Wage Regulation, Compensation Packages, and Worker Welfare

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Abstract:

This paper explores the relationship between the minimum wage, the structure of employee compensation, and worker welfare. We advance a conceptual framework that describes the conditions under which a minimum wage increase will alter the provision of fringe benefits, alter employment outcomes, and either increase or decrease worker welfare. Using American Community Survey data, we find robust evidence that state-level minimum wage changes decreased the likelihood of having employer-sponsored health insurance. Effects are concentrated among workers in low-paying occupations and offset about 10% of wage increases associated with minimum wage hikes. We also find evidence that both insurance coverage and wage effects exhibit spillovers into occupations moderately higher up the skill distribution.

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The minimum wage has risen in prominence among the policy instruments intended to improve wellbeing for low-skilled individuals. But policy discussions about the minimum wage often conflate welfare effects with impacts on employment. While the employment margin is of first-order importance, there are limitations to what one can conclude from employment alone.[1] In particular, the impact of minimum wage policy on non-wage job attributes has received little attention, even though such attributes are important for understanding how workers value employment arrangements (Sorkin, 2015b; Mas and Pallais, 2016).[2]

In this paper, we explore the theoretical and empirical relationship between the minimum wage and fringe benefits, with a focus on employer-sponsored health insurance. We develop a conceptual framework where firms may optimally shift compensation from non-cash attributes to wages, in the presence of a minimum wage increase. This force impacts worker welfare, even absent any effects on employment. In our empirical analysis using American Community Survey (ACS) data from 2011-2016, we show that state-level minimum wage increases are associated with losses in employer provided health insurance. This suggests the welfare effects highlighted in our model are empirically relevant.

In our model, compensation consists of a combination of cash and non-cash attributes, and depends on worker productivity. We also allow for the possibility of a bargaining wedge whereby the firm pays less in total compensation (cash and non-cash benefits) than a worker's marginal product.[3] When the minimum wage rises above the

[1] These limitations have been recognized in an older theoretical literature ((Wessels, 1980; McKenzie, 1980)).

[2] A handful of papers have either directly or indirectly analyzed minimum wage effects on training and earnings trajectories (Hashimoto, 1982; Acemoglu and Pischke, 1999; Rosen, 1972; Clemens and Wither, 2014). Simon and Kaestner (2004) analyze the relationship between the minimum wage and health insurance coverage, using relatively small samples over the time period 1979-2000, see below.

[3] Bargaining position is linked, in turn, to how closely the market approximates perfect competition.

prevailing wage (cash payment) but below a worker's marginal product, the firm will shift the mix of compensation towards cash and away from non-cash benefits, but will still find it worthwhile to employ the worker. This distortion creates losses to worker welfare which, if large enough, push workers to prefer their outside option of non-work.

Furthermore, in the presence of a bargaining wedge, welfare effects are non-monotonic in the minimum wage. In particular, wage gains associated with increases in worker bargaining power will tend to improve welfare, while wage gains that are accommodated through reductions in non-cash benefits can reduce welfare. Finally, for firms that hire both low- and high-skilled workers, benefits packages may be set collectively.[4] This commonality may lead minimum wage increases to have spillover effects on the compensation packages of higher-skilled workers.

Our empirical analysis focuses primarily on the relationship between minimum wage increases and the prevalence of employer-sponsored health insurance. We exploit recent state-level minimum wage increases and the large samples available in the ACS from 2011-2016. To isolate the workers most likely to be impacted by minimum wage policy, we categorize them based on typical wages in their current or most recent occupation. We also explore more traditional categorizations based on individual demographics (e.g., age and education).

Using a difference-in-differences research design, we estimate that recent minimum wage increases are accompanied by significant declines in employer coverage. For workers in the lowest paying occupations (e.g., food service and retail sales), we find that a $1 minimum wage increase is associated with a 1 to 2 percentage point (3 to 4 %) reduction in the probability of coverage. We also estimate a nearly 1 percentage point (1.5%) loss in coverage for workers in occupations that tend to earn just above the minimum wage

[4]Administrative costs and anti-discrimination law may make it costly for firms to offer worker-specific benefits packages. Provisions in the Affordable Care Act (ACA), for example, prevent employers from charging higher premium contributions to low-wage employees than high-wage employees.

(e.g., clerks and supervisors of food service workers), suggesting a non-trivial role for spillovers. These effects manifest largely among employed workers, rather than through impacts of the minimum wage on employment.

Our estimates are robust to controlling flexibly for factors related to the implementation of the Affordable Care Act (ACA). They are similarly robust to controlling for proxies of aggregate economic and labor market conditions. Controlling for these factors increases the precision of our estimates without substantially altering the point estimates. Estimates are also very similar when we employ a triple-difference estimation strategy, using those in high wage occupations to control flexibly for state-time variation in employer coverage.

To benchmark the magnitudes of employer coverage losses, we compare them to estimated wage gains associated with the minimum wage. We use Occupational Employment Statistics (OES) data, a large employer-based survey administered by the Bureau of Labor Statistics, which has large sample sizes, even at disaggregated levels (such as state-occupation). Relative to household surveys, employer surveys likely suffer less from the canonical measurement error problems that can frustrate efforts to estimate impacts of the minimum wage on the earnings distribution (see, for example, Lee (1999); Autor, Manning, and Smith (2016)).

We find that a $1 minimum wage increase generates significant wage increases for workers in low-to-modest paying occupations. The increases are on the order of 7% and 2% for very low and low paying occupations, respectively, and even 0.4% for the modestly higher paying occupations. Importantly, the wage increases we estimate are substantially larger than what would be required to comply with the new prevailing wage.

When we compare wage changes to changes in employer coverage, we find that coverage declines offset a modest fraction of wage gains for very low wage workers and

a larger fraction for moderately higher wage workers. In very low paying occupations, the coverage decline offsets an average of roughly 10% of the rise in the wage bill. This average offset is composed of some workers who lose coverage and some workers who maintain coverage and receive wage gains. We find offsets of 25% and 60% for workers in the next lowest paying occupation groups, respectively. We cannot reliably measure changes in employer contributions on the intensive margin, which may also decrease in response to increases in the minimum wage.

Our finding of sizeable losses to employer health insurance coverage suggest that welfare effects due to changes in non-wage attributes may be important. We therefore contribute to the literature on the welfare consequences of compensation regulation (Stigler, 1946; Wessels, 1980; McKenzie, 1980; Lee and Saez, 2012). Our framework succinctly merges intuitions connected to bargaining frictions, non-wage job attributes, and the conditions under which a minimum wage increase will tend to increase versus decrease individual welfare. These insights on the welfare implications of non-wage job attributes connect to the literature on benefit incidence (Summers, 1989; Gruber, 1994; Clemens and Cutler, 2014; Kolstad and Kowalski, 2016).

On the empirical side, our analysis contributes to a surprisingly small literature on the relationship between the minimum wage and non-wage job attributes. Driven by analyses of general and firm-specific human capital, early papers focused on job training (Rosen, 1972; Hashimoto, 1982; Acemoglu and Pischke, 1999). The evidence from these papers is mixed. In more recent work, Simon and Kaestner (2004) find no evidence that minimum wage increases affected employer insurance coverage using much smaller samples covering an earlier time period (1979-2000).[5]

[5]Our empirical analysis differs from that of Simon and Kaestner (2004) along several dimensions. First, we harness the insurance coverage variables in the ACS, which has annual samples roughly 20 times the size of samples from the March supplements of the Current Population Survey (CPS); Simon and Kaestner (2004) analyzed these smaller CPS samples along with the National Longitudinal Survey of Youth (NLSY). Second, we analyze a time period during which there were substantially more statutory

Finally, we contribute to the growing literature on the role of firms as mediators of the effects of labor market shocks on individual outcomes (Chetty, Friedman, Olsen, and Pistaferri, 2011; Abowd, Kramarz, and Margolis, 1999; Song, Price, Guvenen, Bloom, and Von Wachter, 2015; Card, Cardoso, Heining, and Kline, 2016). Specifically, we illustrate how benefit arrangements may lead the effects of minimum wage changes to spill over from the least-skilled individuals to those of moderately higher-skilled individuals. Such spillovers are important for interpreting the effects of the minimum wage on earnings and benefit receipt across skill groups.

This paper proceeds as follows. In section 1, we present a conceptual framework for assessing the welfare implications of minimum wage changes, through effects on wages, non-wage compensation, and employment. Section 2 describes the data we use to analyze the effect of minimum wage changes on employer-sponsored health insurance and wage rates. Section 3 presents our empirical strategy, while section 4 presents our results. We conclude in section 5 by discussing some additional implications of our results.

1 A Framework For Analyzing the Effects of Minimum Wage Regulation on Worker Welfare

1.1 Basic Set-up

Suppose a worker has an exogenous productivity level a, the value of the output he or she produces when employed. The individual also has a reservation value v, which reflects his or her valuation of leisure and the consumption that could be financed

changes to minimum wage rates. Third, we highlight the theoretical and empirical relevance of spillover effects that may emerge across firms, occupations, and industries.

through social insurance transfers.[6]

Assume for now that compensation consists entirely of wage income. Bargaining frictions, perhaps due to search costs, enable firms to pay workers wage rates equal to fraction θ of the value of their output.[7] The wage is thus $w = \theta a$ unless the firm is constrained by the minimum wage. Firms maximize profits by employing all individuals they can retain at wage rates less than or equal to the value of their output.

Under these conditions, the minimum wage causes job loss when it exceeds the value of what a worker is able to produce. It can also increase earnings when bargaining frictions create wedges between unconstrained wage rates and the value of output. It is also possible for bargaining wedges to create settings in which a minimum wage hike increases employment.[8]

1.2 Extension To Non-Cash Benefits

Suppose now that compensation includes a combination of cash wages w and non-cash benefits b. For simplicity, let worker utility be $U(w, b) = u(w) + g(b)$, with both u and g assumed to be strictly increasing, concave, and twice continuously differentiable,

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[6]In a framework that explicitly models search, the outside option will also be a function of the value of the matches the individual might find if he or she turns down employment at some initial firm.

[7]If expressed as in a Nash bargaining problem in which the bargaining parameters are α and $1 - \alpha$, we would have $w = \theta a = \alpha a + (1 - \alpha)v$. The relationship between our "reduced form bargaining parameter" and a standard Nash bargaining parameter is thus $\theta = \frac{\alpha a + (1-\alpha)v}{a}$. The wage equals the individual's marginal product under perfectly competitive conditions under either of two conditions. First, $w = a$ if the individual's outside option v equals the value of his or her output a, perhaps due to an absence of search frictions. Second, $w = a$ if the Nash bargaining parameter equals 1, which implies that the reduced form bargaining parameter also equals 1.

[8]See Clemens and Wither (2014) for a more fleshed out discussion of these cases. The minimum wage can increase employment if there are firms that make wage offers that individuals are unwilling to accept even when those individuals would be willing to work at wage rates that are less than or equal to the value of what they can produce. That is, there are cases in which $a > v$, but $a\theta < v$. This implies that, absent the minimum wage, employment fails to materialize in cases in which it would be bilaterally efficient. This can arise in "wage posting" models, but would not occur in standard "ex post bargaining" models (Manning, 2011).

and with $g(0) = u(0) = 0$. That is, worker utility is separable in wages and benefits.[9] The optimal division of compensation between wages and benefits sets the wage equal to w^* such that $u'(w^*) = g'(\theta a - w^*)$. Compensation packages that satisfy this condition minimize the firm's cost for providing the worker with a given level of utility. In this setting, the effect of the minimum wage depends on its value relative to a, as well as the bargaining wedge, $1 - \theta$.

Consider first the case of perfect competition, when $\theta = 1$ (i.e., the bargaining wedge is 0). Figure 1 illustrates the relationship between the minimum wage and worker utility for an individual with productivity a under this assumption. When the minimum wage falls between 0 and w^*, it is non-binding. For minimum wages greater than a, firms cease offering employment, as in the base case illustrated above. Utility then equals the reservation utility, v.

The nuance of taking into account non-wage compensation arises for the region w^* to a. Here, the minimum wage binds the mix of compensation between wages and non-wage benefits, but does not exceed the value of worker output. Firms are thus willing to offer employment, but the utility from compensation with a wage of w_{min} and benefit of $b = a - w_{min}$ falls short of $U(w^*, a - w^*)$. The concavity of u and g implies that the cost of this distortion will rise with the minimum wage in this region (between w^* and a). Figure 1 illustrates two possibilities. Individuals may continue to work because $U(w_{min}, a - w_{min}) > v$ even as w_{min} approaches a (red dashed line). Alternatively, they may exit employment because the minimum wage passes a level w_v defined such that $U(w_v, a - w_v) = v$ (blue solid line).

Thus, in the perfect competition case, allowing for cash and non-cash benefits yields

[9]This formulation embeds the possibility that the firm may be able to provide benefits more cheaply than it would cost the worker to buy with cash (e.g., due to tax preference or risk pooling in the case of health insurance). The separate utility functions, u and g, allow a worker to value a dollar spent on benefits differently than a dollar spent on cash.

two additional implications. First, worker welfare is weakly decreasing in the minimum wage whenever it binds on the mix of compensation and benefits, and this is true even when there is no impact on employment. Furthermore, effects are likely to be non-linear in the minimum wage (i.e., decreasing at an increasing rate). Second, employment effects can arise through the traditional channel (the minimum wage exceeding worker productivity), but also when the mix of compensation and benefits falls below the worker's reservation wage. This latter effect may serve to offset job shortage effects emphasized in the traditional set-up that abstracts away from non-wage job attributes.

Next consider the imperfect competition case. Here, firms have more flexibility to absorb mandated wage increases. Figure 2 illustrates an example in which, absent a binding minimum wage, workers are paid less than the value of their output due to the existence of a bargaining wedge. As before, the minimum wage is non-binding between 0 and w^*, and, for $w_{min} > a$, firms cease offering employment.

Between w^* and $a\theta$, the minimum wage binds on the mix of compensation but not on the total cost of compensation to the firm. We depict the case in which $U(w_{min}, a\theta - w_{min}) > v$ throughout this region. Effects are analogous to the w^* to a region in the perfect competition case.[10]

Between $a\theta$ and a, the minimum wage binds on the total value of compensation, but does not exceed the value of worker output. Firms would then optimally respond by maintaining employment and increasing total compensation. The concavity of u implies that utility will increase with w_{min} at a decreasing rate over this interval. We depict the case in which there is a region over which $U(w_{min}, 0) > U(w^*, a\theta - w^*)$, implying a net

[10]Here we assume that θ does not change when the minimum wage does not bind on total compensation. Other outcomes are possible. For example, if the new mix of compensation and benefits pushes workers below their reservation wage, v, then firms may respond by increasing θ. Or, the existence of the wedge may allow firms flexibility, for example, to raise wages for small minimum wage increases, without adjusting benefits (effectively increasing θ), if they find that to be an easier path. In these instances, the description for the region $a\theta$ to a may be more applicable to the w^* to $a\theta$ region as well.

improvement in the individual's welfare.

The case of imperfect competition illustrates several important features. First, welfare effects are non-monotonic in the minimum wage. As we have drawn it, welfare first decreases (at an increasing rate) as w_{min} first exceeds w^*. Welfare then rises back towards and eventually above its initial level before declining sharply when the individual loses employment. Naturally other outcomes are possible. For example, there may be no interval over which welfare improves. There may also be an interval where workers are pushed below their reservation wage, v, in which case there will be employment effects driven by labor supply.

The existence of various regions, their length, and the size of the potential welfare gains and losses depend crucially on the bargaining wedge $(1 - \theta)$ and a. Our simple framework illustrates that the welfare effects of minimum wage changes can be quite nuanced when jobs have non-wage attributes. First, the minimum wage can affect worker welfare in the absence of effects on either the total cost of compensation or the extensive margin of employment. Second, welfare effects can be negative even when compensation costs rise and no jobs are lost.

1.3 Further Considerations

The analysis thus far assumes that there is just one type of worker, with productivity a and preferences u and g. However, firms frequently employ workers of multiple skill types and/or workers with different preferences for wage income relative to health insurance benefits. In these cases, firms may choose to design benefits packages collectively, rather than on an individual basis, because of administrative costs and to comply with anti-discrimination law.[11]

[11]Empirically, most firms use the same benefits plans for all workers or broad categories of workers. For example, nearly half of firms that provide health insurance offer only one plan. See Summary Table II.a.2.d of the Medical Expenditure Panel Survey.

When firms offer a common benefits package to workers of multiple skill types, minimum wage increases may alter the compensation packages offered to both minimum wage and non-minimum wage workers. Indeed, the optimal mix of pay and benefits trades off the utility cost of distortions to compensation packages for all types of workers, in proportion to their relative shares of a firm's workforce. This has both empirical and welfare implications.

Empirically, reductions in the generosity of benefit packages will also affect individuals higher up the skill distribution. When firms substitute cash for non-cash compensation, cash incomes will rise for both minimum wage workers and workers higher up in the skill distribution. Changes in non-cash compensation can thus generate a "ripple effect," whereby minimum wage increases result in income gains for non-minimum wage workers (Lee, 1999; Autor, Manning, and Smith, 2016).[12]

Changes in the mix of compensation can have nuanced welfare implications. The initial benefits packages will involve mixes of cash and non-cash benefits that are excessively weighted towards cash from the perspective of some workers and towards benefits from the perspective of others. When firms shift from non-cash to cash compensation due to an increase in the minimum wage, the former group's welfare will rise while the latter group's welfare will decline.

Therefore, the intuition that impacts on worker welfare may be non-monotonic in the minimum wage still holds in settings where firms set one benefits package for multiple types of workers. Welfare gains and losses will depend on the initial mix of compensation and benefits and which types of workers are further distorted by changes that optimize for the representative worker. There may be additional implications for firm behavior; for example, minimum wage increases may push firms to alter production

[12]There are, naturally, many proposed mechanisms that can generate wage increases for non-minimum wage workers. We discuss these in more detail in section 4.2.

technology so that they can produce with a more homogenous workforce. While these issues are outside the scope of our framework, we briefly discuss them in the conclusion.

2 Data and Setting

We explore the impact of state-level minimum wage changes on employer-sponsored health insurance and wage rates, as well as heterogeneity in these effects across worker characteristics. We focus on the years 2011-2016, a time period in which we have individual-level data on health insurance coverage and variation in statutory minimum wage policies. In this section, we describe the key data sets and variables, characterize variation in minimum wage laws, and present summary statistics.

2.1 Key Variables

We use data from the American Community Survey (ACS) to measure employer-sponsored insurance coverage. The ACS is a household-based survey, which began a battery of health insurance questions in 2008. These questions ask whether a respondent has health insurance at the time of the interview, and, if so, its source. We focus on the probability that an individual reports having coverage through an employer or union, among the working age population (16-64). The ACS allows us to maintain relatively large samples, even within state-time-occupation cells. This contrasts with the Current Population Survey (CPS), which only collects health insurance information for its Annual Social and Economic Supplement and has much smaller samples (roughly one-twentieth the size of the ACS).

Because individuals vary in the likelihood that their compensation will be directly influenced by a minimum wage hike, we isolate subgroups based on worker characteristics. Previous literature has focused, for example, on population groups such as

teenagers and adults with low levels of education.[13] Much of our empirical analysis focuses on occupations as a way to categorize workers.[14] We use data from the Occupational Employment Statistics (OES) to identify occupations in which wage rates are directly affected by minimum wage increases. The OES is a large employer-based survey produced by the Bureau of Labor Statistics (BLS). It provides information on wage distributions for narrowly defined occupations at both the national and state levels.

We divide occupations into deciles based on the 10th percentile of their 2006 wage distribution.[15] This wage distribution predates both the variation in minimum wages that we analyze and the Great Recession. Occupations whose lowest earners are at the bottom of this distribution are the most likely to be mechanically impacted by minimum wage increases.

We describe the bottom two deciles in Table 1. For the bottom decile, we further distinguish between "Very Low" and "Low" wage occupations, comprising the bottom and top half of occupations in the decile, respectively.[16] This distinction is useful, since minimum wage laws directly impact workers who are at the very bottom of the wage distribution. In practice, we find strongly statistically significant effects of minimum wage increases on the wages of both groups, with quantitatively much larger effects for the Very Low wage occupations.

We group the remaining deciles into three roughly equally sized groups, namely a "Modest" wage group (deciles 2 through 4), a "Middle" wage group (deciles 5 through 7), and a "High" wage group (deciles 8 through 10). We also present estimates for the

[13] See, for example, Katz and Krueger (1992); Neumark and Wascher (1992); Card and Krueger (1994); Kim and Taylor (1995).

[14] Aaronson and Phelan (2017) similarly focus their analysis on occupations to explore the relationship between minimum wage increases and technological substitution.

[15] We define deciles using ACS population weights across occupations in our estimation sample.

[16] To make this divide, we simply group half the occupations into each subcategory, so that each subgroup comprises three (four-digit) occupations. The Very Low wage occupations make up one-third of ACS observations in the decile, while Low wage occupations make up the rest.

disaggregated set of 10 deciles. Modest wage occupations are also listed in Table 1. These are recognizable as relatively low-paying jobs as well, but higher paying than the bottom group (e.g., the front-line supervisors of workers in the lowest decile).

We map OES data to ACS data using 4-digit SOC occupation codes. In the ACS, these codes correspond to an individual's primary or most recent occupation (if unemployed). We use the full population of experienced workers as our sample, estimating the probability of having employer-sponsored health insurance for those currently or previously employed in a given occupation. This allows for the minimum wage to influence coverage due to both job loss and changes to coverage conditional on employment. We also explore results for the sub-population of respondents who are currently employed. We unfortunately cannot measure changes in employer contributions, conditional on coverage. The latter is likely an important margin of adjustment as well, but difficult to measure accurately in datasets with worker characteristics.

In addition to analyzing low-wage occupations, we analyze samples selected on the basis of age and education. These samples are more comparable to those analyzed in previous minimum wage research. They have the advantage that we can relax the restriction that individuals must be connected to an occupation.

A benefit of the occupation-based approach is that it allows us to track the wage response to minimum wage laws using OES data. We explore movement in average hourly wages, as well as 10th and 25th percentiles, by 4-digit occupation, state, and time period.[17] Although we have explored movement in individual-level wages using CPS and ACS data, we find that the OES more faithfully tracks minimum wage increases among the lowest earning occupations. This is likely in part because the OES is larger and in part because, as an employer-based survey, it measures hourly wages with less

[17]OES annual statistics are based on 3-year moving averages. For this reason, we estimate wage effects only for years where the moving averages contain no overlap, namely OES waves 2013 and 2016. This comparison works well with the timing of the policy changes we exploit, see below.

noise than household survey data.

2.2 Variation in State Minimum Wages

We focus our attention on state-level minimum wage changes that occur after 2011. As discussed by Clemens and Strain (2017), there was a lull in minimum wage policy making between the Great Recession and 2013. From 2011 through 2013, all minimum wage increases were linked to inflation indexing provisions. Since January 2013, 19 states have increased their minimum wages through new legislation. Data from 2011 through 2013 thus provide a base period after which states' minimum wage policies diverged substantially.[18]

Across all states, the population-weighted average change in the minimum wage from 2011-2013 to 2014-2016 was roughly $0.40. Across the states in which minimum wage changes occurred, the average change was $0.83 (median of $0.90). Among these states, the minimum wage ranged from $7.25 to $9.04 over 2011-2013 and from $7.50 to $10.50 over 2014-2016. We link state-level minimum wages in July of a given year to ACS and OES data on an annual basis.[19]

2.3 Summary Statistics

Table 2 provides summary statistics separately by occupation groups and time periods. The occupation groups are those described above – Very Low, Low, Modest, Middle, and High wages. The time periods are the 2011-2013 "base" period and the 2014-2016 "post" period during which the bulk of state minimum wage changes occur.

[18]We exclude years prior to 2011 because of their proximity to the Great Recession.

[19]Respondents in the ACS may be surveyed at any time during the calendar year, but the survey date is not available in the public-use files. We therefore cannot pinpoint with certainty what the prevailing minimum wage was at the time a respondent was surveyed. However, we believe this problem is small, since all but a handful of minimum wage changes over this time period were in January of a given year.

ACS data reveal that employer insurance coverage rates are substantial among all occupation groups. Even in the Very Low wage group, 45 percent of respondents from 2011-2013 had employer provided insurance. Coverage rates rise as one moves up the occupational wage distribution. For example, among the High wage occupations, the average coverage rate was roughly 80 percent.

The OES wage data reveal that the 10th and 25th percentile wage rates for the Very Low wage occupations were between $8 and $9, with the mean wage at $9.50 per hour. Mean wages among these occupations rose by $0.70 from 2011-2013 to 2014-2016. Wages for this group were thus low enough that a substantial fraction of workers were likely to be impacted directly by minimum wage increases. Low wage occupations exhibit similar exposure to minimum wage increases at the very bottom of their distributions, but have higher mean baseline wages of $11.20.

Other occupation groups are unlikely to experience direct, mechanical impacts of the minimum wage – that is, workers in these occupations were unlikely to have wages below the minimum wage rates prevailing in 2014-2016. For Modest wage occupations, for example, workers at the 25th percentile earned well above most 2014-2016 minimum wage rates. Only the bottom decile of the Modest wage occupations contains wage rates below the highest of states' 2014-2016 minimum wages. Finally, even the 10th percentile wages of the Middle and High wage occupations exceed the highest of states' minimum wage rates over the period. These occupations are thus extremely unlikely to experience any mechanical impacts from minimum wage increases. Of course, this does not rule out indirect impacts of the minimum wage on these groups.

3 Methods

We begin with this regression specification:

$$Y_{i,o,s,t} = \beta \text{Minimum Wage Policy}_{s,t} + \mathbf{State_s}\alpha_1 + \mathbf{Time_t}\alpha_2$$
$$\mathbf{Occupation_o}\alpha_3 + \mathbf{X_{s,t}}\gamma + \varepsilon_{i,o,s,t} \quad (1)$$

where i indexes individuals, o indexes occupations, s indexes states, and t indexes years. The variable Minimum Wage Policy$_{s,t}$ describes variation in state-level minimum wage policies. In our main specification, we use continuous variation in the level of the minimum wage (recall we use the prevailing minimum wage in July of a given year because the ACS does not report the month during which an individual was surveyed). We estimate separate regressions for each occupation wage group.

We explore two key outcome variables: (1) whether individuals report having employer-sponsored health insurance, as measured in ACS data from 2011-2016, and (2) wage rates, obtained from the OES. Specifications using ACS data are estimated on individual-level observations. Specifications using OES data are estimated on occupation-state-year observations, the level at which the OES data are reported.[20] We weight ACS regressions using sample weights and OES regressions by occupation-state-year employment.

Our baseline specification includes state, occupation, and time fixed effects (the vectors α_1, α_2, and α_3). The coefficient of interest, β, can therefore be described as a difference-in-differences estimator of the effect of changes in the minimum wage on outcome, Y. This most basic set of fixed effects accounts for national-level time shocks, and baseline differences in outcomes across states and occupations. The identifying assumption is that the outcome of interest would have followed similar trends across states if not for differential changes in their minimum wage policy regimes.

[20]We restrict observations to OES estimates in 2013 and 2016 to ensure independent observations across survey years, since OES data report 3-year rolling averages. We use July minimum wages for the midpoint of each time period, 2012 and 2015, respectively. Time-varying control variables are also timed to the midpoint of each period.

If occupation-state pairs trend differently for other reasons, this identifying assumption may not hold. We augment the basic specification with controls that proxy for at least a subset of such potential confounding factors. For instance, we add state-by-occupation and occupation-by-year fixed effects. The former allow for differences in outcomes across state-by-occupation cells; this may be relevant if, for example, retail sales workers in California are more likely to have health insurance than those in Mississippi. The latter allow outcomes to trend differently across occupations on a national basis; this may be relevant if, for example, retail sales workers have become increasingly more likely to receive health insurance relative to their front-line supervisors.

We further control for a range of other factors ($\mathbf{X_{s,t}}$) that may have shaped employer insurance coverage decisions over this time period. To control for variation across states in the evolution of macroeconomic well-being, such as differences in economic recoveries following the Great Recession, we add controls for state-level employment rates (obtained from the BLS), log income per capita (from the Bureau of Economic Analysis), and a median house price index (from the Federal Housing Finance Agency). These controls are important because both wage rates and the generosity of benefit arrangements tend to fluctuate with market conditions.

We also control for variation in the implementation of the Affordable Care Act (ACA) across states. Over the time period we analyze, the prevalence of employer health insurance coverage grew by roughly 1 percentage point, from 58.4 to 59.4 percent across the working age population, according to the ACS. This varied across states for several reasons. We capture some of this variation by controlling for states' decisions regarding the ACA's Medicaid expansion. Specifically, we control for indicators for whether a state was either an early or late implementer of the ACA's Medicaid expansion, each interacted with year effects.

To further account for factors that potentially vary across states and over time, we

explore a triple-difference framework specified in equation (2).

$$
\begin{aligned}
Y_{o,d(o),s,t} = & \sum_{d(o) \neq High} \beta_{d(o)} \text{Minimum Wage}_{s,t} \times \text{Decile}_{d(o)} + \mathbf{State_s} \times \mathbf{Occupation_o} \alpha_1 \\
& + \mathbf{Time_t} \times \mathbf{Occupation_o} \alpha_2 + \mathbf{Time_t} \times \mathbf{State_s} \alpha_3 \\
& + \mathbf{X_{s,t}} \times \mathbf{Decile_{d(o)}} \gamma + \varepsilon_{o,d(o),s,t}. \qquad (2)
\end{aligned}
$$

In equation (2), we pool all occupation groups in one regression, and estimate interactions between the minimum wage and occupation group dummies ($\beta_{d(o)}$). These regressions also include state-by-year fixed effects. The regressions thus use High wage occupations, the omitted occupation group, as a within-state-time control group. This triple-difference approach is useful if states are in fact trending differently over this time period, but in a similar manner across occupation groups. For example, employer coverage may be rising more quickly in states with larger minimum wage increases. As long as these trends are similar for both high- and low-wage occupations, the triple-difference will control for this effect.

4 Results

This section presents our estimates of the effects of recent minimum wage changes on employer insurance coverage (section 4.1) and wages (section 4.2). We discuss magnitudes and the relationship between the insurance and earnings estimates in section 4.3.

4.1 Employer Insurance Coverage

Figure 3 gives a general sense of the relationship between state-level minimum wage changes and changes in employer coverage. The five panels present this relationship separately for each of the five occupation groups we analyze. The changes are calculated from the "base" period (2011-2013) to the "post" period (2014-2016) – the period in which the statutory minimum wage increases occur. We also plot the (unweighted) best linear fit across states. For the Very Low wage occupations (top left), this line is downward sloping and steep. Washington, DC, and Rhode Island, for example, had large minimum wage increases that were accompanied by large declines in insurance coverage. In contrast, coverage for individuals in Very Low wage occupations increased on average in states with no minimum wage changes. The slope of the relationship between minimum wage changes and insurance coverage becomes successively less steep as we examine higher-skilled occupations. For our High wage occupations, the line is essentially flat. These relationships are consistent with our expectation that effects will be stronger for workers who are closer to earning the minimum wage.

Table 3 presents regression estimates of equation (1). The five panels correspond with the five occupation groups. The specification in column 1 controls for state, year, and occupation fixed effects. Column 2 adds two-way fixed effects at the occupation-by-year and occupation-by-state levels. Columns 3 and 4 add macroeconomic and ACA expansion controls, respectively.

Minimum wage increases were associated with substantial declines in employer-sponsored insurance across Very Low, Low, and Modest wage occupations. Beginning with Very Low wage occupations in panel A, we estimate that a $1 minimum wage increase reduces the probability of employer provided insurance by 1.5 to 2.3 percentage points. All estimates are significant at the 1% level. With full controls (column 4), the estimate of -0.018 (with a standard error of 0.006) implies a 1.8 percentage point reduction

in coverage, or a 4% decline.

Results are similar for the Low wage group in Panel B and again all coefficients are significant at the 1% level, though effects are smaller in magnitude. With full controls, we find a 1.3 percentage point reduction in coverage for this group, or 3%. This slightly smaller, though still sizeable, magnitude is in line with the fact that workers in this group are very likely to be earning around the minimum wage, but somewhat less likely than for Very Low wage workers.

We also find a non-trivial effect for Modest wage occupations in Panel C. With full controls, the estimate is a 0.8 percentage point reduction, or nearly 1.5%. Recall, these occupations tend to earn above, but adjacent to, the minimum wage.

Moving to panels D and E, our estimates for Middle and High wage occupations are much smaller in magnitude. They range from -0.003 to -0.009 for Middle wage occupations, and -0.002 to -0.004 for High wage occupations. While a few point estimates are statistically significant, the general impression from these panels is a lack of robust or economically meaningful impacts on these higher wage groups.

Figure 5 presents estimates separately for each wage decile, again disaggregating the bottom decile into Very Low and Low. We estimate equation 1 separately for each decile or group, using full controls (column 4). The figure confirms that we lose little information by aggregating occupations into groups, as in table 3. The Very Low and Low wage occupations exhibit a pronounced, negative relationship between minimum wage increases and employer-sponsored coverage. Estimates involving the next several deciles are smaller but non-trivially negative. Estimates involving the top few deciles are all quite close to zero.

We show in appendix table A.1 that results are robust to different ways of specifying minimum wage variables. When using the log minimum wage (panel B), rather than the level, results are similar in significance and larger in magnitude. We can also categorize

states by the type of minimum wage change enacted: large changes legislated over the time period (cumulatively at least $1.50), small legislated changes (less than $1.50), and inflation indexed changes. These groupings are important to explore since minimum wage increases may have non-linear effects and since changes due to inflation indexing may be fundamentally different – they are small in magnitude (on the order of $0.15 per year) and anticipated. In panel C, we estimate the change in employer coverage from the "base" (2011-2013) to the "post" (2014-2016) periods differentially for these groups. Results look quite sensible, with modest coefficients on indexers, slightly larger coefficients on small legislated changers, and the largest coefficients on large legislated changers.

We next present results using the triple-difference specification in equation (2). As discussed earlier, this specification allows us to use High wage occupations as a state-time control, in case other factors influencing compensation packages are correlated with minimum wage changes. In table 4, we report coefficients on interactions between the minimum wage and indicators for Very Low, Low, Modest, and Middle wage occupations. For column 1, the specification includes all standard two-way fixed effects: occupation-by-state, occupation-by-time, and state-by-time. The reported coefficients are thus our estimates of the differential impact of minimum wage increases on insurance outcomes for each occupation group, relative to High wage occupations (the omitted category). Columns 2 and 3 add macroeconomic and ACA controls, respectively. In each case, we interact the control sets with occupation-group indicators, allowing insurance outcomes to be differentially sensitive to economic conditions across occupation groups. For example, coverage in low wage occupations may be more sensitive to business cycle fluctuations.[21]

[21]Indeed, in our difference-in-differences specifications a given change in macroeconomic conditions tends to predict a larger change in coverage among individuals in the lower paying occupation groups than among individuals in the higher paying groups.

The results again show that minimum wage increases predict declines in employer-sponsored insurance among individuals in relatively low wage occupations. From column 3 (full controls), a $1 minimum wage increase predicts a 1.6 percentage point decline in employer coverage among individuals in Very Low wage occupations, a 1.1 percentage point decline in Low wage occupations, and a 0.7 percentage point decline in Modest wage occupations. This is roughly what one would predict, simply comparing coefficients across occupation groups from table 3, differencing out the coefficient for High wage occupations.

Losses in employer insurance may be due to general employment losses associated with the minimum wage or losses in coverage conditional on employment. The latter could manifest because employers choose to stop offering health insurance, or because low-skilled workers become more likely to work for employers that never offered insurance.[22] Table 5 shows that the insurance declines we estimate are primarily associated with the employed. The table reproduces estimates for the adult population with full controls (column 4 of table 3) and compares these to estimates restricted to the sample of currently employed. We focus on the difference-in-differences results, though the triple-difference specification looks similar. The point estimates are slightly larger in magnitude for this sub-sample. For example, for Very Low wage occupations, a $1 increase in the state minimum wage is associated with a 2.1 percentage point reduction in the prevalence of employer provided insurance coverage among the employed population, compared to 1.8 percentage points for the whole population of those currently or previously employed in Very Low wage occupations. This is sensible since, in practice, we do not see evidence of strong impacts on employment. See appendix table A.2,

[22]The latter margin connects conceptually to the "putty-clay" dynamics emphasized by Sorkin (2015a) and Aaronson, French, Sorkin, and To (2016). The key insight is that some responses to minimum wage changes will occur through the production technology and compensation design choices of new firms, as they are more flexible, rather than through changes in the more rigid operations of old firms.

where we show that impacts of the minimum wage on employment, hours, and weeks worked are small in magnitude and statistically insignificant.

Appendix Table A.3 shows that our findings are robust to analyzing alternative subsamples and relaxing one of our primary sample inclusion criteria. The results presented thus far are restricted to respondents that can be linked to an occupation, which eliminates from the sample individuals who have not been employed in the recent past (5 years). We can instead analyze skill-groups selected on the basis of age and education, which avoids this restriction. Many previous analyses of the minimum wage have focused on young workers and adults with low education levels as groups that might be particularly impacted by minimum wage hikes.

Appendix tables A.3 and A.4 explore results based on these subgroups. We find that the relationship between minimum wage increases and employer insurance coverage is particularly large for young adults (age 16-21) and those with less education (high school or less). Controls for worker demographics, within these categories, has little effect on the results. We also find that, though employment effects are quite small in economic magnitude and lacking in statistical significance for most subgroups, they are sizable for young adults: we estimate that a $1 minimum wage increase is associated with a 0.8 percentage point reduction in employment probability for young adults. Finally, we show that effects across occupation groups from table 3 hold for a given occupation group across these age and education subgroups.

In summary, we find robust evidence that minimum wage hikes are accompanied by losses in employer-sponsored health insurance. In results not reported, we find that these coverage declines are not offset by increases in other forms of coverage. That is, respondents are less likely to have no insurance coverage, and by a similar amount as the estimated drop in employer coverage. Many of the individuals in Very Low and Low wage occupations who lost coverage would be eligible for fairly generous subsidies

through the ACA exchanges, but have in practice elected to remain uninsured.

4.2 Earnings Outcomes

In table 6, we explore the effect of minimum wage changes on wage rates for each of our occupation groups. We present estimates of equation (1) using our full controls specification for three separate dependent variables: the log of the 10th percentile of wage rates, the log of the 25th percentile, and the log of the mean wage rate, in columns 1-3 respectively.

Panel A of column 1 shows that, for Very Low wage occupations, a $1 minimum wage increase predicts a 10.6% increase in hourly wages at the 10th percentile for these occupations. This reflects a roughly $0.80 hourly pay increase (0.106 times $8 – the 10th percentile for this group in 2011-2013, see table 2). From columns 2 and 3 of panel A, we also observe effects up the wage distribution: a 7% increase at the 25th percentile and a 6.7% increase at the mean, each amounting to roughly $0.60 increases (off bases of $8.28 and $9.65 in 2011-2013, respectively).

In Panel B, we find estimates that are somewhat smaller in magnitude, though still statistically significant, for Low wage occupations. Here, a $1 minimum wage increase predicts a 7.6% wage increase at the 10th percentile, or roughly $0.60. Effects amount to 3% at the 25th percentile and 1.9% at the mean, or roughly $0.20 in each case. Modest wage occupations (panel C) see a similar sized increase at their 10th percentile (3% or $0.28), but essentially no effect higher up in their distribution. Finally, for Medium and High wage occupations, effects are tiny in magnitude and statistically insignificant.

Figure 5 presents estimates separately for each decile of the distribution of occupations. The figure shows that we lose little information through the use of our more aggregated occupation grouping. For the 10th percentile wage outcome (top left panel), we find effects are positive and significant for the first several deciles and very close to

zero for the rest. For the other outcomes (25th percentile and mean wages), effects are only significant in the Very Low and Low wage occupations, and at zero for the other deciles.

Wage effects are thus concentrated in the lowest paying occupations, in line with their proximity to the actual minimum wage changes. That is, in 2011-2013, these groups (Very Low wage, Low wage, and Modest wage occupations) are more likely to be earning close to, or below, the eventual minimum wage in 2014-2016. Some of the wage raises experienced by these groups were necessary in order for firms to be in compliance with increases in minimum wage rates. However, the literature also recognizes that minimum wage laws may induce employers to raise wages for groups earning above the minimum wage, but proximate to it. Autor, Manning, and Smith (2016), for example, estimate that minimum wage increases compress 50-10 wage differentials despite not binding on 10th percentile wage rates directly. They are unable, however, to reject the possibility that these spillover effects are due to reporting artifacts. Our approach, using OES wage data, has two key advantages: (1) data are based on large, firm-level surveys; (2) hourly wage rates are likely to be reported with less error in the context of a firm survey than in a household survey.

To what extent do the wage increases we estimate reflect the mechanical effects of minimum wage changes and to what extent do they reflect spillovers? To understand the relative contributions of each component, we calculate the gap between wages in the pre-period (2011-2013) and the level of the minimum wage in the post-period (2014-2016). For most occupation groups and for most parts of the pay distribution, pre-period wages are already well above the eventual minimum wage. However, for the very bottom of the wage distribution, this gap is non-trivial. For example, in Very Low wage occupations, the average 10th percentile wage in the pre-period was about $0.40 below the new post-period minimum wage, among states that had minimum wage

increases.[23] Because the average minimum wage change across states was close to a dollar, we should find a roughly $0.40 increase in wages per dollar of minimum wage increase if raises were purely mechanical. Thus, only half of our estimated $0.80 increase among these occupations can be accounted for by mechanical raises in compliance with new minimum wage laws.

For other parts of the distribution, the role of non-mechanical explanations is even larger. For example, for the 25th percentile of Very Low wage occupations, a $0.15 wage increase per $1 of minimum wage increase would be required to bring this group up to the prevailing wage in the post period. Instead, we estimate a $0.60 increase. For the 10th percentile of Low wage occupations, the purely mechanical effect would have amounted to a $0.20 increase per $1 of minimum wage hike. Instead, we observe an effect three times that size. Finally, for the 25th percentile of Low wage occupations and for the 10th percentile of Modest wage occupations, the purely mechanical effect would be negligble because wage rates were only a few cents below the eventual minimum wages. Instead, we estimate increases on the order of $0.20 to $0.30.

The wage increases in table 6 are thus primarily not driven by mechanical effects of the minimum wage. Increases outside of the very lowest paying occupations (10th percentile of Very Low wage occupations) are driven by other factors. We cannot fully rule out the possibility that wages were, on the whole, growing faster in states that increased their minimum wage rates than in those that did not. However, triple difference estimates, which use the evolution of High wage occupations as a control for state-time variation in wages, are very similar (see appendix table A.5). Given this result and our controls for macroeconomic conditions, our reading of the evidence is that our wage

[23]We calculate the gap between the 2014-2016 minimum wage and the 2011-2013 10th percentile wage. We define a variable that is the maximum of this gap and zero, and then take the mean across occupation-states (for states with non-zero minimum wage increases). That is, we estimate the average amount wages would have to increase by to comply with minimum wage laws, replacing with zero if they already comply.

estimates reflect a sizeable role for non-mechanical effects of minimum wage policy on higher wage workers.

Minimum wage increases may affect compensation at above-minimum wage jobs through several channels. Past work emphasizes channels including firm-worker bargaining and compensation hierarchies (Akerlof and Yellen, 1990; Katz and Krueger, 1992). In the context of our model, spillovers arrive when firms set benefits packages collectively for heterogeneneous workers. Notably, our model's mechanism can rationalizes both the wage and insurance coverage spillovers we find. An additional potential mechanism is labor-labor substitution, wherein employers re-optimize the skill of their labor force, potentially leading to wage increases within occupation (Hamermesh and Grant, 1979). In recent work exploiting the same statutory minimum wage changes, (Clemens, Kahn, and Meer, Work in Progress) find a shift towards more educated and older workers among both job ads and employed workers for low-paying occupations.

4.3 To What Extent Do Coverage Declines Offset Wage Increases?

We now consider the extent to which declines in health insurance coverage offset the wage increases associated with the minimum wage. This requires an estimate of employer contributions to the cost of insurance coverage. We obtain such estimates from a combination of the March CPS supplements and the Kaiser Family Foundation's (KFF) Employer Health Benefits Survey. The March CPS supplements contain worker self-reports of employer contributions to their health care plans, accompanied by basic demographic and employment data. In this survey, employer contributions to insurance plans rise moderately across our occupation groups. In Very Low wage occupations, the average employer contribution, conditional on a positive contribution, was $3,800.[24] For

[24]This estimate includes all employed people age 16-64 in survey years 2012-2017, which cover the previous calendar year.

Low wage occupations, the estimate is $4,400; Modest wage occupations average $5,400; Medium wage occupations average $5,900; High wage occupations average $6,600 in employer contributions to their health care plans.[25] Though based on self-reports, these numbers are reassuringly in line with estimates from the KFF surveys.[26]

From July 2011 to July 2016, the average state minimum wage increase was $1.32, among states with increases. For Very Low wage occupations, our estimates suggest that an increase of this size reduces the likelihood of having employer provided coverage by 2.4 percentage points and increases mean hourly wages by 9%. In the 2011-2013 ACS data, annual earnings among individuals employed in these occupations was about $10,000. The implied effect of the minimum wage changes on annual earnings was thus an average of $900. The decline in employer insurance coverage reduces the cost of this group's compensation by an average of $90 per worker. On average, roughly 10% of the wage gains associated with minimum wage hikes were thus offset by declines in employer provided insurance coverage for individuals in Very Low wage occupations.

For Low wage occupations, we calculate that a $1.32 minimum wage increase would, on average, generate an annual earnings gain of $300 and a $77 decline in the cost of insurance coverage. The coverage decline thus offsets roughly 25% of the wage gain. For Modest wage occupations, average annual earnings increase by a statistically insignificant $100, while the cost of employer coverage declines by $60.[27] The offset thus

[25]The March CPS supplements have much smaller sample sizes than the ACS (roughly one-twentieth the number of observations), but contain sufficient information for a parallel analysis of the impact of minimum wage increases on employer coverage. We find qualitatively similar, though noisier estimates given the smaller samples. We have also explored how the employer contribution amount varies with minimum wage changes, but in general find very noisy zeros.

[26]The KFF's 2017 Employer Health Benefits Survey found that employer contributions were just over $4,000 for single coverage and $11,000 for family coverage. These estimates are based on average annual premiums for retail workers ($5,716 for single coverage and $16,920 for family coverage, see Figure 1.4) and average worker coverage rates (roughly 26 percent of the single premium and 36 percent of the family premium, see Figure 6.26): https://www.kff.org/health-costs/report/2017-employer-health-benefits-survey/.

[27]These estimates use annual earnings calculations from the ACS: $12,000 for Low wage occupations

amounts to a sizeable 60% of the wage gain.

Substantial heterogeneity likely underlies these estimates of average impacts on wages and health insurance coverage. Most importantly, some individuals retain health insurance while others lose it. The distribution of changes in individual welfare thus depend crucially on two factors. First, it depends on the extent to which wage gains accrued to individuals who lost coverage.[28] On this point, the key question we are unable to answer is whether the same individuals experienced both coverage declines and large wage gains. A second key factor, as discussed in section 1, involves the extent to which individuals in Very Low and Low wage occupations value insurance. Risk aversion linked to subsistence constraints could make these valuations high, while the availability of substitutable forms of coverage, for example from the ACA, could make these valuations low (Mahoney, 2015; Finkelstein, Hendren, and Luttmer, 2015; Finkelstein, Hendren, and Shepard, 2017).

5 Discussion and Conclusion

This paper explores the relationship between the minimum wage, the structure of employee compensation, and worker welfare. We advance a conceptual framework that highlights the relevance of non-wage job attributes for evaluating worker welfare and for understanding the spillover effects of minimum wage increases.

We find robust evidence that recent state minimum wage increases resulted in declines in employer-sponsored health insurance for minimum wage earners. Our estimates also suggest that insurance and wage effects spill over to those earning above, but

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and $20,000 for Modest wage occupations.

[28]Note that wage gains going to those who lost coverage is precisely what canonical benefit-incidence theory predicts, as it is the outcome that would most closely maintain the alignment of workers' productivity and compensation (Summers, 1989; Wessels, 1980; McKenzie, 1980).

not far from, the minimum wage. Previous work has considered the possibility of wage spillovers linked to firm-worker bargaining or resulting from compensation hierarchies (Akerlof and Yellen, 1990; Katz and Krueger, 1992). While these perspectives predict wage spillovers, they do not predict the changes we estimate in non-cash compensation. As noted in section 1, benefit packages set in common for high and low skilled workers can rationalize both the wage and insurance coverage spillovers we estimate.[29]

Through what channels might the compensation changes we estimate manifest themselves? Complex benefit arrangements may be costly for firms to reconfigure, resulting in minimum wage effects that accrue gradually over time (Meer and West, 2016). However, over the time period we study, implementation of the ACA's key provisions may have provided a broader opportunity for substantial churn in benefit arrangements. Furthermore, churn of workers across firms and the pool of firms themselves, likely also contribute to declines in coverage. First, low wage workers have especially high turnover rates. Second, new firms may be less likely to sponsor insurance coverage when faced with higher minimum wages. As in the "putty-clay" model emphasized by Sorkin (2015a) and Aaronson, French, Sorkin, and To (2016), new firms will tend to be more flexible than old firms.

We conclude by observing that while employer insurance coverage is an important non-wage job attribute, it is but one of many non-wage job attributes. Our findings thus point to the need for an analysis of other job attributes and how they fluctuate with the minimum wage. Margins of interest, some of which have received attention in recent work, include the flexibility of work hours (Mas and Pallais, 2016), the pace of work, and occupational safety. Standard theory suggests that such margins may

[29]Interestingly, the spillover effects in wages go in the opposite direction of an endogeneity concern in which states increase minimum wages when general labor market conditions erode (and this drives any associated employment losses). In that case, we should instead see wage losses accompanying the insurance losses, when instead we see minimum wage hikes accompanied by wage gains spilling over onto non-minimum wage workers.

have high relevance for worker welfare. Our estimates can be viewed as a lower bound on the extent to which adjustments of non-wage job attributes erode the welfare gains associated with minimum-wage-related wage increases. Examining these other non-pecuniary margins, particularly those that are more difficult to observe in traditional data sources – like workplace amenities – is a fruitful direction for future research.

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Figures and Tables

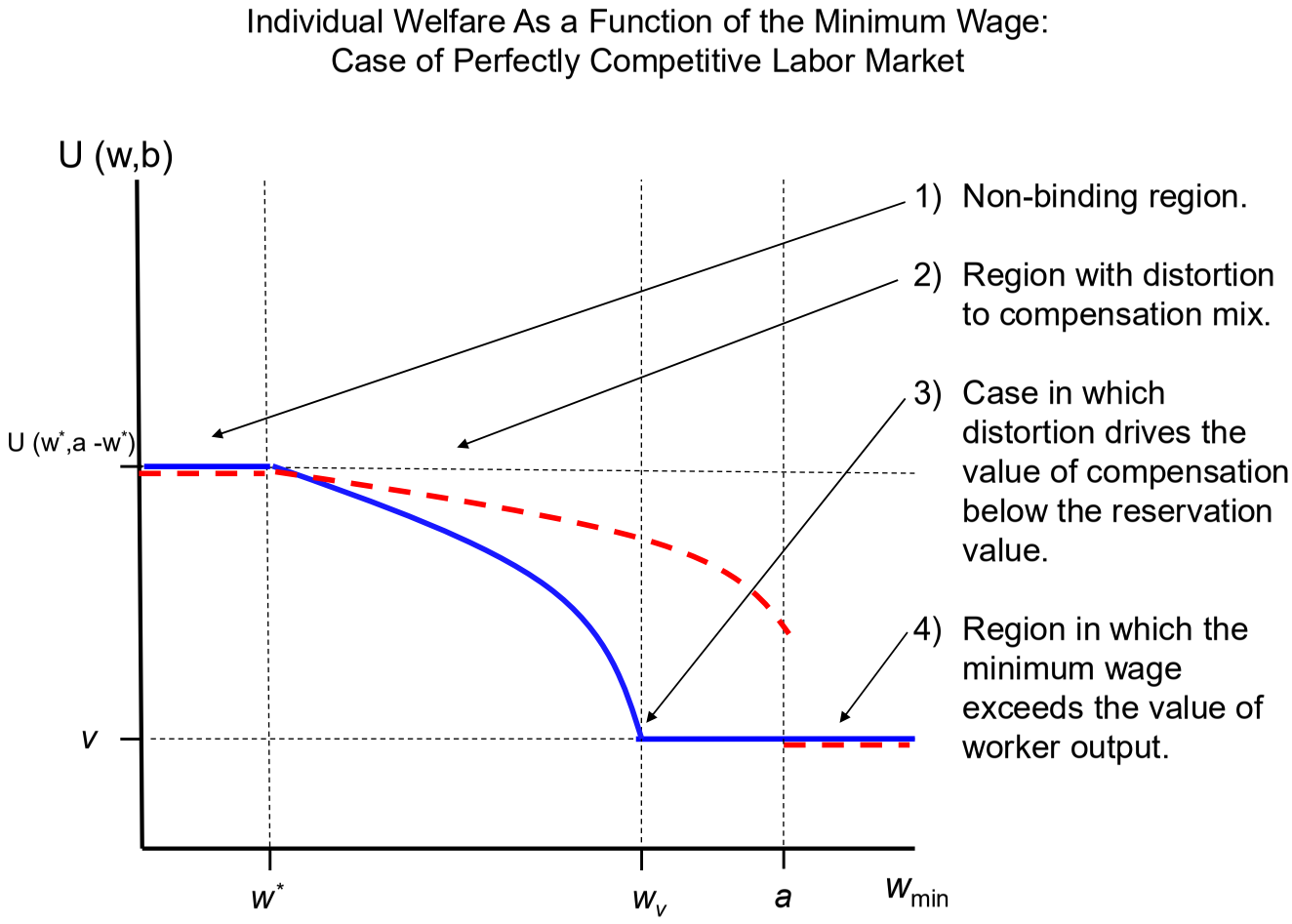

Figure 1: **Individual Utility: Perfect Competition**
The figure depicts an individual's utility as a function of the minimum wage in the case of a perfectly competitive labor market. The individual has productivity of a and receives compensation in the form of benefits b and cash wages a, over which he or she is assumed to have additively separable utility that is increasing and concave in both a and b, $U(w,b) = u(w) + g(b)$ The individual has a reservation utility of v, and thus works so long as $U(w,b) \geq v$. The assumption of a perfectly competitive labor market implies that $w + b = a$. The solid blue line depicts a case in which utility loss from distortion to the compensation package drives the utility from employment below the reservation utility before the minimum wage exceeds the value of the individual's output to the firm. The red dashed line depicts the opposite case.

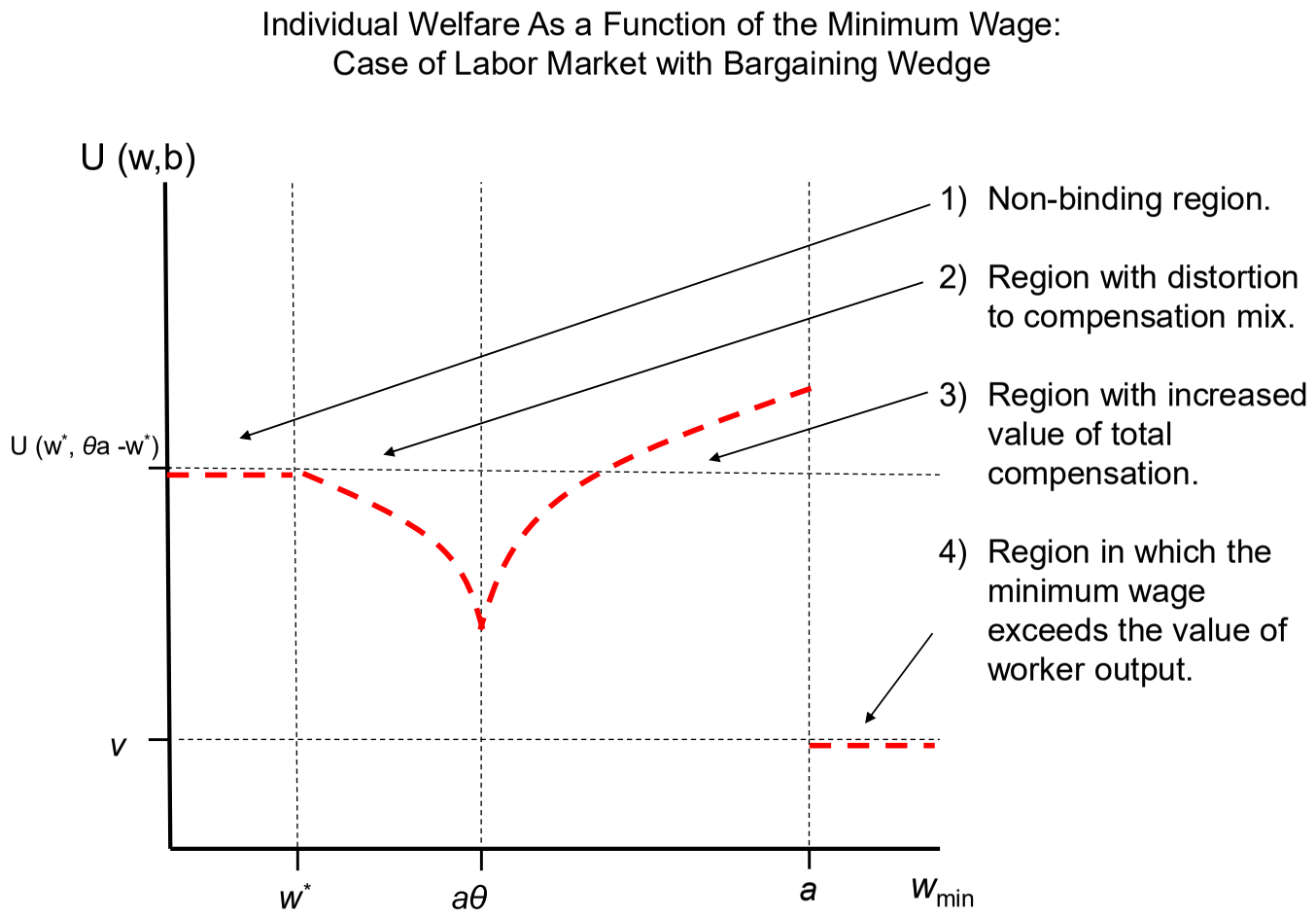

Figure 2: **Individual Utility: Bargaining Wedge**
The figure depicts an individual's utility as a function of the minimum wage in the case of an imperfectly competitive labor market in which a bargaining wedge introduces the possibility that the minimum wage can increase the value of total compensation. The individual has productivity of a and receives compensation in the form of benefits b and cash wages a, over which he or she is assumed to have additively separable utility that is increasing and concave in both a and b, $U(w,b) = u(w) + g(b)$ The individual has a reservation utility of v, and thus works so long as $U(w,b) \geq v$. The bargaining wedge is defined such that, unless the minimum wage is binding on the total cost of the worker's compensation, $w + b = \theta a$. The figure depicts the case in which $u(\theta a) \geq v$, so that distortion to the compensation package does not lead the individual to exit employment. Further, it depicts the case in which there are values of the minimum wage that are less than a and for which $u(w_{min} > u(w^*, \theta a - w^*)$, so that the minimum wage increases the individual's utility relative to the case in which it is fully non-binding.

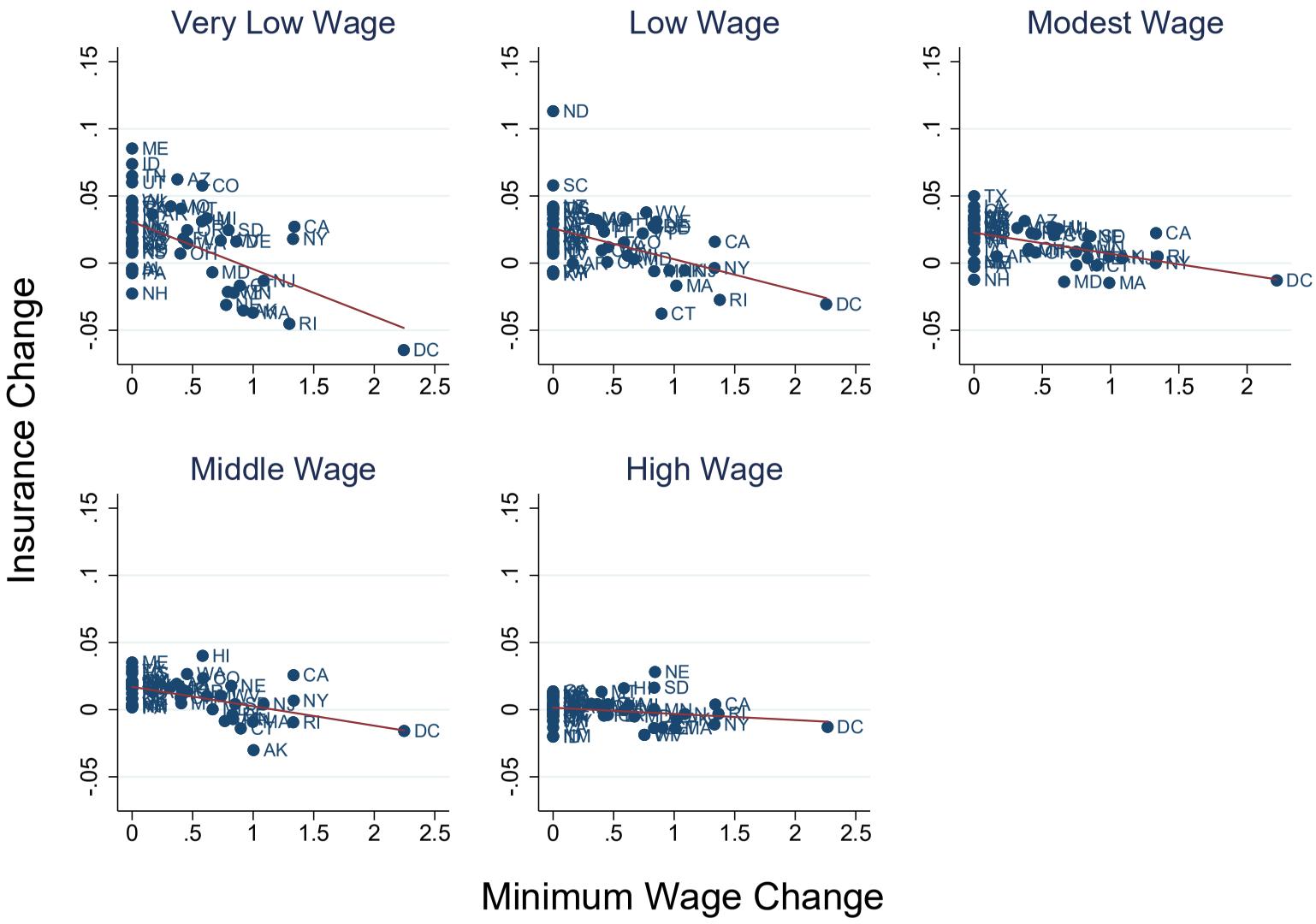

Figure 3: **Minimum Wage Changes and Employer Coverage Changes**
Note: The figure presents scatter plots of state-occupation change in employer insurance coverage on the state minimum wage. Changes refer to the 2014-2016 mean minus the 2011-2013 mean. We group occupations based on their decile of the 10th percentile wage distribution, as measured in the 2006 Occupational Employment Statistics. "Modest", "Medium", and "High" wage occupations correspond to the 2-4, 5-7, and 8-10 deciles, respectively. The bottom decile is split into "Very Low wage" occupations, which represent the bottom third of employment in the decile, and "Low wage" occupations, which cover the rest of the decile.

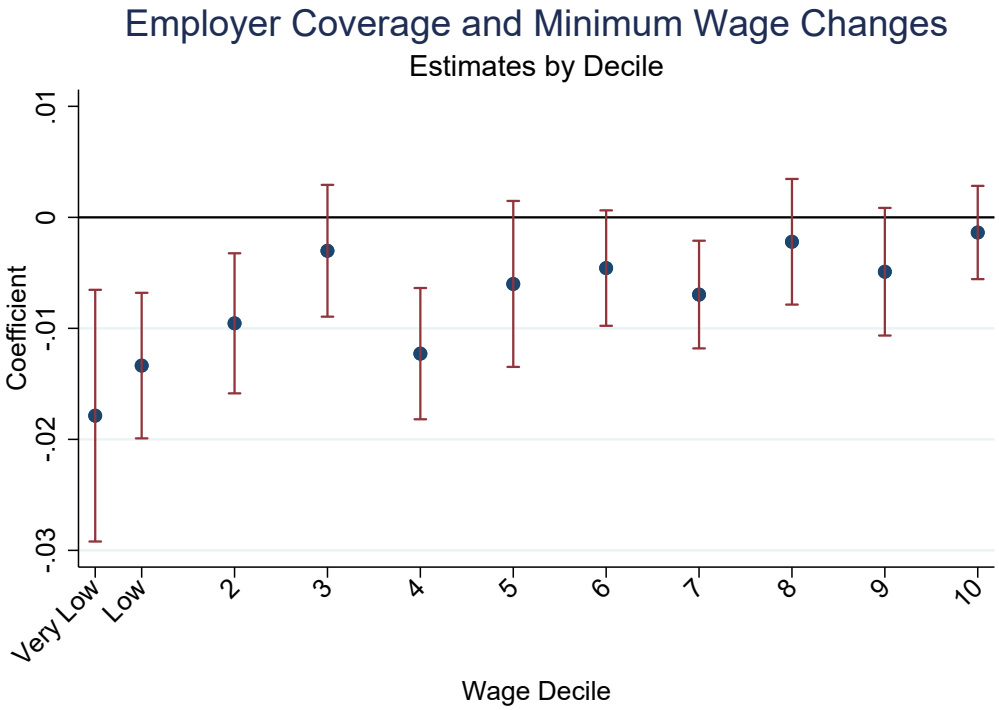

Figure 4: **Insurance Coverage Estimates across Deciles**
Note: The figure reports results of equation (1), estimated separately by decile of their 10th percentile wage (the bottom decile is split into "Very Low" wage occupations, which represent the bottom third of employment in the decile, and "Low" wage occupations, which make up the rest). The dependent variable is an indicator for whether an individual has employer provided insurance coverage, as measured in the American Community Survey from 2011-2016. We regress insurance coverage on the minimum wage in July of each calendar year, as well as full controls (see table 3). We plot the coefficient on the July minimum wage and 95 percent confidence bands.

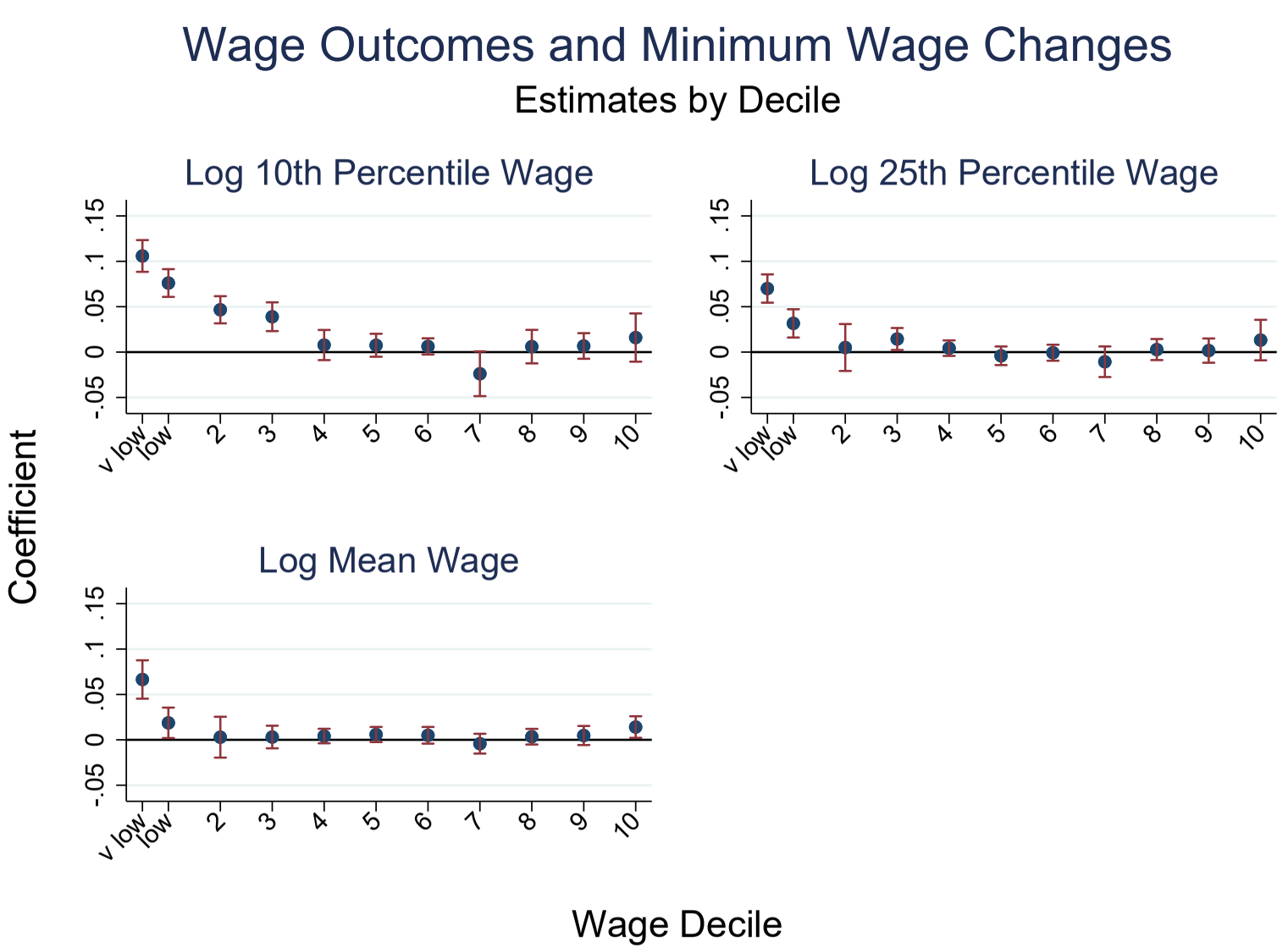

Figure 5: **Wage across Deciles**

Note: The figure reports results of equation (1), estimated separately by decile of their 10th percentile wage (the bottom decile is split into "Very Low" wage occupations, which represent the bottom third of employment in the decile, and "Low" wage occupations, which make up the rest). The dependent variables are points in the occupation-state-year wage distribution, as measured in Occupational Employment Statistics (OES). Our sample consists of OES estimates in 2013 and 2016. Since the OES reports three-year rolling averages, these years reflect 2011-2013 and 2014-2016, respectively. We regress insurance coverage on the minimum wage in July of the midpoint of each time period (2012 and 2015), as well as full controls (see table 3). We plot the coefficient on the minimum wage and 95 percent confidence bands.

Table 1: **Description of Low Wage Occupations**

Panel A: Very Low Wage Occupations

Code	Occupation Description
3530	Food and Beverage Serving Workers
3590	Other Food Preparation and Serving Related Workers
3930	Entertainment Attendants and Related Workers

Panel B: Low Wage Occupations

Code	Occupation Description
3520	Cooks and Food Preparation Workers
3990	Other Personal Care and Service Workers
4120	Retail Sales Workers

Panel C: Modest Wage Occupations

Code	Occupation Description	Code	Occupation Description
2530	Other Teach. and Instr.	4320	Comm. Equipment Operators
2590	Other Ed, Train, and Library	4340	Information Clerks
2720	Ent. and Perf., Sports and Rel.	4341	Record Clerks
2740	Media and Comm. Equipment	4351	Recordkeeping
3110	Nursing, Psych., Home Health Aides	4390	Oth. Office Support
3390	Other Protective Serv.	4391	Oth. Admin. Support
3510	Supervisors of Food Prep/Serv.	4520	Agricultural Workers
3720	Building Cleaning and Pest Control	4530	Fishing and Hunting Workers
3730	Grounds Maintenance Workers	4730	Helpers, Construction Trades
3920	Animal Care/Service Workers	5120	Assemblers and Fabricators
3940	Funeral Service Workers	5130	Food Processing Workers
3950	Personal Appearance Workers	5151	Printing Workers
3960	Baggage Porters, Bellhops, Conc.	5160	Textile, Apparel, Furnishings

Note: The table lists 4-digit SOC occupations that make up three key groups. We group occupations based on their decile of the 10th percentile wage distribution, as measured in the 2006 Occupational Employment Statistics. "Modest" wage occupations correspond to the 2-4th deciles. The bottom decile is split into "Very Low wage" occupations, which represent the bottom third of employment in the decile, and "Low wage" occupations, which cover the rest of the decile. These are the occupations most likely to be mechanically impacted by minimum wage increases.

Table 2: **Summary Statistics**

	Very Low Wage		Low Wage		Modest Wage		Middle Wage		High Wage	
	(11-13)	(14-16)	(11-13)	(14-16)	(11-13)	(14-16)	(11-13)	(14-16)	(11-13)	(14-16)
Employer Coverage	0.445	0.466	0.465	0.479	0.544	0.563	0.649	0.663	0.804	0.804
	(0.497)	(0.499)	(0.499)	(0.500)	(0.498)	(0.496)	(0.477)	(0.473)	(0.397)	(0.397)
10th Pctile Wages	7.879	8.275	8.142	8.519	9.242	9.664	12.51	12.95	22.87	23.72
	(0.365)	(0.656)	(0.420)	(0.676)	(1.082)	(1.132)	(2.251)	(2.304)	(5.869)	(6.036)
25th Pctile Wages	8.276	8.627	8.828	9.180	10.79	11.30	15.54	16.14	28.95	30.21
	(0.344)	(0.583)	(0.548)	(0.719)	(1.746)	(1.812)	(3.077)	(3.182)	(8.100)	(8.294)
Mean Wages	9.561	10.25	11.20	11.71	14.43	15.21	21.23	22.27	40.36	42.69
	(0.788)	(1.155)	(1.036)	(1.144)	(3.408)	(3.458)	(5.360)	(5.497)	(12.82)	(13.64)
Minimum Wage	7.539	7.995	7.547	8.023	7.540	8.005	7.534	7.988	7.546	8.033
	(0.425)	(0.807)	(0.433)	(0.837)	(0.429)	(0.826)	(0.427)	(0.818)	(0.436)	(0.841)
Observations	168894	166983	494992	483884	1358437	1315452	1510548	1481526	1424074	1508161

Note: This table presents summary statistics for our key dependent variables, by occupation group. We group occupations based on their decile of the 10th percentile wage distribution, as measured in the 2006 Occupational Employment Statistics. "Modest", "Medium", and "High" wage occupations correspond to the 2-4, 5-7, and 8-10 deciles, respectively. The bottom decile is split into "Very Low wage" occupations, which represent the bottom third of employment in the decile, and "Low wage" occupations, which cover the rest of the decile; see table 1. Employer insurance coverage rates come from the American Community Survey, while hourly earnings distributions are obtained for Occupational Employment Statistics (OES) at the 4-digit occupation-year-state level. Because OES estimates reflect 3-year averages, we restrict OES data to 2013 and 2016 waves, corresponding to 2011-2013 and 2014-2016 estimates, respectively. Minimum Wage refers to the minimum wage in the state as of July in a given year.

Table 3: **Employer-Sponsored Health Insurance and Minimum Wages**

Dependent Variable	Individual Has Employer Coverage			
	(1)	(2)	(3)	(4)
Panel A:	Very Low Wage Occupations			
Minimum Wage	-0.0146**	-0.0140**	-0.0231***	-0.0179***
	(0.00621)	(0.00628)	(0.00535)	(0.00578)
Observations	335,877	335,877	335,877	335,877
Panel B:	Low Wage Occupations			
Minimum Wage	-0.0129**	-0.0126**	-0.0190***	-0.0134***
	(0.00587)	(0.00607)	(0.00403)	(0.00334)
Observations	978,876	978,876	978,876	978,876
Panel C:	Modest Wage Occupations			
Minimum Wage	-0.0102*	-0.00906*	-0.0151***	-0.00832***
	(0.00551)	(0.00519)	(0.00336)	(0.00231)
Observations	2,673,889	2,673,883	2,673,883	2,673,883
Panel D:	Middle Wage Occupations			
Minimum Wage	-0.00342	-0.00296	-0.00934***	-0.00576***
	(0.00444)	(0.00409)	(0.00209)	(0.00210)
Observations	2,992,074	2,992,069	2,992,069	2,992,069
Panel E:	High Wage Occupations			
Minimum Wage	-0.00207	-0.00200	-0.00446**	-0.00228
	(0.00307)	(0.00295)	(0.00213)	(0.00194)
Observations	2,932,235	2,932,234	2,932,234	2,932,234
SOC4 and State and Year FE	Yes	Yes	Yes	Yes
SOC4-by-Year and SOC4-by-State FE	No	Yes	Yes	Yes
Macroeconomic Controls	No	No	Yes	Yes
ACA Expansion by Year FE	No	No	No	Yes

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Each panel reports separate regressions (of equation 1) restricted to a given occupation group. We group occupations based on their decile of the 10th percentile wage distribution, as measured in the 2006 Occupational Employment Statistics. "Modest", "Medium", and "High" wage occupations correspond to the 2-4, 5-7, and 8-10 deciles, respectively. The bottom decile is split into "Very Low" wage occupations, which represent the bottom third of employment in the decile, and "Low" wage occupations, which cover the rest of the decile; see table 1. The dependent variable is an indicator for whether an individual has employer provided insurance coverage, as measured in the American Community Survey from 2011-2016. We regress insurance coverage on the minimum wage in July of each calendar year, as well as the controls indicated. Macroeconomic controls are the log of personal income, a housing price index, and the employment rate in the state year. ACA expansion controls are indicators for whether the state adopted the medicaid provision in 2014 or later. Standard errors are clustered at the state level.

Table 4: **Employer Coverage and Minimum Wages: Triple Difference Estimates**

	(1)	(2)	(3)
Minimum Wage x Very Low Wage Occs	-0.0120**	-0.0187***	-0.0157**
	(0.00496)	(0.00625)	(0.00672)
Minimum Wage x Low Wage Occs	-0.0110***	-0.0148***	-0.0109***
	(0.00374)	(0.00327)	(0.00295)
Minimum Wage x Modest Wage Occs	-0.00755**	-0.0109***	-0.00658***
	(0.00285)	(0.00245)	(0.00175)
Minimum Wage x Middle Wage Occs	-0.000966	-0.00485*	-0.00368
	(0.00200)	(0.00252)	(0.00279)
Observations	9,912,939	9,912,939	9,912,939
R-squared	0.114	0.114	0.114
SOC4-by-Year FE	Yes	Yes	Yes
SOC4-by-State FE	Yes	Yes	Yes
State-by-Year FE	Yes	Yes	Yes
Macroeconomic Controls by Occupation Group	No	Yes	Yes
ACA Expansion by Occupation Group	No	No	Yes

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. The table reports estimates of equation (2) on the full sample of workers with a non-missing occupation from 2011-2016. The dependent variable is an indicator for whether an individual has employer provided insurance coverage, as measured in the American Community Survey from 2011-2016. We regress insurance coverage on the minimum wage in July of each calendar year interacted with occupation group dummies (High wage occupations are the omitted category), as well as the controls indicated. Standard errors are clustered at the state level. See table 3 for a description of occupation groups and control variables.

Table 5: **Employer Coverage and Minimum Wages: Conditional on Employment**

Dependent Variable	Individual Has Employer Coverage	
	(1)	(2)
	All	Employed
Panel A:	Very Low Wage Occupations	
Minimum Wage	-0.0179***	-0.0210***
	(0.00578)	(0.00653)
Observations	335,877	230,021
Panel B:	Low Wage Occupations	
Minimum Wage	-0.0134***	-0.0130***
	(0.00334)	(0.00386)
Observations	978,876	682,854
Panel C:	Modest Wage Occupations	
Minimum Wage	-0.00832***	-0.00941***
	(0.00231)	(0.00281)
Observations	2,673,883	2,019,718
Panel D:	Middle Wage Occupations	
Minimum Wage	-0.00576***	-0.00765***
	(0.00210)	(0.00232)
Observations	2,992,074	2,444,616
Panel E:	High Wage Occupations	
Minimum Wage	-0.00228	-0.00282
	(0.00194)	(0.00201)
Observations	2,932,235	2,584,126
SOC4 and State and Year FE	Yes	Yes
SOC4-by-Year and SOC4-by-State FE	Yes	Yes
Macroeconomic Controls	Yes	Yes
ACA Expansion by Year FE	Yes	Yes

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. See table 3. Column 2 restricts to individuals who were employed at the time of the survey.

Table 6: **Wage Outcomes and Minimum Wages Changes**

	(1)	(2)	(3)
Dependent Variable	log(10th pctile)	log(25th pctile)	log(mean)
Panel A:	Very Low Wage Occupations		
Minimum Wage	0.106***	0.0700***	0.0665***
	(0.00892)	(0.00794)	(0.0108)
Observations	306	306	306
Panel B:	Low Wage Occupations		
Minimum Wage	0.0761***	0.0316***	0.0187**
	(0.00780)	(0.00795)	(0.00856)
Observations	306	306	306
Panel C:	Modest Wage Occupations		
Minimum Wage	0.0306***	0.00844*	0.00350
	(0.00473)	(0.00434)	(0.00404)
Observations	3,084	3,084	3,084
Panel D:	Middle Wage Occupations		
Minimum Wage	-0.00239	-0.00488	0.00238
	(0.00652)	(0.00436)	(0.00289)
Observations	3,660	3,660	3,660
Panel E:	High Wage Occupations		
Minimum Wage	0.00863	0.00485	0.00632*
	(0.00801)	(0.00593)	(0.00354)
Observations	2,784	2,784	2,784
SOC4 and State and Year FE	Yes	Yes	Yes
SOC4-by-Year and SOC4-by-State FE	Yes	Yes	Yes
ACA Expansion by Year FE	Yes	Yes	Yes
Macroeconomic Controls	Yes	Yes	Yes

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Each panel reports separate regressions (of equation 1) restricted to a given occupation group. See table 3 for a description of groups and control variables. The dependent variables are points in the occupation-state-year wage distribution as reported in Occupational Employment Statistics (OES) data collected by the Bureau of Labor Statistics. Our sample consists of OES estimates in 2013 and 2016. Since the OES reports three-year rolling averages, these years reflect 2011-2013 and 2014-2016, respectively. We regress insurance coverage on the minimum wage in July of the midpoint of each time period (2012 and 2015), as well as the controls indicated. Standard errors are clustered at the state level.

Appendix Material

A Summary of Observation Counts

This section briefly summarizes information related to the ACS samples we analyze. The full sample consists of all individuals ages 16 through 65 (inclusive) surveyed by the American Community Survey in year 2011 through 2016 (inclusive). This otherwise unrestricted sample contains 12,178,715. Our primary estimation sample further restricts to the 9,991,241 individuals associated with an occupation – individuals are asked to report the occupation on their primary job, or, if not working, their most recent occupation of the last 5 years. This sample thus excludes people with no recent work experience. We further lose 78,290 observations in occupations that cannot be matched to the OES in 2006. This results in our primary estimation sample of 9,912,951 observations (the sum of sample sizes across all columns in table 2). When we instead explore effects across demographic groups (age and education), we can use the full sample of 12 million.

Regression samples typically fall a handful short of the full number of observations due to "singleton observations," meaning cases in which there is a single observation in a given occupation-by-state-by-year cell. In our triple-difference specification, for example, we lose 12 such observations; this yields the reported observation count of 9,912,939.

B Appendix Tables and Figures

Table A.1: **Employer Coverage and Minimum Wages: Alternative Specifications**

	(1)	(2)	(3)	(4)	(5)
Panel A:			Level of the Min. Wage		
Minimum Wage	-0.0179***	-0.0134***	-0.00832***	-0.00576***	-0.00228
	(0.00578)	(0.00334)	(0.00231)	(0.00210)	(0.00194)
Observations	335,877	978,876	2,673,883	2,992,069	2,932,234
Panel B:			Log of the Minimum Wage		
Ln(Minimum Wage)	-0.142***	-0.107***	-0.0693***	-0.0454**	-0.0196
	(0.0485)	(0.0264)	(0.0179)	(0.0178)	(0.0159)
Observations	335,877	978,876	2,673,883	2,992,069	2,932,234
Panel C:			Policy Categories		
Large Increaser x Post-2013	-0.0299**	-0.0188***	-0.0153***	-0.0139***	-0.00481
	(0.0125)	(0.00519)	(0.00389)	(0.00426)	(0.00386)
Small Increaser x Post-2013	-0.0146	-0.0114*	-0.00829	-0.00803***	-0.000334
	(0.0100)	(0.00578)	(0.00495)	(0.00288)	(0.00225)
Indexer x Post-2013	-0.0101	-0.00636	-0.00978**	-0.00701**	-0.00276
	(0.00852)	(0.00502)	(0.00389)	(0.00284)	(0.00391)
Observations	335,877	978,876	2,673,883	2,992,069	2,932,234
Full Controls from table 3	Yes	Yes	Yes	Yes	Yes
Occupation Group	Very Low	Low	Modest	Middle	High

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. See table 3. Panel A replicates the specification from column 4. Panel B uses the log of the minimum wage (instead of the level) as the key explanatory variable. Panel B divides states with minimum wage changes into: (1) those with large newly legislated increases (at least $1.50 cumulatively over the time period), (2) smaller legislated increases (less than $1.50), and (3) inflation indexers. We report coefficients on the interaction of these groupings and an indicator for the "post" period (after 2013).

Table A.2: **Effects on Extensive and Intensive Margins of Employment**

	(1)	(2)	(3)	(4)	(5)
Panel A:	Share of Population Employed in Occupation Group:				
	Very Low	Low	Modest	Middle	High
Minimum Wage	0.000436	1.96e-05	-0.00140	0.00150	0.00104
	(0.000335)	(0.000510)	(0.00104)	(0.000910)	(0.000860)
Observations	10,108,965	10,108,965	10,108,965	10,108,965	10,108,965
Panel B:	Usual Weekly Hours, Conditional on Employment in Occupation Group				
Minimum Wage (Jan)	0.00456	0.109	-0.0937*	-0.00319	-0.0201
	(0.142)	(0.0814)	(0.0471)	(0.0329)	(0.0366)
Observations	230,021	682,854	2,019,725	2,444,622	2,584,126
Occupation	Very Low	Low	Modest	Middle	High
Panel C:	Weeks worked, Conditional on Employment in Occupation Group				
Minimum Wage (Jan)	0.118	0.120	-0.0579	-0.0407	-0.0419*
	(0.123)	(0.0976)	(0.0496)	(0.0347)	(0.0225)
Observations	230,021	682,854	2,019,725	2,444,622	2,584,126
Occupation	Very Low	Low	Modest	Middle	High
State FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
ACA Expansion by Year FE	Yes	Yes	Yes	Yes	Yes
Macroeconomic Controls	Yes	Yes	Yes	Yes	Yes

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. The table reports estimates of equation (1). The dependent variable in panel A is an indicator equalling 1 if the individual is employed in the indicated occupation group and zero otherwise. It is estimated on the full ACS sample. In panels B and C, the samples are restricted to employed individuals in the indicated occupation group. We use the prevailing minimum wage in January (rather than July) of the survey year because the dependent variables refer to work variables in the previous 12 months. Because the results in this table involve employment in various occupations, the control variables exclude both the aggregate employment rate and all sets of fixed effects involving the occupation in which an individual is employed.

Table A.3: **Estimates across Age and Education Groups: Employer Coverage and Employment**

Dependent Variable	Employer Coverage		Employment	
	(1)	(2)	(3)	(4)
Panel A:	Young Adults			
Minimum Wage	-0.0136***	-0.0133***	-0.00787*	-0.00843**
	(0.00368)	(0.00358)	(0.00399)	(0.00322)
Observations	1,519,158	1,519,158	1,519,158	1,519,158
Panel B:	Low Experience, Low Education			
Minimum Wage	-0.0106***	-0.0103***	-0.00299	-0.000313
	(0.00308)	(0.00272)	(0.00282)	(0.00397)
Observations	1,692,654	1,692,654	1,692,654	1,692,654
Panel C:	High Experience, Low Education			
Minimum Wage	-0.00808***	-0.00868***	8.23e-05	0.00103
	(0.00219)	(0.00235)	(0.00187)	(0.00213)
Observations	3,026,376	3,026,376	3,026,376	3,026,376
Panel D:	Low Experience, High Education			
Minimum Wage	-0.00560**	-0.00499**	0.00298*	0.00216
	(0.00240)	(0.00227)	(0.00177)	(0.00187)
Observations	2,463,832	2,463,832	2,463,832	2,463,832
Panel E:	High Experience, High Education			
Minimum Wage	-0.00285	-0.00264	0.00203	0.00431***
	(0.00220)	(0.00227)	(0.00149)	(0.00159)
Observations	3,476,695	3,476,695	3,476,695	3,476,695
Full Controls	Yes	Yes	No	No
Demographic Controls	No	Yes	No	Yes

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Each panel reports separate regressions (of equation 1 restricted to a given demographic group. See table 3. Groups are exhaustive: Young Adults restrict to age 16-21, Low Experience is age 21-40, High Experience is age 41-65, Low Education is high school or less, High Education is some college or more. The dependent variable in columns 1 and 2 (3 and 4) is an indicator for whether an individual has employer provided insurance coverage (is employed), as measured in the ACS from 2011-2016. In columns 1 and 2, full controls include those listed in column 4 of table 3. Columns 3 and 4 include all controls in appendix table A.2. Where indicated, we add demographic controls for linear age and years of education, both interacted with year dummies.

Table A.4: **Employer Coverage and Minimum Wages: Estimates across Occupation and Age/Education Groups**

	(1)	(2)	(3)	(4)
Panel A:		Very Low Wage Occupations		
Minimum Wage	-0.0179***	-0.0212**	-0.00759	-0.0214**
	(0.00578)	(0.00831)	(0.00666)	(0.0104)
Observations	335,877	126,198	118,021	91,658
Panel B:		Low Wage Occupations		
Minimum Wage	-0.0134***	-0.0198***	-0.0166***	-0.00118
	(0.00334)	(0.00448)	(0.00529)	(0.00393)
Observations	978,876	265,525	404,753	308,598
Panel C:		Modest Wage Occupations		
Minimum Wage	-0.00832***	-0.0119**	-0.0110***	-0.00449
	(0.00231)	(0.00529)	(0.00274)	(0.00289)
Observations	2,673,883	306,766	1,432,215	934,813
Panel D:		Middle Wage Occupations		
Minimum Wage	-0.00576***	-0.0122	-0.00597**	-0.00521**
	(0.00210)	(0.00756)	(0.00267)	(0.00227)
Observations	2,992,069	154,266	1,278,566	1,559,149
Panel E:		High Wage Occupations		
Minimum Wage	-0.00228	-0.00106	-0.00556	-0.00142
	(0.00194)	(0.0118)	(0.00418)	(0.00237)
Observations	2,932,234	42,715	444,176	2,445,145
Full Controls	Yes	Yes	Yes	Yes
Sample	All	Young Adult	Low Ed Adult	High Ed Adult

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. Each panel reports separate regressions (of equation 1) restricted to a given occupation (indicated at the panel heading) and age/education group (indicated at the bottom under "Sample"). Full controls are those included in column 4 of Table 3. See also table A.3.

Table A.5: **Wage Outcomes and Minimum Wages: Triple Difference Estimates**

	(1)	(2)	(3)
Dependent Variable	log(10th pctile)	log(25th pctile)	log(mean)
Minimum Wage x Very Low Wage Occs	0.0962***	0.0634***	0.0577***
	(0.00945)	(0.00729)	(0.0118)
Minimum Wage x Low Wage Occs	0.0678***	0.0267***	0.0114
	(0.00757)	(0.00600)	(0.00690)
Minimum Wage x Modest Wage Occs	0.0222**	0.00365	-0.00354
	(0.00938)	(0.00653)	(0.00467)
Minimum Wage x Medium Wage Occs	-0.0109	-0.00981*	-0.00480
	(0.00759)	(0.00574)	(0.00420)
Observations	10,140	10,140	10,140
R-squared	0.997	0.998	0.999
SOC4-by-Year FE	Yes	Yes	Yes
SOC4-by-State FE	Yes	Yes	Yes
State-by-Year FE	Yes	Yes	Yes
ACA Expansion by Occupation Group	Yes	Yes	Yes
Macroeconomic Controls by Occ. Group	Yes	Yes	Yes

Note: +, *, **, and *** indicate statistical significance at the 0.10, 0.05, 0.01, and 0.001 levels respectively. See tables 4 and 6. The table reports estimates of equation (2). We regress wage outcomes (as measured in the OES) on the minimum wage in July of each calendar year interacted with occupation group dummies (High wage occupations are the omitted category), as well as the controls indicated.