CONSTRAINING GROWTH: ADVANCE LAYOFF NOTICE AND CORPORATE INNOVATION

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Abstract

Firms adopt more conservative innovation policies when required to provide advance layoff notice to displaced workers. Exploiting state-level Worker Adjustment and Retraining Notification (WARN) Acts, which mandate such notice in plant closings and mass layoffs, and establishment-level employment and location data, we find that firms exposed to the Acts have lower R&D spending and fewer patent grants and citations. We argue that these results arise from the operational constraints that protecting workers from abrupt displacement imposes on firms. Reinforcing this view, establishment-level evidence shows reduced establishment openings and acquisitions, increased divestitures, and slower employment growth in WARN-passing states.

JEL Classifications: D22, G30, J21, J63, K31, O32

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1. Introduction

The recent widespread layoffs at tech giants like Meta and Twitter have increased scrutiny of corporate employment decisions. While some support firms' ability to adjust their workforce quickly in response to changing market demands, others advocate for protecting workers from abrupt job loss (e.g., Bogage (2022), Isaac (2023)).[1] How firms respond to an increase in employment protection is the subject of a growing body of academic research (e.g., Autor (2003), Simintzi, Vig, and Volpin (2015), Serfling (2016), Bai, Fairhurst, and Serfling (2020)). In particular, recent work finds that firms increase their innovation activities to facilitate the substitution of capital for workers, thus mitigating the negative impact of higher employee protection costs on firm value (Bena, Ortiz-Molina, and Simintzi (2022)).

Our paper contributes to this literature by introducing a new quasi-natural experiment that closely resembles the increased scrutiny the recent wave of layoffs in the U.S. tech sector have garnered, showing that firms respond to increases in employees' protection from sudden mass displacement by *reducing* their innovation activities. Specifically, we exploit state adoptions of the Worker Adjustment and Retraining Notification Act (referred to as mini-WARN Acts) that require employers to provide advance notice (e.g., 60 to 90 days, depending on the state) to workers that are being displaced in a plant closing or mass layoff.[2] The Act aims to give workers time to adjust to impending job loss, arrange for skill retraining, and secure new employment. Employers who fail to provide the advance notice are liable for back pay and fringe benefits to each displaced worker for each day of violation. We find that a decrease in operational flexibility explains the decline in corporate innovation.

State mini-WARN Acts negatively shock operational flexibility via at least two channels. First, because of the advance notice requirement, the process of shutting down an establishment or laying off workers is delayed by the advance notice period. Indeed, in 2017, the American shipbuilding

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[1] More than 93,000 workers were laid off from public and private tech companies in the U.S. in 2022, while another roughly 145,000 workers have been let go so far in 2023 (e.g., Vedantam (2023), The Economist (2023)). Software engineers represent the largest share of workers laid off in the tech sector in 2023 and are having particular difficulty securing new comparable employment (e.g., Duffy (2023), Mayer (2023)).

[2] Eight states adopt mini-WARN Acts during our sample period, 1999 to 2019. These eight Acts require mandatory compliance by employers and are designed to be more expansive than the federal WARN Act that was passed in 1988 by applying to smaller employers and layoffs (all eight states), requiring longer notice periods (two-of-the-eight states), and removing certain exceptions that are allowed by the federal version (one-of-the-eight states).

company, National Steel and Shipbuilding Company (NASSCO) Holdings Inc., tried to evade delaying a temporary layoff of workers by not providing them the 60 days' advance notice required by California's mini-WARN Act. The employees and their labor union sued NASSCO for violating the Act and were awarded backpay and lost pension benefits for the period that advance notice was due.[3] As a corollary of this first channel, if a firm's financial condition does not permit delaying closing a plant or laying off workers, it may be forced into shutting down or letting go of employees at a relatively better-performing establishment that is not covered by the law. Second, firms may try to offset the advance notice requirement by paying voluntary severance to workers for what would have been the advance notice period. However, non-voluntary severance required by preexisting contractual obligations does not exempt employers from giving advance notice. Twitter's layoffs in November of 2022 illustrate this second channel, where, upon being acquired by Elon Musk, the company laid off roughly 3,700 employees (e.g., Campisi (2022), Wiessner (2022)). According to Musk's Twitter account, "everyone exited was offered 3 months of severance which is 50% more than legally required [by California's mini-WARN Act]" (e.g., Farivar (2023)). Whether Musk's legal obligation is satisfied is yet to be determined, as he currently faces a lawsuit from the laid-off workers who claim that Twitter's prior management had promised (in the merger agreement) that their severance package would be "equal to or better than" two months of base pay, three months of stock vesting, a pro-rated bonus payout, and a cash contribution to cover ongoing health insurance (e.g., Hays (2023)).

On the face of it, it is unclear how firms might adapt their innovation activities in response to the increased operational inflexibility that arises from protecting workers from abrupt job loss. On the one hand, the literature on real options predicts that the advance notice owed to employees that are being displaced would reduce the time to maturity of the put option to abandon establishments and workers, thus hindering firms' ability to manage risk (e.g., Kemna (1993), Abel et al. (1996), Triantis (2000)). All else equal, this should decrease firms' risk tolerance (e.g., Hackbarth and Johnson (2015), Gu, Hackbarth, and Johnson (2018)). In contrast, innovation is an inherently idiosyncratic and unpredictable process, requiring an exceptional tolerance for risk and failure (e.g., Holmstrom (1989),

[3] According to NASSCO Holdings Inc.'s webpage, its workforce comprises "highly dedicated professionals anchored in teamwork and propelled by innovation" (https://nassco.com/about-us/); Case title: *The International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers, Local 1990 et al.* v. *NASSCO Holdings Inc.*, 17 Cal. App. 5th 1105, 226 Cal. Rptr. 3d 206 (Ct. App. 2017).

Tian and Wang (2014)). Additionally, recent survey evidence from CFOs indicates that, on average, firms tend to focus on shorter-term investment projects and business plans due to the unreliability of forecasts beyond two years (Graham (2022)). Requiring advance notice in employment decisions could magnify the difficulty of investing and planning over longer-term horizons.[4] All told, this suggests that firms will respond to a decrease in operational flexibility by reducing their innovation activities.

On the other hand, protecting workers from abrupt mass displacement increases firms' labor dismissal costs, thus creating operational inflexibility by making the labor input more rigid. Prior theoretical work shows that, if capable, firms respond to an increase in labor market rigidities by inventing new production techniques that allow them to adjust their production to take advantage of higher and more cost-effective capital-to-labor ratios (e.g., Atkinson and Stiglitz (1969), Jones (2005), León-Ledesma and Satchi (2019)). Providing empirical support for this channel, Bena, Ortiz-Molina, and Simintiz (2022) find that firms use innovation as a mechanism to develop new methods of production to facilitate the substitution of capital for labor, which allows them to mitigate the adverse effect of labor market rigidities on production costs and operating leverage. Alternatively, Acharya, Baghai, and Subramanian (2014) show that employment protection spurs innovation by increasing the enforceability of employment contracts, thereby limiting the possibility that employers can holdup inventor-workers following the success of an innovative project, thus, encouraging increased effort by the inventors and the pursuit of innovation activities by the employing firms.

To test these opposing predictions, we use a difference-in-differences estimator that compares changes in the innovation activities of firms with varying exposures to the mini-WARN Acts. The laws apply to workers in the state where they are employed, and for most of the publicly traded firms in our sample (the CRSP-Compustat merged database), their employees are dispersed across several states. Further, depending on the state, mini-WARN Acts can apply to employment sites with as few as 25 to 100 workers. Thus, relying on the location of firms' state of headquarters is insufficient to proxy for their exposure to the Act. Rather, firms are differentially affected by the mini-WARN Acts based on

[4] As explained by one of the surveyed CFOs in Graham (2022), "a short, reliable planning horizon leads to conservative decision-making because conservative decisions leave firms with more options and flexibility in the future" (p. 1998). Consistent with this view and using the same survey data, Barry et al. (2022) find that workplace flexibility (i.e., the ability for employees to work remotely), investment flexibility, and financial flexibility facilitated firms' navigation of the COVID-19 crisis and had direct and interactive effects on their business plans.

the distribution of their employees across states. We exploit this variation by identifying the location and the number of employees at each of a firm's establishments using data from the National Establishment Time Series (NETS) Publicly Traded database and constructing a weighted-average measure of a firm's mini-WARN Act exposure using the proportion of its employees that work in states with the law. The regressions include firm fixed effects to control for static differences between firms with more and less exposure to the Act and year fixed effects to control for time-varying economy-wide factors. Some specifications also include state fixed effects to control for static differences across headquarters' states and time-varying firm characteristics that may correlate with innovation activities.

Using R&D expenditures as a measure of an innovation input and patent grants and citations as measures of innovation outputs, we find that exposure to state mini-WARN Acts significantly decreases firms' pursuit of innovation. For firms experiencing a one standard deviation increase in their exposure to the Act (33.1%), their expenditure on R&D declines by 5.1%, patent grants decrease by about 2.6%, and patent citations fall by roughly 6.0% relative to their respective means. The findings are similar if we use: (i) a Poisson model when specifying patent counts as the dependent variable; (ii) the mean value of a firm's citations over patents as the dependent variable without taking the natural logarithm and adding one to it; (iii) the percentage of a firm's establishments or large establishments (that employ 100 or more workers) in states with mini-WARN Acts to construct the weighted-average exposure measure. For firms in industries more suited for workplace automation, for which the laws are less applicable, exposure to mini-WARN Acts has a less pronounced negative effect on R&D and a positive effect on patent grants and citations. We view these cross-sectional results as consistent with prior work that finds that firms respond to higher labor dismissal costs by increasing their process innovations to aid the adoption of more capital intensive production methods, and with the expectations of CFOs after the COVID-19 crisis that firms with low workplace flexibility will turn to automation to replace labor (Barry et al. (2022), Bena, Ortiz-Molina, and Simintzi (2022)).

Overall, the results show that firms respond to increased worker protection from sudden mass layoffs by decreasing their innovation activities. We next examine whether increased operational inflexibility arising from the mini-WARN Act's advance notice requirement drives this finding. First, if having less operational flexibility pushes firms to shorten their investment and planning horizons (e.g., Graham (2022)), the law's negative effect on innovation activities should be greater for firms that historically relied on longer-term business plans. Distinguishing firms with longer-term planning horizons based on the percentage of long-term oriented words that their executives use during conference calls (Brochet, Loumioti, and Serafeim (2015)), we find that a one standard deviation increase in mini-WARN Act exposure results in differential decreases in R&D expenditures of about 7.0%, patent grants of nearly 7.1%, and citations of about 4.7% relative to their respective means.

Second, if operational inflexibility diminishes the value of firms' put option to abandon workers and thus their ability to manage risk and tolerate failure (e.g., Abel et al. (1996), Abel and Eberly (1996), Hackbarth and Johnson (2015)), we expect that their patenting strategies will become more conservative (e.g., Manso (2011)). Consistent with this expectation, we find that as firms' exposure to the mini-WARN Act increases, their patents that focus on exploiting their existing knowledge base increase, while their patents that explore new areas of knowledge decline. As a final test of this channel, we investigate whether the shift we document among firms with more exposure to the law toward more conservative innovation activities decreases their overall level of risk (e.g., Hsu (2009)). Using stock return volatility as a measure of firm risk, we find that a one standard deviation increase in mini-WARN Act exposure decreases the annualized standard deviation of firms' daily stock returns by about ten basis points. In sum, these results support operational inflexibility as a key channel underlying the negative relation between worker protection from abrupt mass displacement and corporate innovation.

An empirical challenge posed by exploiting firms' exposure to multiple mini-WARN Acts (i.e., "treatment" events) for identification is providing evidence that the parallel trends assumption is satisfied and that heterogenous treatment effects do not materially bias our difference-in-differences estimator (e.g., Roberts and Whited (2013), Callaway and Sant'Anna (2021)). We deal with this challenge by taking advantage of our establishment-level data from NETS, constructing a sample of nearly 1.8 million establishment-year observations from 1999 to 2019 to examine how key establishment-level policies change in response to the mini-WARN Act. Indeed, establishments in a single state are only treated once with the law's passage, enabling us to test the parallel trends assumption. Moreover, we restrict the sample to include only establishment-years that are either not treated by a mini-WARN Act or have not been treated for more than five years to account for dynamic treatment effects (e.g., Baker, Larcker, and Wang (2022)).

Beyond addressing endogeneity concerns, analysis of establishment-level outcomes provides a robustness check of our firm-level results and offers a valuable opportunity to examine if other policies also become more conservative following exposure to the Act, further supporting the operational inflexibility channel. We begin this investigation by exploring the effect of worker protection from sudden mass job loss on employment growth using a difference-in-differences methodology with establishment, year, and location state fixed effects. Our preferred specification, which includes controls for time-varying establishment characteristics, shows that employment growth slows by 3.3% following the law's effective date relative to the sample standard deviation. Further, a timing analysis shows no differential trends in employment growth between establishments in mini-WARN Act-passing states and those located elsewhere, consistent with satisfying the parallel trends assumption.

Our next set of tests considers how establishment restructuring decisions are affected by protecting workers from abrupt mass displacement. We add parent firm fixed effects to these regressions to account for static differences across firms that could correlate with restructuring decisions. First, we show that the likelihood of a parent firm opening or acquiring an establishment is about 2.0% or 1.3% lower if in a state with a mini-WARN Act. Second, we find that parent firms are roughly 1.2% more likely to close small establishments and about 1% more likely to divest establishments in Act-passing states. These results are consistent with the institutional detail of the laws whereby employee size thresholds (e.g., between 25 to 100 workers, depending on the state) determine whether an establishment would be legally obligated to provide advance notice in a closing or mass layoff and appear consistent with parent firms trying to minimize their exposure to the mini-WARN Act.

Finally, we consider whether the more conservative employment growth rates and restructuring decisions result in a reduction in establishments' risk. Following prior work (e.g., Akey and Appel (2021)), we measure establishment-level risk using the Paydex score in the NETS data. The Paydex variable is a business credit score based on establishments' payment history with suppliers and vendors, where a lower score indicates higher payment risk. Our findings show that establishments' payment risk decreases after the mini-WARN Act in their state becomes legally binding. Results from timing analyses confirm the absence of statistically significant pre-trends in Paydex scores between establishments in law-enacting states and those located elsewhere, consistent with satisfying the parallel trends assumption. In sum, the results from the establishment-level analyses reinforce our interpretation that increased operational inflexibility arising from worker protection from abrupt job loss leads to more conservative policies and, thus, the decline in firms' innovation activities.

Our paper contributes to several strands of literature. First, we add to existing work that studies the link between labor market frictions and firm outcomes by presenting novel evidence on how employment protection can negatively impact corporate innovation. Conversely, prior work has mainly identified its positive effects (e.g., Acharya, Baghai, and Subramanian (2014), Bena, Ortiz-Molina, and Simintiz (2022)). An important difference that partially explains the contrasting findings is the *type* of employment protection being examined. Our paper highlights the role of protecting a collective group of workers from abrupt job loss, whereas these previous studies consider the effect of protecting individual employees from unjust dismissal. A notable exception is Bradley, Kim, and Tian (2017), who find that labor market frictions from unionization hinder firm innovation by misaligning employees' incentives, inducing inventors to either shirk or depart the firm. We complement this existing research by showing how employment frictions that derive from limiting a firm's ability to adjust its workforce quickly create operational inflexibility that impedes innovation. Relatedly, these findings contribute to prior studies that document the impact that various types of corporate flexibility have on firm policies and performance (e.g., MacKay (2003), Chod, Rudi, and Van Mieghem (2010), Chen, Kacperczyk, and Ortiz-Molina (2011), Rapp, Schmid, and Urban (2014), Gu, Hackbarth, and Johnson (2018), Cook, Kieschnick, and Moussawi (2019), Fahlenbrach, Rageth, and Stulz (2021), Barry et al. (2022), Gu and Hackbarth (2022), Graham (2022), Papanikolaou and Schmidt (2022)).

Lastly, to the best of our knowledge, our paper is the first to exploit state mini-WARN Acts as a source of identifying variation in worker protection from sudden mass displacement.[5] These Acts and their implications for firm policies are interesting in their own right, but the fact that they capture the current scrutiny regarding the widespread layoffs in the U.S. tech sector makes them especially relevant. Additionally, states have relatively recently adopted these laws (the latest in 2018) and continue to amend prior versions to protect workers from recent developments such as the COVID-19

[5] Prior work examines how the federal WARN Act affects advance notice provisions, workers' post-displacement outcomes, and the stock returns of firms closing plants (e.g., Addison and Blackburn (1994a, 1994b), Ruhm (1994), Spivey, Blackwell, and Marr (1994), Levin-Waldman (1998)). Other studies use federal WARN Act notices to forecast aggregate job loss and other economic indicators, mass layoffs, and the permanence of layoffs during the COVID-19 pandemic (e.g., Kudlyak and Wolcott (2020), Hall and Kudlyak (2021), Krolikowski and Lunsford (2022)).

crisis (e.g., Koepke (2020)). In contrast, most prior studies in this literature exploit the wrongful discharge laws, particularly the good faith exception to the at-will employment doctrine, for identification (e.g., Autor, Kerr, Kugler (2007), Acharya, Baghai, and Subramanian (2014), Serfling (2016), Bai, Fairhurst, and Serfling (2020), Bena, Ortiz-Molina, and Simintiz (2022)). The good faith exception applies when a court rules that an employer discharges a worker out of bad faith, malice, or retaliation. Thus, the motivation for the recent wave of tech sector layoffs is unlikely to trigger the good faith exception; rather, changing market conditions and operational concerns are the most cited reasons. For example, when describing Meta's layoffs, CEO Mark Zuckerberg declared that its "management theme for 2023 is the 'Year of Efficiency' and [that it is] focused on becoming a stronger and more nimble organization" (e.g., Vanian (2023)). Further, nearly all adoptions of the good faith exception took place in the 1980s, with its most recent passage in 1998. Our study helps move this literature forward by proposing the mini-WARN Acts as an identification strategy, which represents a more recent development in the U.S. labor market, offering new avenues for future research.

The rest of the paper is organized as follows. Section 2 describes the institutional background of the state and federal WARN Acts. Section 3 details the empirical methodology and data. Section 4 reports the main firm-level empirical results. Section 5 presents the establishment-level findings. Section 6 concludes.

2. Institutional Background

This section discusses the institutional background of the state and federal WARN Acts. We start by describing the federal WARN Act because the state mini-WARN Acts – that are the focus of our study – were adopted after and expanded on the federal version.

The U.S. Congress enacted the federal WARN Act into law on August 4, 1988, and it went into effect on February 4, 1989. The WARN Act requires that large employers give at least 60 calendar days of advance notice to workers that are being displaced by a plant closing or mass layoff. The purpose of the advance notice is to provide workers with time to adjust to the pending employment loss, arrange for skill training or retraining (if necessary), and secure alternative employment (e.g., Krolikowski and Lunsford (2022)). The WARN Act applies to employers with 100 or more full-time employees or 100 or more employees who work for at least a combined 4,000 hours per week (exclusive of overtime hours).

Two types of employment losses trigger the advance notice requirement of the WARN Act.[6] The first type is a plant closing, defined as a temporary or permanent shutdown of a single site of employment (or one or more facilities or operating units within a single site) that involves 50 or more full-time employees during any 30-day period. The second type is a mass layoff, which is defined during any 30-day period as either a layoff of 500 or more full-time employees at a single employment site or an employment loss of 50 to 499 full-time employees if they comprise at least one-third of the workforce at a single site of employment. The WARN Act may also be triggered if an employer engages in several layoffs at a single employment site that does not meet the minimum employment loss requirements of a plant closing or mass layoff during a 30-day period, but, when aggregated over a 90-day period, exceed the minimum requirements, unless the employer can prove that separate and distinct causes led to the layoffs and that they were not an attempt to evade its obligations under the WARN Act (e.g., Koepke (2020)).

Full-time employees covered by the WARN Act include hourly and salaried workers, managers, and supervisors that work on average at least 20 hours per week and that have worked at least six of the last 12 months since the date that advance notice was required (e.g., Addison and Blackburn (1994a)). Conversely, part-time employees, which includes recently hired employees working full-time hours and seasonal workers, contract employees that another employer pays, and self-employed workers, are not counted toward the employment loss thresholds in a plant closing or mass layoff (e.g., Collins (2012)). Although part-time and non-payroll workers are not considered to determine whether an employment loss threshold is reached, they are still due advance notice (e.g., Levine (2007)).

Advance notice must be provided to each employee that is reasonably expected to experience an employment loss because of a plant closing or mass layoff or, if the employee is covered by a collective bargaining agreement, to their union representative, to the chief elected official where the plant closing or mass layoff is located (e.g., mayor), and to the state-sponsored entity (e.g., the state dislocated worker unit) that is designated to assist the displaced workers via rapid response activities such as

[6] Under the WARN Act, an employment loss is defined as an involuntary termination of employment, a layoff that exceeds six months, or a reduction in hours worked of greater than 50% during each month of any six months.

training services and job search assistance. Included in the written notification are the name and address of the affected employment site, a description of the planned action (e.g., the anticipated number of affected employees), and a statement as to whether the layoff is expected to be permanent or temporary, the date(s) when the layoffs will begin, and the name of a company official to contact for more information (e.g., Collins (2012)). The requirements of the WARN Act are enforced by individual or class action civil lawsuits filed in federal district courts by aggrieved workers, their union representatives, or units of local government against employers that are alleged to be in violation (e.g., Ehrenberg and Jakubson (1990)).[7] While the WARN Act does not specify a limitation period for civil actions, federal courts have held (and the Supreme Court has affirmed) that it should be governed by the state's statute of limitations where the employment loss occurs (e.g., Shulman (2002)).

Employers who fail to provide the required advance notice under the WARN Act are liable for back pay and fringe benefits (including medical expenses) to each displaced worker for each day of violation up to a maximum of 60 days. This penalty is reduced for each day that notice was given and by wages, health insurance premiums, or other employee benefits paid by the employer during the period of violation, and it can be offset by voluntary severance payments not required by legal or contractual obligations (e.g., Shulman (2002)).[8] Severance payments that are contractually stipulated by a preexisting plan cannot be used to offset the penalties. Employers are also subject to a civil penalty of up to $500 per day for, at most, 60 days for failing to provide advance notice to the local government. However, this fine is waived if the liability with the aggrieved workers is settled in full within three weeks of the plant closing or mass layoff.

The WARN Act stipulates three exceptions that permit employers to provide fewer than 60 days of advance notice. First, the "faltering company" exception applies to employers actively seeking capital or business that would enable them to avoid or postpone a shutdown and believe in good faith that providing advanced notice would prevent them from obtaining the capital or business needed to

[7] Although the WARN Act authorizes the U.S. Department of Labor (DOL) to establish regulations and provide non-binding guidance in interpreting the regulations, it does not permit the DOL any investigative or enforcement authority; that responsibility falls solely on the courts.

[8] Penalties may also be reduced at the court's discretion if an employer can demonstrate that it had reasonable grounds for believing that its actions were not in violation of the WARN Act and that the violation occurred in good faith. Courts also have the discretion to award the prevailing litigant(s) with reasonable attorneys' fees (Koepke (2020)).

remain in operation. This exception is permitted for plant closings but not for mass layoffs. Second, the "unforeseeable business circumstances" exception applies if business circumstances that are not reasonably foreseeable by the employer at the time notice should be provided change unexpectedly and are the cause of the plant closing or mass layoff. Business circumstances under this exception include the cancellation of a large contract by a major customer, a non-natural disaster (e.g., a terrorist attack), a worker strike at a key supplier, or the sudden onset of a severe economic recession. Third, the "natural disaster" exception applies when the plant closing or mass layoff is due to a natural disaster (e.g., earthquake, hurricane, storm, or flood). This exception does not apply if the plant closing or mass layoff is the indirect result of a natural disaster, although the unforeseeable business circumstance exception might apply. However, even if one of these exceptions applies, the DOL insists that employers provide as much notice as is practicable.

The WARN Act also exempts an employer from providing advance notice if the plant closing or mass layoff occurs because an employer consolidates or relocates its business but offers to transfer its workers to another employment site within a reasonable commuting distance in a timely manner, if the workers that are being displaced were hired with the understanding that their employment was temporary, or if a plant closing or mass layoff was the result of a strike or lockout, barring that the employer did not lock out workers to evade the notice requirements. Small employers with fewer than 100 full-time workers or 100 or more workers who work less than a combined 4,000 hours per week are also exempt from the WARN Act. Finally, during the sale of all or part of a business, the buyer (seller) is exempt from any notice requirements that are triggered before (after) the effective date of the sale, in which case the seller (buyer) is responsible for providing the requisite advance notice.

Several states have adopted their versions of the federal WARN Act, commonly called "mini-WARN" Acts. Table 1 shows which states have adopted a mini-WARN Act, when it was adopted and went into effect, and how it differs from the federal version. We identify 12 states that have adopted mini-WARN Acts that create federal "WARN-like" obligations and require mandatory compliance.[9] Employers with employment sites in these states must comply with the requirements stipulated in the

[9] While other states have adopted plant closing and mass layoff legislation, we do not consider them mini-WARN Acts because they do not mandate compliance and/or their standards are not comparable and typically less stringent than the federal WARN Act.

states' mini-WARN Act and the federal WARN Act. Indeed, many of the requirements imposed by the mini-WARN Acts are stricter and more expansive than in the federal version, applying to smaller employers and layoffs, requiring longer notice periods, and removing certain exceptions that are allowed by the federal WARN Act. For example, California's mini-WARN Act applies to employers with 75 or more full or part-time workers, requires 60 days advance notice if 50 or more workers will be displaced by a plant closing, mass layoff, or relocation of the employer's business in a 30-day period, and does not make an exception for unforeseeable business circumstances. New York's mini-WARN Act requires employers with 50 or more full-time workers or 50 or more employees that work a combined 2,000 hours per week to provide 90 days of advance notice if, over a 30-day period, there is a plant closing, mass layoff, or relocation that results in employment losses of 25 or more workers that comprise one-third of the labor force at the employment site.

Numerous legislative attempts have been made to amend the federal WARN Act to expand its coverage of employers and layoffs, increase the length of the required notice, and establish a government-sponsored agency to monitor and enforce its requirements. Most recently, in October of 2007, the House passed the "Trade and Globalization Assistance Act," which proposed an increase in the notice period from 60 to 90 days, revising the definition of covered employment losses in mass layoffs to eliminate the requirement that when 50 to 499 full-time workers are laid off, they must amount to one-third of the workforce at the employment site, and providing the DOL the authority to investigate and attempt to resolve violations of the WARN Act. However, no further action was taken after the bill passed the House and was referred to the Senate Committee on Finance. Thus, the state mini-WARN Acts remain the most strict and expansive form of advance notice legislation in the U.S.

3. Empirical Methodology and Data

3.1. Empirical strategy for measuring firms' exposure to the mini-WARN Act

We exploit the enactment of state mini-WARN Acts to identify statistical variation in worker protection from sudden mass displacement ($Mini\text{-}WARN_{st}$) and examine its effect on corporate innovation.[10] The legal requirements stipulated by these laws apply to workers in the state where they

[10] The variable $Mini\text{-}WARN_{st}$ is an indicator for whether state s has a legally binding mini-WARN Act as of year t, based on the law's effective year, and zero otherwise.

are employed, and most publicly traded firms in the U.S. have operations and workers that are geographically dispersed across several states (e.g., Garcia and Norli (2012)). Moreover, depending on the state, the employee size thresholds specified by the mini-WARN Act range between 25 and 100 workers per employment site. Thus, relying on a firm's state of headquarters location alone is insufficient to proxy for its exposure to the law. Rather, firms are differentially affected by a mini-WARN Act based on the distribution of their operations and workers across states.

We identify the state-by-state location of each of a firm's establishments (i.e., headquarters, subsidiaries, branches, and plants) according to its historical five-digit Federal Information Processing Standards (FIPS) codes using information from the NETS Publicly Traded database. This database provides us with a complete list of every establishment owned by a publicly traded firm. It includes, among other data, information on FIPS, employment, and the year of observation. Each establishment from the NETS data is matched to its parent company by company name via a "fuzzy" matching algorithm combined with manual inspection. We measure the geographic dispersion of firm i's operations and workers, and thus its exposure to a mini-WARN Act in year t, using the proportion (w_{ist}) of its labor force located in a state s with a legally binding law. Specifically, for firm i in year t, its weighted-average exposure to the mini-WARN Act is $Mini\text{-}WARN_{it} = \sum_s w_{ist}\, Mini\text{-}WARN_{st}$.

3.2. Sample selection

The main sample includes all publicly traded firms in the CRSP-Compustat merged database (excluding regulated utility and financial firms) that can be matched to their establishments in the NETS data and have non-missing data for the variables used in the main tests. Our sample period is from 1999 to 2019, which starts three years before California's mini-WARN Act's passage in 2002 and ends in the year that Delaware's mini-WARN Act becomes legally binding. During our sample period, eight states enact these laws. Four states adopted mini-WARN Acts before our sample period, with Maine, Hawaii, and Tennessee passing laws with effective years before or during the year of the federal WARN Act's effective year in 1989 and Wisconsin's mini-WARN Act becoming legally binding in 1991. We do not include the firm-years surrounding these earlier events for two reasons. First, our measure $Mini\text{-}WARN_{it}$ is constructed using establishment-level data from NETS, which starts in 1990. Second, the requirements of these earlier state mini-WARN Acts can be less stringent than the federal version, and thus workers in these states may be more likely to use the federal WARN Act (Siebert (1992)). In contrast, many of the requirements of the eight laws adopted and amended during our sample period are stricter and more expansive than the federal Act applying to more firms and layoffs (all eight states), requiring longer notice periods (two-of-the-eight states), and removing certain exceptions that the federal WARN Act permits (one-of-the-eight states).

The final sample includes 49,125 firm-year observations. We winsorize all continuous variables at the 1% level to deal with the potential of extreme outliers. Table 2 reports the summary statistics for the variables used in our main tests. Figure 1 shows the percentage of employees and establishments in states with legally binding mini-WARN Acts per year over our sample period. Appendix A provides variable definitions.

3.3. Econometric specification

We estimate the following OLS regression model to examine whether employment protection stemming from increased mini-WARN Act exposure changes a firm's innovation activities:

$$y_{it(t+2)} = \beta_1 Mini\text{-}WARN_{it} + \gamma' \mathbf{X}_{it-1} + f_i + \omega_t + \alpha_s + \varepsilon_{it}, \quad (1)$$

where y is one of three measures of corporate innovation for firm i in year t or t+2 (depending on the measure). The first measure $R\&D/Assets$ is the ratio of a firm's research and development expenditures to its book value of assets. We use the value of a firm's R&D and book assets in its fiscal year t and set missing values to zero. The second measure $Ln(1 + Npats)$ is the natural logarithm of one plus the number of patents a firm applies for and is eventually granted in a given year. Our last measure of corporate innovation $Ln(1 + Cite/Npats)$ is the natural logarithm of one plus the average number of citations a firm's patents receive in a given year. Thus, the first measure considers a firm's investment in an innovation input, while the last two measures focus on its innovation output. As in Fang, Tian, and Tice (2014), we add one when taking the natural logarithm to avoid losing firm-years with zero patents or citations and lead both measures by two years because this is the average time it takes to obtain a patent. The data on patenting activity derives from Kogan et al. (KPSS (2017)).[11]

[11] We use an updated version of the KPSS patent data: https://github.com/KPSS2017/Technological-Innovation-Resource-Allocation-and-Growth-Extended-Data. This data provides information on all granted patent applications and forward citations from 1926 to 2020. Thus, the sample period for our t+2 patent regressions is from 1999 to 2018.

The key independent variable of interest, $Mini\text{-}WARN$, quantifies the effect of firm i's exposure to a mini-WARN Act based on the proportion of its employees working in a state with a legally binding law in year t. We also include a vector of controls (**X**) to account for the following firm characteristics in year t-1: the natural logarithm of the book value of assets, Tobin's Q, return on assets, the natural logarithm of the firm's age, financial leverage, cash holdings, capital expenditures, and fixed assets. Further, our preferred regression model specification includes firm (f) fixed effects to control for unobserved, time-invariant differences across firms, year (ω) fixed effects to control for time-varying economy-wide factors, and state (α) fixed effects to control for unobserved, time-invariant differences across historical headquarters' states. Lastly, because our key independent variable is a firm-specific measure, we adjust standard errors for clustering at the firm level.

4. Main Results

4.1. Worker protection from abrupt mass job loss and corporate innovation

We begin our analysis by considering whether an increase in employment protection from sudden mass displacement affects R&D expenditures. Table 3 presents the findings. Column 1 includes our weighted-average measure of a firm's exposure to mini-WARN Acts and firm and year fixed effects. Column 2 adds state fixed effects, and column 3 further controls for firm size, Tobin's Q, return on assets, and age. Last, column 4 additionally controls for a firm's financial leverage, cash holdings, capital expenditures, and fixed assets. The coefficient estimates across the four columns indicate a negative and statistically significant relationship between R&D expenditures and exposure to mini-WARN Acts. As for the economic significance of the effect, the coefficient of -0.009 on $Mini\text{-}WARN$ in our fully specified model in column 4 implies that for firms with a one standard deviation increase in exposure to mini-WARN Acts (0.331), R&D expenditures to book assets decrease by 0.3 (= -0.009 × 0.331) percentage points, which represents a decrease of 5.1% (=-0.003/0.059) relative to the mean.

Next, Table 4 reports the results from our analyses that examine the relationship between a firm's exposure to mini-WARN Acts and its patenting activity. Columns 1-2 present the results using patent counts (i.e., the "quantity" of a firm's innovation output) as the dependent variable, while columns 3-4 tabulate the results with patent citations (i.e., the "quality" of its innovation output) as the dependent variable. The odd-numbered columns include our weighted-average measure $Mini\text{-}WARN$ and firm, year, and state fixed effects, whereas the even-numbered columns further specify the full set of firm-level controls. Table 4 shows that $Ln(1 + Npats)$ and $Ln(1 + Cite/Npats)$ decrease significantly for firms exposed to state mini-WARN Acts. Specifically, Columns 1-2 show coefficients of -0.078 and -0.065 on $Mini\text{-}WARN$, indicating that for every one-standard-deviation increase in this variable, the number of patents a firm is granted in a given year decrease by 2.4% to 2.9% relative to its mean of 8.21. Further, relative to the mean of 1.83, the coefficients of -0.132 and -0.107 in columns 3-4 suggest that firms' average number of citations per patent in a given year decrease by 5.4% to 6.6% for every one-standard-deviation increase in their exposure to the mini-WARN Acts.[12]

Overall, the evidence in Tables 3 and 4 is consistent with increases in employment protection from exposure to state mini-WARN Acts hindering corporate innovation.

4.2. Robustness tests of the main results

We conduct additional analyses to examine the robustness of the main findings. The results in this section are reported in the Internet Appendix.

First, instead of measuring R&D expenditures during a firm's fiscal year t and patenting activities during the fiscal year t+2, we consider alternative measurement horizons in Table IA1. Specifically, in Panel A, we measure R&D spending as $R\&D_t/Assets_{t-1}$, $R\&D_{t+1}/Assets_t$, and $R\&D_{t+1}/Assets_{t+1}$, and in Panel B, we measure patent grants and citations as $Ln(1+Npats)_{t+1}$, $Ln(1+Npats)_{t+3}$, $Ln(1+Cite/Npats)_{t+1}$, and $Ln(1+Cite/Npats)_{t+3}$. The results continue to show a negative relation between mini-WARN Act exposure and corporate innovation over these alternative measurement horizons. Second, in Table IA2, we consider whether our OLS regression analysis that uses the natural logarithm of one plus patent-based outcomes produces biased estimates (Cohn, Liu, and Wardlaw (2022)). Employing a Poisson model in columns 1-3 with patent grants specified at t+1, t+2, and t+3 as the dependent variable, and an OLS model in columns 4-6 with the mean value of a firm's citations per granted patents during years t+1, t+2, and t+3 as the dependent variable, we find a robust negative relation with mini-WARN Act exposure.

[12] We calculate the economic significance of the effect of $Mini\text{-}WARN$ on patenting activity as follows: EXP(coefficient × $Mini\text{-}WARN$'s standard deviation) – 1 × ((1 + mean of patent measure) / mean of patent measure).

Third, Table IA3 shows that our findings are qualitatively similar using alternative weights in constructing $Mini\text{-}WARN$ based on the firms' percentage of establishments or large establishments (that employ 100 or more workers) in states with legally binding mini-WARN Acts. Fourth, we restrict our sample to only include firms that operate in four-digit SIC industries that historically file and are granted patents (e.g., Atanassov (2013)), and show in Table IA4 that our main findings are qualitatively similar. Lastly, in Table IA5, we employ an alternative standard error clustering technique that clusters by the state where the greatest percentage of a firm's establishments are located over our sample period. We break ties by first using the firm's headquarters state (if it is one of the tying states) and then by using the state where the largest share of a firm's employees work. Using this alternative clustering level, we continue to find that exposure to mini-WARN Acts results in significant declines in innovation activities.

4.3. Cross-sectional heterogeneity: Industry workforce automation

We further analyze what drives the negative effect of employment protection on corporate innovation by testing whether exposure to mini-WARN Acts differentially matters if the firms operate in industries where the workforce is more likely to be automated. States adopt Mini-WARN Acts to protect workers by requiring employers to provide them with advance notice about an impending dismissal so that the workers have more time to adjust to the pending job loss, arrange for skill retraining, and find alternative employment. Thus, if firms operate in industries that are more suited for workforce automation, then the effect of state mini-WARN Act exposure on corporate innovation should be less pronounced because (i) firms in the industry do not expect to employ labor to the same extent in the future, or (ii) at present, there are fewer workers (lower worker-to-machine ratios) to consider for purposes of triggering the Act when making decisions related to closings and layoffs.

To reinforce the findings that we document in Tables 3 and 4, which imply that employment protection from sudden mass displacement leads to less R&D investment and fewer patent grants and citations, we investigate whether exposure to mini-WARN Acts has a smaller negative impact on innovation if firms operate in industries that are more suited for workforce automation. We test this hypothesis empirically by augmenting our regression model (1) to include the interaction of $Mini\text{-}WARN$ with an indicator variable for whether industry j's "substitutability of labor with automated capital" is greater than the sample median ($High\ SLAC$) in year t-1. The continuous measure $SLAC$

comes from Bates, Du, and Wang (2020), and it captures the ex-post probability of industry automation (Appendix A outlines its estimation). Table 5 presents our findings from this analysis.

Columns 1-2 show the results with $R\&D/Assets$ as the dependent variable, while columns 3-4 (5-6) report the results with $Ln(1 + Npats)$ ($Ln(1 + Cite/Npats)$) as the dependent variable. The odd numbered columns include the standalone variables $Mini\text{-}WARN$ and $High\ SLAC$, their interaction, and firm, year, and state fixed effects. The even-numbered columns add the firm-level controls. Table 5 documents that R&D investment decreases less and patent grants and citations do not decrease for firms exposed to state mini-WARN Acts and operating in industries highly suitable for workforce automation. The coefficient of -0.012 on $Mini\text{-}WARN$ in columns 1-2 imply that, relative to its mean, the R&D expenditures of firms that operate in an industry that is less suited for workforce automation are 6.7% lower for every one standard deviation increase in a firm's exposure to state mini-WARN Acts. However, the coefficients of 0.010 and 0.009 on $Mini\text{-}WARN \times High\ SLAC$ indicate that for firms with a one-standard-deviation increase in exposure to state mini-WARN Acts and that operate in industries with an above-median level of $SLAC$, R&D expenditures to book assets decrease by 0.07 to 0.10 percentage points (e.g., = -0.012 × 0.331 + 0.009 × 0.331), representing a decrease of 1.1% to 1.7% relative to its mean. Interpreted differently, operating in an industry better suited for workforce automation reduces the sensitivity of R&D investment to mini-WARN Act exposure by 75.0% to 83.3%, respectively.

Moving to columns 3-4, the coefficients of -0.122 and -0.105 on $Mini\text{-}WARN$ suggest that firms that operate in an industry with a below median level of $SLAC$ and that experience a one-standard-deviation increase in $Mini\text{-}WARN$ decrease their quantity of patents by 3.8% to 4.4% relative to its mean. Conversely, the coefficients of 0.172 and 0.162 on $Mini\text{-}WARN \times High\ SLAC$ imply that for firms with a one-standard-deviation increase in $Mini\text{-}WARN$ and that operate in industries with a workforce that is more likely to be automated, patent counts increase by 1.9% to 2.1% relative to its mean. Columns 5-6 report similar evidence using $Ln(1 + Cite/Npats)$ as the dependent variable. Specifically, the coefficients of -0.187 and -0.167 on $Mini\text{-}WARN$ and 0.288 and 0.263 on $Mini\text{-}WARN \times High\ SLAC$ indicate that for firms experiencing a one-standard-deviation increase in mini-

WARN Act exposure and that are in industries with a greater than median sample level of $SLAC$, their mean number of citations per patent increase by 4.9% to 5.3% relative to its mean.[13]

Hence, for firms that operate in industries that are more suited for workforce automation and thus less exposed to the employment protection that arises from the mini-WARN Acts, the laws' negative effect is attenuated for R&D investment and completely offset for patenting activity.[14]

4.4. Channel analysis: Operational inflexibility

Our findings show that firms respond to an increase in employment protection from sudden mass displacement by reducing their innovation activities. In the following sections, we analyze whether increased operational inflexibility stemming from exposure to the mini-WARN Act's advance notice requirement is a potential channel that explains this result. Evidence from the real options literature suggests that the advance notice owed to employees reduces the time to maturity of firms' put option to abandon establishments and workers, thus hindering their ability to manage risk (e.g., Kemna (1993), Abel et al. (1996), Abel and Eberly (1996), Triantis (2000)). All else equal, this may decrease firms' tolerance for bearing risk (e.g., Hackbarth and Johnson (2015), Gu, Hackbarth, and Johnson (2018)). Conversely, innovation is an inherently unpredictable and idiosyncratic process, requiring an extraordinary tolerance for risk and failure (e.g., Holmstrom (1989), Tian and Wang (2014)). Additionally, surveyed responses from CFOs suggest that, on average, firms tend to focus on shorter-term investment projects and business plans because of the unreliability of forecasts beyond two years (Graham (2022)). Hence, requiring firms to give advance notice could amplify the difficulty of investing and planning over longer-term horizons.

4.4.1. Cross-sectional heterogeneity: Planning horizons

If operational inflexibility induces firms to shorten their investment and planning horizons (e.g., Graham (2022)), we expect that the negative impact of mini-WARN Act exposure on R&D

[13] The economic significance of the total effect of $Mini\text{-}WARN$ and $Mini\text{-}WARN \times High\,SLAC$ on patenting is calculated as: EXP($Mini\text{-}WARN$'s coefficient × $Mini\text{-}WARN$'s standard deviation + $Mini\text{-}WARN \times High\,SLAC$'s coefficient × $Mini\text{-}WARN$'s standard deviation) – 1 × ((1 + mean of patent measure) / mean of patent measure).

[14] We view these cross-sectional results as being consistent with prior work that finds that firms respond to an increase in labor dismissal costs by increasing their process innovations to facilitate the substitution of capital for labor and with surveyed CFOs' expectations post-COVID 19 that firms with low workplace flexibility are more likely to use automation to replace labor (Barry et al. (2022), Bena, Ortiz-Molina, and Simintzi (2022)).

expenditures, patent grants, and citations will be even greater for firms that have historically relied on longer-term business plans. To examine this hypothesis, we measure a firm's planning horizon based on the types of words that its senior executives use during conference calls. Conference calls are a voluntary disclosure mechanism that enables managers to communicate corporate strategies and forward-looking information and interact with and respond to questions from analysts. Using the dictionary of short- and long-term oriented keywords from Brochet, Loumioti, and Serafeim (2015), we create the indicator $Long\ Horizon$ by setting it equal to one if the ratio of the number of long-term oriented words that a firm's senior executives use when communicating with sell-side analysts during earnings conference calls to the number of long- and short-term oriented words they use, averaged over the past three years (i.e., historically), is greater than the sample median. For the regression analysis, we interact $Mini\text{-}WARN$ with $Long\ Horizon$ measured in year t-1. Conference call data comes from FactSet Events and Transcripts, and we exclude firm-years with missing observations in this data.

Table 6 presents the results of this analysis. We use $R\&D/Assets$ as the dependent variable in columns 1-2 and $Ln(1 + Npats)$ ($Ln(1 + Cite/Npats)$) in columns 3-4 (5-6). The odd-numbered columns include the standalone terms $Mini\text{-}WARN$ and $Long\ Horizon$, its interaction, and firm, year, and state fixed effects, while the even-numbered columns further include our firm-level controls. The coefficients across the six columns indicate that mini-WARN Act exposure does not significantly impact corporate innovation for firms with historically shorter planning horizons. In contrast, for firms with an above-the-sample median planning horizon, the operational inflexibility arising from exposure to mini-WARN Acts leads to significant decreases in R&D spending, patent counts, and citations. In terms of the economic significance of the effect, relative to the respective dependent variables' mean, a one-standard-deviation increase in $Mini\text{-}WARN$ is associated with a differential decrease in R&D spending of 6.7% to 7.3%, patent counts of 6.9% to 7.3%, and patent citations of 4.6% to 4.7%. Thus, the negative effect of mini-WARN Act exposure on innovation activities is differentially experienced by firms with historically longer-term planning horizons. Overall, we interpret this evidence as consistent with operational inflexibility impeding firms' pursuit of innovation by inducing more conservative and nearer-term corporate policies.

4.4.2. Patenting strategies

Next, we investigate whether increased operational inflexibility changes the patenting strategies of firms. If exposure to the mini-WARN Act's advance notice requirement decreases the time to maturity of firms' put option to abandon establishments and workers, thus decreasing the ability to manage risk and tolerate failure (e.g., Abel et al. (1996), Abel and Eberly (1996), Hackbarth and Johnson (2015)), we expect that the patenting strategies of these firms will become more conservative. This prediction is consistent with prior theoretical work that shows that motivating a firm's innovation beyond exploiting its existing knowledge base and toward exploration of "ground-breaking" invention requires both a short-term tolerance for failure as well as long-term rewards for success (e.g., Manso (2011)). Following prior work (e.g., Chemmanur et al. (2019)), we define a patenting strategy as either being "exploitative" or "explorative" based on whether at least 80% of its citations refer or do not refer to its existing knowledge base, respectively. A firm's existing knowledge base includes its prior portfolio of patents and all of the patents that its patents have cited during the past five years. We then create the two dependent variables, $Exploitative$ and $Explorative$, based on the percentage of a firm's patents that fall into either of these respective classifications. Consistent with our analysis in Table 4, we measure each of these patenting strategy measures in year t+2. Table 7 presents the findings.

Columns 1-2 show the results using $Exploitative$ as the dependent variable, while columns 3-4 report the findings with $Explorative$ as the dependent variable. We include the measure $Mini\text{-}WARN$ and firm, year, and state fixed effects in the odd-numbered columns, whereas the even-numbered columns add the full set of firm-level controls. Inspecting the first two columns, we find that exposure to mini-WARN Acts significantly increases the percentage of exploitative patents. In terms of the economic significance of the effect, the coefficient estimates of 0.021 and 0.022 imply that for every one standard deviation increase in $Mini\text{-}WARN$, the firm's ratio of exploitative patents that are based on its current knowledge base increase by 3.4% to 3.5% relative to its sample mean (0.206). In contrast, the negative and significant coefficient estimates of -0.008 and -0.007 in columns 3-4 suggest that, relative to its sample mean (0.009), a one standard deviation increase in a firm's exposure to state mini-WARN Acts leads to decreases of 25.7% to 29.4% in its percentage of exploratory patents that focus on new areas of knowledge. These findings support the view that less operational flexibility due to mini-WARN Act exposure reduces firms' tolerance for risk and failure, leading to more conservative patenting strategies.

4.4.3. Firm risk

Table 8 examines whether the shift toward more conservative innovation activities that we find among firms exposed to mini-WARN Acts is associated with a decrease in risk (e.g., Hsu (2009)). We measure firm risk using stock return volatility (e.g., Serfling (2014), Bernile, Bhagwat, and Yonker (2018)). Our first measure $Ln(Total\ Risk)$, is the natural logarithm of the annualized standard deviation of a firm's daily stock returns over its fiscal year. The second measure $Ln(Idiosyncratic\ Risk)$, is created by taking the natural logarithm of the annualized standard deviation of the estimated residuals from regressions of daily stock returns on the Fama-French three factors over a firm's fiscal year.

Columns 1-2 show the results using $Ln(Total\ Risk)$ as the dependent variable, while columns 3-4 employ $Ln(Idiosyncratic\ Risk)$. We include our weighted-average measure of mini-WARN Act exposure and firm, year, and state fixed effects in the odd-numbered columns and add the firm-level controls in the even-numbered columns. The coefficients on $Mini\text{-}WARN$ in each of the four columns indicate a negative and significant association with stock return volatility. In particular, the coefficient estimates of -0.003 in columns 1-2 suggest that an increase of one standard deviation in a firm's exposure to the mini-WARN Acts is associated with a decrease in its total stock return volatility of about 10 basis points (=-0.003 × 0.331), whereas the coefficient estimate of -0.003 in columns 3-4 imply a similar reduction of roughly 10 basis points in its idiosyncratic risk.

5. Corroborating Evidence from Establishments

The findings so far are consistent with greater operational inflexibility spurred by exposure to mini-WARN Acts decreasing firms' tolerance for risk and inducing a shift toward more conservative business plans that require less investment in innovation. However, an empirical challenge of exploiting firms' exposure to more than one state's mini-WARN Act (i.e., multiple "treatment" events) for identification is providing evidence that the parallel trends assumption is satisfied and that dynamic treatment effects do not materially bias our inference (e.g., Roberts and Whited (2013), Callaway and Sant'Anna (2021)). We deal with this challenge to our firm-level analysis by using the establishment-level data from NETS. Because establishments in a single state are only treated once with the law's passage, we can test the parallel trends assumption and account for dynamic treatment effects (e.g., Baker, Larcker, and Wang (2022)). In addition, analysis of establishment-level outcomes provides a robustness check of our firm-level results, potentially offering further support of the operational inflexibility channel if these policies also become more conservative with exposure to the Act.

5.1. Sample construction

We use employment, financial, and geographic data for every U.S. establishment owned by a publicly traded firm from the NETS Publicly Traded database. Wall & Associates construct this database by converting snapshots of archival data collected annually by Dun and Bradstreet (D&B) into a time series of historical establishment information. While there are no legal obligations requiring that establishments report to D&B because D&B is a prominent source of business credit information to lenders, establishments intent on procuring lines of credit from financial institutions or suppliers have the incentive to comply with D&B's request for information. Moreover, D&B gathers additional establishment-level data from company filings, telephone calls, news reports, press releases, legal and bankruptcy filings, payment and collection activities, and government and postal service records. Recent studies using the NETS database for establishment-level analyses include Faccio and Hsu (2017), Addoum, Ng, and Ortiz-Bobea (2020), Farre-Mensa, Hegde, and Ljungqvist (2020), Akey and Appel (2021), Borisov, Ellul, and Sevilir (2021), and Bartram, Hou, and Kim (2022).

To enter the sample, we require that the establishments have non-missing historical information on employment, sales, and five-digit FIPS codes and employ at least 25 employees. This last requirement is meant to reduce potential estimation noise from small establishments that NETS tends to over-sample (Barnatchez, Crane, and Decker (2017)) and do not meet the minimum employee size thresholds stipulated by the mini-WARN Acts.[15] Finally, we restrict the sample to establishment-years that are either not treated by a mini-WARN Act or that have not been treated for more than five years since the Act became legally binding to account for the presence of dynamic treatment effects (e.g., Baker, Larcker, and Wang (2022)). These data filters yield our main establishment-level sample that comprises 1,753,841 establishment-year observations from 1999 to 2019. We winsorize continuous

[15] However, our findings are not materially affected by this requirement.

variables at the 1% level to deal with potential outliers. Panel B of Table 2 presents the summary statistics, and Appendix A provides variable definitions.

5.2. Employment growth rates

We test whether an increase in worker protection from sudden mass dismissal after a state mini-WARN Act becomes legally binding leads to slower employment growth rates by estimating the following establishment-level panel regression model:

$$Employment\ Growth_{lt} = \beta_1 Mini\text{-}WARN_{st} + \gamma' \mathbf{X}_{lt-1} + f_l + \omega_t + \alpha_s + \varepsilon_{lt}, \quad (2)$$

where *Employment Growth* is measured as the natural logarithm of establishment *l*'s employment in the observation year *t* minus the natural logarithm of its employment in the previous year *t*-1, *Mini-WARN* is an indicator variable set to one if the state *s* where the establishment is located has a mini-WARN Act that is legally binding as of the observation year. **X** represents a vector of establishment-level controls that are measured in the year prior to the observation year and include: *Sales Growth*, the natural logarithm of sales (*Ln(Sales)*), the natural logarithm of employees (*Ln(Employees)*), and *Employment Growth*. We also include establishment fixed effects (f) to control for unobserved, time-invariant differences across establishments, year fixed effects (ω) to control for time-varying economy-wide factors, and state fixed effects (α) to control for time-invariant differences across location states. Standard errors are clustered by the establishment's state of location. Table 9 reports the findings from this analysis.

Column 1 includes the *Mini-WARN* indicator and establishment and year fixed effects. The results indicate a negative and statistically significant relationship between employment growth rates and a legally binding mini-WARN Act. Specifically, the coefficient estimate shows that establishments have slower employment growth rates by 0.81 percentage points after the law's effective date. Given that the sample standard deviation of *Employment Growth* is 13%, this result represents a relative decrease in employment growth rates of 6.2% (=0.81/13.0). Column 2 adds state fixed effects, and column 3 further controls for the establishment's sales growth rate. The findings in these columns remain similar to those in Column 1, suggesting that employment growth rates decrease by 0.84 to 0.88 percentage points once a mini-WARN Act becomes legally binding. Column 4 additionally controls for the natural logarithm of sales, and Column 5 for the natural logarithm of employees. Column 6 specifies a control for an establishment's employment growth rate in the previous year. Adding these controls reduces the magnitude of the coefficient estimates but strengthens the statistical significance of the effect of the mini-WARN Act on employment growth. Across these columns, the results show a significantly negative reduction in employment growth rates after a mini-WARN Act becomes legally binding by about 0.41 to 0.43 percentage points. These estimates imply that employment growth rates slow by 3.2% to 3.3% relative to the sample standard deviation following the law's effective date.[16]

Figure 2 explores whether there are pre-trends in employment growth rates before a mini-WARN Act becomes legally binding by examining the timing of the changes in the differences in employment growth between establishments located in mini-WARN Act-passing states and establishments located elsewhere. To create this figure, we modify regression model (2) by replacing the *Mini-WARN* indicator with eleven separate indicator variables for each year from five years before to five years after a mini-WARN Act becomes legally binding. Specifying this model with either no or the full set of establishment-level controls, the results show that in the five years before a state's mini-WARN Act becomes legally binding, the employment growth rates of establishments in those states are not statistically different from those of establishments located elsewhere, consistent with satisfying the "parallel trends" assumption.[17] Conversely, in each of the five years after a mini-WARN Act's effective date, the employment growth rates of establishments in the enacting states decline significantly relative to establishments in states without such a law.[18]

5.3. Restructuring decisions

Next, we investigate whether establishment restructuring decisions are affected by protecting workers from abrupt mass job loss. Our first set of tests considers whether a legally binding mini-WARN Act impacts the likelihood that an establishment will open or be acquired. We create the

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[16] We interpret the economic significance of the coefficients relative to the sample standard deviation because *Employment Growth* can take negative values. However, for completeness, the coefficient of -0.41 estimated using the model in Column 6 implies that employment growth declines by 29.3% (=0.41/1.4) relative to the sample mean; this magnitude is on par with prior work that analyzes employment growth (e.g., Hombert and Matray (2018)).

[17] The coefficient on the *t*-4 indicator using the model without controls is not statistically significant (p-value > 0.10).

[18] We also find that the sales growth rates of establishments in mini-WARN Act-states decrease significantly following the law's effective date. These results are reported in Internet Appendix Table IA6 and Figure IA1. However, we interpret these findings with caution because a material number of sales observations in the NETS data are not actual values reported by the establishments but are imputed by either D&B or Wall & Associates (e.g., Addoum, Ng, and Ortiz-Bobea (2020)).

indicator *Birth* by setting its value equal to one in the observation year the establishment opens based on the variable *FirstYear* in the NETS data and zero otherwise. The indicator *Acquisition* is set equal to one in the first observation year after the establishment's parent firm changes and zero otherwise. We adjust regression model (2) in this analysis to include parent firm fixed effects to account for time-invariant differences across firms that could correlate with restructuring decisions and, specific to the birth analysis, we measure the establishment-level controls in the observation year because there are no prior years of data before the birth.

Panel A of Table 10 presents the results on establishment births. Column 1 specifies the indicator for whether the establishment is in a state with a legally binding mini-WARN Act and establishment, parent firm, year, and state fixed effects. Column 2 adds controls for the natural logarithm of sales and the natural logarithm of employees. The results in these columns show that an establishment is 2.0% less likely to open in a state with a legally binding mini-WARN Act. Columns 3 and 4 add the interaction of the *Mini-WARN* indicator with an indicator for whether the establishment has fewer than 100 workers (*Small Establishment*). The coefficients on the interaction term (= -0.01) and the standalone *Mini-WARN* indicator (= -0.02) suggest that smaller and larger establishments are significantly less likely to open in a state with a legally binding Act. Thus, the operational inflexibility spurred by the advance notice obligation of the laws in plant closings and mass layoffs leads to a decrease in the likelihood that firms open establishments in those states.

Panel B of Table 10 reports the findings on establishment acquisitions. Columns 1 and 2 show that firms are 1.2% to 1.3% less likely to acquire establishments in a state with a legally binding mini-WARN Act. Columns 3 and 4 interact the *Mini-WARN* indicator with the one-year lagged *Small Establishment* indicator. The significant coefficient on the standalone *Mini-WARN* variable (= -0.01) and the insignificant coefficient on its interaction with *Small Establishment* (= -0.01) implies that there is not a significant differential decrease in acquisitions based on the size of the establishment; rather, both large and small establishments are about 1.0% less likely to be acquired if in a state with a legally binding mini-WARN Act. Columns 5 and 6 assess whether performance matters in a firm's decision to acquire an establishment. We create the indicator *Negative Sales Growth* that equals one if an establishment had a negative sales growth rate in the year prior to the observation year and interact it with *Mini-WARN*. The results show that firms are about 1.0% to 1.1% less likely to acquire establishments with positive sales growth in an Act-passing state and nearly 2.0% to 2.1% less likely (a differential of 1.0%) to acquire establishments with negative sales growth.

The last set of tests analyzes the impact of the mini-WARN Act on establishment restructuring decisions by considering its effect on the likelihood of establishment closures and divestitures. An establishment closure (*Death*) is defined using an indicator variable set equal to one if the establishment closes in the observation year and zero otherwise. The NETS data includes the variable *LastYear*, which we use to assign the year of death of the establishment. We define an establishment divestiture (*Divestiture)* using an indicator variable that equals one in the last observation year before the parent firm assigned to the establishment in the NETS data changes and zero otherwise. Regression model (2) is adjusted in this analysis to include parent firm fixed effects.

Panel A of Table 11 presents the results on establishment deaths. Column 1 includes an indicator for whether the establishment is located in a state with a legally binding mini-WARN Act as well as establishment, parent firm, year, and state fixed effects. Column 2 further adds the full set of establishment-level controls. The results suggest that the mini-WARN Act leads to a 1.0% increase in the likelihood that an establishment closes. At first blush, this finding might seem counterintuitive because the mini-WARN Acts increase the legal requirements that firms must follow before shutting down. We aim to understand this result better using two separate interaction analyses. First, we modify the regression model in Columns 3 and 4 to include the interaction of *Mini-WARN* with the one-year lagged *Small Establishment* indicator. Consistent with the institutional detail of the mini-WARN Act, we find a significantly lower likelihood of roughly 1.0% that a large establishment with 100 or more employees (where the burden of advance notice is especially costly) closes after a mini-WARN Act's effective date. In contrast, the coefficient on the interaction term indicates that small establishments with fewer than 100 workers are differentially about 2.0% more likely to close once a mini-WARN Act becomes legally binding (-1.2% total effect). We interpret this evidence as suggestive of firms strategically choosing to close establishments: (i) before they grow large enough to meet the employee-size thresholds specified by a mini-WARN Act, and (ii) where, if the obligations of the law were required, it would be easier to manage because there are fewer workers to notify.

Second, we interact *Mini-WARN* with the one-year lagged *Negative Sales Growth* indicator in Columns 5 and 6 to assess the role of performance in a firm's decision to shut down an establishment.

The coefficient on the interaction term implies that poor-performing establishments are not differentially more or less likely to close after a mini-WARN Act becomes legally binding. Rather, even with a positive sales growth rate, an establishment's death is statistically more likely in a mini-WARN passing state by about 1.0%. Taken together, the findings from Panel A of Table 11 suggest that, in an effort to reduce the risk of triggering a mini-WARN Act, firms shut down establishments because of the size of their workforce, irrespective of their past performance.

Panel B of Table 11 reports the findings on establishment divestitures. Columns 1 and 2 show that the likelihood that a firm divests an establishment is not significantly related on average to the presence of a legally binding mini-WARN Act. Columns 3 and 4 add the interaction of the *Mini-WARN* and *Small Establishment* indicators. The estimates imply that larger establishments comprised of 100 or more workers are about 1.0% more likely to be sold after a mini-WARN Act becomes legally binding. In contrast, there is no differential change in the divestiture of smaller establishments. We interpret these results as suggesting that firms attempt to reduce their exposure to mini-WARN Acts by selling off their larger establishments. Using a different interaction term, Columns 5 and 6 interact the *Mini-WARN* and *Negative Sales Growth* indicator variables. The coefficients on the standalone mini-WARN Act indicator imply that establishments with positive sales growth in the prior year are 1.0% more likely to be divested after a mini-WARN Act becomes legally binding. Conversely, the coefficients on the interaction term indicate that establishments with negative sales growth in the prior year are differentially 1.0% less likely to be divested (for a total effect of close to 0.0%). Hence, when firms can find a buyer for its establishments that are in mini-WARN Act-passing states, the likelihood that the sale is completed is conditional on the establishment having a positive sales growth rate, whereas a potential buyer is differentially less likely to acquire an establishment in a mini-WARN Act-state if the establishment recently had a negative sales growth rate (i.e., the increased worker protection from abrupt displacement constrains firms' ability to divest establishments).

Overall, the findings in Tables 10 and 11 indicate that the operational inflexibility brought about by the advance notice requirement of a mini-WARN Act changes establishment-level decision-making in a way that is consistent with the parent firm adopting a more conservative restructuring strategy to reduce its exposure to the law.

5.4. Payment risk

Lastly, we test whether a firm's decision to slow establishment-level employment growth and adopt a more conservative restructuring policy shields some of its exposure to the operational inflexibility and risk brought about by the mini-WARN Act. We follow prior work (e.g., Akey and Appel (2021)) and measure establishment-level risk using the Paydex score in the NETS data. The Paydex score is a business credit score determined by D&B based on the trade credit performance information (i.e., payment history) obtained from an establishment's suppliers and vendors. The score ranges from 0 to 100 and is value-weighted by the size of the payment obligation, and a lower score indicates higher payment risk. The NETS data includes the variables *PAYDEXMIN* and *PAYDEXMAX*. We take the natural logarithm of the midpoint of these values to create the dependent variable *Ln(PayDex)*.[19] Our establishment-level risk analysis employs regression model (2), and Table 12 presents the findings.

Columns 1 and 2 specify the dependent variable *Ln(PayDex)*, while Columns 3 and 4 use *PayDex/AvgPayDex*. The odd numbered columns include an indicator for whether the establishment is located in a state with a legally binding mini-WARN Act as of the observation year as well as establishment, year, and state fixed effects. The even-numbered columns further control for establishment-level characteristics in the year prior to the observation year. The coefficient estimates in each of the four columns suggest a negative and significant relation between a state mini-WARN Act and the Paydex score. Regarding the economic significance of the effect, the estimates in the first (last) two columns imply that establishment-level payment risk decreases by 0.88 (0.83) percentage points after the mini-WARN Act becomes legally binding.

We also examine whether there are pre-trends in the Paydex score before a mini-WARN Act's effective year. We plot the results from this analysis in Figure 3. Consistent with satisfying the parallel trends assumption, relative to establishments in states without a mini-WARN Act, there is no statistical difference in Paydex scores of establishments located in a mini-WARN Act passing state in the five years before the law becomes legally binding. However, each year after at least the second year of a

[19] Our results are robust if we use either *PAYDEXMIN* or *PAYDEXMAX* to construct the dependent variables.

mini-WARN Act's effective year, the Paydex scores of the establishments in those states are significantly higher than that of establishments located elsewhere.

In sum, the results from the establishment-level analyses reinforce our interpretation that increased operational inflexibility arising from worker protection from abrupt mass job loss results in firms adopting more conservative policies and reducing their innovation activities.

6. Conclusion

The recent wave of layoffs in the U.S. tech sector has sparked a debate on the need to balance firms' operational flexibility in response to market changes and the protection of labor from sudden dismissal. Our study adds new and important insight to this debate by examining how an increase in employment protection from abrupt mass job loss changes firms' innovation activities. We propose state adoptions of the Worker Adjustment and Retraining Notification (mini-WARN) Act, which mandates employers to provide advance notice to workers displaced in a plant closing or mass layoff, as a new strategy to identify statistical variation in employment protection from sudden mass displacement. The Act aims to give displaced employees time to adjust to the impending job loss, arrange for skill retraining, and secure new employment. Employers found guilty of not providing the required advance notice are liable for back pay and benefits (e.g., medical, retirement) to each displaced worker for each day of violation.

Using the information on the location and number of employees at each of a firm's establishments from the NETS Publicly Traded Database, we construct a weighted-average measure that captures a firm's exposure to the mini-WARN Act based on the percentage of its labor force working in states with the law. We employ a difference-in-differences estimator to compare changes in the innovation activities of firms with varying exposures to the mini-WARN Acts. Using R&D expenditures as a measure of an innovation input and patent grants and citations as measures of innovation outputs, we find that firms exposed to the Act exhibit statistically significant declines in all three innovation measures. The negative effect is especially pronounced for firms operating in industries that are less suited for workforce automation.

These findings are best explained by employment protection from abrupt mass job loss creating operational inflexibility that reduces firms' tolerance for risk and failure and induces a shift to more conservative corporate policies. Consistent with this interpretation, we find that the negative impact of mini-WARN Act exposure on innovation is greater for firms with historically longer-term planning horizons and that firms respond to exposure to the law by adopting more cautious patenting strategies that exploit existing knowledge at the expense of exploring new. Reinforcing these findings using our establishment-level data, we show slower employment growth rates, lower likelihoods of establishment births and acquisitions, and higher likelihoods of smaller (larger) establishment deaths (divestitures) in mini-WARN Act-states.

Our results have important implications for researchers and policymakers. On the research side, they demonstrate the potential of the mini-WARN Act setting as a quasi-natural experiment for identifying the link between employment protection from sudden mass displacement and firm policies and outcomes. They also highlight the importance of considering distinct types of worker protections (e.g., group protection against abrupt layoffs versus individual protection from unjust dismissal) and their differing implications for corporate decisions and performance. On the policy side, our findings bring attention to a pertinent and unintended "crowding out" effect of labor laws aimed at protecting current workers from sudden mass displacement. Namely, constraining corporate labor adjustments for the benefit of existing employees can create operational inflexibility that hinders innovation and growth, potentially at the expense of prospective workers.

References

Abel, A.B., Dixit, A.K., Eberly, J.C., Pindyck, R.S., 1996. Options, the value of capital, and investment. *Quarterly Journal of Economics* 111, 753-777.

Abel, A.B., Eberly, J.C., 1996. Optimal investment with costly reversibility. *Review of Economic Studies* 63, 581-593.

Acharya, V.V., Baghai, R.P., Subramanian, K.V., 2014. Wrongful discharge laws and innovation. *Review of Financial Studies* 27, 301-346.

Addison, J.T., Blackburn, M.L., 1994a. The Worker Adjustment and Retraining Notification Act. *Journal of Economic Perspectives*, 8, 181-190.

Addison, J.T., Blackburn, M.L., 1994b. Has WARN warned? The impact of advance-notice legislation on the receipt of advance notice. *Journal of Labor Research*, 15, 83-90.

Addoum, J.M., Ng, D.T., Ortiz-Bobea, A., 2020. Temperature shocks and establishment sales. *Review of Financial Studies* 33, 1331-1366.

Akey, P., Appel, I., 2021. The limits of limited liability: evidence from industrial pollution. *Journal of Finance* 76, 5-55.

Atkinson, A.B., Stiglitz, J.E., 1969. A new view of technological change. *Economic Journal* 79, 573-578.

Author, D.H., 2003. Outsourcing at will: the contribution of unjust dismissal doctrine to the growth of employment outsourcing. *Journal of Labor Economics* 21, 1-42.

Autor, D.H., Kerr, W.R., Kugler, A.D., 2007. Does employment protection reduce productivity? Evidence from US states. *Economic Journal* 117, F189-F217.

Bai, J., Fairhurst, D., Serfling, M., 2020. Employment protection, investment, and firm growth. *Review of Financial Studies* 33, 644-688.

Baker, A.C., Larcker, D.F., Wang, C.C.Y., 2022. How much should we trust staggered difference-in-differences estimates. *Journal of Financial Economics* 144, 370-395.

Barnatchez, K., Crane, L.D., Decker, R.A., 2017. An assessment of the national establishment time series (NETS) database. Working paper, Federal Reserve Board.

Barry, J.W., Campello, M., Graham, J.R., Ma, Y., 2022. Corporate flexibility in a time of crisis. *Journal of Financial Economics* 144, 780-806.

Bartram, S.M., Hou, K., Kim, S., 2022. Real effects of climate policy: financial constraints and spillovers. *Journal of Financial Economics* 143, 668-696.

Bates, T.W., Du, F., Wang, J.J., 2020. Workplace automation and corporate financial policy. Working paper, Arizona State University.

Bena, J., Ortiz-Molina, H., Simintzi, E., 2022. Shielding firm value: employment protection and process innovation. *Journal of Financial Economics* 146, 637-664.

Bernile, G., Bhagwat, V., Yonker, S., 2018. Board diversity, firm risk, and corporate policies. *Journal of Financial Economics* 127, 588-612.

Bogage, J., 2022. Elon Musk's Twitter layoffs, explained. *Washington Post*, November 4.

Borisov, A., Ellul, A., Sevilir, M., 2021. Access to public capital markets and employment growth. *Journal of Financial Economics* 141, 896-918.

Bradley, D., Kim, I., Tian X., 2017. Do unions affect innovation? *Management Science* 63, 2251-2271.

Brochet, F., Loumioti, M., Serafeim, G., 2015. Speaking of the short-term: disclosure horizon and managerial myopia. *Review of Accounting Studies* 20, 1122-1163.

Callaway, B., Sant'Anna, P.H.C., 2021. Difference-in-differences with multiple time periods. *Journal of Econometrics* 225, 200-230.

Campisi, N., 2022. What's the WARN Act and why is Twitter being sued for violating it? *Forbes Advisor*, November 23.

Chemmanur, T.J., Kong, L., Krishnan, K., Yu, Q., 2019. Top management human capital, inventor mobility, and corporate innovation. *Journal of Financial and Quantitative Analysis* 54, 2383-2422.

Chen, H.J., Kacperczyk, M., Ortiz-Molina, H., 2011. Labor unions, operating flexibility, and the cost of equity. *Journal of Financial and Quantitative Analysis* 46, 25-58.

Chod, J., Rudi, N., Van Mieghem, J.A., 2010. Operational flexibility and financial hedging: complements or substitutes? *Management Science* 56, 1030-1045.

Collins, B., 2012. Worker Adjustment and Retraining Notification (WARN) Act. Working Paper, Congressional Research Service.

Cook, D.O., Kieschnick, R., Moussawi, R., 2019. Operating leases, operating leverage, operational inflexibility and sticky costs. *Finance Research Letters* 31, 369-373.

Duffy, C., 2023. She was weeks away from maternity leave at Twitter. Then Elon Musk took over.

CNN, March 6.

Ehrenberg, R.G., Jakubson, G.H., 1990. Why WARN: plant closing legislation, *Regulation* 13, 37-46.

Faccio, M., Hsu, H-C., 2017. Politically connected private equity and employment. *Journal of Finance* 72, 539-574.

Fahlenbrach, R., Rageth, K., Stulz, R.M., 2021. How valuable is financial flexibility when revenue stops? Evidence from the COVID-19 crisis. *Review of Financial Studies* 34, 5474-5521.

Fang, V.W., Tian, X., Tice, S., 2014. Does stock liquidity enhance or impede firm innovation? *Journal of Finance* 69, 2085-2125.

Farivar, C., 2023. Twitter still hasn't sent severance agreements, and ex-workers are demanding answers. *Forbes,* January 6.

Farre-Mensa, J., Hegde, D., Ljungqvist, A., 2020. What is a patent worth? Evidence from the US patent "lottery". *Journal of Finance* 75, 639-682.

Garcia, D., Norli, Ø., 2012. Geographic dispersion and stock returns. *Journal of Financial Economics* 106, 547-565.

Graham, J.R., 2022. Presidential address: corporate finance and reality. *Journal of Finance* 77, 1975-2049.

Gu, L., Hackbarth, D., 2022. Inflexibility and leverage. Working paper, The University of Hong Kong.

Gu, L., Hackbarth, D., Johnson, T., 2018. Inflexibility and stock returns. *Review of Financial Studies* 31, 278-321.

Hackbarth, D., Johnson, T., 2015. Real options and risk dynamics. *Review of Economic Studies* 82, 1449-1482.

Hall, R.E., Kudlyak, M., 2021. Why has the US economy recovered so consistently from every recession in the past 70 years? Working paper, The Federal Reserve Bank of San Francisco.

Hays, K., 2023. Elon Musk faces upward of $130 million in legal costs to fight laid-off Twitter workers over severance pay. *Insider,* February 24.

Holmstrom, B., 1989. Agency costs and innovation. *Journal of Economic Behavior & Organization* 12, 305-327.

Hombert, J., Matray, A., 2018. Can innovation help US manufacturing firms escape import competition from China? *Journal of Finance* 73, 2003-2039.

Hsu, P-H., 2009. Technological innovations and aggregate risk premiums. *Journal of Financial Economics* 94, 264-279.

Isaac, M., 2023. Meta to lay off another 10,000 workers. *New York Times*, March 14.

Jones, C.I., 2005. The shape of production functions and the direction of technical change. *Quarterly Journal of Economics* 120, 517-549.

Kemna, A.G.Z., 1993. Case studies on real options. *Financial Management* 22, 259-270.

Koepke, A.H., 2020. Loss in the time of coronavirus: evaluating WARN obligations during a pandemic. *Florida Bar Journal* 94, 18-23.

Kogan, L., Papanikolaou, D., Seru, A., Stoffman, N., 2017. Technological innovation, resource allocation, and growth. *Quarterly Journal of Economics* 132, 665-712.

Krolikowski, P.M., Lunsford, K.G., 2022. Advance layoff notices and aggregate job loss. Working Paper, Federal Reserve Bank of Cleveland.

Kudlyak, M., Wolcott, E., 2020. Pandemic layoffs. Working paper, The Federal Reserve Bank of San Francisco.

León-Ledesma, M.A., Satchi, M., 2019. Appropriate technology and balanced growth. *Review of Economic Studies* 86, 807-835.

Levin-Waldman, O., 1998. Plant closings: is WARN an effective response? *Review of Social Economy*, 56, 59-79.

Levine, L., 2007. The Worker Adjustment and Retraining Notification Act (WARN). Working Paper, Congressional Research Service.

MacKay, P., 2003. Real flexibility and financial structure: an empirical analysis. *Review of Financial Studies* 16, 1131-1165.

Manso, G., 2011. Motivating innovation. *Journal of Finance* 66, 1823-1860.

Mayer, G., 2023. The layoffs are here for those who chose to ‘learn to code.’ *Insider*, April 24.

Papanikolaou, D., Schmidt, L.D.W., 2022. Working remotely and the supply-side impact of Covid-19. *Review of Asset Pricing Studies* 12, 53-111.

Rapp, M.S., Schmid, T., Urban, D., 2014. The value of financial flexibility and corporate financial policy. *Journal of Corporate Finance* 29, 288-302.

Roberts, M.R., Whited, T.M., 2013. Endogeneity in empirical corporate finance. In: Constantinides, G., Harris, M., Stulz, R. (Eds.), Handbook of the Economics of Finance 2, 493-572. Elsevier, Amsterdam, Netherlands.

Ruhm, C.J., 1994. Advance notice, job search, and postdisplacement earnings. *Journal of Labor Economics*, 12, 1-28.

Serfling, M., 2014. CEO age and the riskiness of corporate policies. *Journal of Corporate Finance* 25, 251-273.

Serfling, M., 2016. Firing costs and capital structure decisions. *Journal of Finance* 71, 2239-2286.

Shulman, C.C., 2002. The Worker Adjustment and Retraining Notification Act. *Journal of Pension Planning and Compliance* 28, 23-35.

Siebert, B., 1992. Downsizing: An overview of legal considerations. *Labor Law Journal* 43, 483-487.

Simintzi, E., Vig, V., Volpin, P., 2015. Labor protection and leverage. *Review of Financial Studies* 28, 561-591.

Spivey, M.F., Blackwell, D.W., Marr, M.W., 1994. Advance notice of plant closings and firm value. *Journal of Business Research*, 31, 49-53

Tian, X., Wang, T.Y., 2014. Tolerance for failure and corporate innovation. *Review of Financial Studies* 27, 211-255.

Triantis, A.J., 2000. Real options and corporate risk management. *Journal of Applied Corporate Finance* 13, 64-73.

Vanian, J., 2023. Meta's 'Year of Efficiency' was everything Wall Street needed to hear from Zuckerberg. *CNBC*, February 1.

Vedantam, K., 2023. The Crunchbase tech layoffs tracker. *Crunchbase News*, March 24.

Where have all the laid-off tech workers gone?, 2023. *The Economist*, March 23.

Wiessner, D., 2022. Explainer: will Twitter layoffs violate U.S. law? *Reuters*, November 6.

Appendix A. Variable Definitions

This table provides definitions of the main variables used in our study. Variables that are not included here are defined in either the corresponding section of the paper or in the table captions.

Variable	Definition	Source
Acquisition	An indicator equal to one in the first observation year after the parent firm of the establishment changes and zero otherwise.	NETS
Age	The number of years that a firm has been included in the CRSP-Compustat merged (CCM) database.	CCM
Assets	Book value of assets (in millions).	CCM
Birth	An indicator equal to one if the establishment opens in the observation year and zero otherwise.	NETS
CAPX/Assets	The ratio of capital expenditures to the book value of assets.	CCM
Cash Holdings	The ratio of cash and short-term investments to the book value of assets.	CCM
Cite/Npats	The mean value of a firm's citations per filed and eventually granted patents. Missing values of the ratio are set to zero.	KPSS
Death	An indicator equal to one if the establishment closes in the observation year and zero otherwise.	NETS
Divestiture	An indicator equal to one in the last observation year before the parent firm of the establishment changes and zero otherwise.	NETS
Employees	The number of employees at a given establishment.	NETS
Employment Growth	The natural logarithm of establishment-level employment in the observation year minus the natural logarithm of establishment-level employment in the previous year.	NETS
Exploitative	The percentage of exploitative patents filed and eventually granted during a given year. A patent is classified as exploitative if at least 80% of its citations refer to its existing knowledge, where existing knowledge includes the firm's patent portfolio and the patents the firm cites over the past five years.	USPTO (via Prof. Woeppel's website)
Explorative	The percentage of explorative patents filed and eventually granted during a given year. A patent is classified as explorative if at least 80% of its citations do not refer to its existing knowledge, where existing knowledge includes the firm's patent portfolio and the patents the firm cites over the past five years.	USPTO (via Prof. Woeppel's website)
Financial Leverage	The ratio of a firm's debt in current liabilities plug long-term debt to its book value of assets.	CCM
High SLAC	An indicator set to one if an industry's "substitutability of labor with automated capital" (SLAC) value is above sample median, and zero otherwise.	Frey and Osborne (2017) and the U.S. Bureau of Labor Statistics.
Idiosyncratic Risk	The annualized standard deviation of the estimated residuals from regressions of daily stock returns on the Fama-French three factors over a firm's fiscal year.	CRSP and Ken French's website.
Long Horizon	An indicator set to one if the average of the ratio of the long-term words to long-term plus short-term words that a firm's executives use when communicating during conference calls during the past three years is greater than the sample median, and zero otherwise.	FactSet Events and Transcripts

	This measure and its classification of long-term vs. short-term words follows Brochet, Loumioti, and Serafeim (2015).	
Mini-$WARN_{it}$	A weighted-average of a firm's exposure to a state mini-WARN Act based on the percentage of its employees that work at an establishment in a state with a legally binding mini-WARN Act.	NETS
Mini-$WARN_{st}$	An indicator set to one if a state s has a legally binding mini-WARN Act by year t.	NETS
Negative Sales Growth	An indicator set to one if the establishment has a negative annual sales growth rate in the year before the observation year and zero otherwise.	NETS
Npats	The number of patents filed and eventually granted in a given year. Missing values of patent counts are set to zero.	KPSS
PayDex	The midpoint of the range between PAYDEXMIN and PAYDEXMAX, where PAYDEXMIN (PAYDEXMAX) is the minimum (maximum) value of an establishment's PAYDEX score.	NETS
PayDex/AvgPayDex	The ratio of PayDex to the sample average PayDex score in a given year.	NETS
PPE	The ratio of fixed assets (i.e., property, plant, and equipment) to book value of assets.	CCM
R&D/Assets	The ratio of R&D expenditures to book value of assets. Missing value of R&D are set to zero.	CCM
ROA	The ratio of net income to book value of assets.	CCM
Sales	Establishment-level sales in a given year.	NETS
Sales Growth	The natural logarithm of establishment-level sales in the observation year minus the natural logarithm of establishment-level sales in the previous year.	NETS
SLAC	Substitutability of Labor with Automated Capital (SLAC) for each industry j at year t is calculated as follows: $$SLAC_{j,t} = \sum_{o} Prob_o \times \frac{Emp_{j,o,t} \times Wage_{j,o,t}}{\sum_o Emp_{j,o,t} \times Wage_{j,o,t}}$$ where $Prob_o$ is the probability of computerization for occupation o using Frey and Osborne (2013, 2017). $Emp_{j,o,t}$ ($Wage_{j,o,t}$) is the number of employees (average annual wages of workers) assigned to occupation o in industry j at time t. This measure follows Bates, Du, and Wang (2020).	Frey and Osborne (2017) and U.S. Bureau of Labor Statistics
Small Establishment	An indicator set to one if the number of employees at the establishment is between 25 and 99 in the year before the observation year and zero otherwise.	NETS
Tobin's Q	A firm's book value of assets plus its market value of equity minus its book value of equity divided by its book value of assets.	CCM
Total Risk	The annualized standard deviation of a firm's daily stock returns over its fiscal year.	CRSP

Figure 1

Yearly Fraction of Employees and Establishments Located in States with Mini-WARN Acts

This figure plots the annual fraction of employees and establishments that are located in states that have enacted Mini-WARN Acts over the period 1999 to 2019. Figure A shows with blue circles the fraction of workers employed at establishments in states that have Mini-WARN Acts. Figure B graphs with blue squares the fraction of establishments located in states that have Mini-WARN Acts. Figure C plots with blue triangles the fraction of large establishments, defined as having 100 or more employees, and with red diamonds the fraction of small establishments, defined as having less than 100 employees, located in states that have Mini-WARN Acts.

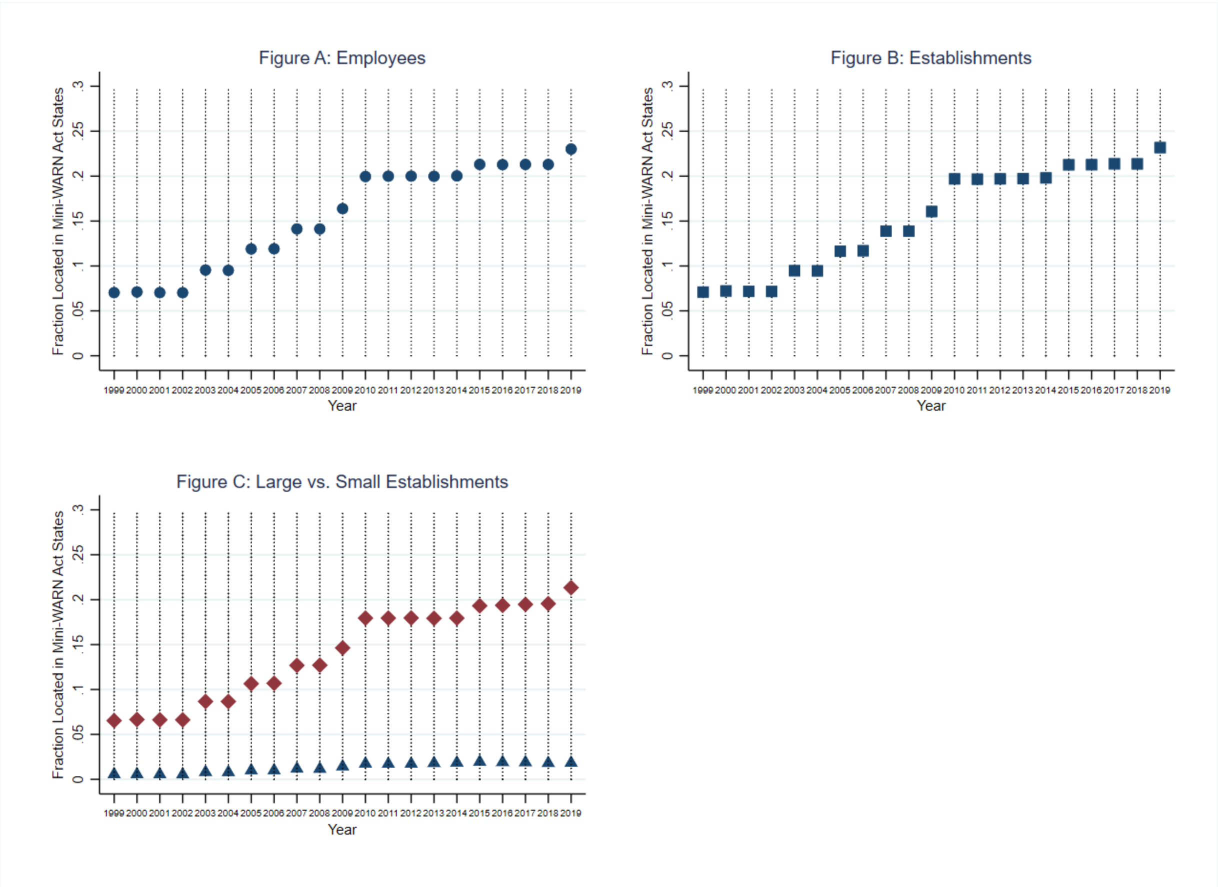

Figure 2
Mini-WARN Acts and Employment Growth: Timing Analysis

This figure plots the coefficient estimates (β_{-5}- β_5) from the following panel regression relating establishment-level employment growth to the enactment of a state Mini-WARN Act over the period 1999-2019:

$$Employment\ Growth_{it} = \sum_{t=-5}^{5} \beta_t Mini\text{-}WARN\ Timing\ Indicator_s[t] + Controls_{ist} + \varepsilon_{it}$$

The dependent variable *Employment Growth* is the natural logarithm of establishment-level employment in the observation year minus the natural logarithm of establishment-level employment in the previous year. *Mini-WARN Timing Indicator[t]* is an indicator of the year *t* relative to the effective date of the respective Mini-WARN Act (e.g., *Mini-WARN Timing Indicator[-t]* is set to one if the observation year is *t* years before the effective date and zero otherwise; *Mini-WARN Timing Indicator[t]* is set to one if the observation year is *t* years after the effective date and zero otherwise). Establishment-level controls measured in the year prior to the observation year include: *Sales Growth*, *Ln(Sales)*, *Ln(Employees)*, and *Employment Growth*. Appendix A provides variable definitions. All the models include establishment, year, and state fixed effects. State fixed effects are defined using the historical state of location of the establishment. 90% confidence intervals based on standard errors clustered by the establishment's historical state of location are plotted.

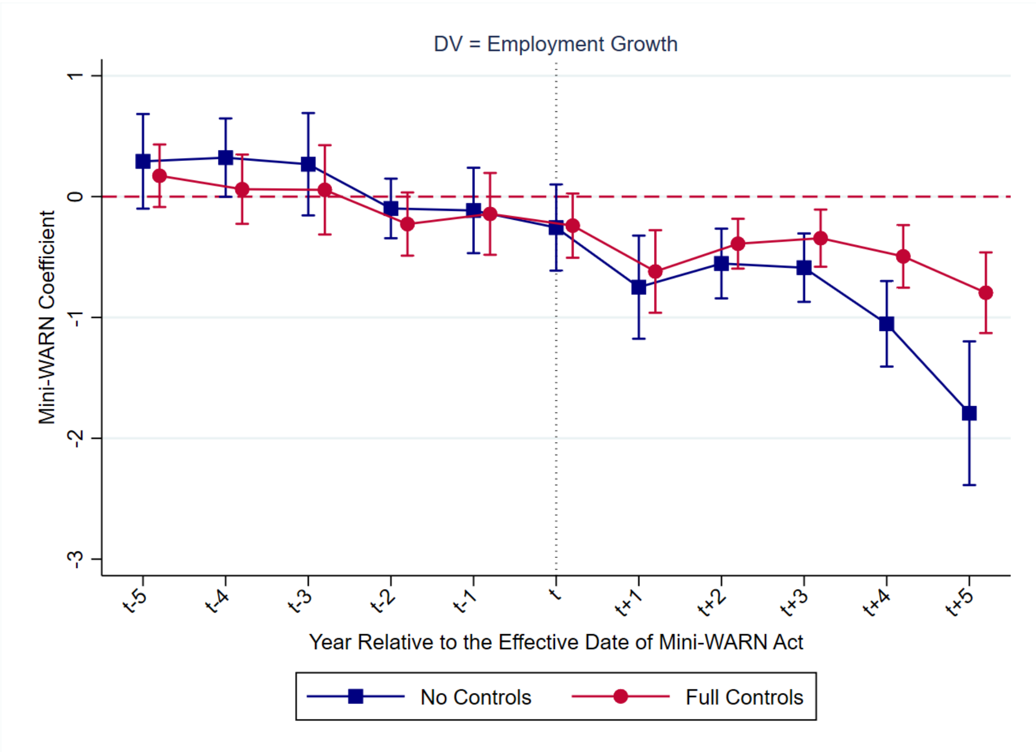

Figure 3
Mini-WARN Acts and PAYDEX Scores: Timing Analysis

This figure plots the coefficient estimates (β_{-5}- β_5) from the following panel regression relating establishment-level PAYDEX scores to the enactment of a state Mini-WARN Act over the period 1999-2019:

$$PayDex_{it} = \sum_{t=-5}^{5} \beta_t Mini\text{-}WARN\ Timing\ Indicator_s[t] + Controls_{ist} + \varepsilon_{it}$$

The NETS dataset includes a minimum and maximum PAYDEX score. The PAYDEX score is an index (dollar-weighted) that reflects an establishment's historical payment performance. The index ranges from 1 to 100, where a higher number indicates a greater likelihood that an establishment will make timely payments on its debts. We use these scores to create the variable *PayDex*, which equals the midpoint of the range between PAYDXMIN and PAYDEXMAX. The dependent variable *Ln(PayDex)* in the left figure is the natural logarithm of an establishment's *PayDex* in the observation year. The dependent variable *PayDex/AvgPayDex* in the right figure is the ratio of an establishment's *PayDex* over the sample average *PayDex* in the observation year. *Mini-WARN Timing Indicator[t]* is an indicator of the year *t* relative to the effective date of the respective Mini-WARN Act (e.g., *Mini-WARN Timing Indicator[-t]* is set to one if the observation year is *t* years before the effective date and zero otherwise; *Mini-WARN Timing Indicator[t]* is set to one if the observation year is *t* years after the effective date and zero otherwise). Establishment-level controls measured in the year prior to the observation year include: *Sales Growth*, *Ln(Sales)*, *Ln(Employees)*, and *Employment Growth*. Appendix A provides variable definitions. All the models include establishment, year, and state fixed effects. State fixed effects are defined using the historical state of location of the establishment. 90% confidence intervals based on standard errors clustered by the establishment's historical state of location are plotted.

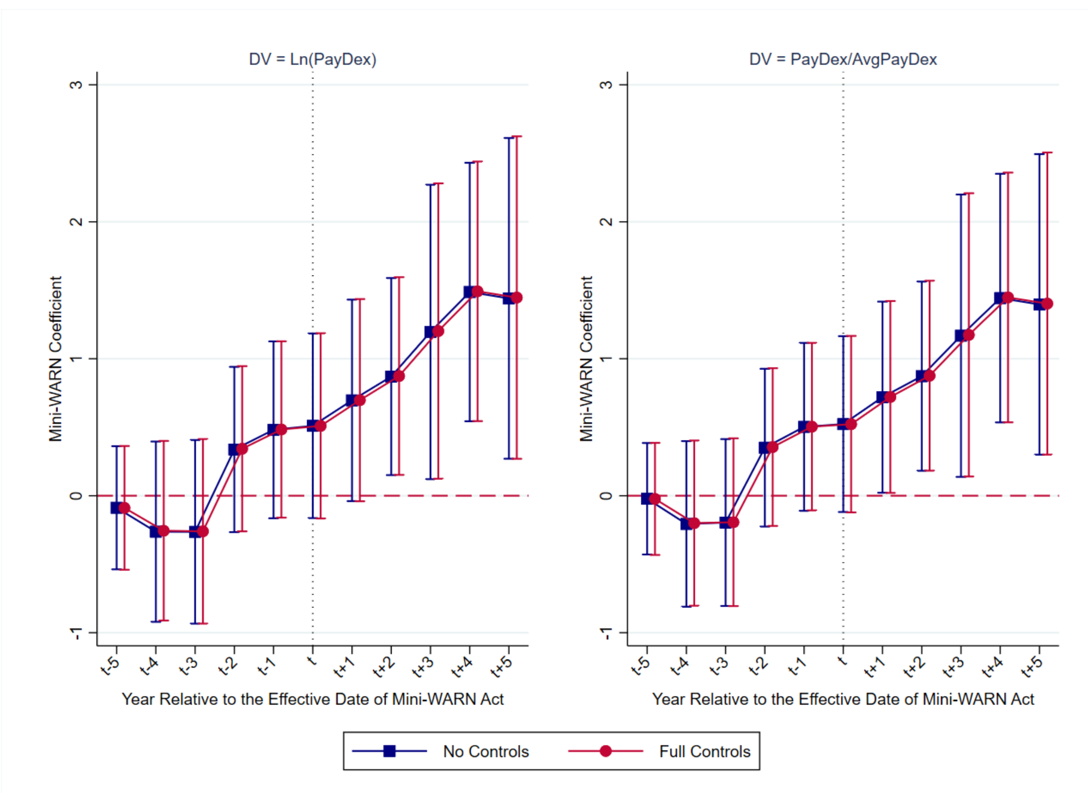

Table 1
State Mini-WARN Acts

This table lists the states that have enacted mini-WARN Acts. We include the month and year that each of the states' mini-WARN Acts become legally binding (i.e., its effective month and year). Additionally, we summarize the main differences between the respective state's mini-WARN Act and the federal WARN Act. The month and year of adoption are listed in parenthesis if they are different from the effective month and year.*

State	Month/Year Effective (Adopted)	Main Differences with the Federal WARN Act
California	01/2003 (09/2002)	Applies to employers with 75 or more full or part-time workers, requires 60 days advance notice if 50 or more workers will be displaced by a plant closing, mass layoff, or relocation of the employer's business in a 30-day period, and does not make an exception for unforeseeable business circumstances.
Delaware	01/2019 (07/2018)	Applies to employers with at least 100 full-time employees who work an aggregate of 2,000 hours per week and requires 60 days advance notice if 50 or more workers are displaced in a plant closing or relocation in a 30-day period, or if 500 or more employees or 50 or more employees representing one-third of the total workforce at an employment site are displaced in a mass layoff in a 30-day period.
Hawaii	07/1987	Applies to employers with 50 or more employees, requires 60 days advance notice before the closing or partial closing or a covered establishment due to: a sale, transfer, merger, other business takeover, or transaction of business interests, or any other close of business transaction that results in the layoff of employees, and does not make an exception for unforeseeable business circumstances or natural disasters.
Illinois	01/2005 (08/2004)	Applies to employers with 75 or more full-time employees or 75 or more employees who work at least 4,000 hours per week in the aggregate and requires 60 days advance notice if, during any 30-day period, 25 or more full-time employees are laid off if they constitute one-third or more of the full-time employees at the site or 250 or more full-time employees are laid off in a plant closing, mass layoff, or relocation.
Iowa	07/2010 (03/2010)	Applies to employers with 25 or more employees and requires 30 days advance notice before a permanent or temporary closing of a single site of employment or a mass layoff that will result in a loss of 25 or more full-time employees.

* Other states have adopted versions of plant closing and mass layoff legislation. However, we do not consider them mini-WARN Acts because they do not mandate compliance (e.g., Maryland (before 10/2020), Michigan, Minnesota) or their standards are not comparable and typically less stringent than the federal WARN Act (e.g., Connecticut, Kansas, Massachusetts, Ohio, Oregon, South Carolina).

Maine	07/1980 (04/1980)	Applies to employers with 100 or more workers and requires 90 days advance notice before an establishment closing due to relocation, termination or consolidation of the employer's business or if 500 or more employees or 50 or more employees representing one-third of the total workforce at an employment site are displaced in a mass layoff. Severance pay is also required at the rate of one week's pay for each year, and partial pay for any partial year, from the last full month of employment.
New Hampshire	01/2010 (08/2009)	Applies to employers with 100 or more employees and requires 60 days advance notice before a permanent or temporary closing of a single site of employment or a mass layoff that will result in a loss of 25 or more full-time employees in the same calendar week.
New Jersey	12/2007	Applies to employers with 100 or more employees and requires 60 days advance notice before a mass layoff, termination of operations, or transfer of operations that discharges 500 or more employees or at least 50 employees representing at least one-third of the total workforce at the employment site. New Jersey's mini-WARN Act was amended to require 90 days advance notice before a layoff of 50 employees (even if they comprise less than one-third of the total workforce at the employment site), and to include severance pay equal to one week of pay per year of service (including both full- and part-time employees). The changes were scheduled to take effect on 07/2020, however, due to COVID-19, the effective date is now 04/2023.
New York	02/2009 (08/2008)	Applies to employers with 50 or more full-time workers or 50 or more employees that work a combined 2,000 hours per week and requires 90 days advance notice if, over a 30-day period, there is a plant closing, mass layoff, or relocation that results in employment losses of 25 or more workers that comprise one-third of the labor force at the employment site.
Tennessee	05/1989	Applies to employers of between 50 and 99 employees and requires 60 days advance notice if a relocation greater than 50 miles, full or partial closing, workplace modernization, or other implementation of management policy results in a workplace reduction of 50 or more employees over a three-month period.
Vermont	01/2015 (05/2014)	Applies to all employers and requires 45 days advance notice before closing or conducting mass layoffs of 50 or more employees over a 90-day period.
Wisconsin	04/1991 (03/1991)	Applies to employers with 50 or more employees and requires 60 days advance notice before a permanent or temporary closing that displaces at least 25 employees or in a mass layoff that displaces one-fourth of its workforce or 25 employees, whichever is greater, or 500 or more employees at an employment site or within a single municipality.

Table 2
Summary Statistics

This table presents summary statistics for the main variables. Panel A reports the summary statistics for the firm-year observations. The sample period is 1999 to 2019, with the exception of the patent variables, which cover the years 1999 to 2018. Panel B presents the summary statistics for the establishment-year observations over the period 1999 to 2019. Continuous variables are winsorized at their 1st and 99th percentiles. Appendix A provides variable definitions.

Panel A: Firm-Level

	N	Mean	Std. Dev.	P25	Median	P75
$R\&D_t$ / $Assets_t$	45,786	0.059	0.125	0.000	0.004	0.064
$Npats_{t+2}$	49,125	8.206	34.97	0.000	0.000	1.000
$Ln(1+Npats)_{t+2}$	49,125	0.600	1.244	0.000	0.000	0.693
$Cite/Npats_{t+2}$	49,125	1.830	5.680	0.000	0.000	0.000
$Ln(1+Cite/Npats)_{t+2}$	49,125	0.390	0.861	0.000	0.000	0.000
$Exploitative_{t+2}$	49,125	0.206	0.363	0.000	0.000	0.333
$Explorative_{t+2}$	49,125	0.009	0.040	0.000	0.000	0.000
Ln(Total $Risk)_t$	46,053	0.036	0.021	0.021	0.03	0.045
Ln(Idiosyncratic $Risk)_t$	46,053	0.034	0.022	0.019	0.028	0.043
Mini-$WARN_{it}$	49,125	0.245	0.331	0.000	0.075	0.372
$Ln(Assets)_{t-1}$	49,089	5.907	2.058	4.384	5.866	7.342
Tobin's Q_{t-1}	49,027	2.115	1.800	1.125	1.527	2.341
$Ln(1+Age)_{t-1}$	49,125	2.768	0.752	2.197	2.833	3.332
ROA_{t-1}	49,069	-0.058	0.306	-0.055	0.030	0.074
Financial $Leverage_{t-1}$	48,891	0.221	0.226	0.012	0.175	0.346
$R\&D_{t-1}$ / $Assets_{t-1}$	49,089	0.060	0.126	0.000	0.004	0.066
Cash $Holdings_{t-1}$	49,083	0.204	0.227	0.032	0.115	0.300
$CAPX_{t-1}$ / $Assets_{t-1}$	48,811	0.052	0.059	0.016	0.033	0.064
PPE_{t-1}	49,044	0.246	0.223	0.074	0.172	0.351
Ln(Total $Risk)_{t-1}$	47,899	0.037	0.022	0.021	0.031	0.046

Panel B: Establishment-Level

	N	Mean	Std. Dev.	P25	Median	P75
Employment $Growth_t$	1,753,841	0.014	0.130	0.000	0.000	0.000
$Death_t$	1,753,841	0.034	0.181	0.000	0.000	0.000
$Divestiture_t$	1,753,841	0.050	0.218	0.000	0.000	0.000
$Birth_t$	1,903,285	0.036	0.185	0.000	0.000	0.000
$Acquisition_t$	1,753,841	0.057	0.232	0.000	0.000	0.000
$PayDex_t$	1,068,285	70.78	9.020	66.50	73.00	78.00
$Ln(PayDex)_t$	1,068,285	4.264	0.143	4.212	4.304	4.369
$PayDex/AvgPayDex_t$	1,068,285	0.999	0.126	0.937	1.028	1.097
Sales $Growth_t$	1,753,841	0.036	0.216	-0.025	0.015	0.072
Mini-$WARN_{st}$	1,753,841	0.088	0.283	0.000	0.000	0.000
$Ln(Sales)_t$	1,753,841	16.22	1.309	15.23	16.16	17.17
$Ln(Employees)_t$	1,753,841	4.325	0.867	3.555	4.174	4.920
Small $Establishment_t$	1,753,841	0.626	0.484	0.000	1.000	1.000
Negative Sales $Growth_t$	1,753,841	0.344	0.475	0.000	0.000	1.000

Table 3
Mini-WARN Acts and R&D Expenditure

This table reports the results from panel regressions relating R&D expenditure to a firm's exposure to state Mini-WARN Acts over the period 1999 to 2019. The dependent variable *R&D/Assets* is measured as R&D expenditure in year t scaled by the book value of assets in year t. *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)*. Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. t-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	$R\&D_t / Assets_t$			
	(1)	(2)	(3)	(4)
$Mini\text{-}WARN_{it}$	-0.008**	-0.008**	-0.008**	-0.009***
	(-2.08)	(-2.24)	(-2.57)	(-2.62)
$Ln(Assets)_{t-1}$			-0.012***	-0.011***
			(-8.10)	(-7.49)
Tobin's Q_{t-1}			-0.001*	-0.002***
			(-1.69)	(-2.58)
ROA_{t-1}			-0.056***	-0.060***
			(-11.87)	(-11.74)
$Ln(1+Age)_{t-1}$			0.003	0.003
			(0.83)	(1.02)
Financial $Leverage_{t-1}$				-0.006
				(-1.11)
Cash $Holdings_{t-1}$				0.036***
				(5.39)
$CAPX_{t-1} / Assets_{t-1}$				0.026**
				(2.36)
PPE_{t-1}				0.010
				(1.06)
Ln(Total Risk) $_{t-1}$				-0.182***
				(-4.27)
Firm FEs	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓
State FEs		✓	✓	✓
Observations	45,339	45,339	45,283	43,766
Adjusted R^2	0.760	0.761	0.773	0.780

Table 4
Mini-WARN Acts and Patenting Activity

This table reports the results from panel regressions relating patenting activity to a firm's exposure to state Mini-WARN Acts over the period 1999 to 2018. The dependent variable *Ln(1+Npats)* in columns 1-2 is the natural logarithm of one plus the number of patents a firm files and is eventually granted during year t+2. The dependent variable *Ln(1+Cite/Npats)* in columns 3-4 is the natural logarithm of one plus the ratio of a firm's citations to patents during year t+2. *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *R&D/Assets*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)*. Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	$Ln(1+Npats)_{t+2}$		$Ln(1+Cite/Npats)_{t+2}$	
	(1)	(2)	(3)	(4)
$Mini\text{-}WARN_{it}$	-0.078**	-0.065**	-0.132***	-0.107***
	(-2.44)	(-2.02)	(-3.94)	(-3.21)
$Ln(Assets)_{t-1}$		0.076***		-0.002
		(6.20)		(-0.18)
Tobin's Q_{t-1}		0.017***		0.027***
		(4.58)		(5.91)
ROA_{t-1}		-0.020		-0.013
		(-1.01)		(-0.57)
$Ln(1+Age)_{t-1}$		0.193***		0.138***
		(4.83)		(3.37)
Financial $Leverage_{t-1}$		-0.204***		-0.117***
		(-4.92)		(-2.59)
Cash $Holdings_{t-1}$		0.147***		0.209***
		(3.17)		(4.08)
$CAPX_{t-1}/Assets_{t-1}$		-0.079		-0.071
		(-0.94)		(-0.67)
$R\&D_{t-1}/Assets_{t-1}$		0.029		-0.096
		(0.31)		(-0.99)
PPE_{t-1}		0.277***		0.282***
		(3.60)		(3.37)
Ln(Total Risk) $_{t-1}$		0.417		1.518***
		(1.61)		(4.48)
Firm FEs	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓
State FEs	✓	✓	✓	✓
Observations	48,736	46,983	48,736	46,983
Adjusted R^2	0.775	0.776	0.505	0.512

Table 5
Mini-WARN Acts, Industry Workforce Automation, and Corporate Innovation

This table reports the results from panel regressions relating corporate innovation to firm-level exposure to state Mini-WARN Acts. The sample period in columns 1-2 (3-6) is 1999-2019 (1999-2018). The dependent variable *R&D/Assets* in columns 1-2 is R&D expenditure in year t scaled by the book value of assets in year t. The dependent variable *Ln(1+Npats)* in columns 3-4 is the natural logarithm of one plus the number of patents a firm files and is eventually granted during year t+2. The dependent variable *Ln(1+Cite/Npats)* in columns 5-6 is the natural logarithm of one plus the ratio of a firm's citations to patents during year t+2. *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. *High SLAC* is an indicator variable set to one if a firm operates in an industry with an above sample median level of "substitutability of labor with automated capital" (SLAC) in year t-1, and zero otherwise. We follow Bates, Du, and Wang (2020) in estimating *SLAC*. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)* (and *R&D/Assets* in Columns 4 and 6). Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	$R\&D_t$ /$Assets_t$		$Ln(1+Npats)_{t+2}$		$Ln(1+Cite/Npats)_{t+2}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Mini\text{-}WARN_{it}$ × High $SLAC_{t-1}$	0.010**	0.009**	0.172***	0.162***	0.288***	0.255***
	(2.28)	(2.21)	(3.58)	(3.32)	(5.52)	(4.89)
$Mini\text{-}WARN_{it}$	-0.012**	-0.012***	-0.122***	-0.105***	-0.187***	-0.160***
	(-2.44)	(-2.74)	(-3.19)	(-2.70)	(-4.83)	(-4.15)
High $SLAC_{t-1}$	-0.006***	-0.006***	0.043*	0.046*	0.068***	0.071***
	(-3.34)	(-3.18)	(1.76)	(1.86)	(2.62)	(2.73)
Controls		✓		✓		✓
Firm FEs	✓	✓	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓	✓	✓
State FEs	✓	✓	✓	✓	✓	✓
Observations	40,812	40,104	43,742	42,935	43,742	42,935
Adjusted R^2	0.769	0.784	0.786	0.788	0.509	0.515

Table 6
Mini-WARN Acts, Longer-Term Planning Horizons, and Corporate Innovation

This table reports the results from panel regressions relating corporate innovation to firm-level exposure to state Mini-WARN Acts. The sample period in columns 1-2 (3-6) is 1999-2019 (1999-2018). The dependent variable *R&D/Assets* in columns 1-2 is R&D expenditure in year t scaled by the book value of assets in year t. The dependent variable *Ln(1+Npats)* in columns 3-4 is the natural logarithm of one plus the number of patents a firm files and is eventually granted during year t+2. The dependent variable *Ln(1+Cite/Npats)* in columns 5-6 is the natural logarithm of one plus the ratio of a firm's citations to patents during year t+2. *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. *Long Horizon* is an indicator variable set to one if the ratio of "long-term" oriented words that a firm's executives use when communicating during conference calls during the past three years to its long-term and "short-term" oriented words during the same time frame is greater than the sample median in year t-1, and zero otherwise. Our measure and classification of the time horizon of words follows Brochet, Loumioti, and Serafeim (2015). Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)* (and *R&D/Assets* in Columns 4 and 6). Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. t-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	$R\&D_t/Assets_t$		$Ln(1+Npats)_{t+2}$		$Ln(1+Cite/Npats)_{t+2}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Mini\text{-}WARN_{it}$ × Long $Horizon_{t-1}$	-0.013**	-0.012**	-0.193***	-0.203***	-0.091**	-0.094**
	(-2.42)	(-2.43)	(-2.88)	(-2.97)	(-2.23)	(-2.30)
$Mini\text{-}WARN_{it}$	0.001	0.000	0.043	0.054	0.065	0.070
	(0.10)	(0.05)	(0.37)	(0.47)	(1.10)	(1.18)
Long $Horizon_{t-1}$	0.003*	0.003**	0.060**	0.068**	0.018	0.023
	(1.74)	(2.07)	(1.97)	(2.23)	(1.00)	(1.26)
Controls		✓		✓		✓
Firm FEs	✓	✓	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓	✓	✓
State FEs	✓	✓	✓	✓	✓	✓
Observations	16,194	16,071	16,990	16,859	16,990	16,859
Adjusted R^2	0.844	0.846	0.775	0.778	0.526	0.532

Table 7
Mini-WARN Acts and Patenting Strategies

This table reports the results from panel regressions relating patenting strategies to a firm's exposure to state Mini-WARN Acts over the period 1999 to 2018. The dependent variable *Exploitative* in columns 1-2 is the percentage of a firm's patents during year t+2 that exploit its existing knowledge base. The dependent variable *Explorative* in columns 3-4 is the percentage of a firm's patents during year t+2 that explore new areas outside of its existing knowledge base. We follow Chemmanur et al. (2018) in defining a firm's existing knowledge base and classifying its patents as either being exploitative or explorative. *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *R&D/Assets*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)*. Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	$Exploitative_{t+2}$		$Explorative_{t+2}$	
	(1)	(2)	(3)	(4)
$Mini\text{-}WARN_{it}$	0.021**	0.022**	-0.008***	-0.007***
	(2.11)	(2.19)	(-5.57)	(-4.55)
Controls		✓		✓
Firm FEs	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓
State FEs	✓	✓	✓	✓
Observations	48,736	46,983	48,736	46,983
Adjusted R^2	0.526	0.531	0.267	0.273

Table 8
Mini-WARN Acts and Firm Risk

This table reports the results from panel regressions relating stock return volatility to a firm's exposure to state Mini-WARN Acts over the period 1999 to 2019. The dependent variable *Ln(Total Risk)* in columns 1-2 is the natural logarithm of the annualized standard deviation of a firm's daily stock returns. The dependent variable *Ln(Idiosyncratic Risk)* in columns 3-4 is the natural logarithm of the annualized standard deviation of the estimated residuals from regressions of daily stock returns on the Fama-French three factors. *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *R&D/Assets*, *Cash Holdings*, *CAPX/Assets*, and *PPE*. Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. t-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	$Ln(Total Risk)_t$		$Ln(Idiosyncratic Risk)_t$	
	(1)	(2)	(3)	(4)
$Mini\text{-}WARN_{it}$	-0.003***	-0.003***	-0.003***	-0.003***
	(-5.60)	(-5.79)	(-4.66)	(-5.08)
Controls		✓		✓
Firm FEs	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓
State FEs	✓	✓	✓	✓
Observations	45,611	45,122	45,611	45,122
Adjusted R^2	0.658	0.693	0.669	0.706

Table 9
Mini-WARN Acts and Employment Growth

This table reports the results from panel regressions relating establishment-level employment growth to the enactment of Mini-WARN Acts over the period 1999 to 2019. The dependent variable *Employment Growth* is measured as the natural logarithm of establishment-level employment in the observation year minus the natural logarithm of establishment-level employment in the previous year. *Mini-WARN* is an indicator set to one if the state where the establishment locates has a Mini-WARN Act in effect by the observation year and zero otherwise. Control variables measured at the establishment-level and in the year before the observation year include: *Sales Growth*, *Ln(Sales)*, *Ln(Employees)*, and *Employment Growth*. Appendix A provides variable definitions. State fixed effects are defined using the historical state of location of the establishment. *t*-statistics in parentheses are calculated from standard errors clustered by the establishment's historical state of location. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Employment Growth$_t$ × 100					
	(1)	(2)	(3)	(4)	(5)	(6)
Mini-WARN$_{st}$	-0.811***	-0.840***	-0.882***	-0.434***	-0.419***	-0.411***
	(-3.29)	(-3.20)	(-3.17)	(-4.85)	(-3.32)	(-3.23)
Sales Growth$_{t-1}$			-3.286***	4.335***	1.060***	0.128
			(-9.12)	(29.52)	(6.84)	(1.59)
Ln(Sales)$_{t-1}$				-16.668***	-0.405***	-0.158*
				(-46.39)	(-4.41)	(-1.91)
Ln(Employees)$_{t-1}$					-23.550***	-23.862***
					(-51.41)	(-55.13)
Employment Growth$_{t-1}$						2.077***
						(6.82)
Establishment FEs	✓	✓	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓	✓	✓
State FEs		✓	✓	✓	✓	✓
Observations	1,753,841	1,753,841	1,753,841	1,753,841	1,753,841	1,753,841
Adjusted R^2	0.084	0.084	0.087	0.343	0.468	0.469

Table 10
Mini-WARN Acts and Establishment Births and Acquisitions

This table reports the results from panel regressions relating establishment-level births and acquisitions to the enactment of Mini-WARN Acts over the period 1999 to 2019. The dependent variable *Birth* in Panel A is measured using an indicator equal to one if the establishment opens in the observation year and zero otherwise. The dependent variable *Acquisition* in Panel B is measured using an indicator equal to one in the first observation year after the parent firm of the establishment changes and zero otherwise. *Mini-WARN* is an indicator set to one if the state where the establishment locates has a Mini-WARN Act in effect by the observation year and zero otherwise. *Small Establishment* is an indicator set to one in Panel A (B) if the number of employees at the establishment is between 25 and 99 in the (year before the) observation year and zero otherwise. *Negative Sales Growth* is an indicator set to one if the establishment has a negative annual sales growth rate in the year before the observation year and zero otherwise. *Sales Growth* is defined as the natural logarithm of establishment-level sales in the observation year minus the natural logarithm of establishment-level sales in the previous year. Establishment-level controls in Panel A (B) are measured in the (year before the) observation year and include: *Ln(Sales)* and *Ln(Employees)* (and *Sales Growth* and *Employment Growth*). Appendix A provides variable definitions. Firm fixed effects are defined using the historical parent firm of the establishment and state fixed effects are defined using the historical state of location of the establishment. *t*-statistics in parentheses are calculated from standard errors clustered by the establishment's historical state of location. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Establishment Births

	$Birth_t$			
	(1)	(2)	(3)	(4)
$Mini\text{-}WARN_{st}$	-0.020***	-0.020***	-0.015***	-0.015***
	(-5.09)	(-5.08)	(-3.27)	(-3.31)
$Mini\text{-}WARN_{st}$ × Small $Establishment_t$			-0.008***	-0.008***
			(-3.98)	(-3.84)
Small $Establishment_t$			0.004***	0.001
			(2.75)	(0.40)
Controls		✓		✓
Establishment FEs	✓	✓	✓	✓
Firm, Year, & State FEs	✓	✓	✓	✓
Observations	1,903,285	1,903,285	1,903,285	1,903,285
Adjusted R^2	0.105	0.105	0.105	0.105

Table 10 – (*Continued*)

Panel B: Establishment Acquisitions

	Acquisition$_t$					
	(1)	(2)	(3)	(4)	(5)	(6)
Mini-WARN$_t$	-0.013***	-0.012***	-0.008***	-0.009***	-0.011**	-0.010***
	(-5.49)	(-5.25)	(-3.97)	(-4.46)	(-3.80)	(-3.56)
Mini-WARN$_t$ × Small Establishment$_{t-1}$			-0.007	-0.005		
			(-1.41)	(-1.05)		
Mini-WARN$_t$ × Negative Sales Growth$_{t-1}$					-0.006**	-0.007***
					(-2.42)	(-2.90)
Small Establishment$_{t-1}$			0.021***	-0.049***		
			(8.76)	(-10.08)		
Negative Sales Growth$_{t-1}$					-0.000	-0.001
					(-0.37)	(-0.63)
Controls		✓		✓		✓
Establishment Fes	✓	✓	✓	✓	✓	✓
Firm, Year, & State FEs	✓	✓	✓	✓	✓	✓
Observations	1,750,643	1,750,643	1,750,643	1,750,643	1,750,643	1,750,643
Adjusted R^2	0.238	0.243	0.238	0.244	0.238	0.243

Table 11
Mini-WARN Acts and Establishment Deaths and Divestitures

This table reports the results from panel regressions relating establishment-level deaths and divestitures to the enactment of Mini-WARN Acts over the period 1999 to 2019. The dependent variable *Death* in Panel A is measured using an indicator equal to one if the establishment closes in the observation year and zero otherwise. The dependent variable *Divestiture* in Panel B is measured using an indicator equal to one in the last observation year before the parent firm of the establishment changes and zero otherwise. *Mini-WARN* is an indicator set to one if the state where the establishment locates has a Mini-WARN Act in effect by the observation year and zero otherwise. *Small Establishment* is an indicator set to one if the number of employees at the establishment is between 25 and 99 in the year before the observation year and zero otherwise. *Negative Sales Growth* is an indicator set to one if the establishment has a negative annual sales growth rate in the year before the observation year and zero otherwise. Establishment-level controls measured in the year before the observation year include: *Sales Growth*, *Ln(Sales)*, *Ln(Employees)*, and *Employment Growth*. Appendix A provides variable definitions. Firm fixed effects are defined using the historical parent firm of the establishment and state fixed effects are defined using the historical state of location of the establishment. *t*-statistics in parentheses are calculated from standard errors clustered by the establishment's historical location state of location. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Establishment Deaths

	$Death_t$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Mini\text{-}WARN_{st}$	0.005**	0.005**	-0.005**	-0.005**	0.005***	0.005***
	(2.46)	(2.40)	(-2.32)	(-2.27)	(3.44)	(3.49)
$Mini\text{-}WARN_{st}$ × Small $Establishment_{t-1}$			0.017**	0.017**		
			(2.60)	(2.54)		
$Mini\text{-}WARN_{st}$ × Negative Sales $Growth_{t-1}$					-0.001	-0.001
					(-0.23)	(-0.31)
Small $Establishment_{t-1}$			-0.006***	0.003*		
			(-3.99)	(1.88)		
Negative Sales $Growth_{t-1}$					0.000	0.000
					(0.11)	(0.27)
Controls		✓		✓		✓
Establishment, Firm, Year, & State FEs	✓	✓	✓	✓	✓	✓
Observations	1,750,643	1,750,643	1,750,643	1,750,643	1,750,643	1,750,643
Adjusted R^2	0.141	0.141	0.141	0.141	0.141	0.141

Table 11 – (*Continued*)

Panel B: Establishment Divestitures						
			Divestiture_t			
	(1)	(2)	(3)	(4)	(5)	(6)
Mini-WARN_{st}	0.005	0.004	0.006*	0.007*	0.007*	0.007*
	(1.37)	(1.31)	(1.87)	(1.92)	(1.74)	(1.72)
Mini-WARN_{st} × $\text{Small Establishment}_{t-1}$			-0.003	-0.004		
			(-0.66)	(-0.75)		
Mini-WARN_{st} × $\text{Negative Sales Growth}_{t-1}$					-0.008**	-0.008**
					(-2.61)	(-2.56)
$\text{Small Establishment}_{t-1}$			-0.005***	0.004**		
			(-3.22)	(2.43)		
$\text{Negative Sales Growth}_{t-1}$					0.007***	0.011***
					(5.51)	(6.94)
Controls		✓		✓		✓
Establishment, Firm, Year, & State FEs	✓	✓	✓	✓	✓	✓
Observations	1,750,643	1,750,643	1,750,643	1,750,643	1,750,643	1,750,643
Adjusted R^2	0.254	0.254	0.254	0.254	0.254	0.254

Table 12
Mini-WARN Acts and Establishment Risk

This table reports the results from panel regressions relating an establishment-level PAYDEX score to the enactment of Mini-WARN Acts over the period 1999 to 2019. The NETS dataset includes a minimum and maximum PAYDEX score. The PAYDEX score is an index (dollar-weighted) that reflects an establishment's historical payment performance. The index ranges from 1 to 100, where a higher number indicates a greater likelihood that an establishment will make timely payments on its debts. We use these scores to create the variable *PayDex*, which equals the midpoint of the range between PAYDXMIN and PAYDEXMAX. The dependent variable *Ln(PayDex)* in columns 1-2 is measured at the establishment-level as the natural logarithm of *PayDex* in the observation year. The dependent variable *PayDex/AvgPayDex* in columns 3-4 is measured as the establishment's *PayDex* scaled by the sample's average *PayDex* in the observation year. *Mini-WARN* is an indicator set to one if the state where the establishment locates has a Mini-WARN Act in effect by the observation year and zero otherwise. Establishment-level controls measured in the year before the observation year include: *Sales Growth*, *Ln(Sales)*, *Ln(Employees)*, and *Employment Growth*. Appendix A provides variable definitions. State fixed effects are defined using the historical state of location of the establishment. *t*-statistics in parentheses are calculated from standard errors clustered by the establishment's historical state of location. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	$Ln(PayDex)_t \times 100$		$(PayDex/AvgPayDex)_t \times 100$	
	(1)	(2)	(3)	(4)
$Mini\text{-}WARN_t$	0.875***	0.875***	0.833***	0.833***
	(2.87)	(2.85)	(2.86)	(2.85)
Controls		✓		✓
Establishment FEs	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓
State FEs	✓	✓	✓	✓
Observations	1,068,285	1,068,285	1,068,285	1,068,285
Adjusted R^2	0.360	0.360	0.363	0.363

Constraining Growth: Advance Layoff Notice and Corporate Innovation

Internet Appendix

Figure IA1
Mini-WARN Acts and Sales Growth: Timing Analysis

This figure plots the coefficient estimates (β_{-5}- β_5) from the following panel regression relating establishment-level sales growth to the enactment of a state-level Mini-WARN Act over the period 1999-2019:

$$Sales\ Growth_{it} = \sum_{t=-5}^{5} \beta_t Mini\text{-}WARN\ Timing\ Indicator_s[t] + Controls_{ist} + \varepsilon_{it}$$

The dependent variable *Sales Growth* is the natural logarithm of establishment-level sales in the observation year minus the natural logarithm of establishment-level sales in the previous year. *Mini-WARN Timing Indicator[t]* is an indicator of the year *t* relative to the effective date of the respective Mini-WARN Act (e.g., *Mini-WARN Timing Indicator[-t]* is set to one if the observation year is *t* years before the effective date and zero otherwise; *Mini-WARN Timing Indicator[t]* is set to one if the observation year is *t* years after the effective date and zero otherwise). Establishment-level controls measured in the year prior to the observation year include: *Employment Growth*, *Ln(Employees)*, *Ln(Sales)*, and *Sales Growth*. Appendix A provides variable definitions. All the models include establishment, year, and state fixed effects. State fixed effects are defined using the historical state of location of the establishment. 90% confidence intervals based on standard errors clustered by the establishment's historical state of location are plotted.

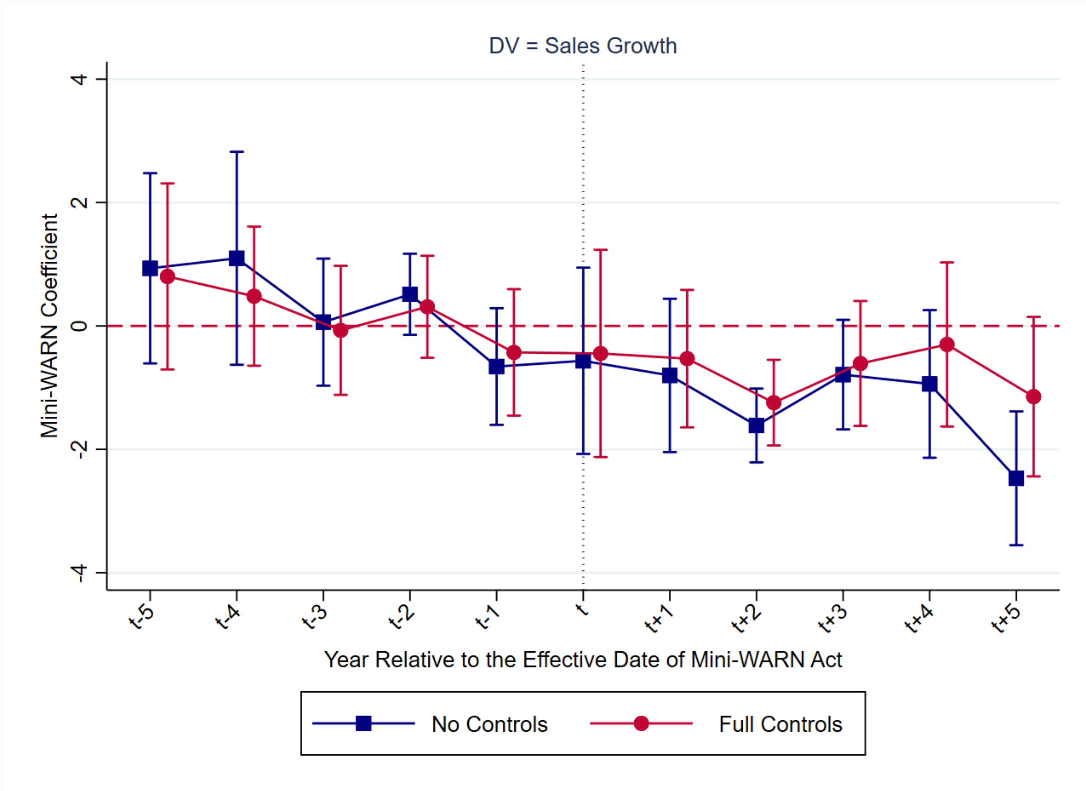

Table IA1
Mini-WARN Acts and Corporate Innovation: Alternative Measurement Horizons

This table reports the results from panel regressions relating corporate innovation to a firm's exposure to state Mini-WARN Acts. Panel A presents the results specifying R&D expenditure as the dependent variable, where columns 1-2 (3-4) measure R&D expenditure in year t (t +1) scaled by the book value of assets in year t-1 (t), and columns 5-6 measure R&D expenditure in year t+1 scaled by the book value of assets in year t+1. Panel B shows the results specifying patent grants and citations as the dependent variables, where columns 1-2 (3-4) measure the natural logarithm of one plus the number of patents a firm is granted during year t+1 (t+3), and columns 5-6 (7-8) measure the natural logarithm of one plus the ratio of a firm's citations to patents during year t+1 (t+3). *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)* (and *R&D/Assets* in Panel B). Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. t-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: R&D Expenditures

	$R\&D_t/Assets_{t-1}$		$R\&D_{t+1}/Assets_t$		$R\&D_{t+1}/Assets_{t+1}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Mini\text{-}WARN_{it}$	-0.014***	-0.011***	-0.016***	-0.014***	-0.008**	-0.008**
	(-4.33)	(-3.68)	(-4.58)	(-4.43)	(-2.09)	(-2.28)
Controls		✓		✓		✓
Firm Fes	✓	✓	✓	✓	✓	✓
Year Fes	✓	✓	✓	✓	✓	✓
State Fes	✓	✓	✓	✓	✓	✓
Observations	48,707	46,983	45,339	43,766	42,348	40,922
Adjusted R^2	0.704	0.742	0.712	0.729	0.772	0.781

Table IA1 – *Continued*

Panel B: Patenting Activities

	$Ln(1+Npats)_{t+1}$		$Ln(1+Npats)_{t+3}$		$Ln(1+Cite/Npats)_{t+1}$		$Ln(1+Cite/Npats)_{t+3}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Mini\text{-}WARN_{it}$	-0.073**	-0.050	-0.087***	-0.078**	-0.139***	-0.106***	-0.120***	-0.101***
	(-2.37)	(-1.62)	(-2.60)	(-2.28)	(-3.89)	(-3.01)	(-3.72)	(-3.17)
Controls		✓		✓		✓		✓
Firm Fes	✓	✓	✓	✓	✓	✓	✓	✓
Year Fes	✓	✓	✓	✓	✓	✓	✓	✓
State Fes	✓	✓	✓	✓	✓	✓	✓	✓
Observations	48,736	46,983	48,736	46,983	48,736	46,983	48,736	46,983
Adjusted R^2	0.812	0.815	0.740	0.741	0.522	0.529	0.488	0.494

Table IA2
Mini-WARN Acts and Corporate Innovation: Alternative Specifications

This table reports the results from panel regressions relating patenting activity to a firm's exposure to state Mini-WARN Acts. The first three columns employ a Poisson model with *Npats* (i.e., the count of a firm's patent grants) measured during year t+1, t+2, and t+3, respectively, as the dependent variable. The last three columns employ an OLS model with *Cite/Npats* (i.e., the ratio of a firm's citations to patents) during year t+1, t+2, and t+3, respectively, as the dependent variable. *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *R&D/Assets*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)*. Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Model:		*Poisson*			*OLS*	
	$Npats_{t+1}$	$Npats_{t+2}$	$Npats_{t+3}$	$Cite_{t+1}/Npats_{t+1}$	$Cite_{t+2}/Npats_{t+2}$	$Cite_{t+3}/Npats_{t+3}$
	(1)	(2)	(3)	(4)	(5)	(6)
$Mini\text{-}WARN_{it}$	-0.403***	-0.315**	-0.221	-1.263***	-0.945***	-0.709***
	(-2.76)	(-2.17)	(-1.46)	(-3.95)	(-3.87)	(-3.57)
Controls	✓	✓	✓	✓	✓	✓
Firm Fes	✓	✓	✓	✓	✓	✓
Year Fes	✓	✓	✓	✓	✓	✓
State Fes	✓	✓	✓	✓	✓	✓
Observations	24,370	22,774	21,098	46,983	46,983	46,983
Pseudo/Adjusted R^2	0.922	0.922	0.925	0.393	0.383	0.373

Table IA3
Mini-WARN Acts and Corporate Innovation: Alternative Mini-WARN Definitions

This table reports the results from panel regressions relating corporate innovation to firm-level exposure to state Mini-WARN Acts. The sample period in column(s) 1 (2-3) is 1999-2019 (1999-2018). The dependent variable *R&D/Assets* in column 1 is R&D expenditure in year t scaled by the book value of assets in year t. The dependent variable *Ln(1+Npats)* in column 2 is the natural logarithm of one plus the number of patents a firm files and is eventually granted during year t+2. The dependent variable *Ln(1+Cite/Npats)* in column 3 is the natural logarithm of one plus the ratio of a firm's citations to patents during year t+2. In Panel A, *Mini-WARN Establishments* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its establishments that are located in states with a legally binding mini-WARN Act as of year t. In Panel B, *Mini-WARN Large Establishments* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its large establishments, defined as having 100 or more workers, that are located in states with a legally binding mini-WARN Act as of year t. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)* (and *R&D/Assets* in Columns 2-3). Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Defining Mini-WARN exposure using percentage of establishments

	$R\&D_t/Assets_t$	$Ln(1+Npats)_{t+2}$	$Ln(1+Cite/Npats)_{t+2}$
	(1)	(2)	(3)
Mini-WARN $Establishments_{it}$	-0.008**	-0.100***	-0.160***
	(-1.97)	(-2.79)	(-4.15)
Controls	✓	✓	✓
Firm Fes	✓	✓	✓
Year Fes	✓	✓	✓
State Fes	✓	✓	✓
Observations	43,766	46,983	46,983
Adjusted R^2	0.780	0.776	0.512

Panel B: Defining Mini-WARN exposure using percentage of large establishments

	$R\&D_t/Assets_t$	$Ln(1+Npats)_{t+2}$	$Ln(1+Cite/Npats)_{t+2}$
	(1)	(2)	(3)
Mini-WARN Large $Establishments_{it}$	-0.006*	-0.062*	-0.125***
	(-1.76)	(-1.88)	(-3.70)
Controls	✓	✓	✓
Firm Fes	✓	✓	✓
Year Fes	✓	✓	✓
State Fes	✓	✓	✓
Observations	43,766	46,983	46,983
Adjusted R^2	0.780	0.776	0.512

Table IA4
Mini-WARN Acts and Corporate Innovation: Alternative Sample

This table reports the results from panel regressions relating R&D expenditure (patenting activity) to a firm's exposure to state Mini-WARN Acts over the period 1999 to 2019 (2018). In this alternative sample, we exclude firms that operate in four-digit SIC industries that never patent (e.g., Atanassov (2013)). The dependent variable *R&D/Assets* in columns 1-2 is measured as R&D expenditure in year t scaled by the book value of assets in year t. The dependent variable *Ln(1+Npats)* in columns 3-4 is the natural logarithm of one plus the number of patents a firm files and is eventually granted during year t+2. The dependent variable *Ln(1+Cite/Npats)* in columns 5-6 is the natural logarithm of one plus the ratio of a firm's citations to patents during year t+2. *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)* (and *R&D/Assets* in columns 4 and 6). Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. *t*-statistics in parentheses are calculated from standard errors clustered by firm. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	$R\&D_t/Assets_t$		$Ln(1+Npats)_{t+2}$		$Ln(1+Cite/Npats)_{t+2}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Mini\text{-}WARN_{it}$	-0.008**	-0.009***	-0.074**	-0.063*	-0.122***	-0.099***
	(-2.24)	(-2.70)	(-2.19)	(-1.84)	(-3.49)	(-2.86)
Controls		✓		✓		✓
Firm Fes	✓	✓	✓	✓	✓	✓
Year Fes	✓	✓	✓	✓	✓	✓
State Fes	✓	✓	✓	✓	✓	✓
Observations	41,845	40,437	44,903	43,345	44,903	43,345
Adjusted R^2	0.757	0.777	0.773	0.775	0.508	0.514

Table IA5

Mini-WARN Acts and Corporate Innovation: Alternative Standard Errors Clustering Level

This table reports the results from panel regressions relating R&D expenditure (patenting activity) to a firm's exposure to state Mini-WARN Acts over the period 1999 to 2019 (2018). The dependent variable *R&D/Assets* in columns 1-2 is measured as R&D expenditure in year t scaled by the book value of assets in year t. The dependent variable *Ln(1+Npats)* in columns 3-4 is the natural logarithm of one plus the number of patents a firm files and is eventually granted during year t+2. The dependent variable *Ln(1+Cite/Npats)* in columns 5-6 is the natural logarithm of one plus the ratio of a firm's citations to patents during year t+2. *Mini-WARN* is the weighted-average of a firm's exposure to state mini-WARN Acts based on the percentage of its employees working in establishments that are located in states with a legally binding mini-WARN Act as of year t. Firm-level control variables measured during year t-1 include: *Ln(Assets)*, *Tobin's Q*, *ROA*, *Ln(1+Age)*, *Financial Leverage*, *Cash Holdings*, *CAPX/Assets*, *PPE*, and *Ln(Total Risk)* (and *R&D/Assets* in columns 4 and 6). Appendix A provides variable definitions. State fixed effects are defined using a firm's historical state of headquarters. t-statistics in parentheses are calculated from standard errors clustered by the state where the greatest percentage of a firm's establishments are located over the sample period. We break ties, respectively, using either a firm's headquarters state (if this is one of the tying states) or the state with the largest share of employees. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	$R\&D_t/Assets_t$		$Ln(1+Npats)_{t+2}$		$Ln(1+Cite/Npats)_{t+2}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Mini\text{-}WARN_{it}$	-0.008***	-0.009***	-0.078***	-0.065**	-0.132**	-0.107*
	(-2.91)	(-3.09)	(-2.83)	(-2.64)	(-2.11)	(-1.89)
Controls		✓		✓		✓
Firm Fes	✓	✓	✓	✓	✓	✓
Year Fes	✓	✓	✓	✓	✓	✓
State Fes	✓	✓	✓	✓	✓	✓
Observations	45,339	43,766	48,736	46,983	48,736	46,983
Adjusted R^2	0.761	0.780	0.775	0.776	0.505	0.512

Table IA6
Mini-WARN Acts and Sales Growth

This table reports the results from panel regressions relating establishment-level sales growth to the enactment of Mini-WARN Acts over the period 1999 to 2019. The dependent variable *Sales Growth* is measured as the natural logarithm of establishment-level sales in the observation year minus the natural logarithm of establishment-level sales in the previous year. *Mini-WARN* is an indicator set to one if the state where the establishment locates has a Mini-WARN Act in effect by the observation year and zero otherwise. Control variables measured at the establishment-level and in the year before the observation year include: *Employment Growth*, *Ln(Employees)*, *Ln(Sales)*, and *Sales Growth*. Appendix A provides variable definitions. State fixed effects are defined using the historical state of location of the establishment. *t*-statistics in parentheses are calculated from standard errors clustered by the establishment's historical state of location. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sales $Growth_t$ × 100					
	(1)	(2)	(3)	(4)	(5)	(6)
$Mini\text{-}WARN_{st}$	-1.291**	-1.333**	-1.413**	-0.851**	-0.738**	-0.776**
	(-2.39)	(-2.38)	(-2.43)	(-2.03)	(-2.21)	(-2.13)
Employment $Growth_{t-1}$			-8.408***	2.338***	2.126***	13.381***
			(-9.79)	(6.13)	(5.16)	(20.09)
$Ln(Employees)_{t-1}$				-27.197	-2.135**	-4.748***
				(-70.81)	(-2.21)	(-6.49)
$Ln(Sales)_{t-1}$					-25.550***	-22.834***
					(-21.65)	(-24.50)
Sales $Growth_{t-1}$						-10.389***
						(-15.03)
Establishment FEs	✓	✓	✓	✓	✓	✓
Year Fes	✓	✓	✓	✓	✓	✓
State Fes		✓	✓	✓	✓	✓
Observations	1,753,841	1,753,841	1,753,841	1,753,841	1,753,841	1,753,841
Adjusted R^2	0.026	0.026	0.029	0.206	0.286	0.292