# R&D Tax Credits and the Acquisition of Startups*

William McShane† Merih Sevilir‡

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**Abstract**

We propose a novel mechanism through which established firms contribute to the startup ecosystem: the allocation of R&D tax credits to startups via the M&A channel. We show that when established firms become eligible for R&D tax credits, they increase their R&D and M&A activity. In particular, they acquire more venture capital (VC)-backed startups, but not non-VC-backed firms. Moreover, the impact of R&D tax credits on firms' R&D is increasing with their acquisition of VC-backed startups. The results suggest that a key strategy for these firms to augment their R&D efforts is by acquiring startups rather than solely focusing on increasing their R&D intensity in-house. We also highlight evidence that startups do not appear to benefit from R&D tax credits directly, perhaps because they typically lack the taxable income necessary to directly benefit from the tax credits. In this context, established firms can play an intermediary role by acquiring startups and reallocating R&D tax credits, effectively relaxing the financial constraints faced by startups.

**JEL Classification: G34, O3, M13**

**Keywords:** R&D, M&A, startups, venture capital, tax credits

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†Otto-von-Guericke University Magdeburg and the Halle Institute for Economic Research (IWH), Kleine Märkerstraße 8, D-06108 Halle (Saale) Germany. Phone: +49 345 7753-766. E-mail: william.mcshane@iwh-halle.de.

‡ESMT Berlin and the Halle Institute for Economic Research (IWH), Kleine Märkerstraße 8, D-06108 Halle (Saale) Germany. Phone: +49 345 7753-808. E-mail: merih.sevilir@iwh-halle.de.

# 1 Introduction

Established firms play an important role in the creation and progress of entrepreneurial startups. They provide capital to early-stage startups in the form of corporate venture capital and to later stage startups by acquiring them.

In this paper, we propose another novel role of established firms in the creation and growth of entrepreneurial startups. We present evidence that established firms may play a role in allocating R&D tax credits to startups. Existing work focuses on how R&D tax credits facilitate R&D and innovation at the firm- and geographic-level (Wu, 2005; Wilson, 2009; Moretti and Wilson, 2014; Guceri and Liu, 2019), and document important spillovers from R&D to other firms (Bloom, Schankerman, and Van Reenen, 2013; Lucking, Bloom, and Reenen, 2019; Babina and Howell, 2018). In this paper, we examine a novel mechanism through which established firms take advantage of R&D tax credits by acquiring startups.

When an established firm becomes eligible for R&D tax credits, the firm may take advantage of it by increasing its internal R&D spending. Given that a large majority of R&D expenses covers salaries and wages paid to R&D human capital (scientists, inventors, and engineers), one way for a firm to benefit from the credit is to hire R&D talent from the external labor market. Another potentially more efficient way of increasing R&D labor could be to acquire a startup. Different from mature and established firms, the most visible and predominant asset of a startup is its human capital, as in the team of people who work at the startup together. Hence, acquiring a startup might be a more efficient way of obtaining R&D labor than hiring R&D workers from the external labor market given that startups represent a team of people working together. Moreover, existing studies show that large, bureaucratic, and hierarchical firms exhibit lower R&D and innovation productivity because they are less attractive to entrepreneurial-minded employees, scientists and inventors. Small entrepreneurial startups, on the other hand, have greater innovation productivity (Bernstein, 2015; Tåg, Åstebro, and Thompson, 2016; Schnitzer and Watzinger, 2022). In short, an active M&A market for entrepreneurial startups may enhance established firms' ability to benefit from R&D tax credits by acquiring them. Hence, it is plausible to expect that the level of M&A activity by established firms should increase subsequent to a tax-induced decrease in their user cost of R&D.

In contrast to established firms, startups typically lack the taxable income necessary to benefit from R&D tax credits (Bankman and Gilson, 1999). This limitation prevents startups from directly capitalizing on these tax incentives and, as a result, may constrain their growth

and innovation capabilities. Hence, it is plausible to expect that established firms may play an intermediary role in allocating R&D tax credits to small startups by acquiring them and by relaxing their financial constraints (Erel, Jang, and Weisbach, 2015). Put differently, established firms may increase the efficiency of R&D tax credits by reallocating them to R&D intensive startups that arguably need R&D capital the most while at the same time have the lowest ability to access it.

Consistent with these arguments, we find that established firms respond to plausibly exogenous tax-based R&D incentives by increasing both their R&D and M&A expenditures. In particular, when the tax-component of the user cost of R&D capital declines, established firms increase their acquisition of VC-backed startups, but not of other non-VC-backed companies. Specifically, we find that a one standard deviation increase in the user cost of R&D capital is associated with a 10.6% lower expected count in the acquisition of VC-backed targets. Importantly, we find that the user cost of R&D capital exhibits no relationship with the acquisition of non-VC-backed targets.

These results suggest that a key strategy for these firms to augment their R&D efforts is by acquiring R&D-intensive startups rather than solely focusing on increasing their R&D intensity in-house. In line with this interpretation, we find that the impact of R&D tax incentives on R&D is increasing with the number of VC-backed startups acquired by the firm.

Consistent with the idea that startups lack the income to benefit from R&D tax credits directly, a number of papers have found that state R&D tax credits have no impact on startups and, more generally, small firms. For example, Lucking (2018) and Curtis and Decker (2018) find no impact on employment at new firms in states passing R&D tax credits. Similarly, Babina and Howell (2018) find no impact on aggregate firm entry. We further substantiate these findings by examining the relationship between changes in the tax price of R&D induced by state tax credits and venture capital activity, which serves as a proxy for VC-backed startup activity. Our analysis reveals no discernible relationship between the two. The fact that startups do not appear to directly benefit from these tax credits suggests an even greater importance of the reallocative effect of the established firms R&D tax credit induced M&A activity. We present evidence that startups and the startup ecosystem benefit from R&D tax credits largely through the M&A activity of established firms.

Our paper makes several novel contributions. First, it proposes a novel re-allocative role for M&As through which R&D tax credits are reallocated from established firms to small

startups. This evidence suggests a new positive role of established firms on the creation and growth of small startups. Second, the efficiency of R&D tax credits could be greater in economies with an active market for corporate control with lower barriers and frictions to conduct M&As. In economies with less developed and liquid market for corporate control, R&D tax credits could be less effective as the search costs and frictions associated with finding R&D human capital in the external labor market may reduce firms' incentives to benefit from such credits. In addition, antitrust regulations making it harder for established firms to acquire smaller startups might have a negative impact on the efficiency of R&D tax credits. Third, R&D tax credits may contribute to the creation of new firms and startups as they result in M&A capital for entrepreneurs, inventors and scientists. Prior work by Phillips and Zhdanov (2013) suggest greater M&A activity expands the incentives for small firms to engage in R&D, suggesting an indirect channel through which state tax credits may enhance small firm R&D even if the firms cannot directly benefit from the R&D tax credits.

Beyond the literature on the economic impacts of R&D tax credits, this paper also contributes to the literature on the interaction between innovation and M&A. Seru (2014) finds that merged parties produce fewer citation-weighted patents following acquisitions and interprets this as evidence that M&A stifles innovation. Phillips and Zhdanov (2013) presents evidence that large firms acquire innovation from R&D intensive targets and argues that established firms' R&D may optimally decline with M&A. Bena and Li (2014) find that low-R&D firms tend to be acquirers and R&D-intensive targets tend to be targets. A common theme among these papers is the argument that established firms acquire the target's innovation, but do not acquire to pursue further innovation. These studies share a focus on the acquisitions of publicly-listed targets.

In contrast, our results suggest that, in response to plausibly exogenous declines in the tax price of R&D, firms acquire startups to increase their innovation activity. We find that firms increase the acquisition of VC-backed startups when faced with lower R&D costs and that R&D is increasing in the number of VC-backed startups acquired. In this context, as opposed to acquiring startups either for their existing inventions or to strategically terminate the target's invention (Cunningham, Ederer, and Ma, 2021), firms facing reduced R&D costs acquire startups in order to pursue more innovation activity.

# 2 Data

**Compustat** We use Compustat to observe acquirer characteristics. We remove all finance, real estate, and utility companies and restrict the sample to US headquartered firms. Further, we drop all observations with negative asset, R&D, and capital expenditure values.

**R&D Tax Price Data** We exploit variation in the tax-price of R&D introduced by tax credits, depreciation allowances, and income taxes. Consider the adapted Wilson (2009) extension of the Hall-Jorgenson user cost of capital formula for R&D (per dollar invested):

$$\rho_{it} = \frac{1 - D_{it}}{1 - \tau_{it}}[r_t + \delta] \tag{1}$$

where $D_{it}$ is the effective value of tax credits and depreciation allowances, $\tau_{it}$ is the rate of corporate income tax, $r_t$ is the real interest rate, and $\delta$ is the depreciation rate of R&D capital. Since $r_t$ and $\delta$ are assumed to not vary across firms, the approach focuses on the tax price component of the user cost, $\rho^t_{it} = \frac{1-D_{it}}{1-\tau_{it}}$.

The tax price can be thought of as having a federal and state tax price. The federal tax price, $\rho^F_{ft}$, is firm-specific because it varies with the firm's age, previous R&D spending, sales, taxable profit, and when the firm first had qualifying R&D expenditure. Each of these components then interacts with policy changes in the federal R&D credit rate, deduction rules, and the corporate tax rate. Our calculation of $\rho^F_{ft}$ follows that of Bloom, Schankerman, and Van Reenen (2013).

The state-level R&D tax price, $\rho^S_{s,t}$, takes into account state-level R&D tax credits, depreciation allowances and corporate taxes. Estimates of the state-level R&D tax price comes from Wilson (2009). State R&D credits were introduced gradually over time and interact with changes in state corporate tax rates. Lucking (2018) extends this data through 2015, which we adjust to use the same Hall-Jorgenson user cost of R&D capital formula employed by Wilson (2009).

To bring $\rho^S_{s,t}$ to the firm level, we follow (Bloom, Schankerman, and Van Reenen, 2013) and (Lucking, Bloom, and Reenen, 2019) by using the share of the firm's patents inventors located in each state $s$ as weights. Data on firm patents comes from the NBER Patent Data Project, which includes data from the U.S. Patent and Trademark Office matched to gvkey (see Hall, Jaffe, and Trajtenberg (2001) for details).[1] We denote this firm-specific term $\rho^S_{i,t}$.

[1]The NBER Patent Data Project goes until 2006. We fix shares in 2006 through 2015. This limits the sample to firms that issued at least one patent between 1990 and 2006.

State R&D tax credits are arguably quasi-exogenous to the firm. Bloom, Schankerman, and Van Reenen (2013) find no relationship between state economic variables and R&D tax credit adoption. Miller and Richard (2010) investigate the drivers of R&D tax credits and find that more manufacturing-intensive states and one-party control of state government predict the adoption of R&D tax credits.

We then take the mean of $\rho^F_{i,t}$ and $\rho^S_{i,t}$ for each firm to get a measure of the tax price of R&D faced by the firm, which we refer to as $\rho^S_{i,t}$.

**VentureXpert** To identify M&A transactions involving VC-backed startups and measure aggregate state-level VC volumes, we use VentureXpert as provided by Refinitiv Eikon under the Private Equity Screener. Kaplan and Lerner (2017) demonstrates that of VC databases, VentureXpert has the best coverage of VC investments for our sample period. For measuring aggregate state VC activity, we define VC investments as any VC investment in a single company, regardless of whether or not there were multiple VC investors attached to the deal.

**Bureau of Economic Analysis** For state-level regressions, we include growth in GDP and log personal income from the Bureau of Economic Analysis.

**SDC Platinum:** We use SDC Platinum, also known as Eikon or Thomson Reuters Mergers and Acquisitions Data, to observe the number of acquisitions conducted by each firm. We filter transactions to completed deals in which the acquirer took at least a 50% stake in the target and owned at least 90% of the target following the transaction.[2]

That most M&A transactions do not disclose transaction values poses a challenge to measuring firms' aggregate acquisition activity. This problem is particularly acute in our setting, as we are interested in the acquisition of private VC-backed startups, which are unlikely to be subject to FTC and SDC reporting requirements (Wollmann, 2019). Beyond examining the count of acquisitions, researchers typically take one of the following approaches when measuring acquisition activity: Measure the total cash flow to acquisitions from Compustat, which has the disadvantage that it ignores stock offers or, alternatively, aggregate observable deal values in SDC for each acquirer, which ignores unreported transaction values and thereby a majority of M&A transactions (Netter, Stegemoller, and Wintoki, 2011). [3]

[2]We also exclude repurchase deals, stake purchase deals, self-tender deals, buybacks, acquisitions of partial interest, exchange offers, and recapitalizations.

[3]Barrios and Wollmann (2022) find that around 29.5% of the aggregate volumes of M&A conducted by publicly-listed firms is unreported in SDC.

To circumvent this problem, we create a measure of total acquisition expenditure following an approach similar to Barrios and Wollmann (2022). This approach relies on two components. First, publicly listed firms are required to disclose the total annual cash flow associated with M&A activities[4]. This allows us to capture both the undisclosed and disclosed cash expenditure on acquisitions. Second, because issuing stock involves considerable fixed expenses, acquisitions involving stock issuance are likely to be sufficiently large to trigger the SEC's mandatory reporting thresholds for transactions material to investors.[5] Hence, the large majority of transactions involving stock issuance should be disclosed and thereby observable in SDC Platinum. Accordingly, we collapse the stock value reported in SDC Platinum to the firm-year level and combine this with Compstat's aqc to obtain a measure of total acquisition spending of each acquirer in our sample.

[4]Reported as aqc is Compustat

[5]While thresholds vary depending on the type of transaction, the most important threshold for publicly-listed firms is whether the size of the transaction exceeds 10% of the acquirer's assets. If this threshold is reached, the acquirer must disclose the transaction value in an 8-K report.

# 3 Results

## 3.1 R&D Tax Price and M&A

Panel A of Table 1 presents summary statistics for our sample of publicly-listed firms. The sample consists of 3,587 unique firms over 25 years, amounting to 38,640 firm-year observations with coverage for all variables.[6]

In the average firm-year, 0.73 acquisitions are conducted. Approximately 16.4% of acquisitions are of VC-backed private companies. Interestingly, mean M&A expenditure is relatively similar in volume to that of R&D expenditure in the sample, at 104.5 million USD per year and 115.18 million USD per year, respectively. Average capital expenditure is larger than both, but not drastically so at 149.9 million USD per year. This suggests that inorganic growth is of similar importance to growth in tangible assets and intangible assets for established, publicly-listed firms. At the same time, only approximately 44% of firms have non-zero M&A expenditure in a given year.

We begin by estimating the impact of the firm's R&D tax price, $\rho^t$, on acquisition activity at the firm-level, with a particular eye to the acquisition of startups. As the variables explored in our firm-level regressions are either count or count-like data (both acquisition expenditure and R&D expenditure are heavily skewed with real zeros), we use Poisson regressions with firm and year fixed effects throughout.[7] We also control for the lag of various firm financials, such as firm size and cash holdings. Standard errors are two-way clustered at the state and year level.

Table 2 presents the impact of the tax price of R&D on the count of acquisitions. The first two columns indicate that the tax price of R&D capital has no statistically significant impact on the total number of acquisitions of the firm. Looking to the count of non-VC-backed companies acquired in columns 3 and 4, the coefficient on the tax price of R&D is even closer to zero and becomes positive with controls.

However, in Columns 5 and 6, we limit the outcome to the count of VC-backed companies acquired and find a negative and statistically significant coefficient on the R&D tax price.

[6] We limit the sample to firms with non-missing values for all of our main regressions. Because CAPX is only used in robustness tests, we do not limit the sample to firm-year observations with non-missing CAPX values.

[7] As a robustness check, we rerun all fully saturated firm-level Poisson regressions using log-linear models for outcome variables that are not count data in Table A2. The change in specification does not meaningfully change the results.

The economic magnitude of this coefficient is large. Column 6 indicates that a one standard deviation change in the tax-based user cost of R&D capital is associated with approximately a 10.6% lower expected count of acquisitions of VC-backed firms. At approximately 11.2% of a standard deviation in the count of VC-backed companies acquired, this suggest the R&D tax price is an economically important driver of the acquisition of VC-backed firms.

These results suggest that in response to a reduction in the tax price of R&D, firms acquire startups to increase their R&D activity. That we find no evidence of an increase in the acquisition of companies not backed by VC suggests that this is unique to the acquisition of startups.

In the appendix Table A3, we show that it makes little difference whether one examines the acquisition of in-state or out-of-state VC-backed targets. Coefficients are similar for both groups of targets. This suggests that M&A spillovers to startups from the R&D tax incentives of established firms are not geographically restricted. A likely explanation for this lack of geographical bias is that these acquirers are large, publicly-listed firms that operate nationally. Hence, these firms may have only a limited geographical bias for acquisitions in their head-quarter state. Moreover, our measured reduction in R&D tax price can come from any state in which the firm is patenting, which may not always coincide with the firm's head-quarter state.

We examine M&A expenditure as outcome variable in Columns 1 and 2 of Table 3. We find that increases in the tax-price of R&D reduce M&A expenditure. With controls, its expected value is reduced by 25.8% given a one standard deviation increase in the tax price of R&D. While seemingly very large, this is equivalent to 2.2% of a standard deviation in M&A spending.

For comparison, we look to R&D expenditure as an outcome variable in Columns 3 and 4 of Table 3. Intuitively, we find that increases in the tax-price of R&D reduce R&D. This result is in line with the literature finding that tax-based changes in the user cost of R&D drive R&D among established firms (see Babina and Howell (2018), Bloom, Schankerman, and Van Reenen (2013), and Lucking, Bloom, and Reenen (2019)) and speaks to the validity of our specification. In terms of economic magnitude, a one standard deviation increase in the tax price of R&D results in a decline in expected R&D spending of 13.0%, equivalent to 2.6% of a standard deviation in R&D expenditure. Interestingly, this is strikingly similar to the equivalent number when using M&A as an outcome variable of 2.2 percent. These results

suggest that firms' acquisition activity and R&D activity respond similarly to tax-incentives for R&D.

So far, we have shown that established firms increase M&A activity in response to arguably tax-driven reductions in their user cost of R&D and that this M&A activity appears to be centered on acquisition of VC-backed startups. In Table 4, we investigate whether the impact of the tax-price of R&D, $\rho^t$, is moderated by the acquisition of VC-backed companies. First, we demonstrate in columns 1 through 3 that both the tax-price of R&D and the acquisition of VC-backed companies predict R&D spending. Interacting the tax-price of R&D with the natural log of the count of VC-backed acquisitions in columns 4 and 5, we find that the impact of the tax-price of R&D is increasing in the number of VC-backed companies acquired. This relationship is perhaps best communicated by Figures 1a and 1b, which plots the average marginal effects of each term along different values of the interaction term. One observes that the impact of acquiring VC-backed companies on R&D is highest for low values of $\rho^t$ and, vice versa, the impact of $\rho^t$ on R&D is larger the more VC-backed companies the firm acquires.

The presence of this interaction is consistent with an interpretation in which the acquisition of startups is a channel through which established firms scale up their R&D activity in response to reduce R&D costs. This speaks strongly for the idea that firms acquire startups to increase their R&D activity.

## 3.2 State R&D Tax Credits and Venture Capital

We continue by estimating the impact of within-state variation in R&D tax prices on aggregate VC volumes, as measured by both the count of VC deals and the aggregate volume of VC investments in millions of USD. Given that VC investments are heavily skewed and contain real zeros, we use poisson regressions. For a number of reasons, poisson regressions have been shown to be preferable to log-linear models for such outcomes (see, for example, Cohn, Liu, and Wardlaw (2022) and Santos Silva and Tenreyro (2006), among others).

Table 1 Panel B presents state-year level summary statistics. The average state in our sample had approximately 83.10 VC rounds in a given year and saw 678.13 million USD in VC investment. Across states, the average number of VC investments varies considerably, from 1.00 per year in Alaska to 1589.69 per year in California. Similarly, there is significant variation in R&D tax prices, with a minimum value of 1.03 and a maximum of 1.38.

We control for state macroeconomic conditions using growth in GDP and the log of personal income. Additionally, we include state and year fixed effects throughout. All standard errors are clustered at the state- and year-level.

Table 5 presents the results. Across all specifications, we observe no relationship between the R&D tax price and venture capital volume. The coefficient on the R&D tax price have the right sign for the count of VC rounds as an outcome variable in columns (1) and (2) but is not statistically distinguishable from zero with or without control variables. In columns (3) and (4), we examine the impact on total VC raised in millions of USD. Here the coefficient is positive and its confidence intervals are centered around zero.

Together, the results in Table 5 suggest that at the state-level, state R&D tax credits have no observable direct impact on venture capital activity. This is consistent with a number of papers finding no discernible impact of state R&D tax credits on small or young firms (see Lucking (2018), Curtis and Decker (2018), and Babina and Howell (2018)). That state-level changes in R&D tax credits appear to have no perceptible direct impact on startup activity can possibly be explained by the fact that, unlike in some Western countries such as Canada (Agrawal, Rosell, and Simcoe, 2020), firms are typically only able to benefit from state R&D tax credits if they have income tax to offset. The fact that startups typically are unprofitable, mitigates their ability to benefit from these tax programs.

These results underscore the importance of the M&A channel for startups to benefit from tax-based R&D incentives. More concretely, because established firms appear to respond to

R&D tax credits by increasing their acquisition of startups irrespective of targets' location, the fact that we observe no direct local impact on VC activity suggests that R&D tax credits only reach the startup ecosystem indirectly through the M&A channel. By providing M&A capital to startups and their investors, established firms enhance the effectiveness of R&D tax credits in incentivizing and financing startups' innovative activities.

## 3.3 Robustness

One concern could be that it is unclear whether Poisson regressions are suitable for R&D expenditure as an outcome variable. More than 90% of firm-years in our sample have non-zero R&D values, whereas Poisson regressions are more efficient for outcomes with long tails and many zeros. Accordingly, we run log-linear regressions with one plus R&D variable for all fully saturated models using R&D as an outcome in the paper. The results are reported in Table A2 and are economically consistent with the results reported using Poisson regressions.

Another concern could be that R&D tax credits simply alleviate firms' financial constraints. The accompanied increase in cash flow could then drive investment broadly defined to include expenditure on items including R&D, physical capital, and M&A. Under this hypothesis, the relationship between the tax-based user cost of R&D and the acquisition activity of established firms is simply driven by an increase in after-tax net income. We view this as improbable as it is incongruent with the fact that we find that declines in the tax-based user cost of R&D are associated with the acquisition of VC-backed startups, but not other firms.

Still, to directly address this concern, we show in Appendix Table A4 that a decline in the tax-based user cost of R&D capital is not associated with changes in capital expenditure. Using the log of capital expenditure as an outcome variable, we observe that the coefficient on the user cost of R&D is statistically insignificant across all specifications. Moreover, with the inclusion of R&D spending as a control variable in Column (3), the coefficient becomes positive, which could be interpreted as suggesting that any impact on capital expenditure is driven by physical capital investment scaling up with intangible capital. These results should ease any concern that the relationship between the tax price of R&D and acquisition activity is driven by changes in cash flow, as opposed to a lower R&D tax price.

# 4 Conclusion

In conclusion, this paper highlights the novel role of established firms in the allocation of government-provided R&D credits/subsidies to entrepreneurial startups. By taking advantage of R&D tax credits and acquiring startups, established firms can effectively increase their R&D labor and enhance their innovation capabilities. The research findings indicate that a plausibly-exogenous decrease in the user cost of R&D capital leads to increased acquisition of venture capital-backed startups by established firms. This suggests that acquiring R&D-intensive startups is a strategic approach for firms to augment their R&D efforts, rather than solely relying on internal R&D intensity.

Furthermore, the study reveals that startups, perhaps due to their limited taxable income, appear unable to directly benefit from R&D tax credits. Hence, the intermediary role of established firms in reallocating these credits to startups becomes crucial in alleviating their financial constraints and fostering their growth and innovation potential. The evidence supports the notion that the reallocation effect of R&D tax credit-induced M&A activity by established firms plays a significant role in supporting startups, which have a high need for capital but limited access to it.

In summary, this paper sheds light on the re-allocative role of established firms in utilizing R&D tax credits to acquire startups, facilitating the creation and growth of entrepreneurial ventures. The findings emphasize the importance of an active M&A market for startups in the efficient allocation of R&D tax credits. Potential future research could examine whether or not inactive M&A markets hinder the capacity of established firms to reallocate R&D capital to the startup ecosystem.

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# Tables

**Table 1:** Summary Statistics

The table presents summary statistics of the major variables in our analyses. For Panel A, the sample consists of firms with non-missing values for the variables of interest. Firm financials are winsorized at the 1% level. For Panel B, the sample consists of states between 1990 and 2015.

| Panel A: Firm-Year Level | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std.Dev. | p10 | p25 | Med. | p75 | p90 | n |
| M&A | 0.75 | 7.41 | 0.00 | 0.00 | 0.00 | 1.00 | 2.00 | 37070 |
| VC M&A | 0.13 | 1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 37070 |
| Non-VC M&A | 0.63 | 6.52 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 37070 |
| M&A Spending | 104.50 | 1200.17 | 0.00 | 0.00 | 0.00 | 3.68 | 71.06 | 37070 |
| R&D | 115.18 | 572.90 | 0.61 | 2.40 | 10.15 | 39.89 | 151.73 | 37070 |
| CAPX | 148.94 | 1087.09 | 0.12 | 0.71 | 4.89 | 32.09 | 171.07 | 36735 |
| $\rho^t$ | 1.08 | 0.03 | 1.05 | 1.06 | 1.08 | 1.10 | 1.11 | 37070 |
| Total Assets | 3193.00 | 21295.36 | 8.11 | 30.76 | 138.34 | 792.39 | 4069.60 | 37069 |
| Tobin's Q | 3.26 | 7.15 | 0.96 | 1.23 | 1.78 | 2.98 | 5.41 | 36943 |
| Cash Holdings | 0.27 | 0.26 | 0.02 | 0.05 | 0.18 | 0.42 | 0.68 | 37066 |
| Leverage | 0.14 | 0.21 | 0.00 | 0.00 | 0.05 | 0.21 | 0.36 | 36995 |
| ROA | -0.11 | 0.80 | -0.49 | -0.08 | 0.09 | 0.16 | 0.22 | 37035 |
| Panel B: State-Year Level | | | | | | | | |
| | Mean | Std.Dev. | p10 | p25 | Med. | p75 | p90 | n |
| VC Rounds | 83.10 | 253.41 | 3.00 | 6.00 | 21.00 | 72.00 | 141.00 | 1210 |
| VC Raised | 678.13 | 2702.84 | 3.75 | 17.25 | 91.48 | 445.28 | 1204.53 | 1210 |
| $\rho^S$ | 1.17 | 0.05 | 1.12 | 1.16 | 1.18 | 1.20 | 1.21 | 1210 |
| GDP Growth | 4.81 | 3.11 | 1.50 | 3.30 | 4.70 | 6.50 | 8.60 | 1210 |
| Income p.c. | 0.03 | 0.01 | 0.02 | 0.02 | 0.03 | 0.04 | 0.05 | 1210 |

**Table 2:** Acquisitions by Target Type

The table presents the results from estimating Poisson regressions on the count of acquisitions by target type. The unit of observation is at the acquirer-year level. The dependent variable in columns (1) and (2) is the number of acquisitions with no restriction on target type. In columns (3) and (4) the dependent variable is the number of acquisitions of targets that are not VC-backed. In columns (5) and (6) the dependent variable is the number of acquisitions of targets that are VC-backed. Control variables are lagged by one year and winsorized at the 1st and 99th percentiles. level. Standard errors are two-way clustered at the headquarter state-year level. Detailed variable definitions are provided in the appendix. $***$, $**$, and $*$, represent statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1) All | (2) All | (3) Non-VC | (4) Non-VC | (5) VC | (6) VC |
|---|---|---|---|---|---|---|
| $\rho^t$ | -2.149 | 0.231 | -0.437 | 1.462 | -7.872*** | -4.050*** |
| | (1.883) | (1.232) | (1.639) | (1.413) | (2.573) | (1.304) |
| Log Assets | | 0.242*** | | 0.187*** | | 0.377*** |
| | | (0.015) | | (0.016) | | (0.055) |
| ROA | | 0.231** | | 0.237** | | 0.398* |
| | | (0.090) | | (0.114) | | (0.233) |
| Cash | | 0.610*** | | 0.578*** | | 0.844*** |
| | | (0.130) | | (0.149) | | (0.116) |
| Tobin's Q | | 0.016*** | | 0.018*** | | 0.017*** |
| | | (0.002) | | (0.002) | | (0.005) |
| Leverage | | -0.662*** | | -0.610*** | | -0.970*** |
| | | (0.113) | | (0.149) | | (0.223) |
| Constant | 3.931* | -0.626 | 2.003 | -1.596 | 8.444*** | 1.166 |
| | (2.022) | (1.267) | (1.763) | (1.516) | (2.742) | (1.312) |
| N | 28705 | 28705 | 27699 | 27699 | 15218 | 15218 |
| Pseudo $R^2$ | 0.628 | 0.632 | 0.621 | 0.624 | 0.432 | 0.442 |
| Firm Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |

**Table 3:** R&D and Acquisition Expenditure

The table presents the results from estimating Poisson regressions on total expenditure on acquisitiosn and R&D, seperately. The unit of observation is at the acquirer-year level. The dependent variable in columns (1) and (2) is total acquisition expenditure and in columns (3) and (4) it is total R&D expenditure. Control variables are lagged by one year and winsorized at the 1st and 99th percentiles. Standard errors are two-way clustered at the headquarter state-year level. Detailed variable definitions are provided in the appendix. $***$, $**$, and $*$, represent statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1) M&A Spending | (2) M&A Spending | (3) R&D | (4) R&D |
|---|---|---|---|---|
| $\rho^t$ | -14.545*** | -10.773** | -9.312** | -5.040*** |
| | (4.770) | (4.560) | (4.181) | (1.630) |
| Log Assets | | 0.567*** | | 0.670*** |
| | | (0.094) | | (0.044) |
| ROA | | 2.264** | | -0.048 |
| | | (1.106) | | (0.089) |
| Cash | | 1.406* | | -0.290** |
| | | (0.763) | | (0.146) |
| Tobin's Q | | 0.034** | | 0.003 |
| | | (0.014) | | (0.007) |
| Leverage | | -1.846*** | | -0.160 |
| | | (0.468) | | (0.119) |
| Constant | 22.648*** | 13.098** | 16.890*** | 6.323*** |
| | (5.096) | (5.154) | (4.477) | (1.878) |
| N | 28389 | 29296 | 35571 | 35571 |
| Pseudo $R^2$ | 0.643 | 0.660 | 0.947 | 0.967 |
| Firm Fixed Effects | Yes | | Yes | Yes |
| Year Fixed Effects | Yes | | Yes | Yes |

**Table 4:** Startup Acquisitions and the Tax Price of R&D

The table presents the results from estimating Poisson regressions on R&D. The unit of observation is at the acquirer-year level. The dependent variable in columns (1) and (2) is total acquisition expenditure and in columns (3) and (4) it is total R&D expenditure. Control variables are lagged by one year and winsorized at the 1st and 99th percentiles. Standard errors are two-way clustered at the headquarter state-year level. Detailed variable definitions are provided in the appendix. $***$, $**$, and $*$, represent statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1) R&D | (2) R&D | (3) R&D | (4) R&D | (5) R&D |
|---|---|---|---|---|---|
| Log(VC) | 0.191*** | 0.182*** | 0.118*** | 4.381*** | 2.018*** |
| | (0.058) | (0.051) | (0.031) | (1.168) | (0.602) |
| $\rho^t$ | | -8.845** | -4.824*** | -7.284* | -4.190*** |
| | | (3.845) | (1.469) | (3.970) | (1.451) |
| $\rho^t \times$ Log(VC) | | | | -3.937*** | -1.780*** |
| | | | | (1.099) | (0.567) |
| Log Assets | | | 0.664*** | | 0.661*** |
| | | | (0.046) | | (0.046) |
| ROA | | | -0.056 | | -0.058 |
| | | | (0.086) | | (0.089) |
| Cash | | | -0.270* | | -0.270 |
| | | | (0.142) | | (0.165) |
| Tobin's Q | | | 0.003 | | 0.003 |
| | | | (0.007) | | (0.007) |
| Leverage | | | -0.136 | | -0.136 |
| | | | (0.109) | | (0.109) |
| Constant | 6.817*** | 16.296*** | 6.079*** | 14.621*** | 5.425*** |
| | (0.024) | (4.114) | (1.707) | (4.252) | (1.682) |
| N | 35571 | 35571 | 35571 | 35571 | 35571 |
| Pseudo $R^2$ | 0.947 | 0.948 | 0.968 | 0.949 | 0.968 |
| Firm Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes |

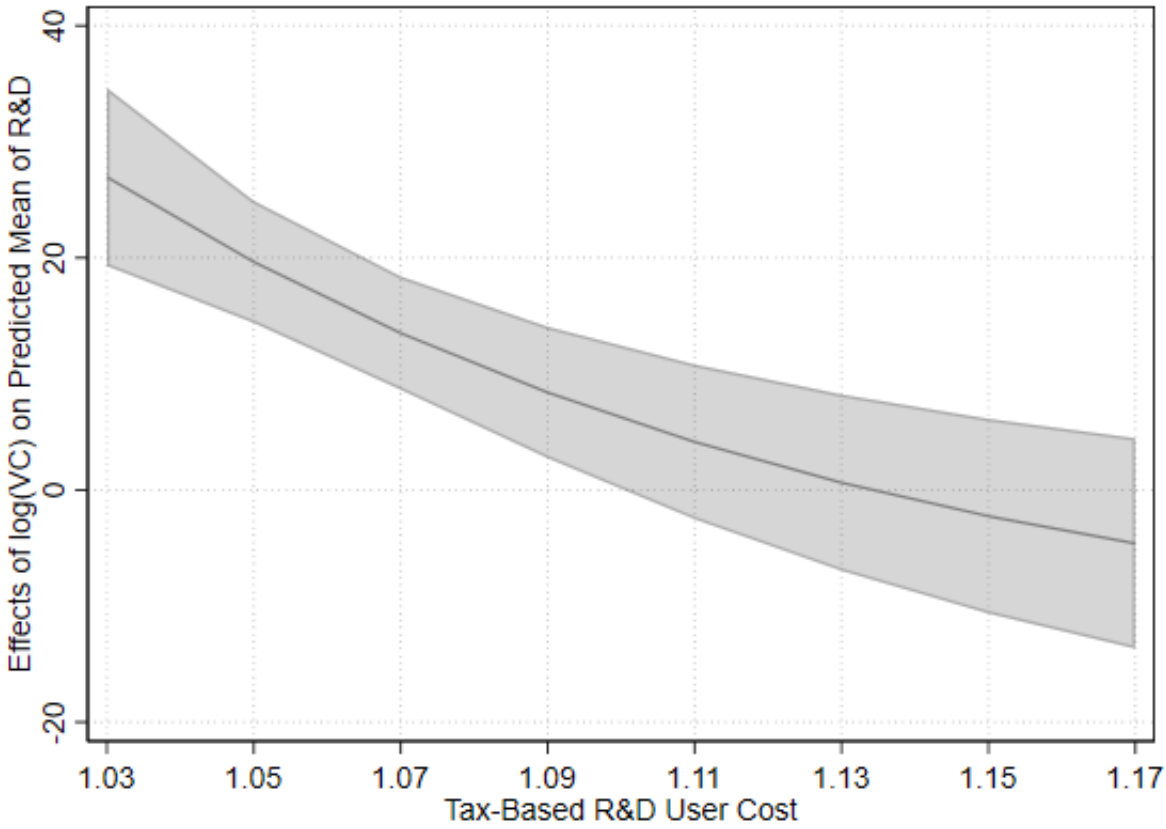
**Table 5:** State-level R&D Tax Price and Venture Capital

The table presents the results from estimating Poisson regressions on the aggregate number of venture capital rounds and volume, separately. The unit of observation is at the state-year level. The dependent variable in columns (1) and (2) is the total number of venture capital rounds conducted in the state and in columns (3) and (4) it is the total volume of venture capital raised. Standard errors are two-way clustered at the state-year level. Detailed variable definitions are provided in the appendix. $***$, $**$, and $*$, represent statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1)<br>VC Rounds | (2)<br>VC Rounds | (3)<br>VC Raised | (4)<br>VC Raised |
|---|---|---|---|---|
| $\rho^S$ | -0.208 | -0.380 | 0.112 | 0.279 |
| | (0.683) | (0.669) | (2.277) | (2.346) |
| GDP Growth | | 0.013** | | 0.013 |
| | | (0.005) | | (0.012) |
| Log(Income p.c.) | | 0.625 | | 0.982 |
| | | (0.695) | | (1.769) |
| Constant | 5.882*** | -0.475 | 8.082*** | -2.520 |
| | (0.804) | (7.230) | (2.592) | (20.124) |
| N | 1648 | 1648 | 1210 | 1210 |
| Pseudo $R^2$ | 0.959 | 0.959 | 0.931 | 0.931 |
| State Fixed Effects | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes |

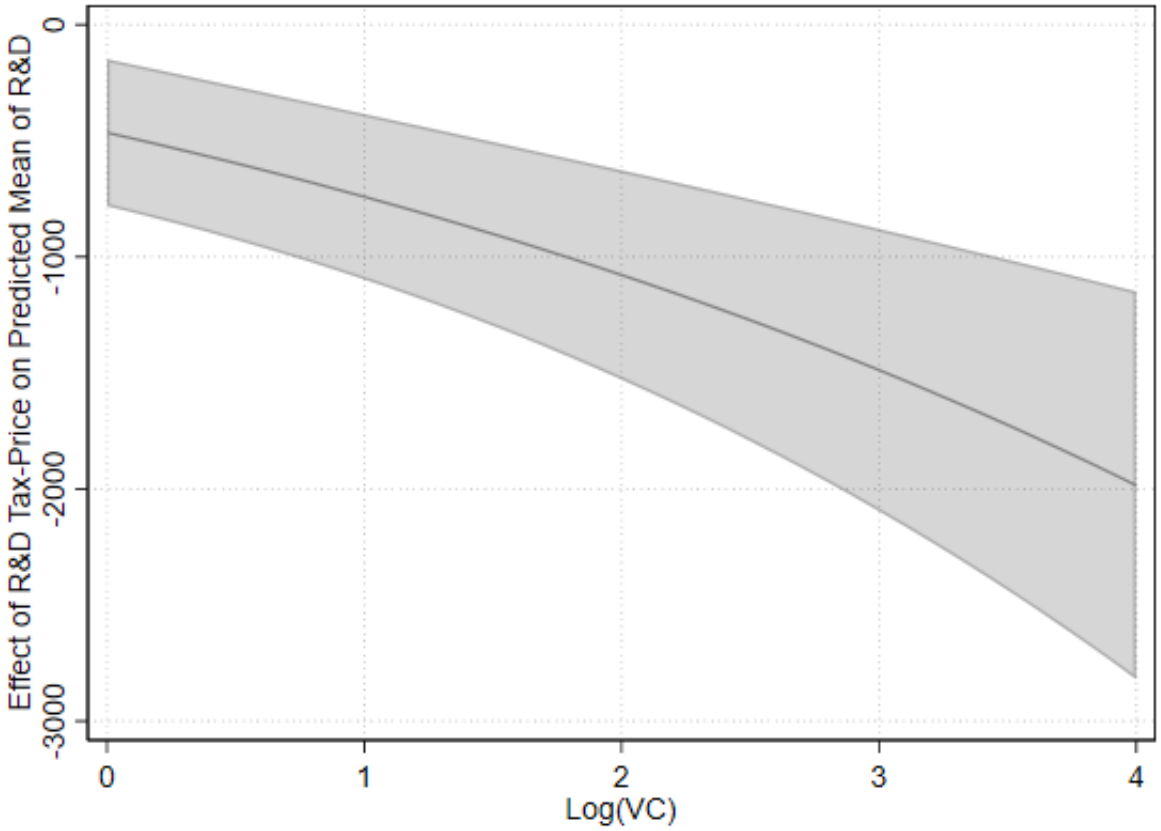
# Figures

**Figure 1a:** Average Marginal Effects of VC-Acquisitions on R&D Expenditure




The displays the average marginal effect of $Log(VC)$ on the predicted mean of R&D given different values of the tax price of R&D from the interaction term in Column 5 of Table 4. The shaded region represents 95% confidence intervals.

**Figure 1b:** Average Marginal Effects of R&D Tax Price on R&D Expenditure




The graph displays the average marginal effect of the tax price of R&D given different values of $Log(VC)$ from the interaction term in Column 5 of Table 4. The shaded region represents 95% confidence intervals.

# 5 Appendix Tables

**Table A1:** Variable Definitions

| Variable Name | Definition |
|---|---|
| VC Rounds | Aggregate number of venture capital rounds conducted in the state |
| VC Raised | Aggregate volume of venture capital invested in the state in mil. USD |
| $\rho^S$ | State-level tax component of R&D user cost |
| GDP Growth | State GDP growth |
| Income p.c. | Average per capita income of households in the state reported in USD MIL |
| M&A | Count of number of companies acquired by the firm |
| VC M&A | Count ofn umber of private companies acquired by the firm with venture capital backing |
| Non-VC M&A | Count of number of companies acquired by the firm without venture capital backing |
| M&A Spending | Total expenditure on M&A of the firm in mil. USD |
| R&D | Total expenditure on on R&D (xrd) in mil. USD |
| $\rho^t$ | Average of tax component of R&D user cost from state and federal R&D credits and incomes taxes |
| Total Asset | Firm's total assets in mil. USD (at) |
| Tobin's Q | Total assets (at) minus total common equity (ceq) plus common shares outstanding (csho) times the price at close (prcc_c), all divided by total assets (at) |
| Cash Holdings | Cash holdings (che) divided by total assets (at) |
| Leverage | Total long-term debt (dltt) divided by total assets (at) |
| ROA | Operating income before depreciation (oibdp) divided by total assets (at) |
| CAPX | Capital expenditure in mil. USD |

**Table A2:** Log-Plus-One Models

The table presents the results from ordinary least squares regressions. The unit of observation is at the acquirer-year level. The dependent variable is the natural log of R&D expenditure plus one. Standard errors are two-way clustered at the headquarter state-year level. Control variables are lagged by one year and winsorized at the 1st and 99th percentiles. Detailed variable definitions are provided in the appendix. $***$, $**$, and $*$, represent statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1)<br>Log(R&D) | (2)<br>Log(R&D) | (3)<br>Log(R&D) |
|---|---|---|---|
| $\rho^t$ | -2.423*** | -2.328*** | -2.286*** |
| | (0.492) | (0.480) | (0.483) |
| Log(VC) | | 0.237*** | 0.913* |
| | | (0.020) | (0.455) |
| $\rho^t \times$ Log(VC) | | | -0.634 |
| | | | (0.429) |
| Log Assets | 0.573*** | 0.566*** | 0.566*** |
| | (0.022) | (0.021) | (0.021) |
| ROA | -0.116*** | -0.115*** | -0.115*** |
| | (0.012) | (0.012) | (0.012) |
| Cash | -0.038 | -0.046 | -0.046 |
| | (0.037) | (0.036) | (0.036) |
| Tobin's Q | 0.010*** | 0.010*** | 0.010*** |
| | (0.001) | (0.001) | (0.001) |
| Leverage | -0.057*** | -0.051*** | -0.051*** |
| | (0.018) | (0.018) | (0.018) |
| Constant | 2.357*** | 2.278*** | 2.234*** |
| | (0.527) | (0.515) | (0.520) |
| N | 35571 | 35571 | 35571 |
| Adjusted $R^2$ | 0.955 | 0.956 | 0.956 |
| Firm Fixed Effects | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes |

**Table A3:** Instate versus Out-of-State VC-Backed Targets

The table presents the results from Poissoin regressions. The dependent variable in Column 1 is the count of VC-backed targets headquartered in the same state as the headquarters of the firm. The dependent variable in Column 2 is the count of VC-backed targets headquartered outside the state of the headquarters of the firm. The unit of observation is at the acquirer-year level. Standard errors are two-way clustered at the headquarter state-year level. Detailed variable definitions are provided in the Appendix Table A1. $***$, $**$, and $*$, represent statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1)<br>In-State VC | (2)<br>Out-of-State VC |
|---|---|---|
| $\rho^t$ | -5.884*** | -4.999*** |
| | (2.094) | (1.929) |
| Constant | 4.977** | 4.406** |
| | (2.199) | (2.060) |
| N | 6088 | 13445 |
| Pseudo $R^2$ | 0.209 | 0.238 |
| Firm Fixed Effects | Yes | Yes |
| Year Fixed Effects | Yes | Yes |

**Table A4:** Tax Price of R&D and Capital Expenditure

The table presents the results from ordinary least squares regressions. The unit of observation is at the acquirer-year level. The dependent variable is the natural log of capital expenditure plus one. Standard errors are two-way clustered at the headquarter state-year level. Control variables are lagged by one year and winsorized at the 1st and 99th percentiles. Detailed variable definitions are provided in the appendix. $***$, $**$, and $*$, represent statistical significance at the 1%, 5% and 10% levels, respectively.

| | (1) Log(CAPX) | (2) Log(CAPX) | (3) Log(CAPX) |
|---|---|---|---|
| $\rho^t$ | -0.578 | -0.112 | 0.817 |
| | (0.661) | (0.657) | (0.762) |
| Log(R&D) | | | 0.389*** |
| | | | (0.018) |
| Log Assets | | 0.533*** | 0.311*** |
| | | (0.017) | (0.016) |
| ROA | | -0.041*** | 0.004 |
| | | (0.014) | (0.015) |
| Cash | | -0.125*** | -0.112*** |
| | | (0.034) | (0.031) |
| Tobin's Q | | 0.019*** | 0.015*** |
| | | (0.002) | (0.002) |
| Leverage | | -0.190*** | -0.166*** |
| | | (0.036) | (0.033) |
| Constant | 2.878*** | -0.311 | -1.213 |
| | (0.711) | (0.735) | (0.828) |
| N | 35258 | 35258 | 35258 |
| Adjusted $R^2$ | 0.914 | 0.940 | 0.945 |
| Firm Fixed Effects | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes |