bank loans injections (balance) to Total capital injections (balance)
Personal Credit Card %	Personal credit card injections (balance) to Total capital injections (balance)
Personal Bank Loans %	Personal bank loans injections (balance) to Total capital injections (balance)
Personal Debt: Total	Personal debt injections (balance) to Total capital injections (balance)
Business Debt: Insiders	Business debt from friends and family injections(balance) to Total capital injections (balance)
Business Debt: Outsiders	Personal credit card, bank loans, other loan and credit line injections (balance) to Total capital injections (balance)
Business Credit Line %	Business credit line injections(balance) to Total capital injections (balance)
Business Credit Card %	Business credit card injections(balance) to Total capital injections (balance)
Business Bank Loan %	Business Bank loans injections (balance) to Total capital injections (balance)/ balance to Total injections / balance
Business Other Loan %	Business other loans injections (balance) to Total capital injections (balance)
Business Debt : Total	Business debt injections (balance) to Total capital injections (balance)
Debt: Total	Debt injections (balance) to Total capital injections (balance)

Equity: Owner	Owners' equity injections (balance) to Total capital injections (balance)
Equity: Insider	Equity from friends and family injections (balance) to Total capital injections (balance)
Equity: Outsider	Equity from angels, venture capitalists, government and/or companies injections (balance) to Total capital injections (balance)
Equity: Total	Insider and outsider equity injections (balance) to Total capital injections (balance)

**Figure 1: Firm continuum and sources of finance**



Source: Berger and Udell (1998, p. 623)

**Table 1 Firm level characteristics**

<b>Panel A: Business</b>									
<b>Characteristics</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2004-2011</b>
Legal status									
Proprietorship %	35.70	34.75	34.05	33.90	34.83	33.67	32.52	31.13	34.09
LLC %	30.68	31.04	31.56	30.61	31.06	31.64	32.41	34.09	31.45
Corporation %	27.81	28.94	29.54	30.72	29.83	30.66	31.10	30.68	29.67
Partnership %	5.82	5.28	4.85	4.78	4.28	4.02	3.97	4.10	4.79
Location									
Home-based %	50.43	50.23	50.22	51.13	50.77	50.43	49.17	48.52	50.21
Leased space, Other %	49.57	49.77	49.78	48.87	49.23	49.57	50.83	51.48	49.79
Urban %	83.00	83.13	82.88	83.12	82.47	82.24	83.18	83.26	82.92
Large Rural Town %	8.87	8.59	8.74	8.74	9.13	8.90	8.55	8.48	8.76
Small Rural Town %	4.36	4.31	4.22	4.19	4.36	4.54	4.26	4.14	4.30
Isolated Small Rural Town %	3.73	3.92	4.09	3.88	4.03	4.31	4.00	4.12	3.98
Number of banks( by Zip code)	9.12	9.05	8.98	9.01	9.09	9.01	9.10	9.05	9.05
Provide Services %	85.67	87.64	87.40	86.94	87.59	86.59	86.91	87.22	86.95
Provide Products %	51.15	50.72	48.20	47.37	46.81	44.94	45.44	42.79	47.82
Provide Services and Products %	37.06	38.67	35.79	34.68	34.72	32.00	32.70	30.47	35.09
Information proxy %	23.57	1.88	12.64	14.64	8.28	16.58	17.46	21.22	14.23
Assets (Ln)	9.13	9.85	9.94	9.95	9.95	9.93	10.03	10.02	9.80
Sales (Ln)	6.84	8.19	8.42	8.68	9.14	10.14	10.16	10.47	8.73
Credit risk	3.41	3.26	3.01	2.92	2.82	2.86	2.95	2.90	3.06
Firms with IP rights %	19.30	19.67	20.54	19.19	18.72	17.73	18.76	17.74	19.11
Firms with R&D activity %	17.58	17.42	18.72	15.25	14.41	12.42	11.72	11.96	15.50
Firms with Comparative Advantage %	63.35	66.29	63.01	59.73	56.74	46.27	46.22	41.39	57.34
Employees	1.06	1.94	2.28	2.26	2.26	2.37	2.59	2.92	2.09
Tangible Assets (Ln)	7.01	7.59	7.58	7.68	7.64	7.55	7.77	7.66	7.52
Net Profit (\$)	-2929	13289	29813	28033	25800	26543	33033	47145	22067
<b>N</b>	<b>3140</b>	<b>2837</b>	<b>2554</b>	<b>2330</b>	<b>2092</b>	<b>1928</b>	<b>1775</b>	<b>1630</b>	<b>18286</b>

**Table 1: continued**

<b>Panel B: Industry Classification</b>									
<b>Classification</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2004-2011</b>
Construction %	10.50	11.01	10.82	11.13	10.88	11.41	11.56	11.24	11.00
Manufacturing %	5.90	6.10	5.87	5.53	5.91	5.95	5.66	5.60	5.84
Wholesale & Retail trade %	20.74	19.81	19.93	19.70	19.27	18.41	17.65	17.70	19.39
Services %	50.81	51.52	51.29	50.64	51.64	52.21	53.08	53.17	51.62
Finance, insurance, real estate %	10.78	10.29	10.87	11.55	10.82	10.56	10.62	10.87	10.79
Other	1.26	1.26	1.22	1.45	1.48	1.46	1.43	1.42	1.35
High-tech firms %	1.79	1.80	1.89	1.86	1.89	1.91	1.99	2.07	1.88
Medium-tech firms %	13.20	13.42	14.17	14.39	14.41	14.83	15.09	15.52	14.20
Non-tech firms %	85.00	84.78	83.94	83.76	83.71	83.25	82.92	82.41	83.92
<b>Panel C: Owners' characteristics</b>									
Age (years)	44.80	45.77	46.86	47.99	49.12	50.04	45.96	46.61	46.93
Work experience (years)	11.45	11.53	11.79	11.96	12.04	12.20	12.40	12.58	11.90
Startup experience %	79.51	77.81	78.42	79.90	79.99	79.09	80.95	80.22	79.34
Time commitment (hours/week)	40.75	40.41	39.60	38.72	38.15	37.27	36.97	37.30	38.98
Education									
College degree and above %	45.45	45.06	46.13	46.75	47.42	48.57	49.21	49.56	46.89
Less than college degree %	54.55	54.94	53.87	53.25	52.58	51.43	50.79	50.44	53.11
Self Employed	46.43	51.12	52.35	54.10	50.70	52.41	53.88	52.89	51.32
Gender									
Male %	68.17	67.83	68.07	68.25	67.83	68.37	68.70	69.05	68.22
Female %	31.83	32.17	31.93	31.75	32.17	31.63	31.30	30.95	31.78
Race									
White %	83.04	83.86	84.03	83.74	83.96	84.02	83.88	84.14	83.78
Asian %	3.00	2.85	2.99	3.24	3.45	3.66	3.83	3.98	3.28
Black %	8.20	7.69	7.82	7.84	7.87	7.48	7.57	7.15	7.76
Other %	5.76	5.60	5.16	5.18	4.72	4.84	4.72	4.73	5.18
Hispanic %	5.59	5.25	5.02	4.71	4.50	4.62	4.82	4.42	4.95
<b>N</b>	<b>3140</b>	<b>2837</b>	<b>2554</b>	<b>2330</b>	<b>2092</b>	<b>1928</b>	<b>1775</b>	<b>1630</b>	<b>18286</b>

**Table 2 Firm level financial capital**

**Panel A: Balance- year end**

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2004-2011</b>
Personal Debt: Insiders	3.11	1.33	1.02	0.97	0.65	0.50	0.46	0.51	1.25
Personal Debt: Outsiders	18.65	13.11	12.36	12.24	11.08	9.81	8.18	6.65	12.31
Personal Credit Card %	10.59	8.71	8.45	9.10	8.41	7.49	6.51	5.39	8.41
Personal Bank Loans %	8.06	4.40	3.91	3.14	2.67	2.32	1.67	1.26	3.90
<b>Total Personal Debt</b>	<b>21.76</b>	<b>14.44</b>	<b>13.38</b>	<b>13.21</b>	<b>11.73</b>	<b>10.32</b>	<b>8.65</b>	<b>7.16</b>	<b>13.56</b>
Business Debt: Insiders	1.13	0.50	0.36	0.15	0.30	0.14	0.09	0.15	0.42
Business Debt: Outsiders	6.50	6.40	7.27	7.17	7.29	5.75	5.68	5.88	6.56
Business Credit Line %	1.36	1.59	2.25	2.32	2.81	2.40	2.49	2.74	2.14
Business Credit Card %	1.82	2.37	2.89	2.78	2.48	1.84	1.85	1.98	2.27
Business Bank Loan %	3.09	2.29	2.08	1.93	1.80	1.47	1.26	1.13	2.02
Business Other Loan %	1.36	0.66	0.41	0.29	0.50	0.18	0.17	0.19	0.55
<b>Total Business Debt</b>	<b>7.63</b>	<b>6.90</b>	<b>7.63</b>	<b>7.32</b>	<b>7.59</b>	<b>5.89</b>	<b>5.77</b>	<b>6.04</b>	<b>6.98</b>
Debt: Total	29.39	21.34	21.01	20.53	19.33	16.20	14.42	13.20	20.54
Equity: Owner	53.68	61.72	60.68	61.01	62.11	63.74	65.18	66.85	61.05
Equity: Insider	1.04	0.53	0.45	0.31	0.18	0.12	0.17	0.14	0.43
Equity: Outsider	1.20	0.73	0.61	0.38	0.37	0.23	0.17	0.19	0.56
<b>Total Equity</b>	<b>55.92</b>	<b>62.99</b>	<b>61.73</b>	<b>61.70</b>	<b>62.67</b>	<b>64.09</b>	<b>65.51</b>	<b>67.18</b>	<b>62.05</b>
Trade finance	7.62	9.35	10.38	10.33	10.88	12.16	12.18	11.86	10.25
Liability	14.68	15.67	17.25	17.77	18.01	19.71	20.07	19.63	17.41
<b>N</b>	<b>3140</b>	<b>2837</b>	<b>2554</b>	<b>2330</b>	<b>2092</b>	<b>1928</b>	<b>1775</b>	<b>1630</b>	<b>18286</b>



**Panel B: Annual capital injections**

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2004-2011</b>
Personal Debt: Insiders	3.41	3.05	2.94	2.46	3.11	2.93	2.37	2.43	2.94
Personal Debt: Outsiders	19.50	26.69	28.96	31.21	31.67	31.71	29.40	27.31	27.24
Personal Credit Card %	11.15	18.12	20.67	23.76	25.31	25.58	24.07	22.83	19.91
Personal Bank Loans %	8.35	8.57	8.29	7.45	6.36	6.13	5.32	4.48	7.33
<b>Total Personal Debt</b>	<b>22.92</b>	<b>29.74</b>	<b>31.90</b>	<b>33.68</b>	<b>34.78</b>	<b>34.64</b>	<b>31.77</b>	<b>29.74</b>	<b>30.18</b>
Business Debt: Insiders	1.25	1.24	1.19	0.50	0.82	0.47	0.70	0.65	0.94
Business Debt: Outsiders	6.54	11.05	14.42	16.37	16.58	16.75	16.30	17.74	13.20
Business Credit Line %	1.33	2.80	4.78	5.93	7.47	7.98	7.85	9.61	4.75
Business Credit Card %	1.73	4.73	6.54	6.83	6.40	6.41	6.99	7.06	5.26
Business Bank Loan %	3.15	3.26	3.27	3.91	3.52	3.77	2.76	2.94	3.33
Business Other Loan %	1.58	1.63	1.42	1.00	1.21	0.69	1.29	1.10	1.31
<b>Total Business Debt</b>	<b>7.79</b>	<b>12.29</b>	<b>15.60</b>	<b>16.87</b>	<b>17.40</b>	<b>17.22</b>	<b>16.99</b>	<b>18.39</b>	<b>14.14</b>
<b>Total Debt</b>	<b>30.70</b>	<b>42.03</b>	<b>47.51</b>	<b>50.55</b>	<b>52.18</b>	<b>51.86</b>	<b>48.76</b>	<b>48.12</b>	<b>44.32</b>
Equity: Owner	56.82	35.97	30.15	26.94	25.44	23.08	24.00	23.83	34.49
Equity: Insiders	0.98	0.76	0.62	0.46	0.31	0.41	0.28	0.41	0.61
Equity: Outsiders	1.23	1.22	0.84	0.71	0.55	0.47	0.23	0.51	0.83
<b>Total Equity</b>	<b>59.04</b>	<b>37.96</b>	<b>31.61</b>	<b>28.10</b>	<b>26.30</b>	<b>23.97</b>	<b>24.50</b>	<b>24.75</b>	<b>35.93</b>
Trade Finance	10.26	20.01	20.89	21.35	21.52	24.17	26.74	27.13	19.75
<b>N</b>	<b>3140</b>	<b>2837</b>	<b>2554</b>	<b>2330</b>	<b>2092</b>	<b>1928</b>	<b>1775</b>	<b>1630</b>	<b>18286</b>

**Table 3 Financial growth pattern over time**

	Random effect model			Fixed effect model			N
	<i>Constant</i>	<i>Time<sub>t</sub></i>	<i>Time<sub>t</sub><sup>2</sup></i>	<i>Constant</i>	<i>Time<sub>t</sub></i>	<i>Time<sub>t</sub><sup>2</sup></i>	
Personal Debt: Insiders	0.032***	-0.002	0.001	0.030***	-0.001	0.001	18286
Personal Debt: Outsiders	0.206***	0.057***	-0.007***	0.205***	0.054***	-0.006***	18286
Personal Credit Card %	0.121***	0.059***	-0.006***	0.118***	0.057***	-0.006***	18286
Personal Bank Loans %	0.084***	-0.002	-0.001	0.087***	-0.003	-0.001	18286
Personal Debt: Total	0.237***	0.055***	-0.006***	0.235***	0.054***	-0.006***	18286
Business Debt: Insiders	0.013***	-0.002*	0.001	0.012***	-0.002*	0.001	18286
Business Debt: Outsiders	0.070***	0.042***	-0.005***	0.080***	0.039***	-0.004***	18286
Business Credit Line %	0.012***	0.021***	-0.001***	0.009***	0.023***	-0.002***	18286
Business Credit Card %	0.024***	0.021***	-0.002***	0.026***	0.02***	-0.002***	18286
Business Bank Loan %	0.031***	0.003	0.001	0.033***	0.003	-0.001	18286
Business Other Loan %	0.016***	-0.002	0.001	0.015***	-0.002	0.001	18286
Business Debt: Total	0.083***	0.040***	-0.005***	0.092***	0.037***	-0.004***	18286
Debt: Total	0.320***	0.094***	-0.011***	0.327***	0.09***	-0.01***	18286
Equity: Owner	0.547***	-0.128***	0.014***	0.508***	-0.122***	0.013***	18286
Equity: Insiders	0.009***	-0.002**	0.001**	0.008***	-0.002*	0.001*	18286
Equity: Outsiders	0.012***	-0.002**	0.001	0.011***	-0.001	0.001	18286
Total Equity	0.568***	-0.133***	0.014***	0.528***	-0.125***	0.014***	18286
Trade Finance	0.113***	0.040***	-0.004***	0.145***	0.035***	-0.003***	18286

\*\*\*, \*\* and \* indicate that the coefficient is statistically different from zero at 0.01 , 0.05 and 0.10 levels.

Figure 2

Capital Injections

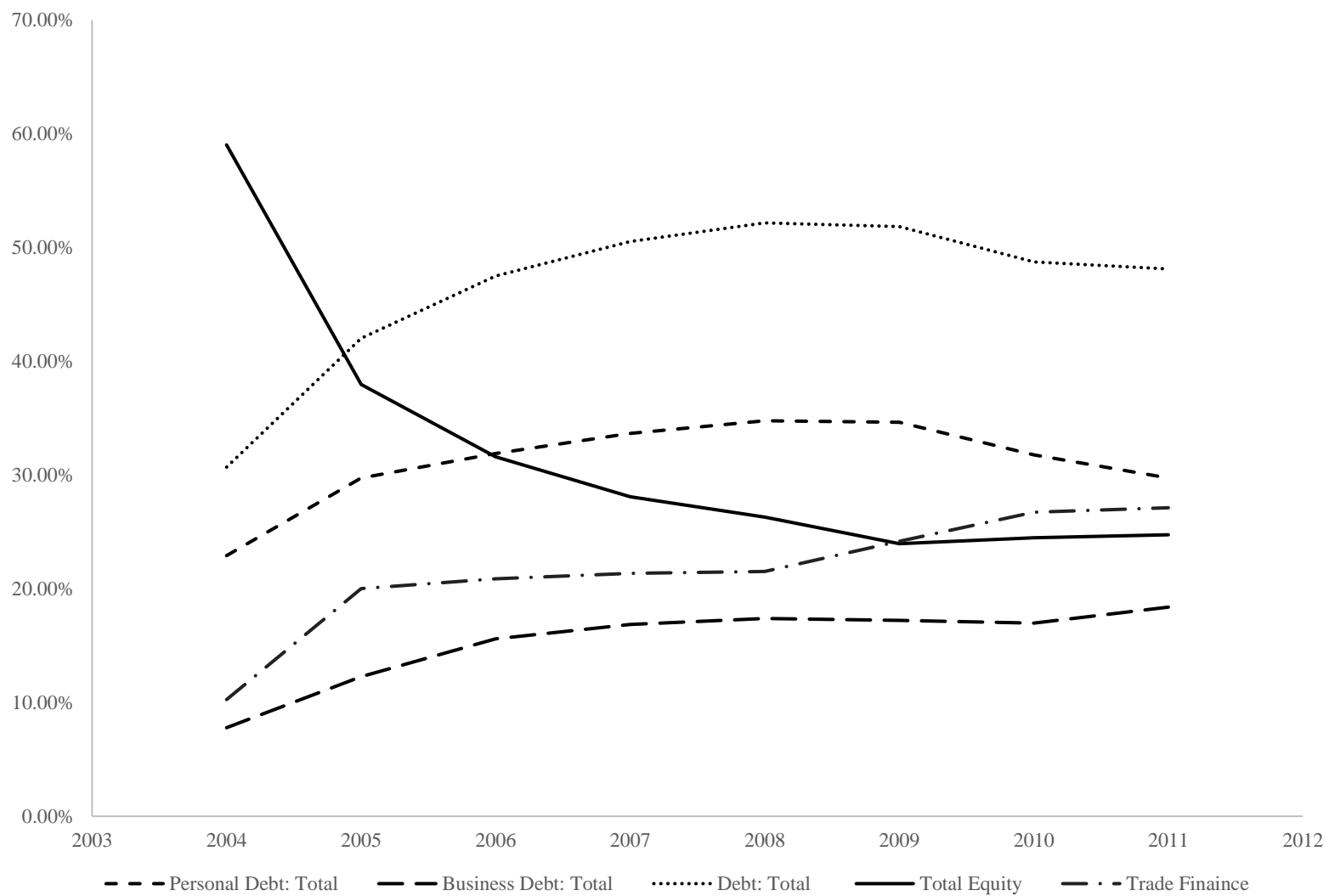


Figure 3

### Personal Debt Injections

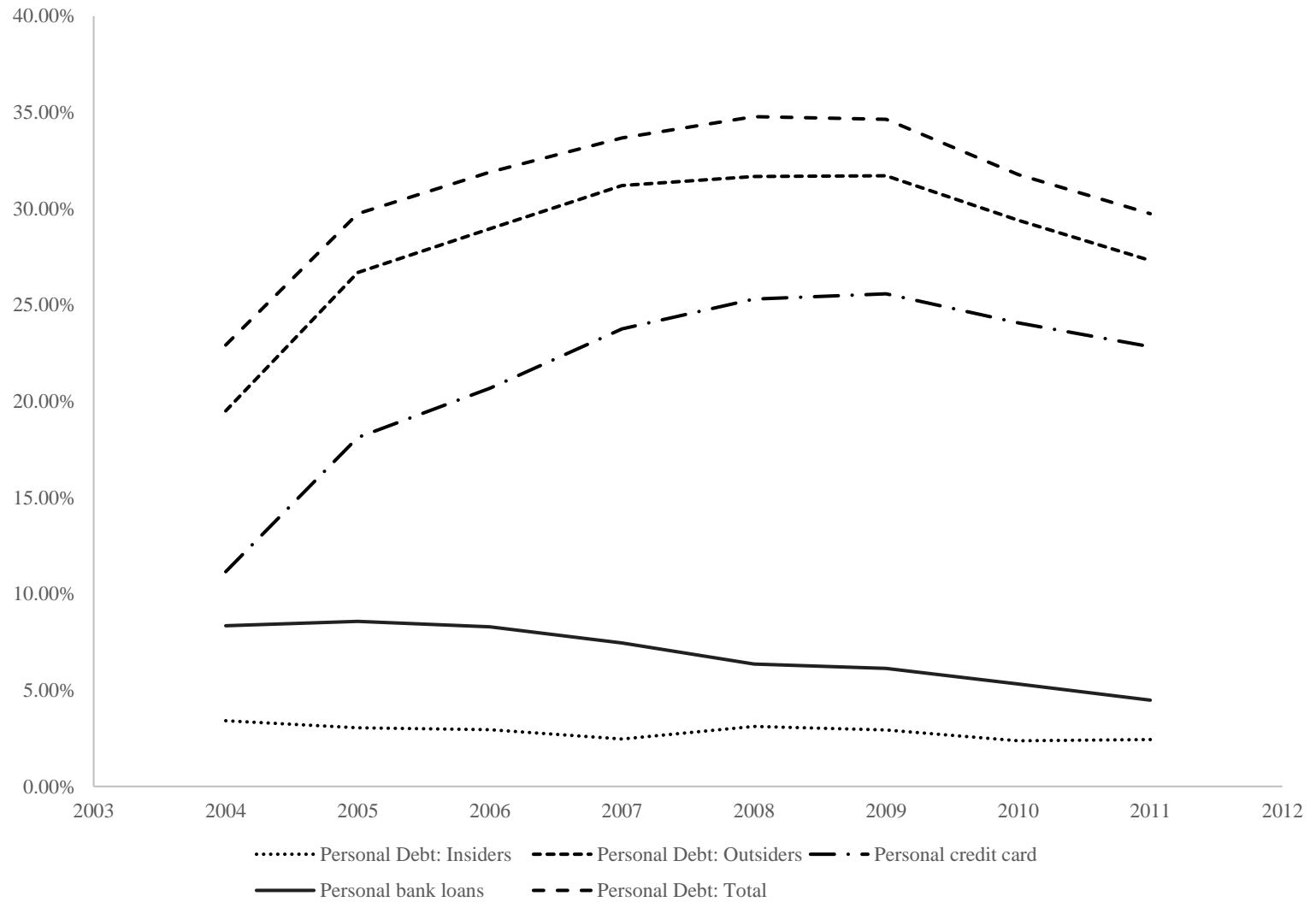


Figure 4

### Business Debt Injections

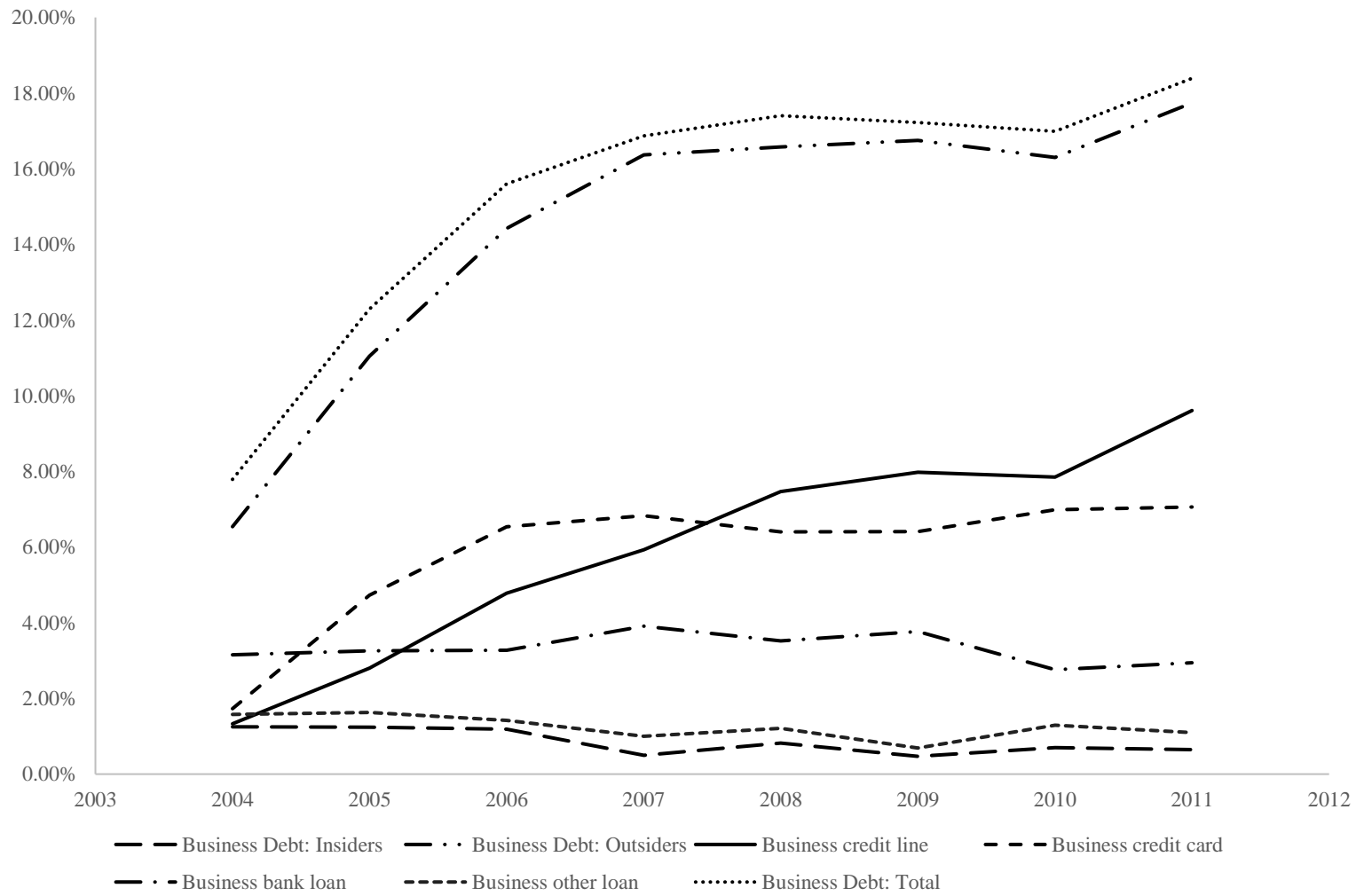
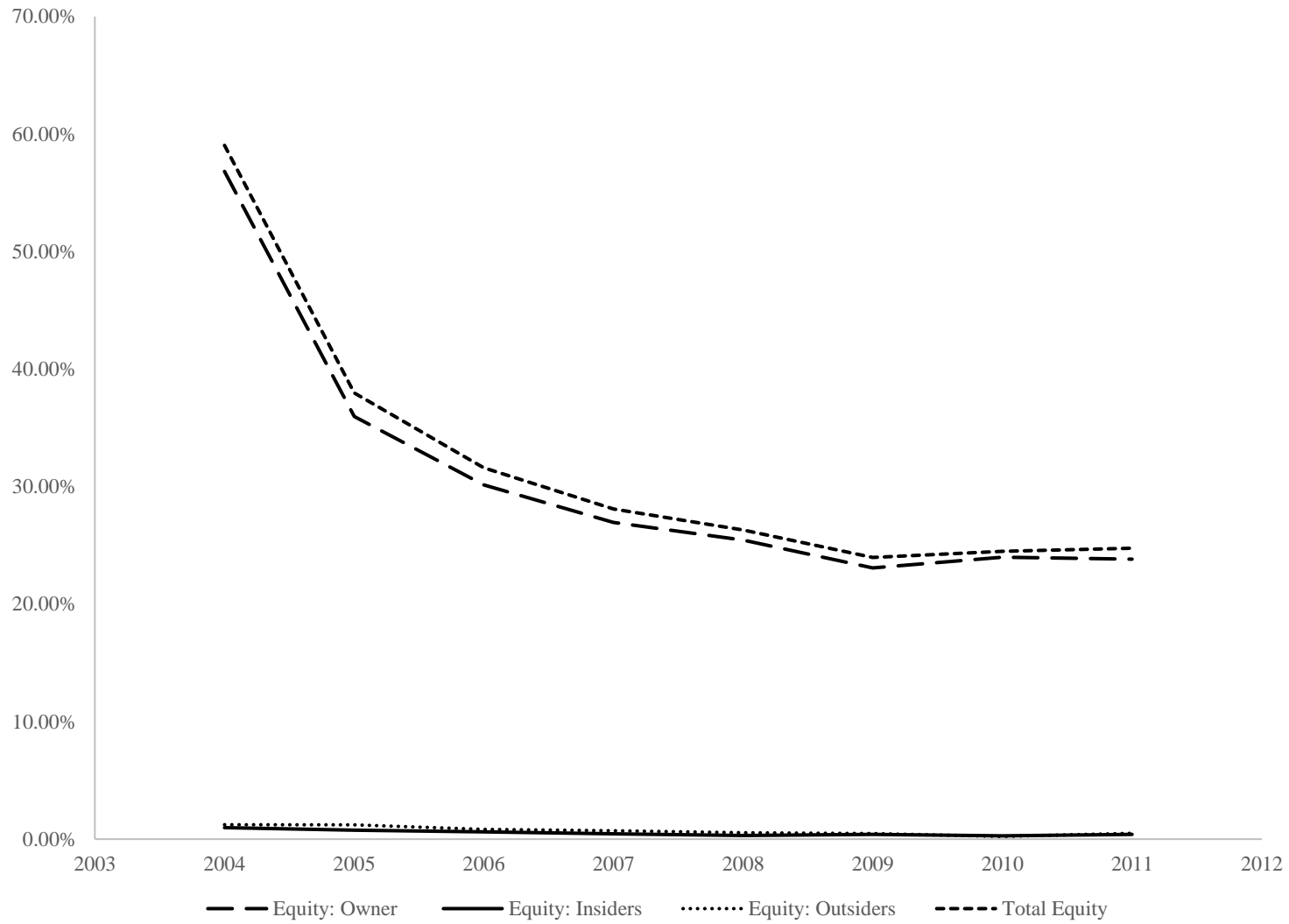


Figure 5

### Equity Injections



**Table 4 Determinants of financial capital injections****Panel A: Personal Debt**

	Insiders	Outsiders	Credit Cards	Bank Loans	Total Personal Debt
R&D activity	0.093***	0.063***	0.053***	0.127***	0.065***
Firms with IP rights	-0.008	0.035*	0.035*	0.047	0.026
Credit risk	0.030**	-0.013	-0.006	-0.026*	-0.006
Tangible Assets	0.118***	0.194***	0.111***	0.334***	0.204***
Sales (Ln)	0.001	0.016***	0.014***	0.012***	0.014***
Information proxy	0.029	-0.002	-0.006	0.003	0.011
Home-based	-0.227***	0.006	0.027*	-0.163***	-0.034**
Profitability	-0.2531***	-0.1659***	-0.1295***	-0.2472***	-0.1908***
Team	-0.224***	-0.064***	-0.104***	0.086***	-0.109***
Work experience (years)	-0.004***	-0.007***	-0.006***	-0.007***	-0.007***
Education	-0.058**	-0.032**	-0.045***	-0.001	-0.038**
Gender	0.036	-0.028	-0.041**	0.095***	-0.025
White	-0.187***	-0.002	-0.036*	0.086**	-0.038*
Constant	-0.620***	-0.125**	-0.188***	-1.069***	0.003

\*\*\*, \*\* and \* indicate that the coefficient is statistically different from zero at 0.01 , 0.05 and 0.10 levels.

**Table 4 continued**  
**Panel B: Business debt**

Type of Business Debt	Insiders	Outsiders	Credit line	Credit Card	Bank Loan	Other loan	Total Business Debt
R&D activity	0.101**	0.093***	0.075**	0.062***	0.090*	0.120***	0.098***
Firms with IP rights	0.027	0.051**	0.110***	0.041**	-0.057	0.009	0.045**
Credit risk	0.014	-0.077***	-0.100***	-0.030***	-0.109***	0.017	-0.067***
Tangible Assets	0.040	0.154***	0.051	0.051**	0.472***	0.101***	0.152***
Sales (Ln)	0.002	0.023***	0.034***	0.012***	0.015***	0.009***	0.020***
Information proxy	0.015	-0.108***	-0.118***	-0.071***	-0.085*	0.010	-0.088***
Home-based	-0.136***	-0.192***	-0.361***	-0.018	-0.422***	-0.150***	-0.196***
Profitability	-0.159***	-0.049***	-0.096***	-0.006	-0.126***	-0.128***	-0.060***
Team	0.018	0.04**	0.083***	-0.038**	0.105**	0.035	0.035*
Work experience (years)	-0.002	0.001	0.002*	-0.001*	0.001	0.001	0.001
Education	-0.019	-0.019	-0.014	-0.004	-0.045	-0.029	-0.021
Gender	0.126***	0.124***	0.158***	0.044**	0.130**	0.134***	0.128***
White	-0.112***	-0.034	0.001	-0.088***	0.096	-0.050	-0.038
Constant	-1.189***	-0.501***	-1.072***	-0.516***	-1.570***	-1.171***	-0.438***

\*\*\*, \*\* and \* indicate that the coefficient is statistically different from zero at 0.01 , 0.05 and 0.10 levels.



**Table 4 continued**  
**Panel C: Equity, total debt and trade finance**

	Total Equity	Equity: Owner	Equity: Insiders	Equity: Outsiders	Total Debt	Trade Finance
R&D activity	0.199***	0.190***	0.023	0.141**	0.097***	0.064*
Firms with IP rights	0.120***	0.093***	0.193***	0.243***	0.024	0.022
Credit risk	0.134***	0.136***	0.019	0.001	-0.053***	-0.053***
Tangible Assets	0.083***	0.079***	0.036	-0.025	0.279***	0.004
Sales (Ln)	-0.032***	-0.032***	-0.004	-0.004	0.025***	0.079***
Information proxy	0.099***	0.098***	0.072	-0.078	-0.044	-0.175***
Home-based	0.033	0.050**	-0.110***	-0.418***	-0.139***	-0.282***
Profitability	-0.408***	-0.392***	-0.250***	-0.388***	-0.190***	-0.028
Team	0.093***	0.050**	0.325***	0.535***	-0.068***	0.044
Work experience (years)	0.002*	0.002*	-0.004**	-0.001	-0.008***	0.006***
Education	0.029	0.023	0.021	0.039	-0.046**	-0.323***
Gender	-0.039	-0.050*	0.010	0.300***	0.037	0.186***
White	-0.115***	-0.118***	0.001	0.069	-0.035	0.212***
Constant	-0.102	-0.132**	-1.396***	-2.156***	0.189***	-1.434***

\*\*\*, \*\* and \* indicate that the coefficient is statistically different from zero at 0.01 , 0.05 and 0.10 levels.