# How Do Health Insurance Costs Affect Low- and High-Income Workers?

**Abstract**

We examine the causal effect of employer-sponsored health insurance premiums on firms' employment and employment outcomes of low- versus high-income workers. To address endogeneity concerns, we instrument for premiums using idiosyncratic variation in insurers' recent losses, which is plausibly exogenous to their customers who are employers. Using IRS microdata, we show that following an exogenous increase in premiums, firms reduce employment. Lower-income workers become more likely to be separated from their jobs, become unemployed, experience a large earning reduction upon job separation, and lower wage growth rate even when retained.

Keywords: Health insurance, insurer losses, worker skills, firm employment, labor composition, inequality

JEL Codes: G22, G31, G28, G18, J01, J08, J32, J22, J23

# 1 Introduction

While health insurance protects households from the financial repercussions of health shocks, its costs are large and rapidly rising. Health insurance is often sponsored and heavily subsidized by employers in the U.S.; as of 2021, 54% of Americans are covered by employer-sponsored health insurance and U.S. employers contributed $16,253 on average in health insurance premiums per family plan.[1] Unlike many other labor costs such as wages and payroll taxes, health insurance costs do not scale with individual productivity, so these costs are larger as a fraction of overall compensation for low-income workers.[2] Ceteris paribus, health insurance cost is a flat, per-person cost and can depress demand for labor, especially for low-income workers (as hypothesized by Saez and Zucman 2019 and Deaton and Case 2021), who also face increasing displacement risk from other well-documented headwinds in the labor market, including imports, outsourcing, and automation.[3] In part due to these potential labor market distortions, the role employers should play in health care provision is the subject of a heated policy debate. However, Finkelstein et al. (2023) state that how the employer-sponsored health insurance scheme contributes to labor market inequality has received little attention in the literature. In this paper, we study how plausibly exogenous variation in firms' health insurance costs affects employment, and how the effect varies across workers along the income spectrum.

Typically, both firms and workers contribute to workers' health insurance premiums. Holding the health insurance takeup rate fixed, an increase in health insurance premiums would likely manifest as some combination of an increase in total labor costs per worker (earnings + firm contributions) paid by the firm and a decrease in take-home pay net of health insurance (earnings - worker contributions) received by the worker. The former case creates incentives for firms to lay off workers while the latter creates incentives for workers to leave. Thus, in theory, increases in health insurance costs should reduce firms' labor usage. The answer becomes less

[1] See, https://www.census.gov/library/publications/2022/demo/p60-278.html and KFF Employer Health Benefits Survey, 2021 https://www.kff.org/report-section/ehbs-2021-summary-of-findings/.

[2] Firms have limited ability to make smaller health plan contributions to workers with lower productivity. One constraining factor is the Affordable Care Act, which mandates that workers' contributions need to be less than a percentage of their household income. The percentage varies over time and has been between 9% and 10%. Ouimet and Tate (2022) find small within-firm variations in firms' health benefit costs.

[3] A number of papers document a weakening demand for low- and middle-skill workers in the U.S. See, e.g., Acemoglu and Autor (2011), Karabarbounis and Neiman (2014), Autor et al. (2020), and Kehrig and Vincent (2021).

clear when one considers labor market frictions. For instance, firms may be able to pass most of the cost increases onto workers if their labor supply is sufficiently inelastic, if workers can avoid paying higher premiums by obtaining comparable coverage elsewhere (e.g., through spouses or private plans), or if workers are inattentive to changes in their contribution to the benefit. Even without cost passthrough, labor adjustment costs might prevent firms from responding sufficiently in the short run to cost increases. It is thus an empirical question whether and to what extent changes in health insurance costs affect firm employment.[4]

Moreover, importantly, different workers can be affected differently, so there can be distributional implications of changes in health insurance costs. If employment does adjust in response to higher insurance premiums, one might expect such adjustments to be stronger for low-income workers since the same dollar increase in premiums leads to a larger proportional increase in firms' costs or employees' net-of-insurance pay for lower-paid workers.

To test these hypotheses, we construct a unique employer-employee matched dataset spanning the period of 2012–2019. We combine Census administrative microdata on the U.S. firms and their workers with information on firms' health insurance costs. Specifically, we collect this information from Form 5500, which is a mandatory filing for firms with benefit plans covering more than 100 participants. We also gather financial data of insurance providers from their financial filings under ACA. We find that, following a plausibly exogenous increase in health insurance premiums, firms reduce employment. Low-income workers, who also experience the largest increase in job separation, unemployment, and more severe wage declines upon job separations compared to high-income workers. The effect is absent or the opposite for high-income workers.

To study how health insurance premiums affect firms and their workers, one must address potential endogeneity concerns. For example, firms that want to retain and attract workers may choose to offer more generous, but costlier health insurance plans. This suggests a correlation between premiums and other unobservable drivers of employment growth. We overcome this challenge by designing a novel identification strategy to isolate changes in health insurance premiums that are plausibly exogenous to firm-level conditions. Specifically, we use idiosyncratic variation in insurers' losses as an instrumental variable for premiums faced by their customers,

[4]To this end, using non-administrative data, prior literature provides mixed evidence on the effect of health insurance premiums on firm employment. While Baicker and Chandra (2006) document negative employment effects, Almeida et al. (2021) find that increased health insurance premiums induced by the ACA reduced the number of workers covered by health insurance, but not the total number of employees.

i.e., employers.

We expect insurer losses to affect the premiums they charge for several reasons. First, existing evidence suggests that negative financial shocks often create incentives for firms to prioritize immediate cash flows over more distant ones.[5] Second, ACA guidelines specifically cap insurers' profits in three consecutive years and therefore tie potential premium increases to recent losses. Higher recent losses provide room for insurers to raise prices under these guidelines. Third, past losses affect insurers' beliefs about future claims. We elaborate on these mechanisms in Section 2. Regardless of the mechanism, we argue that an insurer's decision to increase premiums in response to its prior losses reflects its own internal objectives and constraints, rather than its customers' employment policies. This is our key exclusion restriction.

Using a two-stage-least-squares (2SLS) design, we study the effect of idiosyncratic shocks to firms' health insurance costs on subsequent firm and worker outcomes. Our instrument is highly relevant: the first-stage results suggest that a one-standard-deviation increase in insurers' losses predicts a 1.4% to 2% increase in premiums. Furthermore, we provide direct evidence that past insurer losses do not predict firms having larger claims in the future but do predict higher insurer markups (proxied by the ratio of premiums to claims). This is consistent with loss-driven premium changes reflecting insurers' objectives rather than omitted employer or worker characteristics.

We find that an increase in the instrumented insurance premiums leads to a significant decline in firms' overall employment. Our estimates suggest that a 10% increase in premiums is associated with a 2–3% decline in firm-level employment. The employment changes are primarily driven by a reduction in the number of retained workers rather than a decline in the number of new hires. These findings suggest that firms are responsive to these idiosyncratic shocks to health insurance costs.

More importantly, we test the hypothesis that an increase in health insurance premiums should affect lower-income workers more than their higher-income peers. For each worker, we compute her average earnings during the previous five years and then estimate how her employment outcomes are affected differently by health insurance premiums depending on her

[5]See, e.g., Chevalier (1995), Chevalier and Scharfstein (1996), Gilchrist et al. (2017), Khanna and Tice (2005), and Campello (2003). For insurance markets, see, e.g., Froot and O'Connell (1999), Koijen and Yogo (2022), and Ge (2022). As we discuss in Section 2.2, demand from existing customers is likely to be quite inelastic in our setting, creating scope for insurers to generate short-run cash flows by raising markups.

past earnings. For this analysis, we use individual-level data and impose individual, firm, and state-by-industry-by-year (or individual and firm-by-year) fixed effects in our 2SLS estimation. These fixed effects absorb various confounding factors. For example, individual fixed effects address concerns related to worker-firm sorting: e.g., (low-skilled) workers with a lower or higher tendency to switch jobs or become unemployed are more likely to be matched to firms whose insurance premiums increased due to our shock. The state-by-industry-by-year fixed effects control for industry or local dynamics. Alternatively, we also replace state-industry-year with firm-by-year interactive fixed effects to eliminate concerns related to employers' conditions.

We partition workers into terciles based on their past earnings, and examine the effect of health insurance premiums on job separation in each income tercile. We find that workers in the lowest income tercile experience the greatest increase in separation probability. Our estimates suggest that a 10% increase in health insurance premiums is associated with a 3-percentage-points increase in separation probability for low-income workers. This magnitude drops to 1–2-percentage-points for middle-income workers. Interestingly, the separation probability of high-income workers do not increase with health insurance premiums. If anything, their separation probability decreases by around 1.5-percentage-points in the year following the premium increase. This finding could reflect firms' effort to substitute low-income, low-skill workers with high-income, high-skill ones.

Since we do not observe reasons for separation, it is possible that our results are driven by larger increases in the probability of low-income workers voluntarily quitting for more desirable jobs elsewhere. To shed light on this issue, we examine two additional worker-level outcomes following an increase in employer-sponsored health insurance premiums: the probability that a worker becomes unemployed and the probability that a worker's earnings experience a severe drop upon job separation. We find that, following a 10% exogenous increase in premiums, the unemployment probability increases by 1–2-percentage-points for low-income workers, while it declines by nearly 1 percentage point for high-income workers. Similar patterns emerge for the probability of severe earnings decline (in the bottom 20 percentile of the year) upon job separation: A 10% exogenous increase in premiums leads to a 2-percentage-points increase in such probability for low-income workers, but a small decline for high-income workers, around 0.3 percentage points.

There are two takeaways from these findings. First, our separation results are unlikely

driven by low-income workers quitting for more desirable jobs. Moreover, increases in health insurance premiums have negative effects on the career outcomes of low-income workers, but can be beneficial for high-income workers. When facing a similar increase in labor costs for high- and low-income workers, firms seem to adjust their internal labor composition, relying more heavily on high-income, high-skill workers.

A natural question is how workers' earnings change following an increase in health insurance premiums. Unfortunately, we are unable to fully answer this question since we only observe the net amount of workers' gross earnings minus their own pre-tax deductions (including health insurance and retirement plan contributions if they participate). We examine workers' wage growth rate in our instrumental variable setting and find that health insurance premiums have a negative average effect on the affected low-income workers' wage growth, including in the retained sample.

Another natural question is whether firms pass the increase in health insurance costs to workers through higher worker contribution towards health insurance. Unfortunately, we do not observe either workers' individual contributions or firm-level total/average. We find that the average participation rate (the number of plan participants as a ratio to the number of employees) drops significantly with our instrumented premiums. This could be a result of increased employee contributions to health plans.[6]

Taking stock, our findings are consistent with two (not mutually exclusive) mechanisms. First, higher premiums charged by insurers increase employer contributions, which incentivize firms to lay off workers and/or cut hours for a subset of workers to make them ineligible for employers' health plans. Second, firms may elect to pass on part or all of the increased cost to workers, by reducing eligibility and/or pushing up employee contributions. This reduces workers' effective earnings and leads them to seek outside options. Regardless of the interpretation, low-income workers seem "worse off" as they are more likely to fall into unemployment, suffer large declines in earnings upon job separation, and have lower earnings growth even when retained.

[6]It is worthwhile to discuss other reasons for the declining participation rates. First, firms can make some workers ineligible by converting them to part-time workers. This channel is unlikely to drive our findings as we find that the part-time worker ratio at the firm-year level does not change with health insurance premiums. Second, firms can stop offering health insurance to spouses. Third, firms can stop offering health insurance to some workers. While plausible, this channel is unlikely to explain the magnitude of our findings as ACA mandates that firms with at least 50 full-time employees offer health insurance plans to at least 95% of those workers.

From the firm's perspective, lower worker plan participation likely brings long-run effects. The fact that, even absent formal mandates, firms contribute to workers' health insurance implies that they place some value on worker plan participation.[7] Such value may come from workers' higher attachment to firms. When workers stop participating following a rise in premiums, they may be less productive (partly because they are more likely to leave, causing the firm to incur the cost of replacing them in the future). Findings by Madrian (1994), Garthwaite et al. (2014), and Ouimet and Tate (2022) suggest that employer-sponsored health insurance induces stronger attachment of workers to their jobs, i.e., the "job lock" effect (see the review in Gruber 2000 and Gruber and Madrian 2002, and theoretical arguments in Dey and Flinn 2005). Therefore, the marginal benefit of each worker for the firm declines, moving the firm's demand curve to the left. We thus cannot directly infer a labor demand elasticity from our estimates, because shocks to premiums likely induce shifts in both firm labor demand and labor supply curves.

Our study contributes to the growing literature on the effect of health insurance costs on employment outcomes. Prior and concurrent studies exploit different sources of variation in health insurance costs using a variety of datasets and arrive at mixed conclusions. Gruber (1994) finds that when states stipulated that childbirth be covered comprehensively in health insurance plans, female workers' wages declined without an effect on employment. Cutler and Madrian (1998) find that the rising cost of health insurance is associated with increasing work hours. Using similar data over a different sample period, Baicker and Chandra (2006) document that higher insurance premiums reduce the probability that a worker is employed full-time and the hours worked. Buchmueller et al. (2011) find that employer health insurance mandate in Hawaii had no effect on workers' employment probabilities. Several other papers study the effect of the Affordable Care Act (ACA), which mandated many employers to offer health insurance plans to employees. Almeida et al. (2021) finds that public firms do not change employment, but cut the number of covered workers. Mulligan (2020) argues that firms cut jobs to stay under 50 employees to avoid triggering the employer mandate. Dillender et al. (2022) find that part-time employment increases.

[7] Note that both employers' and employees' contributions to health insurance are income- and payroll-tax deductible when employers offer Section 125 plans so there are no tax savings through employers' contributions. Section 125 plans are likely prevalent among the firms in our sample (with more than 100 plan participants), given that 92% of firms with 200 or more employees signed up for such plans as of 2012. See https://www.kff.org/report-section/tax-subsidies-for-private-health-insurance-i-federal-and-state-tax-exclusions-for-esi/.

Particularly related to us, Brot-Goldberg et al. (2024) use county-level hospital mergers as shocks to healthcare costs to study a host of county-level outcomes. Consistent with our paper, they also find a negative effect on employment, especially for low- and mid-income workers. Contemporaneous work by Ouimet and Tate (2022) uses variation in health insurance costs come from the competitive pressure from other employers in the same MSA and industry in providing high-quality plans. They find a negative effect of health insurance costs on entry relative to the exit rate for low-income workers.

Our study differs from the other papers in important ways. First, we document heterogeneous impacts of workers across the income distribution, which is overlooked in other papers except concurrent papers by Ouimet and Tate (2022) and Brot-Goldberg et al. (2024). Second, prior papers in this literature use aggregate shocks that often can confound with other macro or regional shocks, as well as affect many employers and employees' outside options for obtaining health insurance. For example, the ACA affects a large number of employers in complex ways and also affects individuals' ability to obtain health insurance independent of employers. Our paper takes advantage of idiosyncratic and exogenous shocks that generate variation within markets. This strategy allows us to better tease out the exact mechanism, identify the causal effect of health insurance costs without the influence of other factors (e.g., goods prices that increase as a result of aggregate health insurance cost increases). Third, the variation in health insurance costs in the other papers can be combined with a higher valuation of health insurance by workers either due to better plan quality (e.g., Ouimet and Tate 2022 and Gruber and Krueger 1991) or higher healthcare costs (e.g., Brot-Goldberg et al. 2024). In our setting, we argue that the variation we exploit is uncorrelated with workers' valuation of the insurance. Thus, we can isolate the effect of higher costs from employees' higher valuation of insurance plans.

We are also related to Finkelstein et al. (2023), who calibrate a theoretical model about how the employer-sponsored health insurance regime and the rise in health insurance premiums contribute to lower equilibrium wages and employment for low-skilled workers. We empirically examine how the premiums of employer-sponsored health insurance premiums on the employment outcomes of workers across the skill spectrum. This paper is also related to the broader literature on non-wage benefits, including seminal theoretical work by Summers (1989) and recent work by Clemens et al. (2018), Liu et al. (2023) and Simintzi et al. (2023).

Third, our novel finding that insurers raise premiums following losses, including losses in-

curred in other states, contribute to the literature on health insurance pricing, which mostly focused on consumer behavior and the market structure of the industry (e.g., insurer competition, market segmentation, bargaining between insurers, employer, and healthcare providers, as well as search frictions).[8] Our instrument, particularly the one using insurer losses from other states, also highlights the role of insurers in transmitting shocks across geographical regions and firms. We thus complement existing work showing how insurers propagate shocks in the economy (e.g., Ellul et al. 2011, Koijen and Yogo 2015, and Bhardwaj et al. 2022 ).

Fourth, our paper contributes to the literature on how the cost of labor affects employment outcomes. Relative to the literature that largely uses regional or macro shocks (e.g., minimum wage or payroll tax changes), this paper uses a unique *idiosyncratic* shock that affects the cost of labor. To the best of our knowledge, ours is the the only one that studies the effect of an idiosyncratic exogenous shock to labor costs. Intuitively, idiosyncratic shocks can have very different effects as a systemic shock. For example, when minimum wages increase, all the employers and workers' outside options are affected; firms may also raise output prices. This may explain why seminal papers by Katz and Krueger (1992), Card and Krueger (1994), landmark meta-analyses by Card and Krueger (1995), as well as recent papers such as Engbom and Moser (2022) and Harasztosi and Lindner (2019) argue that the effect of minimum wages on employment is small.[9] We are also related to papers using other *systemic* shocks to labor costs such as payroll tax (Kramarz and Philippon 2001 and Saez et al. 2019) and employment subsidies (Katz 1996).

Finally, we add to the literature on the persistent decline in labor share as well as the demand for low- and middle-skill workers (Autor and Dorn 2013). Prior literature focuses on the impact of import competition (Autor et al. 2013, Lu and Ng 2013, Pierce and Schott 2016), technological advancement (Doms et al. 1997, Acemoglu and Restrepo 2019, Acemoglu and Restrepo 2020), and tax policies (Tuzel and Zhang 2021 and Smith et al. 2022). We add to this line of research by focusing on a less explored, yet important part of labor input cost, namely health insurance premiums. Our study highlights its heterogeneous effect on workers across

[8]See, e.g., Town and Liu (2003), Frank and Lamiraud (2009), Dafny (2010), Dafny et al. (2012), Avraham et al. (2012), Starc (2014), Ericson and Starc (2015), Dafny et al. (2015), Trish and Herring (2015), Ho et al. (2017), Ho and Lee (2017), Dafny (2019), Dickstein et al. (2024), and Tebaldi (2024).

[9]The literature estimates a wide range of effect of minimum wages on employment, from negative to positive, see survey by and Flinn (2011), as well as recent work by Harasztosi and Lindner (2019), Karabarbounis et al. (2022), Dustmann et al. (2022), and Azar et al. (2024) and so on.

income levels, potentially shedding light on another source of deteriorating labor demand for low-wage workers. Relatedly, we also contribute to the literature trying to explain the widening the wage gap between the skilled and un-skilled workers, which has focused on technological development, institutional changes (e.g. labor unions and minimum wages), globalization, and worker-firm sorting.[10] Our results imply that rising health insurance costs could be another force behind the rising wage inequality.

# 2 Identification Strategy: Instrument for Premiums

## 2.1 Instrumenting Premiums with Insurer Losses

We estimate the causal effects of health insurance premiums on employer and employee outcomes by instrumenting premiums with losses (approximately claims scaled by premiums) at the insurance company level, while controlling for state-by-industry fixed effects to partial out factors at this level that affect both the left- and right-hand sides. In robustness tests, we also use insurers' losses incurred in states outside of the focal firm's state. We expect that larger losses should lead insurers to charge higher premiums, which in turn influence firms and workers.

There are several reasons why larger losses can lead insurers to charge higher premiums.[11] First, past losses generate greater pressure for firms to increase short-term profits, even if such actions can hurt long-term profits due to various reasons such as a gradually shrinking customer base as a result of the higher prices. Losses can tighten financial constraints, making liquidity especially valuable for insurers' current operations. If the elasticity of short-term demand for insurance to premiums is low, increasing premiums can increase liquidity in the short term. This intuition builds upon findings in the prior literature, suggesting that tightened financial constraints motivate firms to increase prices (Chevalier 1995, Chevalier and Scharfstein 1996, and Gilchrist et al. 2017). Similar effects are documented by studies focusing specifically on the insurance industry (Froot and O'Connell 1999, Koijen and Yogo 2022, and Ge 2022).[12]

[10] See, for example, Katz and Murphy (1992), Goldin and Katz (2009), Acemoglu and Autor (2011), and Autor et al. (2020), Card et al. (2004), Farber et al. (2021), and Lee (1999), Feenstra and Hanson (2003), Goldschmidt and Schmieder (2017), Abowd et al. (1999), Mueller et al. (2017), and Song et al. (2019).

[11] Note that health insurers do not face regulatory restrictions in their pricing in the large group market, in which our sample firms fall.

[12] How firms should change product prices to increase short-term profits will depend on the demand

Additionally, this response could arise from managerial incentives to manage short-run earnings (Stein 1989 and Edmans et al. 2017).

Second, insurers may update their perception about the "correct" pricing after witnessing past losses. In other words, losses could lead insurers to expect higher costs in the future and raise premiums accordingly. Note that because we use an insurer's loss ratio of their *entire* operating portfolio, comprised of the insurer's many customers in many different locations and industries, it is unlikely that a specific employer's claims or healthcare environment drive our instrument. We also use multiple methods to alleviate related endogeneity concerns. For example, as an alternative instrument, we construct insurers' losses in states other than the focal employer's state.

Third, the ACA mandates that insurers spend at least 85% of premiums on claims in every three consecutive years in a state in the large group (employer) market or rebate customers. In other words, insurers' pricing is capped at a level in proportion to recent losses. Some insurers may be constrained by this restriction due to low claim payouts in the past two years and cannot reach their optimal pricing. Higher recent losses can thus allow these insurers to raise prices closer to the optimal levels, while still being compliant with the 85%-rule.

The validity of our instrument relies on it satisfying the exclusion restriction, i.e., insurer losses should not be correlated with the employment outcomes of employers and their workers through channels other than changes in health insurance premiums. The insurers in our sample are large, often national conglomerates that insure a large number employers and individuals. Losses incurred by these insurers reflect the gap between the average premium charged and the claims filed by insured individuals across numerous geographical locations. They are unlikely to be determined by the conditions of the focal firm. With time (or state-by-time) fixed effects, we essentially remove the time-series variation in aggregate losses and focus on the idiosyncratic component. This addresses the concern that insurers' losses could reflect macroeconomic (or regional) conditions or macro (or regional) trends in healthcare costs. We provide additional evidence to substantiate the exclusion restriction in Section 7. For example, we show that insurer losses are not associated with higher future claims, but are positively associated with higher future markups (proxied by premiums divided by claims).

elasticity. In addition, as Ge (2022) argues, for long-term products, such as those sold by life insurance companies, whether selling the product increases or decreases insurers' short-term liquidity and capital also matters for how firms change product prices.

Moreover, our results hold when premiums are instrumented by insurers' losses from states outside of focal firms' locations. This alternative instrument is unlikely to be correlated with the firm and workers' outcomes through channels other than health insurance premiums. Using these out-of-the-state losses as instruments, our results stay similar. This further supports the exclusion restriction. This also suggests that the third explanation above is unlikely the only driving force.

## 2.2 Insurers' Pricing Power

The mechanisms for our first stage described in Section 2.1 depend on the assumption that insurers often possess market power and can raise prices without losing a large number of customers. In this section, we provide arguments and evidence suggesting that insurers in our data have substantial pricing power.

First, switching insurers is difficult for the firm and costly for its workers. Due to the complexity of health insurance plans, the market for employer-sponsored plans presents significant search friction and is intermediated by brokers. Moreover, changing insurance plans is costly for employees, as they may lose valuable relationships with existing healthcare providers due to changes in coverage networks. In addition to searching for new providers, plan participants also have to spend time learning the often complex rules of the new health insurance plan.

Due to these reasons, employers are likely to have relatively inelastic demand towards their current insurers, allowing insurers to gain substantial pricing power in this market (see Dafny 2010 and Dafny et al. 2012 for related evidence). Consistent with our argument that employer-insurer relationships are sticky, we find that firm-insurer relationships are relatively persistent in our data: 9.8% of firms switch in a given year. The sticky employer-insurer relation helps support the idea that it is difficult for firms to seek lower-price options when their insurers face losses. As we discuss in Section 7, we find that firms do not become more likely to switch insurers after their insurers suffer larger losses.

Moreover, we note that the switching argument is likely to lead to a weak first-stage result. We instrument for current premiums using losses incurred by the firm's prior (rather than current) insurer. Suppose firms can switch to other insurers to avoid paying higher premiums due to prior insurers' losses. This type of switching should prevent us from finding a strong relationship between premiums and prior insurers' losses at the first stage. However, as we dis-

cuss below, our first stage is sufficiently strong, indicating that firms are not able to completely offset the effect of insurers' losses on premiums.

# 3 Data

## 3.1 Employers' Health Insurance Data

We obtain information on employer-sponsored health insurance plans from the Annual Reports of Employee Benefit Plan required by the Department of Labor. The data come from the "Insurance Information" section of Schedule A of Form 5500. All employer-sponsored plans with more than 100 participants need to file Form 5500. Part III of Schedule A reports the premium and number of participants associated with various types of contracts. We classify the following types as health plans: health (other than dental or vision), HMO (health maintenance organization) contract, PPO (preferred provider organization) contract, and stop-loss contract. Form 5500 provides rich information regarding the employer, including its name, employer identification number (EIN), location, and phone number. More importantly, the data include the total premium paid, the number of participants, and the insurer for each plan-year observation. We exclude firms that are self-insured or have a unionized workforce (i.e., firms that report any collective-bargaining welfare plans).

We define premiums per participant as the ratio of total premiums divided by the number of participants for a given plan-year observation. Both the premiums and the number of participants include those of covered family members of employees. When an employer reports health insurance contracts with multiple insurers, the premium per participant is the sum of all the premiums divided by the sum of the number of participants across all the insurers. Our main explanatory variable, which we instrument for, is the natural log of premiums per participant.

One caveat is that plan premiums reported on Form 5500 include premiums paid by employers as well as those paid by employees. Premiums paid by employers account for around 73% of total premium payments for family plans according to a 2021 Kaiser Family Foundation Survey.[13] This portion reflects a direct labor cost faced by firms and can drive the employment effect. However, we note that the premium paid by employees is still relevant. Suppose employees need to contribute more to health insurance plans when insurers charge higher premiums.

[13] See, https://www.kff.org/health-costs/report/2021-employer-health-benefits-survey/.

Workers now receive lower net compensation after deducting such benefit payments from their salaries. Given our state-by-year or state-by-industry-by-year fixed effects, the shocks we exploit are idiosyncratic and not affecting workers' outside options. Thus, we expect premium shocks to affect firm employment by decreasing employees' take-home pay or increasing employers' labor costs.

## 3.2 Construction of Instrumental Variable

Insurers' financial data come from the Centers for Medicare & Medicaid Services (CMS). Under the Affordable Care Act, health insurers need to report the different components of their underwriting performance to the CMS by state and market. A market can be "individual", "small group", or "large group", where "group" is mostly synonymous with "employer." Most states classify plans with at least 51 participants as large groups, while some states use 101 as the cutoff. Because only plans with at least 100 participants need to file Form 5500, the majority of the plans in our sample belong to the large group market. In computing insurers' losses, we use claims and premiums in their large group market because, within an insurer, the pricing choices of large group customers (employers) are likely to be more connected with gains and losses in the "large group" market than with other markets, because there is often a separate department managing "large group" markets versus other markets within an insurer.

The ACA regulates insurers' medical loss ratio, requiring insurers to reach a minimum loss ratio of 0.85 based on the performance of three consecutive years. Otherwise, insurers need to send rebates to customers. The numerator for the ratio calculation is claims plus allowable expenses and other adjustments over three years. The denominator is premiums plus adjustment over three years.

Many insurers operate as regional subsidiaries of insurance conglomerates. We compute the medical loss ratio at the conglomerate level using insurers' National Association of Insurance Commissioners (NAIC) group codes reported in the CMS data. Specifically, we sum up the aforementioned numerators (denominators) across all individual divisions within a conglomerate. The aggregation at the conglomerate level is motivated by two reasons. First, with the active internal capital market within insurer groups (see Ge 2022 and Oh et al. 2022), losses from other divisions could spillover and influence the financial constraints of the focal division. Moreover, other divisions' performance can change insurers' expectations about future claims.

Insurers may expect future claims to be higher if recent losses are high in other divisions.

Because of the ACA 0.85 rule, we impose a floor value of 0.85 on the loss ratio computed at the conglomerate level.[14] If an employer contracts with multiple insurers in year $t-1$, we take the premium-weighted average of all these insurers' medical loss ratios, using the premiums between the focal employer and each of the insurers in $t-1$ as the weights.

Formally, our measure of insurer losses for firm $i$ in year $t$ is defined as:

$$Insurer\ Loss_{i,t-3\ to\ t-1} = \sum_{j\in 1}^{N_i} w_{i,j,t-1} max\{LossRatio_{j,t-3,t-1}, 0.85\} \tag{1}$$

where $LossRatio_{j,t-3,t-1}$ is the loss ratio of insurer $j$ originating from its large group market aggregated across all divisions over the past three years. $N_i$ is the total number of insurers that work with firm $i$. $w_{i,j,t-1}$ is the insurer $j$'s share of employer $i$'s premiums in year $t-1$.

## 3.3 Worker Data from the U.S. Census and IRS

We obtain micro-level employer-employee matched data from the SOI Individual Tax Returns (W2) data provided by the Internal Revenue Service (IRS). This database provides information on the job affiliation (identified by EIN) and annual wage income for all U.S. taxpayers from 2005 onward. We exclude workers who are younger than 18 or older than 70.

Our analysis relies primarily on two samples. The first sample is a firm-year panel, where we track the changes in a firm's total employment around shocks to health insurance premiums. The key variable of interest is *Log(Employees)*, the log of the total number of workers employed by a firm in a year. When calculating employment at the firm level in year $t$, we exclude employees whose annual wages are less than minimum wages at 20 hours per week for 52 weeks, as these workers may be separated within year $t$.[15]

We exclude firms whose number of participants is less than 50% of their number of employees. This helps us focus on firms for whom health insurance is a meaningful portion of labor costs. We link the employers of taxpayers in the W2 data to their insurance plan information from

[14] This procedure is slightly different from ACA regulation, which requires that individual insurers' medical loss ratio at the state level to be at least 0.85 in the large group market. However, this should work against us from finding a strong first-stage result.

[15] One caveat is that these workers could be part-time. Another caveat is that we potentially include in the employment count workers who are separated during year $t$ but earn more than minimum wages at 20 hours per week.

F5500 based on the employer identification number (EIN). Some noises may arise from this mapping. For example, a parent company can shift the reporting of workers and/or health insurance plan participants from one EIN to another over time. To correct for potential data biases, we compute each EIN's year-on-year growth rate in the total number of workers, as well as the growth rate in the number of plan participants, and exclude EINs where the two differ by over 30 percentage points. We also present robustness tests where we aggregate employment, premiums, and the instrument across all the EINs at the parent company level, where we match EINs to the parent company using the LBD database and a matching algorithm based on phone number, address, company name, and EIN.

Our second sample is an individual-year panel, tracking workers' employment outcomes over time also based on W2 data. In this sample, we examine the differential impact of insurance premiums on high- and low-income workers, based on workers' average earnings in the past five years, excluding the years when they do not have earnings.

We define four individual-level outcome variables of interest. First, we define *1(Separated)*, an indicator that equals one if a worker stops reporting wage income that exceeds minimum wage at 20 hours a week for 52 weeks from theri $t-1$ employer. To further gauge worker outcomes upon job separation, we examine unemployment rates. Specifically, *1(Unemployed)* is an indicator that turns to one if a worker earns less than minimum wage at 20 hours a week and do not file any 1099 with the IRS (which are filed by contractors and ad hoc service workers). Other than unemployment, we define *1(Separation&Wage Drop)* to describe undesirable job separations. This variable equals one if a worker leaves their $t-1$ employer in year $t$ and if their earnings in year $t$ relative to the prior five-year average is in the bottom quintile of year $t$, and zero otherwise. *Wage Growth* is the the log difference between workers' wage in year $t$ and her prior 5-year average (excluding zeros).

## 3.4 Summary Statistics

Table 1 presents the summary statistics for our key variables of interest, including premium per participant, firm and worker employment, and technology investment variables. In the firm-year sample, the average and median values of the insurer loss ratio are both 0.89. On average, firms in our sample employ 270 workers. Health insurance premiums are on average \$6,763 per individual participant. In the individual-level panel, workers have an average probability of 81%

of continuing working for the same employer as the previous year and 3% of being unemployed. They also have an average 5-year nominal wage growth rate of around 20%.

TABLE 1 ABOUT HERE

# 4 Empirical Specification

We rely on an instrumental-variable approach to estimate the effect of health insurance costs on firm and worker outcomes. The instrument for insurance premiums in year $t$ is the medical loss ratio of a firm's insurer during the previous year, $t-1$, which is the portion of premiums being spent on medical claims, aggregated from year $t-3$ to year $t-1$, bounded below at 0.85 due to the aforementioned ACA rule that insurers must spend 85% of the premiums on medical claims or rebate customers.

Using the firm-level sample, we estimate the following regressions in a two-stage-least-square framework:

$$Premium_{f,t} = \beta Insurer\ Loss_{f,t-3\ to\ t-1} + \alpha_f + \tau_t + \epsilon_{f,t} \tag{2}$$

$$Y_{f,t} = \gamma \widehat{Premium}_{f,t} + \lambda_f + \kappa_t + \nu_{f,t}, \tag{3}$$

where $f$ represents a firm, $t$ represents a year, and $Premium_{f,t}$ stands for the log of premium per participant paid by firm $f$ during year $t$. Note that a firm's premiums in year $t$ is almost always determined before the start of year $t$. $Insurer\ Loss_{f,t}$ is the weighted average of medical loss ratio across all firm $f$'s insurers over the previous three years, as defined in Section 3.2. $Y_{f,t}$ represents various firm-level outcomes, including the log of employees and log of plan participants. The analysis includes firm and year fixed effects, and further layers on industry-by-year, state-by-year, and industry-by-state-by-year fixed effects to better control for local- and industry-level conditions. Standard errors are clustered by firm.

For the individual-level panel analysis, we focus on the heterogeneous effect of insurance costs on high- and low-wage workers. We expect that the same percentage increase in health insurance premiums likely reduces firms' demand for workers with lower earnings levels relative to their more highly remunerated coworkers. We test this hypothesis in two ways. First, we estimate a two-stage-least-square regression for the interactive effects of worker income terciles

and health insurance premiums:

$$Premium_{f,t} \times Tercile^{j}_{i,t} = \sum_{k=1}^{3}(\beta^{j,k} Insurer\ Loss_{f,t-3\ to\ t-1} \times Tercile^{k}_{i,t} + \delta^{j,k} Tercile^{k}_{i,t}) + \alpha^{j}_{f} + \zeta^{j}_{i} + \tau^{j}_{s,m,t} + \epsilon^{j}_{i,f,t} \quad (4)$$

$$Y_{i,f,t} = \sum_{j=1}^{3}(\gamma^{j} \widehat{Premium_{f,t} \times Tercile^{j}_{i,t}} + \delta^{j} Tercile^{j}_{i,t}) + \lambda_{f} + \eta_{i} + \kappa_{s,m,t} + \nu_{i,f,t}, \quad (5)$$

where $i$ represents an individual, $f$ a firm, $t$ a year, $s$ a state, and $m$ an industry. $Tercile^{k}_{i,t}$ $(k = 1, 2, 3)$ and $Tercile^{j}_{i,t}$ $(j = 1, 2, 3)$ both represent a set of three indicators that equal one if worker $i$'s past average earnings fall into the $k^{th}$ $(j^{th})$ tercile in year $t$. Equation 4 represents a set of three first-stage regressions.

The second stage outcome $Y_{i,f,t}$ represents individual employment outcomes as defined in Section 3.3: (1) *Separated*, the dummy variable for whether person $i$ is not employed in firm $f$ during year $t$ or $t+1$; (2) *Unemployed*, the indicator for whether person $j$ becomes unemployed; (3) *Separation&Wage Drop*, an indicator that turns to one when upon job separation, worker $i$'s earnings relative to her past five-year average drop to the bottom quintile of the sample distribution; (4) *Wage Growth*, the log difference of a worker's wage relative to her past five-year average.

Our initial specification controls for individual $(\zeta_i)$, firm $(\alpha_f)$, and state-by-industry-by-year interactive $(\tau_{s,m,t})$ fixed effects. These fixed effects help remove the confounding effects of cross-people heterogeneity, cross-firm differences, and local business or labor market conditions. For example, individual fixed effects address concerns related to worker-firm sorting: e.g., low-skilled workers with a lower or higher tendency to switch jobs or become unemployed are more likely to be matched to firms whose insurance premiums increase. The coefficient of interest is $\{\gamma_j\}$ $(j = 1, 2, 3)$, which captures the effect of health insurance premiums on the employment outcomes of workers whose income falls in the $j^{th}$ tercile. Our most stringent specification includes firm-by-year interactive fixed effects to remove all confounding employer-year-level conditions. Standard errors are clustered by firm.

In addition, we also directly compare the effects on low-income and high-income workers working in the same firm at the same time via a within-firm analysis by replacing the state-by-

industry-by-year fixed effects with firm-by-year fixed effects, as well as omitting the interaction terms involving the highest income tercile indicator in both stages. The estimated coefficients on the interaction between premium and the lowest (middle) terciles present the diffence of the premium effect between workers in the lowest (middle) tercile and those in the highest tercile.

# 5 Health Insurance Premium and Firm-Level Employment

We examine the effect of health insurance premiums on firm-level employment using the two-stage-least-square approach. To start, we present results from the first stage (Equation 2) in Panel A of Table 2. The dependent variable is the natural logarithm of premium per plan participant ($Log(Premium\ per\ Person)_t$) and the independent variable is insurers' loss ratio over the past three years ($InsurerLoss_{t-3\ to\ t-1}$). In column (1), we test our main specification, controlling for firm fixed effects and year fixed effects. We then add more stringent fixed effects. In column (2), we add state-by-year fixed effects, in column (3), we include industry-by-year fixed effects, and in column (4), state-by-industry-by-year fixed effects. These fixed effect structures remove confounding effects arising from local or industry-level dynamics and allow us to only compare firms whose insurers face idiosyncratic shocks to their peers in the same state or/and industry. Across these specifications, coefficients on $Insurer\ Loss_{i,t-3\ to\ t-1}$ are statistically significant and generate stable economic magnitudes. A one-standard-deviation increase in insurer losses (0.022) is associated with 1.5% to 2% increase in premium per person, depending on the specification.

Table 2 About Here

Results from the second stage are presented in Panel B. Our main dependent variable is the log number of employees in a firm ($Log(Employees)_t$). The fixed effect specifications in columns (1) through (4) follow those of Panel A. We find that the predicted increase in insurance premiums is associated with a substantial decline in employee counts. The estimate in column (1) suggests that a 10% increase in premium per person leads to a 3% reduction in employees.

We next examine whether the decline in employment is driven by a reduction in the number of retained workers or newly hired ones. We investigate these two mechanisms in columns (5)

and (6), respectively. Results suggest that higher health insurance premiums are associated with a significant reduction in the number of retained workers, and the effect has a similar magnitude as the drop in employment. In contrast, there is no statistically significant link between predicted changes in health insurance premiums and the number of new hires.

# 6 Health Insurance Premium and Worker-Level Outcome

## 6.1 Worker-Level Job Separation

Results in Table 2 indicate that increases in health insurance costs lead to a reduction in the number of existing workers at the firm-year level. We now focus on the differential effects of insurance premiums on existing workers' separation probability across income levels. We switch to the individual-year panel discussed in Section 3.3 and estimate Equations 4 and 5. We are interested in the coefficients on the interaction between insurance premiums and worker income levels, measured by the past 5-year average earning or its tercile rankings. We hypothesize that low-wage workers are more likely to be separated from firms because the same increase in premiums will raise the relative cost of employing low-income workers to high-income workers.

Table 3 reports the second-stage results. Our dependent variable is an indicator for whether a worker is separated from his or her $t-1$ employer, i.e., *1(Separated)*. In Panel A, we examine the effects of premium shocks on the separation probability of workers in different terciles based on past 5-year average earnings. Columns (1) and (2) report the results for worker separation probability in year $t$, immediately following the premium increase (determined at the end of year $t-1$), and columns (3) and (4) report the results for the separation probability of the following year (i.e., year $t+1$).

Table 3 About Here

Results from Panel A suggest that, when employers face higher health insurance premiums, low-income workers face a large, significant increase in separation probability, while high-income workers experience an reduction in separation probability. To interpret it directly, a 10% increase in premiums leads to a 3-percentage-point increase in the separation probabil-

ity of low-income workers, but a 1-percentage-point decrease in those of high-income workers. Workers with medium level of incomes experience a smaller increase in separation probability, around 1–2 percentage points. When we impose firm-by-year interactive fixed effects, the coefficients on *Log(Premium per Person)×Low Income* indicate the differential effects of premium shocks on low-income relative to high-income workers. The coefficients are similar to the difference between the coefficients of *Log(Premium per Person)×Low Income* and *Log(Premium per Person)×High Income* without firm-by-year fixed effects. Results in columns (3) and (4) further indicate that this differential separation effect persists in the following year.

Overall, our evidence suggests that health insurance premiums increase the separation probability of low-income workers, but not for high-income workers. This is consistent with our argument that health insurance imposes a fixed cost on eligible workers, which makes up a larger share of firms' costs of hiring low-wage workers.

One natural question is whether such results are driven by low-wage workers quickly landing other, potentially more desirable jobs, which will offset any negative effect of increased health insurance costs on these workers. To further shed light on this question, we look into other worker career outcomes, such as unemployment and large wage drops.[16]

## 6.2 Worker-Level Unemployment

In this section, we examine the differential effects of premium changes on the probability of unemployment after job separation between high-income and low-income workers. To do so, we regress the indicator variable *1(Unemployed)* on the interaction between insurance premiums and worker past income, both tercile indicators and continuous measures. To take into account the fact that workers may transition to a contractor position, we set *1(Unemployed)* to be zero if the worker files a Form 1099.[17]

Table 4 presents the results from this analysis. The specifications strictly follow the ones in Table 3. Wereport the second-stage of the instrumental variable results on the interaction between health premiums and income tercile indicators.

Table 4 About Here

[16]However, it is possible that workers voluntarily become unemployed or opt for a lower-paying job to qualify for Medicaid. Since this is not the workers' initial choice, it is arguably less optimal for workers compared to the world before the insurance premium increases. Thus, we argue that insurance premium increases have an adverse effect on low-income workers.

[17]We do not observe the details including earnings reported on Form 1099.

Results in Panel A indicate that after a rise in health insurance premiums, low-income workers are significantly more likely to become unemployed, while high-income workers become less likely to do so. Estimates from column (1) suggest that a 10% increase in premiums leads to a 1-percentage-point increase in the unemployment probability for low-wage workers, while a 0.7-percentage-point *decline* in the unemployment probability of high-income workers. The difference is around 1.8 percentage points, which is confirmed in the within-firm analysis in column (2). Results in columns (3) and (4) further suggest that this differential unemployment effect persists in the following year.

## 6.3 Worker-Level Large Wage Declines Upon Separation

We continue to explore the consequences of health premium shocks on worker career outcomes. Here, we focus on the probability that workers experience a large decline in wages upon job separation. Specifically, we define an indicator variable *1(Separation&Wage Drop)* that turns to one if a worker is separated from their previous employer and also experiences a wage growth in the bottom quintile across all worker observations, which corresponds to a negative growth rate, i.e., a wage decline. Such a decline in wages generally suggests undesirable and involuntary employment outcomes, i.e., either the worker does not find a full-time job, or the worker has to settle for a lower-paying job.

Results are shown in Table 5. In Panel A, we find that a 10% increase in health insurance premiums is associated with 2 percentage points greater probability of low-income workers experiencing severe wage drop after separation, and such an effect persists in the following year. This effect flips the sign to a negative 0.3 percentage point for high-income workers, indicating that such workers become less likely to experience a large earnings drop upon separation with their previous employer.

Table 5 About Here

Taken together, findings in Table 4 and Table 5 indicate that the earlier result regarding the effects of health premiums on low-wage workers' separation probability is unlikely explained by low-income workers' voluntarily changing jobs more compared to high-wage workers.

## 6.4 Worker-Level Wage Growth for All and Retained Workers

In the last step of the individual-level analysis, we investigate whether changes to health insurance premiums affect worker wage growth. As we will discuss more in the Section 9, the fact that firms have discretion over the size of employee contributions implies that changes in health insurance costs could shift both labor supply and demand curves. As a result, we do not have a clear prediction on how wages should change. One more complication is that the object of interest is workers' wages (before health insurance deduction) plus firms' contribution towards workers' health insurance, which we do not observe. We only observe the earnings from Form W2, Box 1, i.e., earnings after workers' own health insurance deduction. A third issue is that as we argued earlier, firms can shift full-time workers to part-time status differentially for high- versus low-wage workers, which also complicates the interpretation of any effect on worker wages.

Nevertheless, we examine the effect of health insurance costs on workers' wage growth. We compute each worker's wage growth rate by comparing the difference between log of her wages in year $t$ to log of her average wages from $t-4$ to $t-1$. We repeat the specifications as in the previous worker-level regressions, replying on the IV approach.

Table 6 reports second-stage results from the wage analysis. In Columns (1) and (2), we use all workers matched to an employer in our sample in $t-1$. In Columns (3) and (4), we use workers that are retained in year $t$ by their $t-1$ employers. The estimates indicate that among both all and retained workers, low-income workers experience a large decline in wage growth rate. The effects on the other two groups of workers are not statistically significant from zero. In Column (1), the coefficient on the interaction term between premium and the indicator for low-income workers indicates that when premiums increase by 1%, low-income workers' wage as a ratio to their past average decrease by -0.26%. Column (3) suggests that this number is -0.18%.

The results on retained workers are consistent with several ideas. First, since the wages we observe are earnings after workers' own health insurance deduction, it could be the case that employers pass some of the increase in premiums onto low-income workers, by increasing workers' contribution amounts or lowering their wages. Second, it could also be that low-income workers are more likely to be converted to part-time so that they can be ineligible for health insurance. As a result, their total earnings decline. The effect on low-income workers' wage growth is more negative among all than retained workers. This is consistent with our earlier

findings that low-income workers also experience a larger increase in separation, unemployment, and a large wage drop upon separation.

TABLE 6 ABOUT HERE

# 7 Addressing Concerns Related to the IV

In this section, we discuss various concerns related to our instrumental variable approach. We also test its sensitivity to alternative empirical choices.

We first use an alternative instrument to address several concerns. We constructing losses using only premiums and claims that originated from areas outside of the focal employer's state. *Insurer Loss (Other States)* thus captures insurers' incentives to change premiums induced by losses unrelated to the focal firms' operations. This alternative instrument addresses several concerns. The first concern regarding our earlier results is that when the employer is large and accounts for a meaningful fraction of the insurer's revenue, some unobservables about the employer can drive both the insurer's losses and its employment outcome. The second concern this alternative instrument addresses is that insurers' losses are correlated with firms' and workers' outcomes endogenously. For example, if (low-income) workers in certain locations are getting sicker, causing both their adverse labor market outcomes and higher insurer losses (if insurers are heavily exposed to these locations).

Panel A of Table 7 first presents results using this alternative instrument at the firm-year level. Column (1) presents the first-stage result. The instrument is positively and statistically significantly related to the premium per worker faced by firms. Column (2) presents the second-stage result with firms' log of employees as the outcome variable. The coefficient on the instrumented premium is negative and statistically significantly different from zero.

Panel B of Table 7 repeats Columns (1) and (2) in Table 3 and Table 4 using insurers' losses incurred in other states as the instrument. The results are similar to those using our main instrument. Again, low-income workers see a larger increase in their job separation and unemployment probability.

Could our results be driven by declines in worker health? Firms with declining worker health may struggle to keep their workers or are more likely to lay off workers. These firms may also face increasing health insurance premiums because insurers witnessed past losses related

to these firms and anticipate a deterioration of worker health in the future.

We directly evaluate this argument by testing the correlation between future claims per person at the employer-year level and insurer losses. Note that only a subset of employer-year observations report claims data in Form 5500. This leads to some sample attrition. Column (1) of Table 8 reports the results. We do not observe any positive correlation between insurer losses and future claims per person. If anything, there is a weak, negative association. Results in column (2) indicate that insurer losses positively predict future markup, measured by the premium-to-claims ratio at the employer-year level. Taken together, our results do not support the argument that insurers' losses are related to declining worker health. Instead, they are consistent with the argument that losses lead insurers to charge higher markups.

Table 8 About Here

Finally, we consider the argument that, as insurers suffer from losses, firms may switch to other insurers that charge lower premiums. In Section 2.2, we discuss the frictions in this market that can lead to insurers having substantial pricing power. These frictions partially alleviate the switching concern. Here, we explicitly examine the probability of a firm switching insurers when its insurer experiences larger losses.[18] We construct an indicator $1(\textit{Switch Insurer})_{t-1 \textit{ to } t+1}$, which equals one if an employer changes their insurer between year $t-1$ and $t+1$, and zero otherwise. This indicator is then regressed on our instrument, *Insurer Loss*. Column (3) of Table 8 suggests that firms are not more likely to switch away from insurers that experience larger losses. This supports the idea that insurers have substantial market power and employers do not simply switch insurers to insulate themselves from the increase in premiums following their insurers' losses.

[18] We only consider the largest insurer in terms of the employer's premium when there are multiple insurers.

# 8 Effects of Health Insurance Premiums on Plan Participation

Firms have the discretion to decide the split between employer and employee contributions toward health insurance premiums.[19] In response to premium increases, firms can pass on part or all of such increases to workers in the form of higher employee contributions. Since employee take-up is voluntary, one would expect that such a policy would discourage plan participation. Likewise, by converting full-time workers to part-time in other ways, employers may induce declines in plan participation.[20]

TABLE 9 ABOUT HERE

We investigate how worker participation in employer-sponsored health insurance plans changes following shocks to plan premiums. In columns (1) through (3) of Table 9, we examine the effect of health insurance premiums on the number of plan participants in a firm. The analyses again use our instrumental variable approach and include analogous specifications to the firm-level employment specification (Panel B of Table 2), except that our outcome variable is the log number of plan participants rather than the number of employees. Across all specifications, we estimate that increases in premiums lead to substantial changes in the number of participants (with elasticities between -0.76 and -0.77), which are 2-3 times that of our baseline employment effects. We next directly check whether insurance premiums affect the fraction of workers that enroll in an employer-sponsored health insurance plan. We do so by computing the ratio of the number of plan participants to total employment, i.e., the "take-up ratio," and use this ratio as the dependent variable in the second stage of our 2SLS approach.[21] Columns (4) through (6) report the results. Across all fixed effects specifications, we estimate large declines in the take-up ratio in response to rising health insurance costs.

Overall, our findings suggest that plan participation is substantially more responsive to

[19] One exception is ACA's affordability mandate: workers' contributions need to be less than a percentage of their household income. The percentage varies over time and was 9.56% in 2018.

[20] We can observe workers' number of hours worked in the ACS survey. However, each worker is surveyed only once in most instances, limiting our ability to test whether workers are converted from full-time to part-time.

[21] The number of participants includes eligible dependents. Thus, we do not strictly measure the "take-up ratio". However, this caveat of our measurement will unlikely change the interpretation of our results.

health insurance costs than employment counts. This means that, following a hike in insurance premiums, at least some of the workers that remain in the firm stop enrolling in health insurance plans, likely due to increases in employee contribution. With a lower take-up rate, workers potentially become less attached to the firm, which can be costly to the firm in the long run.

# 9 Discussion of the Firm-Level Magnitude: Why Premium Changes Induce Both Labor Supply and Labor Demand Changes

Our main employment estimates in Section 5 suggest that a 1% increase in premiums results in 0.2% decline of employed workers, implying a large elasticity of employment to total labor costs if taken at face value. However, for the reasons we discuss below, we advise against inferring a labor demand elasticity from our estimate, because rising health insurance costs likely induce both labor demand and labor supply responses. Nonetheless, we provide a back-of-the-envelope calculation for such a number here. Based on Table 1 in Finkelstein et al. (2023), we assume that the percent of workers who obtain health insurance from their employers is 66%, average annual earning is $70,333, average annual premium is $7,000 for single coverage, $14,000 for plus one coverage, and $20,000 for family coverage. We assume that the split between these three coverage categories is equal, which gives an average premium of $13,667. Thus, a 10% increase in health insurance premiums corresponds to a $1,367 increase, which is equivalent to a wage increase by 2% ($1,367/$70,333).[22] Thus, the coefficients in Table 2 are analogous to firms reducing employment by 1-1.5% in response to 1% wage increase.

The usual vertical axis for supply and demand curves presents wages. In our setting, the vertical axis should present wages plus firms' health insurance contributions. Assume that the health insurance take-up rate stays constant. When health insurance premiums increase, holding wages plus firm contributions fixed, workers will need to contribute more for their health

[22]To compare with the prior literature, we compute the "elasticity" in terms of wage increases rather than total labor costs. Note that same as Finkelstein et al. (2023), we ignore the fact that firms on average pay around 75% of the health insurance premium, as the total premiums should be included in the total costs of labor regardless of the actual incidence, which is consistent with the tax literature. We are also ignoring the change in plan take up in response to the shock. We are also omitting the payroll tax exemption of health insurance premiums.

insurance. Suppose premiums rise by $X. Holding the take-up rate and firm contribution fixed, workers have to contribute $X extra for their health insurance, reducing their take-home pay by $X. This shifts a firm's labor supply curve up by $X. This should allow us to estimate the slope of the labor demand curve.

However, as we show above, take-up rates do not stay constant, but instead decline with higher premiums. Among workers that stay with the firm, some will opt out of their employers' health insurance and choose alternative options such as their spouses' employer-sponsored plans. As noted above, lower take-up is costly to the firm in the long-run. The fact that typical employee contributions are substantially smaller than premiums implies that firms value worker take-up. For instance, workers may be more attached if they are enrolled in their employers' health plans. In other words, while costly in the short-run, providing insurance benefits helps firms retain valuable human capital and reduce expected additional costs in the future (e.g., search costs). In Table A1, we find that a higher health insurance take-up rate corresponds to a higher retention rate at the firm-year level.

Higher premiums make it costlier for firms to induce health insurance take-up, and thus, lower the dynamic surplus and thus the marginal benefit per dollar of current labor expenditure. As a result, firms' labor demand curve shifts to the left. Therefore, while our results suggest that firms are quite responsive to health insurance costs, it is not easy to directly infer a labor demand elasticity.

# 10 Conclusion

Employer-sponsored health insurance is a significant component of labor costs. We examine the causal effect of health insurance premiums on firms' employment, both in terms of quantity and composition, as well as technology investment decisions. To address endogeneity concerns, we design an instrument for insurance premiums using idiosyncratic variation in insurers' losses that is plausibly exogenous to their customers, i.e., individual employers and their workers. Using Census microdata, we show that following an increase in increased premiums, firms reduce employment. Relative to higher-wage coworkers, lower-wage workers experience a larger increase in the probability of being separated from their jobs and remaining unemployed for two years following the shock.

Our paper provides potential implications for policymakers. In particular, a downside of employer-sponsored health insurance is that it introduces labor-market distortions. The effects are more adverse for low-income workers, whom the ACA is intended to protect through its Affordability Mandate. We might also want to consider whether it is valuable to subsidize costs firms incur to provide insurance for low-income workers.

Our paper also speaks to the persistent decline in the labor share and a weakening demand for low- and middle-skill workers in the U.S. (e.g., Acemoglu and Autor (2011), Karabarbounis and Neiman (2014), Autor (2014), Autor et al. (2020), Kehrig and Vincent (2021)). A growing body of research investigates various determinants of this structural shift, including technological progress, trade exposure, and offshoring pressure, which are forces that have made substitutes increasingly competitive. Health insurance costs, which have been rising faster than inflation and wages, could be an alternative and complementary channel that exacerbates the decline in firms' labor demand for these workers. Although our paper documents the partial equilibrium effects of idiosyncratic shocks to health insurance costs, we highlight that such costs could be distortionary to firms' employment and worker composition.

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# Figures and Tables

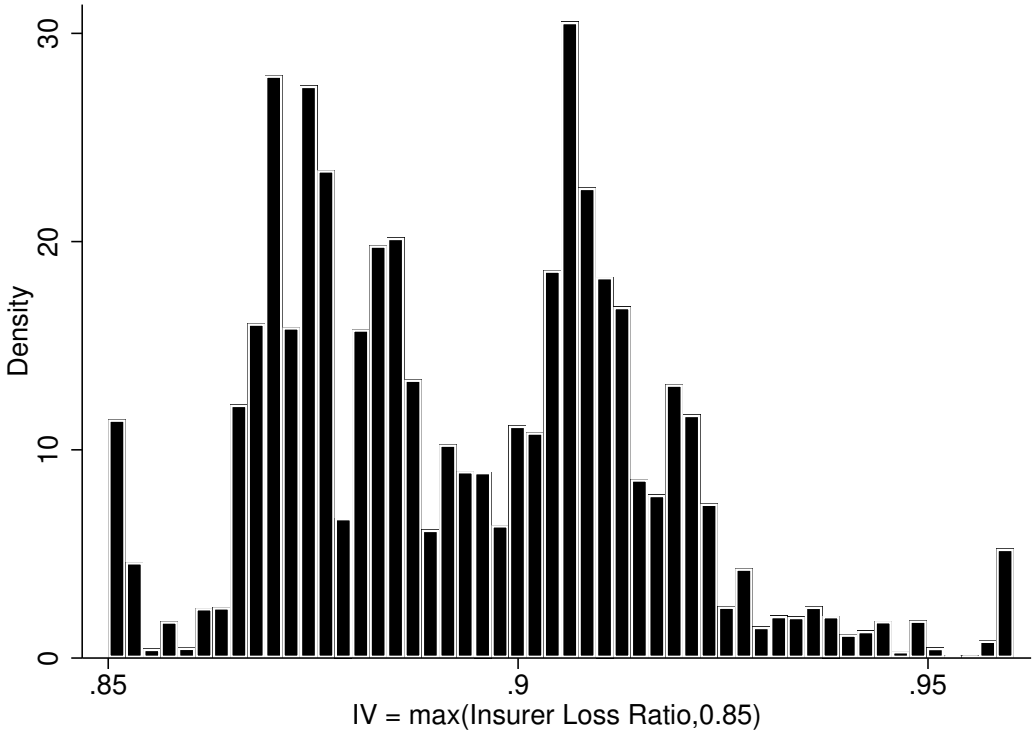
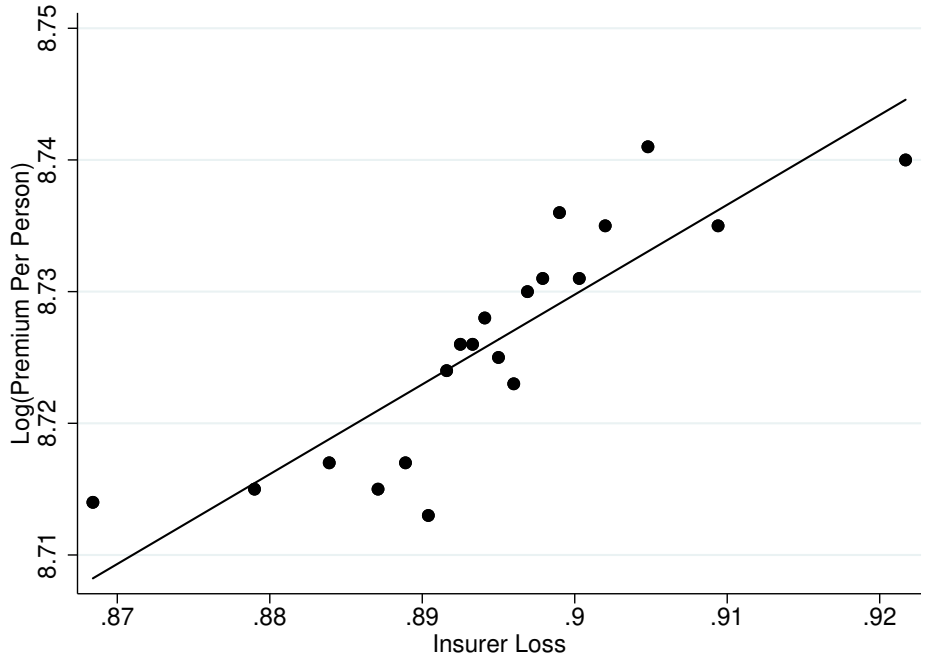



**Figure 1. Distribution of Instrumental Variable, Insurer Losses**

This Figure displays the distribution of our main instrumental variable, *Insurer Loss*, matched to Form 5500 data.

**Panel A: First Stage—Insurer Loss and Log(Premium Per Person)**




**Panel B: Second Stage—Predicted Log(Premium Per Person) and Firm Employment**

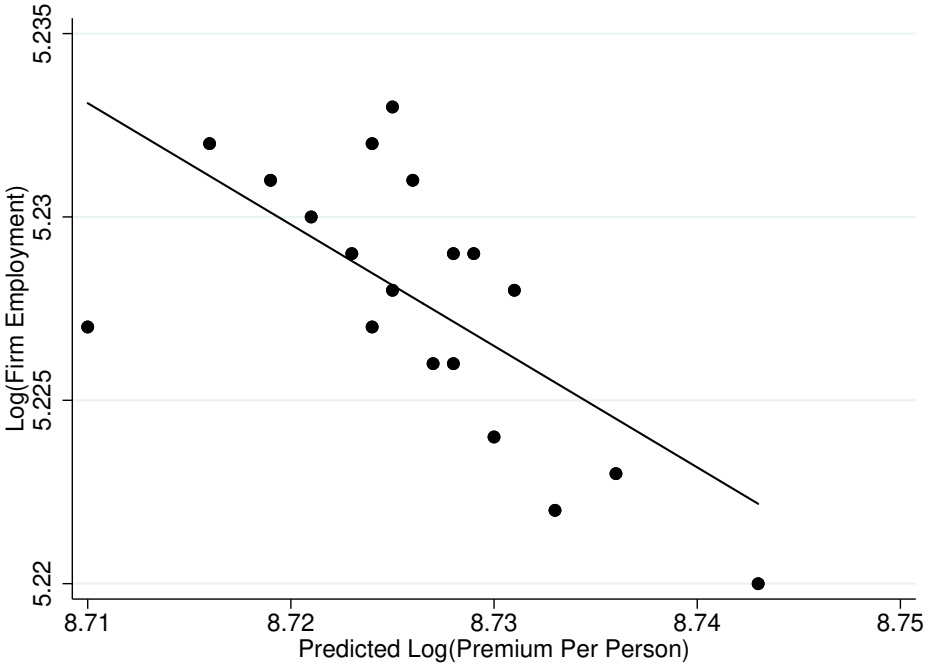



**Figure 2. Binscatter Representation of Instrumental Variable Estimation**

Panel A is a binned scatter plot of our main endogenous variable, *Log(Premium per Person)*$_t$, against its instrumental variable, *Insurer Loss*. Panel B is a binned scatter plot of natural log of firm employment against *Predicted Log(Premium per Person)*$_t$. *Predicted Log(Premium per Person)*$_t$ is the predicted outcome variable from regressing *Log(Premium Per Person)*$_t$ on *Insurer Loss*$_{t-3\ to\ t-1}$ along with firm and year fixed effects. We first absorb the firm and year fixed effects from all four variables.

**Table 1. Summary Statistics**
This table presents summary statistics for the key variables used in our study.

| Variable | Mean | Std. Dev. | P10 | Median | P90 |
|---|---|---|---|---|---|
| **Firm-Year Sample** | | | | | |
| *Insurer Loss*$_{t-3\ to\ t-1}$ | 0.8946 | 0.02214 | 0.8695 | 0.8936 | 0.9206 |
| *Premium per Person*$_t$ (in \$) | 6763 | 3138 | 3715 | 5926 | 11130 |
| *Log(Premium per Person)*$_t$ | 8.726 | 0.4235 | 8.22 | 8.687 | 9.318 |
| *#Employees*$_t$ | 270.2 | 352.9 | 68 | 188 | 502 |
| *Log(Employees)*$_t$ | 5.228 | 0.8657 | 4.22 | 5.236 | 6.219 |
| *Log(Premium/Claims)*$_t$ | 1.388 | 1.011 | 0.9286 | 1.236 | 1.71 |
| *Claims per Person*$_t$ | 5710 | 10410 | 2645 | 4774 | 9421 |
| *Log(Claims per Person)*$_t$ | 8.476 | 0.541 | 7.881 | 8.471 | 9.151 |
| *1(Switch Insurer)*$_{t-1\ to\ t+1}$ | 0.2152 | 0.411 | 0 | 0 | 1 |
| **Worker-Year Sample** | | | | | |
| *1(Unemployed)*$_t$ | 0.02859 | 0.1667 | 0 | 0 | 0 |
| *1(Retained)*$_t$ | 0.8143 | 0.3889 | 0 | 1 | 1 |
| *Wage Growth*$_{t-4\ to\ t}$ | 0.1946 | 0.5608 | -0.1496 | 0.07384 | 0.5483 |
| *Wage Growth*$_{t-4\ to\ t+1}$ | 0.2044 | 0.6008 | -0.2071 | 0.08539 | 0.6244 |

**Table 2. How do health insurance premiums affect firm employment?**
This table presents results from estimating the effect of health insurance premiums on the number of participants using instrumental variable and OLS approaches. Observations are at the firm-year level. Panel A (B) presents the first (second)-stage results for the instrumental variable regressions. In Panel A, the dependent variable is the natural logarithm of premium per participant. In Panel B, the dependent variable is the log number of employees in columns (1)-(4), the log number of employees retained from the previous year in (5), and the log number of new hires in (6). In each panel, we start with firm fixed effects and year fixed effects and progressively include more rigorous fixed effects. Standard errors are corrected for clustering at the firm level. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors and are heteroskedasticity robust and clustered by firm. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

**Panel A: First-Stage Results, Premium per Person**

| Dep. Var.:*Log(Premium per Person)*$_t$ | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *Insurer Loss*$_{t-3\ to\ t-1}$ | 0.6563*** | 0.8464*** | 0.6661*** | 0.8699*** |
| | (7.14) | (8.00) | (7.26) | (7.89) |
| Firm FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | | | |
| State-Year FE | | Yes | | |
| Industry-Year FE | | | Yes | |
| State-Industry-Year FE | | | | Yes |
| Estimation Type | IV | IV | IV | IV |

**Panel B: Second-stage Results, Firm Employment**

| Dep. Var.: | *Log(Employees)* | | | | *Log(Retained)* | *Log(NewHires)* |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Log(Premium per Person)*$_t$ | -0.2955*** | -0.2117** | -0.2740** | -0.1674* | -0.2758** | -0.1389 |
| | (-2.69) | (-2.26) | (-2.57) | (-1.85) | (-2.46) | (-0.64) |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | | | | Yes | Yes |
| State-Year FE | | Yes | | | | |
| Industry-Year FE | | | Yes | | | |
| State-Industry-Year FE | | | | Yes | | |
| Estimation Type | IV | IV | IV | IV | IV | IV |
| Observations | 92000 | 88000 | 88500 | 86500 | 91500 | 91500 |
| Cragg-Donald F Stat | 161.00 | 212.50 | 163.40 | 203.90 | 158.80 | 158.80 |

**Table 3. Health insurance premiums and the job separation of high- and low-wage workers.** This table presents results estimating the heterogeneous effect of health insurance premiums on worker job separation depending on income levels. Observations are at the worker-year level. We present the second-stage results of the instrumental variable regressions, where log premium per person and its interaction terms with worker past earnings are instrumented with lagged insurer losses and its interaction terms with worker past earnings. The independent variable is an indicator of whether the worker is separated with their $t-1$ employer in year $t$, and in year $t+1$. *Low Income*, *Med Income*, and *High Income* are indicators for whether workers' past earnings fall into the bottom, middle, or top terciles of our sample, respectively. Controls include the tercile dummies (with one of them automatically omitted due to fixed effects). We weight observations with the inverse of the number of employees at each firm, to reduce the influence of large firms. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

| Dep. Var.: | $1(Separated)_t$ | | $1(Separated)_{t+1}$ | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Log(Premium per Person)*$_t$×*Low Income* | 0.2610*** | 0.3402*** | 0.2743*** | 0.3854*** |
| | (4.52) | (7.01) | (3.53) | (7.03) |
| *Log(Premium per Person)*$_t$×*Med Income* | 0.0979** | 0.1813*** | 0.0506 | 0.2064*** |
| | (2.16) | (5.03) | (0.74) | (4.85) |
| *Log(Premium per Person)*$_t$×*High Income* | -0.0593 | | -0.1448** | |
| | (-1.49) | | (-2.14) | |
| Controls | Yes | Yes | Yes | Yes |
| Firm FE | Yes | | Yes | |
| Individual FE | Yes | Yes | Yes | Yes |
| State-Industry-Year FE | Yes | | Yes | |
| Firm-Year FE | | Yes | | Yes |
| Estimation Type | IV | IV | IV | IV |
| Observations | 18430000 | 18440000 | 18430000 | 18440000 |

**Table 4. Health insurance premiums and the unemployment of high- and low-wage workers.**

This table presents results estimating the heterogeneous effect of health insurance premiums on worker unemployment depending on income levels. Observations are at the worker-year level. We present the second-stage results of the instrumental variable regressions, where log premium per person and its interaction terms with worker earnings are instrumented with lagged insurer losses and its interaction terms with worker earnings. The independent variable is an indicator of whether the worker is unemployed in year $t$, and in year $t+1$. *Low Income*, *Med Income*, and *High Income* are indicators for whether workers' past earnings fall into the bottom, middle, or top terciles of our sample, respectively. Controls include the tercile dummies (with one of them automatically omitted due to fixed effects). We weight observations with the inverse of the number of employees at each firm, to reduce the influence of large firms. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

| Dep. Var.: | $1(Unemployed)_t$ | | $1(Unemployed)_{t+1}$ | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Log(Premium per Person)*$_t$×*Low Income* | 0.1147*** | 0.1872*** | 0.0885** | 0.1542*** |
| | (5.62) | (8.36) | (2.27) | (5.91) |
| *Log(Premium per Person)*$_t$×*Med Income* | 0.0231* | 0.0949*** | 0.0348 | 0.0917*** |
| | (1.69) | (6.34) | (0.97) | (4.39) |
| *Log(Premium per Person)*$_t$×*High Income* | -0.0714*** | | -0.0723** | |
| | (-5.75) | | (-2.28) | |
| Controls | Yes | Yes | Yes | Yes |
| Firm FE | Yes | | Yes | |
| Individual FE | Yes | Yes | Yes | Yes |
| State-Industry-Year FE | Yes | | Yes | |
| Firm-Year FE | | Yes | | Yes |
| Estimation Type | IV | IV | IV | IV |
| Observations | 18430000 | 18440000 | 18430000 | 18440000 |

**Table 5. Health insurance premiums and the wage decline of high- and low-wage workers upon job separation.**

This table presents results estimating the heterogeneous effect of health insurance premiums on the wage decline upon job separation depending on workers' past income. Observations are at the worker-year level. We present the second-stage results of the instrumental variable regressions, where log premium per person and its interaction terms with worker past earnings are instrumented with lagged insurer losses and its interaction terms with worker past earnings. The independent variable is *Separation&Wage Drop*, which equals one if an individual separates from his previous employer (as of year $t-1$) in year $t$ and their year $t$ earnings relative to the prior five-year average drops to the bottom quintile of the sample distribution, zero otherwise. *Low Income*, *Med Income*, and *High Income* are indicators for whether workers' past earnings fall into the bottom, middle, or top terciles of our sample, respectively. Controls include the tercile dummies (with one of them automatically omitted due to fixed effects). We weight observations with the inverse of the number of employees at each firm, to reduce the influence of large firms. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

| Dep. Var.: | $1(Separation\&Wage\ Drop)_t$ | | $1(Separation\&Wage\ Drop)_{t+1}$ | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Log(Premium per Person)*$_t$×*Low Income* | 0.1515*** | 0.2022*** | 0.1208*** | 0.1510*** |
| | (5.07) | (7.12) | (3.05) | (4.88) |
| *Log(Premium per Person)*$_t$×*Med Income* | 0.0571** | 0.1019*** | 0.0140 | 0.0532** |
| | (2.49) | (4.70) | (0.41) | (2.13) |
| *Log(Premium per Person)*$_t$×*High Income* | -0.0331* | | -0.0526 | |
| | (-1.70) | | (-1.58) | |
| Controls | Yes | Yes | Yes | Yes |
| Firm FE | Yes | | Yes | |
| Individual FE | Yes | Yes | Yes | Yes |
| State-Industry-Year FE | Yes | | Yes | |
| Firm-Year FE | | Yes | | Yes |
| Estimation Type | IV | IV | IV | IV |
| Observations | 18430000 | 18440000 | 18430000 | 18440000 |

**Table 6. Health insurance premiums and the wage growth of high- and low-wage workers.** This table presents results estimating the heterogeneous effect of health insurance premiums on the wage decline upon job separation depending on workers' past income. Observations are at the worker-year level. We present the second-stage results of the instrumental variable regressions, where log premium per person and its interaction terms with worker past earnings are instrumented with lagged insurer losses and its interaction terms with worker past earnings. The independent variable is *Wage Growth*, which is the growth rate in percentages of workers' year $t$ earnings relative to the prior five-year average. *Low Income*, *Med Income*, and *High Income* are indicators for whether workers' past earnings fall into the bottom, middle, or top terciles of our sample, respectively. Controls include the tercile dummies (with one of them automatically omitted due to fixed effects). We weight observations with the inverse of the number of employees at each firm, to reduce the influence of large firms. In Panel A, we use all workers matched with an employer in our sample in year $t-1$. In Panel B, we only use workers that are retained by their $t-1$ employers. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

| Dep. Var.: | $Wage\ Growth_t$ | | | |
|---|---|---|---|---|
| Sample: | All Workers | | Retained Workers | |
| | (1) | (2) | (3) | (4) |
| *Log(Premium per Person)*$_t$×*Low Income* | -0.2648*** | -0.3743*** | -0.1774*** | -0.2684*** |
| | (-3.94) | (-6.03) | (-3.09) | (-5.04) |
| *Log(Premium per Person)*$_t$×*Med Income* | -0.0096 | -0.1070** | 0.0428 | -0.0353 |
| | (-0.18) | (-2.35) | (0.93) | (-0.94) |
| *Log(Premium per Person)*$_t$×*High Income* | 0.0261 | | 0.0069 | |
| | (0.46) | | (0.13) | |
| Controls | Yes | Yes | Yes | Yes |
| Firm FE | Yes | | Yes | |
| Individual FE | Yes | Yes | Yes | Yes |
| State-Industry-Year FE | Yes | | Yes | |
| Firm-Year FE | | Yes | | Yes |
| Estimation Type | IV | IV | IV | IV |
| Observations | 18430000 | 18440000 | 15580000 | 15590000 |

**Table 7. Health insurance premiums and the job separation of high- and low-wage workers, using insurers' losses from other states as instrument.**

This table presents results estimating the heterogeneous effect of health insurance premiums on worker job separation depending on income levels. Observations are at the worker-year level. We present the second-stage results of the instrumental variable regressions, where log premium per person and its interaction terms with worker past earnings are instrumented with lagged insurer losses from states other than the focal employer's state and its interaction terms with worker past earnings. The independent variable is an indicator of whether the worker is separated with their $t-1$ employer in year $t$, and in year $t+1$. *Low Income*, *Med Income*, and *High Income* are indicators for whether workers' past earnings fall into the bottom, middle, or top terciles of our sample, respectively. Controls include the tercile dummies (with one of them automatically omitted due to fixed effects). We weight observations with the inverse of the number of employees at each firm, to reduce the influence of large firms. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

**Panel A: Firm-Level, Both Stages**

| 2SLS Stage: | 1st Stage | 2nd Stage |
|---|---|---|
| Dep. Var.: | *Log(Premium per Person)* | *Log(Employees)* |
| | (1) | (2) |
| *Insurer Other State Loss*$_{t-3\ to\ t-1}$ | 0.4692*** | |
| | (6.76) | |
| *Log(Premium per Person)*$_t$ | | -0.3256*** |
| | | (-2.63) |
| Firm FE | Yes | Yes |
| State-Industry-Year FE | Yes | Yes |
| Estimation Type | IV | IV |
| Observations | 63500 | 63500 |
| Cragg-Donald F Stat | | 107.50 |

**Panel B: Individual-Level, Second Stage**

| Dep. Var.: | $1(Separated)_t$ | | $1(Unemployed)_t$ | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Log(Premium per Person)*$_t$×*Low Income* | 0.2287** | 0.4297*** | 0.1806*** | 0.2514*** |
| | (2.24) | (3.69) | (3.56) | (4.35) |
| *Log(Premium per Person)*$_t$×*Med Income* | 0.1495* | 0.3427*** | 0.0487 | 0.1377*** |
| | (1.93) | (2.77) | (1.63) | (2.94) |
| *Log(Premium per Person)*$_t$×*High Income* | -0.1196* | | -0.0808*** | |
| | (-1.78) | | (-3.30) | |
| Controls | Yes | Yes | Yes | Yes |
| Firm FE | Yes | | Yes | |
| Individual FE | Yes | Yes | Yes | Yes |
| State-Industry-Year FE | Yes | | Yes | |
| Firm-Year FE | | Yes | | Yes |
| Estimation Type | IV | IV | IV | IV |
| Observations | 13610000 | 15160000 | 13610000 | 15160000 |

**Table 8. Insurer losses and future claims, markups, and employer-insurer matching**
This table presents results estimating the correlation between three employer outcomes related to health insurance and lagged insurers' losses. Observations are at the firm-year level. The dependent variable is the natural log of dollar claims per plan participant in year $t$ in column (1), premium divided by claims in year $t$ in column (2), and an indicator for whether the employer switched the insurer from year $t-1$ to $t+1$ in column (3). Insurers' losses are based on data from years $t-3$ to $t-1$. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

| Dep. Var.: | (1) *Log(Claims per Person)* | (2) *Premium/Claim* | (3) *1(Switch Insurer)* |
|---|---|---|---|
| *Insurer Loss*$_{t-3\ to\ t-1}$ | -0.3131 | 1.7110*** | -0.3374 |
| | (-1.41) | (3.99) | (-0.81) |
| Firm FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| Estimation Type | OLS | OLS | OLS |
| Observations | 17500 | 17500 | 65000 |

**Table 9. The effect of health insurance premiums on employee insurance take up.**
This table presents results estimating the effect of health insurance premiums on employees' insurance take up. In columns (1)-(3), the dependent variable is the log number of health insurance plan participants. In columns (4)-(6), the dependent variable is the ratio of plan participants to employees. We include firm fixed effects and year fixed effects in columns (1) and (3), firm fixed effects and state-by-year fixed effects in columns (2) and (4), firm fixed effects and industry-by-year fixed effects in columns (3) and (6). We do not include firms that file Form 5500 Schedule D Part 2 as we do not have data on the number of participants for these firms. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

| Dep. Var.: | *Log(Participants)* | | | *Participants/Employees* | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| *Log(Premium per Person)*$_t$ | -0.7736*** | -0.7667*** | -0.7558*** | -0.6279*** | -0.7173*** | -0.6226*** |
| | (-6.05) | (-6.76) | (-6.04) | (-4.03) | (-5.12) | (-4.07) |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | | | Yes | | |
| State-Year FE | | Yes | | | Yes | |
| Industry-Year FE | | | Yes | | | Yes |
| Estimation Type | IV | IV | IV | IV | IV | IV |
| Observations | 84500 | 84500 | 84500 | 80500 | 80500 | 80500 |
| Cragg-Donald F Stat | 151.60 | 203.50 | 155.70 | 140 | 187.90 | 144.30 |

# Appendices

## A Variable Definition

- *Insurer Loss*: insurers' loss ratio as defined in Section 3.2
- *Insurer Loss (Other States)*: insurers' loss ratio as defined in Section 3.2, but with insurers' performance in states other than the focal firm's state
- *Log(Premium per Person)*: natural log of total firm-level health insurance premiums divided by the number of participants
- *Log(Employees)*: natural log of the firm-level number of employees
- *Log(Retained)*: natural log of the firm-level number of retained employees from the previous year
- *Log(NewHires)*:natural log of the firm-level number of newly hired employees
- *Log(Claims per Person)*: natural log of firm-level total health insurance claims divided by the number of participants
- *Premium/Claims*: firm-level total premiums divided by total claims
- *1(Switch Insurer)*: indicator for firm switching health insurer
- *Total Premiums/Wages*: firm-level total premiums divided by total wages
- *Industry Q*: industry-level average Q (measured using publicly traded firms)
- *Local Unemployment*: county-level unemployment rate based on BLS data
- *1(Retained)*: indicator of whether the worker is retained in year $t$ by their $t-1$ employer
- *1(Unemployed)*: indicator of whether the worker is unemployed. We classify workers as unemployed if their W2 wages are lower than the federal minimum wage at 20 hours per week and do not file any IRS 1099 filings.
- *Worker Past Earnings*: average earnings during the previous five years (excluding years with zero earnings)
- *Wage Growth*: worker-level wage growth rate

# B Additional Results

**Table A1. Relationship between health insurance take-up rate and worker retention rate, firm-level analysis.**
This table presents results estimating the relationship between lagged health insurance take-up rate and worker retention rate in the current and subsequent year. See Appendix A for variable definitions. *t*-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

| Dep. Var.: | *Worker Retention Rate*$_t$ | | *Worker Retention Rate*$_{t+1}$ | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Health Insurance Take up Rate*$_{t-1}$ | 0.02736*** | 0.02425*** | 0.03255*** | 0.03070*** |
| | (37.39) | (21.18) | (33.61) | (20.62) |
| Year FE | Yes | Yes | Yes | Yes |
| Firm FE | | Yes | | Yes |
| Estimation Type | IV | IV | IV | IV |
| Observations | 155000 | 145000 | 155000 | 145000 |

**Table A2. The Effects of Health Insurance Premiums on New Hire Skills and Wages**
This table reports results estimating the effect of health insurance premiums on the skills and wage levels of new-hire workers. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

| Dep. Var.: | (1) $Wages_{t-5,t-1}$ | (2) $Wages_t$ |
|---|---|---|
| *Log(Premium per Person)*$_t$ | 0.1489 | 0.1904* |
| | (1.31) | (1.65) |
| Firm FE | Yes | Yes |
| Year FE | Yes | Yes |
| Estimation Type | IV | IV |
| Observations | 90500 | 90500 |
| Cragg-Donald F Stat | 159.10 | 158.80 |

**Table A3. Health insurance premiums and the job separation, interacting with continuous past income.**

This table presents results estimating the heterogeneous effect of health insurance premiums on worker job separation depending on income levels. Observations are at the worker-year level. We present the second-stage results of the instrumental variable regressions, where log premium per person and its interaction terms with worker past earnings are instrumented with lagged insurer losses and its interaction terms with worker past earnings. The independent variable is an indicator of whether the worker is separated with their $t-1$ employer in year $t$, and in year $t+1$. Controls include workers' log of past average wages. We weight observations with the inverse of the number of employees at each firm, to reduce the influence of large firms. See Appendix A for variable definitions. $t$-statistics are reported in parentheses. Standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

| Dep. Var.: | $1(Separated)_t$ | | $1(Separated)_{t+1}$ | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Log(Premium per Person)*$_t$ | 0.1005** | | 0.0572 | |
| | (2.41) | | (0.89) | |
| *Log(Premium per Person)*$_t$×*Past Income* | -0.1263*** | -0.1147*** | -0.1567*** | -0.1136*** |
| | (-5.84) | (-7.30) | (-5.31) | (-6.69) |
| Controls | Yes | Yes | Yes | Yes |
| Firm FE | Yes | | Yes | |
| Individual FE | Yes | Yes | Yes | Yes |
| State-Industry-Year FE | Yes | | Yes | |
| Firm-Year FE | | Yes | | Yes |
| Estimation Type | IV | IV | IV | IV |
| Observations | 18430000 | 18440000 | 18430000 | 18440000 |