Health Care Costs and Corporate Investment

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Abstract

Health care costs for U.S. employers tripled in the past twenty years. Using firm-specific health expenses data, I show that firms negatively adjust capital expenditures and R&D expenses in response to changes in health care costs. The effects are greater for firms that are financially constrained, employ more high-skilled workers, or work with fewer insurers. Additional tests confirm that hiring fewer workers and reducing wages do not offset rising health costs enough to counteract this lower investment channel. My findings suggest that increased health care costs limit a firm's ability to expand physically or through innovation.

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1. Introduction

The US health care system depends on the private business sector to cover the health care costs of nearly 60% of working-age Americans. Health benefits are a non-negligible part of workers' compensation,[1] and most large firms voluntarily offer the coverage. In 2018, US employers spent $727 billion to provide health coverage for 175 million people.[2] From 1999–2016, the workers' earning and inflation increased cumulatively by 60% and 44%, respectively, while health insurance premiums increased by 213%.[3] Despite the magnitude of health care costs and the link to a firm's operation, few studies have examined how a firm's corporate decisions are affected by changes in employee health care costs. In this paper, I explore the effect of health care costs on firms by examining whether and how these costs affect capital and R&D investment decisions.

Long-standing belief and theory hold that employers pass on the increments in health care costs dollar for dollar to workers in the form of lower wages (Summers, 1989; Gruber, 1994). According to this "full pass-through" view, a rise in health care costs should affect only labor market outcomes and household decisions; health care costs should have no impact on a firm's production and investment.[4]

Even if employers do not fully pass the health care costs to workers in practice, how health care costs affect investment is theoretically ambiguous. On one hand, health care costs can increase investment by reducing worker mobility. In particular, the prevalence of employer-sponsored health benefits can create "job-lock," a phenomenon in which employees stay at their jobs for fear of losing health coverage (Madrian, 1994; Garthwaite, Gross, and Notowidigdo, 2014). If changing jobs, a worker may not necessarily receive the same level of benefits in a new firm,[5] and the gap in benefit generosity widens when health care costs

[1] Health benefits average 7–10% of employer cost for employee compensation across industries and sectors. Source: https://www.bls.gov/news.release/ecec.toc.htm

[2] National Health Expenditure Data, Centers for Medicare and Medicaid Services, Sponsor Highlights, 2018.

[3] Kaiser Family Foundation Employer Health Benefits Survey (KFF Survey), 2016. https://www.kff.org/health-costs/report/2016-employer-health-benefits-survey

[4] More recent research shows a partial substitution between wage and health benefits and a reduction in employment (Currie and Madrian, 1999; Baicker and Chandra, 2005; Lubotsky and Olson, 2015). But it is still unclear whether firms' investment would be affected.

[5] For example, the Health Insurance Portability and Accountability Act (HIPAA) allows firms to offer

increase. As a result, employees stay in their current positions and are more likely to invest in firm-specific skills. This, in turn, enhances productivity, and motivates firms to increase corporate investment (see, e.g., Belot, Boone, and Van Ours, 2007; Jeffers, 2018).

Conversely, health care costs can decrease corporate investment through two non-mutually exclusive channels. First, since health care costs are a part of labor costs, an increase in input costs reduces the optimal scale of the firm and investment ("scaling channel"). Additionally, a rise in a firm's health benefit expenses decreases internal cash, as firms need to either make higher payments to insurance companies or contribute more to their health plan funding reserves. Because external financing is costly (Fazzari, Hubbard, and Petersen, 1988; Lamont, 1997; Rauh, 2006), firms reduce investment as a response ("financial constraint channel"). Both channels predict a negative relationship between health care costs and investment.

Therefore it is an empirical question of whether health care costs affect investment and in what direction. However, there are important obstacles to empirically establishing the relationship. First, it is difficult to distinguish the effect of health care costs from other factors that could affect investment decisions, such as investment opportunities. For example, a growing firm might offer generous health plans, and at the same time, invest heavily. I address the endogeneity concerns by exploring two settings that introduce exogenous variations in health care costs faced by employers. In these two settings, the exogenous variations change health care costs in opposite directions and affect different components of the cost.

An additional challenge is that data are sparse on firm health care spending and plan characteristics. Consequently, I construct a dataset on firm-level health benefits gathered from Form 5500 welfare benefit plan data maintained by the U.S. Department of Labor. These data contain information about welfare plans with more than 100 participants, including total insurance expenses, number of participants, type of plan, and other bundled fringe benefits.

My first identification strategy is tied to state-level medical malpractice tort reforms that reduce health care costs. Tort reforms aim to lessen the ability of patients to litigate and/or lower patient damages in medical malpractice cases. This reduces the incentive for health providers to engage in excessive precautionary treatment and "defensive medicine" ex ante,

health benefits based on job tenure.

resulting in lower medical treatment intensity (Currie and MacLeod, 2008; Frakes, 2012). This, in turn, reduces medical costs (Kessler and McClellan, 1996) and employer-sponsored health insurance premiums (Avraham, Dafny, and Schanzenbach, 2010).

I use a difference-in-differences research design to examine corporate investment changes, exploiting the staggered change of tort reforms across states that lower health care costs. Specifically, I focus on the tort reform concerning *caps on noneconomic damages*; these changes restrict the amount plaintiffs can claim for physical pain and emotional suffering. A first-stage regression, using Form 5500 data, confirms that tort reforms reduce employers' health care costs. The second stage results show that the enactment of caps on noneconomic damages increases total corporate investment by 8.9% from its average level. The tort reforms used in the analyses are solely for medical malpractice and are mainly lobbied for by health practitioners. Additional robustness tests show that the results are not driven by product liability reforms, state partisan status or local consumer demand. The results also hold when using a matched sample by propensity score matching or considering time-varying industry-level shocks.

For my second identification strategy, I use the concentration increase after insurer mergers as the instrument for health care costs. I exploit the fact that competition in the U.S. health insurance market varies across geographical markets and the industry is overall not competitive.[6] Past studies have found that concentrated health insurance market leads to health premium rises and adverse consumer outcomes (Dranove, Gron, and Mazzeo, 2003; Dafny, Duggan, and Ramanarayanan, 2012; Starc, 2014). As employers purchase policies or services from the commercial insurance market, market structure changes in the insurance industry affect the health care costs of employers.

The US insurance industry is regulated at the state level; insurers have persistent and heterogeneous market presences across states. I therefore focus on state-level local markets and examine the abrupt concentration changes induced by national-level horizontal mergers. Concentration is measured by Herfindahl-Hirschman Index (HHI). Using changes in the HHI

[6]"Competition in Health Insurance: A Comprehensive Study of U.S. Markets," American Medical Association, 2016. Competitiveness is evaluated by the Horizontal Merger Guidelines of the Department of Justice and Federal Trade Commission.

as an instrument, I conduct a two-stage least squares (2SLS) regression analysis to look at how health care costs affect corporate investment. The first-stage regression confirms that post-merger concentration changes significantly correlate with premium prices—validating the relevance criterion. The estimates from the 2SLS analysis indicate that, on average, a 1% increase in health care costs decreases the investment rate of the sum of capital expenditures and R&D expenses by 0.8% from its average level. A back-of-the-envelope calculation shows that, in 2016, a 10% increase in health care costs would have resulted in a $2.1 million expenditure for the median firm in the sample. The analysis estimates a corresponding reduction of $2.76 million in the median firm's total investment.

The key assumption of this identification strategy is that insurance market competitiveness affects corporate investment only through employers' health care costs. Merger events are not random; however, by restricting merger type and exploring the purpose of mergers, it is possible to explore a context in which insurer mergers do not relate to companies' investment opportunities. First, I exclude mergers in which the operations of the acquiror and the target overlap in only one state; this reduces the likelihood that the merger is for the purpose of expanding business in that particular state.[7] Second, the driving force behind the wave of mergers during my sample period was the enactment of the Medicare Modernization Act (MMA),[8] which allows private insurers to operate in the senior care market and is not related to employers and their corporate investment opportunities.

After establishing a negative relationship between health care costs and corporate investment using the identification strategies of tort reforms and insurer mergers, I look at the underlying mechanisms to explain how health care costs affect a firm's investment decisions. Besides the scaling channel, by which higher health care costs move firms' optimal frontier inwards and yield lower investment levels, another possibility is via the financial constraint channel. Firms pay cash to insurance companies, or set up cash reserves to pay out medical claims. If health care costs reduce investment due to decline in available funds, then the in-

[7] As a robustness check, I include only mergers in which the target and the acquiror have more than 30 overlapping states in operation, and the results hold.

[8] MMA initiated Medicare Part D, which offers prescription drug plans to Medicare subscribers; the act also enhanced the Medicare Advantage market, in which Medicare health plans are offered by private companies that contract with Medicare.

vestment of constrained firms will be affected by a greater extent. By examining subgroups of firms based on whether they are financially constrained, I demonstrate that more constrained firms increase their investment by a larger magnitude when their health care costs decrease.

However, there is still evidence supporting the worker mobility channel, which predicts a positive relationship between health care costs and investment. Specifically, I look at inventors and examine their movements across firms after health care costs change. I find that health care costs reduce the likelihood of inventors' departure from their original firms or joining new firms. If higher worker mobility discourages corporate investment, this provides suggestive evidence that health care costs might increase investment in some cases. However, baseline results demonstrate that this worker mobility channel is dominated by other forces that predict a negative relationship between health care costs and investment.

In the last section of the paper, I examine the implications of the findings. I first look at which type of firms face more of an impact from health care costs. Skilled labor plays a vital role in economic growth. Notably, high-skilled labor is associated with higher demand for employer-sponsored health benefits because these benefits are tax-deductible, and therefore worth more to workers in higher-income brackets (Gruber and Levitt, 2000). Since a firm's health costs depend on the fraction of employees demanding health benefits, a firm with more high-skilled workers will be more exposed to changes in health care costs. By conducting subsample analysis on industries with different compositions of skilled labor, I find that firms in industries with higher average skills increase their investment more when health care costs decrease. This can be attributed to a larger liquidity shock to high-skilled firms for having had greater exposure, and also the complementarity between high-skilled labor and capital (Krusell et al., 2000; Autor, Levy, and Murnane, 2003). Results indicate that firms with more skilled labor are more susceptible to rises in health care costs.

Since employers interact with insurance companies to set up their health plan, the bargaining power of employers relative to insurers affects the final price they pay. More bargaining power means firms can better insulate themselves from the cost shocks passed on by health insurers. I find that firms with less bargaining power experience a higher increase in insurance price and reduce their investment by a larger magnitude after health care costs

increase.

Finally, I investigate whether health care cost shock is transitory or whether it has a long-term impact on the growth of firms. To shed light on this question, I look at innovation production by empirically examining patent holding by firms. I find that a decrease in health care costs is associated with an increase in patent applications (conditional on being granted) and patent accumulation in the following three years. The average number of citations of the patent portfolio also increases. These findings indicate that health care costs affect future corporate productivity. Together, I find that health care costs will have a greater impact on firms with more high-skilled workers and lower bargaining power, which are the growth firms in the economy, and will have long term negative effects on innovation output.

This study contributes to the corporate finance literature on determinants of corporate investment (e.g., Fazzari, Hubbard, and Petersen, 1988; Lamont, 1997; Rauh, 2006) and on internal capital markets (e.g., Giroud and Mueller, 2015; Ge, 2020). Furthermore, my paper contributes to the emerging branch of literature that examines how labor market frictions affect investment decisions. For example, Bai, Fairhurst, and Serfling (2020) study investment changes in response to changes in labor protection law, and Gustafson and Kotter (2018) and Cho (2018) look at minimum wage changes. This study expands the scope of empirical work that investigates how input costs affect investment by looking beyond minimum-wage sensitive industries and investigating an important component of labor costs that applies to almost all large firms, namely health care costs. In addition, by examining the relationship between rising health care costs and investment, this paper provides a new explanation and adds to the discussion on the decline of investment in the United States in the past 30 years (Gutiérrez and Philippon, 2017).

This paper intersects a wide range of literature studying the effect of labor markets on firm value and corporate decisions (e.g., Chen, Kacperczyk, and Ortiz-Molina, 2011; Agrawal and Matsa, 2013; Serfling, 2016) and is the first to document how health care costs, which are an important part of worker compensation, affect firms' corporate policies and outcomes. This paper also highlights the importance of labor heterogeneity in affecting firms' outcomes (e.g., Belo, Li, Lin, and Zhao, 2017; Ghaly, Anh Dang, and Stathopoulos, 2017), by documenting

that firms with more high-skilled workers are more affected by shocks from health care costs.

Health economics research documents that the health insurance market is becoming more concentrated (e.g., Dranove, Gron, and Mazzeo, 2003; Dafny, Duggan, and Ramanarayanan, 2012; Starc, 2014). The results of my study show that this concentration adversely affects real business outcomes. Prior studies on employer-sponsored health benefits have investigated labor market outcomes and firms' decision-making on plan offering and plan generosity. These studies usually focus on small businesses (see Bundorf, 2002; Abraham, Feldman, and Graven, 2016), but I look at large firms and their corporate decisions. There are also studies looking at the employer health insurance mandates and its implications for firms' labor outcomes, many focusing on the consequences of Affordable Care Act (ACA)'s mandate (e.g., Buchmueller, DiNardo, and Valletta, 2011; Dillender, Heinrich, and Houseman, 2020; Almeida, Huang, Liu, and Xuan, 2021). The advantage of not using Obamacare as the source of variation is that Obamacare's employer mandate is at the federal level and is universal for firms with more than 50 employees. In contrast, this paper explores two settings with state-level variations that induce upward and downward changes in health care costs spanning a longer time horizon. This paper is the first to document that health care costs crowd out corporate investment, and to explore the financial constraint channel.

The rest of the paper is organized as follows. Section 2 provides background information on employer-sponsored health benefits, tort reforms, and the health insurance market. Section 3 describes the data and the sample selection procedure. Section 4 describes the empirical methodology and presents the main results and robustness checks using two identification strategies. Section 5 analyzes the potential channels through which health care costs affect corporate investment. Section 6 investigates the differential effect of health care costs on firms with different characteristics and the implications for innovation production. Section 7 concludes.

2. Background

2.1. Employer-Sponsored Health Benefits

In the United States, employers play a crucial role in the provision of health care. Employer-sponsored health benefits cover more than 150 million employees and their dependents. Employer plans have the highest enrollment among all existing plan types, followed by Medicaid and Medicare, which cover 60 million and 40 million individuals respectively. ACA marketplaces and the individual market cover 20 million people. Consumers usually prefer health plans offered by their employers over ones from the individual market because employer-sponsored health benefits have pricing advantages as a result of economies of scale and favorable tax treatment.

The cost of employer-sponsored health benefits has increased sharply in the past twenty years. In 2018, the average family plan premium was \$19,616, up from \$5,791 in 1999.[9] Because health benefits are important tools for firms to attract and retain talent, employers—especially large ones—are reluctant to reduce benefits out of concern for firms' reputation and employee morale. Therefore, despite the rising cost, large employers continue to offer generous health benefits.

Evidence of this is the steady trend in employer contribution ratio over the past twenty years—a typical large employer contributes 80% or more of the cost for single premiums and 75% for family premiums. Anecdotal evidence suggests that employers explicitly state their contribution ratio when introducing health plan offerings to employees, and it reflects badly on the employer if the ratio decreases.

Although offering health benefits is voluntary, large employers rarely cancel their plans. In the period from 1999 to 2018, more than 98% of firms with 200 or more employees offered health benefits; for firms with 10–199 employees, however, the offering rate dropped from 81% to 70%.[10] In other words, large employers are not likely to adjust contribution ratio or terminate plans to buffer health care price hikes.

Employers may choose a number of methods to sponsor health care plans. A plan can be

[9] KFF Survey, 2018.
[10] KFF Survey, 2018.

fully insured, self-insured, or a combination of these two plan funding methods (mixed insured). In a traditional fully insured plan, the employer purchases health policies from outside health insurance companies. In self-insurance, the employer pays employees' medical claims directly, setting up tax-exempt reserves for claim payouts and making regular contributions to the reserve. Insurance companies are still hired by self-insured firms as third-party administrators (TPAs) for network access, plan design, and medical claim processing, but insurers earn less because they extract mark-up only through administrative services. Some employers also buy stop-loss insurance for catastrophic losses.

Firms usually offer a menu of health plan options to employees, varying in the restrictiveness of the provider network, or in the ratio between out-of-pocket expenses and annual premiums. HMO (health maintenance organization), POS (point of service), PPO (preferred provider organization), and indemnity plans are the most common traditional plans. Their restrictiveness ranges from HMOs, the most restrictive, covering only in-network providers, to indemnity plans, with no restrictions on the network status of providers. Besides those traditional plans, high deductible health plans (HDHPs) gained popularity in the mid-2000s. Although HDHPs might be attractive to employers because of their lower annual premiums, "high deductibles" mean employees often need financial incentives to choose an HDHP over traditional plans with lower deductibles and out-of-pocket caps. In 2018, only about 5% of employers limit their offering to providing HDHPs only, and HDHP providers have to incentivize employees to choose these plans. For example, employers on average contribute $12,444 for an HDHP family plan and $12,121 for a PPO family plan in 2018.[11] In addition, larger employers usually offer lower HDHP deductibles, which increases the costs for these plans.

There is a wealth of literature on employer-sponsored health insurance studying employee preference, household demand and adverse selection problems. Unfortunately, the impact of health price changes on employers is generally ignored, owing to the common belief that employers fully pass on any incremental increases in health care costs to workers in the form of lower wages (Summers, 1989; Gruber, 1994). More recent empirical evidence shows that

[11] KFF Survey, 2018

there is only a partial substitution between wage and health benefits. Baicker and Chandra (2005) use medical malpractice data to estimate that a 10% increase in health insurance premiums decreases wages by 2.3%, reduces hours worked by 2.4%, and causes a 1.9% shift from full-time to part-time work. Lubotsky and Olson (2015) have found no evidence that Illinois school teachers' salaries had been affected by insurance cost changes between 1991 and 2008; nor do school districts respond to higher health insurance costs by reducing the number of teachers. These empirical findings on partial substitution between wage and benefits, together with the survey evidence on large employers' limited ability to cut benefit generosity, provide motivating evidence that increases in health care costs directly affect employers themselves.

2.2. Medical Malpractice Tort Reforms

A tort is a civil wrong that causes harm or loss to a claimant and results in legal liability for the person who commits such an act. Tort reform is a legislative alteration, passed on a state-by-state basis, that reduces the ability of a victim to bring litigation, or limits the type or amount of damages plaintiffs can claim. Medical malpractice tort reforms seek to limit medical malpractice lawsuits and damages, as medical malpractice liability accounts for a significant proportion of health care expenditure. An estimate of the cost of medical malpractice in 2008 was a substantial $55.6 billion (Mello, Chandra, Gawande, and Studdert, 2010).

Within the broad category of medical malpractice tort reforms, the following are the most common reforms: caps on noneconomic damages, which limit the amount a plaintiff can claim for physical pain and emotional suffering; caps on punitive damages, which restrict the maximum claim for the purpose of punishing the defendant; collateral source reforms, which modify the common law rulings that the plaintiff's insurance cannot be used to offset the defendant's share of the damage; and joint and several liability reforms, which prevent the plaintiff from collecting full damages from one "deep-pocket" defendant, thereby restricting the proportion of damages to each defendant's share of responsibility. Periodic payment, split recovery, caps on total damages, patient compensation funds, and contingency fee funds are

less common medical tort reforms. Holtz-Eakin (2004) and Avraham (2007) summarize these tort reforms and state-level status over time.

Medical malpractice tort reforms affect health care costs in two ways. First, tort reforms lower health providers' liability costs by reducing litigation expenses and liability premiums. Past studies show that tort reforms reduce the number of lawsuits and total payouts (Avraham, 2007); imposing caps on damages, especially noneconomic damages, reduces medical malpractice costs and decreases liability insurance premiums (Viscusi et al., 1993; Born, Viscusi, and Carlton, 1998). Second, tort reforms can change how health care providers practice. Fearing damage to their reputation and monetary loss from malpractice tort lawsuits, health providers may ex ante carry out excessive tests and procedures. This practice, known as "defensive medicine," seeks to demonstrate that there has been no negligence in care and that all diagnosis and treatment options have been exhausted. Mello et al. (2010) estimate that $45.6 billion is spent on defensive medicine per year. Tort reform reduces the practice of defensive medicine by decreasing the threat of potential lawsuits, which, in turn, lessens the intensity of treatment and lowers the medical costs for the average patient.

Empirical studies on this topic often focus on one particular health condition. Kessler and McClellan (1996) study Medicare heart disease patients and find that "direct" tort reforms such as caps on damages and collateral source reforms reduce medical costs by 5% to 9% without altering health outcomes. Studies on pregnancy provide mixed findings. Earlier work by Dubay, Kaestner, and Waidmann (1999) finds that Cesarean sections are associated with greater liability pressures. More recently, Frakes and Jena (2016) use hospital discharge records and clinically validated quality metrics to show that there was no deterioration in health care quality following reforms, such as caps on noneconomic damages. Currie and MacLeod (2008) find that varying reforms could have opposite effects on health outcomes, depending on whether the physicians are exposed to greater liability. Frakes (2012) finds no evidence that malpractice pressure induces a greater number of Cesarean sections but caps on noneconomic damage are associated with reduced use of episiotomies during vaginal deliveries. There is also direct evidence on the effect of medical tort reforms on employer-sponsored health premiums. Avraham, Dafny, and Schanzenbach (2010) use the same proprietary

dataset as Dafny et al. (2012) and find that, from 1998 to 2006, the most common set of tort reforms reduced premiums by about 2% in self-insured firms.

2.3. Health Insurance Market Competition

The US health care system is characterized by its significant dependence on private insurance companies. Health insurers are important intermediaries between patients and providers, and other parties of interest, such as employers and government. But whether the market is competitive and leads to efficient outcomes is questionable. An American Medical Association (AMA) 2016 report on health insurance market competition, used the Horizontal Merger Guidelines of the Department of Justice and Federal Trade Commission to determine that the market in 71% of 388 metropolitan statistical areas (MSAs) were highly concentrated.[12] High concentration in the health insurance market can lead to the exercise of market power and adversely affect consumer welfare, shown by the studies listed below.

There is a growing body of literature on the price effect of insurance market competition and consumer outcomes. Gaynor, Ho, and Town (2015) provides an exemplary summary of this topic. Dafny, Duggan, and Ramanarayanan (2012) use a proprietary dataset covering over 776 employers from 1998 to 2006 to look at how health insurance market competition affects the growth of employer health insurance premiums. They show that the increase in local market concentration between 1998 and 2006 increases the premium by approximately 7% and that the insurance market exercises monopsony power on upstream health providers. Dranove, Gron, and Mazzeo (2003), in their study of local and national HMOs, find that higher competitiveness is associated with lower premiums. Lustig (2010) and Starc (2014) study two other health insurance markets under public health insurance programs and draw similar conclusions about concentration and price increase. Lustig (2010) uses a counterfactual analysis to examine the market for Medicare Advantage,[13] showing that loss of welfare is not caused by adverse selection, but mainly caused by the exercise of market power when there are few insurers. Starc (2014) studies the Medigap[14] market and finds that, in this highly

[12] "Highly concentrated" is defined as having Herfindahl-Hirschman Index (HHI)>2,500.

[13] Medicare Advantage is a Medicare health plan offered by private companies that contract with Medicare.

[14] Medigap pays some health care costs not covered by Medicare, such as copayments, coinsurance, and deductibles. Medigap policies are sold by private companies.

concentrated market, a 1% increase in the two-firm concentration ratio is associated with a 0.26% increase in premium cost.

3. Data

3.1. Employer-Sponsored Health Benefits

To investigate the relationship between health care costs and corporate investment, I first use Form 5500 welfare benefit plan data, maintained by the Department of Labor, to extract employee health benefits information. The Employee Retirement Income Security Act of 1974 requires firms with 100 or more participants on their welfare benefits plan to file a Form 5500 to report plan coverage and characteristics. A firm can have multiple benefit plans and must submit separate filings for each plan it sponsors. Each plan contains information about the type of benefits (e.g., health, dental, vision, life insurance), number of participants, and other plan characteristics such as funding method. Several schedules with various purposes may be attached to the main form; the one relevant for this study is Schedule A, "Insurance Information," which contains insurer information and insurance expense. A firm must attach a Schedule A form for each insurer it hires. Data are available by filing year from 1999 onward.

I retain the plans for health benefits and drop stand-alone dental, vision, and life insurance plans. After aggregating Form 5500 plan-level filing information to firm level, I merge the data with the Compustat universe using the employer identification number (EIN). A firm might have separate EINs for its subsidiaries, but Compustat keeps only one EIN at the consolidated firm level. I therefore manually match Compustat and Form 5500 data by company name, industry and address. I also retrieve the subsidiary list for US public firms from Bureau van Dijk and conduct matching using subsidiary names, filtering by address and industry.

Table 1, Panel A, reports the summary statistics of health plan variables from the Form 5500-Compustat merged sample. It contains 43,740 firm-year observations, representing 5,425 unique firms from 1999 to 2016. The health insurance expense of a firm aggregates all the insurance expenses on each Schedule A, which is set to zero if there is no Schedule A

attached. The average insurance expense per participant is calculated as the ratio of total insurance expense to the total number of participants on all insurance policies for each firm, which is used as a proxy of firms' average health care costs in Section 4. Employers pay for health policies and administrative services on a per participant basis. Total insurance expense changes might not necessarily represent changes in the cost of providing health care, as a rise in total premium can result from firm expansion and an increase in employment. Another advantage of scaling total insurance expense by the number of participants from Form 5500, is the opportunity to avoid the attenuation bias and possible correlation between firms' filing patterns and investment decisions. Only firms with 100 participants are required to file Form 5500, therefore firms with participant numbers on or near the threshold enter or exit the sample through time. Also, the aggregation of total expense and linkage to the Compustat parent depends on whether the filings are at the individual or consolidated EIN level. If I scale the insurance expense by a Compustat variable, such as total assets, time-varying bias depending on firms' reporting and participation patterns might be introduced.

The funding status of fully, self, or mixed insured is determined by several factors, including premium per participant, third-party administrator (TPA) status, stop-loss status, and funding source (see the Appendix for more details). Funding status indicates to what extent insurance expenses from Form 5500 represent total health care costs. For fully insured firms, insurance expenses approximate the entire health cost. For self-insured firms, insurance expenses do not include medical claim costs that employers pay directly from cash reserves,[15] and therefore are only a portion of employers' total health care costs. Table 1 shows that about 34% of the firms are fully insured, and about 33% are entirely self-insured. The most common fringe benefits bundled with health are prescription drugs, dental, and vision. About half of the firms have HMO plans.

Panels B and C report the summary statistics of non-missing key Compustat variables from the Form 5500-Compustat merged sample and the Compustat universe for the period 1999–2016. A comparison of Panels B and C shows that firms in the Form 5500-Compustat-merged dataset are generally larger, older, and more profitable.

[15]Insurance expenses for self-insured firms include costs such as stop-loss insurance premiums, network access fees and TPA fees.

[Insert Table 1 Here.]

3.2. Tort Reform

The first identification strategy is a quasi-natural experiment in the setting of medical malpractice tort reforms. To retrieve the list of medical malpractice tort reforms, I use the Database of State Tort Law Reforms (Avraham, 2018), which contains 11 medical malpractice tort reforms enacted or struck down in each state from 1980 to 2018. I focus on the most common and well-studied medical malpractice tort reform, that of caps on noneconomic damages. I also look at three other common reforms: caps on punitive damages, collateral source reforms and joint and several liability reforms. Within the sample period of 1999–2016, twelve, nine, five and five states, respectively, passed the four tort reforms of interest. Table A.1 shows the states with changes to tort reform, by year, from 1990 to 2018.

3.3. Health Insurance Market Competition

The second identification strategy relies on the changes in competitiveness of the health insurance market over time. I use the information on total premium written by each insurer to calculate insurers' market share and the market concentration measures in each state each year. The National Association of Insurance Commissioners (NAIC) reports the top 125 insurers, by state, for total health premiums written each year. Data are available from 2004 to 2016. Each regional insurance carrier has a unique NAIC code that can be tracked over time and linked to its national parent company.

I then obtain health insurance company merger information from Zephyr and SDC Platinum. For selection criteria, I require both the acquiror and the target to be in the industry of Direct Health and Medical Insurance Carriers (NAICS Code: 524114), and I restrict the search to within the United States. I include only complete deals with a deal value, if available, of greater than $10 million. Both acquiror and target must also have a valid record from the NAIC, which ensures that they both have a non-trivial market share at the state level. In order to avoid local mergers, I also require both acquiror and target to operate in more than one state. Targets with a single line of business in Medicaid or

Medicare are excluded, because those mergers are unlikely to impact the competition in the employer-sponsored health insurance market. Also excluded are targets that sold only part of their business, because this is unidentifiable in the NAIC dataset. There are 14 such mergers in the period 2005–2016. Table A.2 shows the list of mergers. The last three columns of the table show the number of state-level markets in which the acquiror and target operate one year before the merger respectively, and the number of markets which they both operate in.

4. Empirical Strategy and Results

4.1. Firm Investment Decision and Health Premium

I begin my analysis by looking at the correlation between health insurance expense and investment at the firm-year level. Figure 1 shows the scatter-bar plot of the relation. The y-axis, $Investment/Asset$, is the sum of capital and R&D expenditures divided by the lagged total assets. The x-axis shows the average insurance expense per participant in log form, $log(Average\ Insurance\ Expense)$, divided into 30 equal-weighted groups; the scatter graph shows the average $Investment/Asset$ in each group. The gray line shows the linear polynomial fit using the underlying raw observations. The graph indicates a positive correlation between average insurance expenses and investment.[16]

This positive relation can be a demonstration that health care costs improve corporate investment, for example, through the worker mobility channel. But this positive relation can also be attributed to the underlying endogeneity issues. Health care expense can correlate with corporate investment on various levels. For example, at the market level, an economic boom in a local area may increase both investment and demand for health care, thus driving up the price of health insurance policies. At the firm level, a growing firm can invest aggressively and provide more generous health benefits, which drives up its health care spending. Therefore, in the next part, I investigate the effect of health care costs on firms' investment by exploring events that generate exogenous variations in employers' health care costs.

[16]The positive correlation persists for the subsample of fully insured firms.

4.2. Tort Reform

I first explore the causal relationship between health care costs and corporate investment using exogenous variations in employer health care spending induced by state-level medical malpractice tort reforms. As discussed in Section 2.2, medical malpractice tort reforms reduce health providers' exposure to malpractice lawsuits, and lower the incentive for health providers to engage in "defensive medicine." Therefore, tort reforms lessen the intensity of treatment and reduce patients' average medical costs, and this effect translates into a decrease in employers' health care costs. I exploit the staggered introduction of medical malpractice tort reforms that were passed state by state from 1999 to 2016. I focus on tort reforms of caps on noneconomic damages, which is the most common reform with well-documented economic consequences. I also look at four common tort reforms—caps on noneconomic damages, caps on punitive damages, collateral source, and joint and several liability reforms—and examine them together.

4.2.1. Main Results

To investigate how reductions in health care costs induced by medical malpractice tort reforms affect corporate investment, I adopt a difference-in-differences research design to explore the staggered change of tort reforms across states. The sequence and timing of state-level tort reforms are shown in Table A.1 and are also described in Section 3.2. The panel regression model is shown in Equation 1. *TortReform* is a dummy variable that equals one if the reform is in effect in state m in year $t-1$. The dependent variable $Investment$ is the investment outcome (CAPEX, R&D expense, or the sum of the two) for firm i in year t that is located in state m. I also include firm and state-level controls to ensure that the results are not driven by firm-level time-varying factors and macroeconomic factors. Firm controls include lagged size, cash, q, PPENT, profit margin, and firm age; state-level controls include income per capita and unemployment rate. Firm and year fixed effects are included in all specifications. Standard errors are clustered at the state and firm levels for all regressions. Since the effects of tort reforms and insurance company mergers and acquisitions (M&As) in Section 4.3 are at the state level, this clustering method accounts for potential

heteroskedasticity and arbitrary correlation in the error term within the local market and firm over time (Bertrand, Duflo, and Mullainathan, 2004).

$$Investment_{imt} = \beta \cdot TortReform_{mt-1} + \phi \cdot controls_{it-1} + \alpha_i + \lambda_t + \epsilon_{it} \quad (1)$$

Table 2 presents the results on Equation 1. Columns 1-3 show the effect of tort reforms of caps on noneconomic damages on the three investment measures. The dependent variables in Columns 1-2, *CAPEX* and *R&D*, are Compustat variables of capital and R&D expenditure scaled by lagged assets, and *INVESTMENT* in Column 3 is the sum of scaled capital and R&D expenditures assuming R&D to be zero if missing. Column 4 shows the results of using the four common reforms together as explanatory variables. The point estimate of 0.006 in Column 1 implies that the enactment of caps on noneconomic damages increases the capital expenditure to asset ratio by 0.6%, which translates into a 9.4% increase in *CAPEX*, given that the average is 0.064 during the sample period. Column 3 shows that the enactment of tort reform increases total investment by 1.3%, which translates into an 8.9% increase from the average level in the sample period. Combining all four tort reforms together in Column 4 yields similar results. The sign of the coefficient of joint and several liability reform is consistent with that of Currie and MacLeod (2008), who find an opposite effect on physician behavior for this reform compared with other reforms. The result is robust with the absence of controls, and when extending the sample period back to 1990.

Figure 3 shows the effect of tort reforms on investment by the difference in years relative to the event. The y-axis indicates the magnitude of coefficient estimate as well as the 95% confidence interval. The x-axis is the year relative to the tort reforms. The excluded year is four or more years before the reforms. As shown by the graph, before the reforms, the estimated difference in investment between control states and treated states is not statistically significant from zero. Following the reforms, the total investment level increases significantly in the treated states relative to the control states. There is a time lag between the enactment of tort reform and the rise in investment, because it takes time for a reduction in medical treatment intensity to be translated into savings in employers' health costs.

[Insert Table 2 Here.]

The inverse relation between health care costs and investment can be explained in two ways. First, a reduction in input cost expands a firm's optimal scale, thus the firm raises investment. Second, firms use cash to pay for health expenses, and a decrease in health costs increases available cash and subsequent investment. The underlying mechanism is discussed in more detail in Section 5.

4.2.2. Robustness Checks

Propensity Score Matching For difference-in-differences research designs, treatment and control firms, ideally, should be identical in all dimensions that determine firms' investment decisions. To account for this, I assemble a matched sample based on the closest propensity score between treatment and control firms. I also restrict the period to three years before and after the enactment of the tort reform of caps on noneconomic damages.

First, I investigate the differences in observable firm characteristics to determine the dimensions for matching between treatment and control firms. The treatment firms are those that enact the caps on noneconomic damage reform during the sample period, excluding states that reverse the reforms in the next year. The sample of control firms comprises firms headquartered in the states that do not experience changes in tort law during the sample period. Table 3, Panel A, shows the mean and standard deviation for relevant firm characteristics of treatment firms and the full control sample before matching. The last column reports the t-statistics for the differences in mean values. The results show that the treatment firms and the control firm sample are statistically different in age, size, Q, cash-to-asset, log(PPENT), and profit margin, which is the set of controls I use in all analyses. These dimensions are also used for propensity score matching.

Panel B displays the treatment and control firms' summary statistics after propensity score matching. The matched control firm is from the same year and same 2-digit SIC industry as the treatment firm, with the closest propensity score estimated using firm size, age, Q, cash-to-asset, log(PPENT) and profit margin one year before the enactment. I use two rounds of matching with replacement. The t-statistics show that the treated and matched firms are similar in the dimensions of interest after matching.

Table 3, Panel C, shows the OLS regression results of Equation 1 using the matched sample. Consistent with the baseline analysis, the results using the matched sample predict an increase in investment level after the enactment of tort reforms, and the effect is stronger than the unrestricted full sample. The results are similar when I use five years before and after the enactment or when I use one round of matching.

[Insert Table 3 Here.]

Product Liability Another major category of tort reforms is for product liability. There might be speculations that the tort reforms studied in this paper affect firms' investment and operation through changes in product liability rather than through the health care cost channel. This is unlikely. Different types of tort reforms are passed independently and separately. Even in the domain of medical malpractice, there are differences for the time of enactment and that of strike down among different tort measures, as shown in Table A.1. The tort reforms used in this paper are specific to medical malpractice. Also, the most common tort measure under product liability tort reforms is the statute of repose limitations (Hubbard, 2006), which limits how long after the sale or first use of a product a plaintiff can bring a lawsuit for injuries. Caps on noneconomic damage are much less prevalent for product liability tort reforms.

Although it is unlikely that product liability tort reforms drive the results, as a robustness check, I run the specification in Equation 1 excluding industries that are prone to product liability: machinery, automobile and truck, aircraft, transportation, and abrasive and asbestos products.[17] Table 4 shows the results. The results are unaffected after excluding the industries that could benefit from product liability tort reforms. In another test, I exclude the only two states (Oregon and Mississippi) that either enacted or struck down caps on noneconomic damages tort reform for both medical and nonmedical liability together in my sample period, and the results are unaffected (untabulated).

[Insert Table 4 Here.]

[17]Machinery (Fama-French 48 Industry: 21), automobile and truck (Fama-French 48 Industry: 23), aircraft(Fama-French 48 Industry: 24), transportation (Fama-French 48 Industry: 40), abrasive and asbestos products (SIC 3290-3293).

Partisan Status Another question is whether a state's partisan status would move investment and tort reforms in the same direction. One might question that tort reform is passed more easily when the "pro-business" Republican Party is in power, which encourages business activity and investment at the same time. To look at the effect of partisan status on tort reforms, I use the State Partisan Balance Data from Klarner (2013) to include the interaction of tort reform of caps on noneconomic damages with whether or not the state is considered Republican in that year. A Republican state is defined as one in which Republicans control two or more of three state institutions: the two chambers of the state legislature and the governor's office.

The results are shown in Table 5. The coefficients on tort reform remain largely unchanged, and the interaction term is statistically insignificant, proving that the investment increase is not driven by a state's partisan status. Another potential concern is that lobbying activity might influence the passage of tort reforms. However, lobbyists involved in medical malpractice tort reform are most likely hired by health care providers, liability insurance companies, and trial lawyers, not by business owners.

[Insert Table 5 Here.]

Geographical Dispersion I use the location of a firm's headquarters as the state in which the given tort reforms and insurer M&As (in Section 4.3) affect the firm, following previous studies examining the effects of labor law on firms (e.g., Acharya, Baghai, and Subramanian, 2013; Agrawal and Matsa, 2013). Ideally, the treatment should be weighed by employee composition across all states in which the firm has establishments. However, Compustat only records a firm's incorporation and headquarters states and does not track individual establishment locations. Assuming that a significant portion of operations and employees is in the firm's headquarters state, focusing on treatment in the headquarters state is a good representation of overall treatment.

To test whether this assumption is valid, and to confirm that using the headquarters state is a reasonable approach, I explore whether geographically dispersed firms are less affected by health care shocks. Since firms that are more geographically dispersed have a

lower percentage of employees in the headquarters state, and if the headquarters state does not matter, we will see no difference between firms that are more or less geographically dispersed. Otherwise, more dispersed firms would be less affected when the headquarters state's health care costs change.

I use data on geographic dispersion from Garcia and Norli (2012), who parse SEC filings and measure dispersion by the frequency with which each state name is mentioned. The dataset runs from 1995 to 2008, and I use the extrapolation method to extend the data to my sample period. Results are shown in Table 6. Columns 1 and 2 are the subsamples that are divided based on whether the number of states in which a firm is present exceeds the sample median. Columns 4 and 5 are the subsample of whether the firm presents in more than one state, or just one state. Columns 3 and 6 are the interaction exercises. As the results show, firms that are geographically dispersed are less affected by health care shocks than firms that are less dispersed. This confirms that using a firm's headquarters state as the location for treatment is a reasonable approach; this approach will only bias down the estimation magnitude compared to the ideal scenario.

[Insert Table 6 Here.]

Industry-Level Shocks and Local Consumer Demand In many cases, firms use health benefits to draw employees from competitors; therefore, the benefits offered, and firms' sensitivity to health care costs, are more similar within an industry than across industries. With consideration of industry-level shocks, in the previous subsection, I exclude industries that are prone to product liability lawsuits and show that the investment increase is not caused by industries that benefit from product liability tort reforms. To further address unobservable time-varying industry factors that may simultaneously affect investment decisions and medical malpractice tort reforms in Equations 1, I include industry-year fixed effects to the baseline analysis for the tort reform setting. The results are shown in Table A.3.

These results show that adding industry-year fixed effects does not change the negative relation between health care costs and firm investment. The magnitudes shown in Table A.3 are smaller than the baseline results in Table 2, but they are not statistically apart. The

coefficient is smaller because different industries have different sensitivities toward health care costs. For example, industries with more high-skilled workers are more prone to changes in health care costs, which translates into a stronger effect on investment. Section 6 will elaborate this in detail. Adding industry-year fixed effects might underestimate the average effects among all treated firms. Importantly, the results in Table A.3 demonstrate that the negative relation between health care costs and investment is not driven by transitory industry shocks.

There might also be concerns that the effect of increased health care costs will affect firms' investment indirectly through local consumer demands. The rationale is that a reduction in health care costs increases consumers' purchasing power, and therefore, encourages firms to produce and invest more. This is not likely. First, if a household decides to have health insurance, they are likely to obtain the plan via employers. Because employers pay for the majority of the plan cost given the preset contribution ratio, the effect of a health care costs increase on an individual's wealth level is much smaller than that for employers. Second, all analyses control for state-level personal income and unemployment rate, which alleviates the concerns about household income changes. To further address the concern about local demand, I check if there is any difference in investment patterns between tradable and non-tradable industries. Non-tradable industries primarily depend on local demand (Adelino et al., 2017); therefore, if the changes in corporate investment are mainly driven by local demand, we should see significantly higher increases in investment for non-tradable industries after the tort reforms.

To conduct the analysis, I split the sample used in the baseline analysis by whether the firm belongs to a non-tradable industry.[18] Table A.4 shows the results. It shows that non-tradable industries' investments are not more affected by the tort reforms compared with tradable industries. Admittedly, the investment pattern for non-tradable and tradable industries can be different, but given the non-tradable subsample's coefficient on $I(Tort)$ has low economic magnitude and statistical significance, this set of results provides suggestive evidence that consumer demand is not the dominant reason for increase in investment. Overall, it is not

[18]Non-tradable industries are defined at two-digit NAICS level: 23 (Construction), 44-45 (Retail Trade), and 72 (Accommodation and Food Services).

likely that the increase in investment is driven by industry shocks or local consumer demands.

Using Form 5500 Insurance Expense Data For the baseline analysis in Section 4.2.1, the underlying assumption is that tort reforms of caps on noneconomic damages reduce employers' health care costs. Previous studies on medical malpractice tort reforms have established the negative relation between tort reforms and medical costs, and Avraham et al. (2010) show that tort reforms decrease employers' insurance premiums (see Section 2 for more details). Here, I use the health insurance expense data from Form 5500 to verify the relation. One drawback of Form 5500 is that data contains only the insurance expense. Insurance expenses represent a firm's entire health care costs for fully insured firms. However, as discussed in Section 3, for self-insured firms, insurance expenses are only a portion of employers' total health care costs. Therefore, I expect the effect of tort reforms on health expenses to manifest only in fully insured firms using Form 5500 data, although tort reforms affect employers' true health costs regardless of funding methods.

The results of a 2SLS regression of investment on health care costs, instrumented by tort reforms, are shown in Table A.5. The first three columns are the first stage results regressing $log(average\ insurance\ expense)$ on the indicator of tort reform of caps on noneconomic damages. The independent variable is the log form of total insurance expense divided by the total number of participants covered by a firm's plans, aggregating all the health benefit plans of a firm from Form 5500. In Column 1, the sample includes all Compustat firms matched to the Form 5500 dataset. Columns 2 and 3 are subsamples of firms that are and are not fully insured. Column 3 shows that, for fully insured firms, the enactment of tort reforms on average decreases health care costs by 11.1% in the period 1999–2016. Including firms that are not fully insured lessens the statistical significance and economic magnitude in Columns 1 and 2. Columns 4-6 show the IV-2SLS results using $I(Tort)$ as an instrument for $log(average\ insurance\ expense)$ on the fully insured subsample. The magnitude of 2SLS results is comparable to the M&A setting in Table 8. This set of results confirms the negative relationship between tort reforms and employers' health care costs.

4.3. Insurance Market Mergers and Acquisitions

4.3.1. Main Results

To examine how health care costs affect corporate investment, the second set of exogenous variations relies on the industrial organization of the health insurance market. As discussed in Section 2.3, prior literature finds that the health insurance market is very concentrated and that an increase in concentration is correlated with an increase in premium (Dranove et al., 2003; Dafny et al., 2012; Starc, 2014). Therefore, the changes in insurance premiums induced by changes in health insurance market concentration can be used as a source of variations for health care costs faced by employers.

I first examine the competition dynamics for local health insurance markets. Figure 2 provides a snapshot of the Herfindahl-Hirschman Index (HHI) for each state in 2004, 2008, 2012, and 2016. As shown by the graphs, there is great variation in the health insurance market HHIs across states and across time, and many local markets are very concentrated. Table 7, Panel A, shows that the mean HHI for the state-level health insurance market is 1951.[19] Besides, the top four firms in each state-level market, on average, make up 68.6% of the total market share. These figures confirm the previous findings on the insurance market's high concentration; the changes in concentration across regions and time provide sources of variations for the analysis.

Although changes in health insurance market concentration are largely orthogonal to individual non-insurance firms, the insurance market HHI itself may not be a good candidate to instrument health care costs. This is because both local insurance market competitiveness and firms' investment may vary with regional economic conditions. To address this issue, I look at the induced change in concentration following insurers' merger and acquisition (M&A) activities. To measure the changes in concentration after mergers, I build on the works of Garmaise and Moskowitz (2006), Dafny et al. (2012), and Ashenfelter et al. (2015) to construct the "cumulative simulated change in the HHI," which is the projected change in the HHI that would have occurred after the merger if nothing else changed. The purpose

[19]The state-level HHI is expected to be lower than the MSA-level HHI because there are more players at state level.

of using the projected change (instead of the actual change[20]) in the HHI is to tease out post-merger market share adjustments that may correlate with local market conditions.

The construction of this simulated change in the HHI ($sim\Delta HHI$) is illustrated in Equation 2. It takes the difference between the HHI of combined market shares of the acquiror and target after the merger, and the sum of the individual HHIs of the acquiror and target before the merger. $AcquirorShare$ and $TargetShare$ are the market shares in each local market m for the target and acquiror one year before the merger was completed. To account for the persistence of the merger effect as well as subsequent mergers in the local market, I construct $c\_sim\Delta HHI$ which is the cumulative increment in $sim\Delta HHI$ over the year for local market m, and use it as the instrument for health insurance price changes.

$$\begin{aligned} sim\Delta HHI_{mt} &= (TargetShare_{mt-1} + AcquirorShare_{mt-1})^2 - (TargetShare^2_{mt-1} + AcquirorShare^2_{mt-1}) \\ &= 2 \times TargetShare_{mt-1} \times AcquirorShare_{mt-1} \end{aligned} \tag{2}$$

[Insert Table 7 Here.]

I gather insurers' market share information from the National Association of Insurance Commissioners (NAIC). State-level market share data are available from 2004 to 2016. I also record the horizontal mergers in the health insurance market in the period 2004–2016. Table A.2 presents the merger list. Section 3.3 describes the data collection procedure.

To evaluate whether $c\_sim\Delta HHI$ is a valid instrument for premium changes, first we want to know whether it is a good representation of insurance market concentration changes. Table 7, Panel B, displays this result. It shows that $c\_sim\Delta HHI$ is strongly correlated with market concentration in the current period and the next period. But it does not perfectly correlate with the change in market structure in the next period, indicating that there is a readjustment in the local market after the mergers. To validate the relevance criteria of the instrumental variable (IV) strategy approach, I run the first stage regression of $c\_sim\Delta HHI$ on the average insurance expense per participant using Equation 3. Table 8, Column 1,

[20]Section 4.3.2 will briefly discuss the results using actual change in the HHI.

presents the results. It shows that the simulated change in the HHI is strongly correlated with the average insurance expense. A one standard deviation increase in $c\_sim\Delta HHI$ leads to a 6.5% increase in average health costs.

$$log(average\ insurance\ expense)_{imt} = \beta_1 \cdot c\_sim\Delta HHI_{mt-1} + \phi_1 \cdot controls_{it-1} + \alpha_{1i} + \lambda_{1t} + \epsilon_{1it} \tag{3}$$

Columns 2-4 of Table 8 show the instrumental variables two-stage-least-squares (IV-2SLS) results of average health insurance expense on investment, based on Equation 4 and instrumented by $c\_sim\Delta HHI$. The dependent variables in Columns 2-3, $CAPEX$ and $R\&D$, are Compustat variables of capital and R&D expenditure scaled by lagged assets, and $INVESTMENT$ in Column 4 is the sum of scaled capital and R&D expenditures assuming R&D to be zero if missing. I use the same set of firm and state level time-varying controls as in the previous tort reform setting, which includes lagged size, cash, q, PPENT, profit margin, age, income per capita and unemployment rate. Standard error continues to be clustered at the state and firm level.

$$Investment_{imt} = \beta_3 \cdot log(average\ \widehat{insurance}\ expense)_{imt-1} + \phi_3 \cdot controls_{it-1} + \alpha_{3i} + \lambda_{3t} + \epsilon_{3it} \tag{4}$$

[Insert Table 8 Here.]

Column 2 shows that the negative shock of health care costs has a significant effect on capital expenditure. Column 3 indicates that the health care costs rise induced by insurer M&A has no effect on R&D expenditures. This is probably because R&D investment is long-term and therefore hard to cut back quickly. Results from Column 3 also alleviate the concerns that R&D may contain skilled worker compensation and therefore might be reduced mechanically via passing-through the health care costs to workers. Aggregating capital expenditure and R&D expense, the coefficient of -0.09 in Table 8, Column 4, indicates

that a 1% increase in average health care costs is associated with a 0.8% decrease in the total investment level.[21]

To elaborate on the magnitude of this number, I make a back-of-the-envelope estimate using the median firm in my sample in 2016. The median employment for the Compustat-Form 5500 merged sample is 3,223, and the median total investment is $35 million. I use the Medical Expenditure Panel Survey-Insurance Component (MEPS-IC) survey to calculate enrollment number and average health premium for this median firm.[22] According to the MEPS-IC survey for 2016, the enrollment rate for firms with 100 or more employees is 56%. For average health costs per enrollee, MEPS-IC reports that, in 2016, the single premium is $6,499, the employee-plus-one premium is $12,701, and the family premium is $18,784. The enrollment percentages for these three types of plans are about 50%, 20% and 30% respectively. Thus, a 10% increase in health care costs is a $2.1 million increase in health costs for a median firm in my sample, and the coefficient in Table 8 predicts a $2.76 million reduction in the total investment.[23]

The motive for using this second identification strategy of insurer M&A is twofold. First, this approach confirms the negative relationship between health care costs and investment, by looking at a scenario where health care costs increase. In contrast, for the tort reforms setting, health care costs decrease. Second, Form 5500 has employers' health insurance expense data, and health care cost variations induced by insurer M&A act directly on health insurance expense; thus, this second identification strategy enables us to obtain the magnitude of the effect of health care cost changes on investment for all firms in the sample regardless of plan funding method.

[21] An alternate way to represent health care costs, besides *log(average insurance expense)*, is total insurance expense scaled by lagged total assets. The signs and statistical significance level of using *insurance expense/assets* are consistent with the baseline results. See Section 3.1 for more discussion about the choice of measurements.

[22] Form 5500 numbers are not used here, because aggregating the participant number and insurance expenses from Form 5500 could underestimate the actual total enrollment and health expenses. One reason for this is that Form 5500 does not require filing of plans with fewer than 100 participants. Also, insurance expenses are not necessarily equivalent to health expenses across plans. Also see Section 3.1.

[23] This is not a one-to-one substitution as both the scaling channel and the financial constraint channel could be in effect.

4.3.2. Robustness and Discussion

The key assumption for the second identification strategy is that health insurer M&As affect corporate investment only through merger-induced rises in health care prices. Therefore, the motivation behind insurer mergers is important. During the sample period, it is unlikely that the purpose for these mergers correlates with employers' financial decisions. In fact, the mergers were largely driven by the expansion of the Medicare market following the Medicare Modernization Act (MMA).

Enacted in 2003, the MMA went into effect in January 2006. One of the act's most prominent features is Medicare Part D, an optional prescription drug benefit program for Medicare enrollees. In 2018, there were 44 million people enrolled in more than 700 drug plans. The MMA also changed Medicare Advantage plans to further facilitate the involvement of private insurers to sell Medicare plans. Enrollment in Medicare Advantage plans increased from 5 million in 2003 to 22 million in 2019. The MMA has had no direct impact on employers because Medicare beneficiaries no longer rely on them for health benefits. But the enactment of the MMA is a monumental event for the US health care system given the vast number of Medicare enrollees and the surging demand for prescription drugs, and this prompted a response from insurers.[24] [25] Data from the Centers for Medicare & Medicaid Services (CMS)[26] on monthly Medicare Part D and Medicare Advantage enrollment, available from 2006 onwards, shows that many targets in our sample are significant players in the Medicare market. Only three targets (Wellchoice, Great West Healthcare, and Celtic Group) are not identified as Medicare Part D or Medicare Advantage service providers. The analysis is robust when the three non-Medicare insurer mergers are excluded.

For the instrument used in the analysis, some might wonder why not use the actual

[24] For example, in the case of the merger between UnitedHealth and PacificCare, the press release stated that "PacifiCare is best known for its strong focus on senior health care...and [UnitedHealth] joins PacifiCare as a leader in Medicare program innovation."

[25] After MMA went into effect in 2006, insurers with large Medicare segments experienced significant revenue growth. Total revenues in 2006 increased by 48% for Humana and 52.8% for HealthSpring. On the other hand, the revenue growth in 2006 for less Medicare-focused firms Aetna and Cigna was 8% and -2%, respectively.

[26] https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MCRAdvPartDEnrolData

change of the HHI. The instrument, $c\_sim\Delta HHI$, is the projected change in the HHI based on a hypothetical case that the merging parties do not change their combined market share after the merger. The projected change in the HHI, plus an adjustment, yields the actual change in the HHI after merger. The adjustment part is problematic, however, because it can be correlated with local market conditions; for example, merging insurers might further expand their combined market share if the local market is promising, or vice versa. If the actual change of the HHI is used as the instrument for Table 8, there is still a strong positive correlation between health care costs and the instrument, but the negative effect on investment in 2SLS diminishes. This is consistent with the speculation that the combined market share adjustment of merging insurers moves in the same direction as the investment.

There might be concerns that the results are driven by the insurers' intention to capture a particular market. If the target operates only in one state, it is reasonable to doubt that the acquisition correlates with that state's economic outlook. Although those targets have already been excluded from the sample, as a robustness check, I further restrict the mergers to the ones which the acquiror and the target have more than 30 overlapping markets, so that insurers decision to merge, as well as the impact of the merger, does not depend on a single market. There are six such mergers. Table A.6 shows that the results still hold.

It is also unlikely that insurance companies undertake the merger with the intent to capture customers from one or a few specific employers, as the potential newly-added customers are negligible considering a national insurer's scope of operation. For example, the median employee number in the sample is under five thousand, whereas the total medical enrollment of UnitedHealth was more than 30 million in 2008.[27] The M&A decision in the insurance market could not be driven by an individual employer's activities.

To account for the possibility that industry-level shocks induce M&A activities in the health insurance industry and alter firms' investment decisions at the same time, I exclude financial and insurance firms from all analyses. To further address unobservable time-varying industry factors that may simultaneously affect investment decisions and insurer M&As, as is done for the tort reform setting, I include industry-year fixed effects in the baseline analysis.

[27]Source: *Directory of Health Plans: 2009* (Washington, DC: Atlantic Information Service, 2009).

The results are shown in Table A.7. These results show that adding industry-year fixed effects does not change the negative relation between health care costs and firm investment. More discussion on the coefficient magnitude for including industry-year fixed effects can be found in Section 4.2.2.

5. Mechanisms

In previous sections, I show a negative relation between health care costs and firm investment. Here, I further explore the mechanisms through which health care costs affect firm investment.

Scaling Channel Health benefits are offered as part of employees' compensation packages and are therefore a component of labor cost. An increase in labor costs reduces firms' optimal scale. As a result, firms reduce production and cut investment (*scaling channel*).

Supporting the scaling channel, Table 9, Column 1, shows that after health care costs are reduced, assets grow at a faster rate. Firms' optimal scales increase and therefore encourage investment. Employment flow that is moving in the same direction as firm investment would also support the scaling channel. In Table 9, Column 2, I look at Compustat *Employment* growth after tort reforms, and find that the confidence interval of the coefficient on employment growth overlaps with the one for total investment, but the coefficient is not statistically significant. Measurement issues may prevent further interpretation of the results. The Compustat *Employment* item does not measure firms' employment flow precisely. Also, since high- and low-skilled workers have differential demands when it comes to health benefits, it is possible that firms shift to hiring more high-skilled workers in response to a reduction in labor costs for high-skilled work, but maintain the same aggregate level of employment. Although using Compustat *Employment* provides limited evidence on employment response, the negative correlation between health care costs and employment changes has been well-documented in other studies using CPS data (Baicker and Chandra, 2005) and industry-specific employee data (Lubotsky and Olson, 2015).

[Insert Table 9 Here.]

Financial Constraint Channel Column 3 and 4 in Table 9 show that, besides investment, firms also increase acquisition and advertising spending after health care costs decrease. This indicates that the scaling channel is not the only force working here. Health care costs can also decrease investment through the financial constraint channel.

Fully insured firms pay the insurance company for policies on a monthly or annual basis from their cash holdings. For firms with at least one self-insured plan, a tax-exempt reserve will be set up for future claim payouts, and firms usually deposit three or six months' worth of projected health spending into their reserve. This prepares the firms for catastrophic events and any miscalculations of future health spending projections. Similar to defined benefit retirement plans, the assets in the reserve can also be used to invest in financial securities. If there is a reduction in health care costs, firms can pay less cash to the insurance company or contribute less to the health plan reserves. Because external finance is costly (Fazzari, Hubbard, and Petersen, 1988; Lamont, 1997; Rauh, 2006), firms will use available internal cash to increase investment.

To validate this financial constraint channel, I first check firms' cash level after health care costs change. Table 9, Column 5, confirms that after health care costs decrease, firms' internal cash increases. I then explore this potential channel by examining whether more financially constrained firms are more affected by changes in health care costs. The results are shown in Table 10. I divide the firms into two categories based on how financially constrained they are, measured by whether the firm issues common dividends, by firm size, and profit level. Columns 1, 4, and 7 show results for firms that do not issue dividends, are of a smaller size and have a lower profit level, respectively, and are considered to be more financially constrained. Columns 2, 5, and 8 show the subsamples of less financially constrained firms. Columns 3, 6, and 9 show the interaction exercise. To allow full flexibility, I also interact all other control variables with the financial constraint dummy. The dependent variable is total investment expenditure over lagged assets. The interaction terms in Columns 3, 6, and 9 show that the increase in investment is 7-8% higher (based on the sample mean of investment) for more constrained firms after the enactment of tort reforms. The analysis demonstrates that more financially constrained firms increase investment more when there is a reduction

in health care costs. Unreported results on firms that filed Form 5500, Schedule H,[28] show that both their contribution to the reserve, and total expenses out of the reserve, decrease following a reduction in health care costs.

[Insert Table 10 Here.]

Worker Mobility Channel Health care costs might reduce investment through scaling and financial constraint channels, but they can also increase investment by reducing worker mobility. Since health insurance is commonly offered through employment, workers tend to stay in their current jobs to retain the health coverage, a phenomenon known as "job-lock" (e.g., Madrian, 1994; Garthwaite, Gross, and Notowidigdo, 2014). This situation occurs because employees might not necessarily receive the same benefits when changing jobs. For example, HIPAA allows employers to offer more generous plans to employees with longer job tenure. When a person transitions from being a seasoned employee to a new hire, they may forgo the favorable health plan of the old employer. When health care costs increase, the gap between health benefits offered by current and potential new employers widens. As a result, employees are more likely to stay in their current positions and invest in firm-specific skills, which in turn enhance productivity and corporate investment (e.g., Belot, Boone, and Van Ours, 2007; Jeffers, 2018).

To investigate whether health care costs discourage worker mobility, I examine a particular professional group of workers, inventors, and track their mobility when health care costs change. The advantage of focusing on inventors is that they are high-skilled workers, and, therefore, have a higher demand for health benefits (will be discussed in Section 6.1). Inventor information is obtained using the Harvard Business School inventor database and the USPTO patent database. Inventor mobility variables are constructed in a similar way as Ma, Tong, and Wang (2020). Table A.8 shows that when health care costs decrease, inventors are more likely to leave their current firm, or join the firm as new employees. The results indicate that higher health care costs help firms retain workers and firm-specific human capital. Therefore, it is possible that through the worker mobility channel, investment would increase after health

[28]Schedule H, "Financial Information," is voluntarily filed by firms with self-insured plans to report their financial information related to plan funding.

care costs rise. However, this channel is dominated by forces that lead to an overall negative relationship between investment and health care costs.

6. Implications

In this section, I investigate which type of firms are affected more by changes in health care costs and whether health care costs have a long-term impact on firms.

6.1. High-Skilled Firms

Firms' exposure to health care costs depends on how many employees are enrolled in their health plans. On the supply side, most public firms offer health benefits voluntarily and continue to do so after the enactment of the Affordable Care Act.[29] Under the Health Insurance Portability and Accountability Act (HIPAA) nondiscrimination rules, employers can only differentiate employee plan eligibility based on "bona fide employment-based classifications" such as full-time status. On the demand side, even if firms offer health plans, employees may not necessarily opt in. Plans usually require an employee contribution and total compensation includes health benefits, thereby potentially reducing real wages. Apart from factors such as age, health (Strombom et al., 2002), and whether a spouse has employer-sponsored health benefits (Dushi and Honig, 2003), income and skill are important factors affecting employee enrollment decisions.

Income level matters for health plan enrollment because employer-sponsored health benefits are exempt from federal income and payroll tax. Therefore, benefits are worth more to employees in higher income brackets since they reduce taxable income (Gruber and Levitt, 2000). Rampini and Viswanathan (2018) show that insurance is monotonically increasing in household wealth due to limited enforcement. Survey evidence also suggests that the employer-sponsored health plan enrollment rate increases with household income. For example, the 2018 National Compensation Survey from the Bureau of Labor Statistics (BLS) reports that the participation rates (offering rate times enrollment rate) of health

[29] ACA requires firms having 50 or more full-time employees to offer health insurance or risk paying a penalty.

care plans among employees are 26%, 61%, 74%, and 82% from the lowest quartile to the highest quartile of the average wage, respectively. This pattern is not driven by full-time status.[30] Thus, high-wage workers are more likely to take up health benefits compared to their lower-income peers, and firms with more high-wage workers would be affected more by changes in health care costs.

Table 11, Panel A, tests whether the negative relation between health care costs and investment is sensitive to firms' average wage level. The exercise is carried out on subsamples divided by higher and lower average industry wages in the setting of medical malpractice tort reforms. I use tort reforms because those reforms affect firms' health spending regardless of health plan funding method. I obtain industry-level wage data using Occupational Employment Statistics (OES) data from the BLS for the period 1999–2016, following Belo et al. (2017) and Ghaly, Anh Dang, and Stathopoulos (2017). Pre-2002 data are at the 3-digit SIC level and post-2002 data at the 4-digit NAICS level. OES data contain information on occupational-level hourly wage and the number of workers linked to each industry. I therefore compute the weighted average hourly wage for each industry based on its occupation distribution. The results are shown in Table 11, Panel A. The interaction terms in Columns 3, 6, and 9 are positive and statistically significant, consistent with the estimates from the subsample tests. The interaction term in Column 9 means that the increase in total investment is 2.4% higher for firms with more high-wage workers after the enactment of tort reforms, which is a 16.4% difference based on the sample mean.

A worker's skill level is highly correlated with wages (Murphy and Welch, 1992), and, therefore, high-skilled workers also have higher demand for employer-sponsored health care and such firms have higher exposures to changes in health care costs. Table 11 Panel B tests whether firms with more high-skilled workers are affected more by changes in health care costs. Labor skill data are derived from OES data and the Department of Labor's O*NET database. O*NET has information on the skill level ranking (job zone) ranging from one to five for each Standard Occupational Classification (SOC) occupation. I then calculate the weighted average industry-level skill index similar to the method for average wage. On

[30]See also Kaiser Family Foundation Analysis of National Health Interview Survey, 2014

subsamples split into higher and lower average industry skill levels, using enrollment count from Form 5500, I perform t-tests and find that the plan enrollment ratio is significantly higher for high-skilled firms. Table 11, Panel B, shows the regression results on how health care costs can have different impact for firms with different labor skill level. The interaction term in Column 9 means that the increases in total investment are 2.0% higher for firms with more high-skilled workers after the enactment of tort reforms, which is a 13.7% difference based on the sample mean. The results confirm that firms in higher-skilled industries increase investment more than firms in lower-skilled industries do in response to a decrease in health care costs.

Besides having higher exposure to health care costs due to higher employee demand, the effect of health care costs on high-skilled firms can be exacerbated by the complementarity between high-skilled labor and capital. If high-skilled labor and capital are complementary, which together substitutes for low-skilled labor (Krusell et al., 2000; Autor, Levy, and Murnane, 2003), and since high-skilled workers have a higher demand for health care, a rise in health care costs can lead to a more than proportional decrease in high-skilled labor, and a greater reduction in investment in response.

[Insert Table 11 Here.]

6.2. Employers' Bargaining Power

When purchasing insurance policies or services, employers bargain with insurers to set the price. The final price that employers pay contains insurers' mark-up; more bargaining power reduces this mark-up and therefore lowers employers' health care costs. A firm can work with multiple insurers for each plan they sponsor. Many factors are related to firms' bargaining power. Besides firm characteristics such as profitability (Dafny, 2010), the set of insurers the firm is working with can be important in negotiating a better deal.

To illustrate why this is the case, think about a hypothetical firm with an HMO plan from Insurer A and a PPO plan from Insurer B. In renewing Insurer A's HMO plan, the firm would renegotiate the terms proposed by Insurer A. To gain a better bargaining position, the firm can threaten to divert employees to Insurer B's PPO plan by paying a higher employer

contribution to the PPO plan, or moving the HMO plan entirely to Insurer B. If the firm switches the HMO plan to Insurer B, the cost would be lower compared with initiating the HMO plan with a new insurer. First, searching cost is minimized because the firm already has a working relationship with Insurer B. Second, switching cost associated with changing plans is lower, as at least some employees are familiar with Insurer B's system, such as its claim reimbursement procedure and provider network. Therefore, a firm has more bargaining power with Insurer A if it has an additional working relationship with Insurer B. Insurance market concentration increase will affect all firms, regardless of whether they have business with the merger parties. However, if a firm is working with multiple insurers or a more diverse base of insurers, i.e., having a balanced insurer set, it could better control the magnitude of price increases.

I gather firm-level insurer information using Form 5500, Schedule A to examine firms' insurer set and bargaining power. Cross-validation with NAIC data on national-level insurer affiliation yields 264 unique insurance groups for the Form 5500-Compustat merged dataset. To quantify firms' insurer set, I construct two measures. First, I count the number of insurers that a firm works with for a given year. The median number of insurers is two per year. To further account for how insurers split participants within the firm, I also construct a *within-firm insurer HHI* measure, which is the sum of the squares of the insurer share of participants in a firm in a given year. The median within-firm insurer HHI is 0.56.

To see how bargaining power relative to insurers affects firms' outcomes, I examine the changes in insurance expense and investment after insurer M&As for subsamples split by firms' insurer set. In addition to the set of controls used in my previous analysis, I also control for the geographic dispersion of firms, using the number of states in which a firm operates, from Garcia and Norli (2012) as in Section 4.2.2, to take into account the correlation between firms' insurer network size and geographical dispersion. Table 12 shows the results. The first four columns are the results for samples split by whether or not a firm works with more than one insurer in that year, and the last four columns are samples split by *within-firm insurer HHI*. Columns 1, 2, 5, and 6 show the first-stage result of regressing $log(average\ insurance\ expense)$ on $c\_sim\Delta HHI$, conditional on firms' bargaining power.

The results suggest that firms that work with more insurers or have a lower within-firm insurer concentration can better insulate themselves from health premium price shocks. Columns 3, 4, 7, and 8 show the reduced-form results of regressing firm investment on $c\_sim\Delta HHI$. (The coefficient of the unsplit sample is -0.327 with t-statistics of -4.179.) The results in Columns 3 and 4 suggest that firms with more insurer options reduce investment less than those that only work with one insurer. Similarly, Columns 7 and 8 show that firms with a balanced distribution of participants among insurers reduce investment less than the ones with dominating insurers. Therefore, firms' bargaining power relative to insurers play a critical role in price control.

Larger firms have higher bargaining power. For superstar firms, an increase in health care costs can be a comparative advantage for them in the labor market, since those firms can obtain the same health plan at a lower price (and therefore offer higher wages or a better plan to workers). This can help them to attract talents and, further, gain market share, in addition to other advantages, such as network effects and economy of scale of intangible capital (Autor, Dorn, Katz, Patterson, and Van Reenen, 2020).

[Insert Table 12 Here.]

Implication for Firms' Productivity It is important to know whether the effect of health care cost shocks is transitory or whether it has a long-term impact on firms' productivity. If firms spend the cost-saving from health care on meaningful projects and improve their fundamentals, then curbs on health care costs are critical for businesses. If not, the issue might be less severe. To shed light on this question, I examine firms' patent production and accumulation. The patent data is from Ma (2020), which contains the full list of patents that a public firm owns at each point in time between 1976 and 2012. This source also provides information on the number of lifetime citations received by each patent as well as the sources of those citations. I examine the number of new patents produced following health care cost reductions, as well as the average quality of new patents and the firm's patent portfolio. The results are shown in Table A.9.

Columns 1-4 show that a decrease in health care costs is associated with an increase in the

number of patents applied (conditional on being granted) in the next one or three years; firms also obtain more patents in their portfolio. Looking at Columns 5-8, the average number of citations of newly-applied patent after tort reform does not significantly change, but the average number of citations of all patent stock increases. This might be because firms are able to acquire more high-quality patents directly from the market for technology or through corporate M&As. Together, the results indicate that after health care costs decline, innovative firms are able to produce more patents and maintain a higher quality patent portfolio.[31] Overall, health care cost shocks can have a real impact on firms' future productivity.

7. Conclusion

Health care issues have received much attention in recent years from both the public and policymakers. Despite employers' heavy involvement in health care provision in the United States, the impact of health care changes on employers has been largely ignored. This paper highlights employers' concerns about rising health care costs by studying the relation between the costs of employer-sponsored health benefits and firms' corporate investment decisions. I construct a dataset on employer-sponsored health benefits of U.S. public firms from 1999 to 2016. Using variations in health insurance market concentration, as well as changes in state medical malpractice tort reforms, I show that changes in health care costs faced by employers negatively affect capital expenditures and R&D spending by U.S. public firms. The effect is especially prominent in firms with more high-skilled workers and firms with lower bargaining power relative to insurers. This pattern can be explained by the financial constraint channel, where I find that the effect is exacerbated in firms that are more financially constrained. Health care costs also impact firms' productivity reflected by altering innovation output. The findings indicate that high-growth firms with more skilled workers are especially vulnerable to health care cost shocks.

[31] Additional untabulated tests confirm that the results still hold after removing firms from the medical device industry.

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Figure 1. Correlation between Firm Investment and Average Health Care Costs

This figure presents the scatter-bar plot of the correlation between firms' total investment and average health care costs. The Y-axis $Investment/Assets$ is the sum of capital and R&D expenditure divided by lagged total assets. The X-axis is the log form of average insurance costs per participant. $Log(Average\ Insurance\ Expense)$ is divided into 30 equal-weighted groups, and the scatter graph shows the average $Investment/Assets$ within the group. The gray line shows the linear polynomial fit using the underlying raw observations.

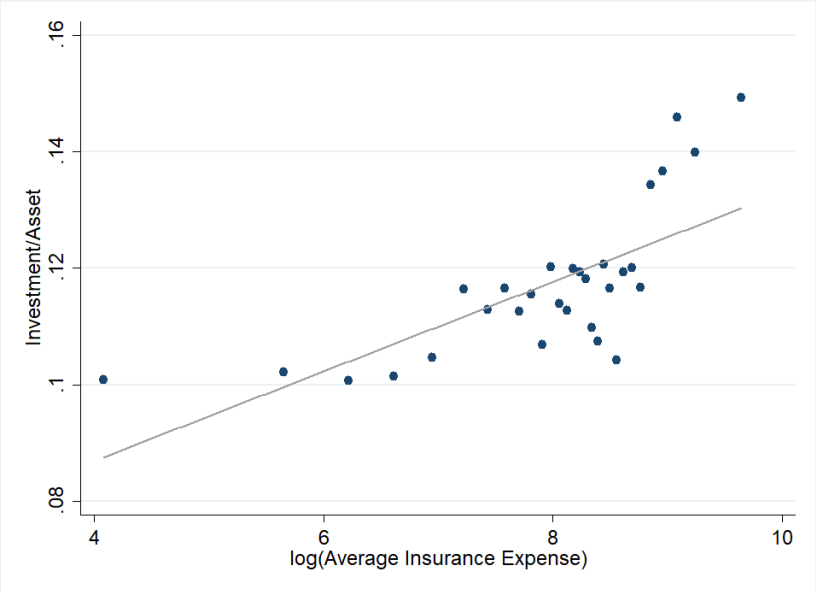


Figure 2. Health Insurance Market Concentration over Time

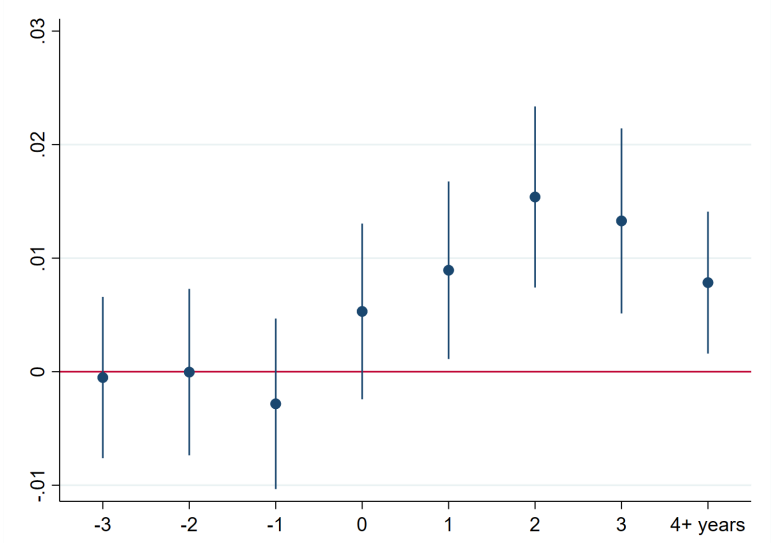
This figure shows the changes in health insurance market concentration across time and geographical regions. The plots present the state-level Herfindahl-Hirschman index (HHI), categorized into groups of fixed intervals and with increments of 500 (on a scale of 0 to 10,000), for 2004, 2008, 2012 and 2016. Darker shades indicate higher level of HHI. HHI is calculated using the annual Market Share Reports from the National Association of Insurance Commissioners (NAIC).

Figure 3. The Difference in Investment by Year to Tort Reform Enactment

This figure presents the dynamics of change in total investment from four years or more before the enactment of caps on noneconomic damages reform to four years or more after. The coefficient estimate and 95% confidence intervals are estimated using the following specification:

$$Investment_{imt} = \sum_{k=-4}^{4} \beta_k \{Treated_i \times n\ years\ to\ enactment\} + \phi \cdot firm\ controls_{it-1} + \gamma \cdot local\ controls_{tm} + \alpha_i + \lambda_t + \epsilon_{imt}$$

The dependent variable *Investment* is the sum of scaled capital and R&D expenditures. Independent variables are the set of dummies indicating whether the observation fits into the specific time frame of the tort reform. I plot the β_k coefficients, which are the estimates representing the differences in *Investment* between the treated firm and firms with no change in the tort reform during the sample period. The omitted category is four years or more before the enactment. The specification includes firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level.



Total Investment

Table 1
Form 5500-Compustat Merged Sample Summary Statistics

This table provides the summary statistics of the sample of employer-sponsored health benefits data linked to the Compustat universe. Employer-sponsored health benefits data come from Form 5500 filings maintained by the Department of Labor. The sample covers all public firms from 1999 to 2016 that filed at least one Form 5500 and can be linked to Compustat via an Employer Identification Number (EIN) or name matching, excluding all utility and financial firms. Panel A reports firm-level information on Form 5500 variables. Panel B reports firm-level information on Compustat variables on the Form 5500-Compustat Merged Sample. Panel C reports the summary statistics of variables in Panel B for the Compustat universe from 1999 to 2016 with non-missing key variables. Variable definitions can be found in Section 3 of the paper and the Appendix. For each variable, I report the mean, standard deviation, and 25th, 50th, and 75th percentiles.

Panel A: Form 5500 Variables (N=43,740)

	Mean	Std.Dev	p25	p50	p75
Average Expense per Participant	4279	6279	1966	3656	5524
Fully Insure	0.344	0.475	0	0	1
Self-Insure	0.328	0.470	0	0	1
Mix Insure	0.327	0.469	0	0	1
Dental	0.323	0.468	0	0	1
Vision	0.186	0.389	0	0	0
Prescription Drug	0.508	0.500	0	1	1
Life Insurance	0.130	0.337	0	0	0
HMO Plan	0.549	0.498	0	1	1
PPO Plan	0.393	0.488	0	0	1

Panel B: Compustat Variables – Form 5500-Compustat Merged Sample (N=43,740)

	Mean	Std.Dev	p25	p50	p75
Assets($mil)	3294.6	11799.7	150.3	515.2	1911.8
PPENT($mil)	878.8	2952.8	18.0	87.4	432.2
Profit Margin	-0.342	4.218	-0.031	0.028	0.072
Age	21.2	15.8	9.0	16.0	30.0
q	2.853	5.320	1.173	1.73	2.818
Cash/Assets	0.185	0.204	0.030	0.104	0.271
Capex/Assets	0.058	0.076	0.018	0.035	0.067
R&D/Assets	0.079	0.139	0.000	0.025	0.103
Investment/Assets	0.114	0.143	0.033	0.069	0.140

Panel C: Compustat Variables – Compustat Universe (N=69,246)

	Mean	Std.Dev	p25	p50	p75
Assets($mil)	2325.8	10782.0	31.8	183.3	942.5
PPENT($mil)	618.0	2511.7	3.0	26.1	206.1
Profit Margin	-2.331	12.539	-0.195	0.012	0.063
Age	18.3	14.2	8.0	14.0	24.0
q	3.769	7.355	1.144	1.803	3.336
Cash/Assets	0.212	0.235	0.032	0.116	0.317
Capex/Assets	0.064	0.106	0.014	0.032	0.068
R&D/Assets	0.118	0.230	0.000	0.032	0.133
Investment/Assets	0.146	0.216	0.032	0.076	0.169

Table 2
Effect of Medical Malpractice Tort Reforms on Firm Investment

This table presents how firms' investment decisions were affected by state-level medical tort reforms from 1999 to 2016. The dependent variables *CAPEX* and *R&D* are Compustat variables of capital and R&D expenditure scaled by lagged assets; *INVESTMENT* is the sum of scaled capital and R&D expenditures. The independent variables are four common medical malpractice tort reforms, which equals one if the reform is in effect in the given year and state during the sample period. All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	CAPEX	R&D	INVESTMENT	INVESTMENT
	(1)	(2)	(3)	(4)
Caps Noneconomic Damages	0.006**	0.009***	0.013***	0.013***
	(2.557)	(2.829)	(2.814)	(2.826)
Caps Punitive Damages				-0.000
				(-0.166)
Collateral Source Reform				0.015**
				(2.034)
Joint and Several Liability Reform				-0.013***
				(-3.062)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	61,408	44,893	61,408	61,408
Adjusted R^2	0.532	0.704	0.666	0.666

Table 3
Effect of Medical Malpractice Tort Reforms on Firm Investment: Matched Sample Analysis

This table presents how firms' investment decisions were affected by state-level medical tort reforms from 1999 to 2016 using the matched subsample analysis. Treatment firms are those with the enactment of caps on noneconomic damage reform during the sample period, excluding states that struck down the reform in the following year. The control sample compromises firms headquartered in states that did not experience changes in the tort law during the sample period, restricted to the years that the treatment took place. Panel A is the comparison of the mean for treatment firms and the full control sample before propensity score matching. The last column reports the t-statistics for the differences in mean values between the treatment firms and the control firm sample. ***, **, and * in the last column indicate significance at the 1%, 5%, and 10% levels, respectively, for a t-test of whether the two samples have equal means.

Panel B shows the comparison of the mean for treatment and control firms after propensity score matching. The control firms are selected from the same year and same 2-digit SIC industry with the closest propensity score, which is estimated using firm size, age, q, cash-to-asset, log(PPENT) and profit margin from one year before the enactment. I use two rounds of matching with replacement. The last column reports the t-statistics for the differences in mean values between the treatment firms and the control firm sample. ***, **, and * in the last column indicate significance at the 1%, 5%, and 10% levels, respectively, for a t-test of whether the two samples have equal means.

Panel C shows the OLS regression results of the difference-in-differences specification using the matched sample. I include observations from three years before to three years after the enactment of caps on noneconomic damages for both treatment and matched firms. $I(Tort)$ is a dummy variable that equals one if the caps on noneconomic damages tort reform are enacted in the state in which the firm is present during the sample period, $I(After)$ is a dummy variable that equals one if the treatment firm (matched control firm) is present within [t+1, t+3] years after the year of enactment. $I(Tort) \times I(After)$ is the interaction term of the two. The dependent variables *CAPEX* and *R&D* are Compustat variables of capital and R&D expenditure scaled by lagged assets; *INVESTMENT* is the sum of scaled capital and R&D expenditures. All specifications include firm and year fixed effects. Columns 2, 5, and 8 include state-level controls for income per capita and unemployment rate. Columns 3, 6, and 9 add firm controls including lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics based on robust standard errors are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Summary Statistics for Treatment and Control Sample – Full Sample in t-1 Year

	Treatment (N=1313)		Control (N=7072)		
	Mean	Std.Dev	Mean	Std.Dev	t stats
log(Age)	2.676	0.777	2.602	0.804	(3.17)**
log(Assets)	4.894	2.566	5.107	2.601	(-2.75)**
q	3.580	6.314	3.155	6.049	(2.25)*
Cash	0.252	0.362	0.166	0.269	(8.13)***
log(PPENT)	2.825	3.097	3.427	3.080	(-6.48)***
Profit Margin	-1.815	8.961	-1.096	6.058	(-2.79)**
Employment	6.910	19.086	8.020	21.225	(-1.88)
Leverage	0.328	0.702	0.364	0.699	(-1.70)
Market Value	1985	6871	1768	6246	(1.07)
Sales	1.211	0.921	1.189	0.883	(0.80)
Sales Growth	0.071	0.443	0.080	0.435	(-0.65)
ROA	-0.037	0.443	-0.011	0.432	(-1.91)

Panel B: Summary Statistics for Treatment and Control Sample – Propensity Score Matched Sample in t-1 Year

	Treatment (N=920)		Control (N=1487)		
	Mean	Std.Dev	Mean	Std.Dev	t stats
log(Age)	2.551	0.746	2.577	0.769	(0.82)
log(Assets)	4.773	2.603	4.818	2.629	(0.42)
q	3.458	5.643	3.230	5.819	(-0.95)
Cash	0.215	0.319	0.201	0.301	(-1.06)
log(PPENT)	2.798	3.048	2.957	3.041	(1.25)
Profit Margin	-1.742	7.861	-1.334	6.730	(1.31)

Panel C: Regression Results

	CAPEX			R&D			INVESTMENT		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$I(Tort) \times I(After)$	0.009**	0.009**	0.010***	0.007*	0.007*	0.009***	0.014***	0.014***	0.017***
	(2.425)	(2.430)	(2.997)	(1.802)	(1.706)	(3.654)	(3.195)	(3.000)	(3.825)
$I(After)$	-0.001	-0.001	-0.003	-0.006**	-0.006*	-0.007**	-0.005	-0.005	-0.008*
	(-0.197)	(-0.240)	(-0.833)	(-2.067)	(-1.789)	(-2.721)	(-1.320)	(-1.240)	(-2.004)
Firm Controls	No	No	Yes	No	No	Yes	No	No	Yes
Macro Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,066	14,066	13,414	10,335	10,335	9,876	14,066	14,066	13,414
Adjusted R^2	0.470	0.470	0.528	0.688	0.688	0.754	0.621	0.621	0.688

Table 4
Effect of Tort Reforms on Firm Investment – Excluding Certain Industries

This table presents how firms' investment decisions are affected by state-level medical tort reforms from 1999 to 2016 excluding industries that are susceptible to product liability lawsuits. The excluded industries are machinery (Fama-French 48 Industry: 21), automobile and truck (Fama-French 48 Industry: 23), aircraft(Fama-French 48 Industry: 24), transportation (Fama-French 48 Industry: 40), and abrasive and asbestos products (SIC 3290-3293). The dependent variables *CAPEX* and *R&D* are Compustat variables of capital and R&D expenditure scaled by lagged assets; *INVESTMENT* is the sum of scaled capital and R&D expenditures. The variables of interest are four common medical malpractice tort reforms during the sample period. The reforms are dummy variables that equal one if the reform is in effect in the given year and state. All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	CAPEX	R&D	INVESTMENT	INVESTMENT
	(1)	(2)	(3)	(4)
Caps Noneconomic Damages	0.007**	0.008**	0.013***	0.014***
	(2.640)	(2.574)	(2.835)	(2.848)
Caps Punitive Damages				-0.002
				(-0.644)
Collateral Source Reform				0.015**
				(2.156)
Joint and Several Liability Reform				-0.013***
				(-3.088)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	57,062	42,579	57,062	57,062
Adjusted R^2	0.533	0.704	0.668	0.668

Table 5
Effect of Tort Reforms on Firm Investment – State Politics

This table presents the results of whether the effect of state-level medical tort reforms on firms' investment decisions is driven by state partisan status. The dependent variables *CAPEX* and *R&D* are Compustat variables of capital and R&D expenditures scaled by lagged assets; *INVESTMENT* is the sum of scaled capital and R&D expenditures. $I(Tort)$ is a dummy variable that equals one if the caps on noneconomic damages tort reform is in effect, and $I(Republican\ State)$ is a dummy variable that equals one if the Republican Party controls two or more of three state institutions: the two chambers of the state legislature and the governor's office. Data on state partisan balance are from Klarner (2013) and are available for 1990 to 2011. All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	CAPEX	R&D	INVESTMENT
	(1)	(2)	(3)
$I(Tort)$	0.012***	0.010**	0.019***
	(2.881)	(2.054)	(2.808)
$I(Republican\ State)$	0.004***	0.000	0.005
	(2.823)	(0.019)	(1.417)
$I(Tort) \times I(Republican\ State)$	-0.005	-0.000	-0.005
	(-1.260)	(-0.119)	(-0.876)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	48,001	35,468	48,001
Adjusted R^2	0.527	0.710	0.665

Table 6
Effect of Tort Reforms on Firm Investment – Geographical Dispersion

This table presents the results on whether the effect of state-level medical tort reforms on firm's investment decisions differs by firms' geographical dispersion. The dependent variable *INVESTMENT* is the sum of scaled capital and R&D expenditures. $I(Tort)$ is a dummy variable that equals one if the caps on noneconomic damages tort reform is in effect. The sample is split into "Dispersed" and "Less Dispersed" by whether the number of states in which the firm is present exceeds the sample median or whether the firm is present in more than one state. Geographical dispersion data are from Garcia and Norli (2012). All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	INVESTMENT					
	Split by Median			Present in Multiple States		
	Dispersed	Less Dispersed	Interaction	Dispersed	Less Dispersed	Interaction
	(1)	(2)	(3)	(4)	(5)	(6)
$I(Tort)$	0.008**	0.013**	0.013**	0.009*	0.031***	0.031***
	(2.413)	(2.064)	(2.065)	(1.937)	(3.203)	(3.228)
$I(Tort) \times I(GeoDispersed)$			-0.004			-0.022***
			(-0.828)			(-2.799)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25,008	28,147	53,155	50,442	2,713	53,155
Adjusted R^2	0.661	0.690	0.687	0.669	0.769	0.675

Table 7
Health Insurer Market Competition

This table presents an overview of the health insurance market competition at the state level from 2004 to 2016. The Herfindahl-Hirschman index (HHI) and the total market share of top insurance firms are used to describe market concentration, which are calculated using the annual Market Share Reports from the National Association of Insurance Commissioners (NAIC). The cumulative simulated change in HHI, $C\_sim\Delta HHI$, is the instrument to proxy for market concentration changes. Its construction is described in Section 4.3 and Equation 2. Panel A reports the summary statistics of variables related to market competition. Panel B reports the state-level regression of the actual HHI or top players' market share on $c\_sim\Delta HHI$ or lagged $c\_sim\Delta HHI$. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Summary Statistics

	N	Mean	Std.Dev	p25	p50	p75
c_simΔ HHI	663	56.2	174.7	0.77	8.1	30.2
HHI	663	1951.6	801.4	1442.3	1793.7	2267.2
Total Marketshare Top 4 Firms	663	0.686	0.092	0.629	0.687	0.753

Panel B: Regression Results

	HHI		Total Marketshare Top 4 Firms	
c_simΔ HHI	0.646***		0.726***	
	(4.953)		(4.408)	
l1.c_simΔ HHI		0.423***		0.452***
		(3.350)		(2.812)
Observations	663	612	663	612
R-squared	0.866	0.874	0.839	0.849
Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes

Table 8
Health Insurance Merger Effect on Firm Investment

This table presents how firms' investment decisions are affected by the health care cost changes after mergers in the health insurance industry. The sample period is 2004–2016, the years for which health insurance market share data from NAIC are available. Column 1 shows the first stage result regressing $log(average\ insurance\ expense)$ on $c\_sim\Delta HHI$. $Log(average\ insurance\ expense)$ is from Form 5500 and described in Section 3.1, and the independent variable $c\_sim\Delta HHI$ is the cumulative simulated change in the HHI described in Section 4.3 and Equation 2. Columns 2-4 show the instrumental-variables-two-stage-least-squares (IV-2SLS) results using $c\_sim\Delta HHI$ as an instrument for $log(average\ insurance\ expense)$. The dependent variables in Columns 2 and 3, *CAPEX* and *R&D*, are Compustat variables of capital and R&D expenditure scaled by lagged assets; *INVESTMENT* is the sum of scaled capital and R&D expenditures.

All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	First Stage	IV-2SLS		
	log(average insurance expense)	CAPEX	R&D	INVESTMENT
	(1)	(2)	(3)	(4)
c_simΔ HHI	3.725***			
	(4.798)			
log(average insurance expense)		-0.107***	0.014	-0.090***
		(-3.656)	(0.768)	(-3.014)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	18,021	17,992	13,400	17,992
F-stats	23.02			

Table 9
Health Care Costs and Firms' Other Outcomes

This table presents how firms' other corporate outcomes are affected by the costs of providing health benefits to employees in the quasi-experimental setting of tort reforms. The sample period is 1999–2016. The independent variable is medical malpractice tort reform of caps on noneconomic damages, which equals one if the reform is in effect in the given year and state. The dependent variable *Asset Growth* is the difference of the natural algorithm of assets between the given year and the year before; *Employment Growth* is the difference of the natural algorithm of Compustat employment between the given year and the year before; *Advertising* is the Compustat advertising expenditure scaled by total assets; *Acquisition* is the Compustat acquisition expenditure scaled by total assets; and *Cash* is the Compustat cash item scaled by total assets. All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Asset Growth	Employment Growth	Advertising	Acquisition	Cash
	(1)	(2)	(3)	(4)	(5)
$I(Tort)$	0.037***	0.010	0.002**	0.003*	0.021**
	(2.766)	(1.640)	(2.019)	(2.006)	(2.213)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	61,770	58,973	25,256	59,776	61,779
Adjusted R^2	0.244	0.148	0.771	0.114	0.481

Table 10
Firm Investment and Health Care Costs – Role of Financial Constraint

This table presents how firms' investment decisions are affected by health care cost reductions induced by tort reforms, conditional on whether the firm is financially constrained. The dependent variable *INVESTMENT* is the sum of scaled capital and R&D expenditures. The sample is split into "Less Constrained" and "More Constrained" by whether the firm pays a common dividend, firm size in relation to the sample median, or whether the operating profit before depreciation scaled by lagged assets is above the sample median. All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	INVESTMENT								
	Dividend			Size			Profit		
	More Constrained	Less Constrained	Interaction	More Constrained	Less Constrained	Interaction	More Constrained	Less Constrained	Interaction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$I(Tort)$	0.016***	0.004*	0.004	0.018**	0.008**	0.008***	0.020**	0.008**	0.008***
	(2.767)	(1.818)	(1.146)	(2.298)	(2.480)	(2.947)	(2.616)	(2.211)	(3.056)
$I(Tort) \times I(Constrained)$			0.011**			0.011**			0.012***
			(2.469)			(2.571)			(2.667)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	46,553	14,855	61,408	29,356	32,052	61,408	28,264	32,141	60,405
Adjusted R^2	0.652	0.640	0.665	0.651	0.668	0.675	0.649	0.661	0.671

Table 11
Firm Investment and Health Care Costs – Role of Labor Wage and Skill

This table presents how firms' investment decisions are affected by costs of providing health benefits to employees, conditional on industry average wage and skill. The sample is split into "Low" and "High" by whether the industry-level average hourly wage or the industry-level average skill level exceeds the sample median. Wage and occupational skill data come from the Bureau of Labor Statistics and Department of Labor, at the 4-digit NAICS level. All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Role of Labor Wage

	CAPEX			R&D			INVESTMENT		
	High Wage	Low Wage	Interaction	High Wage	Low Wage	Interaction	High Wage	Low Wage	Interaction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$I(Tort)$	0.013**	0.003*	0.003*	0.018**	0.005*	0.005	0.030***	0.006**	0.006**
	(2.517)	(1.893)	(1.946)	(2.218)	(1.717)	(1.467)	(2.844)	(2.328)	(2.228)
$I(Tort) \times I(High\ Wage)$			0.010***			0.013**			0.024***
			(4.041)			(2.501)			(5.774)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,352	30,496	58,848	22,814	20,364	43,178	28,352	30,496	58,848
Adjusted R^2	0.582	0.486	0.546	0.688	0.657	0.713	0.663	0.606	0.678

Panel B: Role of Labor Skill

	CAPEX			R&D			INVESTMENT		
	High Skill	Low Skill	Interaction	High Skill	Low Skill	Interaction	High Skill	Low Skill	Interaction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$I(Tort)$	0.010**	0.004**	0.004**	0.020***	0.004	0.004	0.026***	0.006***	0.006**
	(2.103)	(2.557)	(2.568)	(2.753)	(1.586)	(1.097)	(2.690)	(2.743)	(2.361)
$I(Tort) \times I(High\ Skill)$			0.006***			0.016***			0.020***
			(2.594)			(2.958)			(4.748)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,109	30,739	58,848	21,668	21,510	43,178	28,109	30,739	58,848
Adjusted R^2	0.590	0.473	0.545	0.686	0.683	0.712	0.670	0.618	0.676

Table 12
Firm Investment and Health Care Costs – Role of Employers' Bargaining Power

This table presents how firms' investment decisions are affected by the costs of providing health benefits to employees, conditional on firms' bargaining power, which is represented by their insurer set. The sample is split into "Low" and "High" by whether a firm's number of insurers or the within-firm insurer HHI exceeds the sample median. The insurer HHI is computed as the sum of the squares of the insurer share of participants in a firm. More insurers or a low HHI indicates that the firm has more bargaining power. Insurer information is from Form 5500, Schedule A. Columns 1, 2, 5, and 6 show the first stage results regressing $log(average\ insurance\ expense)$ on $c\_sim\Delta HHI$, conditional on firms' insurer options. $Log(average\ insurance\ expense)$ is from Form 5500, and the independent variable $c\_sim\Delta HHI$, which is the cumulative simulated change in the HHI, is an instrument for insurance price increase and described in Section 4.3 and Equation 2. *Geo Disp* is the number of states that a firm operates in for the given year, and the data is from Garcia and Norli (2012). Columns 3, 4, 7, and 8 show the reduced-form results regressing firm investment on $c\_sim\Delta HHI$. The dependent variable *INVESTMENT* is the sum of scaled capital and R&D expenditures.

All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

DepVar=	log(avg insurance expense)		INVESTMENT		log(avg insurance expense)		INVESTMENT	
	Number of Insurers				Within-Firm Insurer HHI			
	> 1	$= 1$	> 1	$= 1$	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
c_simΔ HHI	0.117	5.683***	-0.086	-0.593***	0.659	5.945***	-0.043	-0.574***
	(0.091)	(5.691)	(-0.966)	(-8.770)	(0.519)	(5.283)	(-0.496)	(-9.518)
Geo Disp	0.004	0.004	0.000	-0.001	0.006	0.004	0.000	-0.001
	(1.028)	(0.490)	(0.862)	(-0.826)	(1.456)	(0.599)	(0.776)	(-1.005)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,203	6,991	9,196	6,998	8,364	7,830	8,376	7,818
Adjusted R^2	0.614	0.665	0.845	0.820	0.618	0.655	0.846	0.819

Internet Appendix (Not For Publication)

Table A.1
Summary of State Medical Malpractice Tort Reforms

This table presents the changes in state tort reforms from 1990 to 2016. The data are from the sixth edition of the Database of State Tort Law Reforms (Avraham, 2018). Panel A lists the enactment and strike down of the four most common medical malpractice reforms from 1990 to 2016: caps on noneconomic damages, caps on punitive damages, collateral source reform, and joint and several liability reform. The years with no tort changes are omitted. Years of strike down are the first year that the reform is no longer in place. Panel B lists states that have reforms in place before 1990.

Panel A: Tort Reforms, 1990–2016

	Caps Noneconomic Damages		**Caps Punitive Damages**		**Collateral Source Reform**		**Joint and Several Liability Reform**	
	Enactment	Strike Downs	Enactment	Strike Downs	Enactment	Strike Downs	Enactment	Strike Downs
1990					ME ID		NH MS	
1991		WI NH				GA		
1992		OH					TN NE	
1993		AL	ND			KS		
1994				AL			WI	
1995	IL WI		IN		WI	KY	IL	
1996	ND SD MT		NC NJ OK					
1997	OH		PA OH			AL	OH	
1998		IL OH	AK	OH		OH		IL OH
1999								
2000		OR	AL					
2001					AL			
2002					PA OH		PA	
2003	NV OH MS FL		AR MS		WV		NV OH AR	
2004	OK TX		ID MT		OK			
2005	GA		OH					
2006	IL SC		MO				SC	PA
2010		GA IL						
2011							PA	
2012	NC TN		TN SC					
2014				MO				
2015		UT						

Panel B: States of Tort Reforms Enacted before 1990

Caps Noneconomic Damages	AL AK CA CO HI ID KS MD MA MI MN MO NH OH OR UT WV WI
Caps Punitive Damages	AL CO FL GA IL KS LA MI NE NV NH OR TX VA WA WI
Collateral Source Reform	AL AK AZ CA CO CT DE FL GA HI IL IN IA KS KY MA MI MN MT NE NV NJ NY ND OH OR RI SD TN UT WA
Joint and Several Liability Reform	AK AZ CA CO CT FL GA HI ID IA KS KY LA MI MN MO MT NJ NM NY ND OK OR SD TX UT VT WA WV WY

Table A.2
Health Insurance Market M&A

This table presents the list of horizontal mergers in the health insurance industry for 2004-2016. The mergers are identified using Zephyr and SDC Platinum. To be included in the list, both acquiror and target need to be in the industry of direct health and medical insurance carriers (NAICS Code: 524114), both must be US firms with a valid National Association of Insurance Commissioners (NAIC) code, both must not operate in a single line business for Medicare or Medicaid, and both must operate in more than one state-level market. Only complete deals with a deal value (if available) greater than $10 million are included.

The table reports the completion dates for the merger deals, the names of the acquiror and target, and the deal value if available. The last three columns show the number of state-level markets the acquiror and target operate before the merger, as well as how many states they both have operations in before the merger.

Complete Date	Acquiror	Target	Deal Value($Mil)	Acquiror Market #	Target Market #	Overlapping Market #
12/21/2005	Unitedhealth Group Inc	Pacificare Health Systems Inc	8734	51	40	40
12/28/2005	Wellpoint Inc	Wellchoice Inc	6497	51	2	2
2/25/2008	Unitedhealth Group Inc	Sierra Health Services Inc	2600	51	32	32
4/1/2008	Cigna Corp	Great-West Healthcare	1500	51	51	51
7/1/2008	Centene Corporation	Celtic Group Inc	80	6	43	5
10/1/2010	Coventry Health Care Inc	Mercy Health Plans Inc	n.a.	51	4	4
11/30/2010	Healthspring Inc	Bravo Health Inc	545	47	24	22
8/22/2011	Wellpoint Inc	Caremore Medical Group Inc	800	51	2	2
1/31/2012	Cigna Corp	Healthspring Inc	3800	51	51	51
2/9/2012	Unitedhealth Group Inc	XLHealth Corporation	2000	51	6	6
4/2/2012	Humana Inc	Arcadian Management Services	n.a.	51	15	15
8/31/2012	Cigna Corp	Great American Supplemental	305	51	50	50
12/24/2012	Wellpoint Inc	Amerigroup Corporation	4900	51	10	10
5/7/2013	Aetna Inc	Coventry Health Care Inc	7300	51	51	51

Table A.3
Effect of Medical Malpractice Tort Reforms on Firm Investment – Industry Shocks

This table presents how firms' investment decisions are affected by state-level medical tort reforms from 1999 to 2016. The dependent variables *CAPEX* and *R&D* are Compustat variables of capital and R&D expenditure scaled by lagged assets. *INVESTMENT* is the sum of scaled capital and R&D expenditures. The independent variables are four common medical malpractice tort reforms, which equal to one if the reform is in effect in the given year and state during the sample period. All specifications include firm and 3-digit NAICS industry-year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	CAPEX	R&D	INVESTMENT	INVESTMENT
	(1)	(2)	(3)	(4)
Caps Noneconomic Damages	0.003**	0.009**	0.008***	0.008***
	(2.204)	(2.430)	(3.328)	(3.428)
Caps Punitive Damages				0.001
				(0.349)
Collateral Source Reform				0.011**
				(2.017)
Joint and Several Liability Reform				-0.010***
				(-3.816)
Industry-Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	61,408	44,893	61,408	61,408
Adjusted R^2	0.558	0.701	0.670	0.670

Table A.4
Effect of Medical Malpractice Tort Reforms on Firm Investment – Non-tradable Industries

This table presents how firms' investment decisions are affected by costs of providing health benefits to employees, conditional on whether the industry is a non-tradable industry. Non-tradable industries are defined at two-digit NAICS level: 23 (Construction), 44-45 (Retail Trade), and 72 (Accommodation and Food Services). All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	CAPEX			R&D			INVESTMENT		
	Non-tradable	Tradable	Interaction	Non-tradable	Tradable	Interaction	Non-tradable	Tradable	Interaction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$I(Tort)$	-0.001	0.008***	0.008***	-0.000	0.010***	0.010***	-0.002	0.015***	0.015***
	(-0.373)	(2.793)	(2.792)	(-0.614)	(2.718)	(2.718)	(-0.450)	(2.929)	(2.929)
$I(Tort) \times I(Nontradable)$			-0.009**			-0.010***			-0.017***
			(-2.307)			(-2.736)			(-2.894)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,657	55,740	61,397	4,435	40,487	44,922	5,657	55,740	61,397
Adjusted R^2	0.523	0.532	0.533	0.786	0.696	0.705	0.528	0.666	0.667

Table A.5
Effect of Tort Reform on Insurance Expense Using Form 5500 Data

This table presents the relation between health care insurance premiums from Form 5500 and firm investment decisions using the variations from medical malpractice tort reforms. The sample period is 1999–2016, the years for which Form 5500 data are available. The first three columns are the first stage results regressing *log*(*average insurance expense*) on the indicator of tort reform for caps on noneconomic damage. *Log*(*average insurance expense*) is the log form of total insurance expense divided by the total number of people covered by the firm, aggregating all the health benefit plans of a firm using Form 5500 data. In Column 1, the sample includes all Compustat firms matched to the Form 5500 dataset. In Column 2, firms with fully insured health plans are excluded. In Column 3, only firms with fully insured health plans are included. Columns 4–6 show the IV-2SLS results using $I(Tort)$ as an instrument for *log*(*average insurance expense*) on the fully-insured subsample. The dependent variables in Columns 4–6 *CAPEX* and *R&D*, are Compustat variables of capital and R&D expenditure scaled by lagged assets. *INVESTMENT* is the sum of scaled capital and R&D expenditures. All specifications include firm and year fixed effects as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	First Stage log(avg insurance expense)			IV-2SLS		
				CAPEX	R&D	INV
	All	Exclude Fully-insured	Fully-insured only	Fully-insured only		
	(1)	(2)	(3)	(4)	(5)	(6)
$I(Tort)$	-0.045	-0.045	-0.111**			
	(-1.031)	(-0.807)	(-2.482)			
log(avg insurance expense)				-0.089**	-0.069	-0.125**
				(-2.186)	(-1.197)	(-2.254)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29,311	16,742	12,569	11,706	9,172	11,706
F-stats	1.240	2.288	13.52			

Table A.6
Health Insurance Merger Effect on Firm Investment (National-Level Mergers Only)

This table presents how firms' investment decisions are affected by health care cost changes induced by mergers in the health insurance industry. Only mergers with more than 30 state-level overlapping markets are included. The sample period is 2004–2016, the years for which health insurance market share data from NAIC are available. Column 1 shows the first stage result regressing *log*(*average insurance expense*) on *c_sim*ΔHHI. *Log*(*average insurance expense*) is from Form 5500 and described in Section 3.1, and the independent variable *c_sim*ΔHHI is the cumulative simulated change in the HHI described in Section 4.3 and Equation 2. Columns 2-4 show the instrumental-variables-two-stage-least-squares (IV-2SLS) results using *c_sim*ΔHHI as an instrument for *log*(*average insurance expense*). The dependent variables in Columns 2 and 3, *CAPEX* and *R&D* are Compustat variables of capital and R&D expenditure scaled by lagged assets; *INVESTMENT* is the sum of scaled capital and R&D expenditures.

All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	First Stage	IV-2SLS		
	log(average insurance expense)	CAPEX	R&D	INVESTMENT
	(1)	(2)	(3)	(4)
c_simΔ HHI	4.056***			
	(4.912)			
log(average insurance expense)		-0.116***	0.024	-0.095***
		(-4.987)	(1.326)	(-3.900)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	18,021	17,992	13,400	17,992
F-stats	24.13			

Table A.7
Health Insurance Merger Effect on Firm Investment – Industry Shocks

This table presents how firms' investment decisions are affected by health care cost changes induced by mergers in the health insurance industry. The sample period is 2004–2016, the years for which health insurance market share data from NAIC are available. Column 1 shows the first stage result regressing $log(average\ insurance\ expense)$ on $c\_sim\Delta HHI$. $Log(average\ insurance\ expense)$ is from Form 5500 and described in Section 3.1, and the independent variable $c\_sim\Delta HHI$ is the cumulative simulated change in the HHI described in Section 4.3 and Equation 2. Columns 2–4 show the IV-2SLS results using $c\_sim\Delta HHI$ as an instrument for $log(average\ insurance\ expense)$. The dependent variables *CAPEX* and *R&D* are Compustat variables of capital and R&D expenditure scaled by lagged assets; *INVESTMENT* is the sum of scaled capital and R&D expenditures.

All specifications include firm and 3-digit NAICS industry-year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, cash-to-asset, q, log(PPENT), profit margin, and age. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	First Stage	IV-2SLS		
	log(average insurance expense)	CAPEX	R&D	INVESTMENT
	(1)	(2)	(3)	(4)
c_simΔ HHI	2.859***			
	(3.483)			
log(average insurance expense)		-0.088***	0.020	-0.067**
		(-2.859)	(0.854)	(-2.251)
Industry-Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	18,021	17,992	13,400	17,992
F-stats	12.13			

Table A.8
Health Care Costs and Inventor Mobility

This table presents how firms' inventor reallocation is affected by health care costs in the quasi-experimental setting of tort reforms. The sample period is 1999–2010. I track inventor mobility at the inventor-firm-year-level and aggregate inventor movement to firm level. The independent variable is medical malpractice tort reform of caps on noneconomic damages, which equals one if the reform is in effect in the given year and state. *I(Move)* and *I(Join)* are dummy variables indicating whether any inventors leave or join the firm in the subsequent one to three years.

All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, market value, age, and number of patents held by the firm. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable: Inventor Movement Across Firms						
	I(Move)			I(Join)		
	1 Year	2 Years	3 Years	1 Year	2 Years	3 Years
	(1)	(2)	(3)	(4)	(5)	(6)
$I(Tort)$	0.059***	0.056***	0.061***	0.068***	0.051**	0.043
	(2.920)	(3.210)	(3.568)	(3.563)	(2.181)	(1.290)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,769	10,769	10,769	10,769	10,769	10,769
R-squared	0.497	0.559	0.596	0.512	0.556	0.582

Table A.9
Health Care Costs and Firms' Innovation

This table presents how firms' innovation is affected by costs of providing health benefits to employees in the quasi-experimental setting of tort reforms. The sample period is 1999–2012. The independent variable is medical malpractice tort reform of caps on noneconomic damages, which equals one if the reform is in effect in the given year. The dependent variables are patent citation measurements and the count of patents aggregated to firm level. All specifications include firm and year fixed effects, as well as firm and state-level controls. State-level controls include income per capita and unemployment rate. Firm controls include lagged size, market value, age, and number of patents held by the firm. Utility and financial firms are excluded from the analysis. Standard errors are clustered at the state and firm level. The t-statistics are displayed in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable:	New Patents Applied		New Patents		Average Citation New Patent Applied		Average Citation All Patents	
	Next 1 Year	Next 3 Years	Next 1 Year	Next 3 Years	Next 1 Year	Next 3 Years	Next 1 Year	Next 3 Years
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$I(Tort)$	0.111**	0.303**	0.093**	0.256**	0.016	0.026	0.022***	0.059***
	(1.995)	(1.999)	(2.535)	(2.438)	(0.590)	(0.291)	(2.862)	(2.901)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26,466	23,402	26,232	23,169	10,729	6,271	26,459	23,393
Adjusted R^2	0.766	0.870	0.750	0.843	0.439	0.697	0.886	0.932

Key Variable Definitions

Variable	Definition and Construction
	Financial variables
Assets	Total book assets in millions, adjusted to 2004 US dollars.
Size	The natural logarithm of total book assets, in millions, adjusted to 2004 US dollars.
Age	Number of years since IPO. The natural logarithm of this variable is used in the paper.
Profit margin	Income before extraordinary items divided by sales
q	(book value of debt + market value of equity)/(book value of debt + book value of equity)
Cash/Assets	Cash and short-term investment scaled by total assets.
Capex/Assets	Capital expenditure scaled by total assets.
R&D/Assets	Research and development expenses scaled by total assets.
Investment/Assets	The sum of capital expenditure and R&D expenses scaled by total assets.
Advertising	Advertising expenditure scaled by total assets.
Acquisition	Acquisition expenditure scaled by total assets.
Employment Growth	The growth of Compustat employment from t to t-1.
Sales Growth	The growth of net sales from t to t-1.
	Form 5500 variables
log(Average Insurance Expense)	The natural logarithm of (total insurance expense/total number of participants). Information for both is from Schedule A, aggregated to firm level by Employer Identification Number (EIN).
Self-/Mix/Fully insure	An indicator variable that takes a value of one if a firm's health benefits funding method is self-/mix/fully insured. For details, see Appendix "Form 5500 Data."
	Other variables
HHI	The Herfindahl-Hirschman Index calculated using total premium written by the insurer at the state level.
simΔHHI	The difference between the sum of the pre-merger HHI of target and acquiror, and the HHI of post-merger combined firm.
c_simΔHHI	The sum of simΔHHI from the start of the sample period to the current year.
I(Tort)	An indicator variable that takes a value of one if the tort reform of caps on noneconomic damages is in place.
I(Republican State)	An indicator variable that takes a value of one if the Republican Party controls two or more of three state institutions: each chamber of the state legislature and the governor's office. Data from Klarner (2013).
I(High Wage)	An indicator variable that takes a value of one if the wage at 4-digit NAICS level is above median.
I(High Skill)	An indicator variable that takes a value of one if the occupational skill level at the 4-digit NAICS level is above the median.

I(Geo Dispersed)	An indicator variable that takes a value of one if the number of states in which the firm is present exceeds the sample median or whether the firm is present in more than one state. Data from Garcia and Norli (2012).

A. Form 5500 Data

A.1. Overview

The Employee Retirement Income Security Act ("ERISA") and the Internal Revenue Code ("Code") establish disclosure requirements for the private-sector employee benefit plans. The Department of Labor ("DOL"), the Internal Revenue Service, and the Pension Benefit Guaranty Corporation jointly developed the Form 5500 series in 1975 to allow private firms that sponsor benefit plans for their employees to report and fulfill ERISA and Code requirements. Most Form 5500s are filed for employee pension plans. Welfare plans of a certain size and with certain characteristics are exempt from reporting. Exceptions include plans with fewer than 100 participants, plans for highly compensated employees only, government plans, church plans, and overseas plans that serve mainly nonresident aliens. Form 5500 does not contain information on co-payment or co-insurance, nor does it differentiate between family and single plans.

I retrieve and download all available Form 5500 welfare plan filings data using the EFAST2 system of the DOL. To clean up the data, I first drop all retirement plans, direct filing entities, voluntary filings with fewer than 100 participants, and duplicates filings. I keep plans that indicate they are for health benefits, and therefore exclude stand-alone welfare plans for other non-health benefits such as dental, life insurance, and long-term disability. I aggregate plan-level information to firms using Employer Identification Numbers ("EIN") reported in Form 5500. I then merge the Form 5500 data with Compustat universe using EIN as well as name matching.

A.2. Imputation of Variables

How the plan is funded—whether fully insured, self-insured, or a mix of the two (mixed insured)—is not reported and must be imputed using available information. I follow the algorithm created by the Department of Labor and described in Form 5500 Group Health Plan Research File User Guide (User Guide) to sort plans into fully, mixed or self-insured. Generally speaking, if the per capita premium amount reported is below \$1,800[32] or the filing indicates that the insurance policy could be for stop-loss coverage or payments to a third party administrator (TPA), and if the plan is funded through trust or general assets or reports benefit payments, then it is treated as self-insured. Mixed insured is defined as

[32]This is used in the User Guide, I also use 0.35 multiplied by the annual average single premium for robustness.

plans that do not meet the requirements for self-insured; the number of individuals covered under insurance contracts as reported on Schedule A is less than half of the total number of participants as of the end of the plan year; the filing indicates that the plan is funded through a trust or general assets of the sponsor; or the filing has an attached Schedule H or I that indicates benefit payments. Fully insured is defined as plans that do not satisfy the above criteria. For firm-level funding status, if all plans of a firm are fully insured, then the firm is labeled as a fully insured firm; if all plans are self-insured, then the firm is self-insured; otherwise, the firm is mixed insured.

For total premium, as suggested by the User Guide, the maximum of the values in the following items is used as the premium for that contract. Part I, 2(a), total amount of commissions paid; Part I, 2(b), total amount of fees paid; Part II, 6(b), premiums paid to carrier; Part III, 9(a)(4), earned premium; Part III, 9(b)(3), incurred claims; Part III, 9(b)(4), claims charged; and Part III, 10(a), total premiums or subscription charges paid to the carrier.