Capital Gains Taxation and Funding for Start-Ups

Alexander Edwards
Rotman School of Management
University of Toronto
alex.edwards@rotman.utoronto.ca

Maximilian Todtenhaupt
University of Mannheim & ZEW
maximilian.todtenhaupt@zew.de

January 29, 2018

Keywords: Capital Gains Taxes, Entrepreneurship, Venture Capital

JEL codes: M13, G24, H25

We gratefully acknowledge helpful comments and discussions with Bradley Blaylock, Michelle Hutchens, Casey Schwab, Ryan Wilson, and seminar participants at the University of Mannheim. Edwards acknowledges the financial support of the Social Sciences and Humanities Research Council of Canada and the Rotman School of Management.

Capital Gains Taxation and Funding for Start-Up Firms

Abstract

We examine how capital gains taxes affect investment in start-up (i.e., pre-IPO) firms. Using data on capital raised by start-up firms in individual funding rounds and a difference-in-difference research design, we estimate the effect of the Small Business Jobs Act of 2010, which implemented a full exemption from federal taxation of capital gains from the sale of qualified shares. As a result of higher expected after-tax returns (due to lower future capital gains taxes on the ultimate liquidation of the investment), we hypothesize and find evidence consistent with this capital gains tax reduction increasing the amount of investment in start-up firms per funding round by about 10.3%. We also provide evidence that this effect is confined to start-up firms with more than one founder, firms that we argue have greater financial sophistication.

1 Introduction

Start-up firms are an important source of innovation, productivity growth and job creation (e.g., Decker et al. 2014). Investor returns in these firms are a largely generated in the form of capital gains realized in subsequent takeovers or after the initial public offering (IPO). As such, capital gains taxation is likely an important determinant of the cost of capital for start-up firms. However, prior studies provide little evidence on how taxation affects entrepreneurs' financing and organizational form decisions (Hanlon and Heitzman 2010). In this paper, we provide empirical evidence on the effect of a reduction in capital gains taxation on the amount of funding raised by entrepreneurs.

One reason for the lack of empirical evidence is the limited availability of data on start-up firm financing. Prior literature examining the impact of taxation on venture capital funding relies on aggregate venture capital investment data (e.g., Poterba 1989) or firm-level financing data following an IPO (Guenther and Willenborg 1999).[1] However, financing data on start-up firms, whose success often depends on sufficient access to external financing, is unavailable because most start-up firms operate as private firms. In this study, we overcome this data constraint by analyzing a comprehensive dataset on start-up firm financing that has recently been made available through Crunchbase.com. Crunchbase is an online platform that tracks venture capital financing and allows users to observe the firm-level funding volume for start-ups firms in each round of financing. As pointed out by Kaplan and Lerner (2016), the database provides an opportunity to study the evolution of start-up firm funding in greater detail. Most importantly, information on initial (pre-IPO) funding rounds allows for the study of the financing environment for

[1] Several other studies, which do not focus on taxation, use hand-collected information on funding rounds, usually for a smaller set of randomly selected venture capital backed firms (e.g. Gompers 1995).

entrepreneurial activity in the earliest stages of a business where access to external financial resources is crucial for the business to succeed.

In our empirical analyses, we use Crunchbase to identify the effect of changes in capital gains taxation on the financing environment of start-up firms. In particular, we analyze the impact of the 2010 Small Business Jobs Act (2010 SBJA), which provided for a full exemption from federal taxation of capital gains realized on the sale of the shares of certain small businesses. Firms whose stock qualified for this preferential treatment are called Qualified Small Business Stock (QSBS).[2]

In order to be considered as QSBS shares, there are several requirements that need to be met. An important condition that we exploit in our identification strategy is the requirement for the start-up firm to be a "qualified trade or business." The provisions of the 2010 SBJA explicitly excludes start-up firms focusing on accounting, health, engineering, banking, insurance, or financing services from QSBS status. Start-up firms active in one of the excluded sectors are thus not affected by the 2010 SBJA and their shareholders do not receive the preferential treatment on any capital gains realized upon the disposition of their shares. However, they are likely to be affected by changes in other factors that likely trigger changes in start-up firm financing such as labor market and macroeconomic conditions, investment restrictions and other regulatory policies (Gompers and Lerner 2001) and therefore represent an appropriate control group to use in a difference-in-difference estimation. This approach is particularly useful for investigating the 2010 SBJA, which also contained other measures besides the reduction in capital gains taxation. These measures were, however, not restricted to certain types of firms in the same way as the QSBS tax

[2] We focus on the full exemption of capital gains provided for under the 2010 SBJA but perform some sensitivity analysis around the 75% exemption that was enacted earlier. See section 4 for a discussion of this test and these issues.

exemption and can be controlled for in a difference-in-difference design. Thus, we estimate the effect of the capital gains reduction on venture capital funding by observing the difference in funding obtained by treated and non-treated start-up firms (i.e., firms that qualify as QSBS versus non-QSBS) before and after the 2010 SBJA.

Whether or not the capital gains tax reduction in the 2010 SBJA was a meaningful measure to alleviate the financing constraints of start-up firms is subject to substantial debate. Proponents of the capital gains tax exemption argue that the substantial tax benefits significantly increase the after-tax investment returns and will necessarily increase investment. Critics argue that the 2010 SBJA requirements prevent many firms from being eligible and place such an administrative burden on eligible firms that most start-up firms will not derive a substantial benefit from the 2010 SBJA. Further, to our knowledge, prior studies have not provided evidence on whether capital gains taxation affects the supply side of venture capital funding. While intuitively lower capital gains taxation should increase the after-tax return of investments in start-up firms, which should also increase investment in the start-up firms, it remains an empirical question whether such a mechanism exists in less liquid private markets such as those for funding start-up firms.[3]

The results of our difference-in-difference analysis suggest that the implementation of the 2010 SBJA had a positive impact on the amount of capital raised by qualifying start-up firms. On average, the reform increased the funding amount per funding round by approximately 10.3%. Evaluated at the average amount of funding available to treated firms in our sample, this implies that the 2010 SBJA generated additional funding totalling $8.43 billion for start-up firms. This finding is robust to a number of various additional tests related to the incorporation status of start-

[3] As discussed in greater detail in section 2, there is debate as to which party should benefit from such provisions.

up firms, the inclusion of a number of state level control variables, and the amount of funding per round.

We also identify some heterogeneity in our findings across sample firms. In order to qualify as QSBS, a firm must meet a number of criteria (discussed further below), which implies substantial reporting requirements. We argue that a firm lacking sufficient professional and legal expertise is less likely to satisfy the 2010 SBJA requirements or may not even be aware of the provisions. We conjecture that firms with a single founder, who is almost certainly focused on the operations side, are less likely to have this financial expertise. In particular, these start-up firms are potentially not aware or not able to comply with the reporting requirements for QSBS. We predict that start-up firms with two or more founders are more likely to have this financial expertise. In such a setup at least one of the founders often assumes the role of a business manager that also focuses on investor relations and is able to structure the start-up in such a way that it may qualify for QSBS and thus benefit from the capital gains tax reduction under the 2010 SBJA. We observe that the impact of 2010 SBJA is mainly concentrated in start-up firms with more than one investor.

This paper makes three contributions to the extant literature. First, to the best of our knowledge, this paper is the first to provide empirical evidence for a causal relation between capital gains taxation and the cost of capital for small, pre-IPO start-up firms. While prior work has examined the effect of capital gains taxation on public firms (e.g., Ayers et al. 2003; Dai et al. 2008; Blouin et al. 2009; Sikes and Verrecchia 2012; Li et al. 2016), Hellman and Puri (2002) show that these early stages are the period where access to venture capital is crucial for the further success of start-up firms. Documenting an association between capital gains taxation and funding for start-up firms fills this important gap in the literature.

Second, our research design focuses on the supply side of venture capital funding and thus provides important insights with regards to the extent to which it is affected by capital gains taxation. Although we lack a long enough sample period to trace the effect of capital gains taxation over time, our results suggest that in the current diverse financing environment, capital gains taxation affects the supply-side of venture capital.

Finally, our study evaluates an important policy reform that was directly aimed at increasing the amount of external funding available to start-up firms.[4] With an estimated cost of the federal capital gains tax cut in the 2010 SBJA of $5.1 billion over ten years, it is important to verify whether the desired effect on start-up funding was actually realized.[5] Our results suggest that the reform was indeed helpful to some entrepreneurs while the institutional details of Section 1202 prevented a substantial effect for others.

The paper is structured as follows. In Section 2 we describe the institutional background of capital gains tax exemptions for start-up investments and develop our hypotheses. We then provide details on the research design and the data used in Section 3. The main empirical findings are presented in Section 4. Section 5 presents additional analyses. Finally, Section 6 concludes.

2 Institutional Background and Hypotheses

2.1 The 2010 SBJA and Capital Gains Tax Exemptions for Qualified Small Business Stock

An exemption for capital gains from the sale of shares held in qualified firms (Qualified Small Business Stock, QSBS) from federal taxation was first introduced at an exemption rate of 50% by the Revenue Reconciliation Act of 1993, which added Section 1202 to the Internal

[4] In a public statement, the Small Business Administration under President Obama claimed that the 2010 SBJA would "…ensure that small business owners […] have the capital and tax credits they need to grow and create jobs."
[5] 2011-2021. See Report JCX-19-11 from March 17, 2011 by the Joint Committee on Taxation.

Revenue Code (IRC). For shares to be treated as QSBS, they must fulfill several requirements.[6] First, they need to be issued by a firm that is incorporated as a C corporation and does not have more than $50 million in gross assets before or immediately after the issuance. Gross assets for this purpose include cash holdings and the adjusted bases of other property held by this corporation. However, it should be noted that previously issued stock does not disqualify for the QSBS exemption once a firm is above the gross asset threshold of $50 million. It merely prevents the firm from issuing QSBS again. Second, the firm must be engaged in a "qualified trade or business." Generally, any business for which the principal asset is the skill or reputation of at least one employee of the firm does not qualify. This explicitly excludes the provision of professional services in certain areas (e.g. health, accounting, finance, consulting, leasing) as well as farming and extractive activities from the exemption under Section 1202 (see Table 1 for complete list). We use firms that are engaged in these activities as a control group in our difference-in-difference estimation below. Third, the stock must have been acquired at its original issuance, which excludes any shares traded on the secondary market. Finally, to qualify for the capital gains tax exemption, the stock must have been held by the investor for at least 5 consecutive years.

It should be noted that on the investor side, any entity other than a corporation may benefit from QSBS. Thus, in addition to stock held directly by individuals, investments in start-up firms held through partnerships or other pass-through entities qualify as long as the shareholder has joined the entity before the acquisition of QSBS. This means that both individual angel investors and venture capital firms can benefit from Section 1202. These are the types of investors that have traditionally dominated funding for start-ups and also form the large majority of investors in our data.

[6] Regulation on the tax payer side restrict the amount of eligible gain within one year to USD 10 million or 10 times the aggregate adjusted basis of QSBS sold in this year.

The exemption of capital gains under Section 1202 relates to the ordinary income tax rate on long-term capital gains (28% in 1993). In addition, gains exempted under Section 1202 are treated as a preference item with regard to the Alternative Minimum Tax (AMT). This means that high income earners add back 7% of the exempted gains and pay taxes on this amount at the rate of 28%. Thus, when Section 1202 was implemented in 1993 with an exemption of 50%, the resulting effective tax rate for capital gains that benefit from the QSBS exemption was 14.98% if AMT applied and 14% if it did not. Importantly, when the reduced tax rate on long-term capital gains was introduced by the Taxpayer Relief Act of 1997, tax payers had to choose between benefiting from the reduced tax rate or the QSBS exemption. The reduced tax rate was initially introduced at a maximum rate of 20% which was later reduced to 15% by the Jobs and Growth Tax Relief Reconciliation Act of 2003.[7] Because of the very small spread in the rates, the QSBS exemption was largely ineffective from 1997 onwards. The reporting costs and the stricter conditions on holding periods and qualifying activities related to QSBS were substantial compared to the relatively small tax benefit resulting from this exemption when compared to taxing capital gains at the reduced rate of 15%.[8] In 2009, the QSBS exemption was temporarily increased to 75%. However, it still constituted an AMT preference item such that the effective tax rate remained relatively high at 8.47%.

This was changed by the 2010 SBJA which raised the exemption to 100% for all QSBS acquired after September 27, 2010. Initially, this was implemented as a temporary measure with only stock acquired by December 31, 2010 qualifying. The period was extended several times, first to the end of 2011 and then to the end of 2013 and the end of 2014 before it was finally made permanent by the 2015 Protecting Americans from Tax Hikes (PATH) Act.

[7] Lower rates applied to tax payers in lower brackets.
[8] This has been highlighted by practitioners on various occasions, for instance by Wood (2007).

The 2010 SBJA also provided that the excluded amount would not be subject to AMT. Thus the effective tax rate for capital gains that qualified as a sale of QSBS was set to zero. As a consequence, this reform was widely perceived as the most pronounced change. For instance, it got a lot more attention than other reforms. Consistent with this notion, Figure 1 presents the evolution of the number of online searches for QSBS as recorded by Google Trends. We observe an extraordinarily strong increase in online attention directly after the 2010 SBJA was implemented. Interestingly, most of the searches come from California (untabulated), where most of the start-up firms in our sample are located. Moreover, the lack of attention before the reform implementation suggests that there was only limited anticipation of the law change. People only gathered information once the law was passed. While the 2010 SBJA appears to be the most important reform with regard to capital gains taxation for start-up investments, we still account for a potential effect of the 2009 reform in a robustness test.

2.2 Hypotheses Development

As discussed above, the 2010 SBJA exempted certain capital stock from capital gains taxes (i.e., capital gains on QSBS). If prices are held constant, a decrease in capital gains taxation will increase the after-tax return on investments in these start-up firms (i.e., given the same purchase and sale price, lower tax payments results in higher after tax returns). If this is descriptive, investors will realize all the benefits from the exemption from capital gains taxes on QSBS.

As a natural response to the expected higher after-tax returns on QSBS, investors may be more willing to purchase shares of start-up firms that qualify for the exemption from capital gains taxation. This greater willingness to invest will cause potential investors to bid up the price of

QSBS and allow those start-up firms to raise additional capital. Accordingly, we make our first formal hypothesis:

> *H1: Firms issuing qualified small business stock (QSBS) will raise more funding following the 2010 Small Business Jobs Act (SBJA).*

It is possible that we do not observe our hypothesized relation, as it is not clear whether such a mechanism exists in less liquid private markets such as those for funding start-up firms. In fact, there is debate around this issue. Proponents of the tax exemption argue that the substantial tax benefits significantly increase the after-tax investment returns and will necessarily increase investment. Critics argue that the 2010 SBJA requirements prevent many firms from being eligible and place such an administrative burden on eligible firms that most start-ups will not derive a substantial benefit from the 2010 SBJA.[9]

We argue that firms with a single founder, who is almost certainly focused on the operations side of the firm, are less likely to have the financial expertise necessary to avail themselves to the provisions of the 2010 SBJA and exempt the capital gains on their stock from taxation. Consequently, we predict start-up firms with two or more founders are more likely to have this financial expertise as, in such a setup, at least one of the founders often assumes the role of a business manager that also focuses on investor relations and is able to structure the start-up in such a way that it may qualify for QSBS and thus benefit from the capital gains tax reduction in Section 1202 introduced in the 2010 SBJA. Accordingly, we make our second formal hypothesis:

> *H2: The benefits of the 2010 Small Business Jobs Act relating to QSBS will be concentrated in qualifying firms with two or more founders.*

[9] For example, Woods (2007b, page 347) states "No one will accuse the QSBS rules of being particularly user-friendly." The blog Wealthfront notes, "Unfortunately federal and state tax authorities sometimes make it difficult to claim your QSBS benefit." From https://blog.wealthfront.com/qualified-small-business-stock-2016/ as at January 28, 2018.

Providing additional tension to our hypothesized relations, we also note prior studies provide little evidence on whether capital gains taxation affects the supply side of venture capital funding. While the theoretical relation between capital gains taxation and financing costs appears obvious, it remains an empirical question whether such a mechanism exists for start-up firms. Poterba (1989) argues that a personal capital gains tax reduction affects the amount of start-up funding mainly through the demand side by encouraging potential founders, rather than from an increased supply of funds available from investors. This argument is based on the observation that most venture investment comes from entities that are at least not directly affected by personal taxation. However, more recently, the market for start-up firm financing has diversified. Several crowdfunding platforms allow individuals to invest in start-ups firms.[10] Further, current law allows mutual funds and partnerships to pass on the tax benefit to their individual shareholders.

3 Research Design

3.1 Identification Strategy

We identify the effect of the reduction in the capital gains tax rate for sales of start-up firm shares on the volume of funding raised in individual funding rounds using a difference-in-difference design. More precisely, we estimate how the amount of external equity raised changed after the 2010 SBJA became effective for treated firms relative to the change in external equity raised for non-treated firms. Non-treated firms are those that are not eligible for the Section 1202 capital gains tax exemption because of their economic activity (i.e., the industry in which they operate). The model takes the following form:

[10] Bernstein et al. (2017) describe in detail how individual investors operate on one of the largest of these platforms, AngelList.

$$\ln\left(RAISED_{ij}\right) = \beta_1 POST_{ij} + \beta_2 POST_{ij} \times TREATED_j + \boldsymbol{\beta}\mathbf{X} + \boldsymbol{\phi_i} + \boldsymbol{\phi_j} + \epsilon_{ij} \qquad (1)$$

Our dependent variable is the natural logarithm of $RAISED_{ij}$, which in turn is the US dollar amount of equity raised by start-up firm j in funding round i. $POST_{ij}$ is an indicator variable that captures if the funding round occurred after the implementation date of the 2010 SBJA, September 27, 2010 (coded as one), or before (coded as zero). $TREATED_j$ is an indicator variable that is coded as one when start-up firm j is active in an area that is considered as "qualified trade or business" according to Section 1202, and zero otherwise. We are particularly interested in the estimate for β_2, which captures the differential effect of the 2010 SBJA introduction on the funding of treated vs. non-treated start-up firms. If the capital gains tax exemption did effectively reduce the cost of capital and increase the amount of funding for start-up firms, we expect β_2 to be positive.

Using the amount of funding raised as a measure for capital access of the start-up firm has several advantages. First, $RAISED_{ij}$ is readily available from Crunchbase without further manipulations or approximations that would be necessary to derive the price per share received in the funding round.[11] Second, given that the unobserved valuation of the start-up firm is already captured in the fixed effects (discussed below), $RAISED_{ij}$ closely reflects investors' perception of the investment value of this particular firm over time. Finally, our dependent variable corresponds to the logarithm of market value of equity which is often used as a measure for firm valuation (e.g., Blankespoor et al. 2017) and has been found to be superior to share prices for these purposes (Fernando et al. 2004).

All of the start-up firms for which we observe individual funding rounds are private businesses. This is an important prerequisite for them to qualify for the Section 1202 exemption

[11] In fact, given the data available from crunchbase, a test variable based on price or some valuation multiple is not feasible.

because once they become public, shares traded on the secondary market do not qualify as QSBS.[12] However, as a consequence, detailed annual balance sheet information is not available for these firms such that we cannot estimate an investment model using the standard controls that are available in conventional models using public firm data (e.g. Kaplan and Zingales 1997; Kausar et al. 2016). Instead we rely on an extensive set of fixed effect variables that capture variations in external capital raised across individual start-up firms and funding rounds, as well as a set of control variables that captures variations in the valuation of individual start-up firms over time.

We include a set of funding-round specific fixed effects, $\boldsymbol{\phi_i}$: fixed effects for individual types of funding (e.g., angel investor, Series A, B, C, etc.), fixed effects for the ordering of the funding round (e.g., the first round, second round, or third round of funding for start-up firm j) and a time fixed effect for announcement year of the funding round.[13] The latter captures general time trends in start-up firm financing and macroeconomic effects that affect all start-up firms in the same way.

In addition, we include firm fixed effects denoted by $\boldsymbol{\phi_j}$ that control for firm-specific characteristics that do not change over time. In the case of start-up firms, this is also likely to capture the underlying valuation of the firm since the entrepreneurial activity of these firms usually centres around one particular product or idea that is pursued throughout the initial development phase that we observe. Including funding round fixed effects and firm fixed effects in our model implies that we identify β_2 from variation within start-up firms, that is, from firms that raised

[12] An exemption in this regard is the initial public offering (IPO), which is studied by Guenther and Willenborg (1999).
[13] Note, we are able to include year fixed effects in the model because our coefficient of interest is β_2, which captures the differential effect of the 2010 SBJA introduction on the funding of treated vs. non-treated start-up firms, not the main effect on *POST*. We further note that because we know the exact date of the funding round, we are able to exploit within-year variation in funding. As a result, the year fixed effects are not perfectly collinear with the Post indicator and the coefficient on *POST* captures the short-term change in funding following the SBJA for non-treated firms. In robustness tests we omit the year fixed effects and observe results that are qualitatively and quantitatively similar to those including the fixed effects.

capital both before and after the 2010 SBJA became effective. Greatly reducing concerns that some correlated omitted variable is driving the results that we observe from our empirical tests.

We complement our model with a vector of control variables, **X**. At the start-up firm level, we follow Hellmann and Puri (2002) by including the age (AGE) of the entity on the announcement day of the funding round (in years). This is computed using the founding date contained in Crunchbase. Furthermore, we control for investor valuation using the Crunchbase rank ($RANK$) of the start-up firm on the announcement day of the funding round. The Crunchbase rank uses various proprietary algorithms to rank firms according to their importance. According to Crunchbase, this takes into account "the number of connections of a profile within the platform, the amount of community engagement, funding events, news articles, acquisitions, and more." The ranking algorithm allows for each of these factors to decay over time at different rates such that an individual firm's rank may go up or down when moving from one funding round to the next. In our empirical estimation, $RANK$ is computed by dividing the rank provided by Crunchbase by one hundred.

The firm-level control variables are complemented by a set of variables that capture the evolution of the entrepreneurial environment in the state in which the start-up firm has its headquarters. From the Kauffmann Index Entrepreneurship Series we obtain data for two control variables. The first of these control variables is the share of small firms in that state that have grown to at least 50 employees by their tenth year of operation in all firms with an age of ten years or less ($SCALE$). We also include an additional state level control variable that captures the average growth of start-up firms five years after their founding date in a state in each year ($GROWTH$).

3.2 Data and Sample

Information on funding rounds and start-up firms is obtained from Crunchbase. Crunchbase is a data provider on start-up firms with the goal of informing potential investors.[14] It is updated both directly by start-up firms and by investors, as well as by Crunchbase staff who collect, among other items, information on individual funding rounds (amount raised, type of funding, number of investors, date) and the start-up firms involved (date founded, number of founders, activity). The two main reasons for start-up firms to set up Crunchbase accounts and provide information about their enterprise through these accounts are visibility to the media and potential customers, and to attract attention from investors. The latter is reinforced because Crunchbase is linked to several other databases through which investors frequently choose and analyze potential investments (e.g. Angellist, SeedTable). In this way, Crunchbase provides a data that yields a unique opportunity to study start-up firms in their early stages, which has been highlighted by Kaplan and Lerner (2016).

For our analysis, we begin by obtaining the full sample of start-up firms provided by Crunchbase.com in 2017, the most recent year available at the time of data collection. The details of the sample selection process are provided in Table 3. Due to the nature of our study, we restrict our sample to start-up firms located in the United States. We use funding rounds announced from 2005 through 2016 since, for the period before 2005 there are generally very few funding rounds recorded in the Crunchbase database. We only include firms that were founded on or after January 1, 2000 to focus our analysis on new and potentially innovative start-up firms. Since our identification originates in within-firm variation, we exclude all firms with less than 2 funding round.[15]

[14] According to the Crunchbase website, the platform was initiated to be a "master record of data on the world's most innovative companies" (see https://about.crunchbase.com/about-us/).
[15] However, by construction, our results are not altered when including these firms.

We only analyze funding rounds that constitute an original issue and thus fulfill a basic requirement for being treated as QSBS. Generally, secondary market funding is very rare in the database (less than 200 rounds during our sample period), which probably reflects that this is not a common way to fund start-up firms at the early development stage. In particular, start-up founders are unlikely to sell their own shares before the firm is well established because of the negative signal such a sale would send to future investors. Furthermore, we exclude all funding rounds that raised an amount above $50 million. This helps ensure that the shares issued in the funding rounds we analyze generally qualify as QSBS. Most start-up firms use external capital to cover current expenses such as salaries, office and equipment leases, and legal counsel and other professional fees. Thus, even those firms that obtain larger amounts of external funding in early rounds are unlikely to accumulate more than $50 million in total assets, such that their shares continue to qualify with regard to the Section 1202 capital gains exemption. However, raising an amount above $50 million would most likely not comply with this threshold and we thus exclude these funding rounds.

Crunchbase also provides labels with regard to the type of operating activity of individual start-up firms. We use this information to assess whether a firm falls into one of the categories excluded under the "qualified trade or business" requirement of Section 1202 such that they are not affected by the introduction of the 2010 SBJA. More precisely, we sort all firms with an excluded activity label listed in Table 2 into the control group and the remaining firms into the treatment group.[16]

Finally, we complement the Crunchbase data using information from the U.S. Security Exchange Commission (SEC) regulatory filings. In particular, we match Form D filings to the

[16] We also sort firms into the treatment group if their description mentioned any manufacturing process, regardless of their actual activity.

entities in our database. Form D refers to Regulation D that states under which circumstances the sale of securities does not have to be registered with the SEC (according to the U.S. Securities Act of 1933).[17] Most of the firms in our sample qualify for these exemption and file Form D instead of registering their securities with the SEC. While this form contains much less information on the securities, it states the legal form of the issuing firm at the time of the issuance. We use this information to ascertain that the firms included in our analysis are corporations and thus qualify for a capital gains tax exemption on their shares with regard to the legal form requirement.

4 Empirical Results

4.1 Descriptive Statistics

Our benchmark sample contains 13,593 start-up firms that raised an overall total amount of $219 billion in funding during the sample period. The solid bars in Figure 3 display the number of firms founded in each year. We note that the number of firms founded each year grows in the early part of the sample period and then begins to decline in 2012. This decline in the latter portion of the sample period is primarily caused by two factors. First, our requirement for sample firms to obtain at least two rounds of funding. As founding dates get closer to our data collection data, there is likely insufficient time for some firms to have obtained additional funding rounds. The striped bars in Figure 3 display these firms with a single round of funding. Second, this trend also reflects a general decrease in early-stage funding in recent years, which has been documented by several

[17] To be exempt from registration, firms must comply with one of the following requirements: they offer and sell up to $1,000,000 of their securities in any 12-month period (Rule 504); they offer and sell up to $5 million of their securities in any 12-month period to accredited investors or a limited number of other persons (Rule 505); they do not use general solicitation or advertising to market the securities and offer and sell their securities to accredited investors or a limited number of other persons (rule 506).

sources.[18] Of our sample firms, the majority of start-up firms (56.5%) were founded before the 2010 SBJA act was implemented. This is important for our difference-in-difference identification strategy which includes firm-fixed effects and thus relies on firm observations with funding rounds before and after the 100% tax exemption for capital gains was applied. Each firm goes through a number of funding rounds. The median number of funding rounds in our sample is 4 and the maximum number of funding rounds for an individual firm is 24.

The majority of start-up firms (10,024) were still operating at the time the data was collected. 2,532 firms had already been acquired while 352 had gone public. A smaller number of firms were no longer active (685). For some firms, Crunchbase also provides information on the number of employees that were employed at the time the data was collected. These figures are a good indication on how far the start-up firms in our sample have grown during the observation period. Most firms remain relatively small with 9,089 start-ups having less than 50 employees. However, a few firms grow much larger: 116 entities in our sample have more than 5,000 employees at the end of the observation period.

Table 4 provides an overview of the distribution of the start-up firms in our sample with respect to their headquarter location and industry. Panel A lists the number of firms and number of funding rounds, our unit of observation, for start-up firms headquartered in each U.S. state. More than one third of start-up firms in our sample are located in California (see also Figure 2). This is consistent with California being known for its high concentration of innovative firms. Other start-up hubs are New York, Texas, and Washington. With regard to industries, we sort firms into

[18] For instance, on November 30, 2017, Victor Basta presented data on TechCrunch, the major news platform for start-ups, which showed a decline early-stage funding. He concluded that "[…] there has been a quiet, barely noticed implosion in early-stage VC activity worldwide." (https://techcrunch.com/2017/11/30/theres-an-implosion-of-early-stage-vc-funding-and-no-ones-talking-about-it/, retrieved January 27, 2018). Similar evidence has been provided by Fred Wilson who noted that "The seed and early stage investing market has cooled substantially in the past few years. […] On a deals basis, the cooling off has been dramatic […]." (http://avc.com/2017/12/the-early-stage-slump/, retrieved January 27, 2018).

industries as noted on their Form D filings and present the distribution in Panel B. Most firms in our sample are technology-driven entities of some form. Since many start-up firms create new and innovative products, it is not surprising that a large number of our sample firms classify themselves as "Other."[19]

Descriptive statistics for the variables used in the empirical estimation are presented in Table 5. Panel A displays descriptive statistics for the full sample. Start-up firms in our sample raise an average of $7.3 million per funding round, or $3.7 million at the median. The average age of start-up firms in our sample is approximately 4 years old. No firm is older than 17 years and 95% of the firms in the pooled sample are younger than 9.1 years. This value is slightly lower for treated firms, which raise on average of $7 million, while the average funding round of control start-up firms raises $8.1 million. While the minimum amount of funding in a round in our sample is as low as $900, funding rounds usually involve hundreds of thousands of dollars, and only 5% of the funding rounds in our sample raise an amount below $120,000. Again, the distribution is similar across the group of control and treatment start-up firms. We also find a similar distribution of start-up firm AGE across the start-up firms in the treatment and control groups.

We note that in the other variables, the control group and the treatment group do not exhibit substantial differences, which indicates that both subsamples are similarly distributed across age groups, valuation, and locations. This similarity across treatment and control groups is also true for the number of investors ($INVESTORS$), which we use in an additional analyses. On average, 3.5 investors are involved in one funding round of a start-up firm. The maximum number of investors involved is 43 but the large majority of funding rounds (i.e., 95% of funding rounds) consist of less than 9 investors. Again, this distribution is similar across treatment and control firms.

[19] We note that results are qualitatively and quantitatively similar if we exclude these "other" firms from our analyses.

Table 5 also presents details regarding the number of founders in the start-up firms included in our sample. Most firms in our sample have been founded by a small number of individual entrepreneurs, with both the mean and median number of founders at approximately 2. Few firms are established by more than four founders, and the maximum number of founding entrepreneurs in one start-up firm is 15. In the tests of our second hypothesis, we exploit the variation in the number of founders and split the sample along this dimension to test whether start-up firms with differing degrees of capacity for tax optimal structuring are more or less impacted by the provisions of the 2010 SBJA.

4.2 Estimation Results

The results of our benchmark difference-in-difference analysis are presented in Table 6. In column (1) we present the results from a regression model using the full sample as described above. The estimated coefficient for the interaction of the post-reform indicator with the treatment indicator is positive and significant at the 5% level. This suggests that the reduction in the capital gains tax rate on the sale of qualified start-up firm shares, which was introduced by the 2010 SBJA, had a positive impact on the amount of capital raised by start-up firms. More precisely, it suggests that the 2010 SBJA increased the funding amount per funding round of qualifying start-up firms by approximately 10.3%. Evaluated at the average amount of funding available to treated firms in our sample, this implies that the 2010 SBJA generated an additional funding amount of $8.43 billion for start-ups.

There appears to be no general change in start-up funding immediately after the implementation of the SBJA as the lack of significance of the coefficient for the post-reform

indicator variable indicates.[20] With regard to the other control variables, we find that older start-up firms obtain more financing. Within start-up firms, funding grows by about 10.4% per year. This probably reflects that entrepreneurial firms become more professional in organizing their investor relations as they grow older. Furthermore, potential information asymmetries between potential investors and the start-up firm founders are reduced over time as more information about the true value of the firm is revealed through its operations. We also find that firms that are ranked higher in the Crunchbase ranking system obtain more funding. This is consistent with the notion that the Crunchbase ranking captures the external valuation of the start-up firm. The effect is, however, small in magnitude. Our results suggest, that moving up by one hundred ranks increases the amount of funding in a particular funding round by 0.1%. Recall, the mean unscaled rank in our sample is 45,129.

In column (2), we reduce our sample to only those firms that we identified through their SEC filings to be incorporated. Again, the coefficient for the interaction of the post-reform and the treatment indicator is positive and significant, now at the 1% level. Compared to the result in column (1), the effect is slightly larger. The results in column (2) imply that the 2010 SBJA increased the funding raised by qualifying firms by 13.3%. The increase in magnitude is likely to be attributed to the possible inclusion of non-qualifying firms in regression (1). This increases noise in our estimation and may also induce a downward bias. Again both the age and the Crunchbase rank of a firm at the announcement of a funding round increase the amount of capital raised in a funding round.

[20] Note that we capture general time trends by announcement year fixed effects such that the post-reform indicator variable only captures variation within 2010. We also run our model without year fixed effects and obtain qualitatively and quantitatively similar results. In such a specification, however, we estimate a significantly negative coefficient for the post-reform indicator variable as it also captures a negative time trend in the average size of individual funding rounds.

The findings presented in columns (1) and (2) are robust to including additional controls in column (3). We estimate negative coefficients for both state-level indicators of start-up activity that could be related to an increase in the demand for venture capital funding that is not immediately met by supply. We note, however, that neither of the coefficient estimations are significant.

As a robustness check, we repeat regression (3) without year-fixed effects in column (4) to check whether including these fixed effects affects the results. The coefficient of interest, the β_2 coefficient on the *POST* × *TREATED* interaction term, remains statistically significant with a similar magnitude. In this specification we estimate a significantly negative coefficient for the post-reform indicator variable, as it also captures a negative time trend in the average size of individual funding rounds.

To gain further insights regarding the start-up firms that benefit from the 2010 SBJA to a greater extent, we turn to our examination of hypothesis 2. Specifically, we split the sample and run regressions separately on funding rounds for all start-up firms with only one founder and on funding rounds for start-up firms with two or more founders. Results from these subsamples are presented in Table 7. Consistent with hypothesis 2, for the firms with only 1 founder, we find no effect of the 2010 SBJA on capital raised. In contrast, and providing further evidence consistent with hypothesis 2, we find a significantly positive coefficient when we restrict our estimation sample to funding rounds of start-up firms with two or more founders. The estimated coefficient is almost twice as large as the coefficient estimate in the benchmark regressions (1) and (2) of Table 6. Both results are robust to adding state-level controls for general trends in entrepreneurship reported in columns (3) and (4).

These findings imply that the effect we observe is likely driven by funding of start-up firms with more than one founder. This is consistent with the idea that in single-entrepreneur start-up firms the founding inventor is mainly focussed on developing its product and does not have the ability and the resources to structure the start-up in such a way that potential investors could benefit from the capital gains exemption for QSBS. Furthermore, single-founder start-up firms are probably not able to comply with the substantial reporting requirements for QSBS. In order be able to issue QSBS, firms have to report to the IRS and all shareholders how they meet the criteria for QSBS. Start-up firms with more than one founder often consist of one or more inventors, which are mainly focused on the core product of the firm and a manager with expertise in selling and marketing the invention. The latter would also include the raising of external capital. In this function, the manager is more likely than the inventor to take into account potential benefits from qualifying for the capital gains tax exemption in Section 1202 such that the firm could also benefit from the implementation of the 2010 SBJA.

5 Additional Analysis

5.1 Large Funding Rounds

We conduct several additional analyses to verify the robustness and consistency of our empirical results. In a first set of tests, we check whether our results are robust to excluding funding rounds with large amounts of capital raised by reducing our sample to funding rounds that have raised less than $10 million. This test provides additional comfort that our treated firms are below the $50 million asset threshold required to qualify as QSBS.

Results from this test are presented in Table 8. Column (1) presents the results for this subsample using the same specification as in the benchmark regression in column (1) of Table 6.

The estimated coefficient on the *POST* × *TREATED* interaction term is similar in magnitude, which suggests that our main results is mostly driven by smaller funding rounds. While, for reasons outlined above, we do not expect start-up firms involved in funding rounds with more capital raised to disqualify for the capital gains tax exemption, it is reassuring that the main effect of the 2010 SBJA is driven by small start-up firms. It is also of note that these smaller observations make up the majority of firms in our sample. This finding is also robust to restricting the sample further to firms identified as being corporations in column (2) as well as to adding the additional state-level control variables.

5.2 Generalized Difference-in-difference Design

As an additional robustness check we present estimation results from using a generalized difference-in-difference design in line with Jacobson et al. (1993). In this setting, we re-estimate the model including the interactions of the treatment indicator with the full set of announcement year fixed effects instead of the post-reform indicator. The estimated coefficients for the interactions capture the difference in capital raised between the treatment and control group in each year of our sample period which remains after controlling for other factors and can thus be attributed to the 2010 SBJA. By obtaining estimates for each individual year around the reform, we are able to assess the dynamics of the 2010 SBJA. This has two advantages. First, it allows us to verify that, after controlling for various determinants, there is no significant difference in capital raised between the treatment and the control group prior to the reform. Our difference-in-difference is thus a valid identification strategy. Second, we can use the generalized difference-in-difference design to assess whether the 2009 reform, which preceded the 2010 SBJA and increased the exemption rate in Section 1202 from 50% to 75% had any impact. A disadvantage of the

generalized difference-in-difference design is that we cannot use the exact date of the reform implementation to separate pre- and post-reform periods. Furthermore, this setup does not allow us to make inferences with regard to the overall impact of the reform but only displays the effect in individual years. Both issues do not arise in our benchmark model that we use to estimate the impact of capital gains tax reduction.

We present the results of the generalized difference-in-difference estimation graphically in Figure 4. The coefficients for the pre-reform interactions are all quite small and insignificant. In separate tests for their joint significance as well as the significance of the sum of the pre-reform interaction coefficients we cannot reject the null (p-values of 0.90 and 0.87, respectively). Thus, the parallel trends assumption holds, which validates our difference-in-difference design. Furthermore, we observe significant differences between the control and the treatment group only after the implementation of the 2010 SBJA. The coefficient for the interaction of the treatment indicator and the indicator for funding round announcement in 2009 is close to zero and insignificant. We infer that the 2010 reduction in capital gains taxes is the decisive event in our analysis.

5.3 Alternative Dependent Variable

In Table 9 we use a different dependent variable. Since the 2010 SBJA reduced capital gains taxation for individual investors in particular, it is possible that it affected not only the amount raised in individual funding rounds but also the number of investors (i.e., by attracting more individual investors). We test this by replacing the dependent variable in main specification by the logarithm of the number of investors, $\ln(INVESTORS)$. In column (1) of Table 9 we present the result of a regression using all observations in the full sample for which the number of investors

is recorded in Crunchbase. The estimated coefficient of the interaction term is significantly positive at the 1% level. This implies that the implementation of the 2010 SBJA increased the number of investors per funding round. This finding is robust to using a nonlinear count model in column (2) where we employ the Poisson Pseudo Maximum Likelihood (PPML) estimator proposed by Silva and Tenreyro (2006) in a panel fixed effects estimation. We obtain qualitatively similar results when restricting the sample to firms whose incorporation we can verify through their SEC filings and when adding additional state-level variables in columns (3) and (4), respectively.

5.4 Placebo Test

An additional potential concern is that the estimated impact of the implementation of the 2010 SBJA is either merely a random effect or captures some spurious correlation(s) with omitted variables. If this were case, we should obtain the same results independent of the assignment of treatment and control observations. We test this possibility through a placebo test in which we randomly assign firms to treatment and control groups, keeping the ratio of treated to non-treated firms identical to the original sample (see Table 5). Using these randomly assigned treatment and control groups, we then rerun our benchmark regression with the full set of controls and the sample restricted to incorporated entities (i.e., the specification is identical to regression 3 in Table 6). We repeat this exercise for 1,000 estimations and report the resulting β_2 coefficients on the *POST* × *TREATED* interaction term in a histogram in Figure 5. We find a significantly positive impact (5% confidence level) only for 27 of the 1,000 trials (2.7%). Further, only 0.7% of the estimated β_2 coefficients on the *POST* × *TREATED* interaction term are equal or larger than the coefficient estimated in our benchmark regression using the original sample (0.134, which is plotted as a

reference point in the figure with a solid vertical line). These results reassure us that our tests capture the treatment effect of the 2010 SBJA on start-up funding and not some random effect or omitted variable.

6 Conclusion

In this study we analyze the effect of capital gains taxes on investments in start-up firms on the amount of capital raised by these early stage entrepreneurial firms. Using detailed data on capital raised by start-up firms in individual funding rounds in a difference-in-difference research design we estimate the effect of the 2010 SBJA, which implemented a full exemption from federal taxation of capital gains from the sale of qualified shares (QSBS). The difference-in-difference design exploits that some start-up firms were not affected by this reform as their shares generally do not qualify as QSBS because of the underlying economic activity of the firm. We find that capital gains taxes have a significantly negative impact on the amount of funding obtained by start-up firms. The capital gains tax reduction introduced by the 2010 SBJA, which decreased the effective federal capital gains tax rate on the sale of QSBS by 8.75%, raised the amount of investment in start-up firms per funding round by about 10.3%. This effect is, however, confined to entrepreneurial firms with more than one founder, which suggests that only start-up firms with a more sophisticated structure are able to benefit from the capital gains tax exemption. Single-founder start-up firms are likely to lack the capacity to comply with the administrative requirements to qualify for the capital gains tax exemption in Section 1202 and as a result may not have been able to avail themselves to the benefits.

There are two important takeaways from this study. First, a targeted reduction in capital gains taxes is a useful policy to ease access to external financing for start-up firms. Given that

these firms are an important driver of innovation and economic growth, such reforms may have a positive impact on the whole economy. Second, a large administrative burden limits the extent to which entrepreneurial firms can benefit from such a policy. In particular, single-founder start-up firms are do not appear to be sophisticated enough to exploit the capital gains tax exemption and make their shares more attractive to external investors. This points to a trade-off between targeting the capital gains tax reduction to particular firms, and thereby mitigating the revenue cost of the policy, and broadening the measure in order to affect as many start-up firms as possible.

Appendix: Variable Definition

$RAISED$	Amount of capital raised in a funding round, USD
AGE	Difference between the announcement date of the funding round and the funding date of the issuing firm in years.
$INVESTORS$	Number of investors involved in a funding round
$RANK$	Crunchbase rank divided by 100
$SCALE$	Number of firms that started small but grew to employ fifty people or more by their tenth year of operation as a percentage of all employer firms ten years and younger in the state where the issuing start-up is active.
$GROWTH$	Average percentage change in employment of start-ups five years after founding in the state where the issuing start-up is active.

References

Ayers, B. C., C. E. Lefanowicz, and J. R. Robinson. 2003. Shareholder Taxes in Acquisition Premiums: The Effect of Capital Gains Taxation. *The Journal of Finance* 58 (6): 2783–2801.

Bernstein, S., A. Korteweg, and K. Laws. 2017. Attracting Early-Stage Investors: Evidence from a Randomized Field Experiment. *The Journal of Finance* 72 (2): 509–538.

Blankespoor, E., B. E. Hendricks, and G. S. Miller. 2017. Perceptions and price: Evidence from CEO presentations at IPO roadshows. *Journal of Accounting Research* 55 (2): 275–327.

Blouin, J., L. Hail, and M. H. Yetman. 2009. Capital Gains Taxes, Pricing Spreads, and Arbitrage: Evidence from Cross‐Listed Firms in the U.S. *The Accounting Review* 84 (5): 1321–1361.

Dai, Z., E. Maydew, D. A. Shackelford, and H. H. Zhang. 2008. Capital Gains Taxes and Asset Prices: Capitalization or Lock-in? *The Journal of Finance* 63 (2): 709–742.

Decker, R., J. Haltiwanger, R. Jarmin, and J. Miranda. 2014. The role of entrepreneurship in US job creation and economic dynamism. *The Journal of Economic Perspectives* 28 (3): 3–24.

Fernando, C. S., S. Krishnamurthy, and P. A. Spindt. 2004. Are share price levels informative? Evidence from the ownership, pricing, turnover and performance of IPO firms. *Journal of Financial Markets* 7 (4): 377–403.

Gompers, P. A. 1995. Optimal investment, monitoring, and the staging of venture capital. *The Journal of Finance* 50 (5): 1461–1489.

Gompers, P., and J. Lerner. 2001. The Venture Capital Revolution. *The Journal of Economic Perspectives* 15 (2): 145–168.

Guenther, D. A., and M. Willenborg. 1999. Capital gains tax rates and the cost of capital for small business: evidence from the IPO market. *Journal of Financial Economics* 53 (3): 385–408.

Hanlon, M., and S. Heitzman. 2010. A review of tax research. *Journal of Accounting and Economics* 50 (2): 127–178.

Hellmann, T., and M. Puri. 2002. Venture Capital and the Professionalization of Start-Up Firms: Empirical Evidence. *The Journal of Finance* 57 (1): 169–197.

Jacobson, L. S., R. J. LaLonde, and D. G. Sullivan. 1993. Earnings losses of displaced workers. *The American Economic Review*: 685–709.

Kaplan, S. N., and J. Lerner. 2016. Venture capital data: Opportunities and challenges. In *Measuring Entrepreneurial Businesses: Current Knowledge and Challenges*. University of Chicago Press.

Kaplan, S. N., and L. Zingales. 1997. Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints? *The Quarterly Journal of Economics* 112 (1): 169–215.

Kausar, A., N. Shroff, and H. White. 2016. Real effects of the audit choice. *Journal of Accounting and Economics* 62 (1): 157–181.

Li, O. Z., Y. Lin, and J. R. Robinson. 2016. The effect of capital gains taxes on the initial pricing and underpricing of IPOs. *Journal of Accounting and Economics* 61 (2): 465–485.

Poterba, J. M. 1989. Capital gains tax policy toward entrepreneurship. *National Tax Journal* 42 (3): 375–389.

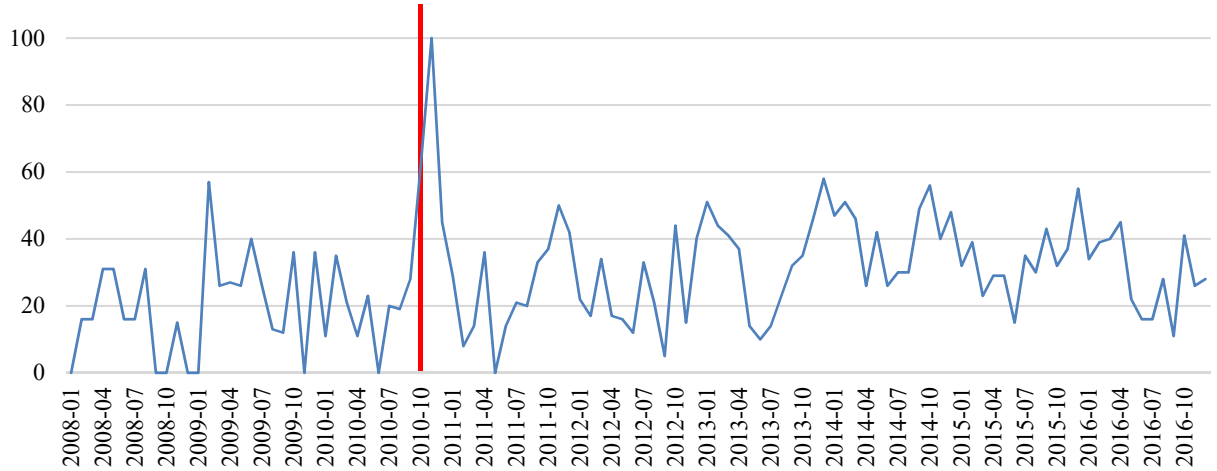
Sikes, S. A., and R. E. Verrecchia. 2012. Capital Gains Taxes and Expected Rates of Return. *The Accounting Review* 87 (3): 1067–1086.

Silva, J. S., and S. Tenreyro. 2006. The log of gravity. *The Review of Economics and statistics* 88 (4): 641–658.

Wood, Robert W. 2007. Qualified Small Business Stock Number Crunching. *M&A Tax Report* 15 (11).

Wood, Robert W. 2007b. Number Crunching and Qualified Small-Business Stock Gains. *Tax Notes* April 23, 2007.

Figure 1: Google Trends, Searches for "Qualified Small Business Stock" in the United States. 2008-2016



This figure reports the evolution of the number searches for "Qualified Small Business Stock" in the United States from 2008 to 2016. The highest value is indexed to 100.

Figure 2: Geographical Distribution of Start-Ups (Number of Start-ups 2005-2016)

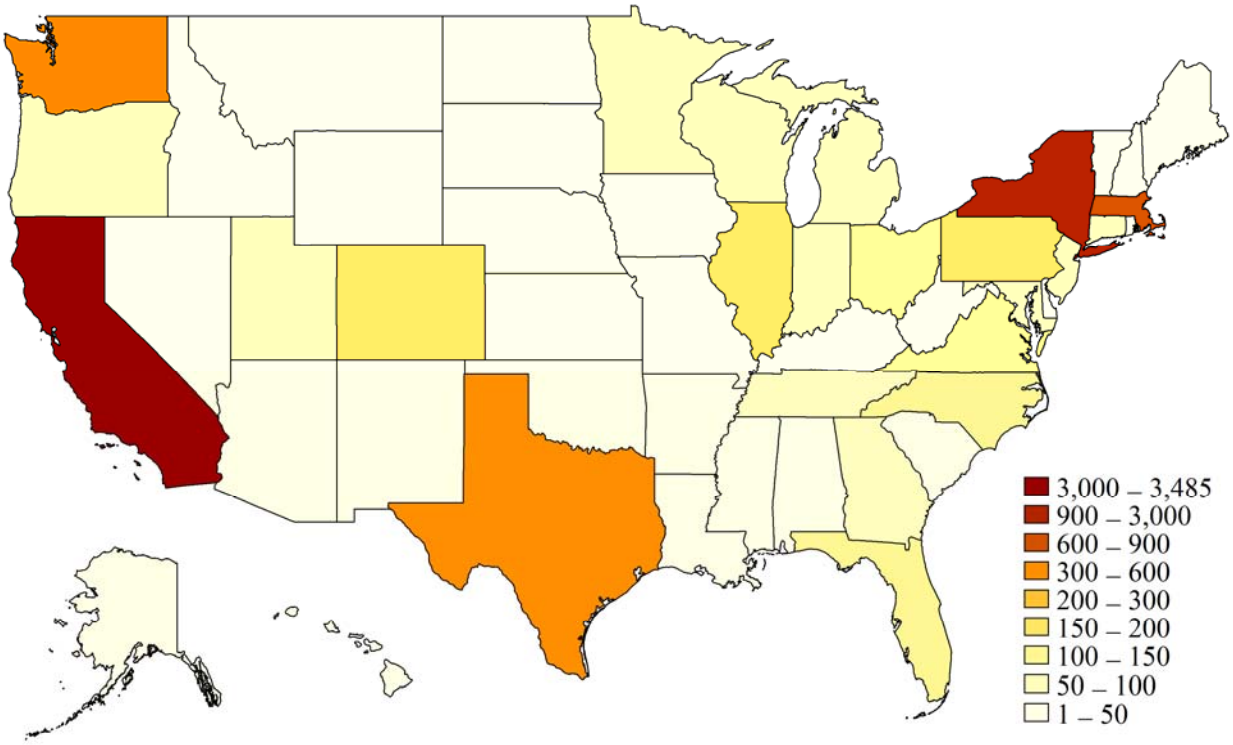


Figure 3: Number of Start-ups Founded, 2000-2016

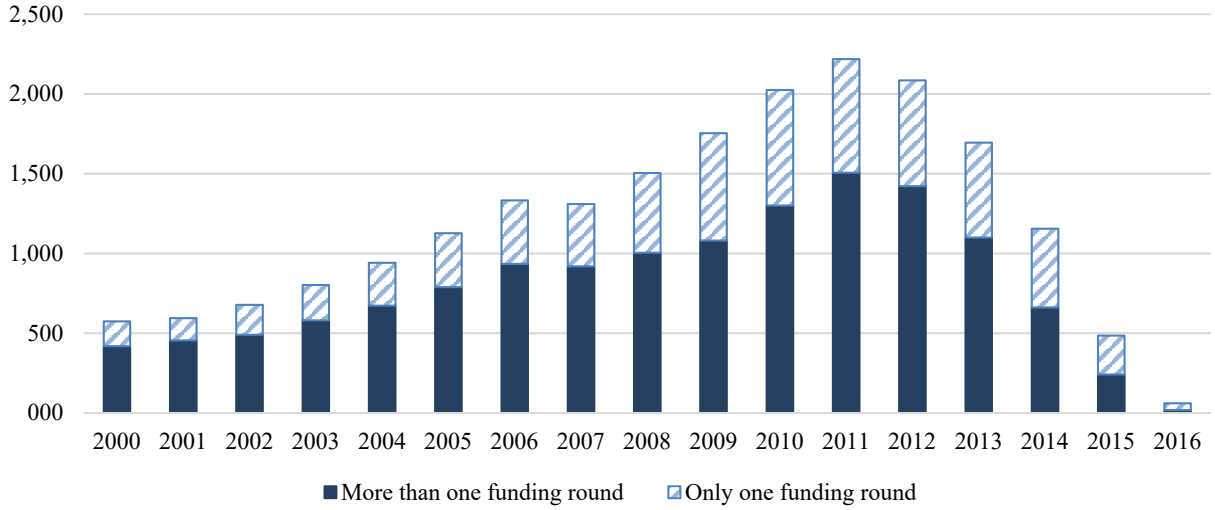
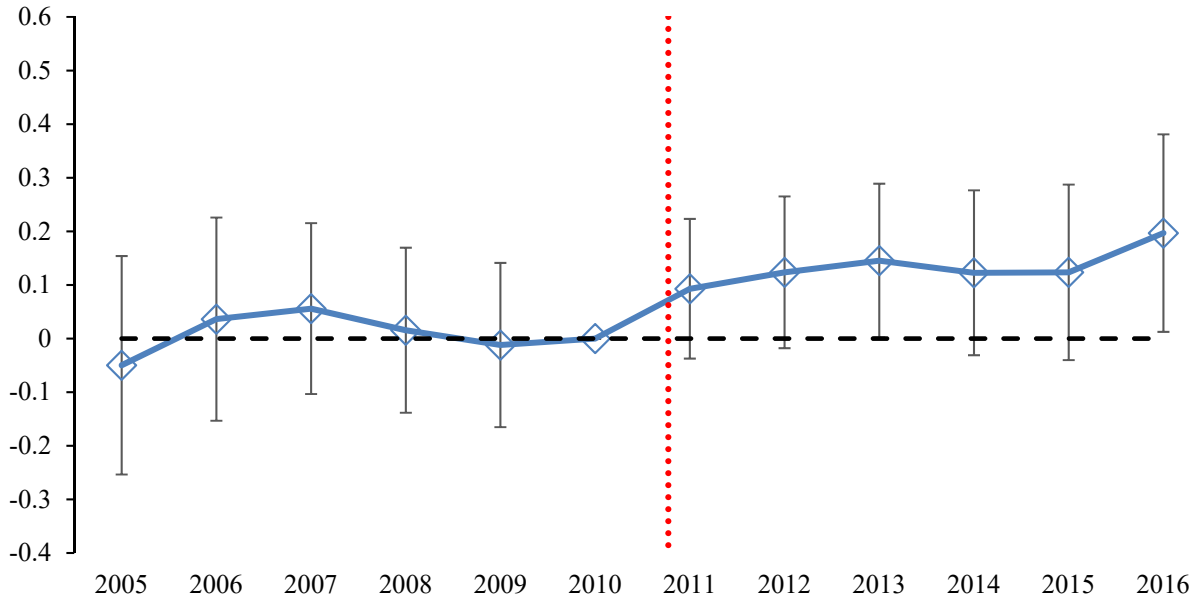


Figure 4: Generalized Difference-in-Difference Design

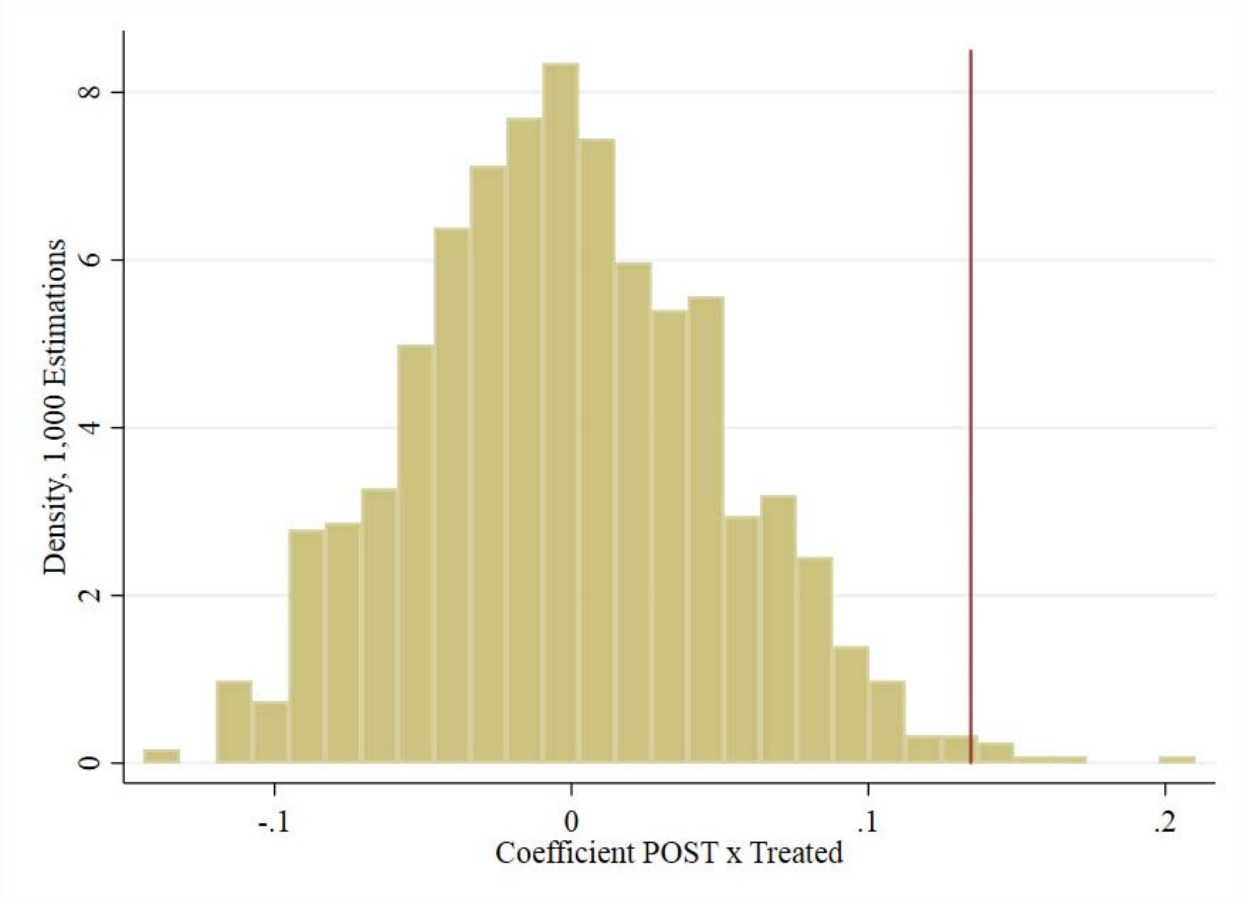


This figure presents the results of a generalized difference-in-difference design following Jacobson et al. (1993). The checks mark the coefficient estimates γ_t from the regression of the following model

$$\ln(RAISED_{ij}) = \sum_{t=2005}^{2009} \gamma_t D_t \times TREATED_{ij} + \sum_{t=2011}^{2016} \gamma_t D_t \times TREATED_{ij} + \boldsymbol{\beta}\mathbf{X} + \boldsymbol{\phi_i} + \boldsymbol{\phi_j} + \epsilon_{ij} \qquad (2)$$

where D_t indicates that founding round i by start-up j was announced in year t and $\boldsymbol{X}$, $\boldsymbol{\phi_i}$ and $\boldsymbol{\phi_j}$ are the same vectors of control variables and fixed effects as in model (1). $TREATED$ marks start-ups conducting activities that are deemed to be a "qualifying trade or business" in the sense of Section 1202 and are thus affected by the capital gains tax reduction of the 2010 SBJA. 95% coefficient intervals are plotted around the coefficient estimates. The dotted red line marks the event of the reform. In line with previous literature we omit the interaction of the implementation year dummy and normalize it to zero in order to avoid perfect collinearity. The estimated coefficients γ_t thus have to be interpreted as the difference between the treatment and control group, after controlling for other factors, relative to year 2010.

Figure 5: Random Assignment to Treatment and Control Group



This figure presents a histogram of the estimated coefficients of a falsification test. In each of the 1,000 separate estimations, the treatment and control group are randomly assigned following a uniform distribution with the ratio of treated and control firms identical to the one of the original sample (see Table 5). Then, the benchmark model with the full set of controls and a restriction to incorporated firms (i.e. a model equivalent to column 3 in Table 6) is re-estimated using the randomly assigned treatment variable. The reported coefficients are for the interaction $POST \times TREATED$.

Table 1: Activities not deemed to be "qualified trade or business" under Section 1202(e)(3)

Services	Financial activities	Other
• Health • Law • Engineering • Architecture • Accounting • Actuarial science • Performing arts • Consulting • Athletics • Financial services • Brokerage	• Banking • Insurance • Financing • Leasing • Investing	• Farming • Harvesting trees • Extracting activities (defined in Section 613 and 613A) • Hotels • Motels • Restaurants

The table lists the activities that are stated in Section 1202(e)(3) as not qualifying for the capital gains tax exemption. In addition to the listed activities, any trade or business where the reputation or skill of one or more employees of a firm is the principal asset of that firm is excluded from the tax exemption. Furthermore any firm for which more than 10% of the value of its net assets consists of shares in other firms or 10% of the overall value of its assets consists of real property is excluded from the exemption.

Table 2: Activity Labels of Control Firms

Accounting	Credit Cards	Hospitality	Psychology
Advice	Crowdfunding	Hotel	Real Estate Investment
Agriculture	Crowdsourcing	Impact Investing	Resorts
Alternative Medicine	Cryptocurrency	Independent Music	Restaurants
Angel Investment	Debit Cards	Industrial Engineering	Retirement
Animal Feed	Debt Collections	Insurance	Seafood
Aquaculture	Dental	Law Enforcement	Shipping Broker
Architecture	Emergency Medicine	Leasing	Stock Exchanges
Asset Management	Environmental Consulting	Legal	Theatre
Assisted Living	Environmental Engineering	Life Insurance	Therapeutics
Auto Insurance	Farmers Market	Livestock	Trading Platform
Banking	Farming	Management Consulting	Transaction Processing
Billing	Finance	Mechanical Engineering	Travel Accommodations
Bitcoin	Financial Exchanges	Medical	Venture Capital
Business Intelligence	Financial Services	Medical Device	Veterinary
Career Planning	Forestry	Mineral	Wealth Management
Chemical Engineering	Fruit	Mining	Wood Processing
Civil Engineering	Genetics	Music	
Clinical Trials	Government	Nursing and Residential Care	
Commercial Insurance	Health Care	Payments	
Compliance	Health Diagnostics	Performing Arts	
Concerts	Health Insurance	Personal Finance	
Consulting	Hedge Funds	Personal Health	
Cosmetic Surgery	Home Health Care	Precious Metals	
Credit	Hospital	Property Insurance	

Table 3: Sample Selection

No.	Sample Selection	Number of Observations
(1)	Pre-IPO and acquisition funding round observations recorded in Crunchbase 2005-2016, US entities	71,549
(2)	Excluding firms with implausible founded dates	70,184
(3)	Excluding non-equity financing	61,008
(4)	Excluding firms founded before 2000	55,222
(5)	Excluding funding rounds which raised more than $50 million USD	53,800
(6)	Excluding funding rounds without sufficient information on control variables	36,585
(7)	Excluding firms with only one funding round	29,832
(8)	Excluding firms which have not filed a firm D	19,485
(9)	Excluding firms which are not a corporation according to their Form D filing	18,091

This table describes the sample selection process. Implausible founded dates are firms that were founded after the first founding round recorded on Crunchbase.

Table 4: Start-ups and Funding Rounds

Panel A: By State

State	No. of Start-ups	No. of Funding Rounds	State	No. of Start-ups	No. of Funding Rounds
Alabama	11	30	Missouri	44	223
Alaska	2	7	Montana	8	26
Arizona	45	169	Nebraska	15	58
Arkansas	12	40	Nevada	24	77
California	3,485	12,761	New Hampshire	27	95
Colorado	182	763	New Jersey	78	283
Connecticut	66	262	New Mexico	8	65
Delaware	9	35	New York	931	3,324
District of Columbia	41	161	North Carolina	101	415
Florida	129	473	North Dakota	1	2
Georgia	97	434	Ohio	112	419
Hawaii	5	23	Oklahoma	9	23
Idaho	10	39	Oregon	83	338
Illinois	191	632	Pennsylvania	157	679
Indiana	57	160	Rhode Island	22	92
Iowa	9	38	South Carolina	12	65
Kansas	20	63	South Dakota	1	2
Kentucky	23	65	Tennessee	69	331
Louisiana	12	32	Texas	310	1,245
Maine	10	40	Utah	81	311
Maryland	99	375	Vermont	7	26
Massachusetts	691	2,804	Virginia	117	440
Michigan	62	240	Washington	318	1,135
Minnesota	77	307	West Virginia	2	8
Mississippi	2	10	Wisconsin	52	185
			Wyoming	1	2
Total	7,937	29,832			

Table 4 (continued)

Panel B: By Industry

Industry	No. of Start-ups	No. of Funding Rounds
Agriculture	4	19
Airlines and Airports	1	2
Biotechnology	323	1,753
Business Services	45	146
Commercial	1	1
Commercial Banking	3	8
Computers	175	686
Construction	2	9
Electric Utilities	1	3
Energy Conservation	18	95
Environmental Services	4	22
Health Insurance	1	2
Hospitals and Physicians	4	15
Insurance	1	3
Investing	2	4
Investment Banking	0	2
Manufacturing	24	99
Oil and Gas	1	7
Other	581	2,255
Other Banking and Financial Services	27	91
Other Energy	63	277
Other Health Care	351	1,779
Other Real Estate	5	20
Other Technology	2,117	9,261
Other Travel	8	20
Pharmaceuticals	129	655
Pooled Investment Fund	2	5
Residential	2	6
Restaurants	5	18
Retailing	74	301
Telecommunications	81	356
Tourism and Travel Services	8	26
Total	4,063	17,946

Table 5: Descriptive Statistics

Panel A: Pooled Sample

Variable	Obs.	Mean	Std. Dev.	Min	5% percentile	Median	95% percentile	Max
RAISED	29,832	7,355,529	9,131,123	900	120,000	3,719,096	28,000,000	49,999,989
AGE	29,832	3.674	2.754	0.000	0.414	3.027	9.173	16.888
RANK	29,832	451.286	304.371	1.120	48.630	395.455	955.590	1000
SCALE	29,671	0.014	0.003	0.007	0.010	0.014	0.019	0.028
GROWTH	29,671	0.570	0.132	0.039	0.411	0.554	0.821	1.984
INVESTORS	23,711	3.485	2.878	1	1	3	9	43
FOUNDERS	25,571	2.042	1.057	1	1	2	4	15

Panel B: Treated Firms

Variable	Obs.	Mean	Std. Dev.	Min	5% percentile	Median	95% percentile	Max
RAISED	19,368	6,956,666	8,545,732	900	125,000	3,600,000	25,000,000	49,999,989
AGE	19,368	3.472	2.644	0.000	0.373	2.837	8.841	15.926
RANK	19,368	429.631	295.071	1.120	45.860	365.740	943.670	1000
SCALE	19,263	0.014	0.003	0.007	0.010	0.014	0.019	0.028
GROWTH	19,263	0.573	0.130	0.039	0.412	0.554	0.821	1.984
INVESTORS	16,031	3.515	2.919	1	1	3	9	43
FOUNDERS	17,013	2.109	1.074	1	1	2	4	11

Panel C: Control Firms

Variable	Obs.	Mean	Std. Dev.	Min	5% percentile	Median	95% percentile	Max
RAISED	10,464	8,093,790	10,084,625	1,000	112,500	3,979,369	30,900,000	49,700,000
AGE	10,464	4.048	2.911	0.000	0.496	3.384	9.682	16.888
RANK	10,464	491.366	317.009	3.180	52.440	449.470	965.790	999.980
SCALE	10,408	0.014	0.003	0.007	0.010	0.015	0.019	0.028
GROWTH	10,408	0.565	0.135	0.127	0.392	0.554	0.817	1.984
INVESTORS	7,680	3.423	2.789	1	1	3	9	39
FOUNDERS	8,558	1.908	1.010	1	1	2	4	15

This table presents descriptive statistics for the regression variables. Panel A presents descriptive statistics for the full sample, Panel B for the treatment observations, and Panel C for the control observations. Detailed variable definitions are presented in the appendix.

Table 6: Regression Results: Capital Raised, Pooled Sample

Variable	(1)	(2)	(3)	(4)
$POST$	-0.062	-0.041	-0.042	-0.120***
	(0.056)	(0.064)	(0.064)	(0.044)
$POST \times TREATED$	0.103**	0.133***	0.134***	0.126***
	(0.042)	(0.048)	(0.048)	(0.048)
AGE	0.104***	0.101***	0.099***	0.032***
	(0.024)	(0.030)	(0.030)	(0.012)
$RANK$	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
$SCALE$			-15.001	-15.148*
			(12.127)	(8.007)
$GROWTH$			-0.103	0.180**
			(0.104)	(0.091)
No. of Observations	29,832	18,091	17,976	17,976
No. of Start-ups	13,593	7,434	7,385	7,385
R^2	0.471	0.457	0.457	0.448

This table presents the results of a difference-in-difference analysis. The dependent variable in all columns is the logarithm of USD raised in a particular funding round. $POST$ indicates that the funding round was announced after effectiveness date of the 2010 SBJA (September 27, 2010) and $TREATED$ marks start-ups conducting activities that are deemed to be a "qualifying trade or business" in the sense of Section 1202 and are thus affected by the capital gains tax reduction of the 2010 SBJA. Column (1) presents regressions using the full sample. In Column (2), a regression using the reduced sample including only start-ups that have been verified to be incorporated through their SEC filings is displayed. The regression in Column (3) adds additional control variables. All regressions include firm fixed effects, announcement year fixed effects, funding round fixed effects, and funding type fixed effects. Column (4) presents results from a replication of regression (3) without announcement year fixed effects. Cluster-robust standard errors (clustered on the start-up level) are presented in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% levels. Detailed variable definitions are presented in the appendix.

Table 7: Regression Results: Capital Raised, Sample Split on Number of Founders

Variable	(1)	(2)	(3)	(4)
$POST$	0.112	-0.074	0.107	-0.063
	(0.106)	(0.095)	(0.106)	(0.095)
$POST \times TREATED$	-0.011	0.194***	-0.009	0.192***
	(0.071)	(0.074)	(0.071)	(0.074)
AGE	0.074	0.112***	0.076	0.110***
	(0.050)	(0.042)	(0.051)	(0.042)
$RANK$	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
$SCALE$			-25.421	-6.864
			(19.212)	(16.861)
$GROWTH$			0.033	-0.192
			(0.170)	(0.143)
No. of Observations	5,941	9,192	5,912	9,118
No. of Start-ups	2,358	3,586	2,345	3,556
R^2	0.402	0.544	0.403	0.543

This table presents the results of a difference-in-difference analysis. The dependent variable in all columns is the logarithm of USD raised in a particular funding round. $POST$ indicates that the funding round was announced after effectiveness date of the 2010 SBJA (September 27, 2010) and $TREATED$ marks start-ups conducting activities that are deemed to be a "qualifying trade or business" in the sense of Section 1202 and are thus affected by the capital gains tax reduction of the 2010 SBJA. Only start-ups which have been verified to be incorporated through their SEC filings are used in the estimation. Column (1) and (2) present regression results using start-ups with one founder or two and more founders, respectively. The regressions in columns (3) and (4) add additional control variables. All regressions include firm fixed effects, announcement year fixed effects, funding round fixed effects and funding type fixed effects. Cluster-robust standard errors (clustered on the start-up level) are presented in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% levels. Detailed variable definitions are presented in the appendix.

Table 8: Regression Results: Capital Raised, Small Funding Rounds

Variable	(1)	(2)	(3)
$POST$	-0.090	-0.054	-0.056
	(0.071)	(0.080)	(0.080)
$POST \times TREATED$	0.110*	0.150**	0.151**
	(0.058)	(0.066)	(0.066)
AGE	0.072**	0.075*	0.075*
	(0.032)	(0.040)	(0.041)
$RANK$	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)
$SCALE$			16.715
			(17.213)
$GROWTH$			-0.155
			(0.136)
No. of Observations	21,879	12,629	12,550
No. of Start-ups	12,123	6,544	6,501
R^2	0.387	0.366	0.365

This table presents the results of a robustness test for difference-in-difference analysis presented in Table 6. Columns (1), (2) and (3) repeat the corresponding columns in Table 6, including only those funding rounds which raise less than USD 10m. All regressions include firm fixed effects, announcement year fixed effects, funding round fixed effects and funding type fixed effects. Cluster-robust standard errors (clustered on the start-up level) are presented in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% levels. Detailed variable definitions are presented in the appendix.

Table 9: Regression Results: Number of Investors

Variable	(1)	(2)	(3)	(4)
$POST$	-0.043*	-0.026	-0.011	-0.011
	(0.023)	(0.028)	(0.026)	(0.026)
$POST \times TREATED$	0.062***	0.041**	0.055***	0.056***
	(0.018)	(0.017)	(0.020)	(0.020)
AGE	-0.002	-0.001	-0.008	-0.009
	(0.010)	(0.011)	(0.012)	(0.012)
$RANK$	-0.003***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
$SCALE$				-1.413
				(4.802)
$GROWTH$				-0.039
				(0.042)
No. of Observations	23,711	24,936	13,767	13,672
No. of Start-ups	11,702	8,697	6,237	6,194
R^2	0.776		0.775	0.775

This table presents the results of a difference-in-difference analysis. The dependent variable in columns (1), (3) and (4) is the logarithm of number of investors in a particular funding round. Column (2) estimates a count model using the Poisson Pseudo Maximum Likelihood estimator proposed by Silva and Tenreyro (2006), again using the number of investors in a particular funding round as dependent variable. $POST$ indicates that the funding round was announced after effectiveness date of the 2010 SBJA (September 27, 2010) and $TREATED$ marks start-ups conducting activities that are deemed to be a "qualifying trade or business" in the sense of Section 1202 and are thus affected by the capital gains tax reduction of the 2010 SBJA. Column (1) and (2) present regressions using the full sample. In Column (3), a regression using the reduced sample including only start-ups that have been verified to be incorporated through their SEC filings is displayed. The regression in Column (4) adds additional control variables. All regressions include start-up fixed effects, announcement year fixed effects, funding round fixed effects and funding type fixed effects. Cluster-robust standard errors (clustered on the start-up level) are presented in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% levels. Detailed variable definitions are presented in the appendix.