The Impacts of Employer Health Insurance Mandates on Labour Market and Health: Evidence from the ACA

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Abstract

This paper examines the effects of the Affordable Care Act's employer mandate on labor market outcomes and health. I exploit variation in the staggered implementation of the employer mandate using a staggered difference-in-differences research design. The main analysis employs a doubly robust difference-in-differences estimator to mitigate selection bias, while honest difference-in-differences methods are used to assess the robustness of key results. The full-sample results indicate that the employer mandate did not significantly increase employer-sponsored health insurance coverage or generate meaningful changes in overall labor market outcomes. However, the effects are heterogeneous across income groups. Among low-income workers, the mandate led to a 9.31 percentage points increase in employer-sponsored health insurance coverage, which was associated with improved self-reported health and greater utilization of health care services. At the same time, low-income workers became more vulnerable to involuntary part-time employment, suggesting that employers were more likely to reduce work hours than to reduce employment in response to the mandate. These findings imply that the employer mandate may improve worker productivity over the long run through better health, but it may also exacerbate income inequality by disproportionately exposing low-income workers to reductions in work hours.

1 Introduction

Healthcare expenditure as a share of gross domestic product (GDP) has increased very fast in the last half-century, rising from 5% in 1960 to 18% in 2025, with 5.5% average annual real growth rate of health spending in the United States (data from Catlin and Cowan (2015) and Centers for Medicare & Medicaid Services). Inability to afford costs of health care contributes to more than 500,000 personal bankruptcy filings annually in the United States. Unlike many other advanced economies where health insurance is public and universal, about half of the population in the United States are covered by employer-sponsored health insurance (ESHI), and 10% of its population are uninsured (data from Fang and Krueger (2022)). Empirical research has shown that people are more willing to use health care services if insured (Chen et al. (2020)). The expensive health care service and low insured rate caused the "death spiral" in American history. In 2010, 16.0% (48.6 million) of persons of all ages and 18.2% (48.2 million) of persons under age 65 years were uninsured, according to National Center for Health Statistics. There are free rider problems in healthcare markets because the Emergency Medical Treatment & Labor Act (EMTALA) ensures public access to emergency services regardless of their ability to pay if they are uninsured. Even though only 35% of the people are covered by public health insurance, healthcare spending still accounts for 25% government expenditures every year in the U.S., which is a 20 percentage points increase compared with the 1960s. Thus we want to find solutions to expand health insurance coverage and prevent more dramatic increases in medical spending of government expenditure at the same time.

Given the long-standing role of employers as the primary providers of health insurance, an employer mandate has been proposed as a potential solution to the coverage gaps discussed above. Compared with expanding public insurance, an employer mandate can increase health insurance coverage while imposing relatively limited additional government spending. However, a central concern is its potential impact on labor market outcomes. By increasing the cost of employing full-time workers, the mandate may induce firms to reduce employment, shift toward part-time workers, or lower wages to offset the additional labor costs. To the extent that these costs are ultimately borne by workers through lower earnings, an employer mandate may resemble requiring workers to purchase health insurance even when they would

not voluntarily do so, as argued by Saez (2021). On the other hand, Summers (1989) argues that employment need not decline if workers value employer-sponsored health insurance sufficiently and are willing to accept lower wages in exchange for the benefit. Consequently, the short-run effects of an employer mandate on labor market outcomes are theoretically ambiguous and must be evaluated empirically. Beyond its short-run labor market effects, an employer mandate may also generate long-run benefits through improvements in workers' health. A growing body of evidence suggests that health insurance improves health outcomes, which can enhance labor productivity over time. If these productivity gains are substantial, firms may find that the long-run benefits of providing health insurance partially or fully offset the associated costs. Evaluating employer mandates therefore requires considering the trade-off between short-run labor costs and long-run productivity gains. How do firms and workers respond to these incentives in practice? What are the overall labor market consequences of employer mandates, and to what extent does expanded employer-sponsored insurance improve health outcomes? This paper addresses these questions using empirical evidence.

In this paper, I first propose a conceptual framework to understand the decisions of workers and employers in the presence of employer-sponsored health insurance (ESHI), employment choices, wages, and other labor market decisions. The model incorporates the trade-off faced by employers: providing health insurance increases labor costs, while health insurance may improve workers' health status and long-term productivity. Wages and compensating differentials are determined as functions of worker productivity. Firms choose workers' hours of work as part of their response to employer mandates, which apply only to full-time workers. Workers whose tasks are more easily substitutable are more vulnerable to reductions in hours and transitions to part-time employment. In this framework, wages do not necessarily decline when workers receive employer-sponsored health insurance, because improved health insurance access may enhance workers' health and productivity in the long run.

Following the conceptual framework, I develop an empirical design to provide causal evidence on the effects of employer mandates under the Affordable Care Act (ACA). Since

the ACA introduced multiple policy reforms that took effect sequentially, I implement a clean identification strategy to isolate the effects of employer mandates from other ACA provisions, including the individual mandate, subsidies for individual health insurance purchases through the Health Insurance Marketplace, Medicaid expansion, family insurance expansion, and other public health insurance programs. I restrict the sample to workers aged 26 to 65 who were not enrolled in public health insurance programs to avoid confounding effects from expansions in Medicaid, family coverage, and other public insurance programs. To focus on labor market outcomes among low-income workers, I further restrict the sample to individuals who were employed before treatment, thereby excluding individuals who appear low-income because they were not employed.

To remove the confounding effects of the individual mandate, I restrict the analysis period to 2014–2016, as the individual mandate became effective in 2014 and was eliminated in 2017. This allows the analysis to focus on the employer mandates implemented in 2015 and 2016. I exclude firms with fewer than 26 employees to eliminate potential effects from small-business tax credits for employers offering health insurance. Because the ACA employer mandate was implemented in two stages, I employ a staggered difference-in-differences design to obtain valid aggregation and account for treatment effect heterogeneity. In 2015, the treatment group consists of workers employed by firms with more than 100 employees in 2014. In 2016, the treatment group consists of workers employed by firms with more than 50 employees in 2015. I use only never-treated workers as the control group, consisting of individuals employed by firms with 26–50 employees in both 2014 and 2015. To further reduce potential selection bias, I combine a doubly robust estimator with the staggered difference-in-differences framework. For key outcomes, I also conduct robustness checks using the honest difference-in-differences approach.

The results show that ESHI provision did not increase significantly in the full sample, and I find limited evidence of overall labor market effects. Before treatment, 74 percent of workers in the full sample were already covered by ESHI. However, among employed workers with wages below the 15th percentile of the wage distribution, the ESHI coverage rate was less than 50 percent before the employer mandates. Focusing on this low-income

group, I find that employer mandates generated a significant 9.31 percentage-point increase in ESHI coverage. Access to employer-sponsored health insurance also improved workers' self-reported health status and increased doctor visits, suggesting improved access to medical care. However, I also find evidence that employer mandates reduced hours of work and increased the probability of transitioning into part-time employment, despite potential improvements in worker productivity and hourly wages.

I conduct two additional robustness checks. First, I redefine the low-income group as workers with wages below the 20th percentile. Second, I account for firms that voluntarily expanded health insurance coverage after the announcement of employer mandates but before the mandates took effect. In this specification, I define workers employed by firms with more than 50 employees in 2014 as treated and workers employed by firms with 26–50 employees in 2014 as the control group. Both robustness checks produce results similar to those in the baseline specification for low-income workers.

Overall, the findings suggest that employer mandates are effective in expanding employer-sponsored health insurance coverage among workers who previously had limited access to such benefits. Improved access to health insurance also enhances health outcomes through greater utilization of medical services, which may improve long-term worker productivity. However, firms also have incentives to reduce working hours and shift workers toward part-time employment. Therefore, although employer mandates benefit workers who successfully retain full-time employment, they may potentially contribute to greater income inequality over the long run by increasing compensation for higher-productivity workers while reducing employment intensity among lower-productivity workers. Future health policy should consider these trade-offs carefully. Although employer mandates can effectively expand insurance coverage, they should be implemented with caution, particularly in an era of rapid AI development when some workers may face greater risks of substitution. Expanding Medicaid and providing subsidies for individual health insurance purchases may represent safer alternatives with fewer potential negative effects on labor market outcomes.

The evidence on how employer health insurance mandates affect labor market outcomes is mixed. Buchmueller et al. (2011) find that Hawaii's Prepaid Health Care Act did not

significantly reduce wages or employment. In contrast, Kolstad and Kowalski (2016) show that the employer mandate under the Massachusetts health reform reduced wages and hours worked, although the decline in wages was slightly smaller than the average cost of employer-sponsored health insurance (ESHI). Gruber (1994) finds that the costs of mandated maternity benefits were largely shifted to the targeted group through lower wages. A related literature examines the labor market effects of changes in the cost of providing employer-sponsored health insurance. Exploiting variation in insurance premiums, Gao et al. (2023) find that higher health insurance costs reduce firm employment, disproportionately increase unemployment among low-wage workers, and encourage firms to substitute technology for labor. Similarly, Baicker and Chandra (2005) use per capita medical malpractice payments as an instrument for health insurance premiums and find that higher premiums reduce hours worked and full-time employment. Because both studies identify the effects of changes in insurance costs among firms that already offer ESHI, they estimate the marginal effects of insurance costs rather than the effects of offering health insurance itself. This paper contributes to the literature by examining how the provision of employer-sponsored health insurance, rather than changes in its cost, affects labor market outcomes. Studying insurance provision has the additional advantage of allowing me to investigate how gaining employer-sponsored health insurance influences workers' health. Empirically, I exploit variation generated by the Affordable Care Act (ACA) employer mandate to estimate its effects on both the extensive margin (employment) and the intensive margin (hours worked). My findings are broadly consistent with the theoretical predictions of Nakajima and Tuzemen (2016), which suggest an increase in part-time employment and a reduction in hours worked. In addition to the effects documented by Buchmueller et al. (2011) and Kolstad and Kowalski (2016), I also examine employers' anticipatory responses, specifically whether firms began offering health insurance before the ACA employer mandate became binding.

Focusing on low-income workers, I find that employer mandates increase employer-sponsored health insurance (ESHI) coverage, although they also appear to reduce labor supply by increasing the likelihood of working fewer hours. These findings complement the existing literature on the Affordable Care Act (ACA). Katherine Abraham and coauthors Abraham

and Farber (2024) show that the expansion of health insurance coverage under the ACA was driven primarily by Medicaid expansion and the establishment of health insurance exchanges. Using a structural equilibrium model, Naoki Aizawa Aizawa and Fang (2020) finds that eliminating the employer mandate would have only a limited effect on ESHI coverage. Exploiting variation from the Massachusetts health reform, Emily Lyons Lyons (2017) estimates that roughly half of the increase in ESHI attributable to the employer mandate would instead have been absorbed by subsidized insurance in the absence of the mandate. In contrast to these studies, I focus specifically on low-income workers, a group with substantially lower pre-reform ESHI coverage, and provide evidence that employer mandates significantly increased ESHI coverage for this population. Regarding labor market outcomes, my results for the full sample are consistent with Buchmueller et al. (2011), which finds little evidence that employer mandates reduce employment. However, for low-income workers, I find that employer mandates increase the probability of transitioning to part-time employment and reduce hours worked. At the same time, I find no evidence that the ACA employer mandate increased unemployment, in contrast to the theoretical prediction of Baicker and Levy (2008).

Third, relative to the existing literature, I provide evidence that employer mandates and employer-sponsored health insurance improve workers' health status. Specifically, I find that individuals experience improvements in health after obtaining employer-sponsored health insurance, consistent with the prediction in Mulligan (2021). Mulligan argues that one important value of employer-sponsored health insurance is its role in maintaining a healthier and more productive workforce. My findings further suggest that this improvement in health operates through increased healthcare utilization: low-income workers who obtain employer-sponsored health insurance significantly increase the number of doctor visits, which in turn contributes to better health outcomes. These results also help explain why firms may not fully offset the cost of providing health insurance through lower wages, as the productivity gains associated with better worker health partially compensate for these costs. My results differ from those in Lennon (2024), who do not find a significant increase in employer-sponsored health insurance coverage in the full sample and consequently do not detect improvements in

health outcomes. Instead, they show that the overall increase in insurance coverage is driven primarily by Medicaid expansion. Similarly, Osmani and Khudri (2025) find that the ACA employer mandate increases the utilization of Pap smear screening among uterine cancer survivors, suggesting a potential channel through which employer-sponsored insurance may improve health outcomes. In contrast to these studies, I focus specifically on low-income workers and examine the health effects of employer-sponsored insurance generated by the employer mandate. I find that low-income workers who obtain employer-sponsored health insurance experience significant improvements in health status and increase their utilization of healthcare services, as measured by the number of doctor visits. The increased use of healthcare services provides a plausible mechanism through which employer-sponsored insurance improves health and may ultimately enhance worker productivity. However, because low-income workers are more vulnerable to reductions in working hours following the employer mandate, they are also less likely to receive employer-sponsored coverage. This mechanism implies that the employer mandate may unintentionally widen income inequality. On the one hand, firms may have incentives to provide health insurance without fully shifting its cost to workers through lower wages if they internalize the long-run productivity gains from a healthier workforce. On the other hand, low-productivity workers are more likely to experience reductions in working hours or transitions to part-time employment, making them less likely to qualify for employer-sponsored insurance and less likely to realize the associated health and productivity improvements. Consequently, while the employer mandate may increase aggregate productivity in the long run, it may also exacerbate income inequality by disproportionately disadvantaging low-productivity workers.

There are recent papers that discuss employer mandates and involuntary part-time employment. Even and Macpherson (2019) find that involuntary part-time employment increased in industries most affected by the employer mandate, and they find no change in part-time employment among workers who were less likely to be influenced by the employer mandate. However, the data they use is from between 1994 and 2014, earlier than the employer mandate formally became effective. Dillender et al. (2022) use observations from Hawaii as the control group. They also find that the ACA increased involuntary part-time

employment in industries most likely to reduce work hours. In this paper, I find evidence that employer mandates increased part-time employment among the low-income group. My results are consistent with the literature.

The remainder of this paper is organized as follows. Section 2 describes the institutional background of the Affordable Care Act (ACA), with particular attention to its complex policy provisions and the ways in which this paper addresses them. Section 3 presents a conceptual framework that motivates the analysis. Section 4 describes the data and reports summary statistics. Section 5 outlines the empirical research design and presents the main results using the full sample. Section 6 then focuses on a subsample for which the employer mandate is expected to have a stronger effect, providing a more precise assessment of its impacts on labor market and health outcomes. Finally, Section 7 concludes with a discussion of the findings and their implications.

2 The Affordable Care Act, Employer Mandate and Labor Market

The Affordable Care Act (ACA) is the most significant regulatory overhaul and coverage expansion after the enactment of Medicaid and Medicare. ACA was signed into law on March 23rd, 2010, and became formally effective in January 2014. Although on July 1, 2010, the Pre-Existing Condition Insurance Plan (PCIP) enabled people with pre-existing conditions to access health insurance, the uninsured rate only changed slightly (15.4% in 2009, 16% in 2010, and 15.7% in 2011). The uninsured rate declined significantly in 2014 after the insurance mandate took effect. The uninsured rate in the United States was 16.6% in 2013 and 10.4% in 2014. The uninsured rate further declined to 8.9% in 2016.

The Affordable Care Act is an ambitious and comprehensive reform, which includes the expansion of Medicaid, individual health insurance mandate, enactments of Exchanges, tax and subsidy incentives, the employer mandate, and so forth. The two mandates are the primary tools to combat adverse selection in health insurance markets. Adverse selection caused severe free rider problems and a low insurance rate (death spiral) in the United States before

the enactment of the Affordable Care Act. In March 2010, the Health Insurance Marketplace (Exchanges) was established. In January 2014, the Affordable Care Act implemented three key policies: Medicaid expansion to adults up to 138% of the Federal Poverty Level, an individual mandate to maintain insurance coverage, and subsidies to lower insurance costs. These pillars, which included federal funding for expansion and tax penalties for non-compliance, aimed to significantly expand insurance coverage.

Although the individual mandate was de facto repealed by the Tax Cuts and Jobs Act of 2017, which reduced the penalty to 0 for violating the individual mandate, the employer mandate remains. There were two stages of enactment of the employer mandate. In January 2015, firms with 100 and above full-time employees who work 30 hours or more each week, or more than 130 hours per month, are subject to the employer mandate. In 2016, firms with 50 or more full-time employees must comply. Employers are required to provide at least one minimum plan which can cover 60% average costs at least. For firms that violate employer mandates, the annual penalty amount is $2,570 per full-time employee, and the first 30 employees are exempted from the calculation. In my empirical analysis, I restrict the sample period to be between 2014 and 2016 to disentangle the impacts of individual mandate.

Small businesses are eligible for health care tax credits (Small Business Health Care Tax Credits) if they provide health insurance through SHOP Marketplace (Small Business Health Options Program Marketplace). Starting from 2014, if firms with less than 25 full-time equivalent employees and workers' average wage lower than $50,000 per year offer health insurance through Small Business Health Options Program Marketplace, they are eligible for tax credits. The tax credits are 50% premiums for small business employers and 35% premiums for small tax-exempt employers. The credit is available to eligible employers for two consecutive taxable years. To exclude effects from small business health tax credits, I restrict the control group to firms with more than 25 full-time equivalent employees.

The Affordable Care Act is a national reform. Some states enacted employer mandates before the ACA. Hawaii's employer mandate legislation was passed in 1974. They require all private-sector employers to provide health insurance to workers who work 20 or more hours per week. The employer mandate in Hawaii is still effective, meaning the ACA mandates

do not affect Hawaii. This makes Hawaii a potential placebo test. Since there are very few observations in Hawaii (276 observations in total), which lead to the issue that key coefficients are omitted because of collinearity, I do not include the results of the placebo test. In April 2006, Massachusetts passed health reform. The Massachusetts reform requires employers with 11 or more full-time employees to offer options to purchase health insurance. And employers must contribute at least 33% of the insurance premium. After the Affordable Care Act became effective, employers in Massachusetts began to follow the ACA instead of Massachusetts's employer mandate (see Sommers et al. (2018)). Thus observations in Massachusetts cannot be used as a placebo test. Since these two state employer mandates passed before the ACA, I take out observations in these two states in the primary empirical analysis. The employer mandate does not apply to insured plans issued in the U.S. territories, i.e., Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, and the Northern Mariana Islands. Thus I also remove observations from Puerto Rico and Island Areas.

The Affordable Care Act revised and expanded Medicaid starting in 2014. All U.S. citizens and legal residents with income up to 133% of the poverty line would qualify for coverage in any state participating in the Medicaid program. Since I restrict the sample to individuals covered by private health insurance or uninsured, I exclude the effects of Medicaid expansion and Medicare savings reform.

Although the Affordable Care Act is mainly a reform in the health insurance system, it has significant impacts on labor markets. Because of some historical reasons, about half of the population in the United States is covered by employer-sponsored health insurance (Fang and Krueger (2022)). In the labor market, employer-sponsored health insurance is always linked to larger firms, higher wages, and lower worker turnovers (Aizawa and Fang (2020)). The main concern of employer mandate before the enactment of the ACA was its potential negative impacts on employment because firms have incentives to reduce full-time workers and lower wages to avoid or reduce the costs of providing health insurance. Meanwhile, by expanding health insurance coverage and improving workers' health status, the productivity of workers and firms will increase. Besides, firms also have incentives to provide health insurance because they know that workers value health insurance, and it is a compensating

differential to retain workers. Thus the Affordable Care Act may profoundly impact the labor market if we consider the short-run and long-term tradeoffs.

3 Conceptual Framework

I provide a conceptual framework to illustrate the idea of this paper. I model the labor supply by simplifying and revising the model of Chen et al. (2020). Workers' preference is given by

$$\mathbb{E}\sum_{t=0}^{T}\left[\beta^t u\left(c_{i,t}\right)\right] \tag{1}$$

i index workers. $t=0$ is the first year they enter labor market. T is the year to retire. t denotes year.

Worker's productivity is heterogeneous:

$$A_{i,t} = z_i S_{i,t} g_t(h_{i,t}), \tag{2}$$

where z_i is exogenous heterogeneous ability. $S_{i,t}$ is the working experience, which increases with actual work hours in a year. $\bar{n}$ is the maximum number of hours a worker can work in a year. $n_{i,t}$ is the number of work hours in year t.

$$S_{i,t} = S_{i,t-1} + \frac{n_{i,t}}{\bar{n}} \tag{3}$$

Worker i's health status can influence her productivity by the function $g(\cdot)$. When she is unhealthy, her productivity will experience a loss of d_t unit. $0 < d_t < 1$, which increases with working years t. The health status is $h \in \{H, U\}$, where H represents being healthy and U represents being unhealthy.

$$g_t(h) = \begin{cases} 1 & \text{if } h = H \\ 1 - d_t & \text{if } h = U \end{cases} \tag{4}$$

The status of health insurance and working years t (related to age) affect the health

transition matrix $\pi^{t,I_{i,t}}$. According to Chen et al. (2020), individuals with health insurance are more likely to stay healthy and transition to a healthy state. The status of insurance state is $I_{i,t} \in \{\text{self-insured}, \text{ESHI}, \text{uninsured}\}$. ESHI means the worker is insured by the employer, which I denote $I_{E,i,t} = 1$.

$$\pi^{t,I_{i,t}} = \begin{bmatrix} \pi_{HH}^{t,I_{i,t}} & \pi_{HU}^{t,I_{i,t}} \\ \pi_{UH}^{t,I_{i,t}} & \pi_{UU}^{t,I_{i,t}} \end{bmatrix}. \tag{5}$$

According to Dillender et al. (2022), workers in industries and occupations that are easier to substitute are more vulnerable to being forced into part-time employment to allow firms to avoid employer mandate penalties. The empirical results in my paper also suggests that employer mandates may reduce hours of work and increase probability to change to part-time employment. To capture this phenomenon, I define an upper bound on available work hours, $\bar{n}_{i,t}$. Let $\hat{n}$ denote the statutory full-time threshold that triggers the employer mandate. If a firm wishes to avoid the mandate for an easily substituted worker, it caps their hours just below the threshold $(\hat{n} - \epsilon)$.

$$\bar{n}_{i,t} = \begin{cases} \bar{n} & \text{if difficult to substitute, or no employer mandate} \\ \hat{n} - \epsilon & \text{if easy to substitute, and there is an employer mandate} \end{cases} \tag{6}$$

Workers are now subject to the constraint $n_{i,t} \leq \bar{n}_{i,t}$.

Workers solve the following maximization problem:

$$\max_{j, c_{i,t}, n_{i,t}, I_{E,i,t}, I_{i,t}, a_{i,t}} \mathbb{E} \sum_{t=0}^{T} \left[\beta^t u\left(c_{i,t}\right)\right] \tag{7}$$

subject to

$$c_{i,t} + a_{i,t+1} + I_{i,t+1}\Pi_t + (1 - I_{i,t})\, m\pi(U|I_{i,t-1}, h_{i,t-1}, t) = w_{j,t}(A_{i,t})n_{i,t} - I_{E,i,t}CD_{j,t}(A_{i,t}) + (1+r_t)a_{i,t}$$

$$a_{i,t+1} \geq 0$$

This means worker i chooses employer j in each period to choose whether to get ESHI $I_{E,i,t}$. If $I_{E,i,t} = 1$, then she is covered by employer-sponsored health insurance. Labor supply is $n_{i,t}$.

The person also chooses whether to insure $I_{i,t}$ if she does not get ESHI. If $I_{i,t} = 1$, then she is either self-insured or covered by ESHI. $a_{i,t}$ is asset. Π_t is the insurance premium the person will need to pay if she purchases insurance by herself. m is the medical fee she will need to pay if she is sick. $\pi(U|I_{i,t}, h_{i,t-1}, t)$ is the probability of being sick, depending on insurance status and health status in the last period, as well as age. $w_{j,t}(A_{i,t})$ is hourly wage that depended on productivity $A_{i,t}$, assuming firms can observe worker's productivity. $CD_{j,t}(A_{i,t})$ is the compensating differential if the firm provides health insurance, also varying with productivity. The compensating differential $CD_{j,t}(A_{i,t})$ represents the implicit price the worker pays to the employer in exchange for receiving health insurance (ESHI). $CD_{j,t}(A_{i,t}) = 0$ if firm j does not provide health insurance to worker i. Workers cannot borrow in this market.

After simplifying and revising the firms' problem in Lamadon et al. (2022), I model the firm's problem as

$$\max_{n_{i,t}, K_{j,t}, w_{j,t}(A_{i,t}), I_{E,i,t}, CD_{j,t}(A_{i,t})} N_{j,t}^{1-\alpha} K_{j,t}^{\alpha} - \sum_{i=1}^{\bar{i}} n_{i,t} w_{j,t}(A_{i,t}) - r_t K_{j,t} - \sum_{i=1}^{\bar{i}} I_{E,i,t} \left(\Pi_{i,t} - CD_{j,t}(A_{i,t})\right) \tag{8}$$

where

$$N_{j,t} = \sum_{i=1}^{\bar{i}} A_{i,t} n_{i,t} \tag{9}$$

Firm j chooses each worker's labor demand $n_{i,t}$. $K_{j,t}$ is capital. Firm j also chooses benefit package, including wage $w_{j,t}(A_{i,t})$ and health insurance $I_{E,j,t}$. If $I_{E,j,t} = 1$, then the firm chooses to provide health insurance to worker i. The compensating differential $CD_{j,t}(A_{q,t})$ depends on the worker's productivity. $\bar{i}$ denote the number of workers in firm j. q denotes workers with ESHI. $\bar{q}$ denotes number of workers with ESHI. $\Pi_{q,t}$ is the premium of insurance to cover worker q.

In this framework, the employer mandate plays a crucial role in shaping the dynamics of insured rates and subsequent impacts on worker health and productivity. Because health insurance acts as a fixed cost ($\Pi_{i,t}$) rather than an hourly wage markup, it creates a non-linearity in labor demand. For highly productive workers, competitive firms provide ESHI ($I_{E,i,t} = 1$) and absorb or pass through the fixed cost via the lump-sum compensating

differential ($CD_{j,t}$). This acquisition of health insurance improves the health status of high-productivity workers ($h_{i,t} \to H$), protecting them from the productivity loss d_t. This fosters further improvements in productivity ($A_{i,t}$) and future wages, contributing to long-term societal productivity gains.

Conversely, less productive workers—particularly those in job positions that are easy to substitute—cannot absorb the fixed cost of insurance without their wages falling below acceptable minimums. To navigate the mandate, firms force these workers into part-time employment by capping their hours ($n_{i,t} \leq \hat{n} - \epsilon$). In such cases, these involuntary part-time workers lose out on ESHI, increasing their probability of transitioning to an unhealthy state. Crucially, the reduction in work hours ($n_{i,t}$) directly impedes the accumulation of work experience ($S_{i,t}$). This slower productivity growth is particularly pronounced among low-income and easily substituted groups. Consequently, while overall societal productivity may rise due to the mandate, this framework elegantly demonstrates how the structural shift toward part-time labor can widen income inequality in the long run.

4 Data

I use data from the 2014 panel of the Survey of Income and Program Participation (SIPP), which covers panel data from 2013 to 2016. This is a monthly dataset. I can observe the same person for a maximum of 4 years. The rich dataset covers data on the labor market, health insurance, demographics, and so forth. I mainly use hourly wage and dummy variable of working part-time to represent intensive labor market outcomes. For extensive labor market outcome, I use a dummy variable of employment to illustrate the effect. I use self-evaluated health scores to represent health status. Although self-evaluation is not the most objective measure of health status: people are sometimes too optimistic about their health status, which may make the health improvement measured in the data more minor than the actual improvement, the health scores still shred lights on their health condition. As you can see in the following section, health insurance positively impacts health. The health score is a five-tier self-evaluation in which individuals evaluate their health to be "excellent", "very good", "good", "fair" and "poor". I transformed the health score to increase with health status: 5 to

1 represents "excellent" to "poor" respectively. Besides, I use variables "number of medical appointments" and "number of sick days" to verify the effects of health insurance on health status. For wages and work hours, I target the main job of the agents. An individual can report up to seven jobs in SIPP. If the individual reports wages and hours in the first job, I use the first job as their main job. If the person has no records in the first job and a record in the second job, I set the second job as the primary job. If the observation has no records in all seven jobs, then I put this observation as unemployed. I consider records of seven jobs simultaneously to catch observations transitioning into another job. I aggregate weekly wages and working hours to be monthly wages and monthly working hours for each individual. To preclude extreme values and outliers, I winsorize salaries and working hours at 1%. As for firm size, I use the firm size of their main jobs, which is the first record that they worked at least 30 hours per week. Ideally, the firm size should be the number of workers who work 30 hours or more per week. However, no publicly available dataset contains this variable. So I use the number of employees instead. The dummy variable "employment" is 1 if the person has a job and no time of layoff during the month. (This is a monthly dataset.) It would be 0 if the person did not have a job or was laid off. Notice that the dummy variable "part-time" does not measure whether the person had a part-time job. Instead, "part-time" measures the work hours of the main job because the dummy variable "part-time" is 1 if the person is employed and worked less than 30 hours per week in the main job. It is 0 if the person worked more than 30 hours per week.

I drop individuals who were never employed to reduce dilution from individuals who remained out of the labor market. I restrict the sample to adults from 26 to 65 years old because people under 26 years old may be covered by family insurance rather than employers or self-purchase, according to the regulation in Affordable Care Act. Senior citizens 65 years or older are covered by Medicare, which is not the private insurance that this paper targets. I remove individuals covered by Medicare, Medicaid, Military health insurance, and Indian Health Services because people who are covered by public health insurance have different characteristics from private insurance policyholders. I further remove observations in Massachusetts and Hawaii in the primary empirical analysis because their state Employer

Mandates became effective earlier and were not part of the Affordable Care Act. I also remove observations who lived in foreign countries, Puerto Rico, and Island Areas since their employers might not need to obey the employer mandates in the ACA. I restrict employer-sponsored health insurance holders to those who get ESHI from current jobs. I remove observations that are self-employed. I restrict sample period to be between 2014 and 2016 to remove confounder of individual mandate. I do not include firms with less than 26 employees in the control group to exclude the impacts of tax credits for small business employers. I use the "never treated" firms with 26 to 50 employees as the control group.

There is potential "seam bias" in SIPP 2014 dataset. The "Seam bias" comes from the phenomenon that respondents tend to provide the same answer within a reference period, which causes the fact that transitions are underestimated within an interview period. One standard method to address seam bias is to include observations at the end of each interview period. However, SIPP was redesigned in 2014, and the reference period was changed from four months to one calendar year. If I only include observations at the end of each interview period, there will not be many observations left. Thus, I use the second standard method to address the seam bias issue to maintain more observations. The second method is to include a dummy variable at the end of each interview period because the seam bias is evident in the last month of each calendar year. Including a dummy variable at the end of each interview period may not fully address the seam bias issue. Still, it will mitigate the bias because the dummy variable will absorb the jump at the end of each interview period.

Table 1 shows summary statistics for the 2015 Employer Mandate. I separate the 2015 employer mandate and the 2016 employer mandate in the summary statistics to be consistent with the staggered difference-in-differences analysis. The staggered difference-in-differences strategy studies the two mandates separately and then aggregates the treatment effects. In this table, "Before" refers to the year 2014, while "After" is from 2015 to 2016. "Large" represents firms with more than 100 full-time employees in 2014, and "Small" contains firms with 26-50 employees. I do not include firms with less than 26 employees to exclude the impacts of tax credits for small business employers. "Wage" and "hours" are monthly salary and work hours. Hourly wage is defined as monthly wages divided by monthly work hours.

The health score is from 1 to 5, representing "poor health" to "excellent" respectively. ESHI is an employer-sponsored health insurance offering rate. This table shows that wages, hourly wage rate, and working hours in large firms are higher than in small firms. ESHI offering rate is also higher in large firms, and workers evaluate themselves healthier in large firms, although workers in small firms are younger. Employment is a dummy variable that equals one if the individual had a job and did not have any layoff. Individuals in "large" and "small" categories worked in 2014, one year before the 2015 employer mandate became effective. "Part-time" is a dummy variable denoting whether the worker worked 30 hours less each week. "Part-time" is missing if the person is unemployed. Surprisingly, small firms (26-50 full-time employees) also increased the employer-sponsored health insurance rate, although there was no policy to stimulate it. The increase in ESHI provision rate is higher than the treated "large" firms (more than 100 full-time employees). There are several potential reasons why the rise of ESHI in the control group is higher: It can be a general equilibrium effect because small firms have incentives to provide health insurance to retain workers if larger firms all provide health insurance and workers value health insurance. The second potential reason is due to measurement errors. The SIPP is a survey data in which workers report the firm size. And workers generally cannot perfectly observe how many workers work 30 hours or more per week in their companies. Variables "medical appointments" and "sick days" represent the number of doctor's visits and the number of sick days (in bed more than half of the day) within a year.

In Table 2, the term "After" refers to the period after January 2016. The category of "Large" firms specifically encompasses those with 51 to 100 full-time employees, aiming to distinguish the effects of the 2016 Employer Mandate from the 2015 Mandate. Meanwhile, "Small" firms pertain to establishments with 26 to 50 employees. The trends in wage, hourly wage rate, working hours, employer-sponsored health insurance (ESHI), and age align with the patterns observed in Table 1. Additionally, employees at larger firms exhibited a higher frequency of doctor visits and overall better health compared to their counterparts in smaller firms. Workers in large firms were more likely to be employed and tended to work longer hours than those in smaller firms. In Table 2, there is a noteworthy increase of 2.7 percentage points

(reflecting a 3.2% increase) in the provision rate of employer-sponsored health insurance among treated firms when compared to small firms. To further investigate the impacts of the employer mandate on employer-sponsored health insurance coverage rates, regression analyses were conducted in Section 5, yielding results consistent with the summary statistics.

Since the size of the increase in ESHI coverage rate in the whole sample is not very large, I zoom in on subsamples that were potentially affected more by the employer mandates. The subgroup I study is the low-income folk. I define the low-income group as workers whose hourly wage was below the 15th percentile before 2015. I choose this definition by the results in Figure 3, which shows that these workers were much less likely to be covered by employer-sponsored health insurance before the employer mandates (with an ESHI coverage rate of 45%) compared with workers whose hourly wage was more than 15th percentile (ESHI coverage rate more than 50%). Table 3 displays the summary statistics for the low-income group that I use to study the 2015 employer mandate. Patterns of variables are similar to Table 1 and 2. The employer mandate in 2015 stimulates 12.9 percentage points or 20.0% increase in the ESHI coverage rate of the larger firms among the low-income group. This means the employer mandate promotes more increase in ESHI provision rate among the lower income group than the whole sample. Table 4 shows the summary statistics of the low-income group in the study of the 2016 employer mandate. The ESHI coverage rate of large firms increased 7.3 percentage points, or 11.3%, during the 2016 employer mandate. In Section 6, I show that the increase in ESHI coverage rate is large and significant.

5 The Impacts of Employer Mandate on Labor Markets

Although employer mandates can increase the coverage rate of health insurance and partially resolve market failure in the healthcare sector, the primary concern of employer mandate of health insurance is that it may distort the labor market and negatively affect employment. Employers have incentives to reduce employees' work hours to circumvent the mandate. They may also reduce employees' wages to compensate for the fees to provide health insurance.

Therefore, an important research question is how employer mandates affect the labor market. As pointed out by Gruber (2000), a central challenge to estimating how employer-sponsored health insurance affects the labor market is a selection: "good jobs", i.e., high-paying jobs, are more likely to offer health insurance because employers want to attract good workers who will likely want to obtain health insurance to diversify their incomes. I use exogenous variations from the Affordable Care Act and difference-in-differences analysis to address the selection problem and study how employer mandate affects labor markets. I also use doubly robust difference-in-differences estimator and covariate adjustment to further manage the potential treatment selection: people may select themselves into large or small firms, with or without health insurance. Before we look into the effects on labor market outcomes, let's first study its impacts on employer-sponsored health insurance rates to measure its effectiveness on health insurance expansion.

5.1 Employer Mandate and Health Insurance Coverage Rate

Studying the impacts of the employer mandate on health insurance coverage rate is the "first stage" to studying how employer mandates affect the labor market. I use a difference-in-differences empirical strategy to measure the changes in health insurance coverage rate after the employer mandates. The treated group consists of workers who worked in firms subject to employer mandates one year before the effective date of employer mandates to be consistent with the rule that the Internal Revenue Service (IRS) uses to decide what firms are eligible for employer mandates. Individual mandate, which took effect in 2013, is a potential confounding factor. To remove the effects of the individual mandate, I restrict the sample period to between 2014 and 2016. This means I study employer mandates conditional on the enactment of the individual mandate. To exclude the effects of Small Business Health Care Tax Credits, I use firms with 26-50 full-time employees as the control group because firms with less than 26 full-time employees are eligible for Small Business Health Care Tax Credits. In 2015, firms with more than 100 qualified employees were subject to the employer mandate, and they were treated. In 2016, medium-sized firms (51-100 employees) became treated. Workers who worked in firms with 26 to 50 employees in 2014 and 2015 formed

the control group. This means I use the "never treated" group as the control group. The medium-size firms (51 - 100 employees, "not yet treated" group) have incentives to provide health insurance earlier to maintain good workers, so removing the medium-size employers from the control group when I study the 2015 employer mandate will generate cleaner results.

There are two distinct treatment periods in the analysis. The initial treatment commenced in 2015, involving a treated group consisting of firms with over 100 employees in 2014. The second treatment was initiated in 2016, focusing on a treated group comprising firms with 51 to 100 full-time employees in 2015. To address treatment heterogeneity effectively, I employ a staggered difference-in-differences approach, as suggested by Callaway and Sant'Anna (2021), incorporating multiple time periods. Within each period t, the investigation centers on assessing the average treatment effect of the treated for each treatment group g.

$$ATT(g,t) = \mathbb{E}\left[Y_t - Y_{g-1} | G_g = 1\right] - \mathbb{E}\left[Y_t - Y_{g-1} | C = 1\right] \tag{10}$$

g is the first treatment time, so $g \in \{2015, 2016\}$. $G_g = 1$ if a unit is first treated in period g. The treatment is irreversible. $C = 1$ denotes the control group. I only use the "never treated" group for comparison. The "never treated" group comprises firms with companies of 26 to 50 full-time employees in the years 2014 and 2015. For each treatment group in each period, the regression equation I use to study the effects of employer mandates on employer-sponsored health insurance (ESHI) is

$$\text{ESHI}_{i,j,t} = \beta_0 + \beta \text{EM}_t \times \text{Large}_{j,t'} + \varphi_t + \varepsilon_{i,j,t} \tag{11}$$

i represents individuals. j denotes firm size, i.e., number of employees. And t denotes time. $\text{ESHI}_{i,j,t}$ is a dummy variable that will equal one if the individual is covered by employer-sponsored health insurance. EM_t is a dummy variable denoting whether the employer mandate became effective, i.e., it is one after 2015 for the 2015 mandate and after 2016 for the 2016 mandate. I do not include firm-size-category fixed effects because firm size is the source of variation used to define the treatment and control groups. Including these fixed effects would absorb the identifying variation underlying the treatment assignment. I

also do not include individual fixed effects because, given the annual survey nature of the data, several categorical variables exhibit insufficient within-individual variation over time, limiting the feasibility and informativeness of such specifications. φ_t is time fixed effect. Standard errors clustered at the firm-size level. Following MacKinnon et al. (2023) and Roodman et al. (2019), I use wild bootstrap to calculate the confidence intervals. In equation 11, t' is one year before the employer mandates became effective. Thus treated group consists of workers who worked in the treated firms one year before the employer mandates. The identification assumption of equation 11 is the traditional difference-in-differences assumption. If there were no employer mandate, the ESHI coverage rate would change at the same amount for large firms (treated) and small firms (control).

$$\begin{aligned} ATT(g,t) &= \mathbb{E}\left[Y_t - Y_{g-1} | G_g = 1\right] - \mathbb{E}\left[Y_t - Y_{g-1} | C = 1\right] \\ &= \mathbb{E}\left[Y_t - Y_{g-1} | G_g = 1\right] - \mathbb{E}\left[Y_t - Y_{g-1} | C = 1\right] + \mathbb{E}\left[Y_t^C | G_g = 1\right] - \mathbb{E}\left[Y_t^C | G_g = 1\right] \\ &= \underbrace{\mathbb{E}\left[Y_t - Y_t^C | G_g = 1\right]}_{ATT} + \underbrace{\left(\mathbb{E}\left[Y_t^C - Y_{g-1} | G_g = 1\right] - \mathbb{E}\left[Y_t - Y_{g-1} | C = 1\right]\right)}_{\text{selection bias}} \end{aligned} \tag{12}$$

$G_g = 1$ means the group was first treated in year g. $\mathbb{E}\left[Y_t^C | G_g = 1\right]$ represents the counterfactual: the outcome of an individual who were not treated although the individual was assigned to treated group g. The identification assumption is the selection bias in equation 12 is zero or parallel trends hold for each treated group.

I follow Callaway and Sant'Anna (2021) to aggregate all the group-time average treatment effects:

$$\theta_W^o = \frac{1}{\kappa} \sum_{g \in \mathcal{G}} \sum_{t=2}^{\mathcal{T}} \mathbf{1}\{t \geq g\} ATT(g,t) P(G = g \mid G \leq \mathcal{T}) \tag{13}$$

This method put more weight on groups with larger group sizes. $\kappa = \sum_{g \in \mathcal{G}} \sum_{t=2}^{\mathcal{T}} 1\{t \geq g\} P(G = g \mid G \leq \mathcal{T})$ to ensure the weights sum up to one. $\mathcal{T}$ is December 2016.

Next, I use event study to uncover the dynamics of the treatment effect. I aggregate the treatment effect of all groups in each period e. $e = t - g$, so it is the time that passes since

the treatment.

$$\theta_{es}(e) = \sum_{g \in \mathcal{G}} 1\{g + e \leq \mathcal{T}\} P(G = g \mid G + e \leq \mathcal{T}) ATT(g, g + e) \tag{14}$$

Figure 1 plots the dynamics of employer-sponsored health insurance using raw data. Panel (a) of Figure 1 shows the result of the whole sample. After the 2015 employer mandate, the average ESHI (employer-sponsored health insurance) coverage rate increased from 71.5% to 73.5%. The graph illustrates that the ESHI coverage rate grew after the 2015 employer mandate for the entire sample. There was a decline in the ESHI rate during 2015, and a slight increase in the coverage rate at the beginning of 2016, after the 2016 employer mandate became effective. I use data from the low-income group to plot panel (b), which I will discuss in Section 6.

Figure 2 depicts the average ESHI coverage rate of the full sample and the low-income group by firm size for both the 2015 employer mandate and 2016 employer mandate. In panel (a), during the 2015 employer mandate, the increase in the ESHI coverage rate of the control group (firms with 26 to 50 employees) was similar to the increase in the treated group in which there were more than 100 employees. As explained in the previous paragraph, this may come from the fact that there may be measurement errors because SIPP is a survey data that asks respondents how many workers are in their firms. In panel (b) of Figure 2, after the 2016 employer mandate, the coverage rate of employer-sponsored health insurance of both the treated group (firms with 51 to 100 workers) and control group (firms with 26 to 50 employees) increased. The increase in treated firms was larger, from 84% to 88%. Results are consistent with Table 1 and 2. For the 2015 employer mandate, the increase in the ESHI coverage rate of the treated group was smaller than the control group. As for the 2016 mandate, the magnitude of the increase in the ESHI coverage rate of the treatment group is not very large compared with the control group. We can see potential seam bias in these two raw data plots. In regressions, I control for time fixed effects, so the seam bias issue will be alleviated. Figure 2 plots the raw data and does not consider time fixed effects. Thus the seam bias is more evident in the raw data plots than in the results from regression, which I will discuss in the following paragraph.

Table 5 summarizes how employer mandates affect coverage rates of employer-sponsored health insurance, which are empirical results of equation 13. The first column represents the effects of the employer mandate on the full sample. There are two groups in the estimation. Firms with more than 100 full-time employees in 2014 began to be treated in January 2015. The second treatment group was firms with 51 to 100 full-time employees in 2015. The first treatment time of the second treated group is January 2016. Firms with 26 to 50 full-time employees in the years 2014 and 2015 are in the control group. The aggregate average treatment effects of the treated is 0.05 percentage points. This suggests employer mandates increased employer-sponsored health insurance coverage rate by 0.05 percentage points in the full sample. The increase is not significant.

Figure 4 shows the event study of changes in the ESHI coverage rate of the whole sample. I obtain confidence intervals by wild bootstrap. These are results of equation 14. Consistent with results in Table 5, the mandates increased the ESHI coverage rate. However, the magnitude of the increase is very small in the 2015 employer mandate. Panel (a) shows the event study of the effects in the full sample. There is a noticeable discontinuity one year before treatment. Referring back to Figure 2, Panel (b), this pre-treatment jump in Figure 4, Panel (a), is driven by a decline in ESHI among small firms with 26–50 employees, rather than by earlier adoption of health insurance among medium-sized firms with 51–100 employees. This decline in ESHI among smaller firms may reflect the effects of other ACA provisions, such as the individual mandate or Medicaid expansion. Consequently, these concurrent policy changes may partially explain the relatively modest increase in ESHI coverage attributable to the employer mandate in the full sample. I will discuss panel (b), the event study of low-income group in Section 6. It turns out that employer mandates increase the ESHI coverage rate more in these subsamples. Since we see a more considerable increase in the ESHI coverage rate in the low-income group, the low-income group will be the primary sample I use to study the effects of employer mandates on the labor market. In this section, I will continue to use the whole sample to illustrate empirical strategies.

5.2 Employer Mandate and Labor Market (Intensive Margin)

I begin by examining the intensive margin to investigate the impact of the employer mandate on the labor market. Specifically, I explore how the employer mandate influences wages and hours of work. The dependent variables, denoted as $y_{i,j,t}$, encompass the logarithm of hourly wages, the likelihood of engaging in part-time employment, and hours of work. Equation 15 represents the regression equation applied to each treated group during each period. The probability of working in a part-time job is represented by the dummy variable $1\{\text{work less than 30 hours per week}\}_{i,j,t}$, taking the value of 1 if the individual works less than 30 hours per week in their primary job. Similar to the earlier discussion, EM_t is a dummy variable indicating whether the employer mandate has taken effect (equal to 1 post-mandate). $\text{Large}_{j,t'}$ signifies whether the individual worked for a large treated firm one year before the employer mandates. Furthermore, φ_t captures time fixed effects. As discussed in the previous subsections, I do not include firm-size fixed effects or individual fixed effects, as doing so would absorb all treatment variation. In this specification, standard errors are clustered at the firm-size level and are derived using wild bootstrap methods. Equation 15 serves as the initial model employed to investigate the intensive margin. The identification assumption of this equation rests on the traditional difference-in-differences assumption: in the absence of an employer mandate, the outcome variable would exhibit similar changes for both large firms (treated) and small firms (control).

$$y_{i,j,t} = \beta_0 + \beta \text{EM}_t \times \text{Large}_{j,t'} + \varphi_t + \varepsilon_{i,j,t} \tag{15}$$

To consolidate the treatment effects across various groups and time periods, I use equation 12 for aggregation and conduct an event study utilizing equation 14, as discussed earlier.

The identification assumption means that if there was no employer mandate, the difference in outcome variable should be the same for large and small firms. However, $\text{Large}_{j,t'}$ can be endogenous because individuals who work in large firms may have different characteristics from those who work in small firms. There can be selection bias. To reduce endogeneity issues, I control for differences in baseline covariates. Controlling baseline covariates can

reduce the potential selection of treatment because the treated and control groups will have similar characteristics after matching. We are measuring how employer mandates affect the labor market, conditional on similar characteristics before employer mandates.

To control for baseline covariates, we can conduct propensity score matching explicitly. First I can estimate the likelihood of a person being exposed to treatment based on personal characteristics and outcome variables before the employer mandate. I use the following logistic model to estimate and predict the propensity score. x includes age, gender, race, industry, education, states, and citizenship. I first calculate propensity scores and then match treated observations with the control group with similar propensity scores. After matching, I perform the empirical analysis with the matched sample. For every matched sample, I conduct covariate imbalance tests and make sure that the covariates are balanced.

$$p(x) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x)}} \tag{16}$$

However, there is a nice method to combine propensity score matching and staggered difference-in-differences. Following Sant'Anna and Zhao (2020), I use a doubly robust estimator for the average treatment effect for the treated in difference-in-differences research designs to perform the matching. The doubly robust method combines inverse probability weighting (IPW) based on propensity score modling with outcome regression model(OR). An estimator is doubly robust if it is consistent as long as one of the two models is correctly specified. The estimand is[1]

$$\tau^{dr} = \mathbb{E}\left[\left(w_1(D) - w_0(D, X)\right)\left(\Delta Y - m_{g,t}(X)\right)\right] \tag{17}$$

where for a general $p(\cdot)$,

$$w_1(D) = \frac{D}{\mathbb{E}[D]}, \quad \text{and} \quad w_0(D, X; p) = \frac{p(X)(1-D)}{1-p(X)} / \mathbb{E}\left[\frac{p(X)(1-D)}{1-p(X)}\right]. \tag{18}$$

D denotes treatment. $p(X)$ is the propensity score. Denote $m_{g,t}(X) = \mathbb{E}\left[Y_t - Y_{g-1} \mid X, C = 1\right]$. I adopt the methodology in Callaway and Sant'Anna (2021), and their method allows the

[1]Equations are from Sant'Anna and Zhao (2020).

combination with a doubly robust estimator for the difference-in-differences research design I mentioned above. I first categorize observations in different groups g, based on their treatment time g. Using doubly robust to conditional on the same characteristics before the treatment, the average treatment effect for units in group g at time t with matching is[2]

$$\mathrm{ATT}_{\mathrm{dr}}(g,t) = \mathbb{E}\left[\left(\frac{G_g}{\mathbb{E}\left[G_g\right]} - \frac{\frac{p_g(X)C}{1-p_g(X)}}{\mathbb{E}\left[\frac{p_g(X)C}{1-p_g(X)}\right]}\right)\left(Y_t - Y_{g-1} - m_{g,t}(X)\right)\right] \tag{19}$$

where $m_{g,t}(X) = \mathbb{E}\left[Y_t - Y_{g-1} \mid X, C = 1\right]$, and $G_g + C = 1$. $m_{g,t}(X)$ is the outcome for the control group C.

$$y_{i,j,t} = \beta_0 + \beta \mathrm{EM}_t \times \mathrm{Large}_{j,t'} + X_{i,j,t} + \varphi_t + \varepsilon_{i,j,t} \tag{20}$$

The main specification is staggered difference-in-difference with doubly robust estimators in Equation 19. I also propose a second specification that adjusts covariates to further mitigate pre-trend. Using equation 20, I estimate the average treatment effect for the treated conditional on the characteristics $X_{i,j,t}$. Thus we match the control group and the treated group before based on their characteristics. I include characteristics that may influence future labor market outcomes, such as age, gender, race, change jobs or not, and states. $1\left\{\text{change job}\right\}_i$ is an indicator function of whether the person changed jobs 0 to 12 months before the treatment time and until the end of the sample period. This means we are interested in how employer mandates affect labor market outcomes conditional on the same characteristics and the same job status before the treatment.

The distinction between methodologies, with and without covariate adjustment, lies in the varied estimation of average treatment effects on the treated. In the absence of covariate adjustment, I utilize equation 15 for estimating average treatment effects, while matching employs equation 20. The methods of aggregation remain consistent with those outlined in the previous section, utilizing equations 13 and 14.

Similar to Buchmueller et al. (2011), my results from the whole sample suggest that

[2]Equations are from Callaway and Sant'Anna (2021).

employer mandate does not affect the labor market significantly. Tables 6 and 7 show the impacts of the employer mandate on labor market outcomes. Table 6 shows the baseline results, and Table 7 displays the impacts with covariate adjustment. My main specifications are equation 15 in each treated group and aggregate effects using equation 19 and 13. Figures 5 and 6 display the dynamics of the impact of employer mandates on labor market outcomes in the full sample. Since most results have pre-trend in the baseline specification, I will focus on results with covariate adjustment, which are in Table 7. Results suggest that employer mandate did not have significant impacts on labor market outcomes. Columns (1), (3) and (4) display impacts on extensive margin. Column (1) suggests that hourly wage decreases about \$0.48 after the employer mandate. But overall it is not significant. One last explanation is that wage is sticky, and we will need long-term data to study the real effect. Column (3) shows that the probability of moving to a part-time job (employed and works less than 30 hours per week in the main job) increases by 0.34 percentage points after employer mandates took effect. In the last column, hours of work decreases by 0.499 hours per week after the reform. Results of intensive margin are not significant. I will further study the behaviors of medium-sized firms in the year 2014 in the low-income group to study the gaming of firms in Section 6.

In Figures 5 and 6, Panel (a), (c), and (d) depict the dynamics of wages, the probability of working in a part-time job, and hours of work. Results in Figure 6 are consistent with Table 7: employer mandate increases the probability of working in a part-time job and reduces hours of work, but the results are not significant.

5.3 Employer Mandate and Labor Market (Extensive Margin)

Next, I study how employer mandates affect employment, which is the extensive margin of the labor market. The dependent variable $1\{employed\}_{i,j,t}$ is one if the individual has a job and does not have any time to lay off. It is zero if the person does not have a job for the entire month. Equation 21 is the regression equation for each treatment group. I obtain confidence intervals from wild bootstrap. Standard errors are clustered in firm-size categories, obtained

from wild bootstrap.

$$1\{employed\}_{i,j,t} = \beta_0 + \beta_1 \text{Large}_{j,t'} \times \text{EM}_t + \varphi_t + \varepsilon_{i,j,t}, \tag{21}$$

Column (2) of Tables 6 and 7 show results of employer mandates and employment. Again, Tables 6 shows the result of baseline specification, and Table 7 is the result with covariate adjustment. Employment changes by 0.188 percentage points after the reform. Panels (c) and (d) in Figure 5 depict the same results as Table 6.

To sum up, for the whole sample, the employer mandates have a small impact on the employer-sponsored health insurance coverage rate. If workers worked in large firms and stayed on the job, they would be 0.05 percentage points higher to obtain health insurance than the control group. The employer mandates do not significantly influence the probability of switching to a part-time job and the hours of work. It is possible that employer mandates actually do not have a great impact on the labor market, as suggested by Buchmueller et al. (2011). Since the employer mandates in the ACA do not significantly increase the ESHI coverage rate in the full sample, I further study the low-income sample that encounters a more considerable increase in ESHI coverage rate in the next section.

6 Subgroup Analysis: Heterogeneity of Treatment Effects

In this section, I focus on the low-income population because, prior to the implementation of the employer mandate, this group had substantially lower rates of employer-sponsored health insurance (ESHI) coverage. As a result, they were expected to experience a larger increase in ESHI coverage following the mandate. Examining this subsample therefore provides a useful setting for assessing the effects of the employer mandate on labor market and health outcomes.

6.1 The Low-income Group

Individuals in the low-income bracket exhibited a lower likelihood of having employer-sponsored health insurance before the implementation of employer mandates, as illustrated in Figure 3. Prior to the mandate, workers with hourly wages above the 15th and 50th percentiles had ESHI coverage rates exceeding 50% and 80% respectively. In contrast, individuals earning hourly wages below the 15th percentile had an ESHI coverage rate of approximately 43%. This indicates a significant opportunity for improvement in employer-sponsored health insurance coverage rates within the low-income group. Therefore, I narrow my focus to the low-income cohort to examine how employer mandates impact both coverage rates and the labor market. I define the low-income group as individuals whose hourly wages fall below the 15th percentile but are above zero before the employer mandates. This criterion ensures that the analysis is limited to employed individuals before 2015, as those in transitional phases may have zero earnings but could secure better employment later. Observations with a zero-dollar hourly wage are excluded to maintain the focus on actively employed individuals.

In panel (b) of Figure 1, I plot the low-income group's change in the ESHI coverage rate using raw data. The average ESHI coverage rate increased by around 9 percentage points. This is a larger increase compared with panel (a), the changes in the full sample. Figure 2 depicts the average ESHI coverage rate of the low-income group by firm size for both the 2015 employer mandate and 2016 employer mandate. In panel (c), during the 2015 employer mandate, the ESHI coverage rate of the control group (firms with 26 to 50 employees) did not change. The ESHI coverage rate of large firms in 2015 increased by about 10 percentage points. In panel (b) of Figure 2, after the 2016 employer mandate, the coverage rate of employer-sponsored health insurance of both the treated group (firms with 51 to 100 workers) and control group (firms with 26 to 50 employees) increased, with larger magnitude in the medium-sized firms (51 to 100 workers). Figure 2 plots the raw data and does not consider time fixed effects. Thus the seam bias is more evident in the raw data plots than in the results from regression, which I will discuss in the following paragraph.

First of all, employer mandates stimulated more increase in ESHI coverage rates in the low-income group than the full sample. Column (2) in Table 5 shows the impacts on ESHI

provision rates. If the workers worked for a larger firm and stayed in the same job, they are 9.31 percentage points more likely to obtain employer-sponsored health insurance than those who worked in a small firm. The increase in the ESHI coverage rate of the low-income group is higher than the full sample. This suggests a demand for employer-sponsored health insurance within the low-income group, and the employer mandates successfully stimulate an increase in the ESHI coverage rate. Results are consistent with Figure 2. Panel (b) of Figure 4 depicts changes in ESHI coverage rate among the low-income group. After one year of the enactment of employer mandates, the coverage rate of employer-sponsored health insurance rises even more among the low-income sample. Overall, there was about a 10 percentage point increase in the ESHI coverage rate among the low-income group.

6.2 Labor Market Outcomes

Next, let's study how employer mandates affect the labor market. I first examine the effects on the intensive margin. Tables 8 and 9 display the impact on labor market outcomes. Table 8 studies the results of baseline specification, and Table 9 shows results with covariate adjustment. Although both Tables 8 and 9 suggest that hourly wages may increase after the reform, there are pre-trends in the event study in both Figures 7 and 8. Column (3) in Tables 8 and 9 show the effects on the probability of switching to part-time jobs among the low-income group. In the result with covariate adjustment, the probability for treated workers to work in a part-time job increases by 4.74 percentage points after employer mandates became effective. Results in Figure 8 are consistent with Table 9. The pre-trend testing I use is to perform a Wald χ^2 test of the null hypothesis that all pre-treatment group-time average treatment effects are simultaneously equal to zero. As the critique by Roth (2022), it can suffer from low power in small sample size. Therefore, following Rambachan and Roth (2023), I apply the Honest DiD approach to evaluate how robust the estimated treatment effects are to unobserved post-treatment trends scaled by pre-treatment fluctuations. Figure A.1 shows the honest difference-in-difference with covariate adjustment results for low-income group. Panel (a) suggests that the results of hourly wage is not stable, although it is significant in Table 9. However, Panel (b) of Figure A.1 indicates that the probability of part-time employment

increases following the implementation of employer mandates. This result remains robust even after allowing for an additional 0.5 units of maximum pre-treatment deviation, as the confidence interval for the corresponding blue bar remains above 0. This means that the probability of working less than 30 hours per week in the main job increases after 1 year of treatment. Similarly, in panel (d) of Figure 7, the hours of work per week decreases after the reform. If we combine the results of wages, the probability of a part-time job, and hours of work, we can see that employer mandates potentially may benefit workers who can stay in their full-time jobs because hourly wages may increase. However, workers who are forced to work less hours suffer from this policy.

The impact of employer mandates on employment appears to be insignificant, as evidenced by the findings in columns (2) in Tables 8 and 9. Panel (b) of Figures 7 and 8 further illustrate effects on employment that are close to zero. These outcomes align with the coefficients presented in Table 8. One plausible explanation for the lack of a substantial impact on the probability of employment is that firms seeking to navigate employer mandates may opt for strategies such as reducing work hours or dismissing workers earlier. Consequently, the firms that remain eligible for employer mandates are more willing to provide health insurance. Ideally, I should study how large firms in 2013, before the ACA, reacted to the employer mandate. However, observations in the year 2013 are removed to circumvent confounding with the individual mandate. In later sections, I examine individuals and firms that took actions prior to the enactment of the policy.

In the main specification, the low-income group are defined as those who were employed before 2015 and the hourly wage is below 15 percentile in the full distribution. I use individuals whose wages are below 20 percentile as the robustness check. Table B.1 describes the results of baseline specification, and Table B.2 shows results with covariate adjustment. The ESHI coverage rate increases by 6.49 percentage points for the 20 percentile low-income group. The increase in ESHI coverage rate is lower than the 15 percentile group. Labor market outcomes are similar to the original 15 percentile low-income group: there may be increase in hourly wage, while probability to be in a part-time job increases and hours of work decreases. Dynamics depicted in Figure A.2 are consistent with results in Tables B.2

and B.1 that I just discuss.

6.3 Health Insurance and Health

In preceding sections, it was discussed that hourly wages might increase when employers are compelled to offer health insurance. One possible explanation for employers not passing the entire cost of health insurance to employees is that, if workers experience improved health after obtaining insurance, it could lead to enhanced productivity for the firm. In this section, my focus shifts to investigating whether the provision of health insurance helps with improvements in health.

Using the following regression equation for each treated group, I study how employer mandate affects health. $y_{i,j,t}$ is dependent variables that include self-evaluated health status, number of doctor visists per month, and number of sick days. Like previous sections, EM_t denotes employer mandate, which equals one after the employer mandate became effective. $\text{Large}_{j,t'}$ is a dummy variable which is one if the respondent worked in a larger firm that was subject to employer mandate 0 to 12 months before the employer mandate became effective, where t' is one year before the employer mandate became effective. φ_t is time fixed effects. Standard errors are clustered in firm-size categories level. I use wild bootstrap to obtain the confidence intervals.

$$y_{i,j,t} = \beta_0 + \beta \text{EM}_t \times \text{Large}_{j,t'} + \varphi_t + \varepsilon_{i,j,t} \tag{22}$$

I aggregate the treatment effects using equation 13 and equation 14. Table 10 displays the empirical results for low income group. Columns (1) to (3) display the results of the baseline specification. Columns (4) to (6) are results with covariate adjustment. The health scores range from 1 to 5, and 5 represents the healthiest score. The results of the samples with and without covariate adjustment are similar. After the employer mandates became effective, health scores increased by 0.115 on average. After obtaining employer-sponsored health insurance, workers increase their physician visits by 0.577 visits per month. Consistent with more frequent healthcare utilization, the reported number of sick days also increases by 1.436 days per month. Overall, these findings suggest that employer-sponsored health

insurance encourages greater use of healthcare services and is associated with an improvement in individuals' self-reported health status. Figure 9 depicts the dynamics of impacts of employer mandates on health outcomes in the low-income group. The figure suggest that the improvement in health scores is larger in the low-income group. Overall, employer mandates have positive impacts on low-income workers' health.

6.4 Earlier Employer Insurance Provision

Next, I examine whether firms offered health insurance before they were required to do so under the employer mandate and assess the effects of early provision on labor market and health outcomes. Because the individual mandate took effect in 2013, I exclude observations from that year. The analysis therefore focuses on medium-sized firms with 51 to 100 full-time employees in 2014 and 2015. Under the employer mandate, these firms were not required to offer health insurance until 2016. Nevertheless, some firms may have chosen to provide coverage before the mandate became binding in order to compete with larger firms for workers and improve employee retention. In Figure 2, when we compare panel (b), impacts of the 2016 mandate on the ESHI coverage rate in the full sample, and panel (d), impacts on the ESHI coverage rate in the low-income group in Figure 2, we notice that the blue line of treated group is flat before the year 2016. However, there was a rise in the ESHI coverage rate in 2015 in the low-income group in panel (d). This implies workers who were in the low-income group potentially received ESHI earlier than the mandate. In Figure A.3, I define the treated group to be firms with more than 50 full-time employees and the treatment time to be January in the year 2015. In panel (a), there was no effect on the ESHI coverage rate in the first year because medium-size firms (51 to 100 full-time employees) responded to the employer mandate in year 2016 in the full sample: they did not provide employer-sponsored health insurance earlier. However, we see an increase in ESHI immediately in panel (b) of A.3. This suggests some medium-sized firms in the low-income group provided ESHI earlier. These results are consistent with panel (b) and (d) in Figure 2. Thus, I will focus on the low-income group to study the impacts of earlier provisions on labor market outcomes.

Figure A.4 displays dynamics of labor market outcomes in low-income group after I

consider medium-sized firms may provide ESHI earlier than the employer mandate. Results are very similar to Figure 7: hourly wage increases, no significant changes in employment, probability to switch to part-time jobs and hours of work. Results in Table B.3 are consistent with the dynamics in Figures A.3 and A.4. The results mentioned above suggest that there may be some earlier ESHI providers among the low-income group. However, impacts on labor market outcomes remain the same even if some medium-sized firms provide insurance earlier.

Table B.4 and Figure A.5 report the estimated effects of the employer mandate on health outcomes after allowing for the possibility that some employers provided health insurance before the mandate took effect. Although the estimated impacts on labor market outcomes remain statistically insignificant, workers experience improvements in health outcomes under this specification. These findings are consistent with the main results in Table 10 and Figure 9: the employer mandate increases doctor visits, which are accompanied by improvements in self-reported health scores.

In summary, the increase in employer-sponsored health insurance (ESHI) coverage is more pronounced among low-income workers than in the overall sample. Within the low-income cohort, the findings provide suggestive evidence that, in response to employer mandates, firms may adjust labor demand primarily by reducing employees' work hours rather than by implementing layoffs. Employer mandates significantly increase ESHI coverage rates among low-income workers and are associated with improvements in their health outcomes. However, while these mandates benefit low-income workers who retain full-time employment—through increased access to health insurance and higher hourly wages—they also increase the likelihood that some workers transition into part-time positions. As a result, employer mandates may generate heterogeneous effects across workers and potentially contribute to greater income inequality within the labor market.

6.5 Placebo Tests

Massachusetts and Hawaii are two states that are potentially suitable for placebo tests. However, as mentioned in Section 2, Massachusetts eliminated Massachusetts' employer mandate

and adopted the ACA, which may change the labor market outcomes. So samples in Massachusetts are not appropriate to be used as the placebo test. I tried using data from Hawaii for placebo tests. However, there are very few observations in the sample. (276 observations in total.) The very few observations cause collinearity and lead to the issue that critical coefficients are omitted.

7 Conclusion and Discussion

The employer mandate represents a potential policy instrument for expanding health insurance coverage in the United States, where approximately half of the population receives health insurance through employer-sponsored plans. However, employer mandates may also generate labor market distortions by increasing labor costs and affecting firms' employment decisions. This paper examines how the employer mandates implemented under the Affordable Care Act (ACA) affected employer-sponsored health insurance (ESHI) coverage and labor market outcomes.

Using staggered difference-in-differences and doubly robust difference-in-differences research designs, I find limited evidence that employer mandates increased ESHI coverage in the full sample. Consistent with the high baseline level of ESHI coverage among workers, I also find little evidence that employer mandates generated significant labor market effects for the overall population.

Since the overall increase in ESHI coverage is limited, I further investigate a subgroup that was more likely to be affected by the policy: low-income workers. These workers had substantially lower ESHI coverage rates before the implementation of employer mandates. Among this group, employer mandates increased ESHI coverage by approximately 9.31 percentage points, a statistically significant effect. Following increased access to employer-sponsored health insurance, low-income workers experienced improvements in self-reported health status and increased utilization of medical care, as measured by doctor visits. Consistent with the conceptual framework, hourly wages increased after the implementation of employer mandates, suggesting that improved health and productivity may partially offset the additional

labor costs associated with providing health insurance.

However, the results also provide evidence of potential labor market adjustments. Employer mandates reduced hours of work and increased the probability of transitioning into part-time employment among affected workers, although I find no significant evidence of employment reductions among either firms subject to the mandate or firms that could potentially avoid the mandate. These findings suggest that firms may respond to employer mandates primarily by adjusting employment structures, such as shifting workers toward part-time positions, rather than reducing employment through layoffs. As a result, workers who retain full-time positions benefit from increased health insurance coverage, improved health outcomes, and potentially higher wages, while some workers may experience reductions in work hours and transitions into part-time employment. These heterogeneous effects suggest that employer mandates may unintentionally widen inequality among workers with different levels of labor market attachment and substitutability.

Overall, the findings indicate that employer mandates can effectively expand ESHI coverage among workers with previously limited access to employer-sponsored insurance and may generate long-term benefits through improved health and productivity. However, policymakers should consider potential labor market responses when designing such policies, particularly reductions in hours of work among vulnerable workers. Alternative approaches, such as Medicaid expansion and subsidies for individual health insurance purchases, may achieve coverage expansion while creating fewer incentives for firms to adjust employment structures.

Finally, this study is subject to several limitations. Measurement error and seam bias in survey data may affect the precision of estimated effects. Future research using more accurate administrative data would allow for a more comprehensive evaluation of the welfare effects of employer mandates, including the trade-off between improved health insurance access and potential labor market distortions.

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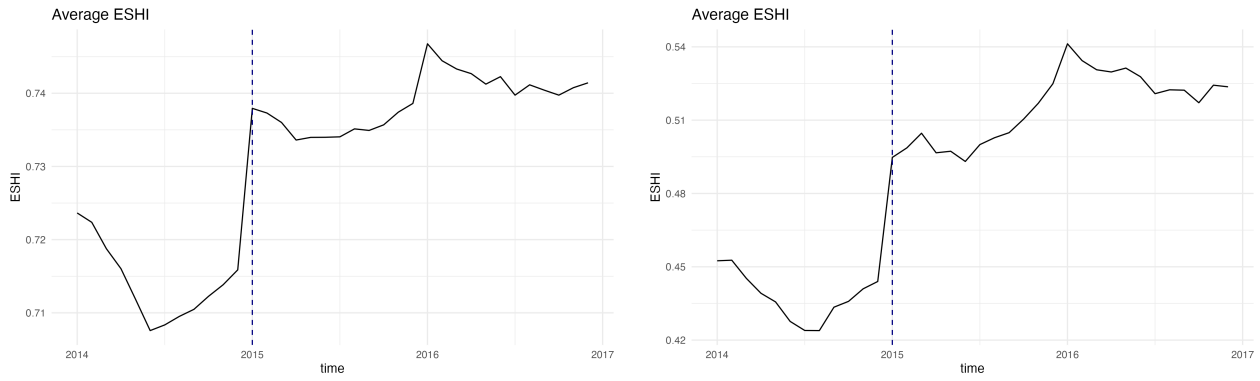
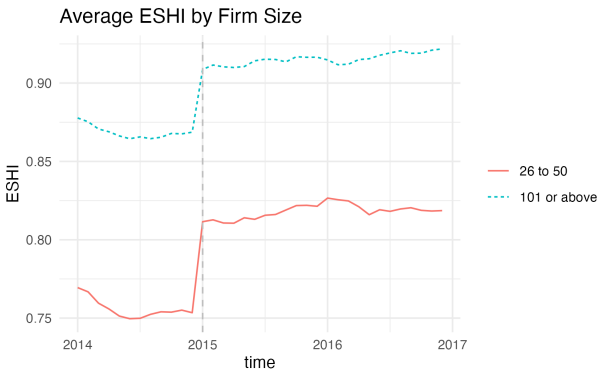
Figure 1: Impact of employer mandate on employer-sponsored health insurance



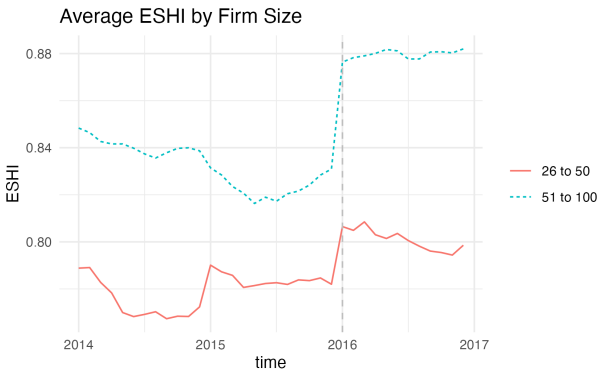
(a) Full sample (b) Low-income group

Notes: The vertical axis represents average ESHI coverage rate. The dash line represents the effective time of the 2015 employer mandate in the Affordabe Care Act. In panel (a), the sample contains observations that are covered by private health insurance and the uninsured. I remove observations in Massachusetts, Hawaii, Puerto Rico and Island Areas, and foreign countries. I also remove observations who are always unemployed and below 26 years old. Self-employers are also not in the sample. The sample in panel (b) is based on panel (a), with restriction to low-income group. People whose hourly wage was below the 15th percentile before the employer mandate became effective are in the low-income group. This definition is based on Figure 3.

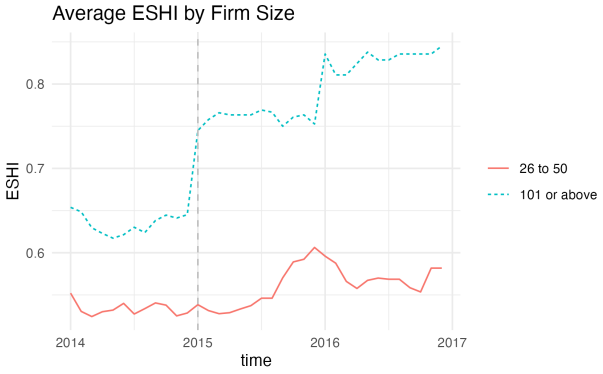
Figure 2: Impact of employer mandate on employer-sponsored health insurance



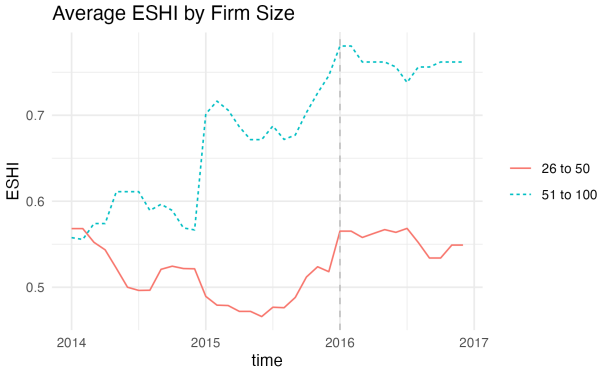
(a) Impacts of 2015 mandate (full sample)



(b) Impacts of 2016 mandate (full sample)



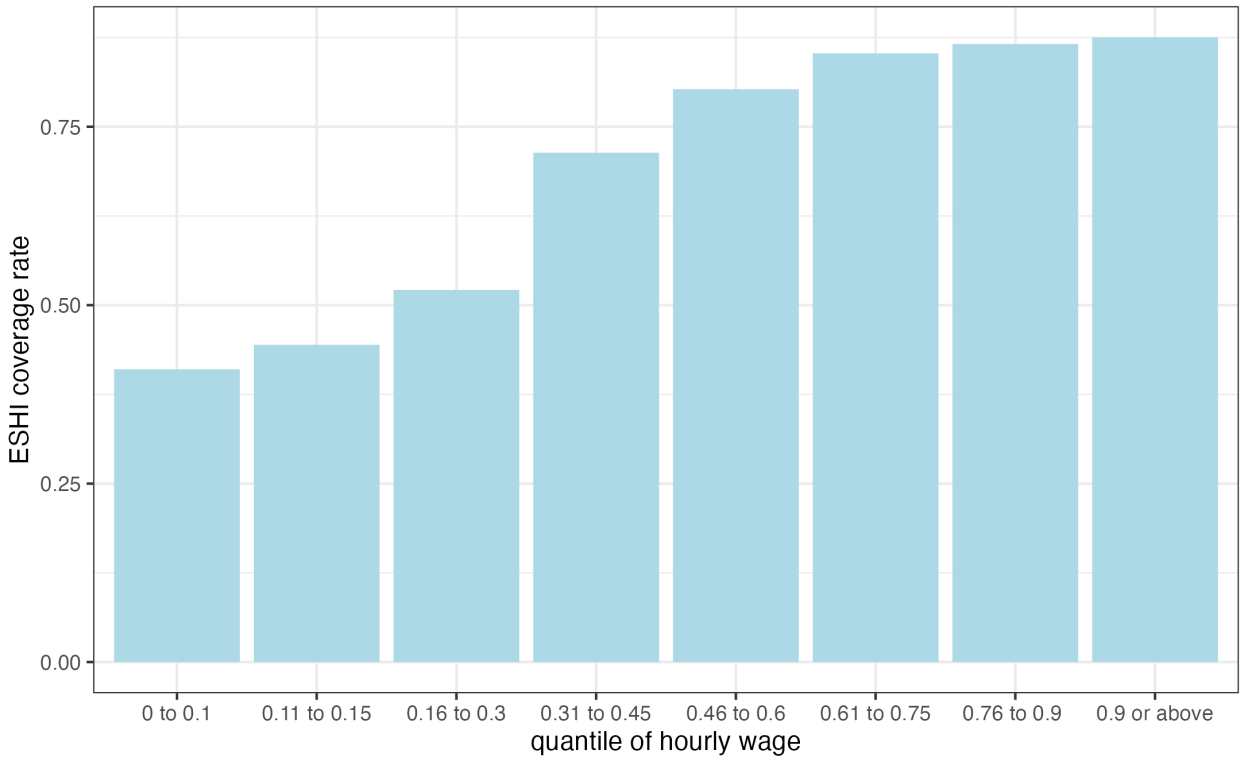
(c) Impacts of 2015 mandate (low-income group)



(d) Impacts of 2016 mandate (low-income group)

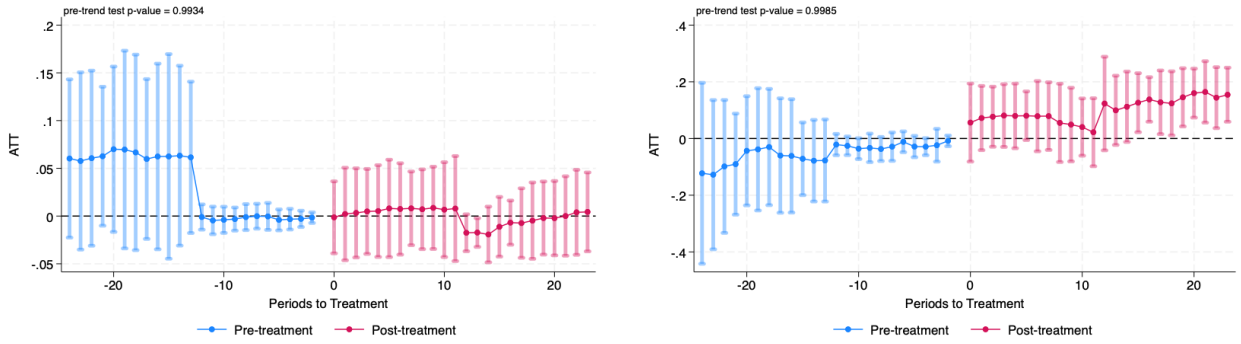
Notes: I plot the average ESHI coerage rate of low-income group by different firm-size categories. I use number of employees in the firm of respondent's main job to represent firm size. In panel (a), the firm size is the number of employees of the firm where the worker worked in 2014. This is to match the policy of Internal Revenue Service, because IRS assesses whether firms should pay penalty based on the firm size one year before the reporting year. Similarly, the firm size in panel (b) is the number of employees of the firm where the worker worked in 2015. Panel (a) and (b) are plots of full sample, while panel (c) and (d) are low-income group.

Figure 3: Wages and ESHI coverage rates before 2015



Notes: The horizontal axis represents bins of hourly wage in percentiles. The vertical axis represents average ESHI coverage rate in 2014, i.e., before the time when the early employer mandate became effective. The sample I use is the full sample, in which I include individuals covered by private health insurance and the uninsured. I remove observations in Massachusetts, Hawaii, Puerto Rico and Island Areas, and foreign countries. I also remove observations who are always unemployed and below 26 years old. Self-employers are not in the sample.

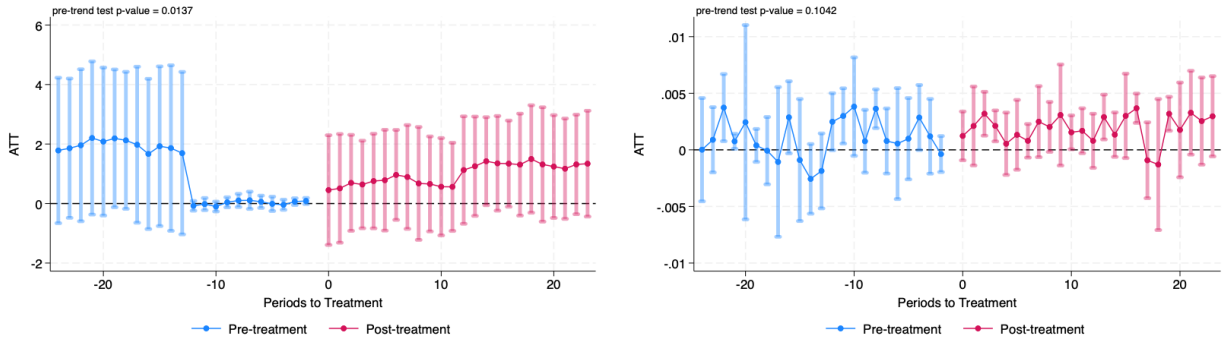
Figure 4: Dynamics of impact of employer mandate on employer-sponsored health insurance



(a) Full sample (b) Low-income group

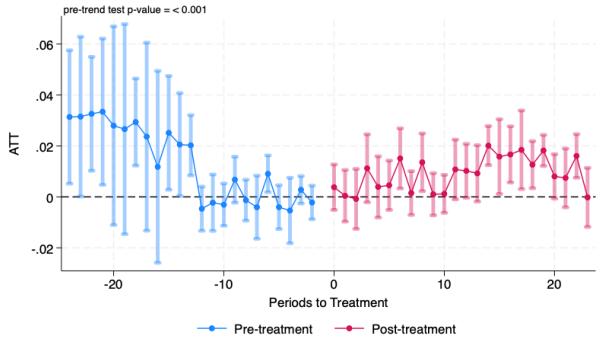
Notes: This figure plots event study of ESHI in the full sample and low-income group respectively. Panel (a) represents the effect of employer mandates on ESHI in the full sample. Individuals who worked in firms with more than 100 employees in 2014 are treated, starting from year 2015. Workers who worked in firms with 26 to 50 employees in 2014 and 2015 are in the control group. Individuals who worked in firms with 51 to 100 employees in 2015 are treated in 2016. Panel (b) shows the effects on low-income group.

Figure 5: Dynamics of impact of employer mandate on labor market outcomes (full sample)

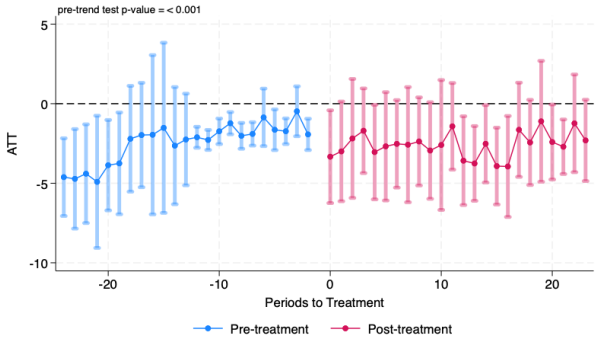


(a) Hourly wage

(b) Employment



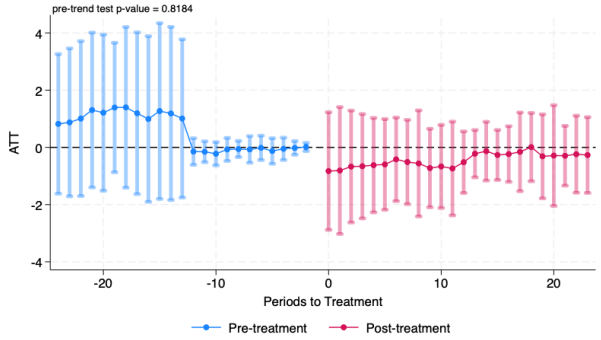
(c) Part-time job



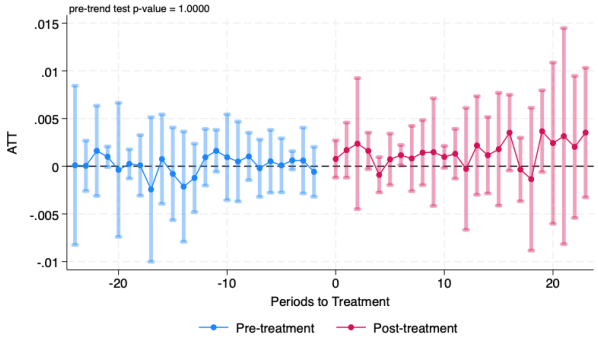
(d) Hours of work

Notes: The vertical axis represents the average treatment effect for the treated, which is the impact of the the employer mandate on labor market outcomes for the full sample. Individuals who worked in firms with more than 100 employees in 2014 are treated, starting from year 2015. Workers who worked in firms with 26 to 50 employees in 2014 and 2015 are in the control group. Individuals who worked in firms with 51 to 100 employees in 2015 are treated in 2016. Panel (a) plots the dynamics of hourly wage. Panel (c) depicts the dynamics of employment. Panel (e) shows the dynamics of part-time jobs. "Part-time" job is a dummy variable that is equal to one if the worker is employed and works less than 30 hours per week in his or her main job. Panel (g) plots the dynamics of hours of work.

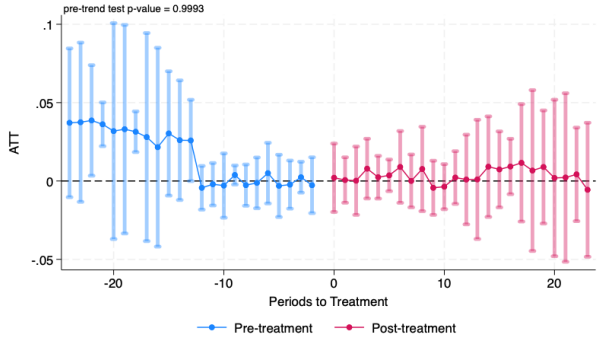
Figure 6: Dynamics of impact of employer mandate on labor market outcomes (full sample, covariate adjusted)



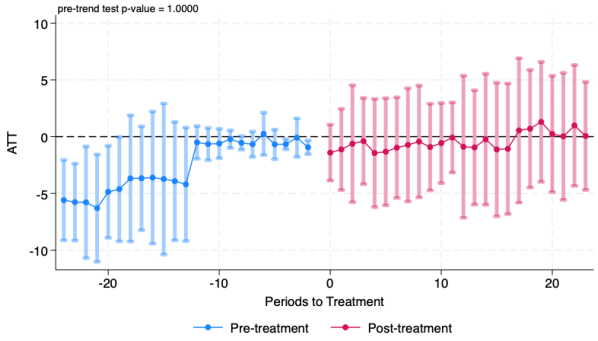
(a) Hourly wage (controled)



(b) Employment (controled)



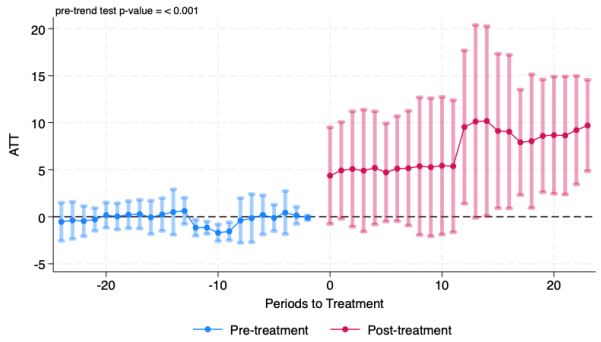
(c) Part-time job (controled)



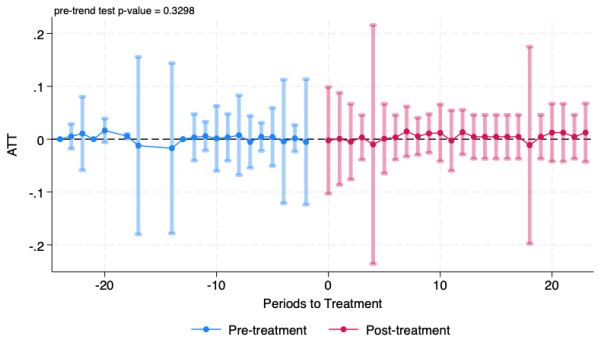
(d) Hours of work (controled)

Notes: I use covariate-adjusted specification. The vertical axis represents the average treatment effect for the treated, which is the impact of the the employer mandate on labor market outcomes for the full sample. Individuals who worked in firms with more than 100 employees in 2014 are treated, starting from year 2015. Workers who worked in firms with 26 to 50 employees in 2014 and 2015 are in the control group. Individuals who worked in firms with 51 to 100 employees in 2015 are treated in 2016. Panel (a) plots the dynamics of hourly wage. Panel (b) depicts the dynamics of employment. Panel (c) shows the dynamics of part-time jobs. "Part-time" job is a dummy variable that is equal to one if the worker is employed and works less than 30 hours per week in his or her main job. Panel (d) plots the dynamics of hours of work.

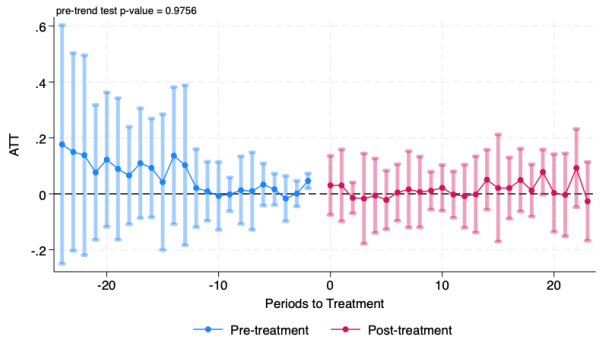
Figure 7: Dynamics of impact of employer mandate on labor market outcomes (low-income group)



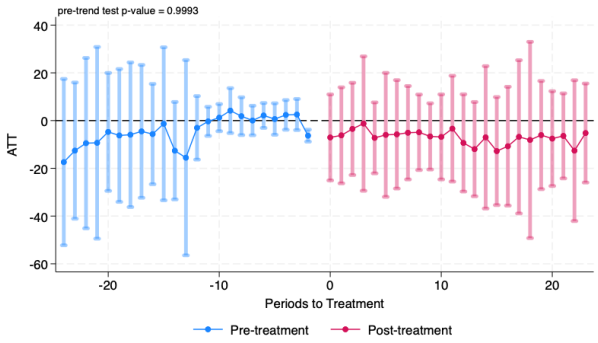
(a) Hourly wage



(b) Employment



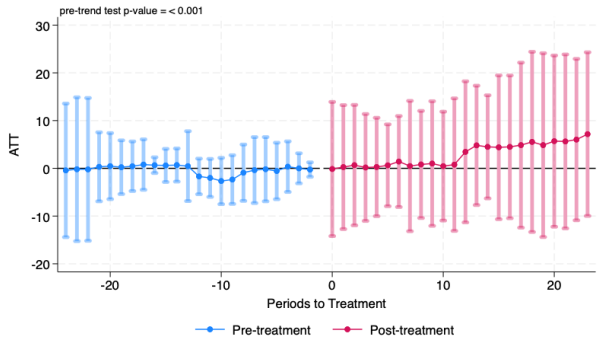
(c) Part-time job



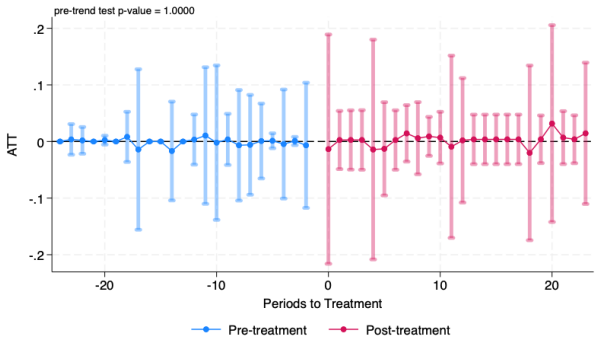
(d) Hours of work

Notes: The vertical axis represents the average treatment effect for the treated, which is the impact of the the employer mandate on labor market outcomes for the low-income group. Individuals who worked in firms with more than 100 employees in 2014 are treated, starting from year 2015. Workers who worked in firms with 26 to 50 employees in 2014 and 2015 are in the control group. Individuals who worked in firms with 51 to 100 employees in 2015 are treated in 2016. Panel (a) plots the dynamics of hourly wage. Panel (b) depicts the dynamics of employment. Panel (c) shows the dynamics of part-time jobs. "Part-time" job is a dummy variable that is equal to one if the worker is employed and works less than 30 hours per week in his or her main job. Panel (d) plots the dynamics of hours of work.

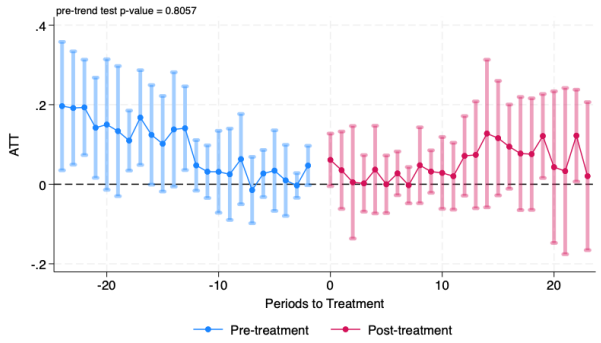
Figure 8: Dynamics of impact of employer mandate on labor market outcomes (low-income group, covariate adjusted)



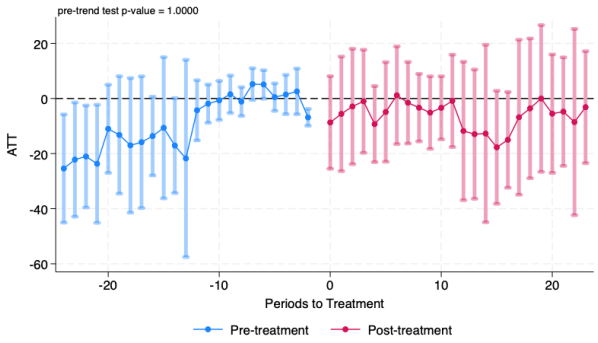
(a) Hourly wage (controled)



(b) Employment (controled)



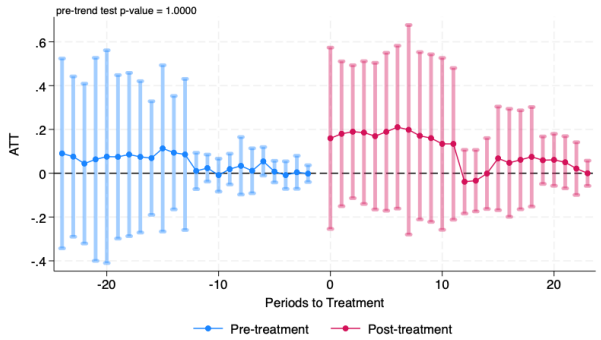
(c) Part-time job (controled)



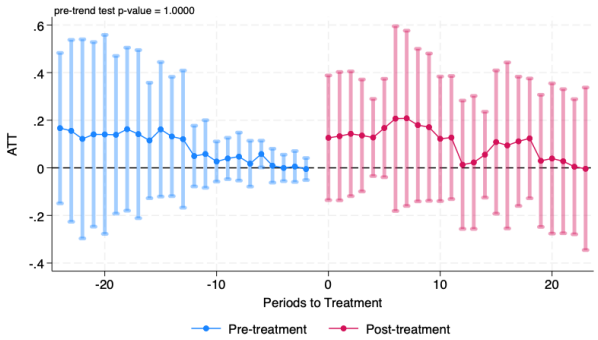
(d) Hours of work (controled)

Notes: I use covariate-adjusted specification. The vertical axis represents the average treatment effect for the treated, which is the impact of the the employer mandate on labor market outcomes for the low-income group. Individuals who worked in firms with more than 100 employees in 2014 are treated, starting from year 2015. Workers who worked in firms with 26 to 50 employees in 2014 and 2015 are in the control group. Individuals who worked in firms with 51 to 100 employees in 2015 are treated in 2016. Panel (a) plots the dynamics of hourly wage. Panel (b) depicts the dynamics of employment. Panel (c) shows the dynamics of part-time jobs. "Part-time" job is a dummy variable that is equal to one if the worker is employed and works less than 30 hours per week in his or her main job. Panel (d) plots the dynamics of hours of work.

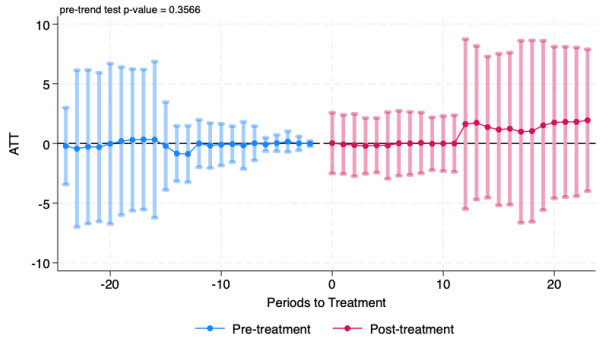
Figure 9: Dynamics of impact of employer mandate on health outcomes (low-income group)



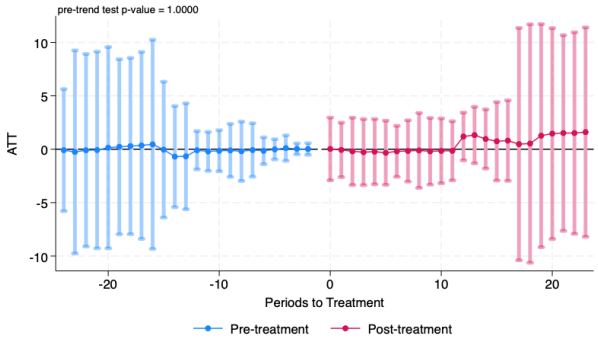
(a) Health score



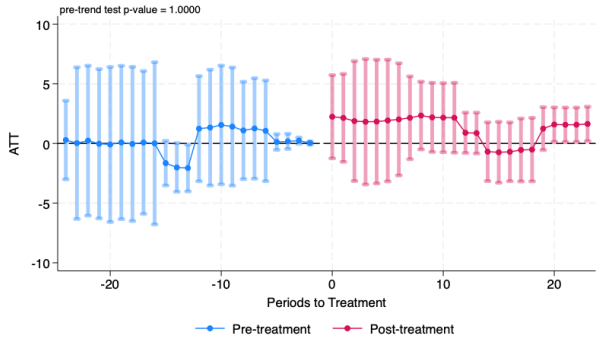
(b) Health score (controled)



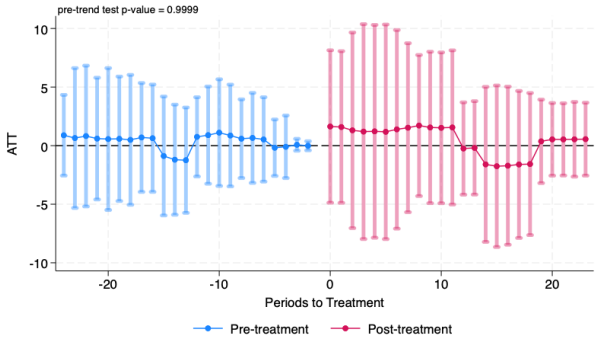
(c) Doctor visists



(d) Doctor visists (controled)



(e) Sick days



(f) Sick days (controled)

Notes: The vertical axis represents the average treatment effect for the treated, which is the impact of the the employer mandate on health outcomes for the low-income group. Individuals who worked in firms with more than 100 employees in 2014 are treated, starting from year 2015. Workers who worked in firms with 26 to 50 employees in 2014 and 2015 are in the control group. Individuals who worked in firms with 51 to 100 employees in 2015 are treated in 2016. Panel (a) and (b) plot the dynamics of health score. I use covariate-adjusted specification in panel (b). Panel (c) and (d) show the dynamics of number of doctor visits. I use covariate-adjusted specification in panel (d). Panel (e) and (f) show the dynamics of number of sick days. I use covariate-adjusted specification in panel (f).

Table 1: Summary Statistics: 2015 Employer Mandate

	Full population		Large		Small		Large-Small
	Before	After	Before	After	Before	After	After-Before
wage	3986.575	4188.105	5210.844	5736.794	3991.618	4527.289	-9.722
wage rate	22.580	23.710	28.187	31.239	22.045	25.180	-0.084
hours of work	168.565	168.854	180.598	179.734	175.622	175.236	-0.478
age	45.420	45.658	45.223	46.682	44.629	46.100	-0.011
employment	0.998	0.998	0.998	0.999	0.997	0.998	0.000
part time	0.111	0.112	0.025	0.040	0.044	0.062	-0.003
health	4.282	4.261	4.315	4.268	4.282	4.235	0.000
medical appointments	3.745	3.996	3.921	4.319	3.644	4.073	-0.030
sick days	2.784	2.891	2.669	2.587	2.925	2.794	0.049
ESHI	0.714	0.739	0.869	0.915	0.756	0.818	-0.015

Notes: This table reports summary statistics of the treatment group and control group in the 2015 employer mandate. The sample I use is the full sample. Treated group consists of workers who work for firms with more than 100 employees in 2014. Workers who worked for firms with 26 to 50 employees in 2014 form the control group. Column (1) and (2) represent the sample with treated group and control group before and after treatment respectively. Column (3) and (4) show summary statistics of the treated group, and column (5) and (6) display the statistics of the control group. The last column represents difference-in-differences.

Table 2: Summary Statistics: 2016 Employer Mandate

	Full population		Large		Small		Large-Small
	Before	After	Before	After	Before	After	After-Before
wage	4042.872	4274.367	4413.466	4821.524	4266.905	4452.447	222.517
wage rate	22.909	24.160	24.247	25.992	23.582	24.753	0.574
hours of work	168.715	168.800	177.650	179.572	176.641	175.989	2.573
age	45.550	45.597	44.769	45.458	44.618	45.253	0.054
employment	0.998	0.998	0.998	0.999	0.997	0.998	0.001
part time	0.111	0.113	0.043	0.041	0.050	0.054	-0.006
health	4.272	4.263	4.303	4.296	4.289	4.259	0.023
medical appointments	3.827	4.073	3.697	4.143	3.775	4.018	0.203
sick days	2.789	3.002	2.293	2.578	2.486	2.356	0.415
ESHI	0.724	0.742	0.831	0.880	0.779	0.801	0.027

Notes: This table reports summary statistics of the treatment group and control group in the 2016 employer mandate. The sample I use is the full sample. Treated group consists of workers who work for firms with 51 to 100 employees in 2015. Workers who worked for firms with 26 to 50 employees in 2015 form the control group. Column (1) and (2) represent the sample with treated group and control group before and after treatment respectively. Column (3) and (4) shows summary statistics of the treated group, and column (5) and (6) display the statistics of the control group. The last column represents difference-in-differences.

Table 3: Summary Statistics: 2015 Employer Mandate (Low-income Group)

	Full population		Large		Small		Large-Small
	Before	After	Before	After	Before	After	After-Before
wage	1129.697	2350.428	1406.431	4016.334	1155.372	2412.792	1352.484
wage rate	7.571	14.759	8.250	23.214	7.565	14.612	7.916
hours of work	148.929	152.178	166.522	164.334	154.337	155.418	-3.269
age	44.088	45.860	45.566	47.015	41.124	43.817	-1.244
employment	0.996	0.997	0.996	0.996	0.996	0.996	0.001
part time	0.245	0.211	0.099	0.095	0.130	0.154	-0.029
health	4.106	4.084	4.059	4.131	4.213	4.077	0.207
medical appointments	3.235	3.825	3.327	4.331	3.008	3.504	0.507
sick days	3.200	3.559	3.336	2.119	5.334	3.104	1.012
ESHI	0.438	0.514	0.635	0.791	0.534	0.561	0.129

Notes: This table reports summary statistics of the treatment group and control group in the 2015 employer mandate for the low-income group. Treated group consists of workers who work for firms with more than 100 employees in 2014. Workers who worked for firms with 26 to 50 employees in 2014 form the control group. Column (1) and (2) represent the sample with treated group and control group before and after treatment respectively. Column (3) and (4) shows summary statistics of the treated group, and column (5) and (6) display the statistics of the control group. The last column represents difference-in-differences.

Table 4: Summary Statistics: 2016 Employer Mandate (Low-income Group)

	Full population		Large		Small		Large-Small
	Before	After	Before	After	Before	After	After-Before
wage	1527.227	2546.606	1730.710	2796.230	1736.389	2694.974	106.935
wage rate	9.947	15.791	10.778	15.899	10.610	15.331	0.400
hours of work	148.683	157.078	159.506	169.457	155.723	168.127	-2.453
age	44.687	46.071	45.170	44.980	42.841	44.770	-2.120
employment	0.996	0.998	0.994	1.000	0.995	0.997	0.004
part time	0.240	0.184	0.141	0.056	0.157	0.091	-0.019
health	4.093	4.100	4.155	4.213	4.001	4.072	-0.012
medical appointments	3.391	4.039	4.060	4.325	2.759	3.095	-0.072
sick days	3.190	4.041	2.775	2.543	1.871	4.219	-2.579
ESHI	0.462	0.527	0.645	0.762	0.512	0.555	0.073

Notes: This table reports summary statistics of the treatment group and control group in the 2016 employer mandate for the low-income group. Treated group consists of workers who work for firms with 51 to 100 employees in 2015. Workers who worked for firms with 26 to 50 employees in 2015 form the control group. Column (1) and (2) represent the sample with treated group and control group before and after treatment respectively. Column (3) and (4) shows summary statistics of the treated group, and column (5) and (6) display the statistics of the control group. The last column represents difference-in-differences.

Table 5: Employer Mandates and Employer-sponsored Health Insurance

	(1) Full sample	(2) Low-income group
ATT	0.0005	0.0931***
	(0.0100)	(0.0349)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: Confidence intervals obtained from wild bootstrap in parentheses. Results clustered in firm-size level. The first column represents impacts of employer mandates on ESHI coverage rate for the full sample. The control group for the first column consists of workers who worked in firms with 26 to 50 employees in 2014 and 2015. The treatment group consists of workers who worked for firms with more than 100 employees in 2014 and more than 50 employees in year 2015. The second column represents impacts of employer mandates on ESHI coverage rate for the low-income group.

Table 6: Employer Mandates and labor market outcomes (full sample)

	(1) hourly wage	(2) employment	(3) part-time	(4) hours of work
ATT	0.938**	0.00188***	0.00849***	-2.575***
	(0.390)	(0.000416)	(0.00312)	(0.961)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: Confidence intervals obtained from wild bootstrap in parentheses. Results clustered in firm-size level. The control group for the first column consists of workers who worked in firms with 26 to 50 employees in 2014 and 2015. The treatment group consists of workers who worked for firms with more than 100 employees in 2014 and more than 50 employees in year 2015. I use full sample in the estimation of this table. The first column represents impacts of employer mandates on hourly wage. The second column represents impacts of employer mandates on employment. The third column represents impacts of employer mandates on part-time jobs. The last column is the effects on hours of work.

Table 7: Employer Mandates and labor market outcomes (full sample, covariate adjusted)

	(1) hourly wage	(2) employment	(3) part-time	(4) hours of work
ATT	-0.480	0.00139***	0.00335	-0.499
	(0.362)	(0.000215)	(0.00439)	(1.280)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows results with covariate adjustment. Confidence intervals obtained from wild bootstrap in parentheses. Results clustered in firm-size level. The control group for the first column consists of workers who worked in firms with 26 to 50 employees in 2014 and 2015. The treatment group consists of workers who worked for firms with more than 100 employees in 2014 and more than 50 employees in year 2015. I use full sample in the estimation of this table. The first column represents impacts of employer mandates on hourly wage. The second column represents impacts of employer mandates on employment. The third column represents impacts of employer mandates on part-time jobs. The last column is the effects on hours of work.

Table 8: Employer Mandates and labor market outcomes (low-income group)

	(1) hourly wage	(2) employment	(3) part-time	(4) hours of work
ATT	6.703***	0.00406	0.0127	-6.707
	(1.375)	(0.00290)	(0.0210)	(6.453)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: Confidence intervals obtained from wild bootstrap in parentheses. Results clustered in firm-size level. The control group for the first column consists of workers who worked in firms with 26 to 50 employees in 2014 and 2015. The treatment group consists of workers who worked for firms with more than 100 employees in 2014 and more than 50 employees in year 2015. The sample in this table is the low-income group. The first column represents impacts of employer mandates on hourly wage. The second column represents impacts of employer mandates on employment. The third column represents impacts of employer mandates on part-time jobs. The last column shows effects on hours of work.

Table 9: Employer Mandates and labor market outcomes (low-income group, covariate adjusted)

	(1) hourly wage	(2) employment	(3) part-time	(4) hours of work
ATT	2.390*	0.00191	0.0474**	-5.706
	(1.263)	(0.00171)	(0.0206)	(7.246)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows results with covariate adjustment. Confidence intervals obtained from wild bootstrap in parentheses. Results clustered in firm-size level. The control group for the first column consists of workers who worked in firms with 26 to 50 employees in 2014 and 2015. The treatment group consists of workers who worked for firms with more than 100 employees in 2014 and more than 50 employees in year 2015. The sample in this table is the low-income group. The first column represents impacts of employer mandates on hourly wage. The second column represents impacts of employer mandates on employment. The third column represents impacts of employer mandates on part-time jobs. The last column shows effects on hours of work.

Table 10: Employer Mandates and health outcomes (low-income group)

	(1) Health score	(2) Doctor visits	(3) Sick days	(4) Health score	(5) Doctor visits	(6) Sick days
ATT	0.115*	0.577*	1.436*	0.112	0.355	0.650
	(0.0675)	(0.311)	(0.848)	(0.0728)	(0.530)	(1.527)
controled				Y	Y	Y

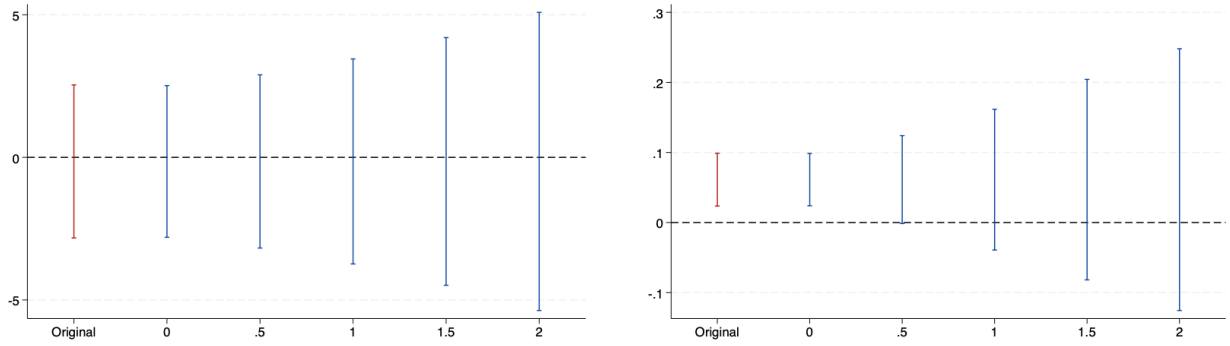
Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: Confidence intervals obtained from wild bootstrap in parentheses. Results clustered in firm-size level. The control group for the first column consists of workers who worked in firms with 26 to 50 employees in 2014 and 2015. The treatment group consists of workers who worked for firms with more than 100 employees in 2014 and more than 50 employees in year 2015. The first column represents impacts of employer mandates on health score in low-income group. Columns (2) and (3) represent effects on number of medical appointment and sick days. I use covariate adjustment in columns (4) to (6).

A Additional Figures

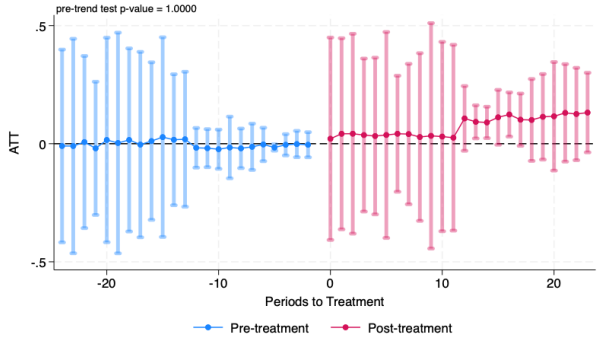
Figure A.1: Honest difference-in-difference (low-income group, covariate adjusted)



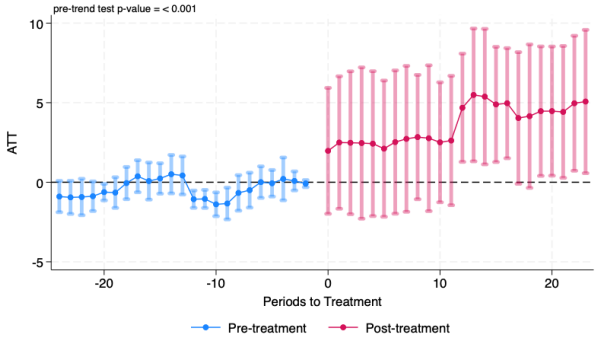
(a) Hourly wage (b) Part-time job

Notes: This figure shows results of honest difference-in-difference for low-income group with covariate adjustment. The vertical axis represents the average treatment effect for the treated, which is the impact of the the employer mandate on labor market outcomes for the low-income group. Individuals who worked in firms with more than 100 employees in 2014 are treated, starting from year 2015. Workers who worked in firms with 26 to 50 employees in 2014 and 2015 are in the control group. Individuals who worked in firms with 51 to 100 employees in 2015 are treated in 2016. Panel (a) plots the dynamics of hourly wage. Panel (b) shows the dynamics of part-time jobs. "Part-time" job is a dummy variable that is equal to one if the worker is employed and works less than 30 hours per week in his or her main job.

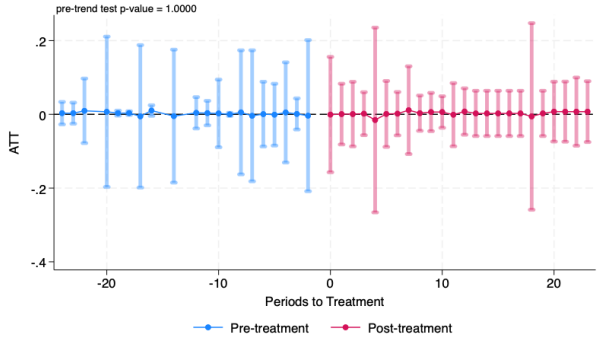
Figure A.2: Dynamics of impact of employer mandate on labor market outcomes (low-income group, 20 percentile)



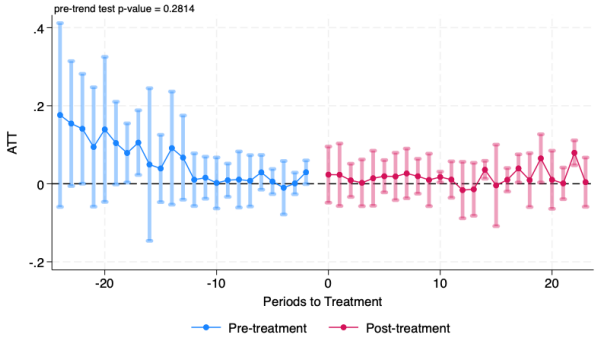
(a) ESHI coverage



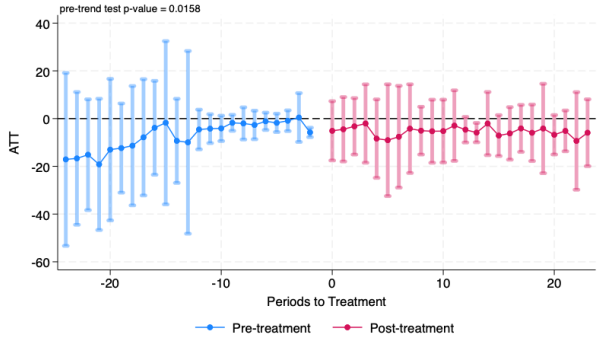
(b) Hourly wage



(c) Employment



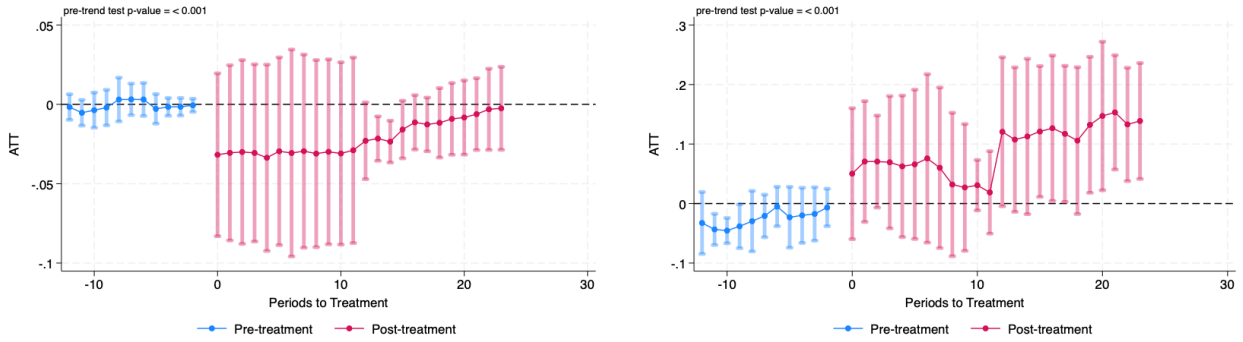
(d) Part-time job



(e) Hours of work

Notes: This figure presents the results for the low-income group, defined as the bottom 20th percentile of the wage distribution. The vertical axis represents the average treatment effect for the treated, which is the impact of the the employer mandate on health outcomes for the low-income group. Individuals who worked in firms with more than 100 employees in 2014 are treated, starting from year 2015. Workers who worked in firms with 26 to 50 employees in 2014 and 2015 are in the control group. Individuals who worked in firms with 51 to 100 employees in 2015 are treated in 2016. Panel (a) plots the dynamics of employer-sponsored health insurance coverage. Panel (b) plots the dynamics of hourly wage. Panel (c) depicts the dynamics of employment. Panel (d) shows the dynamics of part-time jobs. "Part-time" job is a dummy variable that is equal to one if the worker is employed and works less than 30 hours per week in his or her main job. Panel (e) plots the dynamics of hours of work.

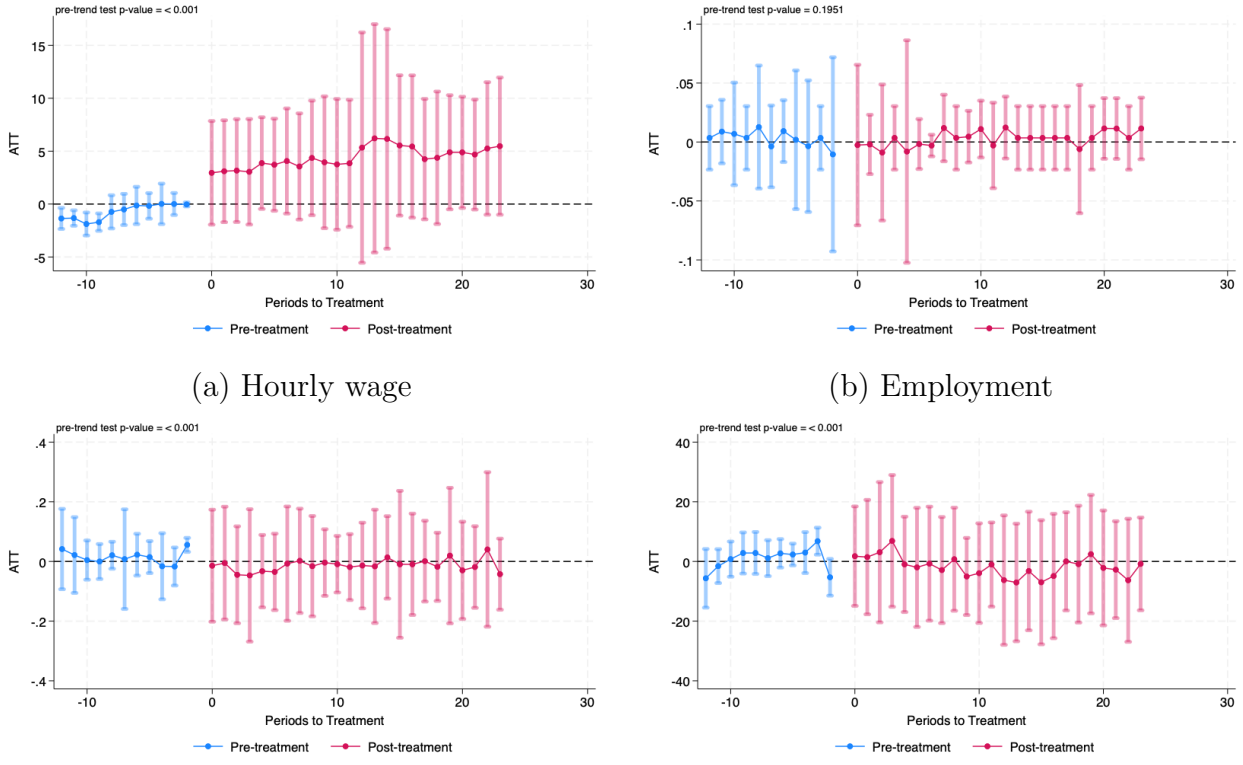
Figure A.3: Dynamics of impact of employer mandate on ESHI (potential early providers)



(a) Full sample (b) Low-income group

Notes: This figure plots event study of ESHI in the full sample and low-income group respectively. Panel (a) represents the effect of employer mandates on ESHI in the full sample. Individuals who worked in firms with more than 50 employees in 2014 are treated. Workers who worked in firms with 26 to 50 employees in 2014 are in the control group. Panel (b) shows the effects on low-income group.

Figure A.4: Dynamics of impact of employer mandate on potential early providers (low-income group)

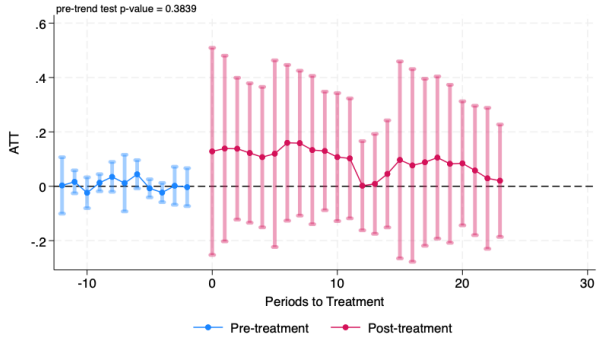


(a) Hourly wage (b) Employment

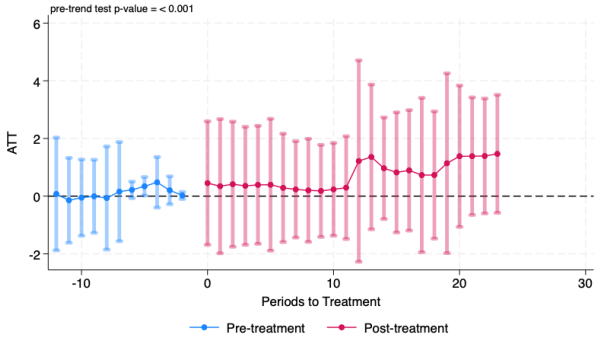
(c) Part-time job (d) Hours of work

Notes: The vertical axis represents the average treatment effect for the treated, which is the impact of the announcement of the employer mandate on labor market and health outcomes for the low-income group. Individuals who worked in firms with more than 50 employees in 2014 are treated. Workers who worked in firms with 26 to 50 employees in 2014 are in the control group. Panel (a) plots the dynamics of hourly wage. Panel (b) depicts the dynamics of employment. Panel (c) shows the dynamics of part-time jobs. "Part-time" job is a dummy variable that is equal to one if the worker is employed and works less than 30 hours per week in his or her main job. Panel (d) plots the dynamics of hours of work.

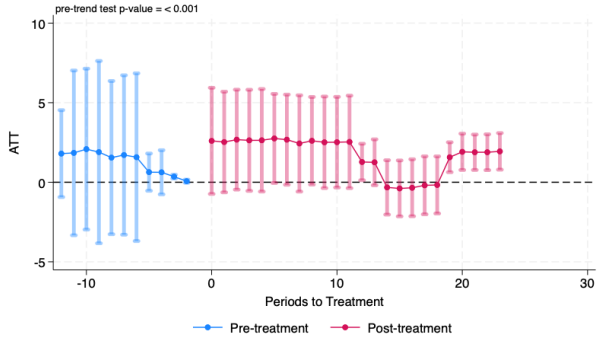
Figure A.5: Dynamics of impact of employer mandate on health outcomes (low-income group, potential early providers)



(a) Health scores



(b) Medical appointments



(c) Sick days

Notes: The vertical axis represents the average treatment effect for the treated, which is the impact of the announcement of the employer mandate on labor market and health outcomes for the low-income group. Individuals who worked in firms with more than 50 employees in 2014 are treated. Workers who worked in firms with 26 to 50 employees in 2014 are in the control group. Panel (a) plots the dynamics of health scores. Panel (b) depicts the dynamics of number of doctor visists. Panel (c) shows the dynamics of number of sick days.

B Additional Tables

Table B.1: Employer Mandates and labor market outcomes (low-income group, 20 percentile)

	(1) ESHI	(2) hourly wage	(3) employment	(4) part-time	(5) hours of work
ATT	0.0649**	3.382***	0.00219*	0.0169**	-5.380**
	(0.0281)	(0.800)	(0.00131)	(0.00754)	(2.546)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the results for the low-income group, defined as the bottom 20th percentile of the wage distribution. Confidence intervals obtained from wild bootstrap in parentheses. Results clustered in firm-size level. The control group for the first column consists of workers who worked in firms with 26 to 50 employees in 2014 and 2015. The treatment group consists of workers who worked for firms with more than 100 employees in 2014 and more than 50 employees in year 2015. The sample in this table is the low-income group. The first column represents impacts of employer mandates on coverage of employer sponsored health insurance. The second column shows effects on hourly wage. The third column represents impacts of employer mandates on employment. The fourth column represents impacts of employer mandates on part-time jobs. The last column shows effects on hours of work.

Table B.2: Employer Mandates and labor market outcomes (low-income group, 20 percentile, covariate adjusted)

	(1) hourly wage	(2) employment	(3) part-time	(4) hours of work
ATT	2.265	0.0028	0.0211	-0.881
	(1.441)	(0.00192)	(0.0241)	(1.916)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows results with covariate adjustment. This table presents the results for the low-income group, defined as the bottom 20th percentile of the wage distribution. Confidence intervals obtained from wild bootstrap in parentheses. Results clustered in firm-size level. The control group for the first column consists of workers who worked in firms with 26 to 50 employees in 2014 and 2015. The treatment group consists of workers who worked for firms with more than 100 employees in 2014 and more than 50 employees in year 2015. The sample in this table is the low-income group. The first column represents impacts of employer mandates on coverage of employer sponsored health insurance. The second column shows effects on hourly wage. The third column represents impacts of employer mandates on employment. The fourth column represents impacts of employer mandates on part-time jobs. The last column shows effects on hours of work.

Table B.3: Employer Mandates and labor market outcomes (low-income group, potential early providers)

	(1) ESHI	(2) hourly wage	(3) employment	(4) part-time	(5) hours of work
ATT	0.0873***	4.363***	0.00276	-0.0135	-1.630
	(0.0208)	(1.074)	(0.00321)	(0.0358)	(6.888)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the impact of the announcement of the employer mandate on labor market and health outcomes for the low-income group. Individuals who worked in firms with more than 50 employees in 2014 are treated. Workers who worked in firms with 26 to 50 employees in 2014 are in the control group. The sample in this table is the low-income group. The first column represents impacts of employer mandates on coverage of employer sponsored health insurance. The second column shows effects on hourly wage. The third column represents impacts of employer mandates on employment. The fourth column represents impacts of employer mandates on part-time jobs. The last column shows effects on hours of work.

Table B.4: Employer Mandates and health outcomes (low-income group, potential early providers)

	(1) Health score	(2) Doctor visits	(3) Sick days
ATT	0.0957*	0.696***	1.778***
	(0.0569)	(0.185)	(0.561)

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table presents the impact of the announcement of the employer mandate on health outcomes for the low-income group. Individuals who worked in firms with more than 50 employees in 2014 are treated. Workers who worked in firms with 26 to 50 employees in 2014 are in the control group. The sample in this table is the low-income group. The first column represents impacts of employer mandates on health scores. The second column shows effects on number of doctor visists. The third column represents impacts of employer mandates on number of sick days per month.