Competition, Reputation, and Venture Capital Investment*

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Abstract

This paper examines the impact of competition on the investment behavior and outcomes of venture capital (VC) firms with differing reputations. Following the introduction of investor tax credit programs that increase competition, reputable VCs decrease the number and size of their investments. The results are more pronounced in states with lower investment requirements and lower VC supply. Reputable VCs also reduce their syndicate size and shrink the time between financing rounds. They become less likely to partner with serial founders and their performance deteriorates. Our results suggest that increasing competition depresses returns for reputable VCs, hurting their incentive to invest.

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In this paper, we study how increasing competition among venture capital (VC) firms affects their investment behavior and portfolio quality. This is of particular importance, as nearly half of the IPOs in the U.S. involve firms backed by VCs (Kerr et al., 2014). For this reason, much research has focused on understanding the role of VC financing and how VC and startup specific characteristics affect their investment decisions.[1] However, much less is known about the role of competition in a VC market with both heterogeneous VCs and heterogeneous startups in shaping the behavior and decisions of the different parties involved. We show that, following the introduction of investor tax credit programs that broaden opportunities for younger and lesser-known investors, reputable VCs experience a decrease in the amounts they invest and in the success of their investments. They also form smaller syndicates, and the duration between financing stages decreases significantly.[2] On the startup side, serial founders tend to partner with lesser-known VCs in preference to partnering with reputable VCs.

A priori, the effect of competition on VCs is not obvious. On the one hand, entry of new investors and the resulting increase in competition should lead to improved monitoring, screening, and efficiency of investment (Jayaratne and Strahan, 1996). On the other hand, if the supply of investors grows more than the supply of good startups, increased entry could lead to excessive competition, which could depress returns for the VCs. Lower expected returns would likely motivate VCs to decrease their monitoring and screening efforts (Keuschnigg, 2003; Lerner, 2009).

The effects of competition do not depend solely on the number of VCs but also on the type of such investors. Ewens et al. (2018) and Nanda and Rhodes-Kropf (2018) argue that investors in startups have become increasingly heterogeneous in recent years.[3] These

[1] See Da Rin et al. (2013) for an excellent survey.

[2] These tax credit programs provide greater incentives for capital-constrained investors characterized by smaller funds. Reputation through association with companies that eventually go public is critical to a VC's ability to raise capital (Gompers, 1996). This leads us to believe that variation in reputation constitutes a good proxy for the quality along which these tax credits provide differential treatment.

[3] Nanda and Rhodes-Kropf (2018) asserted the following on investor heterogeneity:"This seems partic-

new investors, ranging from micro VCs to sovereign wealth funds, have different incentives and objectives, which adds further complexity to understanding the potential impact of heightened competition. In line with this, one important source of heterogeneity can come from differences in the levels of reputation across VCs. Since reputation plays a critical role in a VC's ability to raise funds and attract promising startups, lesser-known ones are likely to be more aggressive in attempting to build their reputation. They can do this by aggressively pursuing promising startups to partner with them and also through grandstanding. Using age as a proxy for reputation, Gompers (1996) argues that young VCs take companies public sooner to signal their skill and to facilitate fundraising in the future.

However, VCs can't build a reputation on their own. They require promising startups to choose to partner with them rather than with established VCs. However, this is costly for startups, as partnering with reputable VCs has certification benefits, especially in earlier stages when information asymmetries are higher (Hsu, 2004; Megginson and Weiss, 1991). This is apparently important, as startups appear to willingly accept worse terms from reputable VCs (Hsu, 2004). It is also likely that such VCs are more skilled and can deliver higher valuations and demonstrate a greater probability of success (Nahata, 2008). However, they do have an important vulnerability, i.e., an Achilles heel, that lesser-known VCs can exploit. By virtue of being more skilled and reputable, such VCs are in greater demand. If scaling up is costly, reputable VCs are more likely to abandon existing partnerships in favor of newer, more promising ones (Guler, 2007; Khanna and Mathews, 2020; Nanda and Rhodes-Kropf, 2018). In other words, being reputable and in great demand increases the opportunity cost of committing to a specific project for reputable VCs. This intrinsic inability to commit to stay for the duration makes them less reliable as partners, and startups that value reliability more will prefer to partner with the lesser-known VCs who are in lower demand and thus are

ularly important given the growing heterogeneity in the types of investors financing early-stage ventures. We believe that characterizing them and studying their implications – both in terms of the composition of syndicates and in terms of the consequences on startups – are promising avenues for future research."

less likely to abandon them.[4] Also, since lesser-known VCs will like to gain reputation, they are likely to offer much better terms regarding how the value created will be shared with the startups. Both of these forces can potentially make them relatively more attractive, despite their lack of experience.

In this paper, we study the investment dynamics of VCs with differing reputation competing for startups that can also differ. Several obstacles exist that hinder the study of the effect of competition on different VC types' investment choices and portfolio success. The first obstacle relates to endogeneity: the decision to enter the VC market is endogenous, and there are likely unobservable factors affecting both the entry of new investors and the success of VC-backed firms (Inderst and Muller, 2004). Therefore, a plausibly exogenous source of variation is critical. Second, VCs tend to invest locally, which necessitates the use of local sources of variation for identification purposes (Hochberg et al., 2015; Sorenson and Stuart, 2001).[5] To address these two main concerns, we use the staggered passage of investor tax credit programs as a source of plausibly exogenous variation in the entry of lesser-known financiers (Denes et al., 2020). These programs effectively subsidize individual investors and investment funds and induce them to make investments in startup companies. Investors participating in these programs receive a credit against their state tax liability, corresponding to a predetermined percentage of their investment amount. An important feature of these programs relevant to our study is that states place a cap on both the per-investor and aggregate state-wide amount of credit to be provided. To illustrate, the cap for Indiana Venture Capital Investment Tax Credit Program is $1 million per investor and $12.50 million in total

[4] Nanda and Rhodes-Kropf (2018) illustrate the potential costs of working with established VCs with the following quote from an investor: "I worry about having a [larger] VC in the seed round because if the VC loses interest, you're toast. It could be for reasons unrelated to the company, but if I am a potential Series A or B investor, and the original investor doesn't go forward, that would be a show stopper for me."

[5] Hochberg et al. (2015) state, "When analyzing VC competition, the geographic match between venture capitalists and startup companies that are seeking capital is critical. The nature of these relationships—including research, due diligence, establishing personal contacts, and monitoring of portfolio companies—makes venture capital a decidedly local industry."

per year. These caps make these programs a greater source of incentive for younger and lesser-known VCs who are likely smaller in size.[6,7]

To quantify success on which reputation is built, we follow Nahata (2008) and Krishnan et al. (2011) and use the cumulative value of IPOs backed by the VC firms. The rationale behind this measure is that IPOs are considered to be the ultimate measure of success for VC firms, and increase their visibility in the eyes of investors and future startup firms (Nahata, 2008). We find that, following the introduction of investor tax credit programs, the number of lesser-known VCs increases significantly within treated states (i.e., by 15.6%). This estimate is economically significant and is in line with Denes et al. (2020) who find an increase of approximately 18% in the number of angel investments.

Next, we examine how investments by VCs with differing reputations are affected by the investor tax credit programs. There are competing predictions. If the reputable and lesser-known VCs are complements, the entry of lesser-known VCs should increase the number of projects available to the reputable VCs (Hellmann and Thiele, 2015). However, if lesser-known VCs become substitutes by pursuing more aggressive investment strategies, such as offering entrepreneurs better contract terms and greater reliability, then fewer projects will be available to reputable VCs, and their skill will be crowded out (Gompers, 1996; Khanna and Mathews, 2020). A similar prediction comes from Inderst and Muller (2004), who argue that the entry of new financiers increases pre-valuations and decreases investment returns, thus also reducing the incentive of reputable VCs to invest. Consistent with Inderst and Muller (2004) and Khanna and Mathews (2020), we find that reputable VCs' number of

[6] In most states, reputable VCs can apply to these programs too. However, relative to fund sizes, caps make these tax credits a greater support for younger or lesser-known investors.

[7] Denes et al. (2020) report that, in total, states spent approximately $8.1 billion for tax credits between 1989 and 2019. This means that, assuming a tax credit percentage of 33%, states supported approximately $25.5 billion of early-stage investments. In 2012, 24 states had active investor tax credit programs and spent $400 million in total, which may be interpreted as approximately $50 million of early-stage investments being supported by states, assuming a tax credit percentage of 33%. This shows that early-stage investor tax credits represent an economically significant treatment, given that the median first-round VC investment in our sample is $2.6 million.

projects as well as the total investment amount decrease significantly within treated states.[8]

To test the hypothesis that increased competition from lesser-known financiers leads reputable VCs to decrease their investment, we exploit two sources of heterogeneity. First, states vary in the minimum investment amount required per investor. More specifically, around half of the states introducing these investor tax credit programs do not impose any minimum investment amount requirements per investor. If minimum investment requirements make it more difficult for lesser-known financiers to enter, then competition should increase more extensively in states with no minimum investment requirements. We observe evidence that is consistent with this hypothesis, in that reputable VCs cut their investment more in states with no minimum investment requirements. Second, Denes et al. (2020) document that these programs are less effective in promoting investment in states that already have a high VC supply. Since there is less entry, the impact on investment strategies of established VCs is smaller. Our results support this reasoning: reputable VCs cut their investment less in states with a higher supply of VC.

However, the impact of increased competition on other actions VCs take with respect to their portfolio of companies could be as important as changes in the amount they invest (Hellmann and Puri, 2002; Hsu, 2004). In line with this idea, we look at the impact on VCs' behavior with respect to staging and syndication as well as changes in the characteristics of entrepreneurs with whom they partner. First, we look at what kind of entrepreneurs reputable VCs are more likely to partner with after the tax-law change in their state. If lesser-known VCs are more aggressive and startups place greater value on relationship commitment from VCs, lesser-known VCs can convince good startups to partner with them rather than with reputable ones (Khanna and Mathews, 2020). In an environment in which the supply of good startups does not grow as fast as the increase in investors, it can become harder for

[8] In Appendix IA.I, we also show that reputable VCs shift their investment from treated to untreated states.

reputable VCs to partner with good entrepreneurs. To test this claim, we look at how serial founders change their behavior post-tax-law changes. It indeed turns out that, following the introduction of investor tax credit programs, serial founders are less likely to pair with reputable VCs.

Next, we study whether reputable VCs also change their staging and syndication strategies in response to increased competition. Increased competition should impact how reputable VCs build their syndicates. Syndication is a process during which VCs cooperate with each other and aggregate different opinions (Da Rin et al., 2013; Lerner, 1994). Increasing entry by lesser-known VCs might have different effects on reputable VCs' syndicating strategies. Faced with increased competition, reputable VCs may consider increasing syndicate size to improve their decision-making process. However, making syndicates larger imposes costs. Nanda and Rhodes-Kropf (2018) argue that there can be substantial coordination frictions within syndicates which is likely to increase as more members are brought in. Thus, VCs may prefer to co-invest with fewer VCs to alleviate the potential costs of syndication. Consistent with this idea, we find that syndicate sizes are smaller in treated states.

Despite existing studies analyzing the effect of startup and VC characteristics (Gompers, 1995; Tian, 2011), little is known about the effects of increased competition on a VC's staging strategy. Stage financing is a tool VCs use to temper moral hazard of founders as well as adjust to changes in uncertainty about a startup's prospects. The higher the uncertainty about the project and the founder, the more likely VCs are to shrink the duration between financing rounds (Gompers, 1996). In support of this assertion, we document that, post-tax-law adoption, the number of days between investment rounds of reputable VCs decreases significantly.

Lastly, we study VCs' investment outcomes. Following Puri and Zarutskie (2012) and Gu et al. (Forthcoming), we consider IPOs and acquisitions as successful outcomes. We find that investor tax credit programs lead reputable VCs to have fewer successful exits: both

the number of IPOs and M&As decrease significantly. The evidence supports the argument that reputable VCs are less likely to have successful exits because of the worsening pool of projects who partner with them. This provides additional support for the argument in Lerner (2009), that an increase in uninformed investors may discourage skilled or established VC firms by depressing their returns as well as their profitability. It also demonstrates why an increase in competition from new entrants may hurt established VCs even more.

The remainder of this paper is organized as follows. Section 1 reviews the literature. Section 2 describes investor tax credit programs. Section 3 presents the data and empirical methodology. Section 4 provides our empirical results. Section 5 discusses the results. Section 6 concludes.

1 Literature Review

Our findings contribute to the set of studies examining the effects of competition among financial intermediaries. A significant number of studies have examined the effects of banking deregulations (Black and Strahan, 2002; Cetorelli and Strahan, 2006; Jayaratne and Strahan, 1996; Kerr and Nanda, 2009; Krishnan et al., 2015). We contribute to this set of studies in the following ways. First, the lack of lender-borrower matched data for small and young firms in the U.S. makes it harder to analyze how increased competition in the banking industry affected banks' portfolio composition and investment policies. VC-level data allows us to see how the portfolio composition of financial intermediaries responds to different shocks as well as how the relationship with a specific young or small borrower evolves. Second, startups resorting to VC are fundamentally different from startups, whose main source of financing is traditional bank financing (Berger and Udell, 2002; Gompers and Lerner, 2000). Lack of tangible assets, knowledge intensity, and higher risk associated with VC-dependent startups make the results of the banking industry harder to apply to the VC industry. Third,

although banks make private equity investments in startups, their role is more strategic than independent VCs (Hellmann et al., 2008). Winton and Yerramilli (2008) argue that VCs visit and monitor borrowers more frequently than banks and take a more active role in the governance of firms, which makes them the most "relational" type of financial intermediary (Hellmann and Puri, 2000).[9]

The opportunity for increased monitoring by banks might be one reason why our findings differ from Jayaratne and Strahan (1996) who find increased monitoring and investment efficiency among banks following an increase in competition. Another reason our findings differ from theirs is related to the quality of groups driving the increase in competition. They argue that banking deregulations allowed large bank-holding companies to consolidate the banking industry by acquiring banks in other states. In contrast to national banks bringing their expertise and scale advantages during banking deregulations, in our study, it is small and uninformed investors that drive the increase in competition, which depresses returns for bigger investors. We, therefore, show that the effects of competition depend on the quality of groups that drive it in the first place, especially in the context of relationship investing.

In a related paper, Gompers and Lerner (2000) show that increasing the supply of capital increases the valuation of VCs' investments. They also show that there is no association between valuations and startup success. We extend their work in two different ways. First, we look at VCs' investment levels in different states as well as their investment strategies, including syndication and staging. Second, we uncover the importance of VC reputation as a channel through which entry of new capital affects financial intermediaries differently. Our findings are also in line with Inderst and Muller (2004), who argue that increased capital supply as a result of easier investor entry can destroy value.

Furthermore, our paper is related to studies that analyze government-sponsored VCs.

[9] Please see Winton and Yerramilli (2008) for a more extensive review of differences between VCs and banks.

There is mixed evidence on the relationship between government-sponsored VCs and private VCs. Leleux and Surlemont (2003) and Brander et al. (2008) provide evidence in support of the complementarity between the two, whereas Cumming and MacIntosh (2006) find significant crowding out within Canadian data. We extend these studies in two ways. First, in line with Lerner (2009), we focus on the quality of VCs that invest in startups and document that VCs do not behave as a homogenous group. Therefore, government investment incentives can have different effects on different types of VCs.[10] Second, detailed data on VCs' investments at each round as well as the staggered introduction of investor tax credit programs come with significant identification benefits.[11] Our empirical approach helps us identify the effect of public involvement by comparing not only the investment of different types of VCs in the same state but also the investment of the same type of VC in different states with and without these programs.

Finally, our study adds to the literature studying the relationship between capital inflows and decline in productivity (Barbosa et al., 2020; Gopinath et al., 2017). Despite the observational link between the two, much less is known about the precise mechanisms through which capital inflows lead to inefficiency and value loss. We present evidence suggesting that "crowding out of skill" is a possible mechanism; entry of lesser-known investors negatively affects the portfolio success of reputable VCs that are more proficient in providing value-added services (Nahata, 2008). This mechanism can have significant macro effects, given the

[10] Upon evaluating the crowding out result of Cumming and MacIntosh (2006), Lerner (2009, pp.121-122) stated, "While this analysis is suggestive, by focusing on the aggregate amount of venture investments, the authors may be missing the larger picture. Conversations with independent Canadian venture funds indicate that they found themselves during these years competing against these uninformed investors, who were in many cases willing to commit capital at huge valuations. Many of the independent groups, convinced that they could not generate profitable returns in the Canadian market, shifted (at least temporarily) to investing in the United States instead. Thus, the problem may have been less with the aggregate amount of funding during these years than with the quality of the groups providing the funding to the entrepreneurs."

[11] Brander et al. (2008) commented on the importance of VC-startup matched data to identify the effect of government sponsoring on VCs as follows: "These results are significant even though it is difficult to obtain sufficient data at a precise enough level to draw strong inferences. In principle, it would be desirable to have data about the actual investment provided to each venture by the different types of venture capitalists, but insufficient information of this type is available."

employment and innovation-related importance of VC-backed firms in the economy (Kerr et al., 2014).

2 Investor Tax Credit Programs

Investor Tax Credit Programs provide a tax credit to individual investors or investment funds to promote entrepreneurship and create jobs. States give investors participating in these programs a credit against their state tax liability. This credit corresponds to a certain percentage of the invested amount. To illustrate, suppose that an investor offers $400,000 to a qualified startup in Illinois. Since the tax credit rate for the Illinois tax credit program is 25%, $100,000 (400,000*0.25) will be deducted from the investor's state tax liabilities. However, states place a cap on both the per-investor and the aggregate state-wide amount of credit to be provided. For example, the cap for the investor tax credit program in Illinois is $500,000 per investor and $10 million total per year. Most states use a "first come, first served" policy in case the aggregate amount of credit demanded by investors exceeds the aggregate amount of credit allocated by states for these programs.

These programs come with explicit qualifying criteria for both firms and investors. As to firms, credit-caps related to age, employment, and revenue constitute the most common criteria. Furthermore, states require qualified firms to be headquartered or to have a minimum percentage of employees in that state, and this requirement is in line with the local job creation objectives of these programs. Owners or family members are not allowed to invest in most states, while out-of-state investors are allowed to participate in order to encourage more capital entry into the state.[12]

As seen in Table I, thirty-one states adopted these programs between 1989 and 2019. Denes et al. (2020) document that, during this time period, states provided approximately

[12] Please see Denes et al. (2020) for a detailed summary of eligibility criteria for each state program.

$8.1 billion for tax credits. These programs are mainly introduced to encourage the development of technology-related industries. For example, the Arkansas Equity Investment Tax Credit Program states the following: "The Equity Investment Incentive Program is a discretionary incentive targeted toward new, technology-based businesses paying wages in excess of the state or county average wage." We see a similar statement from Colorado's Advanced Industry Investment Tax Credit Program: "The Advanced Industry Investment Tax Credit program (C.R.S. 24-48.5-112) was created to grow high-potential advanced industry businesses with the objective of stimulating the State's economy and creating high-paying jobs." These statements show that these programs target industries in which VCs mainly invest.

These programs provide us a promising identification strategy for the following reasons. First, thirty-one states introduced them in a staggered fashion between 1989 and 2019. Second, as Table I shows, states introducing these programs are not concentrated in specific geographic or political regions of the U.S. Third, tax credit rates vary across states, from as low as 10% to as high as 80%, thus representing a level of heterogeneity that we can exploit for our identification and discuss in detail in Section 3. Fourth, the money spent by states is sizable. As illustrated in the introduction, in 2012, states supported an average of $50 million in early-stage investments, which is economically significant, given that the median first-round VC investment in our sample is $2.6 million. Finally, adoption of investor tax credit programs appear exogenous under the state-level economic conditions. By estimating a predictive regression, Denes et al. (2020) find no statistically significant indication that these programs are driven by state-level economic or political conditions. We will revisit the endogeneity concern attributable to state-level economic conditions in Section 4.2.1.

3 Data and Empirical Methodology

3.1 Data Sources and Variable Construction

The main source of data for our analysis is the Thomson Reuters Eikon database. We first restrict the ventures to U.S. firms only. We require the ventures to be in one of the 50 states and that all the ventures receive their initial VC investment between 1980 and 2014 to be included in our sample. Following the existing literature, we exclude the utility industry (SIC code 4900-4999) and the financial services industry (SIC code 6000-6999). Since our focus is the venture capitalists, we only include ventures with identifiable investor information. Our final sample has around 50,000 unique ventures and 6,000 VCs.

For state-level analysis, we aggregate the number of VCs in each state. More specifically, for each state and year, we count the number of reputable VCs and the number of lesser-known VCs that have made at least one investment. We consider a VC to be reputable if its cumulative IPO share is in the top tercile. Similarly, we consider a VC to be lesser known if its cumulative IPO share is in the bottom tercile. Our dependent variables of focus are *Log(Number of Reputable VCs)* and *Log(Number of Lesser-Known VCs)*. We use *ITC* and *Credit Rate* as our main independent variables. *ITC* is a dummy variable that takes the value of one if the state has an active investor tax credit program and zero otherwise. *Credit Rate* is the actual percentage of the tax credit rate of the investor tax credit program.

To build the sample for our main analysis, we create a state-year panel of investment for each VC. We aggregate each VC's investment in the same state in the same year. We focus on both the number of projects the VC is undertaking and the dollar amount of investment. We define *Log(Number of Projects)* and *Log(Investment Amount)* as the natural logarithm of the number of projects a VC invests and the natural logarithm of the dollar amount invested in a given state in a given year, respectively. The variable of focus is the interaction term between the investor tax credit variables (i.e., *ITC* and *Credit Rate*) and *VC Reputation*. *VC Reputation* is a continuous variable based on the cumulative dollar amount of IPOs. Specifically, we define *VC Reputation* as the natural logarithm of the cumulative value of

IPOs backed by the VC firm.

We also study VC investment behavior and outcome. We construct two variables for VC investment behavior. We define *Log(Number of Firms)* as the natural logarithm of the average number of VCs that co-invest in each deal. We define *Duration* as the natural logarithm of the average number of days between the current investment round and the last investment round scaled by the number of remaining rounds. We construct three variables for VC investment outcome. We define *Log(Number of M&A)*, *Log(Number of IPO)*, and *Log(Number of Exit)* as the natural logarithm of the number of projects invested by a VC that are acquired, the natural logarithm of the number of projects invested by a VC that have gone public, and the natural logarithm of the sum of projects invested by a VC that have either been acquired or have gone public, respectively.

For the analysis concerning startup founders, we take extensive effort to hand collect information about founders from Factset, Capital IQ, and PrivCo. We search for the names and other identifying information (if available) about founders for each venture in the Thomson database. The goal is to identify founders who have founded more than one venture in the dataset. We define "serial founder" as an indicator variable that equals one if a founder is also the founder of another startup and zero otherwise.

Throughout the analysis, we introduce state-level controls to control for observable factors in each state. Namely, we include GDP growth, unemployment rate, and the fraction of Republican over the total number of congressmen. We obtain state-level GDP information from the Bureau of Economic Analysis. We define GDP growth as the annual growth rate of the state's GDP. We download seasonally adjusted unemployment rate numbers about each state from the Bureau of Labor Statistics. We hand collect the number of congressmen representing each state from the Congress website. We start from the 96th Congress through the 113th Congress. We separately account for the number of Democrats and Republicans in each state. Under certain circumstances, such as the death of a Congress member or

a member being inducted into the cabinet, a Congress seat becomes vacant. We search congressional records to account to adjust for these situations.

We provide detailed definitions of all variables used in the analysis in Appendix A. We present summary statistics of the main variables in Table II. We report the sample size, the mean, the standard deviation, the 25th percentile, the 50th percentile, and the 75th percentile for each variable. Consistent with Gu et al. (Forthcoming), we see that 20.1% of firms in our sample exit through an IPO (5.1%) or M&A (15%).

3.2 Identification and Empirical Model

We follow an "on-off" approach in the estimation strategy. According to this, the "on" period includes years during which a state has an investor tax credit program, whereas the "off" period includes years without a program. We estimate three equations in this study. First, to examine how the staggered introduction of investor tax credit programs affects the number of reputable and the number of lesser-known VCs, we estimate the following state-year level specification:

$$y_{st} = \alpha_s + \alpha_t + \beta\ ITC_{st} + \delta\ X_{st} + \epsilon_{st}, \tag{1}$$

where s indexes states and t indexes years. We run the specification separately for reputable and for lesser-known VCs. The variable y stands for the (log) total number of reputable VCs, or the (log) total number of lesser-known VCs in a given state. ITC_{st} represents whether the state has any investor tax credit program in place. X_{st} represents control variables including state GDP growth, unemployment rate, and the fraction of members of Congress who are republicans over the total number of congressmen in that state. α_s and α_t are state and year fixed effects, respectively. Due to the concern of serial correlation of errors at the state

level, we cluster standard errors by state (Bertrand et al., 2004). The coefficient of interest, β, represents the mean percentage increase in a state's annual number of a particular type of VCs (i.e., reputable or lesser-known) following the introduction of the investor tax credit program.

Next, to analyze how investor tax credit laws affect different types of VCs' investment behavior as well as our measure of investment success, we estimate the following VC-state-year level specification:

$$\begin{aligned} y_{ist} = \; & \alpha_i + \alpha_s + \alpha_t + \beta_1 \; ITC_{st} + \beta_2 \; VC \; Reputation_{it} \\ & + \beta_3 \; ITC_{st} \times VC \; Reputation_{it} + \delta X_{st} + \epsilon_{ist}, \end{aligned} \tag{2}$$

where i indexes VC firms, s indexes states, and t indexes years. The dependent variable y depends on the test and stands for one of the following: the VC's (log) number of projects, (log) investment amount, duration, (log) number of firms in a syndicate, (log) number of M&As, (log) number of IPOs, and (log) number of exits in a given state. ITC_{st} represents whether the state has any investor tax credit program in place. $VC \; Reputation_{it}$ is the (log) cumulative value of IPOs backed by the VC firm and is our measure of the VC's reputation as in Nahata (2008). X_{st} represents control variables including state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over the total number of congressmen in that state. α_i, α_s, and α_t are VC, state, and year fixed effects, respectively. We use VC and state fixed effects to control for time-invariant characteristics at the VC and state level, respectively. Year fixed effects help us account for aggregate changes in VCs' investment behavior and level of success over time, potentially due to business cycles. We continue to cluster standard errors at the state level.[13] The coefficient of interest, β_3, captures the average incremental effect of investor tax credit programs on the investment

[13] In regressions not reported here, we cluster standard errors at the VC level and find similar results.

behavior and investment success of reputable VCs. These estimates are benchmarked off the corresponding average over VCs with the same reputation operating in states without these programs.

Finally, to analyze how investor tax credit laws affect serial founders' probability to work with reputable VCs, we estimate the following firm-state-year-level specification:

$$\begin{aligned} y_{fist} = \; & \alpha_i + \alpha_s + \alpha_t + \beta_1 \; ITC_{st} + \beta_2 \; Serial \; Founder_{ft} \\ & + \beta_3 \; ITC_{st} \; \times \; Serial \; Founder_{ft} + \delta X_{st} + \epsilon_{fist}, \end{aligned} \tag{3}$$

where f indexes startup firms, i indexes VC firms, s indexes states, and t indexes years. The dependent variable y is an indicator variable equaling one if the founder partners with a reputable firm and zero otherwise. $Serial\ Founder_{ft}$ is an indicator variable that equals one if one of the founders is also the founder of another startup and zero otherwise. As in the two specifications before, ITC_{st} represents whether the state has any investor tax credit program in place, and X_{st} represents control variables including state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over the total number of members of Congress in that state. We continue to cluster standard errors at the state level.[14] The coefficient of interest, β_3, captures the average incremental effect of investor tax credit programs on a serial founder's probability to work with a reputable VC.

4 Empirical Results

[14] As in Equation (2), in regressions not reported here, we cluster standard errors at the VC level and find similar results.

4.1 Number of VCs

We first want to establish the fact that the introduction of investor tax credit programs indeed creates an influx of lesser-known VCs. In turn, the entry of those lesser-known VCs increases the competition for the reputable ones. To do so, we examine the effect of investor tax credit programs on the number of lesser-known and reputable VCs separately. We estimate Equation (1) where the dependent variable is the natural logarithm of different types of VCs. Table III presents the results.

Column 1 documents the results using the investor tax credit dummy, *ITC*, as the main independent variable. The estimated coefficient of interest is 0.156, and is significant at the 5% confidence level. This estimate corresponds to a 15.6% increase in the number of lesser-known VCs and is consistent with Denes et al. (2020), who find an increase of 18% in the number of angel investments following investor tax credit programs. In column 2, we use the tax credit rate, *Credit Rate*, as the main independent variable, and see a similar result.

In columns 3 and 4, we see how the number of reputable VCs is affected in treated states. In column 3, the estimated coefficient of interest is –29.5, which is significant at the 1% confidence level and translates into a 29.5% decrease in the number of reputable VCs in treated states.

Taken together, these estimates indicate that the introduction of investor tax credit programs has an economically significant effect on the composition of VCs operating in treated states: the number of lesser-known VCs increases, whereas the number of reputable VCs decreases.[15]

[15] To answer the question of whether reputable VCs reallocate their portfolio to states without these programs, in Appendix IA.I, we estimate Equation (2) with VC × year fixed effects. We see that reputable VCs increase their number of projects as well as their investment amount in untreated states with respect to treated states.

4.2 Investment Level

Next, we analyze how investor tax credit programs affect the investment of different types of VCs, both in terms of the number of projects and the invested amount. The results in Table III that the number of reputable VCs decreases in treated states does not necessarily mean that reputable VCs that continue to invest in those states decrease their investment; on the contrary, the remaining reputable VCs may very well increase their investment since there is less competition from other reputable competitors. In addition, if lesser-known investors and reputable VCs play a complementary role, then reputable VCs should have access to a larger pipeline of projects following an increase in the number of lesser-known VCs (Hellmann and Thiele, 2015).[16] However, in an environment in which the supply of good startups does not increase as quickly as the number of VCs, lesser-known VCs can become substitutes because their desire to get established could lead them to pursue more aggressive investment policies, leaving reputable VCs with fewer good startups in which invest (Gompers, 1996).

Table IV presents the results for Equation (2). In columns 1 to 4, the dependent variable is the natural logarithm of the number of projects. Column 1 shows that reputable VCs' number of projects significantly decreases in treated states. In terms of magnitude, a one-standard-deviation increase in a VC's reputation decreases the number of projects by 9.3% of its standard deviation, which is economically significant. The results in column 1 suggest that the supply of good startups does not increase as quickly as the number of investors, consistent with the predictions of Lerner (2009). This is also in line with Denes et al. (2020), who argue that these programs do not stimulate the entry of good entrepreneurs. However, this leads to an alternative explanation that reputable VCs might have decreased their investment because of contemporaneous decreasing investment opportunities in treated

[16] To illustrate –complementarity-hypothesis–, Hellmann and Thiele (2015) give the example of Facebook and Google, which received angel financing before working with reputable VCs.

states. To control for state-level investment opportunities, column 2 adds time-varying state-level control variables for political and economic differences between states, including GDP growth, unemployment rate, and the fraction of congressmen who are republicans over the total number of congressmen in that state. The inclusion of these control variables changes neither the magnitude nor the statistical significance of the estimated coefficient in column 1. In columns 3 and 4, we replace the investor tax credit dummy with the tax credit rate and interact it with VC reputation. We find consistent results, both economically and statistically.

While reputable VCs decrease the number of projects in treated states, one cannot infer that they decrease the dollar amount invested in those states, because they may choose instead to target their investments and focus on a smaller number of projects. In columns 5 to 8, we examine VCs' dollar investment amount. More specifically, we use the natural logarithm of the dollar investment amount as the outcome variable. In contradiction to this conjecture, in columns 5 and 6, the estimated coefficients of interest are negative and statistically significant at the 1% confidence level. In terms of economic magnitudes, a one-standard-deviation increase in VC's reputation decreases the number of projects by 7.5% and 7.1% of its standard deviation, respectively. Again, in columns 7 and 8, we focus on the interaction between the credit rate and VC reputation. We document qualitatively similar results. Taken together, we find strong evidence to support the notion that reputable VCs decrease not only the number of projects but also their investment amount in treated states following the introduction of investor tax credit programs.

4.2.1 Robustness Checks

We conduct several tests to ensure the robustness of the results in Table IV. One potential problem is related to the endogeneity of investor tax credit programs. These programs might be related to unobserved economic or political factors that drive states to introduce these

programs and also drive reputable VCs to decrease their investment. We address this concern with a dynamic version of Equation (2) by investigating the effects of the timing of these programs on VC investment. If these programs are adopted because of state-specific economic and political factors, we should be able to detect the effect of these before the enactment.

Table V documents the dynamic effects of investor tax credit programs. We again use the natural logarithm of the number of projects and the natural logarithm of the dollar investment amount as the outcome variables. We construct ten indicator variables to denote the timing of investor tax programs. More specifically, we define $Before^{-5+}$, $Before^{-4}$, $Before^{-3}$, $Before^{-2}$, and $Before^{-1}$ as indicator variables that equal one if the state will start implementing an investor tax credit program in 5 years or more, in 4 years, in 3 years, in 2 years, and in 1 year, respectively. Similarly, we define $After^{1}$, $After^{2}$, $After^{3}$, $After^{4}$, and $After^{5+}$ as indicator variables that equal one if the state started implementing an investor tax credit program 1 year ago, 2 years ago, 3 years ago, 4 years ago, and 5 years ago or more, respectively. We interact the timing indicator variables with VC reputation and focus on the coefficients of the interaction terms. First, the estimated coefficients on *VC Reputation* $\times$ $Before^{-5+}$ to *VC Reputation* $\times$ $Before^{-1}$ are all economically small and statistically insignificant for both the number of projects and the investment amount. This demonstrates that there is no statistically significant difference in the number of projects and investment amounts of reputable VCs at treated and control states before the introduction of investor tax credit programs, which is consistent with the parallel-trends assumption. Second, starting with *VC Reputation* $\times$ $After^{1}$ and *VC Reputation* $\times$ $After^{2}$ for the number of projects and investment amount, respectively, estimated coefficients become statistically and economically significant, which shows that the effects of these programs start materializing 1 or 2 years after their introduction.

To further strengthen our causality claim, we exploit the variation in program eligibility across industries. Most investor tax credit programs provide credit only to startups op-

erating in specific industries. For example, the investor tax credit program in Minnesota stipulates that startups in real estate development, insurance, banking, lobbying, information technology consulting, wholesale and retail trade, leisure and hospitality, transportation, and construction are excluded from the program. One way to reassure that our benchmark results are documenting the effects of investor tax credit programs rather than some state-level economic shocks is to show that the effects are concentrated among industries that are eligible to receive funding. To operationalize this idea, we search each state's eligibility requirements and record both eligible and ineligible industries. In Table VI, we estimate Equation (2) separately for eligible and ineligible industries. In columns 1 to 4, we see that reputable VCs' number of projects and investment amount decrease significantly, whereas we see no significant effects in columns 5 to 8, which shows that benchmark effects come mainly from the industries targeted by investor tax credit programs.

4.2.2 Investment and Heterogeneity in Competition

Our benchmark results support the hypothesis that increasing competition from lesser-known financiers leads reputable VCs to decrease their investment. As further support, we exploit two sources of heterogeneity in the level of competition across states. First, we focus on the cross-sectional variation in the minimum required investment per investor across states. A closer look at these programs shows that almost half of the treated states do not require any minimum investment amount per investor. If minimum investment requirements make it harder for lesser-known financiers to enter, the effects of competition should be stronger in states with no minimum investment requirements. To carry out the test empirically, we augment Equation (2) with *No Minimum*, an indicator variable that equals one if the investor tax credit program requires investors to invest a minimum amount and zero otherwise. Table VII presents the results. In columns 1 and 2, we see that the number of projects financed by reputable VCs decrease more in states with minimum investment

requirement in place. We see a similar effect while using the investment amount as the outcome variable in columns 5 and 6.

The second source of variation in competition relates to the existing supply of VCs in the state. Denes et al. (2020) find that these programs are less effective in encouraging the entry of lesser-known financiers in states with a greater existing VC supply. From a competitive perspective, lower number of entries by lesser-known financiers should result in a less competitive environment. Thus, we expect to see smaller effects of competition on reputable VCs in states with higher existing VC supply. The results reported in columns 3 and 4 as well as columns 7 and 8 support this reasoning. Estimated coefficients on the interaction term with *VC Supply* are positive and statistically significant, which shows that reputable VCs experience a smaller decrease in their number of projects and investment amounts in states with a higher supply of VCs.

Overall, our cross-sectional tests provide further support to the argument that reputable VCs decrease their investment, both in terms of the number of projects and dollar investment amount in states with investor tax credit programs. The results are more pronounced in states with no minimum investment requirements and in states with lower VC supply.

4.3 Investment Behavior and Outcome

After showing that reputable VCs decrease their investment in treated states, we wish to investigate whether increased competition from lesser-known VCs also impacts the staging and syndication behavior of reputable VCs as well as the nature of founders with whom they partner. The impact on such value-added services may be even more important than the impact on VC investments (Hellmann and Puri, 2002; Hsu, 2004).

4.3.1 Startup Founders

We first study changes in the type of entrepreneurs that VCs partner with following the introduction of investor tax credit programs. VCs build their reputation through successful outcomes, and reputation is important for raising capital and attracting startups (Gompers, 1996). This gives lesser-known VCs a greater incentive to gain reputation sooner. To do so, they would like to attract promising startups to partner with them and possibly also through grandstanding (Gompers, 1996). However, startups likely prefer to partner with reputable VCs, as they provide certification benefits as well as a higher probability of success. The relationship with reputable VCs, though, is not free of costs and risks for startups. First, startups often must accept lower valuations in order to partner with reputable VCs (Hsu, 2004). Second, since reputable VCs are in greater demand among startups, it increases their opportunity cost to continue existing relationships in preference to partnering with new, more attractive prospects. This makes them more likely to prematurely abandon existing projects and shift their focus to other projects (Guler, 2007; Khanna and Mathews, 2020; Nanda and Rhodes-Kropf, 2018). Getting abandoned by the VC in an earlier round can send negative signals to other investors, reducing the startup's ability to raise additional financing. Lesser-known VCs, though, are more likely to both offer better terms up front and a stronger commitment not to terminate early, which makes them attractive partners for certain types of startups. One such type is likely to be serial founders, who already have experience and are thus less likely to find the contributions of reputable VCs to be as valuable. Also, they should be able to negotiate better terms with lesser-known VCs, because they are both less risky and bring experience, which such VCs would value more.

We test this conjecture in Table VIII. The dependent variable, *Reputable VC*, is an indicator variable that equals one if the VC's reputation is in the top 50% and zero otherwise. To proxy for the quality of entrepreneurs or project quality, we compare serial founders with first-time founders, because serial founders are more likely to operate successful businesses

with their prior experience (Lafontaine and Shaw, 2016). For serial entrepreneurs, we use *Serial Entrepreneur*, which is an indicator variable that equals one if one of the founders is the founder of another startup and zero otherwise.

In columns 1 and 2, the estimated coefficients of the interaction term *ITC* × *Serial Founder* are statistically significant at the 5% confidence level, and indicate a decrease of 24.8% and 22.8% relative to the sample mean, which is economically significant. This shows that following the introduction of investor tax credit programs, serial founders are less likely to work with reputable VCs. Similarly, in columns 3 and 4, we focus on the estimated coefficients of the interaction term *Credit Rate* × *Serial Founder* and find qualitatively similar results.

4.3.2 Staging and Syndication

Next, we analyze how the competition from lesser-known financiers affects the staging and syndication of reputable VCs' investments. Despite the prevalence of studies analyzing the effects of startup and VC characteristics (e.g., Gompers, 1995; Tian, 2011), to the best of our knowledge, there is no study on how an increase in competition impacts the staging and syndication strategies of reputable VCs.

The effects of lesser-known financiers on reputable VCs' syndication strategy are not obvious. On the one hand, reputable VCs may increase syndicate size to counter the effects of increasing competition. Lerner (1994) argues that syndication leads to better decision making by helping VCs double check their own thinking. It also allows VCs to spread the risk by getting other investors on board. Both are likely to be more important with heightened competition. On the other hand, Nanda and Rhodes-Kropf (2018) argue that the cost of within-syndicate frictions increase with syndicate size, so smaller syndicates will impose lower costs. In addition, as we show in Appendix IA.II that the per-startup investment amount decreases with competition, we would expect a smaller syndicate to be

more appropriate because of the reduced need for both risk sharing and the smaller amount at stake.

To empirically test these hypotheses, we use *Log(Number of Firms)* as our dependent variable, which represents the number of VCs involved in each deal. The independent variables of focus are the interaction terms between the investor tax credit programs and VC reputation. In columns 1 and 2 of Table IX, the estimated coefficients are negative and statistically significant at the 1% confidence level. This shows that, faced with more competition, reputable VCs not only decrease their investment in treated states but also reduce the size of their syndicates.

In terms of stage financing, there are reasons to expect that reputable VCs will stage more often. First, agency models of staging argue that stage financing helps VCs better monitor the progress of projects (Gompers, 1995). Thus, faced with greater competition, reputable VCs will increase their monitoring effort by staging more often. Second, we see in Table VIII that serial founders prefer to partner with lesser-known VCs. Since serial founders are more likely to have successful startups because of their prior experience (Lafontaine and Shaw, 2016), decreasing quality or decreasing certainty regarding the quality of the entrepreneurs might lead reputable VCs to monitor more often, maintaining the option to abandon the project (Gompers, 1995).[17]

To carry out the test, we use *Duration* as our measure of stage financing, which is defined as the natural logarithm of the number of days between the last investment and the current round divided by the number of rounds remaining. We again use the interaction terms between the investor tax credit programs and VC reputation as the independent variables. The negative coefficients in columns 3 and 4 show that reputable VCs stage finance more frequently, i.e., the number of days between reputable VCs' investment rounds decreases

[17] Another interesting hypothesis relies on the fact that young VCs take companies public earlier than older VCs (Gompers, 1996). In order to compete better with younger VCs or to "keep up with the Joneses", reputable VCs might shorten the interval between rounds so that they can take companies public faster.

significantly in states with investor tax credit programs.

4.3.3 Investment Outcome

Lastly, we analyze how the entry of new capital affects reputable VCs' investment outcomes. In Table VIII, we see that serial founders are less likely to partner with reputable VCs, which can have a negative effect on portfolio success due to a deteriorating startup pool available to them. However, in Table IX, we see that reputable VCs shorten the duration between rounds to increase monitoring ex-post. Better ex-post monitoring would counter some of the negative effects of a worse startup pool. To see which effect dominates, we look at how VC investment outcomes are affected.

We consider a VC financed startup to have a successful outcomes if it exits through either an IPO or M&A (Gu et al., Forthcoming; Puri and Zarutskie, 2012). Columns 1 and 2 of Table X indicate that the exits of reputable VCs through both M&As and IPOs significantly decrease following the introduction of investor tax credit programs. A breakdown of exits in columns 3 to 6 shows that both the number of IPOs and the number of M&As decrease significantly.

In summary, we find evidence to support the argument that, when faced with increased competition, reputable VCs are less likely to have successful exits because of worsened startup pools and smaller upfront investments, even when they increase ex-post monitoring. The worsening investment outcomes are consistent with Lerner (2009), who argues that increased competition may depress returns and discourage VC financing.[18]

Following worse investment outcomes, a natural question is whether reputable VCs shift their portfolio to other states. Our estimates in Appendix IA.I are in line with such a

[18] Lerner (2008, p.159) states,"For instance, what happens if the government just subsidizes start-ups (for in-stance, through tax credits)? We might assume that this subsidy will increase the profits of entrepreneurs and venture capitalists. But it may lure more entrepreneurs and venture capitalists into the market, so that, unless the supply of good ideas grows, more firms and financiers are chasing after the same ideas. This competition may depress returns and ultimately discourage entrepreneurs and venture investors. What seems like a reasonable policy turns out to be self-defeating."

resource reallocation explanation.

5 Discussion of the Findings

It is important to discuss the welfare implication of our findings. Denes et al. (2020) argue that investor tax credit programs have no effects on entrepreneurial activity, despite the significant increase in angel investments. They show that these programs allow many inexperienced investors to invest in startups. We take this argument a step further and assert that the costs of these programs are higher than what they find. We show that the influx of unestablished or lesser-known investors has negative spillover effects on more established or reputable capital providers, in line with the conjecture in Lerner (2009). Reputable investors decrease their investment in treated states, and their exit outcomes deteriorate.

The fact that reputable VCs decrease their investment is value reducing for the states introducing these programs. Nahata (2008) and Krishnan et al. (2011) argue that reputable VC backing has positive long-run performance effects on the startups. Hsu (2004) argues that experience, network, and skill make reputable VCs significant providers of value-added services. Reputable VCs' decreased exposure means decreased value-added services for these states.

Our findings suggest that the entry of lesser-known financiers crowds out skill or talent by crowding out reputable VCs. This also shows us that the type or quality of capital can be more important than its quantity, especially in relationship investing. The entry of "dumb money" or "unskilled money" may be discouraging for more experienced or skilled capital, which plays a critical role in value creation.

6 Conclusion

We first show that, following the introduction of investor tax credit programs, the number of lesser-known financiers increases, whereas the number of reputable VCs decreases significantly in treated states. Furthermore, we show that the number of projects for reputable VCs decreases significantly as does the investment amount. The investment results satisfy the parallel trends assumption and are significant only for the set of industries eligible to receive the tax credit. We also report that the effects are stronger in states with no minimum investment requirements and states with lower VC supply.

In the subsequent empirical analysis, we open the box of decreasing investments and look at reputable VCs' investment behavior, including staging and syndication as well as their investment outcomes. First, we show that serial entrepreneurs are less likely to work with reputable VCs. This finding is in line with the set of studies arguing that being associated with reputable VCs is not free of costs and risks (Khanna and Mathews, 2020; Nanda and Rhodes-Kropf, 2018). Providing subsidies to younger or lesser-known financiers can help motivate good entrepreneurs to work with them rather than with reputable VCs, especially in the earlier stages. Next, we show that reputable VCs form syndicates with a fewer number of VCs and decrease the duration between financing rounds following the introduction of investor tax credit programs. Finally, we show that the number of IPOs and M&As for reputable VCs significantly decreases, which shows that their investment performance deteriorates.

Our main contribution is to show the importance of competitive effects in VCs' investment behavior and investment outcomes in light of varying degrees of VC reputation. We present a more nuanced view of "more capital." In an environment in which relationship investing makes quality more important than quantity, entry of lesser-known or inexperienced capital can be distortionary for the entrepreneurial ecosystem by having negative spillover effects

on reputable or more experienced capital.

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Table I
Investor tax credit programs start and end dates

This table presents the start and end dates for the investor tax credit programs. "-" in column 2 means that no end date is specified for the program.

State	Start Date [1]	End Date [2]
Arizona	07/2006	06/2021
Arkansas	09/2007	12/2019
Colorado	01/2010	12/2010
Colorado	07/2014	12/2022
Connecticut	07/2010	06/2019
Delaware	06/2018	-
Georgia	01/2011	12/2020
Hawaii	07/1999	12/2010
Illinois	01/2011	12/2021
Indiana	12/2003	12/2020
Iowa	01/2002	-
Kansas	01/2005	12/2021
Kentucky	07/2014	-
Louisiana	01/2005	06/2021
Maine	09/1988	-
Maryland	07/2006	-
Massachusetts	01/2017	-
Michigan	01/2011	12/2011
Minnesota	04/2010	12/2017
Minnesota	07/2018	-
Nebraska	08/2011	12/2022
New Jersey	01/2012	-
New Mexico	01/2007	12/2024
New York	01/1999	-
North Carolina	01/2008	12/2013
North Dakota	01/1993	-
Ohio	11/1996	-
Oklahoma	01/1998	12/2011
Rhode Island	01/2007	12/2016
South Carolina	06/2013	12/2019
Tennessee	01/2017	-
Utah	07/2011	-
Virginia	01/1999	-
West Virginia	07/2005	06/2008
Wisconsin	07/2004	-

Table II
Summary statistics

This table provides sample summary statistics. Column 1 reports the sample size *N*. Column 2 reports the sample mean. Column 3 reports the sample standard deviation. Column 4 reports the sample 25th percentile. Column 5 reports the sample 50th percentile. Column 6 reports the sample 75th percentile. All variables are defined in Appendix A.

Variables	*N*	Mean	Std. dev.	P25	P50	P75
	[1]	[2]	[3]	[4]	[5]	[6]
Panel A: State level variables						
Log (Number of Reputable VCs)	1785	1.919	1.493	0.693	1.792	3.135
Log (Number of Lesser-Known VCs)	1785	1.853	1.313	0.693	1.792	2.890
ITC	1785	0.053	0.144	0	0	0
Credit Rate	1785	0.148	0.356	0	0	0
Panel B: VC level variables						
Log (Number of Projects)	585,077	0.142	0.377	0	0	0
Log (Investment Amount)	585,077	0.946	2.580	0	0	0
VC Reputation	585,077	13.148	8.733	0	17.951	19.466
ITC	585,077	0.185	0.388	0	0	0
Credit Rate	585,077	0.056	0.130	0	0	0
Log(Number of M&A)	585,077	0.068	0.246	0	0	0
Log(Number of IPO)	585,077	0.022	0.122	0	0	0
Log(Number of Exit)	585,077	0.088	0.287	0	0	0
Log(Number of Firms)	585,077	0.289	0.738	0	0	0
Duration	585,077	0.672	1.899	0	0	0
Panel C: Firm level variables						
Reputable VC	2098	0.487	0.500	0	0	1
Serial Founder	2098	0.020	0.138	0	0	0
ITC	2098	0.255	0.436	0	0	1
Credit Rate	2098	0.070	0.132	0	0	0.200

Table III
Number of VCs

This table presents estimates of the state-level effect of investor tax credits on the number of reputable and lesser-known VCs. The dependent variables are *Log(Number of Reputable VCs)* and *Log(Number of Lesser-Known VCs)*. A VC is considered to be reputable (lesser-known) if its corresponding reputation is in the top (bottom) tercile. The main independent variables are *ITC* and *Credit Rate*. *ITC* is an indicator variable that equals one if the state has implemented the investor tax credit program and zero otherwise. *Credit Rate* represents the tax credit rate of the investor tax credit program. The unit of observation in each regression is a state-year pair. Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable:	*Log(Number of Lesser-Known VCs)*		*Log(Number of Reputable VCs)*	
	[1]	[2]	[3]	[4]
ITC	0.156**		–0.295***	
	(0.076)		(0.099)	
Credit Rate		0.330*		–0.693***
		(0.177)		(0.226)
Control Variables	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Observations	1,785	1,785	1,785	1,785
R^2	0.89	0.89	0.88	0.88

Table IV
Number of projects and investment

This table presents estimates of the effect of investor tax credits on different types of VCs' number of projects and investment amount. In columns 1 to 4 and 5 to 8, the dependent variables are *Log(Number of Projects)* and *Log(Investment Amount)*, respectively. *Log(Number of Projects)* is defined as the natural logarithm of the number of projects invested by the VC. *Log(Investment Amount)* is defined as the natural logarithm of the amount invested by the VC. The main independent variables are the interaction of *ITC* and *Credit Rate* with *VC Reputation*. *ITC* is an indicator variable that equals one if the state has an investor tax credit program and zero otherwise. *Credit Rate* represents the tax credit rate of the investor tax credit program. *VC Reputation* is the natural logarithm of the cumulative value of IPOs backed by the VC firm. The unit of observation in each regression is a VC-state-year triplet. Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable:	*Log(Number of Projects)*				*Log(Investment Amount)*			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
ITC × *VC Reputation*	–0.004***	–0.004***			–0.022***	–0.021***		
	(0.001)	(0.001)			(0.007)	(0.007)		
Credit Rate × *VC Reputation*			–0.010**	–0.010**			–0.060***	–0.059***
			(0.004)	(0.004)			(0.020)	(0.020)
Control Variables	N	Y	N	Y	N	Y	N	Y
VC Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	585,067	585,067	585,067	585,067	585,067	585,067	585,067	585,067
R^2	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17

Table V
Dynamic effect of tax credits

This table presents estimates of the effect of investor tax credits on VCs' number of projects and investment amount. In columns 1 and 2, the dependent variables are *Log(Number of Projects)* and *Log(Investment Amount)*, respectively. *Log(Number of Projects)* is defined as the natural logarithm of the number of projects invested by the VC. *Log(Investment Amount)* is defined as the natural logarithm of the amount invested by the VC. $Before^{-5+}$ is an indicator variable that equals one if the state will start implementing an investor tax credit program in 5 years or more. $Before^{-4}$ is an indicator variable that equals one if the state will start implementing an investor tax credit program in 4 years. $Before^{-3}$ is an indicator variable that equals one if the state will start implementing an investor tax credit program in 3 years. $Before^{-2}$ is an indicator variable that equals one if the state will start implementing an investor tax credit program in 2 years. $Before^{-1}$ is an indicator variable that equals one if the state will start implementing an investor tax credit program in 1 years. $After^{1}$ is an indicator variable that equals one if the state started implementing an investor tax credit program 1 year ago. $After^{2}$ is an indicator variable that equals one if the state started implementing an investor tax credit program 2 years ago. $After^{3}$ is an indicator variable that equals one if the state started implementing an investor tax credit program 3 years ago. $After^{4}$ is an indicator variable that equals one if the state started implementing an investor tax credit program 4 years ago. $After^{5+}$ is an indicator variable that equals one if the state started implementing an investor tax credit program 5 years ago or more. The unit of observation in each regression is a VC-state-year triplet. Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable:	*Log(Number of Projects)*	*Log(Investment Amount)*
	[1]	[2]
VC Reputation × $Before^{-5+}$	0.001	0.003
	(0.001)	(0.004)
VC Reputation × $Before^{-4}$	–0.002	–0.011
	(0.001)	(0.008)
VC Reputation × $Before^{-3}$	–0.002	–0.011
	(0.001)	(0.009)
VC Reputation × $Before^{-2}$	–0.002	–0.012
	(0.001)	(0.010)
VC Reputation × $Before^{-1}$	–0.003	–0.015
	(0.002)	(0.009)
VC Reputation × $After^{1}$	–0.003	–0.019*
	(0.002)	(0.011)
VC Reputation × $After^{2}$	–0.004**	–0.026**
	(0.002)	(0.011)
VC Reputation × $After^{3}$	–0.004**	–0.025**
	(0.002)	(0.011)
VC Reputation × $After^{4}$	–0.004*	–0.025**
	(0.002)	(0.011)
VC Reputation × $After^{5+}$	–0.004*	–0.022*
	(0.002)	(0.012)
Control Variables	Y	Y
VC Fixed Effects	Y	Y
State Fixed Effects	Y	Y
Year Fixed Effects	Y	Y
Observations	585,067	585,067
R^2	0.18	0.17

Table VI
Differential effect of tax credits on industries

This table presents estimates of the effect of investor tax credits across industries varying in eligibility for tax credits. In columns 1 to 4, *Eligible Industries* are industries defined to be eligible for tax credit by the state's investor tax credit program .The dependent variables are *Log(Number of Projects)* and *Log(Investment Amount)*, respectively. *Log(Number of Projects)* is defined as the natural logarithm of the number of projects invested by the VC. *Log(Investment Amount)* is defined as the natural logarithm of the amount invested by the VC. The main independent variables are the interaction of *ITC* and *Credit Rate* with *VC Reputation*. *ITC* is an indicator variable that equals one if the state has an investor tax credit program and zero otherwise. *Credit Rate* represents the tax credit rate of the investor tax credit program. *VC Reputation* is the natural logarithm of the cumulative value of IPOs backed by the VC firm. The unit of observation in each regression is a VC-state-year triplet.Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable:	*Eligible Industries*				*Ineligible Industries*			
	Log(Number of Projects)		*Log(Investment Amount)*		*Log(Number of Projects)*		*Log(Investment Amount)*	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
ITC × *VC Reputation*	–0.004***		–0.022***		–0.002		–0.012	
	(0.001)		(0.007)		(0.002)		(0.007)	
Credit Rate × *VC Reputation*		–0.010**		–0.060***		–0.007		–0.034
		(0.004)		(0.020)		(0.005)		(0.021)
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y
VC Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	585,067	585,067	585,067	585,067	585,067	585,067	585,067	585,067
R^2	0.19	0.19	0.20	0.20	0.17	0.17	0.18	0.18

Table VII
Number of projects and investment: Variation in the level of competition

This table presents estimates of the effect of investor tax credits on different types of VCs' number of projects and investment amount across states varying in the level of competition. In columns 1 to 4 and 5 to 8, the dependent variables are *Log(Number of Projects)* and *Log(Investment Amount)*, respectively. *Log(Number of Projects)* is defined as the natural logarithm of the number of projects invested by the VC. *Log(Investment Amount)* is defined as the natural logarithm of the amount invested by the VC. The main independent variables are the interaction of *ITC* and *Credit Rate* with *VC Reputation*. *ITC* is an indicator variable that equals one if the state has an investor tax credit program and zero otherwise. *Credit Rate* represents the tax credit rate of the investor tax credit program. *VC Reputation* is the natural logarithm of the cumulative value of IPOs backed by the VC firm. *No Minimum* is an indicator variable equaling one for tax credit programs without a minimum required investment amount per investor. *VC Supply* is the natural logarithm of the aggregate state-level VC investment. The unit of observation in each regression is a VC-state-year triplet. Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable:	*Log(Number of Projects)*				*Log(Investment Amount)*			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
ITC × *VC Reputation* × *No Minimum*	–0.003**				–0.022**			
	(0.001)				(0.009)			
Credit Rate × *VC Reputation* × *No Minimum*		–0.009**				–0.061**		
		(0.004)				(0.025)		
ITC × *VC Reputation* × *VC Supply*			0.003**				0.022***	
			(0.001)				(0.008)	
Credit Rate × *VC Reputation* × *VC Supply*				0.011**				0.073***
				(0.004)				(0.026)
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y
VC Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	585,067	585,067	585,067	585,067	585,067	585,067	585,067	585,067
R^2	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17

Table VIII
Tax credits and startup founders

This table presents estimates of the founder-level effect of investor tax credits. The dependent variable, *Reputable VC*, is an indicator variable that equals one if the VC's reputation is in the top 50% and zero otherwise. The main independent variables are the interaction of *ITC* and *Credit Rate* with *Serial Founder*. *ITC* is an indicator variable that equals one if the state has an active investor tax credit program and zero otherwise. *Credit Rate* represents the tax credit rate of the investor tax credit program. *Serial Founder* is an indicator variable that equals one if one of the founders is the founder of another startup and zero otherwise. Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable: *Reputable VC*				
	[1]	[2]	[3]	[4]
ITC × *Serial Founder*	–0.121**	–0.111**		
	(0.053)	(0.049)		
Credit Rate × *Serial Founder*			–0.484***	–0.442***
			(0.154)	(0.145)
Control Variables	Y	Y	Y	Y
VC Fixed Effects	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	N	Y	N
Industry × Year Fixed Effects	N	Y	N	Y
Observations	1,719	1,607	1,719	1,607
R^2	0.95	0.95	0.95	0.95

Table IX
VC syndication and staging

This table presents estimates of the effect of investor tax credits on VCs' syndication and staging. The dependent variable in columns [1] and [2], *Log(Number of Firms)*, is defined as the natural logarithm of the number of VCs that co-invest. The dependent variable in columns [3] and [4], *Duration*, is defined as the natural logarithm of the number of days between the last investment date and the current round date divided by the number of rounds remaining. The main independent variables are the interaction of *ITC* and *Credit Rate* with *VC Reputation*. *ITC* is an indicator variable that equals one if the state has an active investor tax credit program and zero otherwise. *Credit Rate* represents the tax credit rate of the investor tax credit program. *VC Reputation* is the natural logarithm of the cumulative value of IPOs backed by the VC firm. The unit of observation in each regression is a VC-state-year triplet. Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable:	*Log(Number of Firms)*		*Duration*	
	[1]	[2]	[3]	[4]
ITC × *VC Reputation*	–0.007***		–0.015***	
	(0.002)		(0.004)	
Credit Rate × *VC Reputation*		–0.019***		–0.042***
		(0.006)		(0.013)
Control Variables	Y	Y	Y	Y
VC Fixed Effects	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Observations	585,067	585,067	585,067	585,067
R^2	0.16	0.16	0.14	0.14

Table X
VC investment success

This table presents estimates of the effect of investor tax credits on VCs' investment success. The dependent variable in columns [1] and [2], *Log(Number of Exit)*, is defined as the natural logarithm of the number of projects invested by VCs that have involved in mergers and acquisitions or gone public. The dependent variable in columns [3] and [4], *Log(Number of IPO)*, is defined as the natural logarithm of the number of projects invested by VCs that have gone public. The dependent variable in columns [5] and [6], *Log(Number of M&A)*, is defined as the natural logarithm of the number of projects invested by VCs that have involved in mergers and acquisitions. The main independent variables are the interaction of *ITC* and *Credit Rate* with *VC Reputation*. *ITC* is an indicator variable that equals one if the state has an active investor tax credit program and zero otherwise. *Credit Rate* represents the tax credit rate of the investor tax credit program. *VC Reputation* is the natural logarithm of the cumulative value of IPOs backed by the VC firm. The unit of observation in each regression is a VC-state-year triplet. Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable:	*Log(Number of Exit)*		*Log(Number of IPO)*		*Log(Number of M&A)*	
	[1]	[2]	[3]	[4]	[5]	[6]
ITC × *VC Reputation*	–0.003***		–0.001**		–0.002**	
	(0.001)		(0.000)		(0.001)	
Credit Rate × *VC Reputation*		–0.007**		–0.002**		–0.005**
		(0.003)		(0.001)		(0.002)
Control Variables	Y	Y	Y	Y	Y	Y
VC Fixed Effects	Y	Y	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
Observations	585,067	585,067	585,067	585,067	585,067	585,067
R^2	0.15	0.15	0.09	0.09	0.15	0.15

Appendix A: Variable Definitions

This appendix presents the definitions for the variables used throughout the paper.

Variable	Definition
Log (Number of Reputable VCs)	Natural logarithm of the number of VCs with reputation in the top tercile.
Log (Number of Lesser-Known VCs)	Natural logarithm of the number of VCs with reputation in the bottom tercile.
ITC	A dummy variable that equals one if the state has implemented the investor tax credit program and zero otherwise.
Credit Rate	The tax credit rate of the investor tax credit program.
Log (Number of Projects)	Natural logarithm of the number of projects invested by VCs.
Log (Investment Amount)	Natural logarithm of the amount invested by VCs.
VC Reputation	Natural logarithm of the cumulative value of IPOs backed by the VC firm.
No minimum	A dummy variable that equals one if the state has set no minimun investment requirements to qualify for the tax credit and zero otherwise.
VC Supply	Natural logarithm of the aggregate state-level VC investment.
Log(Number of M&A)	Natural logarithm of the number of projects invested by VCs that have involved in mergers and acquisitions.
Log(Number of IPO)	Natural logarithm of the number of projects invested by VCs that have gone public.
Log(Number of Exit)	Natural logarithm of the number of projects invested by VCs that have involved in mergers and acquisitions or gone public.
Log(Number of Firms)	Natural logarithm of the number of VCs that co-invest.
Duration	Natural logarithm of the number of days between the last investment date and the current round date divided by the number of rounds remaining.
reputable VC	A dummy variable that equals one if the VC's reputation is in the top 50% and zero otherwise.
Serial Founder	A dummy variable that equals one if one of the founders is the founder of another startup and zero otherwise.

Internet Appendix for "Competition, Reputation, and Venture Capital Investment"

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Appendix IA.I: Number of projects and investment with VC × Year fixed effects

This table presents estimates of the effect of investor tax credits on different types of VCs' number of projects and investment amount augmenting Equation (2) with VC × Year fixed effects . In columns 1 to 2 and 3 to 4, the dependent variables are *Log(Number of Projects)* and *Log(Investment Amount)*, respectively. *Log(Number of Projects)* is defined as the natural logarithm of the number of projects invested by the VC. *Log(Investment Amount)* is defined as the natural logarithm of the amount invested by the VC. The main independent variables are the interaction of *ITC* and *Credit Rate* with *VC Reputation*. *ITC* is an indicator variable that equals one if the state has an investor tax credit program and zero otherwise. *Credit Rate* represents the tax credit rate of the investor tax credit program. *VC Reputation* is the natural logarithm of the cumulative value of IPOs backed by the VC firm. The unit of observation in each regression is a VC-state-year triplet. Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable:	*Log(Number of Projects)*		*Log(Investment Amount)*	
	[1]	[2]	[3]	[4]
ITC × *VC Reputation*	–0.003**		–0.018**	
	(0.001)		(0.008)	
Credit Rate × *VC Reputation*		–0.008**		–0.048**
		(0.004)		(0.023)
Control Variables	Y	Y	Y	Y
VC × Year Fixed Effects	Y	Y	Y	Y
State Fixed Effects	Y	Y	Y	Y
Observations	570,834	570,834	570,834	570,834
R^2	0.30	0.30	0.29	0.29

Appendix IA.II: Average investment amount per project

This table presents estimates of the effect of investor tax credits on different types of VCs' average investment amount per project. The dependent variable is *Log(Average Investment Amount)*, and is defined as the natural logarithm of the average dollar amount a VC is investing in a given project at the state-year level. The main independent variables are the interaction of *ITC* and *Credit Rate* with *VC Reputation*. *ITC* is an indicator variable that equals one if the state has an investor tax credit program and zero otherwise. *Credit Rate* represents the tax credit rate of the investor tax credit program. *VC Reputation* is the natural logarithm of the cumulative value of IPOs backed by the VC firm. The unit of observation in each regression is a VC-state-year triplet. Control variables include state GDP growth, unemployment rate, and the fraction of congressmen who are republicans over total number of congressmen in that state. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the state level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable: *Log(Average Investment Amount)*		
	[1]	[2]
ITC × *VC Reputation*	–0.019***	
	(0.006)	
Credit Rate × *VC Reputation*		–0.052***
		(0.017)
Control Variables	Y	Y
VC Fixed Effects	Y	Y
State Fixed Effects	Y	Y
Year Fixed Effects	Y	Y
Observations	585,067	585,067
R^2	0.16	0.16