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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, we estimate the effect of the SBJA of 2010, which implemented a full exemption from federal capital gains tax on the sale of qualified shares. Because of higher expected after-tax returns (lower future capital gains taxes), 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 12%. We also provide evidence that this effect is concentrated in start-up firms that are likely to be more financially sophisticated.

Keywords: Capital Gains Taxes, Start-ups, Tax Capitalization

JEL codes: M13, G24, H25

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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, we estimate the effect of the SBJA of 2010, which implemented a full exemption from federal capital gains tax on the sale of qualified shares. Because of higher expected after-tax returns (lower future capital gains taxes), 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 12%. We also provide evidence that this effect is concentrated in start-up firms that are likely to be more financially sophisticated.

1 Introduction

Start-up firms are an important source of innovation, productivity growth and job creation (Haltiwanger et al. 2012; Decker et al. 2014; Adelino et al. 2017). Investor returns in these firms are 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 remain largely silent on how taxation affects entrepreneurs' financing and organizational form decisions (Hanlon and Heitzman 2010). In this study, we provide empirical evidence on the effect of a reduction in capital gains taxation on the amount of funding raised by entrepreneurs.

One potential 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 most start-up firms is unavailable because they operate as private firms. In this study, we overcome this data constraint by analyzing comprehensive information 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-up firms in each round of financing. Our benchmark sample contains 13,431 start-up firms that raised an overall total amount of $218.5 billion in funding during the sample period. 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 entrepreneurial activity

[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).

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. The stock of these firms is called Qualified Small Business Stock (QSBS) if it qualifies for this preferential treatment.[2]

In order to be considered as QSBS, 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 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 exemption and can be controlled for in a difference-in-difference design. Thus, we estimate the effect of the capital

[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.

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 a capital gains tax reduction is 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 administrative requirements of such targeted tax regimes prevents many firms from being eligible and place such an administrative burden on eligible entities that most start-up firms will not derive a substantial benefit. 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 equity, which should also increase the aggregate amount invested, 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 per round by approximately 12%. Evaluated at the average amount of funding available to treated firms in our sample, this implies that the 2010 SBJA generated additional funding totalling $9.6 billion for start-up firms. This finding is robust to various additional tests related to the incorporation status of start-up firms, the inclusion of a number of state level control variables, and restrictions on the amount of funding per round.

We also identify some heterogeneity in our findings across firms. In order to qualify as

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

QSBS, a firm must meet a number of criteria (discussed further below) that require substantial reporting requirements. We argue that firms lacking sufficient financial sophistication (i.e., professional and legal expertise) are 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 most likely focused on operations, are less likely to have this financial expertise. Firms with multiple founders are more likely to have at least one of their founders with some degree of financial sophistication. Alternatively, firms with founders that have also acted as advisors to other firms are also more likely to have some financial expertise. We predict that start-up firms with two or more founders, or a founder who is also an advisor to other firms, are more likely to have this financial expertise and are 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 these start-up firms with greater financial sophistication.

The main results are robust to a battery of robustness tests. These tests include a generalized difference-in-difference research design, which also validates the identifying assumption in our primary analysis. Further analyses examine the robustness around the size of funding rounds (i.e., removing large funding rounds to help ensure firms are below the size cap to qualify as QSBS), and the exclusion of a number of sample years to ensure the results are not an artifact of the expiration of the 2003 tax cuts. We also preform a placebo test randomly assigning observations to the treatment and control groups. A distribution of the observed coefficients from 1,000 repetitions of this test illustrates that it is unlikely that our main finding is randomly observed.

We perform several supplemental analyses to shed additional light on the effects of the 2010 SBJA and the QSBS capital gains tax exemptions. Specifically, we examine if the 5 year holding requirement to qualify as QSBS resulted in start-up firms delaying exits. We document

that the timing of gain realization (captured through the observed exit date through IPO or takeover) does not appear to be impacted by the 2010 SBJA. Finally, we analyze whether the observed increase in funding was a result of (i) additional investors providing funding to qualified start-ups, or (ii) existing investors providing a greater amount of funding in each funding round. We observe that prior to the 2010 SBJA the average number of investors per funding round is greater for the control group but following the SBJA the average number of investors per funding round is greater for the treatment group. We also observe that the average funding per investor is relatively constant throughout the sample period. Taken together, this descriptive evidence is consistent with the increase in funding for qualifying start-up firms following the 2010 SBJA being driven by additional investors providing funding to those qualifying firms (i.e., increasing the supply of funding to start-up firms).

This paper makes several contributions to the extant literature. First, to the best of our knowledge, this paper is the first to provide empirical evidence on 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 (Guenther and Willenborg 1999; Lang and Shackelford 2000; Ayers et al. 2003; Dai et al. 2008; Blouin et al. 2009; Sikes and Verrecchia 2012; Li et al. 2016), several studies show that the early stages are the period where access to venture capital is crucial for the further success of start-up firms (Hellmann and Puri 2002; Kerr et al. 2014; Krishnan et al. 2015). Documenting an association between capital gains taxation and funding for start-up firms fills this important gap in the literature. Given the substantial cost of tax-related incentives for start-up financing, this result is also of high policy relevance.[4]

Second, we contribute to the stream of studies that analyze the supply side of venture

[4] The estimated cost of the federal capital gains tax cut in the 2010 SBJA amounts to $5.1 billion over ten years (2011-2021). See Report JCX-19-11 from March 17, 2011 by the Joint Committee on Taxation.

capital (Jeng and Wells 2000; Da Rin et al. 2006; Hochberg et al. 2010). Our research design focuses explicitly on the supply side of venture capital funding and thus provides important insights regarding the extent that it is affected by capital gains taxation. Our main results are consistent with an increase in the amount of funding that qualified firms raise in each funding round following the 2010 SBJA. In supplemental tests, we document results consistent with the increase in funding coming from additional investors providing funding to qualified start-ups (as opposed to existing investors providing a greater amount of funding in each funding round). 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.

The remainder of the paper is organized as follows. Section 2 describes the institutional background of capital gains tax exemptions for start-up investments and develops our hypotheses. We then provide details on the research design and the data in Section 3. The main empirical findings are presented in Section 4. Section 5 presents additional analyses and 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 Revenue Code (IRC). For shares to be treated as QSBS, they must fulfill several requirements.[5] First, the shares 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

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

for this purpose include cash holdings and the adjusted bases of other property held by the corporation. However, it should be noted that previously issued stock does not disqualify from 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 any investing entity, other than a corporation, might benefit from QSBS status. Thus, in addition to stock held directly by individuals, investments 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.

The exemption of capital gains under Section 1202 relates to the ordinary income tax rate on long-term capital gains (28% in 1993). Gains exempted under Section 1202 were treated as a preference item with regard to the Alternative Minimum Tax (AMT). This means that high-income earners added back 7% of the exempted gains and paid 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.[6] 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%.[7] 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, 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.

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 public 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

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

observe an extraordinarily strong increase in online attention directly after the 2010 SBJA was implemented. We also note that 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 further account for a potential effect of the 2009 reform in a generalized difference-in-differences research design.

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 result 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. In perfect and complete markets, the price will rise so that the after-tax return on the investment will remain constant.[8] 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).*

While prior literature has documented capitalization of capital gains taxes in public firms,

[8] In the Scholes and Wolfson framework, this lower pre-tax rate of return on a tax-favored asset is labelled as an implicit tax (Scholes et al. 2014).

we are not aware of prior research examining the impact of capital gains taxes on early stage, pre-IPO firms. In this unique setting, 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. For these early stage firms and their founders, taxes might not be a first order consideration as they focus on products and attempt to obtain funding simply to maintain solvency and operations. Also anecdotally, 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] Therefore, it is an empirical question as to whether capital gains capitalization exists in start-up firms and whether they will benefit from the reduction in capital gains taxes in the 2010 SBJA.

Related to this notion of founders focusing on operations rather than financial issues such as taxation, we argue that firms with greater financial sophistication at founding are more likely to ensure they benefit from the provisions of the 2010 SBJA and exempt the capital gains on their stock from taxation. For example, firms that have 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 either be aware of the benefits of QSBS or the ability to ensure that they avail themselves to these benefits and exempt their capital gains. Conversely, in firms with multiple founders, at least one of the founders often assumes the role of a business manager that also focuses on investor relations and should be able to structure the start-up in such a way that it may qualify for QSBS status. Further, some founders also act as advisors to other firms. These advisors can help with operational and financial issues such as organization structure and raising capital. As a result, founders who have

[9] For example, Wood (2007b, 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.

also acted as advisors to other firms are more likely to have the financial sophistication to be aware and able to ensure their firms benefit from QSBS status. Consequently, we predict that start-up firms with either two or more founders, or at least one founder who has also acted as an advisor to another firm, are more likely to have this financial expertise and, as a result, ensure they qualify for QSBS status 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 greater financial sophistication.*

Providing additional tension to our hypothesized relations, we also note that 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

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

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 that they operate in). The model takes the following form:

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

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 a "qualified trade or business" according to Section 1202, and zero otherwise. The coefficient of interest is 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 effectively reduced the cost of capital and increased 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 start-up firms 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 should already be captured in the fixed effects (discussed below), $RAISED_{ij}$ closely reflects investors'

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

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 that we observe individual funding rounds for are private businesses. This is an important prerequisite for them to qualify for the Section 1202 exemption because, once they become public, shares purchased 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 and 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 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 the 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

[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.

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

Our model includes 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.

Following Hsu (2004) we include a dummy variable $ANGEL$ that indicates whether a funding round was conducted by an angel investor (rather than a venture capital firm) as an additional control at the funding round level. Angel investors, who are often founders themselves, usually provide smaller amounts of early-stage financing before start-ups engage in the first professional funding round (Kerr et al. 2014). By including this variable we account for industry

preferences of angel investors which may lead to clustering of this type of investors in certain groups of start-ups. Furthermore, we include an indicator for funding rounds after the seed stage ($AFTER\_SEED$) which accounts for the fact that seed funding rounds and later-stage rounds differ substantially in the associated information environment. We thus control for investor-specific preferences with regard to the funding stage at which they invest in start-ups which may be correlated with their preference towards certain industries.

The firm-level control variables are complemented by a set of variables that capture the evolution of the entrepreneurial environment in the state that the start-up firm has its headquarters. We obtain data for two control variables from the Kauffmann Index Entrepreneurship Series. 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 ($STATE\_FIRM\_SCALE$). We also include an additional state level control variable that captures the average employment growth of start-up firms five years after their founding date in a state in each year ($STARTUP\_EMPL\_CHG$).

To test our second hypothesis, we explore cross-sectional variation in financial sophistication among start-up firms. First, we split firms by the number of founders. We distinguish between start-ups founded by a single inventor and start-ups with multiple founders. The number of founders serves as a proxy for the administrative capacity of the start-up. This is consistent with the idea that in single-entrepreneur start-up firms the founding inventor is likely 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 also potentially 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.

Second, we explore heterogeneity in the treatment effect with respect to additional advisory roles performed by the founders. Here, an advisory role for the founder of a firm is a proxy for the sophistication and the managerial experience of the inventors. We argue that more experienced founders with more advisory roles are more likely to make use of the QSBS exemption that involves a substantial amount of institutional knowledge. Conversely, firms whose founders lack advisory experience may also lack the knowledge or ability to respond to the QSBS provisions.

We first repeat regression (1) for the sample split by the number of founders. In addition, we conduct a triple-difference-in-difference analysis by adding the additional interactions $POST_{ij} \times TREATED_j \times MULTI\_FOUNDER_j$ and $POST_{ij} \times MULTI\_FOUNDER_j$ to the benchmark specification. Consistent with the sample splits, $MULTI\_FOUNDER_j$ is an indicator variable that is equal to one if the start-up was founded by more than one person ($MULTI\_FOUNDER$). Since $MULTI\_FOUNDER$ does not vary over time, the baseline effect is captured by the firm-fixed effects. The variable of interest is the interaction $POST_{ij} \times TREATED_j \times MULTI\_FOUNDER_j$, which captures the effect of the expansion of the capital gains tax exemption for QSBS on treated firms with multiple founders.

In a second step, we add the interactions of the number of advisory roles of the founders of a start-up firm, which varies across time and firms, with our variables of interest ($POST_{ij} \times$

$TREATED_j \times ADVISOR\_ROLE_{ij}$ and $POST_{ij} \times ADVISOR\_ROLE_{ij}$) as well as the baseline effect ($ADVISOR\_ROLE_{ij}$). Again, the variable of interest is the interaction $POST_{ij} \times TREATED_j \times ADVISOR\_ROLE_{ij}$.

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. 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 (Kaplan and Lerner 2016).

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 2. 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, as 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.[14] Since our identification originates from within-firm variation, we exclude all firms with less than 2 funding rounds.[15]

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 relatively large 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.

Crunchbase also provides labels with regard to the type of operating activity of 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

[14] In our main analysis, the sample includes firms that may only have funding rounds in the pre- (or post-) 2010 SBJA implementation period. The use of firm fixed effects in our research design helps ensure that the variation from these firms is not driving our results. Nevertheless, as an untabulated robustness check, we repeat our primary analysis on a sample that only includes firms with funding rounds both before and after the 2010 SBJA was implemented. The results are qualitatively and quantitatively similar to the benchmark result presented and discussed below.

[15] However, by construction (i.e. firm-fixed effects), our results are not altered when including these firms.

label listed in Table 3 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 entities in our database. Form D refers to Regulation D that states under what 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.[18]

4 Empirical Results

4.1 Descriptive Statistics

Our benchmark sample contains 13,431 start-up firms that raised an overall total amount of $218.5 billion in 29,280 funding rounds 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 founded firms grows each year in the early part of the sample period and then begins to decline in 2012. This decline is primarily caused by two factors. First, our requirement for sample firms is to obtain at least two rounds of funding. As founding dates get closer to the end point of the data collection, there is likely insufficient time for some firms to have obtained additional funding rounds. The striped bars

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

[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).

[18] Note, we are only able to match a subsample of our observations to Form D filings.

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 sources.[19] Figure 4 displays the overall and average amount of funding received by start-up firms in the sample. We note that, while the total number of newly founded start-ups declines in later years, the total amount of funding does not. Rather, it steadily increases to $29.5 billion in 2015. At the same time, the average amount of funding raised in one funding round also increases in later periods following a temporary decline after the financial crisis in 2008-2009.

Of our sample firms, the majority of start-up firms (57.1%) were founded before the 2010 SBJA act was implemented. This is important for our difference-in-difference identification strategy that 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 for an individual firm is 24.

The majority of sample firms (9,871) were still operating at the time the data was collected. 2,524 firms had already been acquired while 351 had gone public. 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 have grown during the observation period. Most firms remain relatively small with 8,939 start-ups having less than 50 employees. However, a few firms grow much larger: 116 entities in our sample have more than

[19] 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).

5,000 employees at the end of the observation period.

Table 4 provides the distribution of headquarter locations and industries for the start-up firms in our sample. 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. [20] More than one third of start-up firms in our sample are located in California (see also Figure 2). Other start-up hubs are New York, Texas, and Washington. With regard to industries, we sort firms into 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."[21]

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 $7.5 million per funding round, or $4 million at the median. This value is slightly lower for treated firms, which raise an average of $7 million, while the average funding round of control start-up firms raises $8.2 million. While the minimum amount of funding in a round in our sample is as low as $1,000, funding rounds usually involve hundreds of thousands of dollars, and only 5% of the funding rounds in our sample raise an amount below $125,000. The average age of start-up firms in our sample is approximately 4 years. 95% of the firms in the pooled sample are younger than 9.2 years. 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. Most firms in our sample

[20] In addition to the federal level changes in the taxation of capital gains on start-up firms that we exploit in our tests, states can either follow the federal change (conform) or opt to leave the taxation of capital gains unchanged. In untabulated tests we examine this state level variation and observe that our findings are not concentrated in either the conforming or non-conforming states. This is possibly due to both/either the geographic dispersion of investors beyond the home state of the start-up firm and/or the relative small magnitude of state taxes, compared to federal taxes.

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

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.

Given our difference-in-difference research design, it is important that the control group and the treatment group are similar. We present descriptive statistics for these two subgroups in Table 5 Panels B and C. As can be observed from these panels, the differences in the variables between the control group and the treatment group are generally small in magnitude. The two subsamples are similar in most of the observable characteristics, including across age groups, valuation, funding round stages, ranking, location attributes, and number of founders.

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 is evidence consistent with hypothesis 1 and 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 11.98%. 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 $9.6 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.[22] 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 11.6% per year. This possibly reflects that entrepreneurial firms become more professional in organizing their investor relations as they grow older. Furthermore, information asymmetries between potential investors and the start-up firm founders are reduced over time as more information about 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 Crunchbase ranking capturing 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 39,246.[23]

In column (2), we reduce our sample to only those firms that we identified through their SEC filings to be incorporated. Again, results are consistent with hypothesis 1 as 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 14.2%. 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.

The findings presented in columns (1) and (2) are robust to including additional controls

[22] 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.

[23] As we are unsure exactly how Crunchbase determine their rankings, we repeat our analyses removing $RANK$ from the regression model. Inferences remain unchanged.

in column (3). We estimate negative coefficients for both state-level measures of start-up activity, although neither of the coefficient estimates is significant at traditional levels.

As a robustness check, we repeat regression (3) without year-fixed effects in column (4). The coefficient of interest (β_2), which captures the effect of the $POST \times TREATED$ 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, to a greater extent, from the 2010 SBJA, we turn to hypothesis 2. We first 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 results are also confirmed in the triple difference-in-difference analysis, which are presented in column (5). Here, the coefficient estimate for the interaction term $POST \times TREATED \times MULTI\_FOUNDER$ is significantly positive, which implies that treated firms with multiple founders obtained more funding after the 2010 SBJA implementation. The estimated coefficient for the $POST \times TREATED$ interaction is not significantly different from zero, which implies that the effect in the benchmark regression is driven by start-up firms with multiple founders while

start-ups with single inventors did not respond.

In Column (6) of Table 7 we present results when including the interaction of the variables of interest with the number of advisory roles performed by the founder of a start-up firm. The estimated coefficient for the benchmark interaction of interest, $POST \times TREATED$, remains significantly positive and large. Consistent with the notion that start-ups with more financially sophisticated founders are more likely to benefit from the expansion of the QSBS exemption under the 2010 SBJA, the positive significant coefficient on $POST \times TREATED \times ADVISORY\_ROLES$ indicates that the increase in funding was stronger for start-ups whose founders have more advisory roles at the time of the funding round. Taken together, these findings imply that funding of start-up firms with greater financial sophistication likely drives the effect we observe.

4.3 Robustness Tests

We perform a number of analyses as a check of the robustness of the main findings. Our robustness tests include the use of a generalized difference-in-difference research design, analyses around the size of funding rounds, the effect of the 2003 tax cuts, and a placebo test.

4.3.1 Generalized Difference-in-difference Design

As a robustness check, we present results 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 that 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 validating our difference-in-difference 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 significant 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 regarding the overall impact of the reform, but only displays the effect in individual years.[24]

We present the results of the generalized difference-in-difference estimation graphically in Figure 5. The coefficients for the pre-reform interactions are all small and not significant. 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 0.80 and 0.95, respectively). Furthermore, we observe positive differences between the treatment and the control 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 taxes is the decisive event in our analysis.

4.3.2 Large Funding Rounds

We next perform tests to 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.

In untabulated tests we observe that the estimated coefficient on the *POST* × *TREATED*

[24] Both issues do not arise in our benchmark model that we use to estimate the impact of capital gains tax reduction.

interaction term is similar in magnitude, which suggests that our main results is primarily 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 strong in small start-up firms where we have a higher degree of certainty that they are not too large to qualify as QSBS. It is also of note that these smaller observations make up the majority of firms in our sample.

4.3.3 Treatment Effect after the Expiration of the 2003 Tax Cuts

The capital gains tax cut introduced in the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA) expired on January 1, 2013, as a result the top standard rate on capital gains increased from 15% to 20% on that day. The capital gains tax exemption for investments in QSBS was therefore relatively even more valuable from 2013 onwards. It is possible that the treatment effect of the 2010 SBJA could be more pronounced or concentrated in the years following 2013 for two reasons. First, the control group was exposed to a higher capital gains tax rate. Second, the increase in the value of the QSBS capital gains tax exemption could have induced more firms to comply with the corresponding rules and offer QSBS. On the other hand, the expiration of the 2003 JGTRRA tax cuts increased capital gains taxation only for those investors in the top personal income tax bracket, which might have limited its impact.

We test how the post-2013 period affects the results in an additional analysis that restricts the sample period to 2005-2012. In untabulated tests we observe results consistent with the notion that the treatment effect of the 2010 SBJA was more pronounced when the capital gains tax rate was higher in the years from 2013 onwards. The coefficient remains significantly positive and only slightly decreases in magnitude (coefficient ranges between 0.092 and 0.115 depending on the

controls included in the various specifications). This implies that the 2010 SBJA affected funding for start-up firms both before and after the expiration of the 2003 JGTRRA tax cuts.

4.3.4 Fin-Tech and the Financial Crisis

Another potential concern related to our tests is that the 2010 SBJA, which we use for identification, occurred near the financial crisis. Because we use a difference-in-difference rdesign, concerns regarding the financial crisis polluting our analyses are reduced as the financial crisis would only cause a problem for our tests if it differentially impacted control and treatment firms. While we do not view this as likely, one possible scenario that could impact our tests is if fin-tech start-up firms are driving our results. Fin-tech firms are in our control group and it is plausible that the financial crisis disproportionately drove funding down for these firms. To assuage this concern, in untabulated analysis we examine the trend in funding for Fin-tech firms and do not observe a decrease in funding for Fin-tech firms following the financial crisis. As a result, it is unlikely that a drop in funding for Fin-tech firms following the financial crisis is driving our results.

4.3.5 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 the case, we should obtain the same results independent of the assignment of treatment and control observations. We test this possibility through a placebo test where 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 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 6. We find a significantly positive impact (5% confidence level) only for 26 of the 1,000 trials (2.6%). Further, only 0.6% 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, represented by a solid vertical line in the figure). 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.

5 Additional Analysis

We next perform several additional analyses to shed additional light on the effects of the SBJA and the QSBS capital gains tax exemptions.

5.1 Timing of Gain Realization

One requirement for start-up shares to be eligible to the QSBS capital gains tax exemption is that they must be held for at least 5 years. Given that IPOs and acquisitions of start-ups are often the point when investors make an exit and realize the gains of their investment, this condition may provide an incentive for start-ups and their investors to prolong the time between the first funding round and these events. If it exists, this incentive would have become more important after the implementation of the 2010 SBJA, which increased the value of the QSBS capital gains tax exemption. This would, however, also imply that the 2010 SBJA distorts the development of small firms by potentially delaying their access to public capital markets.

There are reasons to believe that the QSBS requirements do not affect the timing of start-up acquisitions and IPOs. First, investors are still eligible for the QSBS exemption if they hold on to their shares in these events, which is entirely possible in an IPO and to lesser extent in an acquisition. In this way, the presence of shareholders with potential QSBS benefits is less likely to stop a start-up from accessing capital markets. Second, there are other factors that are likely to be

more important for IPO timing such as market conditions (Altı 2005), reputation concerns and proficiency of investors (Gompers 1996; Lerner 1994; Tian et al. 2016), or product market competition (Chemmanur and He 2011). These parameters could dominate the IPO timing decision and make considerations regarding the QSBS exemption less relevant.

We use acquisitions and IPOs reported in Crunchbase to investigate whether the 2010 SBJA affected the timing of gain realizations by investors. We only use firms that were founded before the 2010 SBJA implementation to be able to compare firms with similar potential life-spans. Firms that were founded in later periods could be affected by the 2010 SBJA but are also observed for a shorter period of time in our sample. Of the selected start-ups in the estimation sample, 369 firms founded before September 27, 2010 pursue IPOs and 2,019 are acquired during the sample period. In Table 8, we report the average number of years between the first funding round and the event that could trigger the realization of capital gains (IPO or acquisition) for treated and control firms. We differentiate between firms that have announced all their funding rounds before the 2010 SBJA implementation and those that also had funding rounds after September 27, 2010. The latter are likely to be affected by the 2010 SBJA while the former are not.

On average, the time between the first funding round and the acquisition or the IPO is longer than five years. Focussing first on the timing of IPOs, we observe no marked difference between the average number of years from the first funding round to the IPO between firms with and without funding rounds after the 2010 SBJA implementation. This is true for both treatment and control firms. On average, treated firms wait about half a year longer until going public. With regard to the average number of years until an acquisition, the waiting period is higher for firms with funding rounds after September 27, 2010. However, this increase is observed for both control and treatment firms. We thus cannot attribute this effect to the increase in the QSBS capital gains

tax exemption but might rather relate it to general market conditions that affected all start-up firms similarly. Thus, we do not detect any significant effect of the QSBS exemption on the timing of start-up IPOs or acquisitions. This observation is confirmed by a more thorough regression analysis that is reported in Table 9 and also takes into account general time trends and location effects. Therefore, we conclude that for the start-up firms in our sample, the 2010 SBJA did not distort the timing of going public or being acquired. We note, however, that two data features limit this analysis. First, we can only analyze the timing of those start-ups for which we observe either an IPO or an acquisition. If the impact of the QSBS exemption on the timing of these events only evolves over time, we are not able to see it for those firms that were founded in the later part of our sample period. Second, it is not possible to observe the behavior of the initial investors in the observable IPOs and acquisitions and one thus cannot definitively determine whether this is driven by an effort to preserve the QSBS benefit.

5.2 Number of Investors and Funding per Investor

Our main results are consistent with an increase in the amount of funding that qualified firms raise in each funding round following the 2010 SBJA. The increase in total funding per round potentially comes from (i) additional investors providing funding to qualified start-ups, (ii) existing investors providing a greater amount of funding in each funding round, or (iii) some combination of (i) and (ii). To examine which of these possibilities are likely driving the increase in funding we observe, we examine the average number of investors, and amount of funding per investor, for both the treatment and control groups annually during our sample period.

Figure 7, Panel A presents the average number of investors per funding round annually for the treatment and control group. The figure illustrates that the number of investors per funding round increases during the sample period for both groups of start-up firms. In the early part of the

sample period, the average number of investors per funding round is greater for the control group. In the latter part of the sample period, the average number of investors per funding round is greater for the treatment group, with the switch occurring in 2010. This descriptive evidence is consistent with an increase in the number of investors at least partially accounting for the increase in funding for qualifying start-up firms following the SBJA of 2010.[25]

Figure 7, Panel B presents the average amount of funding per investor per funding round annually for the treatment and control group. The figure illustrates that the amount of funding per investor per funding round remains relatively constant throughout the sample period. The average amount of funding per investor per funding round is higher for the control group than for the treatment group throughout the sample period and the spread between the two groups is also relatively stable, with no substantial change pre-/post 2010. This descriptive evidence is not consistent with a change in the amount of funding each investor is providing per round for qualifying start-up firms following the SBJA of 2010. Taken together, the overall evidence is consistent with scenario (i) detailed above, that the increase in funding for qualifying start-up firms following the 2010 SBJA is driven by additional investors providing funding to those qualifying firms (i.e., increasing the supply of funding to start-up firms).

5.3 Alternative Dependent Variable

Finally, in Table 10 we use a different dependent variable and provide a multivariate test of the impact of the SBJA on the number of investors per funding round. Specifically, we replace the dependent variable in main specification by the logarithm of the number of investors, $\ln(INVESTORS)$. In column (1) of Table 10 we present the result of a regression using all

[25] We also examine a number of investor characteristics to determine if any are associated with a propensity of increase investment in qualified start-up firms following the 2010 SBJAs. In untabulated analyses we fail to document a significant association between investment in treated firms in the post period and if the investor (i) has previously acted as an advisor, (ii) has a law degree, (iii) has a business degree, or (iv) has an economics degree.

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.

6 Conclusion

In this study we analyze the effect of capital gains taxes on investments in start-up firms through an examination of 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, 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 the fact 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 percentage points, raised the amount of investment in start-up firms per funding round by about 12%. This effect is, however, confined to entrepreneurial firms with more than one founder and firms with founders that have also acted as advisors to other firms, which suggests that only start-up firms with a more financial sophistication are able to benefit from the capital gains tax exemption.

There are two important takeaways from this study. First, a targeted reduction in capital gains taxes appears to be 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, and firms without founders that are also advisors, do not appear to be sophisticated enough to exploit the capital gains tax exemption and make their shares more attractive to external investors.

Appendix: Variable Definition

ADVISOR_ROLE	The number of advisory roles performed by the founders of a start-up firm at the time of the funding round as reported by Crunchbase.
AGE	Difference between the announcement date of the funding round and the funding date of the issuing firm in years from Crunchbase.
ANGEL	An indicator variable set equal to one if the funding round involved an angel investor (as reported by Crunchbase), zero otherwise.
AFTER_SEED	An indicator variable set equal to one if the funding round was not an early-stage seed investment (as reported by Crunchbase), zero otherwise.
EXPERIENCE	Variable capturing the experience of a founder. It is either equal to *ADVISOR_ROLE* or to *MULTI_FOUNDER*.
FOUNDERS	Number of founders of the start-up as reported by Crunchbase.
INVESTORS	Number of investors involved in a funding round as reported by Crunchbase.
MULTI_FOUNDER	An indicator variable set equal to one if the start-up was created by two or more founders (as reported by Crunchbase), zero otherwise.
POST	An indicator variable set equal to one if the funding round was announced after effective date of the 2010 SBJA (September 27, 2010), zero otherwise.
RAISED	Amount of capital raised in a funding round from Crunchbase.
RANK	Crunchbase rank divided by 100
STARTUP_EMPL_CHG	Employment growth of start-ups from the Kauffman Foundation. Average percentage change in employment of start-ups five years after founding in the state where the issuing start-up is active.
STATE_FIRM_SCALE	Scalability of start-ups from the Kauffman Foundation. 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.
TREATED	An indicator variable set equal to one if the start-up is 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.

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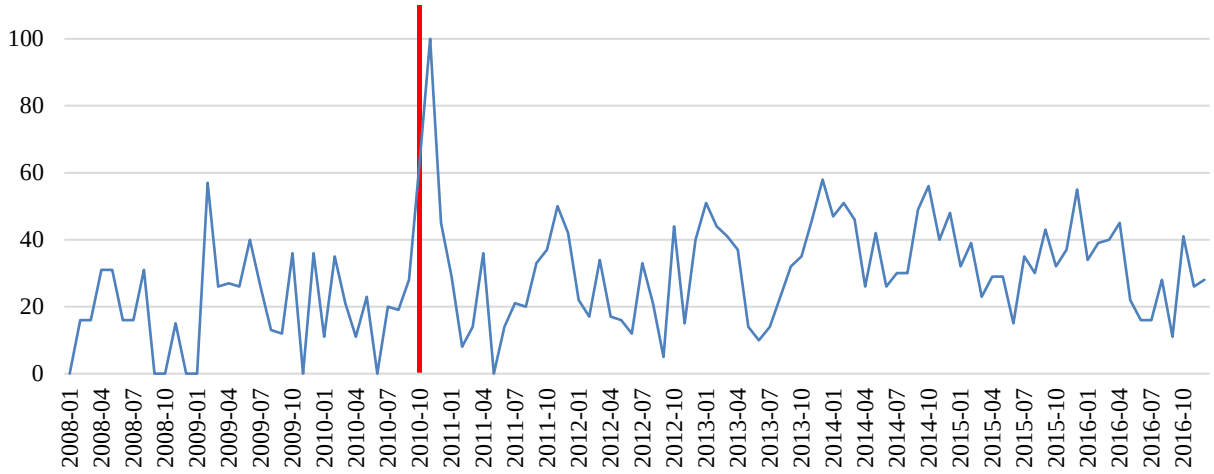
Figure 1: Google Trends, Searches for "Qualified Small Business Stock" in the United States, 2008-2016



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)

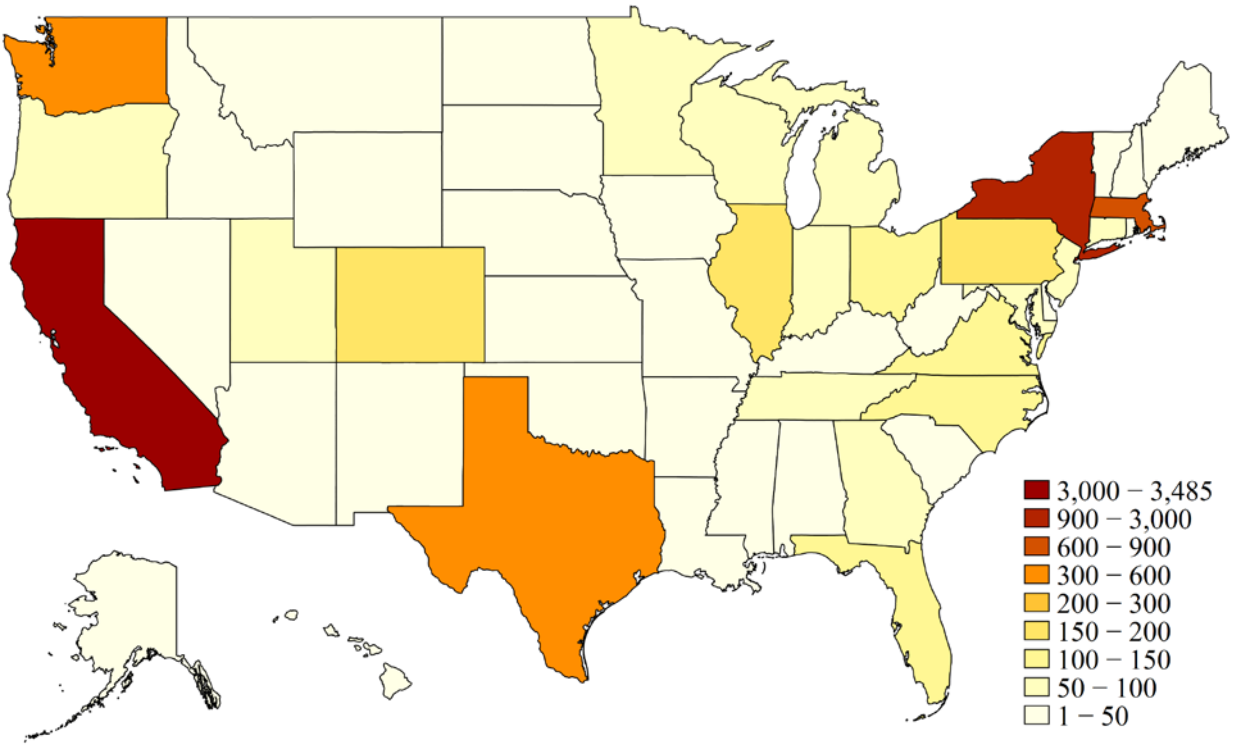


Figure 3: Number of Start-ups Founded, 2000-2016

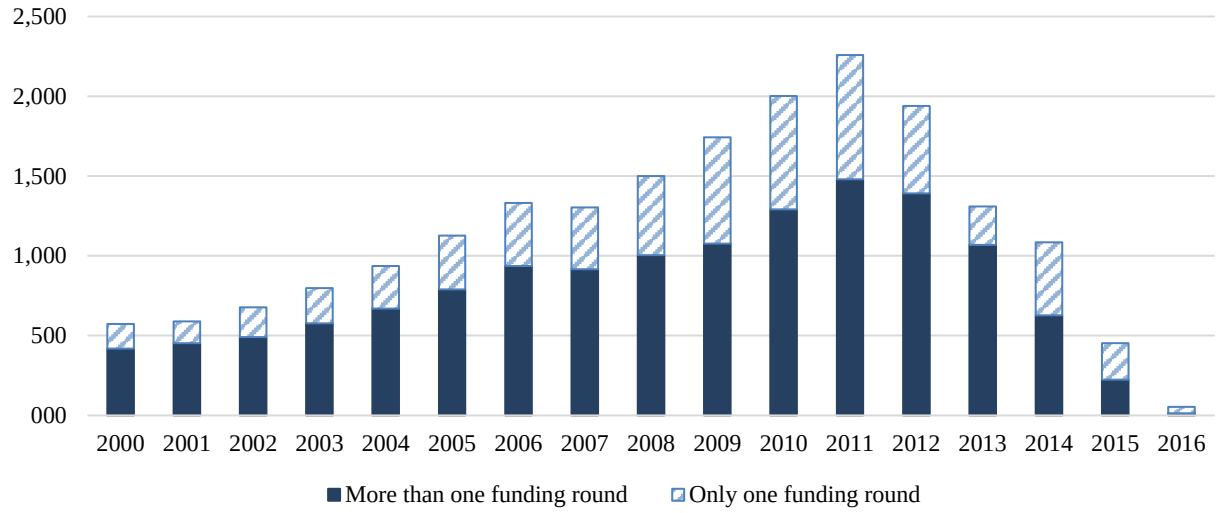
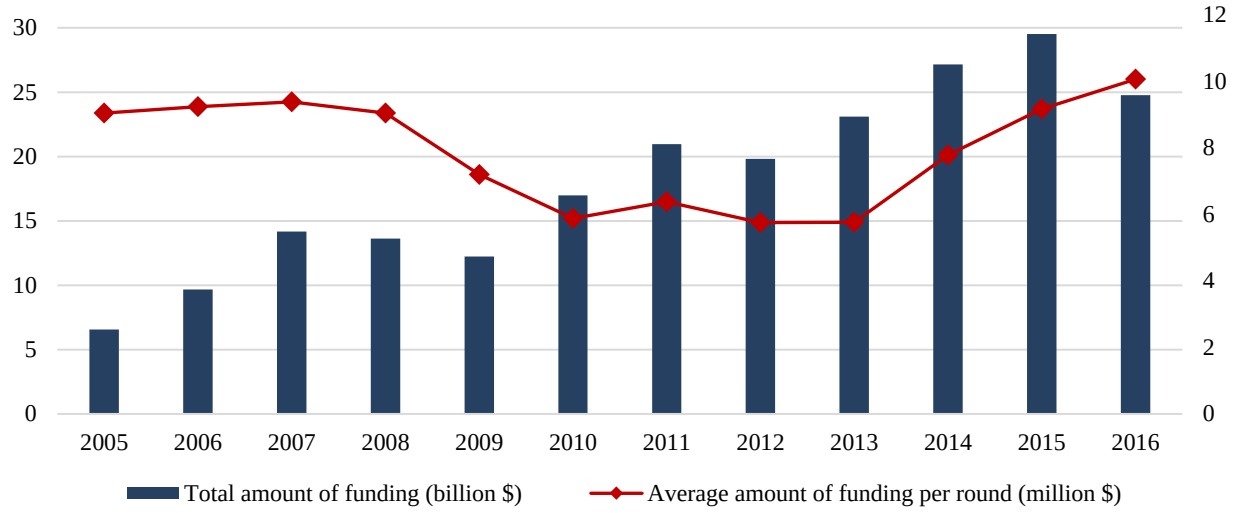
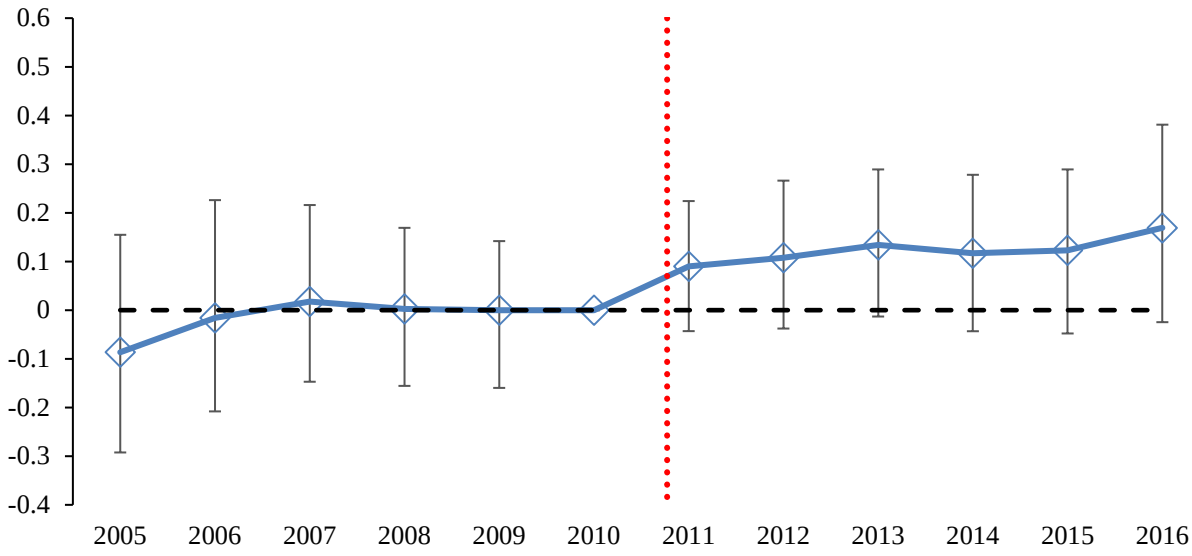


Figure 4: Funding Raised (2005-2016)



This figure displays the total amount of funding (in billion $, bars, left axis) and the average amount of funding per round (in million $, line, right axis) for funding rounds of the start-up firms in the estimation sample from 2005 to 2016.

Figure 5: Generalized Difference-in-Difference Design

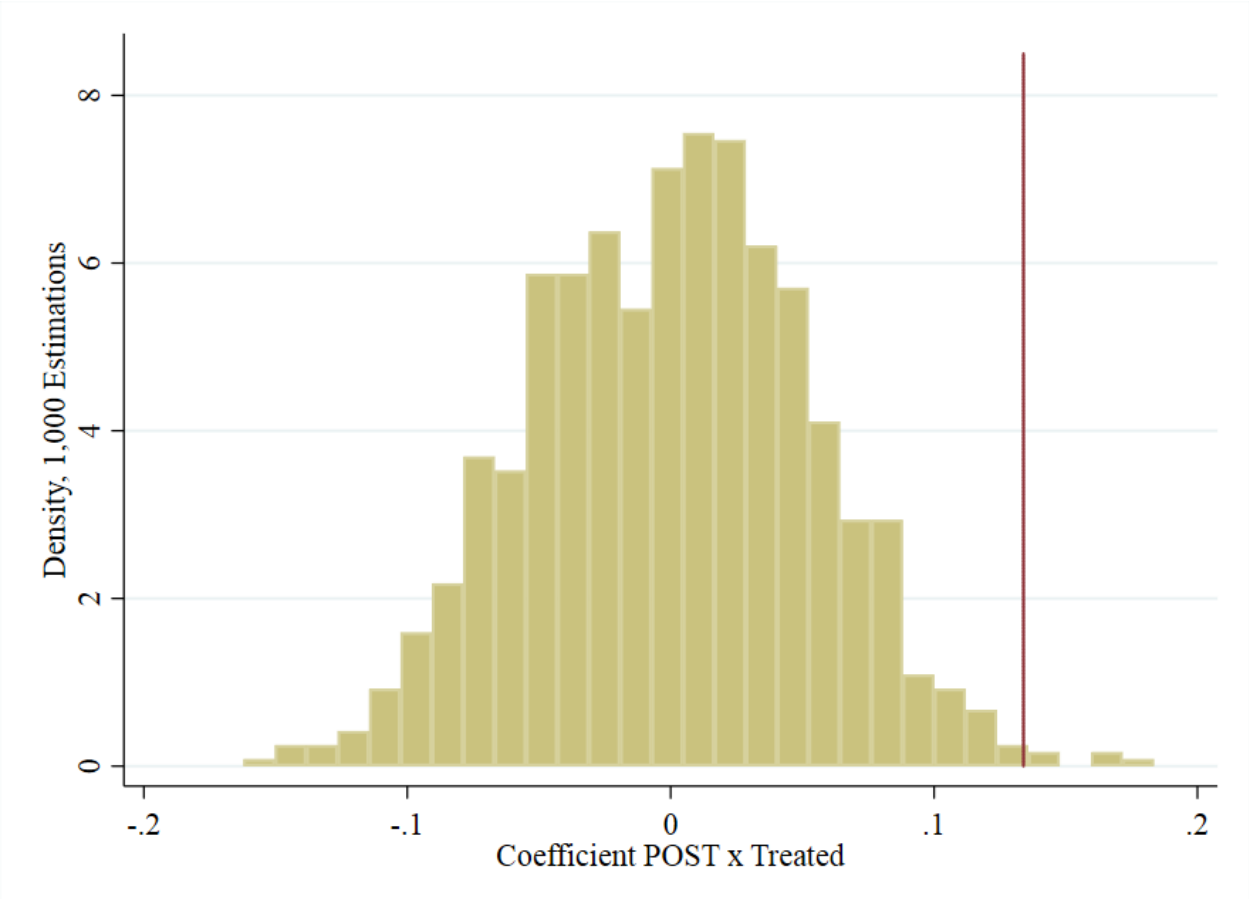


This figure presents the results of a generalized difference-in-difference design following Jacobson et al. (1993). The checks mark the coefficient estimates γ_t from the regression of the following model

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

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.

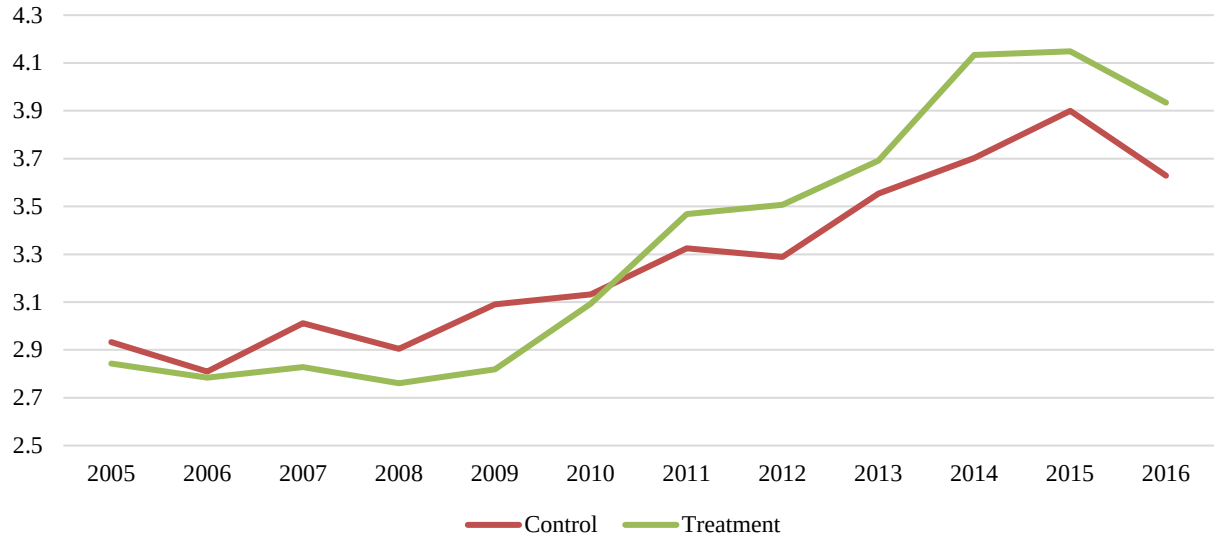
Figure 6: Random Assignment to Treatment and Control Group



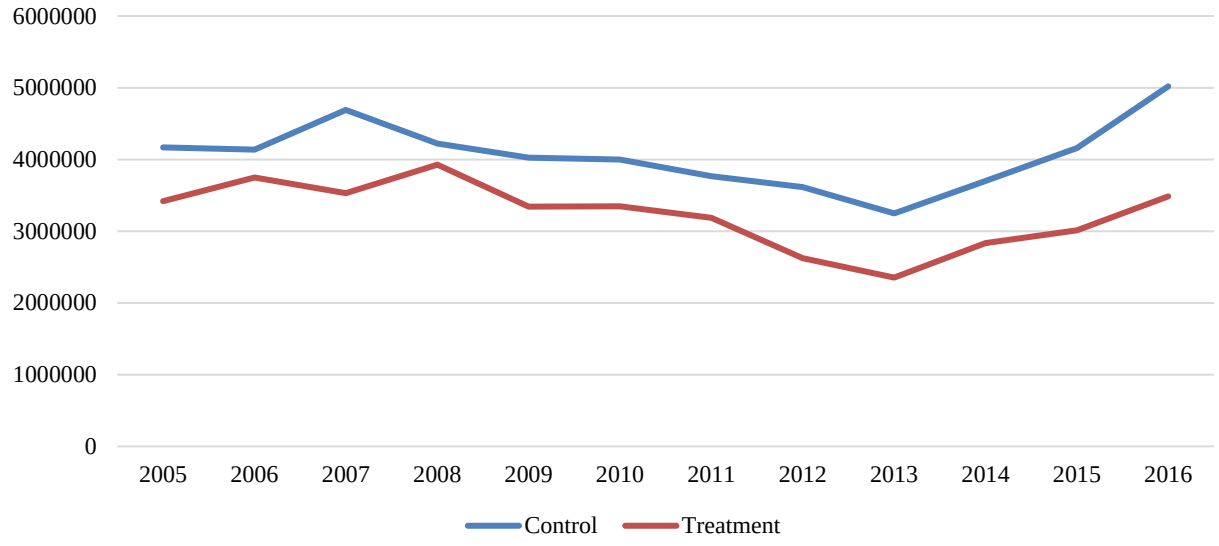
This figure presents a histogram of the estimated coefficients of a falsification test. In each of the 1,000 separate estimations, the treatment and control group are randomly assigned following a uniform distribution with the ratio of treated and control firms identical to the one of the original sample (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 $POST \times TREATED$.

Figure 7: Number of Investors and Funding over Time

Panel A: Average Number of Investors per Round



Panel B: Amount Invested per Round



This figure displays the total average number of investors (Panel A) and average amount of funding per investor per round (Panel B) for funding rounds of the start-up firms in the estimation sample from 2005 to 2016.

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: 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	58,828
(4)	Excluding firms founded before 2000	53,098
(5)	Excluding funding rounds which raised more than $50 million USD	51,682
(6)	Excluding funding rounds without sufficient information on control variables	35,849
(7)	Excluding firms with only one funding round	29,280
(8)	Excluding firms which have not filed a firm D	19,212
(9)	Excluding firms which are not a corporation according to their Form D filing	17,846

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

Table 3: 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 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	41	218
Alaska	2	7	Montana	8	26
Arizona	45	166	Nebraska	15	58
Arkansas	12	38	Nevada	22	73
California	3,453	12,549	New Hampshire	26	94
Colorado	179	735	New Jersey	79	281
Connecticut	68	260	New Mexico	8	61
Delaware	9	34	New York	922	3,251
District of Columbia	39	155	North Carolina	101	411
Florida	127	464	North Dakota	1	2
Georgia	96	430	Ohio	111	407
Hawaii	5	23	Oklahoma	8	22
Idaho	10	38	Oregon	82	331
Illinois	190	621	Pennsylvania	154	664
Indiana	58	159	Rhode Island	22	91
Iowa	9	37	South Carolina	13	61
Kansas	18	61	South Dakota	1	2
Kentucky	22	62	Tennessee	67	327
Louisiana	12	32	Texas	307	1,226
Maine	10	40	Utah	84	311
Maryland	97	368	Vermont	7	25
Massachusetts	684	2,759	Virginia	115	425
Michigan	60	232	Washington	310	1,113
Minnesota	75	302	West Virginia	2	7
Mississippi	2	10	Wisconsin	49	179
			Wyoming	1	2
Total	7,849	29,280			

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	322	1,737
Business Services	45	145
Commercial	1	1
Commercial Banking	3	8
Computers	172	675
Construction	2	9
Electric Utilities	1	3
Energy Conservation	18	94
Environmental Services	4	22
Health Insurance	1	2
Hospitals and Physicians	4	15
Insurance	1	3
Investing	2	4
Investment Banking	0	2
Manufacturing	23	97
Oil and Gas	1	7
Other	579	2,219
Other Banking and Financial Services	28	89
Other Energy	61	274
Other Health Care	351	1,759
Other Real Estate	5	20
Other Technology	2,088	9,097
Other Travel	8	20
Pharmaceuticals	128	650
Pooled Investment Fund	2	5
Residential	2	6
Restaurants	5	17
Retailing	71	294
Telecommunications	81	352
Tourism and Travel Services	8	26
Total	4022	17,673

Table 5: Descriptive Statistics

Panel A: Pooled Sample

Variable	Obs.	Mean	Std. Dev.	Min	5% percen-tile	Median	95% percentile	Max
RAISED	29,280	7,463,949	9,167,521	1,000	125,000	4,000,000	28,366,767	49,999,989
AGE	29,280	3.688	2.754	0.000	0.416	3.047	9.181	16.888
RANK	29,280	448.705	304.001	1.120	48.515	392.460	955.145	1,000
ANGEL	29,280	0.030	0.171	0	0	0	0	1
AFTER_SEED	29,280	0.791	0.407	0	0	1	1	1
STATE_FIRM_SCALE	29,125	0.014	0.003	0.007	0.010	0.014	0.019	0.028
STARTUP_EMPL_CHG	29,125	0.571	0.132	0.039	0.411	0.554	0.821	1.984
INVESTORS	23,341	3.488	2.870	1	1	3	9	43
FOUNDERS	25,070	2.040	1.057	1	1	2	4	15
MULTI_FOUNDER	25,070	0.644	0.479	0	0	1	1	1
ADVISOR_ROLE	29,269	0.279	1.122	0	0	0	2	24

Panel B: Treated Firms

Variable	Obs.	Mean	Std. Dev.	Min	5% percen-tile	Median	95% percentile	Max
RAISED	18,977	7,066,980	8,584,359	1,000	145,000	3,975,000	25,000,000	49,999,989
AGE	18,977	3.487	2,643	0	0.373	2.855	8.852	15.926
RANK	18,977	426.780	294.406	1.120	45.760	362.260	942.630	1,000
ANGEL	18,977	0.035	0.185	0	0	0	0	1
AFTER_SEED	18,977	0.780	0.414	0	0	1	1	1
STATE_FIRM_SCALE	18,875	0.014	0.003	0.007	0.010	0.014	0.019	0.028
STARTUP_EMPL_CHG	18,875	0.574	0.131	0.039	0.412	0.554	0.821	1.984
INVESTORS	15,761	3.517	2.906	1	1	3	9	43
FOUNDERS	16,649	2.108	1.073	1	1	2	4	11
MULTI_FOUNDER	16,649	0.672	0.469	0	0	1	1	1
ADVISOR_ROLE	18,969	0.295	1.131	0	0	0	2	24

Panel C: Control Firms

Variable	Obs.	Mean	Std. Dev.	Min	5% percen-tile	Median	95% percentile	Max
RAISED	10,303	8,195,123	10,114,107	1,000	120,000	4,000,000	31,000,000	49,700,000
AGE	10,303	4.060	2.913	0	0.501	3.403	9.732	16.888
RANK	10,303	489.089	316.994	3.180	52.120	446.580	965.600	999.980
ANGEL	10,303	0.021	0.142	0	0	0	0	1
AFTER_SEED	10,303	0.810	0.392	0	0	1	1	1
STATE_FIRM_SCALE	10,250	0.014	0.003	0.007	0.010	0.015	0.019	0.028
STARTUP_EMPL_CHG	10,250	0.565	0.135	0.127	0.392	0.554	0.818	1.984
INVESTORS	7,580	3.429	2.794	1	1	3	9	39
FOUNDERS	8,421	1.905	1.012	1	1	2	4	15
MULTI_FOUNDER	8,421	0.587	0.492	0	0	1	1	1
ADVISOR_ROLE	10,300	0.250	1.105	0	0	0	2	24

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

	(1)	(2)	(3)	(4)
$POST$	-0.088	-0.070	-0.071	-0.156***
	(0.058)	(0.065)	(0.066)	(0.045)
$POST \times TREATED$	0.113***	0.144***	0.144***	0.130***
	(0.044)	(0.049)	(0.049)	(0.050)
AGE	0.110***	0.105***	0.103***	0.023*
	(0.025)	(0.031)	(0.031)	(0.012)
$RANK$	-0.001***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
$ANGEL$	-0.924***	-1.042***	-1.039***	-1.102***
	(0.059)	(0.089)	(0.089)	(0.090)
$AFTER\_SEED$	1.018***	1.095***	1.095***	1.178***
	(0.028)	(0.039)	(0.039)	(0.038)
$STATE\_FIRM\_SCALE$			-20.035	-25.552***
			(12.423)	(8.288)
$STARTUP\_EMPL\_CHG$			-0.122	0.255***
			(0.108)	(0.095)
Firm and Funding Round Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	N
No. of Observations	29,280	17,846	17,733	17,733
No. of Start-ups	13,431	7,399	7,351	7,351
R^2	0.441	0.423	0.423	0.410

This table presents the results of a difference-in-difference analysis. We estimate the following model

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

The dependent variable in all columns is the logarithm of $ raised in a particular funding round. $POST$ indicates that the funding round was announced after the effective 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 and funding round 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, Heterogeneity in Experience of Founders

	(1) Multiple Founders	(2) Multiple Founders	(3) Multiple Founders	(4) Multiple Founders	(5) Multiple Founders	(6) Advisory Roles
$POST$	0.094	-0.115	0.089	-0.104	-0.081	-0.063
	(0.110)	(0.095)	(0.110)	(0.095)	(0.083)	(0.066)
$POST \times TREATED$	-0.012	0.198***	-0.011	0.195***	-0.016	0.124**
	(0.073)	(0.074)	(0.073)	(0.074)	(0.073)	(0.050)
$POST \times EXPERIENCE$					0.095	-0.007
					(0.083)	(0.043)
$POST \times TREATED \times EXPERIENCE$					0.213**	0.057*
					(0.104)	(0.033)
$EXPERIENCE$						-0.007
						(0.032)
AGE	0.085	0.118***	0.085	0.115***	0.101***	0.099***
	(0.052)	(0.043)	(0.053)	(0.043)	(0.033)	(0.031)
$RANK$	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$ANGEL$	-0.858***	-1.156***	-0.861***	-1.154***	-1.071***	-1.037***
	(0.154)	(0.112)	(0.154)	(0.112)	(0.090)	(0.089)
$AFTER\_SEED$	0.931***	1.156***	0.935***	1.155***	1.102***	1.093***
	(0.070)	(0.049)	(0.071)	(0.049)	(0.041)	(0.039)
$STATE\_FIRM\_SCALE$			-24.057	-8.976	-18.191	-19.140
			(19.912)	(17.381)	(13.189)	(12.438)
$STARTUP\_EMPL\_CHG$			0.037	-0.237	-0.098	-0.120
			(0.180)	(0.147)	(0.115)	(0.108)
Firm, Funding Round and Year FE	Y	Y	Y	Y	Y	Y
No. of Observations	5,876	9,044	5,847	8,971	14,818	17,725
R^2	0.370	0.511	0.371	0.511	0.458	0.424

This table presents the results of a difference-in-difference analysis. We estimate the following model

$$\ln(RAISED_{ij}) = \beta_1 POST_{ij} + \beta_2 POST_{ij} \times TREATED_j + \beta_3 POST_{ij} \times EXPERIENCE_{ij} + \beta_4 POST_{ij} \times TREATED_j \times EXPERIENCE_{ij} + \beta_5 EXPERIENCE_{ij} + \boldsymbol{\beta X} + \boldsymbol{\phi_i} + \boldsymbol{\phi_j} + \epsilon_{ij}$$

$POST$ indicates that the funding round was announced after the effective 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. In columns (1) to (5), $EXPERIENCE$ is captured by the variable $MULTI\_FOUNDER$, which is an indicator that is equal to 1 if more than one founder was involved in the creation of the start-up. 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. Column (5) presents regression results for the full sample with interactions. Since $EXPERIENCE$ is time-invariant in this specification, baseline effect is captured by the firm-fixed effects. In column (6), $EXPERIENCE$ is defined as $ADVISOR\_ROLE$, which is the number of advisory roles that the founders of a start-up firm have at the time of the funding round. Only start-ups which have been verified to be incorporated through their SEC filings are used in the estimation. All regressions include firm fixed effects, announcement year fixed effects and funding round 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: Average Number of Years until Gain Realization

		Average Number of Years between First Funding Round and IPO	Average Number of Years between First Funding Round Acquisition
Treatment group	All funding rounds before 2010 SBJA implementation	6.330	5.269
	At least one funding round following 2010 SBJA implementation	6.252	5.725
	Change	0.078	-0.457 ***
Control group	All funding rounds before 2010 SBJA implementation	5.714	5.352
	At least one funding round following 2010 SBJA implementation	5.773	5.785
	Change	-0.060	-0.433*
Difference in changes between the Treatment vs. Control groups		0.138	-0.024

This table displays the average number of years between the first funding round of start-ups and the IPO or acquisition, respectively. It includes all start-ups for which an acquisition or IPO is observed. ***, **, and * indicate changes and/or differences are significant at the 1%, 5% and 10% levels.

Table 9: Regression Results: Timing of Gain Realization

	(1) Years until IPO	(2) Years until Acquisition
$FUNDING\_POST$	1.533* (0.880)	1.582*** (0.251)
$TREATED$	1.343 (1.167)	0.008 (0.226)
$FUNDING\_POST \times TREATED$	-1.312 (1.203)	0.021 (0.271)
$RANK$	-0.002** (0.001)	-0.001** (0.000)
$\ln(RAISED)$	0.778*** (0.145)	0.533*** (0.046)
No. of Observations	369	2,019
Year and State Fixed Effects	Y	Y
R^2	0.606	0.420

This table presents the results of a difference-in-difference analysis of the following form:

$$TIME_j = \beta_1 FUNDING\_POST_j + \beta_2 FUNDING\_POST_j \times TREATED_j + \beta_3 TREATED_j + \boldsymbol{\beta X} + \boldsymbol{\phi_{ts}} + \epsilon_j \quad (3)$$

where $TIME_j$ is the time between the first funding round and the IPO (in column 1) or acquisition (in column 2) of start-up j in years. $FUNDING\_POST_j$ is a dummy variable that indicates whether any funding round of start-up j occurred after September 27, 2010. $TREATED_j$ 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. **X** is a vector of controls that includes the average Crunchbase rank of start-up j over all funding rounds, $RANK$, and the logarithm of the overall amount raised in all funding rounds by start-up j, $\ln(RAISED)$. ϕ_{ts} is a vector of location (US state) and founding year specific fixed effects. Heteroskedasticity-robust standard errors are presented in parentheses. ***, **, and * indicate significance at the 1%, 5% and 10% levels.

Table 10:Regression Results: Number of Investors

	(1)	(2)	(3)	(4)
$POST$	-0.048**	-0.030	-0.019	-0.019
	(0.023)	(0.032)	(0.026)	(0.026)
$POST \times TREATED$	0.066***	0.039**	0.059***	0.060***
	(0.018)	(0.018)	(0.020)	(0.020)
AGE	0.002	0.008	-0.004	-0.005
	(0.010)	(0.012)	(0.012)	(0.012)
$RANK$	-0.003***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
$ANGEL$	0.164***	0.166***	0.181***	0.179***
	(0.023)	(0.032)	(0.036)	(0.036)
$AFTER\_SEED$	-0.122***	-0.148***	-0.123***	-0.122***
	(0.011)	(0.014)	(0.015)	(0.015)
$STATE\_FIRM\_SCALE$				-3.713
				(4.835)
$STARTUP\_EMPL\_CHG$				-0.021
				(0.042)
Firm and Funding Round Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
No. of Observations	23,341	18,491	13,617	13,524
No. of Start-ups	11,567	6,717	6,202	6,160
R^2	0.774		0.775	0.775

This table presents the results of a difference-in-difference analysis. We estimate the following model

$$\ln(INVESTORS_{ij}) = \beta_1 POST_{ij} + \beta_2 POST_{ij} \times TREATED_j + \boldsymbol{\beta}\mathbf{X} + \boldsymbol{\phi_i} + \boldsymbol{\phi_j} + \epsilon_{ij}$$

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 the effective 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, and funding round 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.