

The Relationship between Sources of Financing and FinTech Growth and Success: Evidence from UK and German FinTech Firms.

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#### **Preface and Acknowledgements**

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#### Abstract

This study examines the relationship between several common sources of equity/debt financing and the development and success of financial technology startups (also defined as Fintech). Fintech startup development is measured by the growth in the number of employees, operating revenues and P/L before Tax. Furthermore, Fintech startup success is proxied as top performance of industry peers based on operating revenues, P/L before tax, as well as medium-term performance. The empirical model is tested on a large dataset of 3,255 firm-level observations of active firms from UK and Germany. The data is gathered from the Orbis/Amadeus database (European subset of Orbis database) and CB insights site, from where firms are selected based on being incorporated year between 2006 and 2015. The results suggest that the relationship between various financing source and Fintech firm development is not strongly significant, except for foundation and research institute funding in terms of operating income growth, mutual and pension fund in UK subsample. Overall, the findings imply that besides financing sources, other resources like technology input are also required for financial technology firms' growth and success.

Keywords: Fintech, financing sources, growth, success, innovation, technology.

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#### 1. Introduction:

The importance of entrepreneurship has been growing with the constant development of technology. Especially since the beginning of the 21<sup>st</sup> century, technological progress has been merging with financial services sector. Originally, the term Fintech defined as technology applied to the back-end of established consumer and trade financial institutions. Starting from the end of first decade of the 21<sup>st</sup> century, the term has expanded to include any technological innovation in the financial sector, including innovation in financial literacy and education, retail banking, investment and even crypto-currencies like bitcoin. A research report from The Deutsche Bank (Dapp et al., 2014) illustrates the Fintech movement as "Fintech is the term that has now become established to describe the digitalization of the financial sector, mostly internet-based technologies in the financial sector." Kanzler (2015) shows that the Fintech market relates mainly to small start-up companies which develop innovative technology solutions, aiming to 1) replace the institutions complete value chain for a specific product or service, 2) replace part of the banks value chain by a new approach of doing things, however, the impact on the banks revenue is less severe since Fintech companies still have to reply on the banks, 3) stand between bank and customers, offering tools and services that aim to improve the customers banking experience. These criteria are used during the sample formulation process.

Furthermore, the term financial technology can apply to many innovations in how people transact business, from the invention of money to double-entry bookkeeping. Since the Internet revolution and mobile Internet revolution, what is more, financial technology has grown rapidly, and Fintech, which originally referred to computer technology applied to the back office of banks or trading firms. Now describes a board variety of technological interventions into personal and commercial finance. Essentially Fintech is any kind of technological innovation in the financial sector, ranging from wealth management leading, payment, regulatory technology, software, and block chain. Below is a couple of examples of Fintech: 1) the mobile-only stock trading app, which charges no fees for trades. 2) Mobile payment. 3) Consumer banking 4) Online personal finance management 5) Budgeting tools. 6) Peer-to-peer sites like Prosper and Lending club promise to reduce rate by opening up competition for loans to board market force.

Technological progresses have continuously transforming the financial sector. As the world's largest user of IT products and services, finance stands to benefit from new generations of processing, storage, mobile and authentication technological as well as social networks, artificial intelligence or distributed systems. New business model are merging that could help turn our single financial services market into practical reality - one where the relationship between customers and suppliers is no long restricted by physical distance or even linguistic difference. One example here is: P2P lending companies can eliminate interest rate risk, credit risk as well as the risk of protecting people's capital. Instead of earning the interest spread, P2P lending platform charge a commission fee for matching the lenders and borrowers. The Economist 2014 shows that loan volumes have passed the \$1.7 billion mark in UK in 2014 and in US loan volumes increased from \$871 million in 2012 to \$2.4 billion in 2013. Wennekers and Thurik (1999) ascertain that the importance of entrepreneurship derives from the need for structural changes that is induced by technological advancements such as those in the late twentieth century. On the other hand, their new product and services also have a lasting impact on our day-to-day life. Some successful stories include firms like Social Finance, Billguard, Square and so on.



(Figure 1: Quarterly Financing Trends. Source: CB insights.)

A report from Accenture (2014) shows that the worldwide investment in Fintech has grown three times for the last five years. Besides, another survey made by CB insights

shows that if the current run rate holds steady in Q4'2017, global Fintech investment dollars and deals activity could top new highs in 2017. Moreover, a report from CB insights also indicates that UK and Germany have contributed more than half of the EU's Fintech development, which is the starting point of this paper.

The aforementioned examples have gained much attention in the financial sector. But how did these companies get there in the first place? How did these companies achieve their growth in both short and long run? This raises the question of who helps these companies to realize such quick growth. Berger & Udell (1998) show that small firms commonly use a multitude of debt and equity financing sources. Next to principal owner finance, small firms frequently obtain financing by venture capitalists, business angels, commercial banks, financial companies, or through trade credit, among others, although the effect of these well-known financing sources is vast, it is vague that among these options compare to each other in effectiveness and specifically regarding to the Fintech setting.

# What is the effect that different sources of financing have on the development on financial startups?

Carpenter and Petersen (2002) examine the relationship between financial constrain and small firm growth. They find that firms with highest degree of financial constrain exhibit a 1 to 1 relationship between internally generated funds and growth, which shows the importance of external capital in the growth process of small firms. A number of studies (Croce, Marti & Murtinu, 2013; Baum & Silverman) have proven that venture capitalists are commonly regarded as the most active financial intermediary with the highest direct impact on startups performance. However, there are many others investors can similarly improve a startup's chance of survival, successful exit and result in a higher growth in the future. Dutta & Folta (2016) have found that when financing by business angels is studied in liaison with venture capital financing, the effect of venture capital investment becomes less pronounced, which rises more interested on this particular topic. Besides private equity financing, small firms access multiple sources of debt financing (Berger & Udell, 1998). Ayyagari, Demirguc-Kunt and Maksimovic (2010) show that formal bank financing is associated with faster firm growth than financing from alternative channels in their sample of Chinese firms. On the other hand, Campello (2006) argues that debt van hurt firm performance if firms are overleverage, this is not hard to imagine since the degree of financial constrain increases as firms increase their leverage.

This study tests the previous literature by simultaneously examining the effectiveness of several common sources of equity and debt financing for the development and success of startups. In this study, startup development is measured as in the number of employee, operating income and PL before tax. Startup success on the other hand, is proxied as top performance of country-industry peers based on operating income and PL before tax as well as medium-term survival. The empirical model is tested by means of a cross-sectional study of large dataset of 3255 firm level observations of active firms from UK and Germany, with a focus on financial technology start-ups. The data is collected from Orbis database, from where the sample period was formulated between 2006 and 2015.

The findings show the relationship between the selected financing source and Fintech development and success is not statistically strong enough, except for foundation and research institute, mutual and pension fund and banking financing in terms of above median performance in full sample and UK subsample analysis. On top of that, the supplementary analysis produces evidences that using more financing sources does not necessarily result in higher growth and higher probability of achieving superior growth compared with their peers. However, results imply using more external financing decreases financial flexibility and possibly increase cost of using external financing. Furthermore, a liquidity shock decreases the probability of a firm achieve above-median performance.

The main contribution of this study is to extend the existing literature on entrepreneurial finance by testing the effectiveness of many different financial technology startups financing sources. By establishing the link between several sources of financing and development as well as success of startups, I believe that this study can be relevant for entrepreneurs, regulators as well as investors. To begin with, the entrepreneurial manager will benefit from understanding the consequences of each financing source on the performance of their own company, and based on their preference, to choose the best-fitted sources of funding. Policy maker can preserve financial stability and guarantee fair market that serve investors and consumer interest by identifying financing sources worth of subsidization. Last but not the least, investors can gain insights of startups that have more future potentials so that they can provide them with funds.

The remaining of this paper is organized as follows. Section 2 provides a literature review theoretical as well as empirical literatures. In the later part of this section a hypothesis is motivated and formulated. In Section 3 described the empirical methodology, definition and measurement of each variable, and other relevant information. Section 4 demonstrates the process of sample selection and statistical summary. Section 5 displays a comprehensive discussion of the results of main and supplementary analyses. Section 6 discusses the drawback and questions for future research on this topic. Section 7 concludes the study.

#### 2. Literature review

#### 2.1 Theoretical literature review

#### **Dependent variable**

When it comes to startup development and success, the academic world has identified a large number of factors that causes variation in the cross-sections. Vesper (1990) has mentioned the right time, place, education and experience, working with partner, starting with greater capital, and applying better management practices as being critical success factors for entrepreneurs. Moreover, Teece (1986) explores in the circumstance under which innovating firms can profit from their innovation and stresses the fact that firms need to be able to acquire complementary assets and capabilities to leverage their innovation. It is not uncommon that timing plays a critical role in this process and since young firms are unlikely to process all of these assets and capabilities in-house, they most likely need to search for them outside of the company. Financially more constrained firms are less likely to acquire the necessary assets and capabilities thus more likely to fail. A critical feature in this process is financial resources of the company. This implies that while that the financial situation of a new startup will not predict its success, but regarded as an important variable along the way.

Many studies point out that the employment data is a commonly-used approach to study young firm development, which is due to the fact of observability. (Davila et al., 2003; Keer, Lerner & Schoar, 2014; Engel, 2002; Colombo & Grilli, 2010; Baum & Silverman, 2004). On top of that, Davila et al. (2003) find that employee growth is significantly positively related to changes in equity valuation and therefore may serve as a proxy for young firm development. Furthermore, other researchers propose to use growth of total or partial productivity (Croce et al, 2013), and profitability is also suggested as one of the commonly used proxy (Fu, Ke & Huang). Baum&Silverman (2002) even come up with the growth in R&D expenditure, since technology is the one of the key driver for technological driven firms. Furthermore, other researches also deliver results that revenue growth or asset growth can be used as proxy to development.

New venture success on the other hand, is typically measured by firm survival rates (Kerr & Nanda, 2009; Kerr et al., 2014; Baum &Silverman, 2004; Holtz-Eakin, Joulfaian & Rosen, 1994.) Once again, Baum&Silverman (2002) suggest innovation expenditures measures should be used when it comes to the success of technology-based firms. More specifically, the relevant measures are patenting rates, forward citation rates and commercialization rate and so on. A positive effect on growth rates is further shown in a study of German VC-backed firms between 1991 and 1998 (Engel, 2002). While firm growth can be regarded as a form of success in some way, several studies have taken a step further to measure the impact of VC financing on firm success. Chemmanur et al. (2011) observe that efficiency gains associated with VC investment positively affect the probability of a successful exit. Other measures of new ventures for instance include the occurrence of an initial public offer or the successful exit of the investor (Chemmanur, Krishnan&Nanday, 2011).

# **Independent variables**

How business is financed has become one of the most fundamental questions of enterprise research. Due to the fact that not all private firms have their data available and dataset is not always complete, the source I can collect relevant data is limited. However, many researchers have conducted their study based on only balance sheet data on debt and equity level or cash flow data of firms to study the impact of external financing source. Next, I will exhibit some findings from several commonly used financing sources from previous literature.

To start with, Kakati (2003) finds that resources-based capabilities as well as competitive strategy are the most important determinants of new venture success. Qualifying criteria are assumed to be equally important as winning criteria, but should be recognized as a competitive necessity rather than a real differentiator. Furthermore, financial capital is one of necessary resources required for enterprises to form and subsequently operate. The relationship between financing of new business has important implication for the economy, given the role that new enterprises play in employment growth, competition, and innovation and export potential (Denis, 2004).

CB insights (2017) shows that the number of VC-backed Fintech companies is much higher than other financing sources backed Fintech companies, moreover, the trend to VC-backed Fintech companies has experienced a steady growth. On top of the positive of offering the startups financial capital, some intermediaries also provide them with additional services. Croce et al. (2013) prove that venture capitalists can have extra value add, which include providing strategic advices, connecting the venture with specialized expertise and perhaps suggesting personnel to take on a role in the new venture. On the other hand, the decision made by VCs regarding to where to allocate their fund can have impact on the growth of target firm. Hochberg et al. (2007), who suggest the following can result in a higher growth for firms: 1) VCs invite others to co-invest in their promising deals in the expectation of future reciprocity, 2) VCs tend to have investment expertise that is both sector-specific and

location specific. In addition, Bertoni et al (2011) find that VC investment positively impact on firm growth most strongly growth in the number of employees. Hellmann and Puri (2000) find that VC investment leads to a significant reduction in time to market for startup companies. Dutta and Folta (2016) find that VC is able to achieve more impactful innovation and successfully exit than other financing sources.

Ayyagari et al. (2010) argues that firms using formal bank financing grow faster than firms using alternative channels of finance. In their study, a panel dataset of 2400 Chinese firms from 1999 to 2002 shows that firms that obtained bank financing show higher profit reinvestment rates and productivity growth that is at least equal to firms that are financed from non-bank sources. On the other hand, Campello (2006) debt can also hurt performance depending on the level of debt, he finds that a certain level of debt results in underperformance, mainly due to cost of capital gets too higher and firm experience less financial flexibility. Moreover, Kotey (1999) notes that many owner-managers do not wish to use long-term debt finance. It is general assumed that business owner adopt a peck-order of financial preference where they use personal finance and funding from family and friends, then banks, before approaching equity and debt sources.

Mazur et al. show (2016) that research institute funding is an important source of funding that research funding is further evaluated and publicly acknowledged to assess whether goals are being achieve. A report from Research Councils UK indicates the importance of research funding on creating and sharing new knowledge and innovation, moreover, it adds value to individual with some key activities and success from the past year.

Besides, another common sources of financing used by small firms are identified by Berge and Udell (1998), which is trade credit. Petersen & Rajan (1997) use their 1987 sample of U.S firms to identify which firms are users and providers of trade credit. In their sample, one category of firms that is frequently offered trade finance is firms that are growing, irrespective of their profitability. The authors find that firms are healthy, firms that are financially constrained and firms with either extremely high or low profits are among the heaviest user of trade credit. Cook (1999) finds that trades debt can help firms to overcome capital market imperfections. In her research work, she observes that trade credit acts as a signal to reduce asymmetric information by signaling credit quality to banks.

Maury (2006) shows that the performance of family controlled firms in comparison to non-family controlled firms, exhibit higher valuation and higher profitability, however, this relationship is compromised by control level of the family shareholder. Lower control levels are associated with higher valuation, vice versa. Their results can be interpreted as in active family control increasing profitability/revenues, while passive control does not. Andres (2008) provides supplementary evidence that family-controlled firms are more profitable than other firm with other type of shareholder in his sample of 275 firms listed on the Frankfurt Stock Exchanges. To be mentioned here, his study is also in line with previous studies, which confirm that the superior performance of family-controlled firms is driven by active involvement of the family as CEOs or board members.

Similar opinions can be found from the relationship between institutional investor involvement and performance of startups. Cornett, Marcus, Saunders and Tehranian (2007) find that investor involvement has a positive impact on operation cash flow return, but this relationship holds for pressure-insensitive investors, who have any existing or potential business relationship with the firm they invest in. this nomenclature of institutional investor type can traced back to Brickley, Lease and Smith (1998), who mention deduce that ongoing business relation may hamper the investor's ability to monitor the firm. Since research on the performance of less common sources of small business finance is rather sparse, I suggest to use theoretical arguments from above-mentioned works to develop my hypothesis in the next section.

On top of what have been discussed. Smalibone (1990) investigates the cause of business failure in the UK using a survey-based sample of consulting client. The ack of revenues as well as undercapitalization were named by the failed business are the main reasons of failure. Furthermore, Gaskill, Van Auken and Manning (1993) research the root cause for small business failure in the US retail industry. They find that, besides managerial planning, lacking of working capital management is another major causes of small business failure.

# **Development of FinTech**

Financial institutions are exposed to rapid changes over the past thirty years as technological innovation is gradually being realized. These technological changes are related to the emerging the IT infrastructure. However, Zilgalvis (2014) mentions that Europe's innovation finance ecosystem lacks scale, plurality, and risk appetite. Furthermore, he also argues that these novel approaches may be held back by regulations that focus on stability, avoiding forum shopping, and preventing fraud, to exclusion of other interest, particularly ignoring innovation and renewal.

On top of that, Cuesta et al (2015) find in their study that there are 3 phases an institution has to go thorough in order to successfully transfer toward digital banking or financial services in general: 1) respond to new competition, 2) technological adaption and 3) strategic position. More specifically, Cuesta et al (2015) argue that before the technology investment turn to be profitable, firms have to a new digital channels and products involve complex new system have to be integrated with previous infrastructure. Moreover, these integrations have to be adapted to comply with regulatory requirement imposed by local, nationwide and supra-national authorities. Furthermore, it is not very clear how long these phases last, there is lacking evidence to suggest the financing sources will directly result better growth through innovation either.

#### **New Financial alternatives**

Besides aforementioned financing sources, a couple of new financing sources are proposed by Garry et al (2014). They argue that entrepreneurial financing is rapidly evolving, whether in developed or developing economies, entrepreneurs combine traditional debt and equity start-up finance with microfinance (Khavul, 2010), crowdfunding (Schwienbacher, Belleflamme & Lambert, 2013), peer to peer lending and other financial innovation (Moenninghoff & Wieandt, 2012) to exploit opportunity they identify but for which more traditional financing is not readily available. However, due to data availability this study is not able to cover them.

#### 2.2 Hypothesis formulation:

In previous section I have outlined the general information about different financing sources and their potential impact on firm growth and success. Based on the aforementioned theoretical gap I develop the relevant hypothesis to this study. This paper aims to assess collectively the relative effectiveness of various financing sources on Fintech's development and success. The industry control is added in this case to difference out the industry average due to the fact that multiple firms operate in one industry can compromise the generalization of results.

#### **Hypothesis:**

**Hypothesis 1.1**: Fintech growth tends to be higher for firms that are venture capital backed.

**Hypothesis 1.2**: The effectiveness of different sources can be revealed by comparing different coefficients.

According to previous literatures, I assume venture capital financing to be the most effective compared to the rest. Berger and Udell (1998) point out that commercial bank debt represents the second most important source of capital for small business. This can represent that bank debt can be seen as a competitive source that might have significant impact on startups' growth. Formal bank financing is found to be associated with faster growth than alternative channels of financing, including trade credit (Ayyagari et al., 2010). Moreover, Maury (2006) and Andres (2008) found that family controlled firms are more profitable than widely-held firms and firms with another type of shareholder.

**Hypothesis 2.1**: the probability of success measured by the performance relative to industry peers is highest for firms that are venture capital backed.

**Hypothesis 2.2**: the probability of success measure by above-medium performance is highest for firms that are backed by public or government authorities.

The previous hypothesis can be translated into the hypothesis relating financing source with firm success with the same underlying reasoning. The firm success is defined by being top performance, as well as above median performance in terms of operating income. Due to the reason that different investors apply various investment strategies in accordance to the riskiness of projects, hypothesis 2.1 and 2.2 merely aim to assess the effectiveness of different financing sources. However, public or government authorities are more likely to keep the venture they invest running after the investment, this can addressed to public authorities tend to remain their reputation or sever political consequences. Therefore I come up with hypothesis 2.2.

**Hypothesis 3**: Fintech with more than one financing sources tends to exhibit higher growth relative to Fintech uses merely one financing source.

Whether or not using more than one financing source contribute higher growth on Fintech has not been tested before, hypothesis aims to investigate the relationship ad impact. Beck et al. (2002) find financing constrains represent a significant obstacle to growth, especially for small firms. Firms that appear to be most constrained exhibit a 1-1 relationship of internal funds and growth. Less constrained firm however, are not limited by internal finance to pursue their potential growth. Based on this finding, I come up with the following hypothesis: degree of financially flexibility has impact on firm growth, this is proxied by the number of financing sources that one firm uses.

**Hypothesis 4.1**: The effect of financing sources of Fintech growth is compromised by if the startup faces a liquidity shock.

**Hypothesis 4.2**: The effect of financing sources of Fintech success is compromised by if the startup faces a liquidity shock.

I define additional hypothesis that are motivated by Smalibone (1990) and Gaskill et al (1993), who identify the root cause of small business failure to be undercapitalization and insufficient working capital, therefore the hypothesis 4.1 and 4.2 are related to the effect of liquidity shock. Although a liquidity shock does not necessarily lead to bankruptcy if the affected firm is able to obtain funding source for its short-term financial obligation,

### 3. Methodology

#### **3.1** The empirical models

# I. Testing for an effect of firm growth

 $Growth_i = \alpha_0 + \beta_1 * C_i + \beta_2 * Fin_i + Error Term_i$ (1)

 $Growth_i = average growth in employee count, operating revenue, P/L before tax for firm i in 5 years.$  $C_i = Control variables (asset growth)$  $Fin_i = Financing source dummy variables.$ 

The model displayed above is used test hypothesis H1.1 and H1.2. In order to do so I regress all measures of firm growth (number of employees, P/L before tax, operating revenues) in separate regressions, together with a dummy variable indicates which financing source that one Fintech uses. Control variable including, asset growth. The intercept  $\alpha_0$  controls for firm fixed effect. Industry variation is controlled as well. Therefore by comparing the coefficients of all different financing sources dummies, their relative effectiveness can be revealed, a statistical significance level helps to identify if one financing source relates to firm growth.

# II. Testing for an effect on firm success

$$Success_i = \alpha_0 + \beta_1 * C_i + \beta_2 * Fin_i + Error Term_i$$
 (2)

Where:

Success<sub>i</sub> is a dummy variable that indicates successful firms in term of being in top performance quartile (in terms of average operating revenues, P/L before tax) of country peers during the 5 years operation

 $C_i$  = Control variables (including asset growth)  $Fin_i$  = financing source dummy variables.

In order to test hypothesis 2.1, I regress both measures of firm success based on relative performance on the same dummy variable that indicating financing sources as mentioned in previous regressions. The purpose of using two measures of success

measures is to keep the results more robust. The same controls and assessment method are used as in the previous regression.

# III. Testing for hypothesis 2.2

Success<sub>i</sub> <sup>survival</sup> =  $\alpha_0 + \beta_1 * C_i + \beta_2 * Fin_i + Error Term_i$  (3)

 $Success_i \ ^{survival} = dummy \ variable \ indicating \ successful \ firms \ in \ term \ of \ survival \ (above median quantile). For instance, firms at least 5 years consecutive years of data after incorporation and status "active" after years.$ 

Hypothesis 2.2 are tested by a model that is very similar to the model used to test hypothesis 2.1. Except this model regress an above median performance measure of firm success on a dummy variable that indicates the financing sources. To be mentioned, I only include active firms in my regressions.

## **IV.** Testing hypothesis 3

 $Growth_i = \alpha_0 + \beta_1 * C_i + \beta_2 * Fin_i + \beta_3 * FinDivsity_i + Error Term_i$  (3)

Where:

Growth<sub>i</sub> = 5-year average growth in employee count, operating revenues, or P/L before tax for firm i

FinDiversity = dummy variable equal to 1 when the number of different financing source used by firm i is large than 1, otherwise 0.

The aforementioned model allow to conduct further analysis (Hypothesis 4) by adding one dummy variable, which indicating the financial constrains level of a firm. When FVar<sub>i</sub> is equal to 1 when firm i uses more than one type of financing source therefore indicates that sample firm is relatively less financially constrained compare with the rest. On the other hand, FVar<sub>i</sub> is equal to 0 when firm i uses merely 1 type of financing source therefore indicates that sample firm is relatively more financially constrained compare with the rest. This hypothesis is based on Becket al. (2002), whose study find financial constrains represent a significant obstacle to growth, especially to small firms. Once again, I observe the statistical significant of the coefficients in this model.

# V. Testing hypothesis 4.1 & 4.2:

 $Growth_i = \alpha_0 + \beta_1 * C_i + \beta_2 * Fin_i + \beta_3 * LiqShock_i + Error Term_i$  (4.1)

*Growth*<sub>i</sub> = average growth in employee count, revenues, or EBIT for firm i between year X and X+3.

 $LiqShock_i = dummy$  variable that is equal to 1 if firm faces a liquidity shock within the first years of operation, otherwise 0.

In this regression aims to test whether or not the effect of sources of Fintech financing on firm growth is compromised by a dummy variable which says the firm faces a liquidity shock. Compared with models in I, II and III, this one adds an interaction term, which is used to investigate whether or not the liquidity variable would compromise the relationship of financing sources. To define the liquidity shock: if firm i experiences an average decrease of current ration, then Liqshock<sub>i</sub>=1, otherwise 0. The coefficients indicates if this hypothesis is significant or not.

Success<sub>i</sub> = 
$$\alpha_0 + \beta_1 * C_i + \beta_2 * Fin_i + \beta_3 * LiqShock_i + Error Term_i$$
 (4.2)

Success<sub>i</sub> =Dummy variable indicating successful firms as mentioned in II and III. LiqShock<sub>i</sub> = dummy variable that is equal to 1 if firm faces a liquidity shock within the first years of operation, otherwise 0.

The aforementioned model tests if liquidity shock would moderate the effect of source Fintech finance on firm success. All three measures of firms introduced earlier will be tested separately. To be mentioned, same as regression 4.1, the coefficients of the interaction term will indicate if this hypothesis is valid or not. Moreover, comparing coefficients reveals statistical significance in order to conclude.

#### **3.2 Definition of variables**

# Dependent variables

The dependent variables of this paper are measures of firm growth and measures of firm success. The way this paper measures firm growth is motivated by Davila et al (2003), Keer et al., (2014) and Baum & Silverman (2004), whose work use employee data as a measure of firm growth. However, the problem of lacking of financial data of small firms points to other measures of firm growth, which are employing operating revenue and P/L before tax of a Fintech. This study extends the applicability by testing all these three measures.

On the other hand, firm success is proxied in two ways. First of all, successful firms are these that are able to stay in business at least three years after establishment, and their profitability stay above 75% quartile compared to the peers. Keer and Nanda (2009) use a similar approach and distinguish between churning industry entry (survival of max 3 years) and long-term entry (longer than 4 years). Although this survival perspective is a natural start, mere survival does not distinguish good performance venture from bad ones. Therefore, the variable which measure profitability of a firm compared to its peer is necessary. This variable is calculated for operating income that is estimated for the first 5 years of operation for every firm. These values are ranked and firms are subsequently categorized as being successful or not, if they belong to the top 75% quartile compared to their peer.

#### Main independent variable

The main independent variables in this paper are dummy variables that indicate financial sources that are used by a firm. Most of them are directly gathered from the Orbis databade. The preliminary sources of equity financing are: venture capital (VC), private equity (PE), bank and financial companies (BE, FI), public or States, governmental authorities (PA), mutual or pension fund (MF), individual or family (IF), self-ownership (SO) and other ownership (OO). These financing sources are be clustered into several categories. I include public or governmental authorities in this paper in order to see if there are some statistical differences between more profitdriven investor and them (One of the hypothesis). Mutual and pension funds are a valuable type of institutional investors in this study since they fit the definition of pressure-insensitive investors by Brickley et al. (1998), which means unlike pressure sensitive institutional investors, they are more concerned about the value of their own investment and pressured management to change firm's strategy, therefore, they should be tested as one category. Self-ownership is considered as one category in this study is due to the following reason, the providers of finance also have impact on fund received firms' strategy, or to a certain extend are involved in their business. The last category contains the rest, unnamed shareholders, research institutions and others. To be mentioned, in this study, all independent variables fall into at least one of the aforementioned categories.

#### **Robustness check**

Performing a robustness check ensures how certain core regression coefficient estimates behave when the regression specification is modified by adding or removing regressors, or a subsample analysis. In this section, a robustness checks is proposed to confirm the main findings of this paper. The robustness check contains the following methods: (I) alternative measure of firm growth and success, growth of profit margin and top performance of profit margin; (II) I rerun regression (1)-(3) analysis with an expansionary of sample period of 10 years, (III) sub-sample regressions based on Germany and UK.

## 4 Sample & Data description

#### 4.1 Sample selection

The data used in order to answer the proposed research questions is collected from Orbis/Amadeus database (which is provided by Bureau Van Dijk) and CB Insights site. Orbis database provides 79 million companies worldwide in the past 10 years both financial and non-financial data on publicly and privately owned business worldwide and is therefore ideal for research on entrepreneurial companies and startups. CB insight provides specific Fintech startups financial data, including their

financing sources and performance, which serves as complementary site for Orbis dataset. The focus of this paper is on the relationship between financing sources of Fintech companies on their development and success. Mostly of these companies are held privately on their early stage, therefore I have selected the following legal forms: private limited companies, partnerships, and sole traders/proprietorships, which represents 1) a business that has a single owner who is responsible for making decision for the company 2) two or more individuals who share the responsibilities of running the companies. Moreover, these legal structures are generally suited for a personal business in which you are the only one who has invested. Unlike a company, the legal person is separated from it owners. Furthermore, since U.S firms are more frequently studied by other studies, I have formulated my sample based on UK and Germany, which have contributed more than half of Fintech funding in EU (CB Insights, 2017) More importantly, there is a sufficient time-series per firm in order to study the effect between Fintech startups financing and their development and success, thus I have incorporated 2006 to 2015 into the sample. Since the focus is on financial startups, I have included only the financial industry (type of entity includes: NACE code from 63 to 68, financial services activities and financial services activities related), excluded firms that are not characterized as entrepreneurial (2-digit NACE codes 01 - 09). On top of that, I select for both active and inactive firms their ownership type that has been defined in section 3.2.

I extract data from Orbis in run to be able to effectively select the following type of firms: active firms, which contain the recent detailed financials. Active firms are required to report values for employees, operating revenue and P/L before tax for 3 consecutive years following in corporation. Firms with a status other than active, on the other hand, are only required to have at least one observation for each employees, operating revenue and P/L before tax during the 2006 and 2015 period. I search in the dataset for companies that are missing at least two consecutive years within the first 4 years after incorporation and delete the other observation.

# **4.2 Descriptive statistics**

#### **Table 1: Overview of financing sources and Statistics**

This table shows the distribution of financing sources across United Kingdom and Germany. From left to right correspond to bank finance, corporate finance, financial company, foundation, research institute, insurance company, mutual and pension fund, individual and family finance, other financing source, private equity, self-ownership, public authorities and venture capital.

Financing Source:	BE	CR	FC	FR	IC	MP	IF	OS	PE	SO	PA	VC
Germany (39.62%)	42	464	179	6	5	16	787	16	2	4	5	2
United Kingdom (60.38%)	24	542	289	2	43	126	862	400	33	-	2	6
Total	66	1006	468	8	48	142	1649	416	35	4	7	8

#### **Panel A: Distribution of Financing sources**

Table 1 exhibits the overview of how different financing sources are distributed in Germany and UK. It is not a surprise to see the number of firms per financing sources differ widely. More specifically, the result shows 1649 out of 3255 observations fall into the category of individual and family ownership, while only 4 are recognized as self-ownership. To be mention, venture capital and private equity only contain namely, 8 and 35 observations in total. With respect to the low number of observations regarding to some financing sources, the generalization of my findings are subject to be compromised.

#### Panel B: Definition of variables used in the following analysis

Variable	Definition	Category
Operating		
income growth	Five-year average growth of operating	
five year	income	Dependent
PL before tax	Five-year average growth of PL before	
growth five year	tax	Dependent
Employee growth		
five year	Five-year average growth of employee	Dependent
Operating	Top 75% performance in terms of	
income quantile 4	operating income	Dependent

PL before tax	Top 75% performance in terms of PL	
growth quantile 4	before tax	Dependent
Above median	Top 50% performance in terms of	-
growth	operating income	Dependent
Profit margin	Five-year average growth of profit	-
growth five year	margin	Dependent
Profit margin	Top75% performance in terms of profit	-
growth quantile 4	margin	Dependent
	Dummy variable equal to 1 if firm uses	-
Bank financing	bank financing	Independent
Corporate	Dummy variable equal to 1 if firm uses	
financing	bank corporate financing	Independent
Financial	Dummy variable equal to 1 if firm uses	
company	financial company	Independent
Foundation and	Dummy variable equal to 1 if firm uses	
research institute	foundation and research institute funding	Independent
Insurance	Dummy variable equal to 1 if firm uses	
company	insurance company financing	Independent
Mutual and	Dummy variable equal to 1 if firm uses	
Pension fund	mutual or pension fund financing	Independent
Individual and	Dummy variable equal to 1 if firm is	
family ownership	funded by individual and family	Independent
Other financing	Dummy variable equal to 1 if firm uses	
source	other financing sources	Independent
	Dummy variable equal to 1 if firm uses	
Private equity	private equity	Independent
	Dummy variable equal to 1 if firm uses	
Public authorities	public authorities funding	Independent
	Dummy variable equal to 1 if firm uses	
Venture capital	venture capital financing	Independent
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Asset growth	Average growth of asset	Independent
Financing	Duminy variable equal to 1 if firm uses	In don on da at
aiversity	more than one financing sources	independent
Liquidity shaal	Duminy variable equal to 1 if firm faces	Indonondert
Liquidity snock	inquiaity snock	independent

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#### **5** Empirical results

This section contains four parts: To begin with, part 1 presents the main results concerning the relationship between various financing sources and firm growth. Next to that, part two shows the results of the regression associated with the impact of selected financing sources on firm success, measured by top performance and abovemedian performance. Furthermore, part 3 provides supplementary analysis that include the results of using multiple financing source and their impact as well as if liquidity shock comprises firm growth. A robustness check is added at the last part regarding to the main analysis.

#### 5.1 Financing sources and firm growth

In the first step of the analysis, the regressions are employed to measure the impact of different financing sources on firm growth, which has not been tested collectively before. Main results do not support hypothesis 1 that firms tend to achieve higher growth in terms of operating income, PL before tax and number of employee growth, if they are VC-backed. Furthermore, the effectiveness of every financing source on growth can be revealed by comparing the coefficients.

Table 2 present the results of regression that examine if VC-backed firm is associated with higher growth. Moreover, in order to make an effective comparison among all financing sources, the associated standardized coefficients as well as standard deviation are reported in the table. Statistical significance can be observed beneath the coefficient. Overall, the results are not in line with what is hypothesized. Based on the outcome of regression (1) to (3), venture capital financing is not associated with higher growth of Fintech. However, foundation and research institute that shows a positive growth of 49.9%, holding the rest constant. It is logical to understand that when research institute inject fund to a Fintech firm, they also provide extra value. For instance relevant skills and input that was necessary for innovation output. Moreover, based on the statistical outcome in table 3, the effectiveness of the rest financing sources is not possible to be compared, therefore I cannot confirm hypothesis 1.1 and 1.2.

In regression (1), the growth is measured in average growth of operating income, the results produce a relatively low r-square (21.8%). What is more, only 1 out of 12 independent variables are statistically significant. However, there are some financing sources show a positive impact on growth, namely banking equity(2.9%), financing companies (0.3%), mutual fund (5.4%), self-ownership(5.6%), individual or family owned (3.4%), public authority (23.8%). Surprisingly, VC financing does not exhibit positive impact, which does not support my hypothesis. Therefore the finding is not consistent with previous studies from Bertoni et al (2011)

In regression (3) tests the relationship between the number of employee growth and all financing sources. The outcome is observed to be less significant compared with regression (1). Mainly because the results do not remain statistically significant, and the r-square (13.5%) is relatively lower, which result in a reduction of the explanatory power of the independent variables. Interestingly, banking financing shows a negative impact of (15.2%) on employee growth, holding the rest constant. Like regression (1) and (3), results of (2) does not support hypothesis 1, major independent variables are not interpretable and r-square is relatively low.

Considering the relative effectiveness of financing sources, none of my regressions provide sufficient evidence in order to make such comparison, due to the fact that the results lack strong statistical significance, the possible explanation would be the following:

To begin with, According to Childress (2015) has addressed the importance of innovation in terms of financial start-ups and other financial institutions growth. More specifically, he mentioned that there are three pitfall of financial innovation within financial institution, regulation, legacy and IT infrastructure, and corporate culture. Therefore, receiving funding is the very first steps that financial technology firms have to go through, and innovation is one of the key drivers to their growth.

In addition, Cuesta et al (2015) find in their study that there are 3 phases an institution has to go thorough in order to successfully transfer toward digital banking or financial services in general: 1) respond to new competition, 2) technological adaption and 3)

strategic position. It is not very clear how long these phases last, there is lacking of evidence to suggest the financing sources will directly result better growth through innovation either.

Furthermore, the short term profit growth may be affected due to investment. For instance, in order to achieve a long term growth and be able to benefit from a positive NPV project, a firms may first need to increase investment in IT infrastructure, innovation or other technological input. These investments usually have direct impact on performance profitability. On top of that, the cost of attracting external funding can also raise a concern if they do not provide the required input to grow.

In general, Irwin&Scott (2010) suggest that start-up proposition are too risky for bank and other capitalists nowadays due to the fact that they have insufficient collateral to engage in secure risk management. Bruton et al (2015) suggest various peer-to-peer networks, both debt and equity, using social networks to harness communities of both entrepreneurs and investors in an effort to improve the efficiency and effectiveness of aggregating and transferring funds.

To sum it up, regressions (1) to (3) do not provide sufficient evidence to support venture capital financing is an effective source. Furthermore, there is no sufficient evidence to reveal the effectiveness of different financing source on firm growth. Except foundation and research institute funding, which has a positive impact on firm growth in terms of operating income. The result mostly is not in line with hypothesis 1, which means rather than financing sources, other aspects like, technological input that is related to growth, innovation and time associated with relevant innovation should be taken in to account.

# Table 2 OLS Regression of financing sources on firm growth

Regression (1) uses 5-year average operating income growth rate as depend variable, regressed on financing sources. Regression (2) uses number of employee growth as dependent variable, and regression (3) is proxied PL before tax growth. Control variable is included. T-statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with \*, \*\*, \*\*\* representatively. The number of observations of r-square are reported at the bottom of the table.

	Average grov	vth (5 years)	
Dopondont variable	Operating income	PL Before tax	Employee Growth
	(1)	growth (2)	(3)
Fin1_BE	0.0292	-0.145	-0.152*
	-0.0643	-0.154	-0.0839
Fin2_CR	-0.0286	-0.0932	-0.0217
	-0.0427	-0.085	-0.0283
Fin3_FC	0.00397	-0.207*	-0.00236
	-0.0489	-0.11	-0.0345
Fin4_FR	0.499**	0.356	0.21
	-0.219	-0.382	-0.142
Fin5_IC	-0.115	-0.173	-0.0947
	-0.105	-0.194	-0.141
Fin6_MP	0.0544	0.181	-0.0146
	-0.0645	-0.139	-0.0375
Fin7_IF	0.0338	-0.0884	-0.0195
	-0.0437	-0.0872	-0.0282
Fin8_OS	-0.0484	-0.225**	0.0316
	-0.0572	-0.111	-0.0419
Fin9_PE	-0.00982	-0.279	0.0192
	-0.0966	-0.272	-0.0591
Fin10_SO	0.0562	0.0328	0.0491
	0.123	-0.138	-0.372
Fin11_PA	0.238	0.131	0.201
	-0.227	-0.109	-0.311
Fin12_VC	-0.0611	-0.0499	-0.0597
	-0.196	-0.101	-0.11
Assetgrowth fiveyear	0.461***	0.143**	0.042
	-0.0433	-0.0673	-0.027
Constant	-0.12	-0.111	-0.0237
	-0.117	-0.238	-0.0743
Industry Control	Yes	Yes	Yes
Observations	653	193	216
R-squared	0.218	0.298	0.135

Standard errors in parentheses

#### 5.2 Financing sources and firm success

In the second part, hypothesis 2.1 and 2.2 are examined. The regression results are denoted by model 2 and 3 about the relationship between firm success and financing sources. The regression results are shown in table 3, the pseudo r-square increases from 9.3% to 17.8% when using different measure for firm success, which means 17.8% of the variation in firm success can be explained by financing sources included in the model. The results are reported on the marginal effect level for each financing source, and z-statistical is reported below the coefficient to indicate if coefficients are significant. Surprisingly, similar to regression (1) to (3), regression (4) to (5) do not provide sufficient evidence to confirm financing sources necessarily results in higher probability of firms being success. Particularly no enough evidence to indicate VC financing is an effective source.

Regression (4) in table 4 regresses various financing sources on the dummy of firm success, which is measure by top performance operating income (top 75%). This model produces mostly insignificant results, this can be seen from the low r-square and none of independent variable has explanatory power to the variation of dependent variable. The insignificant results can be understood as, when a firm wants to pressure better performance, it is likely that they go after riskier projects which are not always proved by the shareholder, this argumentation is extended by Chen (2014), whose research finds firms have to exchange financial flexibility in order to optimize their insider ownership. Another explanation to this relationship is, firm will want to invest in innovation/technological progress therefore the profit is partially comprised. Although there is no significant difference, several coefficients show a positive relationship on firm success, for example, foundation and research institute (15.2%), insurance company financing (20.2%), individual or family member (32.6%), private equity (16.7%), public authority (207.7%), and venture capital (176.8%), holding the rest constant.

Regression (5) in table 4 exhibits results of regression (2) like regression (4), but uses PL before tax growth instead. Once again, the results is quite similar as regression (4), shown by a relatively low pseudo r-square, next to that, only 2 out of 12 financing sources show a statistically significant relationship with the probability of firm being successful. The results are mostly not in line with my hypothesis, a possible

explanation can be, Long (2017) suggest there is a lot investment into digitalize financial services, but it takes long time to become profitable. From an upfront investment it can still be between 5-8 years before the investor see any profit. Therefore, the probability of being successful is not necessary associated only with financing sources.

Furthermore, Shim&Shin (2016) discuss in their study about the key factors in the success of Fintech industry, they come up with government support for innovating traditional financial system, the risk of private e-commerce companies, and perhaps the most importantly, the evolution of TPP system, with regarding to technology, traditional payment technology involves the completion of a number of steps. Remarkably, it seems as if technology/innovation might be the driving force behind comprehensive changes in Chinese finance.

Since, the focus of this study is on financial technology firms, which require more technological progresses than non-tech firms. Kennedy (2013) argued that when it come high-tech-related industry, China is focused on pragmatic tech-nationalism, with polices designed to favor domestic firm while retaining close collaboration with international partner. Barberis (2014) further argues that with help of such policy, China possess unique characteristics that may make it more suitable for Fintech system. With help with such policy, the potential growth of Fintech can be realized.

Nevertheless, results of regression (4) and (5) are not enough to confirm hypothesis 2, which indicate VC-financing is positively related to firm success, and the effectiveness among all financing sources cannot be concluded. However, the results show that the success (being top quantile compared with peers) of Fintech should be considered from a different perspective, which including financial flexibility of a firm, government support for innovating traditional financial systems (Shim&Shin, 2016; Chen 2014).

Regression (6) presents the results of hypothesis 3. In this regression, success is measure as above-median performance of past 5 years, this regression consider above-medium growth as success, unlike two other measures that include top 75% quantile. The results show only 2 out of 12 coefficients are significant, namely are:

mutual and pension fund (139%), banking financing (108%), holding the rest constant. These positive coefficients indicate there is a positive relationship between financing sources and probability of firm being above-medium performance. Although it is not very feasible to compare these financing sources with the rest insignificant coefficients, results indicate that financing source somewhat is important to Fintech success. This is motivated by the 11 out 12 positive coefficients from regression (6), namely are: financial company (12%), foundation and research institute (27.1%), individual or family owned (35.5%), other financing sources (33.6%), self-ownership (40.1%), public authority (87.8%), venture capital (83.9%). Moreover, this result can provide insights to the importance role of financial sources, which is proposed by Teece (1986) finds the essential role of innovation and relevant financial sources that are required to achieve innovation.

On the other hand, the Crowdfunding report (2013) argues that financial institution should involve themselves with new financing alternatives like crowdfunding, instead of searching for traditional funding sources. The insignificant coefficients provide indirect evidence to these pitfalls.

# Table 3 Logistic Regression of financing sources on firm success

Regression (4) uses top 75% performance operating income growth rate growth as depend variable, regressed on financing sources. Regression (5) uses PL before tax as dependent variable, and regression (6) is proxied by above-median survival. T-statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with \*, \*\*, \*\*\* representatively. The number of observations of r-square are reported at the bottom of the table.

	Success J	years	
Dependent variable	Operating income	PL before tax	Above median
	growth (4)	growth (5)	performance (6)
Fin1_BE	-0.361	-0.872	1.083**
	-0.515	-0.995	-0.473
Fin2_CR	-0.0163	-0.468	-0.0263
	-0.335	-0.605	-0.361
Fin3_FC	-0.161	-1.843**	0.12
	-0.392	-0.854	-0.409
Fin4_FR	0.152	0.165	0.271
	0.0103	0.269	0.301
Fin5_IC	0.202	-1.097	-1.003
	-0.86	-1.313	-1.153
Fin6_MP	-0.12	0.474	1.387***
	-0.509	-0.868	-0.51
Fin7_IF	0.326	-0.186	0.355
	-0.332	-0.614	-0.366
Fin8_OS	-0.558	-2.259**	0.336
	-0.464	-0.954	-0.499
Fin9_PE	0.167	0.137	-0.212
	-0.777	0.112	-1.121
Fin10_SO	0.167	0.251	0.401
	-0.412	-0.715	-0.793
Fin11_PA	2.077	0.914	0.878
	-1.667	-1.333	-1.028
Fin12_VC	1.768	0.941	0.839
	-1.453	0.136	0.221
assetgrowthfiveyear	3.365***	-0.0537	1.736***
	-0.618	-0.441	-0.578
Constant	-1.844*	-0.202	-2.312***
	-0.999	-0.786	-0.583
Industry Control	Yes	Yes	Yes
Observations	644	181	610
Pseudo	0.1779	0.0935	0.1293

Standard errors in parentheses

#### 5.3 Additional analysis

#### 5.3.1 Multiple financing source

In third part of regression results, the third hypothesis is tested and explained. The regressions are employed to examine the impact of using multiple financing sources on firm growth, in terms of metrics used in regression (1) to (6). In order to do that, I first create an additional dummy variable in regression (1) to (3). This dummy is equal to one if firm uses more than one financing source, otherwise is 0. This step of analysis is motivated by Beck et al (2002), whose study suggests financial constrain represent a significant obstacle to growth, especially to small firms. Besides, during the data collection process I have realized that some of my sample firms use more than one financing sources, average is equal to 1. The regression results are reported in table 11 and 12.

Overall, there is no sufficient evidence to suggest that using more financing source is associated with higher growth of Fintech firms. The finding is supported by: all coefficients that are associated with using multiple financing sources are negative. Moreover, none of the coefficients of using more financing sources is statistically significant. The main results suggest the using multiple financing sources neither results in higher growth nor increase the probability of firm being successful compared to their peers, both in terms of operating income, PL before tax and number of employees.

The results can be interpreted from the following perspectives. First of all, the cost of external financing can be considered to be one of the explanations, it is logical to think if firms tend to borrow more from multiple sources, the cost associated with borrowing increases as well. Caprio et al. (2010), Dittmar et al. (2003), Harford et al. (2008) represent that the cost of corporate cash holding is associated with offsetting the benefits associated with reduced financing friction. Furthermore, Chen (2014) shows emphasize the importance of financial flexibility of firms. More specifically, he suggest that if firm deviates from its optimal ownership structure, as a consequence, the financial flexibility decreases. This could results in lacking funding, or being restricted to the debtor or credit providers.

Surprisingly, foundation and research institute funding exhibit a positive impact on growth and success in terms of operating income. This result is in line with the outcomes from regression (1) to (6). As part of my interpretation, I consider the following aspect: Bruno (1977); Fesser and Willard, (1990); and Colombo&Grilli (2005) suggest that high-tech firms founded by individuals with select human capital characteristics can leverage the distinctive capabilities associated with the knowledge and skill of their founder to grow larger than other firms. Thus, the possible technological or other human capital input from research institute funding associated with funding can be the key driver to growth, and this key driver is related to innovation/technological progress.

Overall, there is no sufficient evidence to conclude that are financially constrained firms is associated with lower growth. However, previous literatures suggest that low financial flexibility firms tend to.

#### 5.3.2 Liquidity shock

In this step of analysis, a new dummy variable is introduced to the main regression (1) to (3) in order to examine if a liquidity shock compromises the relationship between firm growth and financing sources they use. The results are reported in table 9 in appendix. Although the coefficients indicate there is a negative relationship between a liquidity shock and firm growth, the statistical difference is not significant. Surprisingly, the impact foundation and research institute funding remains positive on operating income growth. These results can be partially addressed to that research institute has the skills associated with better innovation output. What is more, although a liquidity shock may hit a firm, research institute is likely to achieve better results compared to less skilled funding. Overall, the results in table 7 show that liquidity shock does not moderate the relationship between financing sources and firm growth. However, the evidence is not sufficiently strong to explain the effect and confirm the hypothesis.

On top of that, the liquidity shock dummy variable is also added to regression (4)–(6) to test the relationship between liquidity shock and the probability of firm being

successful. Results are reported in table 10 in appendix. In line with the logic that suggests that liquidity shock reduced fund available for investments resulting in a reduced probability of firm success, the coefficients of the liquidity shock dummy are negative in all regressions, however, only significant on above-median performance in terms of operating income growth. Results can addressed to: 1) to achieve higher growth requires more than enough funding, management skills and related strategy is necessary 2) when a firm faces a liquidity shock, implying a firm has limited funding source. However, the cost associated with external funding does not necessarily decreases, which can hurt profitability. Above-median performance on the other hand, is impacted significantly by a liquidity shock, with a probability of 49.7% decrease, holding the rest constant.

Overall, the results suggest evidence is not sufficiently enough to confirm the impact of liquidity shock on firm growth and success. However, I only incorporate current ratio to measure if a firm faces liquidity shock, there are critiques regarding to current ratio. Although it measure a firm's ability to pay short-term and long term obligation. Somewhat it can also be a signal that a company has problems getting paid on its receivables or having long inventory turnover.

# 5.4 Robustness check

In additional to aforementioned measures of growth, this paper also uses in profit margin growth as an alternative growth measure. The first step of performing robustness check is to employ the alternative measure of growth. To do so, I rerun regression (1) to (3) using profit margin growth. The r-square is slightly higher than previous regressions, which represent better explanatory power of the regression of the variance of financing. Results are reported in table 8. To be mentioned, the overall outcome is generally consistent as previous outcomes, there is no evidence to support VC-backed firms is associated with higher performance. However, results also confirm that mutual and pension fund is positively associated with higher growth and better probability of achieving above-median performance. To sum up, the result for using another growth measure yields similar results, suggesting that the statistical relationship between merely financing sources and firm growth is not significant, but mutual and pension fund is a considerable financing source.

The second step of robustness check it to enlarge the sample period. Regression (1) to (3) involves only 5-year average. In this step I have expanded it to 10-year average. This estimation aims to understand if these financing sources have impact on growth in longer period of time, in terms of innovation and technological input. Results are reported in table 7. The impact of foundation and research institute has become more pronounced compared with regression (1). Surprisingly, private equity (17.9%) financing shows a positive relationship on operating income growth, holding the rest constant. However, I have observed that the number of observation has dropped, which raises concerning in generalization and confirm main findings.

Moreover, due to the heterogeneity of constructed sample, I conduct a subsample regression using German and UK data separately to identify the drivers of my results. Based on this analysis, both subsamples are consistent with the main findings, indicating VC-backed firms do not necessarily result in a higher growth compared with other financing sources. More specifically, in the German subsample, produces results that suggest mutual and pension fund source is an effective source in terms of growth, which is not supported in the full sample results. A surprising observation from the subsample of UK subsample is that bank financing is associated with a significant lower growth than in the full sample. However, in terms of success, banking financing, foundation and research institute, mutual and pension fund contribute to higher probability of success. These results are partially in line with the main findings.

To sum it up, 1) there is no enough evidence to compare which financing sources is better due to the statistical insignificant outcomes. However, private equity, foundation and research institute and financial company's impact have become more pronounced on growth in long run. 2) Rather than financing source, other aspects like innovation, cost of financing as well as alternative sources that are not covered in this study can be reasonably considered. 3) In terms of success, UK firms can consider mutual and pension fund, foundation and research institute and banking financing. Overall, these robustness checks have reveal country difference as well as partial in line with results from earlier regression. However, the reduced number of observation remains a concern in the robustness check.

#### 5.5 Implication / Discussion

This section discusses the possible implications of this study, in terms of entrepreneurs themselves, policy makers who can create a system that is favor of Fintech growth, as well as researchers who will do future research on this topic.

To begin with, the analysis show that the relationship between various financing sources and their impact on firm growth and success is not pronounced. However, regressions indicate that foundation and research funding is associated with positive growth in terms of operating income. Banking financing, mutual fund and other financing sources are associated with positive probability of above-median performance.

In additional, many research have emphasized the importance of innovation to technology-based firms and the time involved in this process plays an essential role as well. The results suggest that Entrepreneurs themselves can search for foundation and research institute funding source. Or an alternative funding source that provide relevant skills and technology input that are related to innovation, which can stimulate potential growth. Although the results do not provide evidence on which fund to use, many literature suggest to use crowdfunding, because equity crowdfunding is empowering networks of people to control the creation of new products, media and ideas and is raising funding for charity or venture capital.

Furthermore, motivated by the results that not all financing sources have a direct impact on the growth and success of Fintech firm, implying that policy should be designed to support ecosystem that stimulate potential growth for Fintech firms. Kennedy (2013) emphasizes the importance of such policy that in favor of high-tech related firms. Therefore, the European Commission can design such a policy to support for innovating the traditional financial system, allocating fund more

efficiently, favor firms to closely collaborate with international partner, and make it more suitable for Fintech growth.

Moreover, analysis shows that the measures of success used in this study does not provide much evidence in order to make an effective comparison among all financing sources. Critiques may argue that this represents one of the drawbacks of this study. Due to the fact that most Fintech firms are involved in technology innovation, merely include financing sources does not allow the model to follow the strategies of each firm, as well as the potential output of the innovation investment. For future research, use a different measure of growth and success. For instance, focus on R&D expenditure, patent number, commercialization rate and so on.

# 6 Drawback to limitation:

The fact that the topic is quite new and understudied has made my paper findings limited in generalization. In this section, I discuss several limitations that are relevant to this study.

To begin with, a general concerns about this study is the representativeness of the sample, which can be explained by the following argumentation: 1) due to the fact that large number of incomplete observations has dropped out during the regression, reduction in sample size raise concern about generalization. 2) As for the sample period, data used in this study is collected from Orbis. However, Orbis only provides financial and non-financial data for the past ten year. 3) A number of alternative financing sources are not included in the Orbis dataset, for instance Crowdfunding. Microfinancing, peer to peer lending. World Economic Forum (2016) suggest that equity crowdfunding is funding source that across a network of supporters and is potentially the most disruptive of all the new Fintech platform, because equity crowdfunding is empowering networks of people to control the creation of new products, media and ideas and is raising funding for charity or venture capital.

Furthermore, the limitation associated with this topic is related to the measure of some variables. Due to the fact that Fintech firms are defined as financial technology start-ups, merely use profit and income measure seem to be in sufficient. Moreover, Baum&Silverman (2002) suggest innovation expenditure measure should be used when it comes to the success of technology-based firms, these measures include: patenting rates, forwards citation rates and commercialization rate and so on. Verdi (2006) also suggest that capital expenditures on innovation and R&D expenditure should also be considered. Therefore, starting from the findings from this study, future research can consider the aforementioned measure in terms of success.

Besides, another concern raise from the screening mechanism and selection process used by investors such as venture capital and private equity. These investors usually are more sophisticated and skilled at finding relatively promising companies and investing in them, which might have an impact in this research as in the measured dependent variable can predict independent variables rather than what I have hypothesized. As a result, the results can be biased.

Overall, the values of r-square generated from most regressions are relatively low, consequently, this indicates a relatively low explanatory power of the independent variable in the model.

### 7 Conclusion

The relationship between financial technology start-ups financing and their development and success can be insightful towards to investors, entrepreneurs as well as policy makers, in terms of improve capital allocation efficiency, funding and regulation and policymaking. During my study I have noticed that there are many existing literatures that illustrate impact of various financing sources on small business performance, development and success. However, very few studies have focused on the interaction between Fintech startup financing and their impact in accordance to a comprehensive comparison, especially in the fast growing market of financial technology start-ups such as UK and Germany. Therefore, I have created a

model that is motivated by previous literatures, which includes wide range of financing sources as well as control variables. This paper aims to answer the proposed question in introduction.

This study uses ordinary least squares and logistic regression to examine the relationship between various financing source and their impact on financial start-ups' performance and development. The dependent variable measures are previously proposed and implemented by Davila et al (2003), Colombo & Grilli (2010), Keer & Nanda (2009) and Kerr et al (2014). Next to the core regression I have also implement two supplementary analyses, which focus on the use of multiple financing source and the impact of liquidity shock. To do so, I have added a dummy variable that indicates if a firm faces a liquidity shock, or uses more than one financing source.

Data used in this paper is collected from Orbis database and CB insights website, the advantage of using this Orbis dataset is, it enables me to examine financial characteristics of private firm, most of them are not listed in the exchange. However, the individual level data is not always complete. Final sample contains is 3255 active firm level observations, from UK and Germany, in between 2006 to 2015. CB insights on the other hand, provides many up to date reports regarding to the Fintech development and latest trend, in which enrich my findings and supply information.

The results of this paper suggest that foundation and research institute funding can be considered as an effective financing source in order to achieve higher growth and superior performance in terms of operating income growth. Results shows research institute funding exhibits an increase of 57% (multiple financing source), 49.9% (5-year average growth) 62.2% (10-year average growth), representatively. I related the outcome to the input of network, competence that has impact on innovation output. In addition, banking financing and mutual and pension fund financing are positively related to above-median performance. These results are partially in line with Cornett, Marcus, Saunders and Tehranian (2007) and Ayyagari et al (2010). In addition, I related the insignificant results to the following: 1) financial technology start-ups require more technology input than non-tech firms. Besides financing source, other input that are related to innovation output should also be taken into account. 2)

Timing effect, Cuesta et al (2015) discussed 3 phases an institution has to go through in order to successfully transfer toward digital banking of financial service.

The supplementary analysis shows that the relationship between using multiple financing sources and higher growth is not statistically strong enough. The effect can be partially addressed to the cost of capital and financial flexibility that is associated with using external financing. Furthermore, I have found some evidence in favor of suggesting that a liquidity shock comprises growth of firm. The robustness check confirms the results of the full sample partially. Moreover, the results from robustness check suggest that overall foundation and research institute funding is positively associated with growth in terms of operating growth. More specifically, the impact is more pronounced in UK. Furthermore, mutual and pension funding financing contributes to higher growth, supported by the results. However, there is no sufficient evidence to conclude that VC-backed firms is associated with better performance and higher growth, which is not as expected.

This paper shed light to the relationship between various financing source and Fintech growth and success. In light of the outcome of this study, future study can focus on a large dataset set, including alternative financing source for instance peer to peer lending, crowdfunding and micro financing. Secondly, attention can be addressed to the use of financing source, including a technology progress indictor (R&D, patent ratio) in the model can further reveal the relationship of technological changes that is associated with growth and financing source. Again, Fintech is a relatively new subject and relevant topics are understudied. Therefore the opportunities for future research remain enormous.

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# Appendix

Ownership Type	Description	Code Category
Bank	-	BE
Corporate	This is a generic term, this category includes all companies that are not banks or financial companies, nor insurance companies. They can be involved in manufacturing activities but also in trading activities. (eg B2B, B2C non-financial services)	CR
Financial Company	-	FI
Insurance Company	-	IC
Mutual & pension, Fund/Nominee/Trust/Tuustee	-	MP
Foundation/Research Institute	-	FR
Public authorities, States, Governments	Public is used only for public quoted companies	PA
One or more known individuals or families	Individuals, families, shareholder designated by more than one named individual or families are in this category. The idea behind this is that they would probably exert their voting power together.	
Private equity firms	-	PE
Venture capital	-	
Self onwership	-	SO
Other financing	This category includes more than one unnamed shareholder, either companies unnamed, or a mixture of companies and private owners.	00

# Table 4 Definition of financing sources according to Orbis database.

Table 5.1 Robustness check (1) Subsample financing sources and growth - UK
Regression results below applies the same method as table 2, with the UK setting. Regression
(7) uses 5-year average operating income growth rate as depend variable, regressed on
financing sources, industry control is added. Regression (9) uses number of employee growth
as dependent variable, and regression (8) is proxied PL before tax growth. Control variable is
included. T-statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with *,
**, *** representatively. The number of observations of r-square are reported at the bottom of
the table.

Dependent variable	Operating income	PL growth five	Employee growth
	growth five year (7)	year (8)	five year (9)
Fin1_BE	0.012	-0.335*	-0.042
	-0.120	-0.189	-0.101
Fin2_CR	-0.015	-0.253**	-0.019
	-0.053	-0.115	-0.031
Fin3_FC	0.012	-0.392***	0.008
	-0.061	-0.141	-0.038
Fin4_FR	0.662**	0.347	0.282
	-0.317	-0.480	-0.316
Fin5_IC	-0.108	-0.190	-0.089
	-0.109	-0.210	-0.138
Fin6_MP	0.067	0.080	-0.020
	-0.068	-0.156	-0.037
Fin7_IF	0.047	-0.210*	-0.018
	-0.051	-0.114	-0.029
Fin8_OS	-0.040	-0.315**	0.034
	-0.063	-0.126	-0.044
Fin9_PE	-0.005	-0.253	0.021
	-0.102	-0.281	-0.059
Fin11_PA	0.014	0.209	0.011
	-0.334	-0.296	-0.117
Fin12_VC	-0.013	0.282	-0.060
	-0.203	-0.316	-0.108
assetgrowthfiveyear	0.447***	0.130*	0.0337
	-0.0452	-0.071	-0.028
Constant	-0.105	0.0329	0.0147
	-0.134	-0.292	-0.099
Industry Control	Yes	Yes	Yes
Observations	609	168	181
R-squared	0.202	0.324	0.126
Standard errors in parer	ntheses		
*** p<0.01, ** p<0.05,	* p<0.1		

**Table 5.2 Robustness check (1) Subsample financing sources and success - UK** Regression results below apply the same method as table 3, with the UK setting. Regression (10) uses top 75% performance operating income growth rate growth as depend variable, regressed on financing sources, with industry control. Regression (11) uses PL before tax as dependent variable, and regression (12) is proxied by above-median performance. Z-statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with \*, \*\*, \*\*\* representatively. The number of observations of r-square are reported at the bottom of the table.

Dopondont voriable	Operating income	PL before tax	Above median
	quantile4 (10)	quantile4 (11)	performance (12)
Fin1_BE	0.578	-1.726	2.632***
	-0.953	-1,012	-0.889
Fin2_CR	-0.328	-1.634	0.333
	-0.421	-1,012	-0.438
Fin3_FC	-0.398	-1.781	0.319
	-0.505	-1,012	-0.537
Fin4_FR	0.21	0.0323	1.350**
	-1.003	-0.964	-0.631
Fin5_IC	-0.0141	-1.597	-0.538
	-0.881	-1.012	-1.169
Fin6_MP	-0.29	-1.437	1.722***
	-0.542	-1.012	-0.533
Fin7_IF	0.14	-1.582	0.790*
	-0.395	-1.124	-0.407
Fin8_OS	-0.801	-1.723	0.587
	-0.52	-1.003	-0.525
Fin9_PE	-0.119	-0.302	0.206
	-0.794	-1.383	-1.146
Fin11_PA	0.0601	-0.562	-0.0147
	-1.019	-1.01	-0.752
Fin12_VC	1.955	1.482	1.367
	-1.529	-1.564	-1.074
assetgrowthfiveyear	3.446***	-0.188	1.950***
	-0.654	-0.53	-0.636
Constant	-0.76	15.61	-2.709***
	-0.979	-1,012	-0.665
Industry Control	Yes	Yes	Yes
Pseudo	0.1913	0.1674	0.1353
Observations	591	152	558

Standard errors in parentheses

# Table 6.1 Robustness check (2) Subsample financing sources and growth Germany

Regression results below apply the same method as table 2, with the German setting. Regression (13) uses 5-year average operating income growth rate as depend variable, regressed on financing sources. Regression (15) uses number of employee growth as dependent variable, and regression (14) is proxied PL before tax growth. Control variable is included. T-statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with \*, \*\*, \*\*\* representatively. The number of observations and r-square are reported at the bottom of the table.

Dependent variable	Operating income growth five year (13)	PL growth five year (14)	Employee growth five year (15)
Fin1_BA	0.098	-0.191	-0.438
	0.063	0.402	0.193
Fin2_CR	-0.004	0.184	0.076
	0.063	0.161	0.088
Fin3_FC	-0.001	0.168	-0.182
	0.063	0.217	0.171
Fin4_FR	0.361**	0.442	0.102
	0.198	0.401	0.174
Fin5_IC	0.173	0.47	0.298
	0.179	0.34	0.158
Fin6_MP	0.632***	0.887*	0.056
	0.203	0.409	0.119
Fin7_IF	0.144	0.189	-0.151
	0.094	0.252	0.162
Fin8_OS	-0.008	0.591	-0.072
	0.199	0.287	0.188
Fin9_PE	0.158	0.625	0.121
	0.161	0.364	0.181
Fin10_SO	0.094	0.087	-0.455
	0.198	0.408	0.248
Fin11_PA	0.686	0.706	0.205
	0.197	0.419	0.152
Fin12_VC	0.144	0.232	0.043
	0.165	0.401	0.191
assetgrowthfiveyear	1.051***	0.449*	0.475**
	0.122	0.55	0.164
Constant	-0.211	-0.722	0.165
	0.159	0.442	0.201
Industry Control	Yes	Yes	Yes
Observations	44	25	35
<b>R</b> -squared	0.8266	0.5582	0.5475

Standard errors in parentheses

Table 7 Robustness check (3) enlarge sample period, average growth of 10 years
Regression (19) uses 10-year average operating income growth as depend variable, regressed
on financing sources, control by asset growth. Regression (20) uses PL before tax as
dependent variable, and regression (21) is proxied by number of employee growth. T-
statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with *, **, ***
representatively. The number of observations of r-square is reported at the bottom of the table

Dependent variable	operating income	PL before tax	Employee growth
Dependent variable	(19)	growth (20)	(21)
Fin1_BE	0.0229	0.0846	-0.344*
	-0.148	-0.199	-0.184
Fin2_CR	0.0262	-0.102	-0.203***
	-0.0546	-0.177	-0.0682
Fin3_FC	0.0797	-0.142	-0.341***
	-0.0622	-0.33	-0.1
Fin4_FR	0.622**	0.264	0.546
	-0.196	-0.132	-0.319
Fin5_IC	-0.203*	0.324	0.053
	-0.119	-0.239	-0.111
Fin6_MP	0.0506	0.158	0.121
	-0.0578	-0.32	-0.118
Fin7_IF	-0.0563	0.11	-0.259***
	-0.0505	-0.198	-0.0839
Fin8_OS	-0.0579	-0.0152	-0.178*
	-0.0615	-0.213	-0.0949
Fin9_PE	0.179*	0.137	0.163
	-0.0942	0.249	-0.006
Fin10_SO	-0.342	-0.253	0.685
	0.064	0.183	-0.359
Fin11_PA	0.181	-0.006	-0.019
	-0.182	0.093	0.694
Fin12_VC	-0.0474	-0.026	0.091
	-0.12	-0.019	-0.293
assetgrowthtenyear	1.055***	-0.0383	0.773***
	-0.0901	-0.215	-0.226
Constant	-0.223	-0.251	0.125
	-0.138	-0.247	-0.127
Industry Control	Yes	Yes	Yes
Observations	194	33	32
R-squared	0.553	0.796	0.697

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Table 8 Robustness check (3) Alternative measure of growth and success

Regression (22) uses profit margin growth as depend variable, regressed on financing sources, control by asset growth and industry. Regression (23) uses above median profit margin as a dummy dependent variable. Corresponding T-statistical and Z-statistical are shown below each coefficient at 0.1, 0.05, 0.01 level, marked with \*, \*\*, \*\*\* representatively. The number of observations as well (Pseudo) r-square are also reported at the bottom of the table.

Dependent variable	Profit margin growth five year	Above median
	(22)	performance (23)
Fin1_BA	-0.00967	-0.0413
	-0.104	-1.407
Fin2_CR	-0.153**	-0.988
	-0.0612	-0.831
Fin3_FC	-0.0804	-0.257
	-0.0766	-0.938
Fin4_FR	0.0742	0.533
	-0.223	-1.488
Fin5_IC	-0.121	-1.633
	-0.121	-1.525
Fin6_MP	0.231**	2.320*
	-0.115	-1.357
Fin7_IF	-0.019	0.587
	-0.0604	-0.822
Fin8_OS	-0.142*	-2.716**
	-0.072	-1.119
Fin9_PE	-0.0327	-0.318
	-0.159	-1.447
Fin10_SO	-0.773	1.132
	0.628	-1.004
Fin11_PA	0.761	1.224
	0.637	-1.238
Fin12_VC	0.694	-2.036
	-0.452	-1.409
assetgrowthfiveyear	0.0496	-0.0836
	-0.0599	-1.046
Constant	-0.0365	-0.533
	-0.163	-1.037
Industry Control	Yes	Yes
Observations	141	127
R-squared	0.211	0.181

Standard errors in parentheses

# Table 9 Liquidity shock and growth

Regression (24) uses 5-year average operating income growth as depend variable, regressed on financing sources, control by asset growth. An additional dummy that indicates if firm faces a liquidity is added. Regression (25) uses PL before tax as dependent variable, and regression (26) is proxied by number of employee growth. T-statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with \*, \*\*, \*\*\* representatively. The number of observations of r-square is reported at the bottom of the table.

Dan an dant wariahla	Operating income	PL growth	Employee growth
Dependent variable	growth five year (24)	five year (25)	five year (26)
Fin1_BE	0.0181	-0.146	-0.156*
	-0.0647	-0.154	-0.0842
Fin2_CR	-0.0263	-0.0911	-0.02
	-0.0427	-0.0851	-0.0284
Fin3_FC	0.00444	-0.194*	-0.00148
	-0.0489	-0.112	-0.0346
Fin4_FR	0.480**	0.352	0.204
	-0.219	-0.383	-0.142
Fin5_IC	-0.11	-0.158	-0.103
	-0.105	-0.195	-0.141
Fin6_MP	0.0561	0.184	-0.0125
	-0.0645	-0.14	-0.0377
Fin7_IF	0.0323	-0.082	-0.019
	-0.0437	-0.0878	-0.0282
Fin8_OS	-0.0464	-0.214*	0.0321
	-0.0572	-0.112	-0.0419
Fin9_PE	-0.0161	-0.275	0.016
	-0.0966	-0.272	-0.0593
Fin10_SO	0.754	0.473	-0.269
	0.653	0.347	-0.199
Fin11_PA	0.218	0.162	0.094
	-0.227	-0.036	0.082
Fin12_VC	-0.0603	0.011	-0.0642
	-0.196	-0.13	-0.11
Asset growth five year	0.463***	0.142**	0.0402
	-0.0432	-0.0674	-0.0272
Liquidity shock	-0.0353	-0.0451	-0.0163
	-0.025	-0.0609	-0.0213
Constant	-0.1	-0.103	-0.0241
	-0.118	-0.239	-0.0743
Industry Control	Yes	Yes	Yes
Observations	653	193	216
R-squared	0.221	0.3	0.137

Standard errors in parentheses

# Table 10 Liquidity shock and success

Regression (27) uses top 75% operating income growth as depend variable, regressed on financing sources, control by asset growth. An additional dummy that indicates if firm faces a liquidity is added. Regression (28) uses PL before tax as dependent variable, and regression (29) is proxied by above-median performance in term of operating income. Z-statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with \*, \*\*, \*\*\* representatively. The number of observations of r-square is reported at the bottom of the table.

		PL before tax	
Dependent variable	Operating income	quantile4	Above-median
	quantile4 (27)	(28)	performance (29)
		()	
Fin1_BE	-0.419	-0.866	0.925*
	-0.517	-0.997	-0.479
Fin2_CR	0.000161	-0.416	-0.00893
	-0.335	-0.603	-0.36
Fin3_FC	-0.154	-1.730**	0.135
	-0.392	-0.865	-0.41
Fin4_FR	0.421	0.364	0.106
	-0.369	-0.543	-0.176
Fin5_IC	0.212	-0.949	-0.909
	-0.866	-1.329	-1.15
Fin6_MP	-0.104	0.5	1.440***
	-0.51	-0.873	-0.511
Fin7_IF	0.322	-0.0852	0.332
	-0.332	-0.62	-0.369
Fin8_OS	-0.547	-2.132**	0.425
	-0.463	-0.948	-0.496
Fin9_PE	0.137	0.327	-0.339
	-0.777	-0.748	-1.126
Fin10_SO	0.783	0.361	0.473
	-0.439	-0.654	-0.364
Fin11_PA	1.969	0.911	0.713
	-1.665	0.026	0.684
Fin12_VC	1.791	0.662	0.036
	-1.46	0.649	0.056
Industry Control	Yes	Yes	Yes
	3.346***	-0.0759	1.707***
assetgrowthfiveyear	-0.615	-0.439	-0.571
Liquidity shock	-0.195	-0.372	-0.497**
1 · · · · J · · · · · · ·	-0.215	-0.426	-0.211
Constant	-1.753*	-0.182	-2.103***
	-1.005	-0.786	-0.591
Observations	644	181	610
Pseudo	0.197	0.0974	0.1373

Standard errors in parentheses

# Table 11 Impact of multiple financing sources on growth

Regression (30) uses average operating income growth as depend variable, regressed on financing sources and financing diversity, control by asset growth. A dummy that indicates if firm uses more than once financing sources is added. Regression (31) uses Pl before tax as dependent variable, and regression (32) is proxied by number of employee growth. T-statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with \*, \*\*, \*\*\* representatively. The number of observations of r-square is reported at the bottom of the table.

Dependent	Operating income	PL growth	Employee growth
variable	growth five year (30)	five year (31)	five year (32)
Fin1_BE	0.0899	0.152	-0.0849
	-0.108	-0.296	-0.102
Fin2_CR	0.0336	0.239	0.035
	-0.0989	-0.295	-0.0569
Fin3_FC	0.0657	0.129	0.0512
	-0.101	-0.306	-0.058
Fin4_FR	0.570**	0.748	0.224
	-0.242	-0.506	-0.143
Fin5_IC	-0.0469	0.177	-0.025
	-0.144	-0.355	-0.153
Fin6_MP	0.115	0.514	0.0415
	-0.108	-0.316	-0.0616
Fin7_IF	0.0963	0.24	0.0373
	-0.0997	-0.293	-0.057
Fin8_OS	0.0135	0.105	0.078
	-0.106	-0.302	-0.058
Fin9_PE	0.0561	0.0953	0.076
	-0.135	-0.418	-0.0772
Fin10_SO	0.0634	0.0476	0.0527
	-0.446	-0.537	-0.149
Fin11_PA	0.308	0.314	0.169
	-0.249	-0.364	-0.164
Fin12_VC	-0.003	0.0713	-0.006
	-0.213	0.162	-0.12
Financing			
diversity	-0.0798	-0.386	-0.0755
	-0.114	-0.329	-0.0657
Asset growth five			
vear	0.464***	0.146**	0.0447
	-0.0434	-0.0673	-0.0271
Constant	-0.182	-0.422	-0.0806
	-0.146	-0.356	-0.0892
Industry Control	Yes	Yes	Yes
Observations	653	193	216
R-squared	0.219	0.304	0.141

Standard errors in parentheses

# Table 12 Impact of financing diversity on top performance

Regression (33) uses top 75% operating income growth as depend variable, regressed on financing sources and financing diversity, control by asset growth. A dummy that indicates if firm uses more than once financing sources is included. Regression (34) uses Pl before tax as dependent variable, and regression (35) is proxied by number of employee growth. T-statistical is shown below each coefficient at 0.1, 0.05, 0.01 level, marked with \*, \*\*, \*\*\* representatively. The number of observations of r-square is reported at the bottom of the table.

	Onaratina income	DI hofore tor	Above median
Dependent variable	operating income	PL before tax auontilo 4 (24)	Above median
	quantile4 (55)	quantile4 (54)	performance (55)
Fin1 BE	-0.286	1.500	0.0999
	-0.917	-1.865	-0.927
Fin2 CR	0.0642	2.28	-0.994
	-0.878	-1.856	-0.882
Fin3 FC	-0.081	0.928	-0.838
—	-0.899	-1.98	-0.9
Fin4 FR	0.705**	1.298**	0.653
_	-0.319	-0.551	-0.442
Fin5_IC	0.291	1.765	-2.109
	-1.241	-2.273	-1.467
Fin6_MP	-0.0384	3.25	0.438
	-0.966	-1.999	-0.954
Fin7_IF	0.407	2.54	-0.625
	-0.887	-1.847	-0.896
Fin8_OS	-0.477	0.528	-0.648
	-0.932	-1.924	-0.959
Fin9_PE	0.251	0.375	-1.249
	-1.154	-0.462	-1.409
Fin10_SO	0.029	0.064	-0.412
	-0.0391	0.495	-0.472
Fin11_PA	2.167	0.095	-0.065
	-1.893	-0.130	0.529
Fin12_VC	1.847	0.264	-0.349
	-1.656	-0.197	-0.342
Financing diversity			
high	-0.0992	-3.286	1.258
	-1.001	-2.206	-0.996
assetgrowthfiveyear	3.368***	-0.0289	1.685***
	-0.618	-0.447	-0.58
Constant	-1.923	-2.967	-1.318
	-1.282	-1.966	-1.007
Industry Control	Yes	Yes	Yes
Observations	644	181	610
Pseudo	0.1779	0.1014	0.1318

Standard errors in parentheses