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Right-to-work laws and venture capital investment

Helena Sarkodie^a, Kwabena Boasiako^b, Michael O'Connor Keefe^{a,b,*}, Justin Nguyen^c, Bernard Tawiah^d

^a Victoria University of Wellington School of Economics and Finance, PO Box 600, Wellington 6140, New Zealand

^b Manchester Metropolitan University All Saints, M15 6BH, Manchester, UK

^c Edith Cowan University School of Business and Law, Australia

^d Dixie Leavitt School of Business Southern Utah University, United States of America

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ABSTRACT

Using state-level data from the United States covering the period 1980 to 2020, we explore the effect of right-to-work (RTW) laws on venture capital (VC) investment. Employing a difference-in-differences strategy, we find that the passage of right-to-work laws increases venture capital investment. The results are robust to omitted variable bias, reverse causality and unobservable local economic conditions. We find that the positive effect of RTW laws on VC investments remains significant in states that are highly unionized and technological.

1. Introduction

The 1947 Taft-Hartley Act amended the National Labour Relations Act (NLRA) of 1935 by reaffirming states' constitutional right to establish "right-to-work" (RTW) laws. RTW laws allow workers to join a unionized workplace without paying union dues. Currently, 27 states in the United States have passed RTW laws.¹ Employees in RTW law states are protected by union-negotiated Collective Bargaining Agreements (CBAs). RTW laws increase the attractiveness of the labor force in a state to emerging industries and encourage economic growth (Palomba and Palomba, 1971). The introduction of RTW laws increase employment (Holmes, 1998), reduce financial leverage (Matsa, 2010), boost overall economic and market efficiency (Eisenach, 2015), decrease labor unions' bargaining power (Chava et al., 2020) and increase innovation (Nguyen and Qiu, 2022). This study empirically examines the effect of RTW laws on venture capital investment.

Labor unions are organizations that represent employees. Following the enactment of the NLRA in 1935, labor unions in the US gained enormous authority (Marciukaityte, 2015). In states where there are no RTW laws, unions receive union fees or dues from all workers employed even when those employees do not wish to be covered by

unions. Besley and Burgess (2004) use data from India to show that strong labor rights are linked to reduced economic development and investment. Similarly, Bruno (2015) argues that unionization increases unemployment, and reduces economic development and job growth. Using a regression discontinuity methodology, Bradley et al. (2017) discover that unionization inhibits corporate innovation. Additionally, although unions raise the average wages of the workers they represent, they also create additional expenses for businesses, owners, and some employees (Chen et al., 2012; Frandsen, 2010). While these studies highlight the downsides of unionization, Acharya et al. (2013) find a contrasting result and show that strong labor rights help companies innovate, which is a key driver of economic growth. They argue that by minimizing the likelihood of holdup, these laws promote employees' innovative endeavors and incentivize companies to pursue risky projects.

Venture capital investment is an important source of financing for newly established innovative firms. Rin et al. (2013) defined venture capital as "the professional asset management activity that invests funds raised from institutional investors, or wealthy individuals, into promising new ventures with high growth potential". Venture capital is

* Corresponding author.

E-mail addresses: helena.sarkodie@vuw.ac.nz (H. Sarkodie), k.boasiako@mmu.ac.uk (K. Boasiako), michael.keefe@vuw.ac.nz (M.O. Keefe), hung.nguyen@ecu.edu.au (J. Nguyen), bernardtawiah@suu.edu (B. Tawiah).

¹ On the 28th August, 2017, Missouri state governor Eric Greitens signed the bill into law that will allow Missouri state to be a RTW law state and become the 28th State. However, in 2018, union organizers freeze this law by gathering about 300,000 signatures to repeal the passing of the RTW law and put it on the ballot for voters to decide. About 67 percent of voters in Missouri voted against this law (<https://www.npr.org/2018/08/08/636568530/missouri-blocks-right-to-work-law>)

a major source of funding for start-up businesses, especially for projects requiring a high level of “learning” and “innovation” (Bergemann and Hege, 1998). The literature identifies several benefits (apart from funding) that venture capital provides. Among them are enhancing innovation (Celikyurt et al., 2014), improving productivity (Chemmanur et al., 2011), and fostering firm-to-firm strategic alliances (Lindsey, 2008). Xing et al. (2017) argue that, when unions and venture capitalists meet, both act as powerful stakeholders with divergent interests when venture capitalists frequently possess majority control while labor unions enhance the collective bargaining position of employees. Consequently, VC investors normally choose to invest in environments where labor rights are not strong (Xing et al., 2017). RTW laws diminish the bargaining power of labor unions, thereby restricting their capacity to negotiate for higher wages (Chava et al., 2020). This decreases costs and boosts the firm profitability. Due to higher expected returns to VC investors, we hypothesize that VC investors increase investment in states that implement RTW laws.

Employing difference-in-differences regression techniques, we analyze this hypothesis based on US state-level venture capital investment data obtained from the Refinitiv database for the period 1980 to 2020. The results support our hypothesis and demonstrate that the adoption of Right-to-Work (RTW) laws increases venture capital (VC) investment. We conduct additional tests to address potential endogeneity concerns of our baseline result. First, we test for the parallel trend assumption to investigate the possible existence of reverse causality affecting our baseline result. According to Chava et al. (2013) and Kroszner and Strahan (1999), the timing of the RTW laws in various states may be influenced by state-level factors manifesting differently from state to state. If the magnitude of venture capital investment in the states differ, these differences propelled the passage of the RTW laws, indicating a possible reverse causality between VC investment and the RTW laws. In the case that reverse causality exists, changes in venture capital investment should be seen before the RTW law event. The result before the passage of the RTW laws are insignificant supporting that our baseline result is not affected by reverse causality.

Next, we follow Nguyen and Qiu (2022) and Chen et al. (2021) and use states that are contiguous to RTW laws states to address the likelihood that unobservable local economic conditions might affect our results. We use states that are closer or share border with RTW laws states as control and re-estimate the baseline regression with these new control states. Economic activities in these neighboring states may be causing a spillover effect and could potentially be the driving force behind VC investment in these RTW laws states. If the Right-to-Work (RTW) laws themselves are the primary drivers of VC investment in RTW laws states, rather than economic activities in neighboring states, we would expect our results with the new sample to be positive and significant. Our results remain positive and statistically significant, indicating that RTW laws increase VC investments rather than local economic conditions.

We conduct further analysis to show the impact of the RTW laws on VC investments. We use state-level union coverage to test the assumption that RTW laws reduces labor unions’ bargaining power. Based on this assumption, we expect the impact of RTW laws to be strong among highly unionized states. To address the potential influence of right-to-work (RTW) law adoption on union coverage and minimize the issue of reverse causality, we define the union coverage data to the year 1980. We interact high unionized states ($Union(0/1)_{s,t}$) with RTW law ($RTW(0/1)_{s,t}$) and re-estimate the baseline regression. The findings show that the impact of RTW laws is higher in states that have high union coverage validating the notion that RTW laws are perceived as an external factor that negatively impacts and causes disruption to labor unions. Additionally, we test if alternative scenarios (e.g. selection) influence VC investments other than RTW laws. This is because, venture capitalists might deliberately choose (select) states that they would want to invest in Xing et al. (2017). We use high-tech states as a proxy to investigate this assumption as they are associated

with innovation which increases productivity. As a result, venture capitalists may choose (select) to make investment in high-tech states. We expect our result to be insignificant if selection is the key driver of VC investment and not RTW laws. Our result is still positive indicating that selection does not influence the impact of RTW laws on VC investment.

Also, our result might be affected by an omitted variable bias that occurs concurrently with the adoption of RTW laws. When that happens, then the changes in venture capital investment that we attribute to RTW laws are only correlated and not causal. Although the staggered enactment of RTW laws reduce the likelihood of an omitted variable coinciding with RTW laws, we follow the approach of Cornaggia et al. (2015) and perform a falsification test to address this concern. The results are presented in Appendix A.1. To conduct this test, we randomly assigned states to the distribution of years in which the different RTW laws were passed. The distribution of years in which RTW laws were passed is maintained, but it interrupts the accurate association of states with the years in which the laws were passed. If there are no unobservable shocks present in our test, our re-estimated findings should be insignificant or weaker. Thus, falsely assumed RTW laws should have no impact on VC investment. The results of our randomized RTW laws estimation is insignificant and this non-result minimizes the possibility of an omitted variable bias.

Our paper adds to the existing body of literature on labor law and finance (e.g. Serfling, 2016; Qiu and Wang, 2018 and Ertugrul and Marciukaityte, 2021) and specifically, to the research on the economic effects of the RTW laws (e.g. Nguyen and Qiu, 2022; Chava et al., 2020 and Makridis, 2019). Nguyen and Qiu (2022) find that there is a positive relationship between RTW laws and corporate innovation. They argue that the adoption of RTW laws weakens labor unions bargaining power. This reduces the financial leverage of firms and in turn reduces firms’ distress level, causing firms to innovate more. Also, Chava et al. (2020) assert that RTW laws cause state wage growth to be less than average and causes treated firms to increase capital expenditure, employment, and profitability while reducing leverage. Moreover, Makridis (2019) argues that RTW laws increase union competition, which improves union workers’ economic and life happiness. Our research makes a novel contribution to this body of literature by presenting evidence that the passage of RTW laws have a positive relationship with venture capital investment.

Furthermore, our paper contributes to entrepreneurial finance and VC investment literature (eg. Chemmanur et al., 2011, 2012; Guo and Jiang, 2013; Celikyurt et al., 2014 and Cao et al., 2015). Using Longitudinal Research Database (LRD) of the U.S. Census Bureau, Chemmanur et al. (2011) show that venture capital investment increases firm productivity. Chemmanur et al. (2012) also discover that VC-backed firms have higher management quality and that VC backing and having quality management leads to higher post-IPO performance. Guo and Jiang (2013) discover that firms receiving VC funding exhibit better performance in various metrics such as profitability, labor productivity, sales growth and research and development investment as compared to non-VC-backed firms. Additionally, their study also demonstrates that having VC directors on the board of mature firms is positively linked to greater innovation. Similarly, Cao et al. (2015) document that firms backed by venture capital are more innovative.

Lastly, our paper explores studies on labor law and VC investment (eg. Cumming et al., 2010; Cumming and Li, 2013; Castellaneta et al., 2016; Xing et al., 2017; Gu et al., 2022 and Wang and Yung, 2024). Castellaneta et al. (2016) document how a court ruling in favor of the Inevitable Disclosure Doctrine (IDD) boosts VC investments by assuring investors that the core employees and trade secrets of the VC-backed companies can be retained. In contrast, Gu et al. (2022) show that because the Inevitable Disclosure Doctrine (IDD) limits labor mobility, it decreases the chance of VC investment. They argue that restricted labor mobility makes it more challenging for start-ups to hire the necessary talent from outside sources and also lessens the motivation of current employees to put in extra effort. Using a sizable sample

of companies that underwent an initial public offering between 1983 and 2013, Xing et al. (2017) discover that companies that receive VC funding and operate within industries with high levels of unionization tend to have a lower Tobin's Q and a decreased likelihood of survival. Furthermore, Cumming et al. (2010) argue that cross-country differences in legality have a significant impact on the governance structure of investments in the VC industry. They further argue that better laws facilitate faster deal screening and deal origination. Cumming and Li (2013) find that reduced labor frictions and increased Small Business Innovation Research (SBIR) awards are linked with higher levels of venture capital per population. Using a difference-in-differences approach, Wang and Yung (2024) demonstrate that the adoption of wrongful discharge laws across U.S. states reduces VC investments.

The remaining sections of the paper are as follows. The literature review and hypothesis development are covered in Section 2 while the construction of data and variables is covered in Section 3. We test our hypothesis, analyze the findings and conduct robustness and further tests in Section 4. Finally, Section 5 concludes and summarizes our main findings.

2. Literature review and hypothesis development

Matsa (2010) examines how firms use debt financing to enhance their bargaining power against labor unions. The author finds that firms located in states with high union membership experienced a decrease in both their book and market leverage after the passage of RTW laws in the 1950s and 1960s. This finding confirms the idea that businesses use leverage to increase their negotiating position with unions. Similarly, Marciukaityte (2015) finds that leverage decisions made by unionized companies are significantly impacted by RTW laws. The author asserts that unionized firms in non-RTW laws states increase leverage following an election victory by the Democrats and unionized firms also have a high non-cash asset retention rate, which leads to high market-to-book ratios.

Furthermore, Chava et al. (2020) find that RTW laws tend to reduce unionized workers' pay while increasing profits and the labor-to-assets ratio of labor-intensive businesses. Using information from collective bargaining agreements, they discover that there is a decline in salaries for unionized workers following the passage of RTW laws. The adoption of RTW laws also lead to an increase in employment, investment, dividends, executive compensation, and a reduction in financial leverage. Based on country-level changes in dismissal legislation, Acharya et al. (2013) find that strict dismissal laws make a firm more innovative. They argue that stringent labor laws drive an organization and its workforce to engage in innovative, value-adding activities. Their findings complement that of Acharya et al. (2014), who found that US firms innovate more and start new firms after the gradual passage of wrongful-discharge laws by US states.

Marciukaityte (2015) posits that unionization reduces the amount of free cash flow while also increasing risk. Not all firms affected by high union fees pass these costs (high union fees) on to their customers by raising prices. If firms increase their prices, it reduces their customer base which affects the finances of the firm. Unionized businesses' internal funding is limited by their lower profitability, and their higher risk makes external equity financing more expensive (Chen et al., 2012). As a result, unionization reduces capital expenditures in unionized firms, especially when unions are powerful. Despite the fact that unionized workers receive high average salaries, no evidence exists to suggest that unionized firms are able to recruit more qualified employees as a result of this higher pay.

Because the union's objectives differ from those of the firm as a whole, this introduces a classic agency problem, potentially leading to real inefficiencies. Frandsen (2010) finds that unions are associated with increased turnover of high-productivity employees and decreased turnover of low-productivity employees, which may result in a lower-quality workforce. Fallick and Hassett (1999) link unions to reduced

R&D expenditures, suggesting that this agency problem diminishes investment. Hirsch (1992) analysis of 706 publicly traded companies in the United States from 1972 to 1980 demonstrates that unionized firms make lower investments in capital and research and development. Likewise, using data from 1962 to 1984, Fallick and Hassett (1999) find a drop in the following year's investments after unions win certification elections.

Using data spanning from 1984 to 2009, Chen and Chen (2013) provide evidence to support the inverse correlation between unionization and investment. Overall, their research shows that unionization and investment have a negative relationship, which implies a positive relationship between investments and firms in RTW laws states. By influencing the level of venture capital involvement, labor unions decrease the benefits of VC financing. According to Bozkaya and Kerr (2014), venture capitalists prefer companies with high labor flexibility. When confronted with strong labor rights, venture capitalists may opt to cut their investments in new companies or sell their shares in these firms earlier than they would under normal circumstances. Labor market rigidity is widely regarded and regularly highlighted as a significant factor influencing the intensity of venture capital investment. As a result of the preceding arguments, the following hypothesis emerges:

Hypothesis: The passage of RTW laws leads to an increase in Venture Capital (VC) investments.

In contrast to the prevailing literature, labor unions have the potential to significantly enhance organizational productivity by optimizing the channels of communication between the labor force and management (Freeman and Medoff, 1984). Furthermore, the proactive involvement of unions can play a pivotal role in bolstering employees' morale and motivation within the workplace. Labor unions function as invaluable repositories of data, offering firms valuable insights into the preferences of their workforce. This, in turn, empowers organizations to make judicious decisions pertaining to the alignment of working conditions, workplace regulations, and wage structures. The cumulative effect of these endeavors may culminate in the cultivation of a more contented, cooperative, and industrious workforce, which, in a broader context, leads to a high firm performance (Laroche, 2021). Consequently, this is likely to draw the interest of venture capital investors who are naturally drawn to companies with strong profit potential, offering the prospect of increased returns on their investments.

Employment protection laws provide job security for employees; these laws safeguard employees against arbitrary dismissals and limit the conditions under which employers can fire employees. Employment protection laws share similarities with labor unions in that they both aim to safeguard the rights and interests of workers. Both employment protection laws and labor unions advocate for workers' well-being and job security, albeit through different means. According to research by Manso (2011), an organization's innovation-motivating incentive scheme must reward long-term success and tolerate early failure, which suggests that job security is critical in promoting innovation at the workplace. Thus, the presence of labor unions will attract VC investors due to increased innovation. Based on this literature the effect of RTW laws on VC investment is muted.

3. Data and methodology

3.1. Variable construction

The Taft-Hartley Act of 1947, Section 14(b), empowered states to preclude union security clauses that compel an employee to compulsorily obtain union membership at their workplace. By 2018, twenty-seven (27) states outlawed such agreements (Chava et al., 2020). When a state adopts a RTW law, employees choose whether to join a union. Joining a union or paying union dues ceases to be a condition of employment in a RTW law state. The unions' financial resources are reduced as a result of losing the fees that they previously obtained

Table 1
State Adoptions of RTW Laws in the US.

State	State name	Year RTW	State	State name	Year RTW
AL	Alabama	1953	MT	Montana	
AK	Alaska		NE	Nebraska	1947
AZ	Arizona	1947	NV	Nevada	1952
AR	Arkansas	1947	NH	New Hampshire	
CA	California		NJ	New Jersey	
CO	Colorado		NM	New Mexico	
CT	Connecticut		NY	New York	
DE	Delaware		NC	North Carolina	1947
FL	Florida	1943	ND	North Dakota	1948
GA	Georgia	1947	OH	Ohio	
HI	Hawaii		OK	Oklahoma	2001
ID	Idaho	1986	OR	Oregon	
IL	Illinois		PA	Pennsylvania	
IN	Indiana	2012	RI	Rhode Island	
IA	Iowa	1947	SC	South Carolina	1954
KS	Kansas	1958	SD	South Dakota	1947
KY	Kentucky	2017	TN	Tennessee	1947
LA	Louisiana	1976	TX	Texas	1947
ME	Maine		UT	Utah	1955
MD	Maryland		VT	Vermont	
MA	Massachusetts		VA	Virginia	1947
MI	Michigan	2013	WA	Washington	
MN	Minnesota		WV	West Virginia	2016
MS	Mississippi	1960	WI	Wisconsin	2015
MO	Missouri		WY	Wyoming	1963

This is a list of timelines of states in the US that have enacted the RTW law either through the states statutes or constitution.

from non-unionized workers. To draw in and keep members, unions must expend more effort. In the event that a union member feels that their interests are not being championed by their union, they are entitled to terminate their union membership and cease paying dues (Marciukaityte, 2015). RTW laws are becoming increasingly popular in the United State. For instance, in 1960, about 20% of all states implemented RTW laws, but by 2018, over 50% of states had done so (Makridis, 2019) (see Table 1).

We identify a total of 27 states that passed RTW laws between 1943 and 2020, with Florida (FL) being the first state to adopt RTW law in 1943 and Kentucky (KY) being the last state to adopt RTW law in 2017. We follow Chava et al. (2020) and Nguyen and Qiu (2022) and create an indicator variable in the year that a state implements the RTW (Right-to-Work) law. Twenty states passed the RTW laws prior to our sample period, and within our chosen period, seven additional states joined in to enact the law.

To assess the effects of RTW laws on venture capital investments, we collect initial State-level data from the Refinitiv database covering the years 1980 to 2020, which is our sample period. Our sample period begins in 1980 because the Refinitiv database has only limited amount of information on VC investments made prior to 1980. For instance, only twenty-three states have VC investment data as of 1970 but by 1980, Refinitiv reports VC investment data for almost all the states. Our sample of Venture Capital investments is sourced from firms based in the United States. We began by compiling a list of venture capital investment companies in the database. In the database, we predefine Corporate PE/Venture as an investment type in Eikon. We select the United States as the country and then execute by state, which lists VC investment by state. For each state and year, we create $Ln(VC investment)$ which is defined as the natural logarithm of total VC investment (equity invested) in state s in year t .

We account for several state-level controls that could influence venture capital investment. To capture state economic conditions, we follow Qiu and Wang (2018) and Chen et al. (2021) and include the following state-level controls: GDP per capita which is the ratio of state GDP to state population; State unemployment rate representing the rate of unemployment in the state; State establishment entry, which is the overall rate of establishing businesses in the state and State

establishment exit rate which is the total businesses exit rate in the state. The Bureau of Economic Analysis provides the data used to create the GDP per capita variable. The unemployment rates for each state were collected from the U.S. Bureau of Labor Statistics Local Area Unemployment Statistics Series while, state establishment entry and exit rates were obtained from the U.S. Census Bureau’s Business Dynamics Statistics database. For our baseline regression, all control variables are lagged by a year. A comprehensive description of the variables is presented in Table 2. To reduce the effect of outliers, we winsorize the variables at the 1% and the 99% level.

3.2. Estimation technique

We adopt a difference-in-differences strategy to investigate the impact of RTW laws on venture capital investment. To test the hypothesis, we estimate

$$Ln(VC investment)_{s,t} = \alpha + \delta RTW(0/1)_{s,t} + \beta X_{s,t-1} + \theta_t + \gamma_s + \epsilon \quad (1)$$

where t refers to the year and s to the state. The dependent variable, $Ln(VC investment)$ refers to the natural logarithm of venture capital investment (sum of all equity investment) in the state (Castellaneta et al., 2016); $RTW(0/1)_{s,t}$ is an indicator variable that switches to one in the year and subsequent years after a state passes the right to work law; $X_{s,t-1}$ represents state-level control variables; θ and γ represent year and state fixed effects, respectively. The term ϵ is a random error term. To address concerns about auto-correlation, we cluster standard errors at the state level since the treatment is defined at the state level.

We use states where the RTW laws had not yet been passed during a particular time period (including states that never adopted the RTW laws and those that later adopted them during the study period) to control for possible confounding effects. Due to the staggered nature of the passage of RTW laws at the state level, the fact that many states adopted the RTW laws at various times makes it possible for a given adopting state to serve as both a control and a treatment state, which is a significant benefit of the difference-in-differences approach. Furthermore, the model is unaffected by the fact that certain states adopted the RTW laws prior to the beginning of our sample period while others did not do so.

3.3. Univariate statistics

Table 3 presents an overview of the primary variables used in this research, including the number of observations, mean, standard deviation, 25th percentile, median, 75th percentile, minimum value, and maximum value. $Ln(VC investment)$ has a mean of 10.35 and a standard deviation of 2.506. Table 4 presents the correlation matrix of the variables used in this study. $Ln(VC investment)$ is positively correlated with $RTW(0/1)_{s,t}$. The correlation between the independent variable $RTW(0/1)_{s,t}$ and the dependent variables $Ln(VC investment)$ is consistent with the expected relationship.

4. Testing- RTW laws and venture capital investment

4.1. Baseline regression results

The findings from the baseline estimation in Eq. (1) are presented in Table 5. Across all specifications, we include year and state fixed effects to control for their effects. In columns (1) and (2), RTW law is not lagged but in columns (3) and (4), RTW law is lagged by one year. To demonstrate that the impact of RTW laws on venture capital investment requires some time, the RTW law variable is lagged by one year. We perform the regression analysis both without and with the control variables. In all models, the main variable of interest, RTW law, exhibits a positive and statistically significant coefficient. This result supports the hypothesis that the passage of RTW laws increases Venture Capital investment. We use the results in column (2) and (4) of

Table 2
Variable definitions.

Variable	Definition	Data source
$Ln(VC investment)$	Natural logarithm of the total amount of venture capital (equity invested) in each state s in year t	Refinitiv Eikon database
$RTW(0/1)_{s,t}$	An indicator variable indicating one if a state adopts the RTW law and zero if otherwise	Following (Chava et al., 2020; Nguyen and Qiu, 2022)
$State GDP per capita_{s,t-1}$	The ratio of state gross domestic product to state population	Bureau of Economic Analysis
$State unemployment rate_{s,t-1}$	The Unemployment rate in each state in year t	Bureau of Labor Statistics Local Area Unemployment Statistics Series
$State establishment entry_{s,t-1}$	Establishment entry rate in each state in year t	Business Dynamics Statistics
$State establishment exit_{s,t-1}$	Establishment exit rate in each state in year t	Business Dynamics Statistics
Unionization	Unionization rate in each state in year t	Union Membership and Coverage Database (UMCD)
$Union(0/1)_{s,t}$	An indicator variable indicating one if a state is highly unionized in the year 1980 and zero if otherwise	
$RTW(0/1)_{s,t} * Union(0/1)_{s,t}$	Interaction variable between $RTW(0/1)_{s,t}$ and $Union(0/1)_{s,t}$. $RTW(0/1)_{s,t}$ is an indicator variable indicating one if a state adopts the RTW law and zero if otherwise. $Union(0/1)_{s,t}$ is an indicator variable indicating one if a state is highly unionized and zero if otherwise	
High-Tech	Natural logarithm of the number of high tech firms in each state s in year t	Business Dynamics Statistics database of the U.S. Census Bureau
$Tech(0/1)_{s,t}$	An indicator variable indicating one for high tech states and zero if otherwise	
$RTW(0/1)_{s,t} * Tech(0/1)_{s,t}$	Interaction variable between $RTW(0/1)_{s,t}$ and $Tech(0/1)_{s,t}$. $RTW(0/1)_{s,t}$ is an indicator variable indicating one if a state adopts the RTW law and zero if otherwise. $Tech(0/1)_{s,t}$ is an indicator variable indicating one for high tech states and zero if otherwise	
$RTW(0/1)_{s,t} * Union(0/1)_{s,t} * Tech(0/1)_{s,t}$	Interaction variable between $RTW(0/1)_{s,t}$, $Union(0/1)_{s,t}$ and $Tech(0/1)_{s,t}$. $RTW(0/1)_{s,t}$ is an indicator variable indicating one if a state adopts the RTW law and zero if otherwise. $Union(0/1)_{s,t}$ is an indicator variable indicating one if a state is highly unionized and zero if otherwise. $Tech(0/1)_{s,t}$ is an indicator variable indicating one for high tech states and zero if otherwise	

This table provides the definition of key variables used and the sources the variables were obtained.

Table 5 to explain the economic importance of the relationship between RTW laws and VC investment. To estimate the economic importance we proceed as follows:

$$Ln(VC investment) = \alpha + \delta RTW(0/1) + X\beta + \epsilon$$

$$VC investment = \exp(\alpha + \delta RTW(0/1) + X\beta + \epsilon)$$

$$E(VC investment | RTW = 1) = \exp(\alpha) \exp(\delta) \exp(X\beta) \exp(\epsilon)$$

$$E(VC investment | RTW = 0) = \exp(\alpha) \exp(X\beta) \exp(\epsilon)$$

$$\Delta\% = \frac{\exp(\alpha) \exp(\delta) \exp(X\beta) \exp(\epsilon)}{\exp(\alpha) \exp(X\beta) \exp(\epsilon)} - 1$$

$$\Delta\% = \exp(\delta) - 1$$

In column (2), the estimated coefficient associated with $RTW(0/1)_{s,t}$ is 0.597 meaning that all else being equal, the passing of the RTW law leads to an 81.66 percent increase in venture capital investment at the state level. Also, in column (4) where the RTW law is lagged by one

year, the estimated coefficient associated with $RTW(0/1)_{s,t-1}$ is 0.519 signifying that all else being equal, the passing of the RTW law leads to a 68.03 percent increase in venture capital investment. The baseline findings in Table 5 confirm our hypothesis that states that pass RTW laws have more venture capital investment.

4.2. Robustness tests

Our robustness section is motivated by Baker et al. (2022). He suggests that when the panel is unbalanced and never-treated firms serve as effective controls (i.e. when the parallel-trends assumption is likely to hold), researchers should report the percentage of never-treated observations in the sample. A larger percentage of never-treated units indicates fewer problematic biases associated with DiD regressions. In our study, never-treated states constitute 46% of the sample. We aim to address two primary concerns regarding the causal interpretation of our baseline findings. We use the parallel trend assumption to investigate

Table 3
Summary statistics.

Variables	(1) Obs.	(2) mean	(3) Std. dev.	(4) p25	(5) p50	(6) p75	(7) min	(8) max
<i>Ln(VC investment)</i>	1717	10.35	2.506	9.027	10.44	12.04	0.693	15.62
<i>RTW(0/1)_{s,t}</i>	1717	0.413	0.493	0	0	1	0	1
<i>State GDP per capita_{s,t-1}</i>	1717	0.0399	0.0141	0.0262	0.0412	0.0500	0.0175	0.0724
<i>State unemployment rate_{s,t-1}</i>	1717	5.816	2.025	4.300	5.400	7	2.600	11.90
<i>State establishment entry_{s,t-1}</i>	1717	11.21	2.348	9.433	10.89	12.65	7.280	18.07
<i>State establishment exit_{s,t-1}</i>	1717	10.12	1.622	8.942	9.892	11.06	7.257	14.64
<i>Unionization</i>	1717	13.37	6.481	8.100	12.40	17.60	1.600	35.40
<i>Union(0/1)_{s,t}</i>	1717	0.323	0.468	0	0	1	0	1
<i>RTW(0/1)_{s,t} * Union(0/1)_{s,t}</i>	1717	0.0676	0.251	0	0	0	0	1
<i>High-Tech</i>	1717	11.11	0.954	10.27	11.16	11.77	9.365	13.29
<i>Tech(0/1)_{s,t}</i>	1717	0.325	0.469	0	0	1	0	1
<i>RTW(0/1)_{s,t} * Tech(0/1)_{s,t}</i>	1717	0.0850	0.279	0	0	0	0	1
<i>RTW(0/1)_{s,t} * Union(0/1)_{s,t} * Tech(0/1)_{s,t}</i>	1717	0.0128	0.112	0	0	0	0	1

This table shows the number of observations (obs.), mean, standard deviation (std.dev.), 25th percentile (p25), median, 75th percentile (p75), minimum (Min.) and maximum (Max.) figures for the variables used in this study. A detailed description of the variable generations are provided in Table 2

Table 4
Correlation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
<i>Ln(VC investment)</i> (1)	1												
<i>RTW(0/1)_{s,t}</i> (2)	0.0117	1											
<i>State GDP per capita_{s,t-1}</i> (3)	0.371	-0.0348	1										
<i>State unemployment rate_{s,t-1}</i> (4)	-0.0436	0.0261	-0.228	1									
<i>State establishment entry_{s,t-1}</i> (5)	0.0434	-0.0281	-0.528	0.0894	1								
<i>State establishment exit_{s,t-1}</i> (6)	0.0467	-0.0359	-0.446	0.341	0.730	1							
<i>Unionization</i> (7)	-0.259	-0.292	-0.429	0.176	0.196	0.184	1						
<i>Union(0/1)_{s,t}</i> (8)	-0.209	-0.278	-0.0748	0.0663	-0.0159	-0.0329	0.729	1					
<i>RTW(0/1)_{s,t} * Union(0/1)_{s,t}</i> (9)	-0.242	0.418	-0.0832	-0.0368	-0.0479	-0.0670	0.226	0.387	1				
<i>High-Tech</i> (10)	0.259	-0.200	0.157	0.128	0.119	0.130	-0.126	0.0309	-0.170	1			
<i>Tech(0/1)_{s,t}</i> (11)	-0.133	-0.220	-0.00194	0.122	0.216	0.161	0.254	0.290	0.0774	0.723	1		
<i>RTW(0/1)_{s,t} * Tech(0/1)_{s,t}</i> (12)	-0.177	0.451	-0.0555	0.0393	0.152	0.144	-0.0784	0.0343	0.451	0.393	0.416	1	
<i>RTW(0/1)_{s,t} * Union(0/1)_{s,t} * Tech(0/1)_{s,t}</i> (13)	-0.270	0.301	-0.100	-0.0104	0.0605	-0.00353	0.144	0.279	0.721	0.0272	0.278	0.668	1

This table displays the pairwise correlation coefficients among the variables, which are defined in Table 2. The correlation coefficients are associated with the variables referenced by the corresponding row and column numbers.

Table 5
Baseline regression result.

Variables	(1) <i>Ln(VC investment)</i>	(2) <i>Ln(VC investment)</i>	(3) <i>Ln(VC investment)</i>	(4) <i>Ln(VC investment)</i>
<i>RTW(0/1)_{s,t}</i>	0.683*** (0.192)	0.597*** (0.201)		
<i>RTW(0/1)_{s,t-1}</i>			0.488** (0.199)	0.519*** (0.192)
<i>State GDP per capita_{s,t-1}</i>		-3.450 (20.17)		-4.473 (20.25)
<i>State unemployment rate_{s,t-1}</i>		-0.00747 (0.0552)		-0.00747 (0.0553)
<i>State establishment entry_{s,t-1}</i>		-0.0303 (0.0902)		-0.0289 (0.0905)
<i>State establishment exit_{s,t-1}</i>		-0.00400 (0.0855)		-0.00254 (0.0859)
Year fixed effect	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes
Observations	1717	1602	1629	1602
R-squared	0.757	0.775	0.771	0.775

This table shows the estimation results of the difference-in-differences regressions from the passage of right-to-work laws on VC investment by state. The *RTW(0/1)_{s,t}* and *RTW(0/1)_{s,t-1}* are indicator variables that show RTW laws not lagged and lagged by one year respectively. Columns (2) and (4) control for state-level characteristics and the control variables are all lagged by one period. Also, all regressions control for year and state fixed effects. The *t*-statistic based on robust standard errors clustered at the state level are provided in square brackets. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 6
Parallel Trends Assumption Check: Dynamic effect of RTW laws on VC investment.

Variables	(1) <i>Ln(VC investment)</i>	(2) <i>Ln(VC investment)</i>
$RTW(0/1)^{-3+}$	0.494 (0.461)	0.499 (0.469)
$RTW(0/1)^{-2}$	0.571 (0.412)	0.506 (0.416)
$RTW(0/1)^0$	1.084*** (0.268)	0.894*** (0.263)
$RTW(0/1)^1$	0.628** (0.286)	0.579** (0.267)
$RTW(0/1)^2$	0.907*** (0.271)	0.688** (0.271)
$RTW(0/1)^{3+}$	0.650*** (0.197)	0.573*** (0.209)
<i>State GDP per capita</i> _{s,t-1}		-2.574 (20.17)
<i>State unemployment rate</i> _{s,t-1}		-0.00763 (0.0554)
<i>State establishment entry</i> _{s,t-1}		-0.0307 (0.0902)
<i>State establishment exit</i> _{s,t-1}		-0.00392 (0.0856)
Year fixed effect	Yes	Yes
State fixed effect	Yes	Yes
Observations	1717	1602
R-squared	0.757	0.775

The table explores the result of the parallel trend test that shows that the effect of the RTW law on venture capital investment occurred a few years before the actual event. The $RTW(0/1)^{-2}$, $RTW(0/1)^0$, $RTW(0/1)^1$, $RTW(0/1)^2$, and $RTW(0/1)^{3+}$ are indicator variables that show RTW laws occurred three years before, two years before, the current year, one year after, two years after and three years after respectively. Columns (2) and (4) control for state-level characteristics and the control variables are all lagged by one period. Also, all regressions control for year and state fixed effects. The *t*-statistic based on robust standard errors clustered at the state level are provided in square brackets. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively

the possible existence of reverse causality affecting our baseline result. Next, we use states that are contiguous to RTW law states to address the likelihood that unobservable local economic conditions might affect our results.

4.2.1. Dynamic effect

The timing of the RTW law in various states may have been influenced by state-level factors manifesting differently from state to state (Chava et al., 2020, 2013; Kroszner and Strahan, 1999). If the magnitude of venture capital investment in the states differ, these differences propelled the passage of the RTW laws, indicating a possible reverse causal relationship between venture capital investment and the RTW laws. To explore the possible existence of reverse causality, we analyze the dynamics of state-level venture capital investment. In the case that reverse causality exists, changes in venture capital investment should be seen before the RTW laws events.

Table 6 focuses on the dynamics of state-level VC investment after the RTW laws was passed. We follow Chava et al. (2020) and Chava et al. (2013) and incorporate a series of timing dummies to explore the temporal dynamics. $RTW(0/1)^{-3+}$ is an indicator variable with a value of one for all years up to and including three years before the RTW law was enacted, $RTW(0/1)^{-2}$ is an indicator variable with a value of one for two years before the RTW law was enacted, $RTW(0/1)^0$ is set to one the year the RTW law was passed. $RTW(0/1)^1$ and $RTW(0/1)^2$ are set to one for the years 1 and 2 respectively after the passage of the RTW law. $RTW(0/1)^{3+}$ is set to one for year three and afterward after the passage of the RTW law. We follow Chava et al. (2013) and omit

Table 7
Analysis involving treated states and neighboring control states.

Variables	(1) <i>Ln(VC investment)</i>	(2) <i>Ln(VC investment)</i>
$RTW(0/1)_{s,t}$	0.415** (0.192)	
$RTW(0/1)_{s,t-1}$		0.329* (0.182)
<i>State GDP per capita</i> _{s,t-1}	7.543 (36.01)	6.465 (36.21)
<i>State unemployment rate</i> _{s,t-1}	0.0616 (0.0645)	0.0620 (0.0646)
<i>State establishment entry</i> _{s,t-1}	0.0453 (0.110)	0.0473 (0.111)
<i>State establishment exit</i> _{s,t-1}	0.00712 (0.116)	0.00929 (0.116)
Year fixed effect	Yes	Yes
State fixed effect	Yes	Yes
Observations	1134	1134
R-squared	0.748	0.747

This table shows estimation results of the difference-in-differences regressions from the passage of right-to-work laws on VC investment by state, using only neighboring states bordering to the treated states. The $RTW(0/1)_{s,t}$ and $RTW(0/1)_{s,t-1}$ are indicator variables that show RTW laws not lagged and lagged by one year respectively. The regression result controls for state-level characteristics, year and state fixed effects. The control variables are lagged by one year. The *t*-statistic based on robust standard errors clustered at the state level are provided in square brackets. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively

the year prior to the RTW law. The coefficients of $RTW(0/1)^{-2}$ and $RTW(0/1)^{-3+}$ are insignificant, showing that before the RTW law was passed, there was no impact on the level of state-level VC investment. This demonstrates that reverse causality has no impact on our baseline finding.

4.2.2. Unobservable confounding local economic conditions

Even though observable local economic conditions were taken into account in the baseline regression, our baseline result could still be impacted by unobservable local economic conditions that may be related to both the adoption of RTW law and venture capital investment. In this section, we follow Nguyen and Qiu (2022) and Chen et al. (2021) and address these unobservable local economic conditions by selecting states nearby the treated states in our baseline regression. Thus, we select states that share a border with the treated states in the baseline regression. If local economic conditions that are not readily observable are the driving force behind the adoption of RTW laws and these same conditions, rather than RTW, are spurring venture capital investment, then our baseline results with the new sample will be negative. This is because both types of states (treated states and their nearby untreated states) are probably influenced by factors that are relatively similar to those seen locally. According to Chen et al. (2021), unlike state laws, economic conditions tend to spill across state borders.

We generate an entirely new sample made up of neighboring control states and treated states (using the same baseline regression as shown in Table 5 to test this possibility. We re-estimate Eq. (1) based on this new sample and provide the results in Table 7. The coefficients of the RTW laws indicator variables are still statistically significant and positive, indicating that unobservable local economic condition is unlikely to be the primary driver of the changes in venture capital investment but RTW laws.

4.3. Further tests

4.3.1. Union coverage analysis

Nguyen and Qiu (2022) and Chava et al. (2020) argue that RTW laws reduce labor unions' bargaining power. Based on this assumption,

Table 8
RTW laws and Venture Capital investment: The Effect in Unions and High-Tech states.

	Dependent Variable – $\ln(VC\ investment)$					
	Unionization		High-Tech		Unionization * Tech	
	(1)	(2)	(3)	(4)	(5)	(6)
$RTW(0/1)_{s,t}$	0.655*** (0.189)	0.566*** (0.199)	0.649*** (0.192)	0.562*** (0.202)	0.666*** (0.191)	0.567*** (0.201)
$RTW(0/1)_{s,t} * Union(0/1)_{s,t}$	0.396*** (0.133)	0.305** (0.133)				
$RTW(0/1)_{s,t} * Tech(0/1)_{s,t}$			0.554*** (0.155)	0.537*** (0.174)		
$RTW(0/1)_{s,t} * Union(0/1)_{s,t} * Tech(0/1)_{s,t}$					0.553*** (0.156)	0.537*** (0.174)
$Union(0/1)_{s,t}$	0.490 (0.605)	0.355 (0.507)			0.495 (0.600)	0.349 (0.509)
$Tech(0/1)_{s,t}$			0.260 (0.266)	0.211 (0.286)	0.263 (0.280)	0.209 (0.293)
$State\ GDP\ per\ capita_{s,t-1}$		-3.238 (20.24)		-3.397 (20.07)		-3.295 (20.15)
$State\ unemployment\ rate_{s,t-1}$		-0.00965 (0.0552)		-0.00683 (0.0553)		-0.00895 (0.0552)
$State\ establishment\ entry_{s,t-1}$		-0.0283 (0.0902)		-0.0278 (0.0900)		-0.0259 (0.0899)
$State\ establishment\ exit_{s,t-1}$		-0.000983 (0.0853)		-0.00375 (0.0856)		-0.00125 (0.0852)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1717	1602	1717	1602	1717	1602
R-squared	0.757	0.775	0.757	0.775	0.757	0.776

This table shows the estimation results of the difference-in-differences regressions from the passage of right-to-work laws on venture capital investment by state based on union coverage and high tech. The $RTW(0/1)_{s,t}$ is an indicator variable that equals one if a state adopts RTW and zero otherwise. $RTW(0/1)_{s,t} * Union(0/1)_{s,t}$ is the product of RTW and High Union Coverage. $RTW(0/1)_{s,t} * Tech(0/1)_{s,t}$ is the product of RTW and High-Tech States and $RTW(0/1)_{s,t} * Union(0/1)_{s,t} * Tech(0/1)_{s,t}$ is the product of RTW, High-Tech states and Unionization. $Union(0/1)_{s,t}$ and $Tech(0/1)_{s,t}$ represents high union coverage rate and high tech states respectively. Columns (1) and (2) is the high-unionization sample, columns (3) and (4) represent the high-tech states sample and columns (5) and (6) show the product of RTW, high-unionization and high-tech. Some regression control for state-level characteristics and the control variables are all lagged by one period. Also, all regressions control for year and state fixed effect. The t -statistic based on robust standard errors clustered at the state level are provided in square brackets. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

we expect the economic impact of RTW laws to be stronger among highly unionized states. The union coverage data is obtained from the Union Membership and Coverage Database. To address the potential influence of right-to-work (RTW) laws adoption on union coverage and minimize the issue of reverse causality, we obtain union coverage data in the year 1980. We create an indicator variable as high-union states and interact it with $RTW(0/1)_{s,t}$ to test for this assumption. We add this indicator variable ($Union(0/1)_{s,t}$) and its interaction with $RTW(0/1)_{s,t}$ to the baseline regression and present the results in column (1) and (2) of Table 8. The estimated coefficient of our variable of interest ($RTW(0/1)_{s,t} * Union(0/1)_{s,t}$), which is the interaction between the indicator variable $Union(0/1)_{s,t}$ and $RTW(0/1)_{s,t}$, is positive and statistically significant. This result shows that the effect of the RTW law is higher in states with high union coverage validating the notion that labor unions experience an exogenous, unfavorable shock as a result of RTW law. We use the results in column (2) to gauge the economic importance of the relationship between RTW law and VC investment among highly unionized states. The estimated coefficient of $RTW(0/1)_{s,t} * Union(0/1)_{s,t}$ is 0.305 meaning that all else being equal, the passing of the RTW law in highly unionized states leads to an additional 35.66 percent increase in venture capital investment.

4.3.2. High-tech states analysis

Venture Capitalists deliberately choose states in which they invest (Xing et al., 2017). If the decision to invest is influenced by factors that both positively affect both VC investments and RTW laws, it creates a possible selection problem. To address this possible selection problem,

we investigate if RTW laws have a positive impact on VC investment in high-tech states, where selection is more likely a confounding factor. If we observe a continued positive effect of RTW laws on VC investments in high-tech states, then it suggests that selection bias is not the primary reason for this effect. Thus, we expect our result to be insignificant if selection is the key driver of VC investment and not RTW laws. We obtain high-tech states data from Business Dynamics Statistics database of the U.S. Census Bureau and compute it as natural logarithm of the number of high tech firms in each state s in year t . We follow Xing et al. (2017) and define an indicator variable, $Tech(0/1)_{s,t}$, for states with high-tech firms. We add this variable ($Tech(0/1)_{s,t}$) and its interactions with $RTW(0/1)_{s,t}$ to the regression model and present the result in columns (3) and (4) of Table 8. Our variable of interest ($RTW(0/1)_{s,t} * Tech(0/1)_{s,t}$) is positive and statistically significant, indicating that selection is not the primary driver of the effect of RTW laws on venture capital investment. The economic significance of the relationship between RTW law and VC investment among high-tech states is explained based on the result presented in column (4). The estimated coefficient of $RTW(0/1)_{s,t} * Tech(0/1)_{s,t}$ is 0.537 meaning that all else being equal, the passing of the RTW laws in highly technological states leads to an additional 71.09 percent increase in venture capital investment.

Next, we show if our baseline result will still hold in states with high-unionization rates and high-tech. We add the indicator variable, High-tech, to the product of RTW laws and Unionization. Then, we add the three-way interaction term (i.e. $RTW(0/1)_{s,t} * Union(0/1)_{s,t} * Tech(0/1)_{s,t}$) to the regression model and present the result in columns (5) and (6) of Table 8. The results show that the positive impact of

Table 9
RTW laws and Venture Capital investment: Subsets of states Analysis.

	Dependent Variable – $\ln(VC\ investment)$							
	Exc. Indiana		Exc. Michigan		Exc. Wisconsin		Exc. all three states	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$RTW(0/1)_{s,t}$	0.614*** (0.180)		0.619*** (0.187)		0.613*** (0.181)		0.437** (0.183)	
$RTW(0/1)_{s,t-1}$		0.539*** (0.165)		0.562*** (0.179)		0.552*** (0.172)		0.419** (0.165)
$State\ GDP\ per\ capita_{s,t-1}$	-2.947 (20.01)	-3.881 (20.09)	0.691 (20.22)	0.00965 (20.25)	-3.392 (20.13)	-4.338 (20.21)	1.671 (20.06)	1.322 (20.05)
$State\ unemployment\ rate_{s,t-1}$	0.00462 (0.0554)	0.00430 (0.0556)	-0.0136 (0.0551)	-0.0135 (0.0551)	-0.00499 (0.0550)	-0.00466 (0.0550)	0.00180 (0.0555)	0.00180 (0.0555)
$State\ establishment\ entry_{s,t-1}$	-0.0416 (0.0915)	-0.0416 (0.0917)	-0.0120 (0.0900)	-0.0104 (0.0902)	-0.0216 (0.0907)	-0.0200 (0.0908)	-0.0136 (0.0913)	-0.0134 (0.0914)
$State\ establishment\ exit_{s,t-1}$	-0.0227 (0.0850)	-0.0219 (0.0851)	-0.00535 (0.0859)	-0.00478 (0.0862)	-0.0143 (0.0856)	-0.0127 (0.0859)	-0.0324 (0.0850)	-0.0324 (0.0851)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1562	1562	1568	1,568	1562	1562	1488	1488
R-squared	0.777	0.777	0.777	0.776	0.778	0.778	0.781	0.781

This table shows the estimation results of the difference-in-differences regressions from the passage of right-to-work laws on state-level VC investments based on subsets of states. The $RTW(0/1)_{s,t}$ and $RTW(0/1)_{s,t-1}$ are indicator variables that show RTW laws not lagged and lagged by one year respectively. In Columns (1) and (2), Indiana is excluded from the analysis. In Columns (3) and (4), Michigan is excluded. In Columns (5) and (6), Wisconsin is excluded, and in Columns (7) and (8), all three states (Indiana, Michigan, and Wisconsin) are excluded. Also, all regressions control for year and state fixed effect. The t -statistic based on robust standard errors clustered at the state level are provided in square brackets. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

RTW laws on VC investments still hold in high-unionization rate and high technological states. We use the results in column (6) to gauge the economic importance of the relationship between RTW laws and VC investment among highly unionized and highly technological states. The estimated coefficient of $RTW(0/1)_{s,t} * Union(0/1)_{s,t} * Tech(0/1)_{s,t}$ is 0.537 meaning that all else being equal, the enactment of RTW laws in states characterized by both high union coverage and advanced technology results in an additional 71.09 percent upswing in venture capital investment.

4.3.3. Impact by state VC investment

We construct a time-series graph illustrating the $\ln(VC\ investment)$ activity spanning three years before and after the enactment of Right-to-Work (RTW) laws in six out of the seven states where RTW laws were passed during the sampling period. The graph is presented in Fig. 1. The VC investment of Idaho is not included due to the absence of VC investment before the enactment of the RTW law. VC investment in Idaho commenced more than 10 years after the passage of RTW law. The depicted graph demonstrates a notable surge in VC investment within these states after the passage of RTW laws.

Also, we conduct regression analyses on a subset comprising three states: Indiana, Michigan, and Wisconsin. The detailed results are provided in Table 9. Initially, we excluded each of these states individually from the analysis and ran the regression. Subsequently, we excluded all three states simultaneously and re-ran the regression. Notably, the results consistently indicate a positive and statistically significant effect across all models. This underscores the robustness of our findings, demonstrating that even without the inclusion of these states, the passage of RTW laws leads to an increase in VC investment.

4.3.4. Number, mean and industry VC investment

We examine the impact of Right-to-Work (RTW) laws on venture capital (VC) investment deals. VC investment deals are measured as the annual count of deals in each state. The results, displayed in Table A3 of the Appendix, reveal a significant positive relationship between the presence of RTW laws and the number of VC deals. Furthermore,

we assess whether the average size of VC deals changes in response to the adoption of RTW laws. This analysis is conducted by examining the mean of $\ln(VC\ investment)$ and testing its relationship with RTW laws. The results, presented in Table A4 of the Appendix, demonstrate a statistically significant increase in the average size of VC deals following the implementation of RTW laws in a given state.

Next, we use the Herfindahl–Hirschman Index (HHI) to determine whether VC investments became more concentrated in specific industries after RTW adoption. The HHI measures market concentration by squaring the market shares of all firms and summing the squares (Rhoades, 1993). We first calculated total VC investment by state and year, then calculated industry investment as the total VC investment by state, year, and industry. From this, we derived the market share by dividing industry investment by total investment for each state-year. Finally, we squared the market shares to compute the HHI for each state-year-industry. We tested the relationship between HHI and RTW, predicting a negative association. A negative relationship suggests that VC investments did not become concentrated in specific industries after the adoption of RTW laws. The results, presented in Table A5 of the Appendix, though negative, was statistically insignificant, which aligns with our predicted direction.

5. Conclusion

The 1935 National Labor Relations Act was amended by the 1947 Taft-Hartley and it reaffirms states’ constitutional authority to pass “RTW” (RTW) laws. RTW laws allow workers to join a unionized workplace and enjoy all the benefits that unionized workers enjoy without the worker paying union dues or joining the union. Currently, the RTW laws has been accepted by 27 states. Numerous studies have shown how RTW laws affects corporate policies, but none has examined the impact of RTW laws on venture capital investments. Using US state-level venture capital data from 1980 to 2020, we find that RTW laws states have more investment in venture capital. We employ a difference-in-differences estimation technique to test this hypothesis.

The baseline result is robust to a dynamic effect estimation that takes into account the parallel trends assumption. Additionally, we use

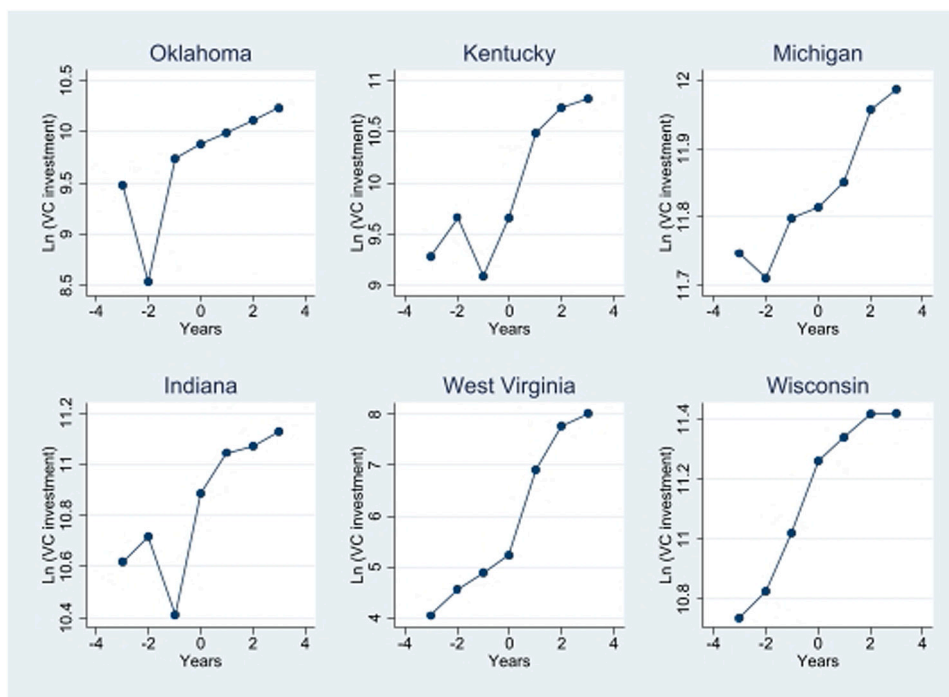


Fig. 1. Univariate analysis of states that passed RTW laws from 1980.

states that are contiguous to RTW states and address the likelihood that unobservable local economic conditions might affect our results. Furthermore, the positive relationship between RTW law and venture capital investment is still significant in states that have high union coverage and are highly technological. Even though we cannot completely eliminate the possibility of an omitted variable bias happening at the same time as the implementation of a state-level RTW law, a falsification test suggests that it is unlikely. Overall, our findings show how the RTW laws have a positive effect on state investments, particularly venture capital.

Our findings might be interesting to regulators, scholars, and practitioners given the ongoing debate surrounding the RTW regulations. The positive effect between RTW laws and VC investment suggests that these laws contribute to a more favorable economic climate for entrepreneurship and business expansion. By reducing the influence of unions and associated costs, RTW laws can enhance labor market flexibility and reduce operational expenses. These factors make states more attractive to venture capitalists, which is essential for fostering innovation and promoting economic development. For policymakers, adopting RTW laws can be a strategic measure to stimulate economic growth. Increased VC investment can result in higher rates of job creation, innovation, and overall economic growth. Our findings offer compelling evidence for the positive economic impact of RTW laws, offering a persuasive argument for their adoption. Policymakers should consider these advantages when formulating labor and economic policies, acknowledging that RTW laws can be pivotal in attracting venture capital and driving long-term economic prosperity.

CRedit authorship contribution statement

Helena Sarkodie: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Kwabena Boasiako:** Supervision, Methodology, Conceptualization. **Michael O'Connor Keefe:** Supervision, Project administration, Formal analysis, Conceptualization. **Justin Nguyen:** Supervision, Conceptualization. **Bernard Tawiah:** Investigation, Data curation.

Appendix A. Online appendix

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.jbankfin.2025.107383>.

Data availability

The authors do not have permission to share data.

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