Documenting M&A's Revelation Effect using State-Level R&D Tax Incentives

Jennifer L Blouin
The Wharton School
University of Pennsylvania
Philadelphia, PA 19104
+1-215-898-1266
blouin@wharton.upenn.edu

Eliezer M. Fich
LeBow College of Business
Drexel University
Philadelphia, PA 19104
+1-215-895-2304
efich@drexel.edu

Anh L. Tran
Cass Business School
City University of London
London EC1Y 8TZ, UK
+44-207-040-5109
anh.tran@city.ac.uk

December 31, 2020

Abstract

Patents contribute more towards the market valuation of firms incorporated in states offering larger R&D tax credit incentives. Accordingly, many firms seek patent grants through acquisition investments. To this end, firms reallocate resources that often finance internal growth (e.g., R&D spending) towards M&A deals. However, in these acquisition investments, which exhibit poor stock return and accounting performance, we detect a transfer of wealth from acquirer to target shareholders. Consequently, our empirical evidence indicates that the decision to grow via M&A in the presence of incentives that promote organic growth, reveals that the firm's has inferior internal investment opportunities.

JEL classification: G34; H25; O30

Keywords: R&D; Tax Credits; Acquisitions; Firm Performance

1. Introduction

Innovation is a critical to firm growth. Firms that innovate increase their productivity and efficiency thereby increasing their potential profitability. As innovation is good for economic growth, jurisdictions often provide tax benefits to incentivize such activities. For example, many countries offer research and development (R&D) tax credits to incentivize R&D in their locales. Although these credits reduce the tax burden of the underlying business, jurisdictions benefit in the long run through the growth of the business's profits. Accordingly, U.S. states have also begun providing R&D incentives to attract corporate investment. Several studies (e.g., Wu, 2008; Girardi, 2016) document that these state-level incentives have been successful in increasing innovative activity.

Ultimately, there are two non-mutually exclusive ways for firms to increase their innovation. They may undertake R&D themselves by, for example, hiring skilled workers and/or setting up labs. However, they also may increase aggregate innovation by acquiring other innovative companies. Work suggests that M&A effectively allows companies to outsource R&D activity to other firms (Phillips and Zhdanov 2013). However, it is unclear whether "buying" innovation signals strength or weakness in the prospects of the acquirer. Seru (2014) argues that not all acquired innovation is used efficiently as its success appears to hinge on the ability of the acquirer to capture the innovation's potential. If a firm is better able to innovate by acquisition, then purchasing R&D may signal that a firm's own R&D activity is limited.

We revisit the efficacy of acquiring R&D, rather than undertaking organic R&D, by studying the role of state-level R&D tax incentives, on merger and acquisition (M&A) deal activity and performance. One trouble with studying the association between R&D and M&A value is that it is notoriously difficult to place an ex-ante value on an acquirer's pre-deal R&D

activity. Furthermore, we cannot value the R&D that is not undertaken by an acquirer because it chose to acquire it instead. As such, we focus on the relative cost of the acquirer's R&D activity.

Existing work suggests that R&D tax incentives reduce the cost of investing in innovation (e.g., Rao, 2016). The basic reasoning is that lower tax rates incentivize investment. Hence, the incremental investment of a firm eligible for state tax incentives would be less costly relative to a firm that cannot avail itself of state-level R&D credits. All else equal, firms with significant footprints in jurisdictions with more generous R&D tax credits should be able to undertake R&D at a relatively lower cost than a firm located in a jurisdiction with fewer R&D incentives. So, a firm eligible for lucrative state incentives that chooses to engage in R&D via acquisition may be signaling that its R&D prospects are poor. Said another way, once the firm chooses to engage in M&A then it potentially reveals to the market that its own R&D investment opportunities may be more limited than the market anticipated. Interestingly, while pursuing the growth by acquiring innovation likely increases firms' M&A activity, such behavior could actually end up having a detrimental effect on the overall value that investors place on the transaction.

Specifically, we investigate whether state-level research and development tax credit incentives are associated with the level of and gain from M&A activity. To inform our research questions, we collect data on the availability and changes to state-level R&D tax credits in the US from 1980 until 2017. During our sample period, 39 states implement a state-level R&D incentive. Once a state adopts R&D benefits it normally maintains the program. However, the amount and the mechanics of the R&D incentive often change. Some states even terminate their R&D incentives. We note that during our sample period, the mean and median R&D tax credit rate across all fifty states is 10%. Therefore, throughout the paper, the marginal effects we estimate are based on raising the tax credit rate from zero to the mean/median 10% value.

We begin by documenting the role of innovation on firm value. Using patent information from the Kogan, Papanikolaou, Seru, and Stoffman (2017) dataset as our proxy for innovation, we obtain results in line with those by Hall, Jaffe, and Trajtenberg (2005). Specifically, we show that a firm's patent output relative to their total assets, improves the market value of the firm (Tobin's q). Notably, the same analyses reveal that the improvement is stronger in the presence of a state R&D tax credit program: raising the tax credit rate by 10% is related to a 0.83% increase in q. This result suggests that, on average, firms that undertake R&D to generate patents derive substantial benefits from state RDTC provisions.

Using M&A data, our next set of tests indicate that, on average, firms headquartered in R&D tax credit states are more likely to make acquisitions. Preliminary evidence is consistent with acquiring firms shifting targets' R&D activity into acquirer locations with more generous R&D tax incentives. By increasing the amount of targets' R&D eligible for state-level credits, acquirers are effectively reducing the cost of deal. Firms with generous R&D credits are also more likely to pursue innovation intensive targets. While increasing the tax credit rate by 10% raises the probability of an acquisition of any target by 23 basis points, the probability increases by 1.95% for innovation intensive targets. Again, these results suggest that acquirers eligible for particularly rich state-tax incentives aggressively pursue innovation intense targets as these buyers can reduce the cost of the acquisition by qualifying for greater R&D credits. Moreover, firms seem to divert resources away from internal innovation activity towards M&A activity. Indeed, R&D spending declines by 0.2% in firms that issue an M&A bid. Importantly, the drop in R&D spending is more drastic in the presence of a state R&D tax credit program: it declines by an additional 0.17% with a 10% increase in the tax credit rate.

Our final set of analyses evaluate the impact of state R&D tax credit incentives on the performance of the acquirer firms. The estimates show that a 10% increase in the tax credit rate is associated with a 0.29% decrease in the average M&A announcement return accruing to the acquirer. For the average sample acquirer, such a decrease represents a drop of about US$16 million in market value. Consistent with the short-term stock return evidence, we also find that the post-M&A operating performance of the business combination falls by 25 basis points for a similar increase in the state R&D tax credit rate. These results indicate that when state R&D tax credits are available, acquirers make lower quality M&A deals. If firms are either sacrificing quality internal R&D or revealing that they lack organic innovation activities, the pursuit of innovation via M&A activity may signal to the market that firms are struggling to innovate internally. Other tests reaffirm this interpretation as we also find that raising the state R&D tax credit rate by 10% is associated with a 5.09% increase in the premium offered to target firms and also with a 0.56% decrease in the M&A-deal synergy. In fact, the lower acquirer returns in tandem with the higher premiums paid to target of firms in locales with generous R&D tax benefits, imply a transfer of wealth from acquirer to target shareholders.

In sum, firms that are granted patents experience a larger improvement in their market value in the presence of state R&D tax credit programs. Consequently, many firms try to obtain patents through acquisition investments. To achieve this goal, these firms redirect resources that typically fuel organic growth (e.g., R&D spending) towards M&A activities. However, as the state R&D tax benefits increase, M&A deals by acquirer firms in states with these benefits exhibit inferior performance. Thus, our empirical results indicate that state-level R&D tax incentives are associated with increased M&A activity involving transactions that destroy considerable value for the acquirer firms that enjoy this benefit. These findings are consonant with the notion that the decision to grow via M&A when incentives that encourage organic growth exist, reveals that the firm has inferior internal growth prospects.

Overall, our paper contributes to three areas of research. First, our work helps researchers understand the incentives of buyers in mergers and acquisitions (M&A). Although theory suggests that M&A is simply another form of investment (e.g., Jovanovic and Rousseau, 2002), it is unclear whether such an investment is always profitable as the market often punishes acquirers at the announcement of a deal. Indeed, much of the early M&A literature suggests that, on average, M&As are detrimental to acquirer shareholders from the zero-to-negative average acquirer abnormal returns upon M&A announcements of public targets (e.g., Jensen and Ruback, 1983; Andrade, Mitchell, and Stafford, 2001) to the "wealth destruction on a massive scale" detailed by Moeller, Schlingemann, and Stulz (2005). While more recent work reports evidence of modest gains for acquirer shareholders in specific circumstances (e.g., Netter, Stegemoller, and Wintoki, 2011), it is still puzzling that firms continue engaging in M&A rather than traditional capital investment. Second, we contribute to the recent stream of literature which focuses on the neoclassical theory of M&A and suggests that researchers have been unable to disentangle the various signals provided at the announcement of an M&A transaction (Wang 2018). Because researchers are often unable to separate the market responses to the different signals, many have inferred that the poor announcement returns imply that there are minimal gains to M&A. However, theory suggests that two key effects, the anticipation and revelation effects, both downwardly bias the market's announcement day response making it difficult to ascertain any gains to M&A. By studying a setting with variation in the information revealed to the market at announcement (i.e., the revelation effect), we are able to help separate the benefits of any potential synergies created in the transaction from the news regarding the firms (in) ability to innovate on its own. Finally, we contribute to the work investigating whether tax incentives increase investment activity. While our work suggests that state-level tax credits are associated with increased R&D, our results suggest that these credits' incentives on M&A activity may not be viewed by the market as being as beneficial as R&D the firm may take on its own.

2. Background

2.1. Innovation and R&D incentives for M&A

The notion that innovation activity is the prime engine of long-run economic growth is long-established (e.g., Schumpeter, 1911; Solow 1957). In fact, as noted by Griliches (1990) and Hall, Jaffe, and Trajtenberg (2005), original innovations increase firm value for several years after they are generated. According to Aghion and Tirole (1994), the government's role on the promotion of innovation is one of the most important areas of public policy so analyzing it should shed light on efficient ways of channeling government money into R&D. Thus, understanding the relation between innovative activities and economic growth remains a fundamental question in the economics, finance, and accounting literatures.

Theory suggests that M&A activity can optimally match buyers and sellers to create value. Rhodes-Kropf and Robinson (2008) theorize that M&A deals in which the parties have complementary resources can create substantial surplus. More recently, Levine (2017) builds a model in which acquirers pursue takeovers to obtain growth options from target firms. Specifically related to innovation, Aghion and Tirole (1994) propose a selection mechanism whereby some firms who are not efficiently innovating source innovation property rights from specialized firms.

Yet, research on the theory of the firm and internal capital markets predicts that, to prevent greater average investment distortions, firms may misallocate some funds by transferring resources from units with good opportunities to others with poor investment opportunities [See, for example, Rajan, Servaes, and Zingales (2000), Rotemberg and Saloner (1994), and Scharfstein and Stein (2000)]. Therefore, whenever units compete for resources, the acquisition of innovative intensive targets (which might need substantial R&D investment) might not significantly improve the acquirer's ability to innovate.

Recent work suggests that the M&A market is used extensively to expand acquiring firms' R&D portfolios. This work suggests that firms whose own R&D prospects tend to be declining are often acquirers. Using a large and unique patent-merger data set over the period 1984 to 2006, Bena and Li (2014) show that companies with large patent portfolios and low R&D expenses are acquirers. Higgins and Rodriguez (2006) find that pharmaceutical firms with declining internal growth are more likely to make innovation-outsourcing acquisitions to restock their research pipelines. Similarly, Sevilir and Tian (2012) find that a positive relation between M&A activity and innovation which is primarily driven by deals involving target firms which have generated patents before becoming targets.

Phillips and Zhdanov (2013) find that smaller firms may innovate more and larger firms may innovate less when the M&A market is active enough to facilitate the transfer of R&D between parties. However, Seru (2014) studies the innovative activity of the parties to M&A after the transactions. He finds that there is variation in the novelty of post-deal innovation depending upon whether a conglomerate was the buyer. Results suggest that large, diversified firms that buy R&D are not as innovative as smaller more-targeted buyers. Interestingly, Seru also finds that the more active the M&A market is, the less innovative the conglomerates are with their acquired R&D. In the extreme, Cunningham, Ederer, and Ma (2020) find that pharmaceutical firms may acquire innovative targets only to stop the target's innovation projects and preempt future competition.

Overall, these findings suggest that buyers pursue targets because of their potential for innovation-induced growth. However, the literature also documents that certain acquirers may not be able to generate as large of benefits or synergies from these acquisitions as other acquirers. We advance this literature by exploring the role of state-level R&D tax credits on the firms that pursue growth though M&A activity.

2.2. Market reactions to M&A

Many empirical papers continue to report negative acquirer returns, at least for large transactions involving listed targets (see Betton et al., 2008, for a review of M&A research). But negative acquirer returns are not unambiguous proof of a poor deal. Acquisition announcements deliver information not only about the transaction itself but also about the acquirer's current condition and strategy. Furthermore, announcement period returns only capture the market's unanticipated response to the M&A news.

The anticipation effect is the phenomenon whereby news about a potential transaction is leaked or inferred by the market ahead of any official announcement (Jarrell and Poulsen, 1989). As such, if there were benefits or synergies that generate gains to the transaction, a portion of the benefits would have been already impounded into price before the actual announcement. This effectively attenuates the market's response on the announcement date.

The revelation effect is the market's response to the fact that by announcing that a firm is making an acquisition, it is indirectly signaling that its best prospects for growth are via the acquisition of another company. In essence, the revelation effect suggests that M&A announcements trigger bad news about the prospects for the acquirer. If we assume that the anticipation effect dampens the positive market response and the revelation effect dominates the anticipation effect, then the average market response at the announcement of an M&A transaction will be negative leading to the incorrect inference that the deal is bad news. Akdogu (2011), for example, explains that acquisitions can be undertaken in response to competitive pressures of which the market is unaware prior to the bid. When this is the case, negative acquirer returns are compatible with value creating transactions because, in the absence of the transaction, acquirers would have been even worse off.

Wang (2018) develops a structural model in the neoclassical framework to separate the anticipation and revelation stock price effects. He points out that it is very difficult to find a counterfactual situation to separate these phenomena. Using his model, Wang estimates that after controlling for the revelation effect that acquirer's gains to M&A are 4%. However, as implied in prior research, the revelation effect is roughly -5% suggesting that the overall return to M&A is -1%. Highlighting the benefits of M&A, Wang (2018) concludes that an active M&A market increases acquirers' value by 13% over their life.

2.3. R&D tax incentives

Much of the empirical work on taxes and investment is based on the fundamental idea that if tax rates on investment go down, and therefore the firm keeps a larger share of the future return, then there are incentives for the firm to invest more. This logic suggests that tax incentives, such as R&D credits, which effectively reduce corporate taxes, should yield increases in investment in innovation.

The difficulty with studying the role of taxation on investment is that federal level taxation affects most firms in the same manner. To overcome identification challenges, researchers have begun studying the largely exogenous staggered changes in state corporate income tax rates (e.g., Heider and Ljungqvist, 2015; Giroud and Rauh, 2018). Relatedly, as researchers have begun studying the role of particular tax incentives, such as the R&D credit, on investment, they have begun relying on variation state-level incentives.

To date, there is a reasonable consensus that state-level R&D activity increases firm-level innovation (e.g., Wilson 2009, Atanassov and Liu, 2020). Said innovation appears to be accompanied by incremental high-technology establishments (Wu, 2008) and employment

(Lucking, 2019).[1] Interestingly, Fazio, Guzman, and Stern (2019) suggests that state-level R&D tax credits result in better performing entrepreneurial investment than state-level general business credits. We capitalize on the variation in R&D incentives to serve as a proxy for the relative cost of innovative investment.

For every state in the US, Table 1 provides information on the year in which R&D tax credit programs become effective as well as the year of expiration for some programs.

3. Sample

To examine innovation's role on acquisition decisions, we begin with 103,998 firm-years for 9,305 unique U.S. firms excluding financials (SIC 4900-4999), utilities (SIC 6000-6999), and public administration firms (SIC 9000-9999) drawn from the merged CRSP-COMPUSTAT database with complete data during fiscal years 1980 to 2016. We match these observations with information from the Securities Data Corporation's (SDC) US Mergers and Acquisitions (M&A) database to detect firms that issue acquisition bids during the sample period. Summary statistics for this sample appear in Panel A of Table 2. We note that the unconditional probability of issuing an acquisition bid is 4.7%, a value that falls within the 4.5% and 8.2% reported by Akbulut (2013) and Cai and Vijh (2005), respectively. The mean R&D spending is 5.2% of total assets. But, when we exclude zero R&D observations, the mean R&D spending rises to 10% of total assets. The later statistic is close to the 9% reported by Koh and Reeb (2015) for their 1980-2006 sample. We investigate the effect of R&D tax credit laws on the probability of making a merger bid with the sample described in Panel A.

To study the effect of R&D tax credit legislation on acquisition performance, we require that (i) the acquisition is completed, (ii) the transaction value reported in SDC is more than $1

[1] Audretsch and Feldman (1996) document that R&D activity results in spillovers that yield incremental employment and production. Therefore, if the R&D tax credit induces additional R&D activity, then it, too, should also be associated with incremental investment.

million and is at least 1% of the acquirer's market value of total assets, measured at the fiscal year-end before the M&A announcement, (iii) the acquirer owns less than 50% of the target's equity before the M&A announcement but more than 50% after the deal is completed, (iv) the acquirer has 272 trading days of stock return data before the M&A announcement available from CRSP and accounting data available from Compustat, and (v) the deal is not classified as a spinoff, recapitalization, exchange offer, repurchase, self-tender, or privatization. This process generates a sample of 7,822 completed U.S. domestic M&A deals made by 3,612 unique U.S. acquirers during calendar year 1980-2017. Panel B of Table 2 reports summary statistics for the sample used in our primary analyses.

According to Table 2 Panel B, our descriptive statistics are similar to those in other M&A papers. Our median values of Acquirer's cumulative announcement return (CAR), Tobin's q, and Leverage are 0.3%, 1.814, and 0.170, respectively. For the same variables, Masulis et al. (2009) report similar median values (0.4%, 1.638, and 0.180). The proportion of hostile deals, diversifying deals, and deals involving non-public targets (private and subsidiary) in our sample are 0.020, 0.424, and 0.592, which are close to the proportions (0.021, 0.421, and 0.563) Chen, Harford, and Lin (2015) estimate for the same variables. Panel C of Table 3 presents the temporal distribution of the 7,822 M&A deals sorted by the acquirer firms' headquarters (HQ) state. For each state, we shade the years in which the R&D tax credit program is active.

4. Empirical analyses

4.1. The impact of innovation on the market value of firms

All else equal, firms with a considerable presence in states with more generous state R&D tax credits should be able to conduct R&D activities at a comparatively lower cost than those in states in which the tax credit is not as generous (Rao, 2016). Consequently, the contribution of innovation activities to the value of a firm should increase in the tax credit benefit. To evaluate this conjecture, we study firms' innovation activity by using the number of patents granted to a firm scaled its assets to proxy for innovation. We draw patent information from the Kogan et al. (2017) dataset which covers all patent applications filed with (and ultimately granted by) the US Patent and Trademark Office (USPTO) from 1926 to 2017. With the identifiers provided for each patent filing firm by Kogan et al., we merge their dataset with ours.

In Table 3 we evaluate the relative contribution of innovation activity to the market value of the firm with six difference-in-differences (DiD) regressions that use Tobin's *q* as the dependent variable. Equation (1) describes our regression specification.

$$ln(\text{Tobin's } q)_{i,t} = \alpha_{i,t} + \beta_1 (R\&D\ tax\ credit)_{s,t} + \beta_2 \text{innovation}_{i,t} \times (R\&D\ tax\ credit)_{s,t} + \beta_3 \text{innovation}_{i,t} + f_i + \omega_{l,t} + \lambda_{j,t} \quad \textbf{(1)}$$

where i indexes firms, s indexes the firm's state of incorporation, l indexes a firm's headquarters (HQ) location, j indexes industries, and t indexes time.

Our main focus is on the β_2 coefficient for the interaction variable between the innovation variable and the R&D tax credit proxy. We use three proxies to estimate the tax credit.[2] In models (1) and (2) we use a variable labeled RDTC which measure the actual R&D tax credit rate effective in the state. Models (3) and (4) proxy the tax credit with the natural logarithm of one plus the RDTC value, where RDTC value is the RDTC rate multiplied by the firm's average R&D spending in the most recent three year and zero otherwise. Lastly, in models (5) and (6), we use RDTC carry forward defined as the number of years for tax credit carry forward

[2] In models (1) and (2) we use a variable labeled RDTC which measure the actual R&D tax credit rate effective in the state. Models (3) and (4) proxy the tax credit with the natural logarithm of one plus the RDTC value, where RDTC value is the RDTC rate multiplied by the firm's average R&D spending in the most recent three year and zero otherwise. Lastly, in models (5) and (6), we use RDTC carry forward defined as the number of years for tax credit carry forward given by the state in which the firm is headquartered and that has passed an R&D Tax Credit law by the firm's fiscal year end date, and zero otherwise. It is set to 100 if the tax credit is refundable in case it exceeds the tax liability.

given by the state in which the firm is headquartered and that has passed an R&D Tax Credit law by the firm's fiscal year end date, and zero otherwise. It is set to 100 if the tax credit is refundable in case it exceeds the tax liability. All of these proxies have a non-zero value only when the tax credit program is active in a state (see Panel C of Table 2).

All regressions control for unobserved firm heterogeneity, time-varying differences across states, and time-varying differences across industries by including firm (f_i), HQ state-by-year ($\omega_{l,t}$), and 3-digit SIC industry-by-year ($\lambda_{j,t}$) fixed effects for a firm *i*, headquartered in state *l*, operating in industry *j*, at time *t*. Robust standard errors are clustered at the state of incorporation level. Angrist and Pischke (2010) and Gormley and Matsa (2014) warn that using controls along with fixed effects may produce biased estimates if they are contemporaneously affected by the identifying construct. Therefore, the baseline estimations of odd-numbered regressions in Table 3 omit all control variables. Nevertheless, we include a vector of control variables in the even-numbered regressions.[3] All models control for serial correlation with robust Rogers (1993) standard errors clustered at the state of incorporation level *s*.

The results in Table 3 indicate that innovation activity contributes positively towards the market value of the firm. This result is similar to that in Hall et. al. (2005). More importantly, according to the interaction term in all specifications, the state R&D tax credit augments the contribution of innovation to a firm's market value. Based on the estimates in model (2), increasing the tax credit rate by 10% is associated with a 0.83% increase in *q*. This result indicates that, on average, firms with patents rip important benefits from state RDTC programs.

4.2. State R&D tax credit incentives and acquisition activity

Ex-ante it is unclear how state-level R&D tax credits would affect M&A activity. On one hand, the presence of state-level R&D tax credits could suggest that firms' internal R&D

[3] The control variables include the following firm characteristics: size, leverage, and return on assets.

activity is sufficiently subsidized by the states so that they need not innovate via acquisition. On the other hand, firms may view the availability of state-level tax credits as providing an opportunity to reduce the cost of the acquisition by shifting targets' innovative activities into tax credit qualifying states. Under this possibility, we should observe a higher likelihood for firms to make acquisitions when headquartered in states with larger tax credit benefits. Moreover, if firms are really intent on acquiring, it is possible that the transactions in those jurisdictions exhibit higher transaction values.

We examine these possibilities in Table 4 in which we report three panels each containing six different DiD regressions which are specified following Equation (2).

$$Acquisition\ proxy_{i,t} = \alpha_{i,t} + \beta_1(R\&D\ tax\ credit)_{s,t} + f_i + \omega_{l,t} + \lambda_{j,t} \quad \textbf{(2)}$$

The *Acquisition proxy* dependent variables we use are as follows. In Panel A, it is an (0,1) indicator set to one if the firm makes an acquisition during the year and set to zero otherwise. In Panel B, it is the natural logarithm of one plus the number of acquisitions made by the firm during the year. In Panel C, it is the natural logarithm of one plus the total value of all acquisitions made by the firm during the year. As with our Tobin's *q* tests, the key explanatory variables in Table 4 are RDTC rate (in models 1 and 2), *ln* (1+RDTC value) (in models 3 and 4) and RDTC carry forward (in models 5 and 6). The control variables in these tests as well as the indexing of all variables also follow the template we use in Table 3.

Across all specifications and different tax-credit proxies, the results in Panel A and Panel B indicate a positive and significant association between the R&D tax credit and the likelihood of making acquisitions. Using the estimates in model 1 of Panel A, raising the state R&D tax credit rate by 10% is related to an increase of 0.23% in the probability of making an acquisition. Considering that the unconditional probability of making a deal in the sample is 4.7%, this estimate is economically meaningful. In addition, the results in Panel C show that firms in

R&D tax credit states are associated with M&A deals with higher transaction values. Based on the coefficients reported in column 1 of Panel C, a 10% increase in the R&D tax credit rate is associated with an uptick of 1.52% in terms of deal value. This increase is economically important as it corresponds to an increase of US$4.4 million for the average M&A in the sample.

We also investigate whether there is any evidence that acquiring firms appear to be moving targets' R&D activity into more generous R&D tax credit states. Albeit indirect evidence, we compare the patent activity of acquirers headquartered in states with R&D tax credit (RDTC) programs (treated cohort) with M&A deals by acquirers headquartered in other states (control cohort) both before and after their respective M&A transactions. We plot the OLS point estimates of patents in period surrounding the M&A deal according to the acquirers' R&D tax credit eligibility. These estimates are drawn from a set of twelve different regressions that include state and year fixed effects. Figure 1 illustrates that the patent activity of the two groups is insignificantly different in the three years prior to the M&A activity. After the year of the transaction, the figure suggests that the acquirers headquartered in states with R&D tax credits have more patents activity than acquirers who have no R&D tax credit program available.[4] However, the bump in patent activity tapers off two years after the transaction. The relatively quick increase and dissipation of the patent activity is more suggestive of a shifting of targets' existing, successful R&D activity rather than any incremental R&D activity generated through the combined enterprise.[5]

---

[4] According to Figure 1, on average, from the year before the acquisition to the year after, patent count increases to 10.86 (*t*-statistic = 3.91) for acquirers in R&D tax credit states. For other acquirers, the average increase is 6.86 (*t*-statistic = 2.84). The difference in means (4 patents) is statistically significant (*p*-value = 0.043). But two years after the M&A, the mean difference in patent count between the two groups is no longer significant.

[5] The authors have procured access to the National Establishment Time-Series or NETS data. In the next version of the paper, we hope to undertake a more detailed analysis to ascertain whether targets' employees and revenues move into acquirers' operation jurisdictions.

In general, the evidence in Table 4 indicates that firms headquartered in locales with more generous R&D tax credit programs are more likely to pursue M&A deals and to spend more in those transactions. Figure 1 also suggests that acquirers' increase M&A activity may stem from the ability to shift targets' R&D activity into jurisdictions with more generous R&D tax credit programs. While it is unlikely that for any individual firm the tax credit is large enough to incentivize M&A transactions, it is possible that firms with limited internal growth potential need to acquire to keep pace with other R&D tax credit recipients that use those incentive to fuel their organic growth. We explore this possibility in greater detail in subsequent analyses.

4.3. R&D spending and M&A decisions

Basic investment theory notes that managers looking to maximize the value of their firms must undertake all independent investment projects that exhibit positive net present values (NPVs). However, when resources are limited, managers should rank all available independent projects and first fund those deemed to be more profitable (highest NPV). In this regard, the choices that managers make reveal new information to investors on the firm's ability to finance its investments and on the range and quality of the firm's investment opportunity set (Myers and Majluf, 1984; Wang, 2018).

With this theory in mind, in Table 5 we analyze the role of state R&D tax credits on the association between R&D spending and acquisition choices. Table 5 contains two panels, each reporting six different DiD regressions which are specified following Equation (3).

$$R\&D\ spending_{i,t} = \alpha_{i,t} + \beta_1 (R\&D\ tax\ credit)_{s,t} + \beta_2 \text{Bid}\ (0,1)_{i,t} \times (R\&D\ tax\ credit)_{s,t} + \beta_3 \text{Bid}\ (,1)_{i,t} + f_i + \omega_{l,t} + \lambda_{j,t} \quad \textbf{(3)}$$

In both panels, the dependent variable in models 1, 2, 5, and 6 is R&D spending scaled by assets whereas in models 3 and 4 it is the natural logarithm of one plus R&D spending. The tests in Panel B use similar dependent variables which we estimate with the imputed two-digit

SIC industry average for firms with missing R&D spending as prescribed by Koh and Reeb (2015). The key explanatory variables in Table 5 are RDTC rate (in models 1 and 2), *ln* (1+RDTC value) (in models 3 and 4) and RDTC carry forward (in models 5 and 6). The control variables in these tests as well as the indexing of all variables also follow the template we use in earlier tables.

The DiD estimates in all the models in Table 5 document a robust inverse association between M&A bidding and R&D spending. More importantly, across all R&D tax credit proxies and all specifications, estimates for the interaction term, *(R&D tax credit) x Bid (0,1)*, indicate that the inverse association is of greater magnitude in jurisdictions with generous R&D tax credit programs. For example, according to model 1 in Panel A, the standalone estimate for Bid (0,1) implies a 0.2% decrease in R&D spending in firms that bid for a takeover target. For bidding firms in tax credit jurisdictions, increasing the state R&D tax credit rate by 10% is associated with a 0.17% additional reduction in R&D spending.

4.4. Targets engaged in R&D

So far, our results indicate that firms in states with generous R&D tax credit programs are more likely to make acquisitions that exhibit higher transaction values. Moreover, the same firms appear to redirect resources typically invested in organic growth (i.e., R&D spending) towards growth thorough M&A. While these findings suggest that some firms bypass organic growth in favor of growth through M&A, the evidence is not conclusive. Therefore, to gain further insight on this issue, we explore whether acquirers in generous state R&D tax credit jurisdictions are more likely to pursue innovation intensive targets. We classify innovation intensive targets as those in the top quartile of R&D spending across all industries in the fiscal year before the M&A announcement.

Pane A of Table 6 reports six DiD regressions based on Equation (2) in which the dependent variable is set to one if the target is innovation intensive and set to zero if it is not. The coefficients in model 1 indicate a 1.95% increase in the probability that the acquisition involves an innovation intensive target when the tax credit rate increases from zero to 10%. This finding is notable because the unconditional probability of acquiring an innovation intensive target in the sample is 19.8%. The results related to the other state R&D tax-credit proxies imply a similar increase in takeover likelihood.

Together with our previous findings, the results in Panel A of Table 6 provide compelling evidence that some firms in states with generous R&D tax credit incentives seek to grow through mergers. Such a strategy is likely motivated by the fact (shown in Table 3) that firms with granted patents benefit more from a state R&D tax credit program. What remains unclear, however, is whether the strategy to grow through M&A benefits acquirer shareholders. We examine this issue next.

4.5. Offer augmentation

Acquirers sometimes revise the amount of their initial M&A offers. Downward revisions are frequently prompted by acquirer managers addressing concerns from investors upon an unfavorable market reaction to the deal's public announcement (Lou, 2005). By contrast, as noted by Ahern (2012), upward revisions often occur when target managers reject the initial offer or when their bargaining power improves (e.g., rival bidders vying for the target).

The result in Panel C of Table 4 show that M&A deals by acquirers in states with bigger R&D tax credits exhibit higher transaction values. It is therefore possible that upward M&A offer revisions account, at least in part, for the higher transaction values. We explore this possibility in Panel B of Table 6 with six regressions based on Equation (2) where the dependent variable equals one if an acquisition of an R&D intensive target exhibits an upward offer revision. The dependent variable equals zero otherwise. Across the six regressions, coefficient estimates for all the R&D tax credit proxies are positive and statistically significant. Increasing the R&D tax credit rate from zero to 10% in model 1 implies a 2.7% increase in the probability of an upward offer revision. This is a substantial effect because the unconditional probability of an upward revision in our sample is just 7%.[6]

While M&A offer augmentations are regularly associated with overpayment for target firms, it is still possible that the deals are advantageous for the acquirer shareholders. We shed light on this possibility next by considering both the stock market and accounting performance of the M&A transactions.

4.6. Deal performance

As noted earlier, firm value maximizing managers must pursue all positive NPV independent investment projects. Therefore, while some firms in states with large R&D tax credit incentives are more likely to grow via M&A, the same firms might be pursuing organic growth. Put differently, it is possible that some firms are able to fund both their M&A investments and their internal (organic growth) investments. On the surface, an issue that nevertheless seems inconsistent with this conjecture is the reduction in R&D spending for firms that make acquisition bids (Table 5). Still, such a reduction will be justified if the M&A is a superior investment. To better understand this issue, we examine the performance of the M&A deals in Table 7.

In Table 7 we run two sets of DiD regressions based on Equation (2) . The first set, reported in Panel A, consists of six models in which the dependent variable is the acquirer's three-day cumulative abnormal return (CAR) centered on the M&A announcement date. Because of the

[6] In our sample, 9.5% of deals experience a bid revision (upward or downward), an incidence similar to that of 10.32% in Bates, Lemmon, and Linck (2006).

concern that investor reactions could be biased by investors' sentiment, in Panel B we run six similarly specified tests in which the dependent variable is the change in the combined firm's average ROA three years after deal completion.

For all of our state R&D tax credit proxies, the estimates in Panel A indicate that deals in locales that offer these incentives the M&A announcement CARs on the acquirers' stock are significantly lower. Raising the state R&D tax credit rate by 10% in model 1 is related to a 0.29% reduction in the acquirer's M&A announcement CAR. Such a drop translates to a decrease of 16 million in market capitalization for the average sample acquirer. The results in Panel B paint an equally bleak picture: a 10% increase in the state R&D tax credit rate is associated with a 0.25% decrease in the operating performance of the merged firm.

Table 8 reports six DiD regressions of the premium offered to target firms (Panel A) and six DiD regression of the synergy associated with the M&A transactions. The offer premium is the four-week acquisition premium reported by SDC whereas as we proxy for a deal's synergy with the combined acquirer and target's cumulative abnormal return (CAR) during the three-day window period centered on the M&A announcement date. All tests, which are based on Equation (2), follow the template of previous analyses in terms of the three independent variables we use to proxy for a state R&D tax credit and the control variables and fixed effects.

Although a 10% increase in the state R&D tax credit rate is associated with a 5.09% increase in the offer premium (model 1 in Pane A), a similar increase in the rate is associated with a 0.56% decrease in the deal synergy (model 1 Panel B). The decrease in synergies is representative of low-quality deals because M&A create synergistic gains whenever investment opportunities flow to firms with a comparative advantage of exploiting their potential. As a result, the evidence in Table 8 of higher offer premiums in lower synergy deals, along with the results showing worse performance by acquirers in states with generous R&D

tax credits (Table 7), suggest a transfer of wealth from shareholders of the acquirer firm to shareholders of the target company.

5. Conclusions

Innovation is key to firm growth. However, the decision to innovate organically versus through acquisition is not well-understood. By using state-level R&D activity, we delve into whether firms that are able to undertake R&D for relatively lower costs are penalized by the market when they purchase innovation instead. Because these state-level incentives reduce the cost of R&D activity, we investigate whether firms that purchase innovation are effectively revealing that their internal R&D activity is relatively poor.

Overall, the totality of our evidence is consistent with the view that the decision to grow via M&A in the presence of incentives that promote organic growth reveals that the firm's has inferior internal investment opportunities. As a result, state-level R&D tax credit incentives are associated with increased M&A activity involving transactions that destroy substantial value for the acquirer firms that enjoy this benefit.

References

Aghion, Philippe, and Jean Tirole. 1994. The management of innovation. *Quarterly Journal of Economics*, 109(4), 1185-1209.

Ahern, Kenneth R. 2012. Bargaining power and industry dependence in mergers. *Journal of Financial Economics*, 103(3), pp.530-550.

Akbulut, Mehmen, 2013. Do overvaluation-driven stock acquisitions really benefit acquirer shareholders, *Journal of Financial and Quantitative Analysis* 48(4) 1025-1055.

Akdogu, Evrim, 2011. Value-maximizing managers, value-increasing mergers and overbidding, *Journal of Financial and Quantitative Analysis* 46, 83-110.

Angrist, Joshua D., and Jörn-Steffen Pischke, 2010. The credibility revolution in empirical economics: How better research design is taking the con out of econometrics. *Journal of Economic Perspectives* 24 (2), 3-30.

Andrade, Gregor, Mark Mitchell, and Erik Stafford, 2001. New evidence and perspectives on mergers, *Journal of Economic Perspectives* 15 (2), 103-120.

Atanassov, Julian, and Xiaoding Liu, 2020. Can corporate income tax cuts stimulate innovation? *Journal of Financial and Quantitative Analysis* 55 (5), 1415-1565.

Audretsch, David, and Maryann Feldman, 1996. R&D spillovers and the geography of innovation and production. *American Economic Review* 86 (3), 630-640.

Bena, Jan, and Kai Li. 2014. Corporate innovations and mergers and acquisitions. *Journal of Finance*, 69(5), 1923-1960.

Bates, Thomas W., Michael L. Lemmon, and James S. Linck. 2006. Shareholder wealth effects and bid negotiation in freeze-out deals: Are minority shareholders left out in the cold? *Journal of Financial Economics* 81 (3), 681-708.

Betton, Sandra, B. Espen Eckbo, and Karin S. Thorburn, 2008. Chapter 15: Corporate Takeovers in *Handbook of Corporate Finance: Empirical Corporate Finance*, 2, Eckbo, B. E., ed. Amsterdam: Elsevier/North-Holland.

Cai, Jie, and Anand M. Vijh, 2007. Incentive effects of stock and option holdings of target and acquirer CEOs. *Journal of Finance* 62 (4), 1891-1933

Chen, Tao, Jarrad Harford, and Chen Lin, 2015. Do analysts matter for governance? Evidence from natural experiments, *Journal of Financial Economics* 115(2), 383-410.

Cunningham, Colleen, Florian Ederer, and Song Ma. 2020. Killer acquisitions. *Journal of Political Economy*, forthcoming. Available at SSRN: https://ssrn.com/abstract=3241707

Fazio, Catherine, Jorge Guzman, and Scott Stern, 2019. The impact of state-level R&D tax credits on the quantity and quality of entrepreneurship, NBER working paper 26099.

Giroud, Xavier, and Joshua Rauh, 2019. State taxation and the reallocation of business activity: Evidence from establishment-level data, *Journal of Political Economy* 127 (3), 1262-1316.

Gormley, Todd A., and David A. Matsa, 2014. Common errors: How to (and not to) control for unobserved heterogeneity. *Review of Financial Studies* 27 (2), 617-661.

Griliches, Zvi, 1990. Patent statistics as economic indicators: A survey. *Journal of Economic Literature* 28 1661-1707

Hall, Bronwyn H., Adam Jaffe, and Manuel Trajtenberg, 2005. Market value and patent citations, *RAND Journal of Economics* 36 (1), 16-38.

Heider, Florian, and Alexander Ljungqvist, 2015. As certain as debt and taxes: Estimating the tax sensitivity of leverage from state tax changes. *Journal of Financial Economics* 118 (3), 684-712.

Higgins, Matthew J., and Daniel Rodriguez. 2006. The outsourcing of R&D through acquisitions in the pharmaceutical industry. *Journal of Financial Economics*, 80(2), 351-383.

Jarrell, Gregg A. and Annette B. Paulsen, 1989, Stock trading before the announcement of tender offers: Insider trading or market anticipation? *Journal of Law, Economics, and Organization* 5, 225-248.

Jensen, Michael C., and Richard S. Ruback, 1983. The market for corporate control: The scientific evidence, *Journal of Financial Economics* 11, 5-50.

Jovanovic, Boyan and Peter L. Rousseau, 2002. The Q-theory of mergers. *American Economic Review* 92 (2), 198-204.

Kogan, Leonid, Dimitris Papanikolaou, Amit Seru and Noah Stoffman, 2017. Technological innovation, resource allocation, and growth. *Quarterly Journal of Economics* 132(2), 665-712.

Koh, Ping-Sheng, and David Reeb, 2015. Missing R&D. *Journal of Accounting and Economics* 60(1) 73-94.

Lucking, Brian, 2019. Do R&D tax credits create jobs? Charles River Associates working paper.

Luo, Yuanzhi. 2005. Do insiders learn from outsiders? Evidence from mergers and acquisitions. *Journal of Finance*, 60(4), pp.1951-1982.

Masulis, Ronald W., Cong Wang, and Fei Xie, 2009. Agency problems at dual-class companies. *Journal of Finance* 64 (2), 1697-1727.

Moeller, Sara B., Frederik P. Schlingemann, and René M. Stulz, 2005. Wealth destruction on a massive scale? A study of acquiring-firm returns in the recent merger wave, *Journal of Finance* 60 (2), 757-782.

Myers, Stewart C., and Majluf, Nicholas S. 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* 13 (2), 187-221.

Netter, Jeffry, Mike Stegemoller, and M. Babajide Wintoki, 2011. Implications of data screens on merger and acquisition analysis: A large sample study of mergers and acquisitions from 1992 to 2009, *Review of Financial Studies* 24 (7), 2316-2357.

Phillips, Gordon M. and Alexei Zhdanov, 2013. R&D and the incentives from merger and acquisition activity. *Review of Financial Studies* 26 (1), 34-78.

Rajan, Raghuram, Henri Servaes, and Luigi Zingales. 2000. The cost of diversity: The diversification discount and inefficient investment. *Journal of Finance*, 55(1), 35-80.

Rao, Nirupama, 2016. Do tax credits stimulate R&D spending? The effect of the R&D tax credit in its first decade. *Journal of Public Economics* 140, pp.1-12.

Rhodes-Kropf, Matthew, and David T. Robinson. 2008. The market for mergers and the boundaries of the firm. *Journal of Finance*, 63(3), 1169-1211.

Rogers, William, 1993. Regression standard errors in clustered samples. *Stata Technical Bulletin* 13, 19-23.

Rotemberg, Julio J., and Garth Saloner. 1994. Benefits of narrow business strategies. The *American Economic Review*, 84 (5), 1330-1349.

Scharfstein, David S., and Jeremy C. Stein. 2000. The dark side of internal capital markets: Divisional rent-seeking and inefficient investment. *Journal of Finance*, 55(6), 2537-2564.

Schumpeter, Joseph A. 1911. The theory of economic development. (New York: Oxford University Press, 1961).

Seru, Amit, 2014. Firm boundaries matter: Evidence form conglomerates and R&D activity. *Journal of Financial Economics* 111, 381-405.

Sevilir, Merih and Xuan Tian. 2012. Acquiring innovation. Unpublished manuscript. Available at SSRN: https://ssrn.com/abstract=1731722

Solow, Robert. M., 1957. Technical change and the aggregate production function. *Review of Economics and Statistics* 39 (3), 312-320.

Wang, Wenyu, 2018. Bid anticipation, information revelation, and merger gains. *Journal of Financial Economics* 128, 320-343.

Wilson, Daniel J., 2009. Beggar thy neighbor? The in-state, out-of-state, and aggregate effects of R&D tax credits. *Review of Economics and Statistics* 91(1), 431-436.

Wu, Yonghong, 2008. State R&D tax credits and high-technology establishments, *Economic Development Quarterly* 22(2), 136-148.

Figure 1: The impact of M&A on innovation output

This figure plots OLS point estimates of the effect of M&A deals on the number of patents. We contrast M&A transactions made by acquirers headquartered in states with R&D tax credit (RDTC) programs (treated cohort) with M&A deals by acquirers headquartered in other states (control cohort). To isolate the effect of the M&A, we evaluate the cohorts of treated and control firms during the six years around each acquisition event year. For each cohort group, we regress the outcome variable on the acquisition relative to year indicators, incorporation state-year, and industry-year fixed effects. We exclude the indicator for year zero (the acquisition year) so that the OLS point estimates map out the effect relative to year zero. The upper and lower bounds represent 95% confidence intervals using heteroskedasticity-consistent standard errors clustered by headquarters state.

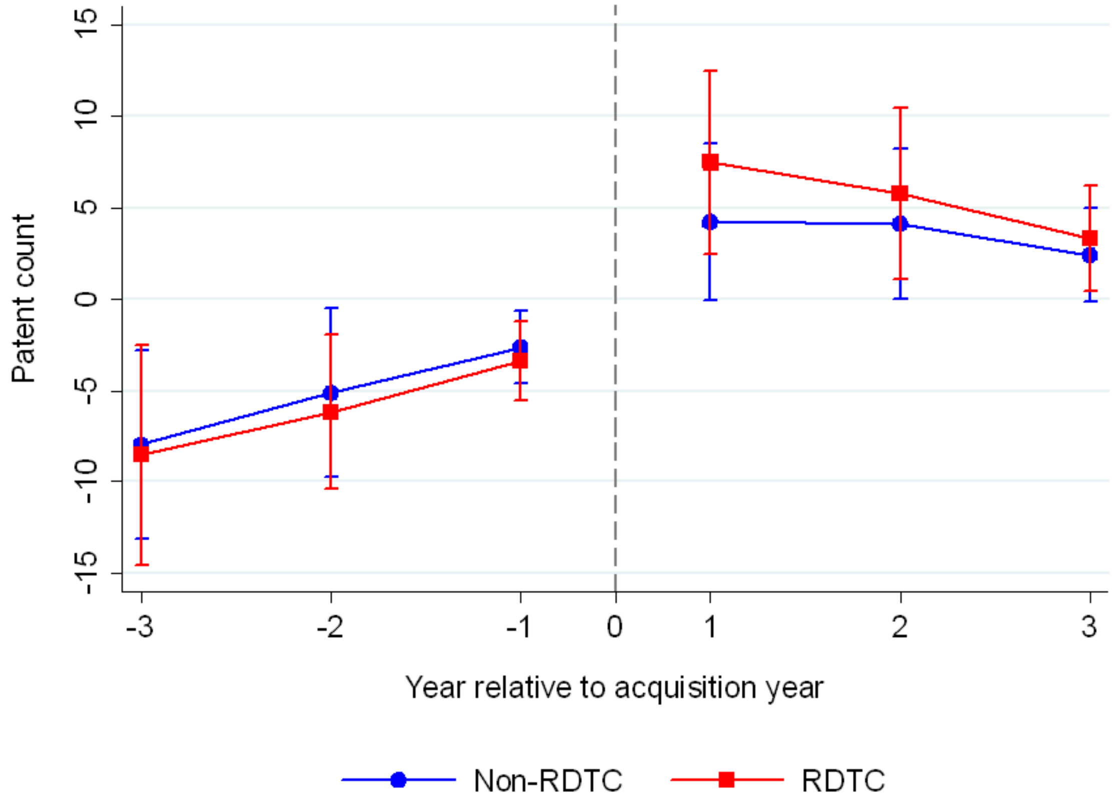

Table 1: State R&D tax credit law adoption and expiry

This table presents the effective and expiry year of the R&D Tax Credit law by state.

State	Effective year	Expiry year	State	Effective year	Expiry year
Alaska	1998		Minnesota	1982	
Arizona	1994		Nebraska	2006	
Arkansas	2003		New Hampshire	2007	
California	1987		New Jersey	1994	
Colorado	1989		New Mexico	2000	
Connecticut	1993		New York	2005	
Delaware	2000		North Carolina	1996	2015
Florida	2012		North Dakota	1988	
Georgia	1998		Ohio	2004	
Hawaii	2000		Oregon	1989	2017
Idaho	2001		Pennsylvania	1997	
Illinois	1990		Rhode Island	1994	
Indiana	1985		South Carolina	2001	
Iowa	1985		Texas	2001	
Kansas	1988		Utah	1999	
Louisiana	2003		Vermont	2011	
Maine	1996		Virginia	2011	
Maryland	2000		Washington	1995	2014
Massachusetts	1991		West Virginia	1986	2013
Michigan	2007	2011	Wisconsin	1986	

Table 2: Summary statistics

In Panel A, the sample consists of 103,998 firm-years for 9,305 unique U.S. firms excluding financials (SIC 4900-4999), utilities (SIC 6000-6999), and public administration firms (SIC 9000-9999) in the merged CRSP-COMPUSTAT database with complete data to analyze acquisition decisions from 1980 to 2017. In Panel B, the sample consists of 7,822 completed U.S. domestic mergers and acquisitions (M&A) from the Thomson SDC M&A database made by 3,612 unique U.S. acquirers excluding financials (SIC 4900-4999), utilities (SIC 6000-6999), and public administration firms (SIC 9000-9999) in the merged CRSP-COMPUSTAT database with complete data to analyze acquisition quality during the fiscal year end 1980-2016 before the merger public announcement date. We exclude observations involving spinoffs, recapitalizations, exchange offers, repurchases, self-tenders, privatizations, acquisitions of remaining interest, and partial interests or assets, and those with deal value less than $1 million. Acquirer characteristics are measured at the fiscal year end before deal announcement. All variables are defined in Appendix A. All dollar values are inflation adjusted to 2001 using the Consumer Price Index (CPI). All continuous variables are winsorized at the 1% and 99% level. Panel C presents the temporal distribution of the 7,822 M&A deals sorted by the acquirer firms' headquarters state. For each state, we shade the years in which the RDTC program is active.

Panel A: Summary statistics – Acquisition decision at the firm-year level					
	Mean	Std	Q1	Median	Q3
R&D tax credit variables					
RDTC rate	0.055	0.084	0	0	0.100
RDTC value (in $ million)	4.210	70.641	0	0	1
RDTC carry forward (years/100)	0.116	0.224	0	0	0.150
Acquisition decision					
Bid (0,1)	0.047	0.212	0	0	0
ln(1 + number of bids)	0.029	0.139	0	0	0
ln(1 + deal value)	0.134	0.727	0	0	0
Firm characteristics					
Market value of equity (in $ billion)	1.086	3.084	0.030	0.128	0.637
Tobin's q	0.226	0.229	0.024	0.158	0.365
Leverage	1.919	1.414	1.084	1.440	2.168
ROA	0.132	0.117	0.027	0.120	0.196
R&D	0.052	0.160	0	0	0.047
Number of patents	0.014	0.121	0	0	0

Panel B: Summary statistics – Completed acquisitions at the deal level					
	Mean	Std	Q1	Median	Q3
Acquirer's R&D tax credit variables					
RDTC rate	0.067	0.089	0	0.050	0.100
RDTC value (in $ million)	24.958	207.248	0	0	0.887
RDTC carry forward (years/100)	0.131	0.223	0	0.070	0.200
Deal performance measures					
CAR(-1,+1)	0.008	0.071	-0.027	0.003	0.041
Offer premium	0.484	0.414	0.208	0.388	0.639
Combined CAR(-1,+1)	0.020	0.066	-0.016	0.012	0.051
Change in combined firm's ROA	-0.011	0.082	-0.048	-0.005	0.032
Goodwill write-off (0,1)	0.106	0.308	0	0	1
Acquirer characteristics					
Market value of equity (in $ billion)	5.598	17.247	0.153	0.602	2.399
Tobin's q	2.561	2.275	1.306	1.814	2.812
Leverage	0.201	0.188	0.021	0.170	0.313
ROA	0.178	0.147	0.080	0.158	0.241
R&D	0.051	0.089	0	0.019	0.074
Deal characteristics					
Deal value (in $ billion)	0.403	1.062	0.018	0.066	0.259
Relative size	0.317	0.547	0.037	0.114	0.338
Private target (0,1)	0.471	0.499	0	0	1
Subsidiary target (0,1)	0.121	0.327	0	0	0
All cash payment (0,1)	0.333	0.471	0	0	1
Tender offer (0,1)	0.098	0.297	0	0	0
Hostile deal (0,1)	0.020	0.141	0	0	0
Competed deal (0,1)	0.037	0.188	0	0	0
Toehold (0,1)	0.039	0.193	0	0	0
Lock up (0,1)	0.005	0.071	0	0	0
Merger of equals (0,1)	0.004	0.061	0	0	0
Diversifying deal (0,1)	0.424	0.494	0	0	1

Panel C: M&A activity and state R&D tax credit law adoption and expiry

State	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
AL	0	0	0	1	0	0	2	2	3	1	0	0	2	2	3	1	1	2	1	0	2	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	28
AR	0	4	0	3	3	1	1	1	4	1	3	1	2	1	3	0	0	1	3	1	1	1	1	0	0	1	1	0	0	0	0	1	0	0	1	0	0	1	41
AZ	0	0	1	3	1	2	1	1	0	2	1	0	0	6	6	10	5	7	7	6	5	3	1	3	1	5	5	6	5	4	5	1	3	1	4	2	2	0	115
CA	1	5	11	12	31	8	17	17	15	10	11	22	31	30	39	69	89	77	100	104	166	62	52	50	57	65	49	52	44	38	35	26	30	23	36	27	21	10	1542
CO	0	2	0	3	6	2	0	3	6	4	4	4	3	9	11	10	17	12	13	7	9	6	3	11	9	6	9	7	3	2	5	3	7	8	6	6	3	1	220
CT	0	4	5	6	9	2	5	1	7	4	2	2	4	3	7	8	7	9	8	13	8	8	3	5	6	10	8	4	4	5	3	4	6	3	9	5	2	5	204
DC	0	0	0	1	0	0	1	0	0	0	3	1	0	0	2	3	1	1	3	4	3	1	0	0	0	2	1	1	3	1	2	2	2	1	1	2	1	0	43
DE	1	1	1	1	3	0	1	0	0	0	0	0	0	1	0	1	1	2	2	2	2	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	22
FL	0	4	5	9	4	2	5	4	4	9	8	12	13	20	15	18	20	22	19	18	11	12	6	9	7	11	12	12	5	2	2	4	3	4	1	8	6	3	329
GA	1	2	2	2	9	4	8	5	5	8	4	11	11	11	8	12	13	19	18	17	14	12	7	8	5	8	5	8	11	4	10	5	3	3	5	4	2	1	285
HI	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
IA	0	0	2	0	0	0	0	0	0	0	1	0	0	0	2	1	0	3	2	0	0	0	1	1	1	1	1	1	1	1	0	0	0	2	0	0	0	1	22
ID	0	0	0	0	4	1	0	0	1	1	0	2	1	1	0	0	0	1	4	0	0	0	1	0	0	0	1	0	2	0	0	0	0	0	0	1	1	0	22
IL	1	13	9	8	10	4	6	8	6	7	6	4	6	7	8	15	21	21	20	15	18	19	5	8	13	7	16	11	6	9	11	14	10	10	16	13	5	3	389
IN	1	0	1	6	5	2	0	0	0	0	0	1	4	0	4	1	5	2	3	0	1	1	3	4	0	2	2	3	2	2	3	0	2	0	3	2	3	2	70
KS	0	0	0	4	2	0	0	1	0	0	0	0	0	0	3	1	3	2	2	0	0	0	1	1	3	5	1	1	0	2	0	0	0	0	1	0	0	0	33
KY	0	0	1	1	4	0	0	0	1	1	0	1	1	0	0	1	2	1	2	1	1	0	0	0	2	0	1	1	1	1	2	3	1	3	3	4	1	0	41
LA	0	0	0	1	3	0	1	0	1	1	0	2	0	0	2	1	6	2	8	2	2	1	1	0	0	1	2	0	6	0	1	1	0	0	1	1	1	0	48
MA	0	9	3	6	5	1	4	7	4	5	6	5	11	13	22	24	27	25	27	20	34	17	12	12	18	16	18	17	14	7	9	9	9	10	13	9	8	3	459
MD	1	2	3	3	2	0	2	2	4	3	0	1	0	0	6	7	4	12	10	5	8	2	2	5	4	1	1	1	2	2	4	2	1	4	2	6	2	1	117
ME	0	0	0	1	2	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
MI	0	2	2	2	5	5	6	6	6	6	1	2	3	4	6	8	6	11	5	10	4	3	1	4	4	5	6	1	1	2	1	1	3	3	2	2	2	3	144
MN	0	0	1	6	9	2	3	4	2	6	1	3	3	11	7	1	16	8	6	10	12	5	3	4	12	9	6	9	5	3	4	3	2	1	2	6	2	2	189
MO	0	3	4	6	6	3	5	1	0	4	6	3	2	7	3	3	6	4	6	4	3	4	5	4	3	3	5	5	2	4	1	1	3	2	2	2	1	2	128
MS	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	2	4	0	0	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	15
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
NC	0	0	0	4	7	1	2	2	4	3	2	2	4	9	3	10	1	11	9	3	6	4	4	6	3	2	5	6	5	2	0	5	6	5	7	3	3	2	151
ND	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	6
NE	1	0	0	1	0	0	1	2	0	0	0	0	0	2	4	4	1	1	1	1	1	0	1	0	1	0	3	0	0	1	2	0	0	0	1	0	0	0	29
NH	0	0	0	1	0	0	0	0	2	0	0	2	0	0	0	4	4	1	2	2	5	1	0	1	3	1	0	1	2	0	0	1	0	0	2	1	0	0	36
NJ	0	5	6	10	8	1	3	2	5	4	6	9	5	7	11	22	11	23	17	26	15	11	7	10	6	9	8	9	6	4	5	5	7	5	6	12	2	4	312
NM	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
NV	0	0	0	0	0	0	0	0	0	0	1	1	1	1	3	1	2	2	6	6	4	1	2	2	2	1	3	0	1	1	1	1	2	3	2	0	2	1	53
NY	1	16	11	13	11	6	10	10	13	12	5	9	13	11	20	23	20	23	22	33	32	16	21	21	13	23	17	16	11	15	6	16	12	8	18	21	10	8	566
OH	1	9	2	8	16	5	8	6	3	4	3	4	3	4	12	12	13	18	13	12	8	6	5	2	14	6	5	3	4	2	3	9	2	4	5	6	2	1	243
OK	0	0	1	2	1	2	1	0	1	1	2	2	2	1	3	4	0	4	3	4	4	4	1	4	4	0	1	1	0	0	1	1	3	1	1	4	1	0	65
OR	0	0	0	1	0	0	0	0	1	0	2	1	0	0	3	5	7	5	4	6	1	3	2	4	3	5	2	2	3	2	2	0	1	1	1	1	1	0	69
PA	0	7	4	4	8	3	1	4	9	2	2	9	13	9	12	13	16	20	17	15	13	8	5	4	12	7	8	6	9	5	10	6	5	2	6	7	5	3	289
RI	0	0	1	1	2	1	1	0	0	0	1	1	1	0	0	1	0	2	4	2	0	0	0	1	0	0	1	2	3	1	1	0	0	3	1	1	2	2	36
SC	0	0	0	0	0	1	0	0	0	1	1	0	0	5	0	3	0	0	3	0	0	2	0	1	0	0	0	1	1	0	0	0	1	0	2	1	0	3	26
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	6
TN	0	1	3	3	2	1	1	2	2	1	0	1	1	3	5	7	10	6	10	12	7	1	1	3	1	0	6	8	1	1	1	2	2	4	6	3	2	1	121
TX	1	13	11	14	20	7	5	8	11	11	14	14	18	25	29	35	36	54	42	40	31	32	24	19	24	30	29	28	30	15	19	16	13	19	15	30	15	10	807
UT	0	0	0	0	1	0	0	2	1	2	1	2	3	3	2	0	5	1	3	1	5	1	2	3	2	3	1	2	1	0	2	3	0	1	1	1	2	0	57
VA	0	1	4	3	4	2	3	4	1	2	3	3	2	3	9	8	8	11	20	10	14	9	7	4	10	10	9	7	3	3	7	8	3	3	2	12	2	2	216
VT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
WA	1	2	0	1	5	1	3	1	1	5	2	1	4	2	2	3	5	6	9	8	10	5	2	2	4	4	1	7	6	2	1	5	3	2	0	4	3	3	126
WI	0	0	0	2	0	0	0	1	0	1	0	2	2	4	1	7	2	7	3	4	6	1	2	1	4	2	6	3	2	1	2	2	1	2	0	3	0	0	74
WV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	6
Total	11	105	94	153	208	70	107	107	123	123	104	141	172	218	278	364	401	441	459	429	468	263	196	218	252	263	261	245	205	146	162	160	146	142	184	210	115	78	7822

Table 3: Regression analyses of the market's valuation of innovation

The sample consists of 103,998 firm-years for 9,305 unique U.S. firms described in Table 2 Panel A. The dependent variable is the natural logarithm of the firm's Tobin's q. In each model we control for whether the respective innovation measure is zero. Firm characteristics include size, leverage, and ROA. All coefficients are estimated by OLS. Industry fixed effects use 3-digit SIC and state fixed effects are based on headquarters location. Robust standard errors are clustered at the state of incorporation level. All other variables are defined in Appendix A. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

	Dependent variable: *ln*(Tobin's q)					
RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Innovation	0.091**	0.133**	0.105**	0.151**	0.089**	0.141**
	(0.040)	(0.022)	(0.036)	(0.020)	(0.031)	(0.024)
RDTC	0.026	0.083***	0.006	0.066*	0.006	0.012
	(0.578)	(0.031)	(0.748)	(0.071)	(0.767)	(0.656)
RDTC × Innovation	1.390***	2.480***	0.213**	0.582***	0.758***	1.059***
	(0.004)	(0.000)	(0.037)	(0.000)	(0.002)	(0.004)
Firm characteristics	No	Yes	No	Yes	No	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	103,998	103,998	103,998	103,998	103,998	103,998
R^2	0.581	0.694	0.581	0.695	0.581	0.694
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Table 4: Acquisition decision

The sample consists of 103,998 firm-years for 9,305 unique U.S. firms described in Table 2 Panel A. The dependent variable is one if the firm makes an acquisition in a given year and zero otherwise in Panel A, the natural logarithm of one plus the number of acquisitions made by the firm in a given year in Panel B, and the natural logarithm of one plus the total value of all acquisitions made by the firm in a given year in Panel C. Firm characteristics include size, Tobin's q, leverage, ROA, and R&D/assets. All coefficients are estimated by OLS due to the use of high dimensional fixed effects. Industry fixed effects use three-digit SIC and state fixed effects are based on the state of incorporation. Robust standard errors are clustered at the state of headquarters level. All variables are defined in Appendix A. We report *p*-values in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Probability of making an acquisition

RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	0.023**	0.035***	0.010**	0.011**	0.018***	0.023***
	(0.019)	(0.001)	(0.020)	(0.010)	(0.006)	(0.000)
Firm characteristics	No	Yes	No	Yes	No	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	103,998	103,998	103,998	103,998	103,998	103,998
R^2	0.226	0.234	0.227	0.224	0.227	0.234
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Panel B: Number of acquisitions

RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	0.022***	0.031***	0.009**	0.010***	0.014***	0.018***
	(0.002)	(0.001)	(0.028)	(0.001)	(0.002)	(0.000)
Firm characteristics	No	Yes	No	Yes	No	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	103,998	103,998	103,998	103,998	103,998	103,998
R^2	0.234	0.243	0.235	0.225	0.235	0.243
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Panel C: Total acquisition value

RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	0.109*	0.157***	0.090***	0.094***	0.054**	0.076***
	(0.072)	(0.006)	(0.004)	(0.001)	(0.023)	(0.005)
Firm characteristics	No	Yes	No	Yes	No	Yes
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	103,998	103,998	103,998	103,998	103,998	103,998
R^2	0.276	0.285	0.240	0.249	0.276	0.248
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Table 5: R&D spending and acquisition decision

The sample consists of 103,998 firm-years for 9,305 unique U.S. firms described in Table 2 Panel A. The dependent variable is R&D expenditure in Panel A and Koh and Reeb (2015) imputed R&D using two-digit SIC industry average for firms with missing R&D spending in Panel B. In models 1, 2, 5, and 6, R&D is scaled by assets. In models 3 and 4, the dependent variable is *ln*(1+R&D spending). Firm characteristics include size, Tobin's q, leverage, and ROA. All coefficients are estimated by OLS due to the use of high dimensional fixed effects. Industry fixed effects use three-digit SIC and state fixed effects are based on the firm's state of incorporation. Robust standard errors are clustered at the state of headquarters level. All other variables are defined in Appendix A. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: R&D

Dependent variable =	R&D / assets		*ln*(1+R&D)		R&D / assets	
RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	0.001	0.006	0.455***	0.399***	0.004	0.005
	(0.932)	(0.313)	(0.000)	(0.000)	(0.500)	(0.282)
Bid (0,1)	-0.002***	-0.005***	-0.111***	-0.047***	-0.002***	-0.005***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)
RDTC x Bid (0,1)	-0.017**	-0.021***	-0.031***	-0.021*	-0.004***	-0.002**
	(0.012)	(0.009)	(0.000)	(0.062)	(0.005)	(0.035)
Firm characteristics	No	Yes	No	Yes	No	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	103,998	103,998	103,998	103,998	103,998	103,998
R^2	0.575	0.645	0.945	0.951	0.575	0.645
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Panel B: Industry average imputed R&D

Dependent variable =	R&D / assets		*ln*(1+R&D)		R&D / assets	
RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	0.007	0.000	0.401***	0.369***	0.005	0.002
	(0.470)	(0.912)	(0.000)	(0.000)	(0.339)	(0.671)
Bid (0,1)	-0.003***	-0.001***	-0.122***	-0.066***	-0.004***	-0.004***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.003)
RDTC x Bid (0,1)	-0.011**	-0.013**	-0.025**	-0.022*	-0.002**	-0.002*
	(0.020)	(0.019)	(0.032)	(0.072)	(0.046)	(0.067)
Firm characteristics	No	Yes	No	Yes	Yes	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	103,998	103,998	103,998	103,998	103,998	103,998
R^2	0.672	0.723	0.918	0.923	0.672	0.723
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Table 6: Are high R&D targets more attractive?

The sample consists of 7,822 completed domestic M&A from the SDC M&A database made by 3,612 unique U.S. acquirers described in Table 2 Panel B. In Panel A, the dependent variable equals one if the bidder acquires a high R&D target and zero otherwise. In Panel B, the dependent variable equals one if SDC indicates that the bid offer is revised upward and zero otherwise. Deal characteristics include relative size, private target (0,1), subsidiary target (0,1), all cash payment (0,1), tender offer (0,1), hostile deal (0,1), competed deal (0,1), toehold (0,1), lock up (0,1), merger of equals (0,1), and diversifying deal (0,1). Acquirer characteristics include size, Tobin's *q*, leverage, ROA, and R&D, and these variables are measured at the fiscal year end before deal announcement. All variables are defined in Appendix A. All coefficients are estimated by OLS. Industry fixed effects use three-digit SIC and state fixed effects are based on the acquirer's state of incorporation. Robust standard errors are clustered at the state of headquarters level. All variables are defined in Appendix A. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: R&D targets

RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	0.195**	0.119*	0.073***	0.040***	0.098*	0.089*
	(0.019)	(0.058)	(0.000)	(0.000)	(0.075)	(0.083)
Deal characteristics	No	Yes	No	Yes	No	Yes
Acquirer characteristics	No	Yes	No	Yes	No	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	7,822	7,822	7,822	7,822	7,822	7,822
R^2	0.321	0.404	0.352	0.410	0.320	0.403
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Panel B: Bid offer upward revision

RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	0.271**	0.243**	0.005*	0.005**	0.017**	0.015*
	(0.036)	(0.040)	(0.060)	(0.043)	(0.023)	(0.066)
Deal characteristics	No	Yes	No	Yes	No	Yes
Acquirer characteristics	No	Yes	No	Yes	No	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	7,822	7,822	7,822	7,822	7,822	7,822
R^2	0.075	0.289	0.097	0.229	0.071	0.262
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Table 7: Acquirer performance

In Panel A, the sample consists of 7,822 completed domestic M&A from the SDC M&A database made by 3,612 unique U.S. acquirers described in Table 2 Panel B. The dependent variable is the acquirer's cumulative abnormal return (CAR) during the three-day window period around the deal announcement date. Deal characteristics include relative size, private target (0,1), subsidiary target (0,1), all cash payment (0,1), tender offer (0,1), hostile deal (0,1), competed deal (0,1), toehold (0,1), lock up (0,1), merger of equals (0,1), and diversifying deal (0,1). In Panel B, the sample consists of 1,994 M&A deals from the original sample described in Table 2 Panel B in which we can calculate the change in operating performance after the deal completion. The dependent variable is the change in the combined firm's operating performance. Deal characteristics include relative size, all cash payment (0,1), tender offer (0,1), hostile deal (0,1), competed deal (0,1), toehold (0,1), lock up (0,1), merger of equals (0,1), and diversifying deal (0,1). In both panels, acquirer characteristics include size, Tobin's q, leverage, ROA, and R&D, and these variables are measured at the fiscal year end before deal announcement. All variables are defined in Appendix A. All coefficients are estimated by OLS. Industry fixed effects use three-digit SIC and state fixed effects are based on the acquirer's state of incorporation. Robust standard errors are clustered at the headquarters state level. All variables are defined in Appendix A. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Acquirer short term announcement return

RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	-0.029***	-0.022**	-0.004***	-0.003**	-0.014**	-0.011*
	(0.000)	(0.030)	(0.001)	(0.011)	(0.033)	(0.052)
Deal characteristics	No	Yes	No	Yes	No	Yes
Acquirer characteristics	No	Yes	No	Yes	No	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	7,822	7,822	7,822	7,822	7,822	7,822
R^2	0.245	0.259	0.246	0.269	0.245	0.267
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Panel B: Acquirer post-deal accounting performance

RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	-0.025**	-0.027***	-0.006**	-0.004*	-0.015***	-0.016**
	(0.017)	(0.007)	(0.015)	(0.061)	(0.002)	(0.015)
Deal characteristics	No	Yes	No	Yes	No	Yes
Acquirer characteristics	No	Yes	No	Yes	No	Yes
Target characteristics	No	Yes	No	Yes	No	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	1,994	1,994	1,994	1,994	1,994	1,994
R^2	0.434	0.534	0.434	0.535	0.433	0.535
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Table 8: Acquisition premium and deal synergy

The sample consists of 2,302 M&A deals from the original sample described in Table 2 Panel B in which offer premium, synergy, and target firm data are available. In Panel A, the dependent variable is the four-week acquisition premium reported by SDC and winsorized at 0% and 200%. In Panel B, the dependent variable is the deal synergy proxied by the combined acquirer and target's cumulative abnormal return (CAR) during the three-day window period around the deal announcement date. Deal characteristics include relative size, all cash payment (0,1), tender offer (0,1), hostile deal (0,1), competed deal (0,1), toehold (0,1), lock up (0,1), merger of equals (0,1), and diversifying deal (0,1). Acquirer and target characteristics include size, Tobin's q, leverage, ROA, and R&D, and these variables are measured at the fiscal year end before deal announcement. All variables are defined in Appendix A. All coefficients are estimated by OLS. Industry fixed effects use three-digit SIC and state fixed effects are based on the acquirer's state of incorporation. Robust standard errors are clustered at the headquarter state level. All variables are defined in Appendix A. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Acquisition premium

Dependent variable =	Offer premium		*ln*(1+dollar premium)		Offer premium	
RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	0.509**	0.385**	0.338***	0.147**	0.123*	0.154**
	(0.014)	(0.036)	(0.000)	(0.046)	(0.064)	(0.030)
Deal characteristics	No	Yes	No	Yes	No	Yes
Acquirer characteristics	No	Yes	No	Yes	No	Yes
Target characteristics	No	Yes	No	Yes	No	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	2,302	2,302	2,302	2,302	2,302	2,302
R^2	0.384	0.450	0.461	0.475	0.380	0.450
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Panel B: Deal synergy

RDTC measure =	RDTC rate		*ln*(1+RDTC value)		RDTC carry forward	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
RDTC	-0.056***	-0.030***	-0.003**	-0.003*	-0.012*	-0.010*
	(0.000)	(0.001)	(0.012)	(0.061)	(0.051)	(0.056)
Deal characteristics	No	Yes	No	Yes	No	Yes
Acquirer characteristics	No	Yes	No	Yes	No	Yes
Target characteristics	No	Yes	No	Yes	No	Yes
State × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	2,302	2,302	2,302	2,302	2,302	2,302
R^2	0.340	0.399	0.340	0.393	0.289	0.298
Regression's *p*-value	0.000	0.000	0.000	0.000	0.000	0.000

Appendix A: Variable definitions

Variable	Definition	Source
RDTC rate	R&D tax credit rate given by the state in which the firm is headquartered and which has passed a R&D Tax Credit law by the firm's fiscal year end date, and zero otherwise.	Girardi (2016)
RDTC value	RDTC rate multiplied by the firm's average R&D spending in the most recent three year and zero otherwise.	Girardi (2016), Compustat
RDTC carry forward	The number of years for tax credit carry forward given by the state in which the firm is headquartered and which has passed a R&D Tax Credit law by the firm's fiscal year end date, and zero otherwise. It is set to 100 if the tax credit is refundable in case it exceeds the tax liability.	Girardi (2016)
Bid (0,1)	One if the firm makes an M&A bid in a given year	SDC, Compustat
Number of bids	The total number of M&A bids made by the firm in a given year	SDC, Compustat
Bid value	The total value of all M&A bids made by the firm in a given year	SDC, Compustat
Acquirer CAR	Acquirer's three-day cumulative abnormal return calculated using excess stock return over CRSP value weighted return relative to the announcement date	CRSP
Offer premium	the offer price divided by the target's stock price four weeks before the merger announcement date, as reported by SDC and limited between 0% and 200%	SDC
Combined CAR	Acquirer's three-day cumulative abnormal return calculated using excess stock return over CRSP value weighted return relative to the announcement date	CRSP
Post-deal change in operating performance	the change in the combined firm's average ROA three years after deal completion compared to the weighted average ROA of the acquirer and the target before the deal, with the weights being their respective market value of assets measured a month before deal announcement	CRSP, Compustat
Post deal goodwill write-off (0,1)	one if the acquirer reports an impairment of goodwill related to the merger during the period of two years after the completion date	Compustat
Size	Natural logarithm of one plus market value of equity (*csho* × *prcc_f*)	Compustat
Tobin's q	Market value of assets over book value of assets: (*at* − *ceq* + *csho* × *prcc_f*)/*at*	Compustat
Leverage	Total debt/Market value of total assets: (*dltt* + *dlc*)/(*at* − *ceq* + *csho* × *prcc_f*)	Compustat
ROA	Return on assets (*oibdp*/*at*)	Compustat
R&D	Research and development spending scaled by assets (*xrd*/*at*), set to zero if missing	Compustat
Number of patents	The total number of patents granted in the year scaled by assets, set to zero if missing	Kogan et al (2017)

Relative size	Deal value/Acquirer's market value of equity two days before the deal announcement	SDC, Compustat
Private target (0,1)	One for private targets, zero otherwise	SDC
Subsidiary target (0,1)	One for subsidiary targets, zero otherwise	SDC
All cash payment (0,1)	One for purely cash financed deals, zero otherwise	SDC
Tender offer (0,1)	One for tender offers, zero otherwise	SDC
Hostile deal (0,1)	One for hostile deals, zero otherwise	SDC
Competed deal (0,1)	One for competed deals, zero otherwise	SDC
Toehold (0,1)	One if the acquirer owns shares in the target before the deal announcement, zero otherwise	SDC
Lock up (0,1)	One if the deal includes a lockup of target shares, zero otherwise	SDC
Merger of equals (0,1)	One if the deal is a merger of equals, zero otherwise	SDC
Diversifying deal (0,1)	One if the acquirer and the target do not belong to the same two-digit SIC	SDC, Compustat
High R&D target (0,1)	One if the target firm belongs to an industry that is in the top quartile of R&D spending across all industries in the fiscal year before deal announcement	Compustat