Minimum Wages, Retirement Timing, and Labor Supply[*†]

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Abstract

We use linked survey-administrative data to study the impact of minimum wage increases on Social Security retirement benefit claiming behavior and labor supply for low-wage, older workers. The share of the labor force working for a rate of pay near the minimum wage increases for older ages near retirement, yet this population is typically ignored in the minimum wage literature. We first verify that we find the expected short-run effects of minimum wage increases on wages, earnings, and employment in the survey data. We then use linked administrative data to estimate hazard models of retirement benefit claiming and panel models of employment over ages 62-70. Individuals exposed to minimum wage increases during these ages delay their claiming of retirement benefits and do so by six months, on average. The delay appears to be driven by an interaction between the minimum wage and the Social Security earnings test. We also find that exposure to minimum wage increases leads to increased full-time and part-time employment during ages 62-70. We combine the claiming and employment outcomes to define partial and full retirement and find that minimum wage increases are associated with less full retirement and more partial retirement. These results suggest that increases in the minimum wage can enhance the financial well-being of low-wage older workers.

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1 Introduction

We test whether minimum wage policy influences retirement and labor supply of older workers by studying Social Security retirement benefit claiming along with the presence and amount of annual earnings. Most minimum wage research focuses on teenagers and restaurant workers. These two groups are disproportionately made up of minimum wage workers, but the proportion of individuals who work for a rate of pay near the minimum wage also increases for ages near retirement (see Figure 1). Theoretical predictions for the effect of minimum wages on retirement claiming and employment are ambiguous, as both labor demand and labor supply play a role and can have opposite effects. Work incentives associated with the Social Security earnings test may also be a factor, as working full-time for the minimum wage corresponds to earnings near the earnings test threshold.

The rules associated with Social Security retirement benefits have been adjusted many times in order to incentivize later retirement. The effect of Social Security retirement eligibility rules and other policies such as Medicare and health insurance on retirement and labor supply have been studied extensively.[1] Given the increased prevalence of low-wage work near retirement and the frequency of state-level minimum wage changes, minimum wage policy may also have important effects on retirement and labor supply.

Our study is the first to analyze the effect of minimum wages on retirement benefit claiming and employment using linked survey-administrative data. The data allows us to track individual-level Social Security receipt and employment over several decades. Some recent evidence related to minimum wages and employment of older workers exists, but is mixed: Borgschulte and Cho (2020) and Fang and Gunderson (2009) find increased employment of older workers following minimum wage increases, but Lordan and Neumark (2018) find that older, low-skilled workers are vulnerable to reduced employment and hours in automobile jobs such as manufacturing. Borgschulte and Cho (2020) also analyze aggregate county/state-by-

[1]See, e.g., Behaghel and Blau (2012a), Deshpande, Fadlon and Gray (2020), Gelber et al. (2018), Gelber, Jones and Sacks (2020), and Gelber et al. (2020) for recent examples related to Social Security retirement rules and French and Jones (2011), Nyce et al. (2013), Shoven and Slavov (2014), and Wettstein (2020) for examples related to Medicare and health insurance. See Blundell, French and Tetlow (2016) for a thorough summary of the literature on retirement incentives and labor supply.

year Social Security beneficiary and payout totals and find mixed results depending on the data source. The use of aggregated data on claiming may be problematic as it cannot account for endogenous migration related to minimum wages or retirement timing, which would influence county/state-by-year totals. Furthermore, changes in retirement benefit claiming and labor supply among older workers are likely temporary adjustments that represent delays in retirement, but the use of aggregated data does not allow for analysis of how long individuals delay claiming or remain employed. Hence, our contribution is the ability to better account for individual-level unobserved confounders and to provide the first evidence on how long, if at all, individuals delay retirement claiming and continue working due to changes in the minimum wage.

We use linked data from the Survey of Income and Program Participation (SIPP), Internal Revenue Service (IRS), and Social Security Administration (SSA). The SIPP data allows us to identify older, low-wage workers based on their average rate of pay using earnings and hours histories, as well as their state of residence. The SSA data allows us to observe Social Security receipt information, including the exact date for first receipt of Old-Age, Survivors, and Disability Insurance (OASDI) retirement benefits. The IRS data allows us to observe annual employment via the presence and amount of wage and salary earnings reported to the IRS.

We find that a 10% increase in the minimum wage is associated with a 0.38 percentage point decline in the probability that an older, low-wage worker claims retirement benefits in a given month after the minimum wage change. This corresponds to a 9% reduction from the sample mean. We also find that a 10% increase in the minimum wage is associated with a 1.5 percentage point increase in the probability of employment (i.e., having positive IRS earnings) in a given year after the minimum wage change, which is a 2% increase from the sample mean. Results based on a falsification sample of individuals with slightly higher wages shows no relationship between minimum wages and retirement claiming or employment, suggesting that our results are not driven by unobserved confounders that more broadly affect the lower part of the wage distribution. We also estimate distributed-lag models and find that the reduction in the probability of claiming retirement benefits is a short-run effect that persists for six months after the minimum wage increase. The increase in the probability of working, on the other hand, persists at least three years after the minimum wage change.

While increased employment can be explained by substitution effects associated with higher wages, the mechanism driving reduced claiming of retirement benefits appears to be related to the interaction between minimum wages and the Social Security earnings test. We test this by exploiting the Senior Citizens Freedom to Work Act of 2000, which removed the Social Security earnings test for individuals past their full retirement age (FRA). Finally, we combine retirement benefit claiming and employment to define full versus partial retirement and show that minimum wage increases are associated with less full retirement and more partial retirement during ages 62-70.

The results in this paper suggest that minimum wage increases in the United States have helped increase the financial well-being of older individuals by encouraging delayed retirement benefit claiming and increased labor supply later in life. The results also suggest that higher wages for retirement-age individuals may improve the solvency of the Social Security system. While many of the rules associated with Social Security retirement benefits have been adjusted over time to encourage more work late in life, minimum wage increases appear to achieve the same result.

The remainder of the paper is organized as follows: Section 2 provides background information on minimum wage policy, the Social Security system, and potential mechanisms. Section 3 describes the data and sample. Section 4 presents the econometric methods. Section 5 discusses the results. Section 6 concludes.

2 Background

2.1 Minimum wage variation and the labor market

Figure 2 shows the number of states with a minimum wage increase in each year from 1978-2014. There are four different periods of federal minimum wage increases during this time, each of which was phased in over multiple years (1978-1981, 1990-1991, 1996-1997, 2007-2009). Federal minimum wage increases affected all or most states, although they have affected fewer states in more recent years due to states increasingly having their own minimum wages that are much higher than the federal. There are also many instances of states raising their own minimum wage in years between federal minimum wage increases. These tend to be more common in years leading up to a federal minimum wage change, but there is at least one minimum wage change in every year except 1982-1984. In 2014, 18 states increased their minimum wage and 24 had a minimum wage higher than the federal level.

Figure 1 shows that teenagers and individuals in their early twenties are very likely to work for a rate of pay near the minimum wage. Teenagers are often the focus of minimum wage research for this reason. However, Figure 1 also shows that individuals around retirement age are more likely to work for a rate of pay near the minimum wage than individuals of prime working age.[2] There are many factors that may contribute to this rise in the share of workers earning near the minimum wage for older ages. Workers with higher rates of pay may retire earlier on average. Alternatively, declining productivity due to aging could lead to lower wages (Ben-Porath, 1967; Lazear, 1979) and changing work preferences as workers age may lead them to trade-off wages for other amenities such as schedule flexibility, non-wage compensation, and location preferences (Ameriks et al., 2020; Giandrea, Cahill and Quinn, 2009; Maestas et al., 2017; Ruhm, 1990; Rutledge and Wettstein, 2020).

A large literature has studied the effects of minimum wages on labor market outcomes. There is robust evidence that minimum wages increase average earnings for the lower part of the wage distribution, but there has been much debate in the literature about whether this comes at the expense of employment for some groups (Allegretto, Dube and Reich, 2011; Allegretto et al., 2017; Dube, Lester and Reich, 2010; Neumark, Salas and Wascher, 2014b,a). This literature has debated the appropriate method to account for the potential correlation between minimum wages and unobserved confounders. Traditional two-way fixed effects specifications for location and time suggest negative minimum wage-employment elasticities in the range of -0.1 to -0.2, while the use of controls for geographic time trends or the comparison of neighboring counties

[2]This fact was first shown by Borgschulte and Cho (2020) using the CPS. We replicated this pattern using monthly wage data from the SIPP, which we describe in more detail in Section 3.

across state boarders produces smaller estimates not distinguishable from zero. Recent work using more flexible methods to account for unobserved heterogeneity or directly comparing the count of missing jobs below versus excess jobs above the minimum wage after a change are consistent with very small employment effects not distinguishable from zero (Cengiz et al., 2019; Totty, 2017), although important questions remain (Neumark, 2017).

Most of this literature has focused on teenagers or specific low-wage sectors such as the restaurant industry. However, older low-wage workers may also be particularly vulnerable to potential loss of employment due to their elevated likelihood of working for a rate of pay near the minimum wage. Some recent work has begun to study older workers, but the results are mixed. Borgschulte and Cho (2020) and Fang and Gunderson (2009) find increases in the overall employment rate of older workers as the minimum wage increases, but Lordan and Neumark (2018) find that minimum wage increases reduce employment in automatable jobs, and that older workers in industries such as manufacturing may be particularly vulnerable to automation. Borgschulte and Cho (2020) also find evidence of reduced Social Security retirement beneficiary and payout totals based on regressions using county-year Social Security retirement totals and county-year minimum wage information. However, a caveat to the use of geographically aggregated data is that it cannot account for endogenous migration, which would be particularly problematic if individuals are likely to migrate when they retire or due to minimum wage changes. The authors include a robustness check using Social Security retirement benefits and other retirement income reported in the CPS and find mixed evidence: they find no relationship between minimum wages and Social Security retirement beneficiary or payout totals, but they do find a reduction in other retirement income.

2.2 The Social Security program

Social Security helps older Americans, workers who become disabled, and families in which a spouse or parent dies. As of June 2019, about 177 million people worked and paid Social Security taxes and about 64 million people received monthly Social Security benefits, with about 48 million of these being retirees. Social Security benefits are intended to supplement one's own retirement income from personal savings once an individual's labor supply decreases later in life.[3]

The Social Security Administration uses tax dollars of workers to fund benefits received by retirees and other beneficiaries. Regular employees pay a Social Security tax of 6.2 percent of their earnings, which employers also have to match, while those that are self-employed pay a 12.4 percent rate. A majority of these tax dollars go into a trust fund that pays benefits to retirees. To become eligible for Social Security benefits, individuals work and earn Social Security "credits." A maximum of four credits can be earned in a given year, and most people need 40 credits (10 years of work) to qualify for benefits.

Social Security replaces a percentage of a person's pre-retirement income. The amount of average wages that Social Security replaces depends on two factors: 1) a person's earnings prior to retirement; and 2) the timing of when a person chooses to start benefits. The benefit amount is based on an individual's 35 highest earning years, but is adjusted depending on when the individual claims their benefits. If an individual starts their benefits at the FRA ($\geq$65 for those born before 1943, $\geq$66 for those born between 1943-1959, and 67 for those born after 1959), this percentage can range from 75 percent for low earners, to about 40 percent for medium earners and 27 percent for high earners.[4] If individuals elect to start benefits prior to reaching the FRA, then the percentages are lower.

While most individuals are eligible to receive retirement benefits at age 62, there are incentives put into place to encourage a delay in retirement until reaching the FRA. Workers that have reached age 62 but have not yet reached the FRA for Social Security are subject to a retirement earnings test. That is, workers earning more than a determined threshold will have a portion of their benefits deferred until reaching the FRA at a rate of one dollar per every two dollars of earnings that lie above the annual limit (in 2020, the limit is $18,240).[5] Once a person reaches their FRA, continuing to work will not reduce their benefits no matter their

[3] For a complete overview of the Social Security program, see https://www.ssa.gov/pubs/EN-05-10024.pdf

[4] Traditionally, the FRA was 65, however over time it has increased to 66, and will gradually rise to 67 for those born 1960 and later.

[5] The threshold is higher for the year during which a person reaches their FRA and applies only to the months before such attainment. That amount was $48,600 in 2020.

earnings. It is important to note that any benefits withheld due to the earnings test are not lost. Upon reaching the FRA, benefits are increased permanently in an actuarially fair way to account for the months in which benefits were withheld.

Traditionally, the earnings test applied to individuals above the FRA as well. These individuals were subject to an earnings test through age 71 from 1975-1982, then age 69 from 1983-1999. The post-FRA earnings test thresholds were higher than the pre-FRA thresholds beginning in 1978. In 2000, President Clinton signed a bill that eliminated the limits on what post-FRA individuals on Social Security could earn, known as the Senior Citizens Freedom to Work Act of 2000. This bill effectively eliminated the earnings test among those that had reached the FRA, allowing these individuals to continue working without being penalized by decreased Social Security benefits.

Social Security retirement claiming rules have been adjusted many times over the years for the purpose of incentivizing more work later in life. Raising the FRA, increasing the earnings test threshold for individuals past the FRA at a faster rate than the standard wage index adjustment beginning in 1996, removing the earnings test for individuals past the FRA in 2000, and increasing the delayed retirement credits associated with delaying past the FRA were all done in order to incentivize more work and reduce strain on the Social Security system (Blundell, French and Tetlow, 2016).[6]

2.3 Minimum wages, retirement benefits, and employment: potential mechanisms

The relationship between minimum wages and employment for older workers could be impacted by both the demand for and supply of labor. Higher minimum wages may decrease the demand for low-wage labor, which in turn may lead to decreased employment for older workers. This

[6]Prior work has found that retirement and labor supply decisions are influenced by a variety of factors including unemployment and the business cycle (Coile and Levine, 2010; Haaga and Johnson, 2012), increasing the FRA (Behaghel and Blau, 2012b; Deshpande, Fadlon and Gray, 2020), changes in Medicare eligibility and rules (French and Jones, 2011; Wettstein, 2020), employer-sponsored health insurance (Nyce et al., 2013; Shoven and Slavov, 2014), and the Social Security earnings test (Engelhardt and Kumar, 2014; Gelber et al., 2018), to name a few.

could subsequently lead to earlier permanent retirement. Alternatively, labor supply effects could lead to decreased or increased employment for older workers. The labor supply mechanism can be characterized as an income versus substitution effect. On the one hand, workers could respond to a wage increase through an income effect, in which case workers reduce their amount of work because they can achieve a target level of income faster. This could subsequently lead to earlier permanent retirement. On the other hand, workers could respond through a substitution effect, in which case they increase their amount of work due to an increase in the cost of leisure. This could subsequently lead to delayed permanent retirement. Hence, theoretical predictions for the effect of minimum wages on employment are multi-faceted and ambiguous.

The theoretical relationship between minimum wages and retirement benefit claiming is also multi-faceted. Minimum wages may indirectly impact claiming through the employment effect described above. If reduced labor demand leads to reduced employment, then workers may turn to retirement benefits to supplement their income. Similarly, the net labor supply effect could impact the timing of retirement benefit claiming if individuals tend to tie the timing of when they claim retirement benefits to the timing of when they exit the labor force. Both the labor demand and labor supply effects on employment therefore imply that a reduction (increase) in employment could lead to an increase (reduction) in retirement benefit claiming. That being said, incentives for claiming retirement benefits are not directly related to employment on the extensive margin: individuals can claim retirement benefits while continuing to work without penalty.[7]

Incentives for claiming retirement benefits are, however, directly related to an individual's amount of earnings. Individuals who earn above the Social Security earnings test threshold while receiving retirement benefits have their benefits temporarily withheld. If minimum wages increase an individual's earnings across or further beyond the earnings test threshold, then their benefits will be temporarily withheld, which reduces the immediate financial return to claiming.

[7]While studies have shown that benefit claiming and intensive margin labor supply in the form of earnings or hours responds to the Social Security earnings test, evidence on extensive margin labor supply adjustments is more mixed. Friedberg (2000), Gruber and Orszag (2003), and Song and Manchester (2007) find no effect of the Social Security earnings test on employment, but recent work by Gelber, Jones and Sacks (2020) and Gelber et al. (2020) does find evidence of an employment effect.

Figure 3 shows the level of the Social Security earnings test threshold over time, as well as the amount of earnings an individual would make if they worked full-time (40 hours per week, 50 weeks per year) at the federal minimum wage. This figure illustrates the relevance of the earnings test for near-minimum-wage workers. The post-FRA earnings threshold tracked the full-time federal minimum wage earnings level pretty closely through the mid-1980s, with the pre-FRA threshold a little below. From the mid-1980s onward, the pre-FRA threshold tracks the full-time federal minimum wage level closely, while the post-FRA threshold diverges somewhat in the late 1990s before its removal in 2000. Thus, regardless of the effect of minimum wages on employment, the interaction of minimum wages with the Social Security earnings test could lead to reductions in retirement benefit claiming if minimum wages push individuals across or further beyond the earnings threshold.

In the analysis of retirement benefit claiming below, we attempt to distinguish between the employment effect mechanism and the interaction between minimum wage increases with the Social Security earnings test. We do this by exploiting the removal of the Social Security earnings test for individuals past their FRA in 2000, which affected the earnings test mechanism but not the employment effect mechanism.

3 Data and Sample Selection

3.1 Linked survey-administrative data

Our data source is the SIPP Gold Standard File (GSF), a Census Bureau product that integrates person-level micro-data from the SIPP with administrative tax and benefit data from the IRS and SSA.[8] The GSF includes all individuals and a subset of longitudinally harmonized variables from nine different SIPP panels (1984, 1990, 1991, 1992, 1993, 1996, 2001, 2004, and 2008). The SIPP includes monthly survey response information for a short period of time, usually a span of two-to-four years.

[8] We use version 7.0 of the GSF. Outside researchers can access a synthetic version of the GSF, known as SIPP Synthetic Beta (SSB). Researchers can then have their results validated on non-synthetic data. More information is available in Benedetto, Stanley and Totty (2018).

Individuals from the SIPP are linked to administrative records from the IRS and SSA in order to merge tax and benefit information. Linkage is based on a protected identification key (PIK), which is a confidentiality-protected version of a social security number. The various SIPP panels all have a 70-90% successful link to the administrative records data, except for the 2001 panel, which has a 47% successful link rate.

For individuals who were successfully linked, the GSF includes tax information from W-2 and Schedule C records along with Social Security benefit application date, receipt date, and amount information. Unlike the SIPP information, the linked administrative data cover a long time frame. The W-2 and Schedule C earnings information includes annual earnings reported to the IRS from 1951-2014.[9] Similarly, the benefit application, receipt, and amount information covers 1951-2014. Thus, while we only know information collected in the SIPP while the person is in the survey, the tax and benefit information cover a much longer time frame.

The GSF is uniquely well-suited to study the impact of minimum wages on retirement timing. The SIPP includes information that is useful for identifying potential minimum wage workers, including monthly earnings, monthly hours worked, birth date, and state of residence. The benefit information from the SSA includes an indicator for receipt of OASDI retirement benefits, the date when receipt of the benefits began, and the monthly amount received in the first month of payment. Together, this information allows us to estimate the effect of exposure to minimum wage changes on wages, earnings, employment, and retirement benefit receipt for low-wage, older workers.

3.2 Sample construction

We are interested in the effect of minimum wages on retirement benefit timing. Individuals cannot receive Social Security benefits before reaching age 62 and can increase their monthly amount received by delaying only until age 70. Our main analysis is therefore restricted to ages 62-70. Because the SIPP is our source of state of residence as well as earnings and hours

[9] The longitudinal W-2 and Schedule C earnings we use come from the SSA's Detailed Earnings Record (DER). The SSA receives the tax information in the DER form the IRS. The SSA performs some cleaning of the data before the Census Bureau recieves it.

information, which we use to identify low-wage workers and minimum wage changes, we limit the sample to individuals who are observed in the SIPP at some point during ages 62-69. We then link monthly and annual historical minimum wage information from Vaghul and Zipperer (2016) and the website of David Neumark.[10] We also link covariate information on state-month and state-year unemployment rates from the Bureau of Labor Statistics and state-year population from the Bureau of Economic Analysis. We adjust all wage, earnings, and minimum wage variables for inflation to 1999 dollars using the R-CPI-U-RS.

In order to identify low-wage workers, we construct an hourly wage variable equal to monthly earnings divided by monthly hours for each month an individual is in the SIPP. We then take an average of these monthly wage observations in order to identify individuals who consistently work for a rate of pay near the minimum wage, similar to the approach in Clemens and Wither (2019). For individuals who experience a change in their state minimum wage while in the SIPP, we take the average of all monthly wage observations prior to the first minimum wage change. We only use months prior to the first minimum wage change in order to avoid conditioning the sample on a variable that is directly affected by the minimum wage change. For individuals who do not experience a minimum wage change while in the SIPP, we take the average of all monthly wage observations while in the SIPP. We then select individuals whose average monthly wage is less than or equal to the prevailing minimum wage before any change plus two dollars.[11] We extend the cutoff above the minimum wage because of measurement error in wages and because it is well-documented that minimum wage effects can spill over to individuals who earn a little above the minimum wage (e.g., Lopresti and Mumford, 2016). We chose the cutoff of two dollars because several studies suggest that these spillovers exist up to about two dollars above the minimum wage value prior to the minimum wage change (Brochu et al., 2018; Cengiz et al., 2019; Fang and Gunderson, 2009; Gopalan et al., 2020).

After identifying older, near-minimum-wage workers, we first validate our design by using

[10]http://www.economics.uci.edu/ dneumark/datasets.html.

[11]Clemens and Wither (2019) study the effect of the series of federal minimum wage increases that occurred during the Great Recession. To create their low-wage sample, they take the average of SIPP monthly wage observations prior to the first federal minimum wage change. They define the "target group" as individuals whose average wage was less than or equal to $7.50, which is equivalent to the federal minimum wage before the changes plus $2.35.

the monthly SIPP information to estimate the short-term effect of minimum wages on hourly wages, earnings, employment, and hours worked. This is primarily intended to be a first-stage test, ensuring that we find the expected short-run effects of minimum wage increases on hourly wages in particular, to validate the sample selection. We restrict this analysis to the subset of near-minimum-wage workers who have a balanced sample of non-missing SIPP observations for each given outcome of interest over a 19 month time-span around their first minimum wage change while in the SIPP. The time-span ranges from six months before the minimum wage change to 12 months after. If the individual did not experience a minimum wage change while in the SIPP, then we use their first 19 months with non-missing information. Using a balanced sample prevents the results from being complicated by changing composition of the sample before and after the minimum wage change, which is always a concern in difference-in-differences style analyses, but especially so in this setting given that minimum wage changes may influence retirement behavior and thus exit from the labor market altogether.

We then turn to the OASDI retirement benefit claiming analysis. We start with the retirement-age, near-minimum-wage sample and make two additional sample restrictions. First, the individual from the SIPP must be successfully linked to the administrative records data as described above and have no record of dying prior to reaching 70 years of age without having claimed retirement benefits.[12] Second, the individual must have at least 40 quarters of covered work prior to reaching age 62, so that they qualify for retirement benefits.[13] We identify retirement benefit claiming in the GSF by using the variable that indicates when OASDI retirement benefit payments began.[14] We use this variable along with the linked monthly minimum wage and birth date information to build a person-month panel that spans from the month an indi-

[12]Information on date of death is obtained using a hierarchy of administrative sources: (i) SSA's Master Benefits Record file, (ii) SSA's Supplemental Security Record file, and (iii) the Census Person Characteristics File with death information coming from the SSA Numident and Master Death Files.

[13]Our data from the SSA reports the total quarters of qualified work per year beginning in 1951. The minimum amount of earnings required in order to qualify for a quarter of covered work changes over time based on average wages. The amount in 2020 was $1,410.

[14]We refer to our outcome as the *claiming* of retirement benefits throughout the paper, although our outcome is actually the date of first *receipt*. This is common in the literature (e.g., Behaghel and Blau, 2012; Deshpande et al., 2020). The date of first receipt, not application, is what determines payout amounts and thus is the variable of interest for financial well-being. Changes in claiming behavior are therefore inferred from changes in receipt timing. The SSA recommends that individuals apply for retirement benefits four months before they would like to begin receiving them: https://www.ssa.gov/benefits/retirement/apply.html

vidual turns 62 through the month they claim retirement benefits or the month prior to turning 70.

Next, we turn to the labor supply analysis. We use the annual W-2 and Schedule C earnings from administrative tax records to measure employment. We make two sample restrictions to the retirement-age, near-minimum-wage sample once again. First, the individual must be successfully linked to the administrative records and have no record of dying prior to the year they turned 71. Second, the individual must have no missing IRS earnings information from ages 62-70. Then we use the linked annual minimum wage information and birth date to build a balanced person-year panel that spans from the year an individual turns 62 through the year an individual turns 70.

Finally, we construct a falsification version of the three samples described above. The falsification sample construction is based on the same age and wage steps described above, except that we select individuals whose average wage is \$5-\$10 above the minimum wage. These individuals have low enough wages that they still belong to the lower part of the wage distribution, but high enough wages that their outcomes should not be influenced by changes in the minimum wage.

3.3 Summary statistics

Table 1 shows summary statistics for the OASDI retirement benefit claiming and employment samples. The outcome variable for the retirement claiming sample is an indicator variable for whether the individual began receiving retirement benefits in the current month. In addition to showing the mean and standard deviation for this variable in the *Time-Varying Variables* section of the table, the *Time-Invariant Variables* section also shows the share of the sample that receives retirement benefits by age 70 and the average age at which individuals first receive benefits.

The outcomes of interest for the employment analysis are three different annual employment indicators. One is an indicator for any employment, based on the presence of any amount of earnings in the IRS data. The others are indicators for full-time and part-time employment, based on the amount of earnings reported in the IRS data. We follow Gorodnichenko, Song and Stolyarov (2013) in how we define full-time and part-time work using earnings reported to the IRS. Full-time work is defined as an individual earning at least 50% of their lifetime highest annual earning amount observed in the data, in inflation-adjusted dollars. Part-time work is defined as earning less than 50% of their highest observed earnings year but still at least $5,000 in inflation-adjusted dollars, which equates to working approximately 20 hours per week at the minimum wage for a full year or working 40 hours per week at the minimum wage for six months.

We also analyze joint benefit claiming and employment outcomes. If an individual has claimed retirement benefits and is part-time employed, then we classify them as partially retired. If an individual has claimed retirement benefits and has no earnings or less than the $5,000 inflation-adjusted dollars needed for part-time employment, then we classify them as fully retired. The summary statistics for these two variables are shown for the employment sample.

The covariates used in the claiming and labor supply analysis include indicators for sex, race, Hispanic status, highest education level, marital status, birth year, health insurance, health insurance via employer, defined-benefit pension, and defined-contribution pension.[15] The continuous covariates include total net worth, total non-housing wealth, state-year unemployment rates, and total annual earnings reported to the IRS.

4 Econometric Methods

4.1 Short-term labor market outcomes

Before analyzing retirement claiming and employment outcomes, we estimate the short-run effect of minimum wage changes on wages, employment, earnings, and hours using the monthly information from the SIPP. We follow recent minimum wage work by Clemens and Wither (2019) and Cengiz et al. (2019) and use an event-based difference-in-differences analysis. We

[15] Health insurance coverage and health insurance via employer are reported longitudinally in the SIPP. Our covariate is equal to one if the respondent ever indicated coverage and zero otherwise. We also explored using covariates for always having coverage or the share of the individual's responses over time that indicate coverage. The results were very similar.

analyze outcomes in a 19 month window ranging from six months before the minimum wage change event to 12 months after the event and regress the outcome of interest on an indicator that corresponds to being in a treated state and the post-treatment months.

The primary regression model is:

$$y_{iast} = \beta\Gamma_{st} + X_{ist}\psi + \tau_a + \alpha_i + \delta_t + u_{iast}, \quad (1)$$

where y_{iast} is equal to one of log(wage), an employment indicator, log(earnings), or log(hours). Γ_{st} is an indicator variable equal to one if the minimum wage was changed in state s during or prior to time period t. X_{ist} includes covariates for the state-year unemployment rate and state-year population. τ_a, α_i, and δ_t are age, person, and time-period fixed effects, respectively.[16] We also estimate specifications with state-specific linear time trends and Census division-by-period fixed effects. β represents the change in the given outcome after an increase in the minimum wage.

4.2 Hazard models of OASDI retirement benefit claiming

We estimate hazard models of retirement claiming. Our main results are based on OLS regressions where the dependent variable is equal to zero in months prior to receiving retirement benefits and one in the month of first receipt, following recent papers on retirement claiming such as Behaghel and Blau (2012b), Deshpande, Fadlon and Gray (2020), and Wettstein (2020). We include age (in months) fixed effects and drop all observations after the month of retirement, thus effectively converting the specification to a hazard model.[17] If an individual does not receive retirement benefits by the month before turning 70 then their time-series stops at that age.

The independent variable of interest is now the log of the minimum wage rather than an event-based indicator variable as in the short-term outcome models. The event-based approach is applicable in the first-stage setting where we are only interested in confirming that we find

[16] The other covariates shown in Table 1 drop out because of the person fixed effects.

[17] We also used probit, logit, and contemporaneous log-log estimation techniques in addition to OLS, for robustness.

the expected immediate effects on outcomes such as wages, as it is rare for states to have more than one minimum wage change within 12 months. So the 19 month time-span allows for a clean window of time around minimum wage events. The retirement benefit claiming and labor supply analyses, on the other hand, cover a time period of up to nine years. Most individuals will be exposed to multiple minimum wage changes over that time period, which complicates an event-based analysis. The log minimum wage approach is common in the literature (see, e.g., the discussion in Cengiz et al. (2019) and Neumark (2018)) and allows us to not only analyze a longer time period, but also account for the size of changes in the minimum wage.

The primary regression model is:

$$Receipt_{iast} = \beta logMW_{st} + X_{ist}\psi + \tau_a + \theta_s + \delta_t + u_{iast}, \tag{2}$$

where $logMW_{st}$ is the log of the minimum wage in state s at time t. X_{ist} is a vector of covariates for macroeconomic and individual characteristics.[18] τ_a, θ_s, and δ_t are age (in months), state, and time period (in months) fixed effects, respectively.[19] The coefficient of interest is β. Under the assumption that minimum wage changes are uncorrelated with unobserved individual or state-year characteristics that also influence retirement claiming conditional on the covariates in the model, β captures the change in the probability of claiming retirement benefits in each time period after a given percent change in the minimum wage.

We also estimate a distributed-lag hazard model in order to observe the evolution in the probability of claiming retirement benefits around the time of a minimum wage change. If an individual chooses not to claim retirement benefits due to a change in the minimum wage, this is likely a temporary delay in claiming, and we would like to be able to estimate the length of such a delay. An event-study model would be ideal for this type of question, but is complicated by

[18]These covariates include continuous variables for the log of the state-year unemployment rate, total net worth, non-housing wealth, total earnings reported to the IRS; and indicator variables for the month in which an individual reaches FRA, sex, race, Hispanic status, highest education level (less than high school, high school, some college, bachelor's, graduate), marital status (never married, married, divorced or widowed), has a defined-benefit pension, has a defined-contribution pension, removal of the social security earnings test after the FRA in 2000, and birth year.

[19]Person fixed effects from equation (1) are excluded here because OASDI receipt is an absorbing state. We replace them with state fixed effects. State fixed effects were exclued from equation (1) because state of residence is only measured once in the SIPP GSF and thus drops out with person fixed effects.

the continuous and recurring nature of minimum wage changes over a nine year time-span. We therefore adopt the approach from Dube, Lester and Reich (2010), who applied a distributed lag model to regressions of employment and earnings on the log of the minimum wage. We include leads up to 12 months prior to the minimum wage change and lags up to 24 months after a minimum wage change in six-month intervals. Including the leads/lags as six-month differences except for the last lag produces coefficients that represent the cumulative response of retirement claiming to minimum wage changes over time. The model is:

$$Receipt_{iast} = \sum_{j=-2}^{3} \beta_{-6j} \Delta_6 logMW_{s,t-6j} + \beta_{-24} logMW_{s,t-24} + X_{ist}\psi + \tau_a + \theta_s + \delta_t + u_{iast}, \quad (3)$$

where Δ_6 represents a six-month difference operator. We expand the balanced panel from ages 62-69 to ages 59-72 in order to include one year of leading values of the log minimum wage and two years of lagged values of the log minimum wage (in six-month differences) for the full sample. The distributed-lag results show how long (if at all) individuals alter their retirement benefit claiming behavior following a change in the minimum wage, i.e., how long any claiming delays last.

4.3 Labor supply

The labor supply analysis is based on OLS regressions where the dependent variable is an indicator variable capturing any employment, full-time employment, or part-time employment in a given year. We do not estimate hazard models for employment because, unlike OASDI retirement benefit claiming, individuals may move in and out employment over time. Because non-employment is not an absorbing state like OASDI claiming, we can also include individual fixed effects. Our analysis is therefore based on a balanced panel of observations from the year in which an individuals turns 62 through the year in which an individual turns 70.

The primary regression model is:

$$WorkStatus_{iast} = \beta logMW_{st} + X_{ist}\psi + \tau_a + \alpha_i + \delta_t + u_{iast}. \tag{4}$$

$logMW_{st}$ is the log of the minimum wage in state s at time t. X_{ist} is a vector of covariates for macroeconomic and individual characteristics. τ_a, α_i and δ_t are age (in years), individual, and time period (in years) fixed effects, respectively. β represents the change in the probability of the given type of work in each time period after a given percent change in the minimum wage.

4.4 Joint claiming and labor supply outcomes

We use the same regression specification as in (4) to estimate the effect of minimum wage changes on the joint claiming and employment outcomes, partial and full retirement, defined in Section 2. We also estimate a hazard model for the first year of full retirement during ages 62-70 even though this outcome is not an absorbing state.

5 Results

5.1 Short-term labor market outcomes

We begin by analyzing short-run labor market outcomes immediately after a change in the minimum wage. Table 2 shows the relationship between minimum wage events and labor market outcomes for employment, wages, earnings, and hours in the first 12 months after a minimum wage change. Wages increase by approximately 9-11% after a minimum wage increase, depending on the specification. This suggests that our sample of low-wage workers are in fact working near the minimum wage and are affected by changes in the minimum wage. Employment and hours do not respond to changes in the minimum wage. Consistent with a wage increase and no evidence of a reduction in employment or hours, we find an increase in earnings almost as large as the increase in wages.

While these results are encouraging for the construction of our sample, they could be driven by unobserved confounders that influence the lower part of the wage distribution in general.

Table 3 repeats the analysis from Table 2, except with individuals whose average wage is \$5-\$10 above the minimum wage. All the coefficients are close to zero relative to Table 2 and lack statistical significance. This suggests that our short-run results are not driven by unobserved confounders that also affect lower wage workers farther away from the minimum wage.

5.2 Hazard models of OASDI retirement benefit claiming

Next we turn to analyzing OASDI retirement benefit claiming behavior. The OLS hazard results in column (1) of Table 4 show a coefficient of -0.0351, which corresponds to a 0.351 percentage point reduction in the probability of claiming retirement benefits in a given month after a 10% increase in the minimum wage, statistically significant at the 5% level. When we add additional controls in column (2), the coefficient is -0.0380, indicating a reduction of 0.380 percentage points, statistically significant at the 1% level. A 0.380 percentage point reduction corresponds to a 9% reduction from the sample mean rate of claiming in a given month. We also see that the month during which an individual reaches their FRA is associated with a 5.15 percentage point increase in the probability of claiming retirement benefits. We consider the model in column (2) to be our preferred model for the claiming hazard results. Results are similar for probit, logit, and contemporaneous log-log estimation.

Table 5 shows results based on the falsification sample. Once again, all of the coefficients are small relative to the results from the near-minimum-wage sample. The coefficient for column (2) is statistically significant, but it suggests an increase in claiming retirement benefits after a change in the minimum wage, which is the opposite sign from the results for the near-minimum-wage sample. The coefficients for the month during which an individual reaches FRA are very similar to the results in Table 4, which suggests that this sample is still responding to benefit claiming incentives even though they do not appear to be affected by changes in the minimum wage.

However, we are interested in not only average level differences in claiming behavior before and after minimum wage changes, but also dynamic responses. The distributed-lag results are shown in Figure 4. There is no visual evidence of leading effects prior to the minimum wage change. The probability of claiming then reduces by approximately 0.6 percentage points for a 10% increase in the minimum wage in the month of the minimum wage change, which is a 15% reduction from the sample mean monthly claiming rate. The reduction remains at 0.6 percentage points and statistically significant for the six-month lag. After six months, the difference in the probability of claiming associated with a minimum wage change returns to near zero and is not statistically significant. The lack of evidence for spurious leading effects and the evidence for temporary rather than permanent reductions in claiming suggest that we are capturing real delays in claiming that result from changes in the minimum wage.

5.3 Labor supply

The labor supply results are shown in Table 6, broken out by any employment, full-time employment, and part-time employment as defined in Section 2.3. Columns (1)-(3) show an increase in the probability of any employment after a change in the minimum wage. Our preferred model with person fixed effects in column (3) shows a coefficient of 0.151. This represents a 0.0151, or 1.5 percentage point, increase in the probability of any work in a given year after a 10% increase in the minimum wage, statistically significant at the 1% level. This corresponds to a 2% increase from the sample mean probability of employment in a given year. The coefficient on the indicator for the year in which a person reaches FRA is small and not statistically significant. The FRA year is only relevant for determining the monthly OASDI payment amount if a person claims retirement benefits, so it is not surprising to see that the FRA is associated with retirement benefit claiming but not annual employment.

Columns (4)-(9) report the results for part-time and full-time employment rather than any employment. The results suggest that the increase in any employment is made up of increases in both full-time and part-time employment. The preferred specification with person fixed effects shows a 1.1 percentage point increase in the probability of both types of employment after a 10% increase in the minimum wage, statistically significant at the 10% level. This corresponds to a 6% increase from the sample mean for full-time employment and a 4% increase from the sample mean for part-time employment.

The falsification sample for employment shows no significant relationship between minimum wages and any employment or full-time employment. There are, however, negative and statistically significant reductions in part-time employment for these relatively higher, but still low-wage, workers after an increase in the minimum wage. The specification with person fixed effects shows a 0.651 percentage point reduction in the probability of part-time employment after a 10% increase in the minimum wage, statistically significant at the 10% level. These results are the opposite sign of the results for the near-minimum-wage sample, so this does not suggest that unobserved confounders are driving the increase in employment for near-minimum-wage workers. It may suggest a labor-labor substitution effect by businesses in order to offset some of the additional labor cost related to the minimum wage increase. If businesses have to pay higher wages to the lowest part of the wage distribution, and even see an increase in the supply of these workers, then they may offset the additional cost associated with these workers by reducing employment of slightly higher wage, part-time workers.

Figure 5 shows the distributed lag model for labor supply. The results are based on the specification for any employment with person fixed effects in column (3) of Table 6. The leading coefficients are generally flat and are not statistically significant. This reduces concerns about the employment result being driven by unobserved confounders. The contemporaneous and lag coefficients are all positive and statistically significant. The contemporaneous coefficient is approximately 0.19, indicating a 1.9 percentage point increase in the probability of employment for pay in the year of a 10% increase in the minimum wage. The lag coefficients are even larger, suggesting that the increase in the probability of employment after an increase in the minimum wage lasts for at least three years after the minimum wage change.

5.4 Robustness and mechanisms

Prior work has shown that estimates of the effect of minimum wages on employment can be sensitive to the inclusion of state-specific time trends and geographic-specific time fixed effects (Allegretto, Dube and Reich, 2011; Allegretto et al., 2017; Dube, Lester and Reich, 2010; Neumark, Salas and Wascher, 2014b,a; Totty, 2017). Table 8 shows robustness of our preferred benefit claiming and employment specifications to the inclusion of controls for other forms of unobserved geographic and time heterogeneity. State-specific time trends account for possible heterogeneous trends in retirement benefit claiming or employment across states that may be correlated with minimum wage policy. Census Region-specific time effects account for regional macroeconomic shocks that may influence claiming or employment and be correlated with minimum wage policy. We also add age-by-time fixed effects which can account for changes in trends towards later or earlier retirement over time.

We sequentially add the additional controls to ensure that the coefficient on the log minimum wage is not sensitive to particular sets of controls. Columns (1)-(4) show results for retirement benefit claiming. Columns (5)-(8) show results for employment. Both outcomes are robust to the inclusion of these additional controls. Including the controls actually strengthens the results, as the coefficient for the log minimum wage increases by 22-25% from the preferred specifications in prior tables to the most saturated specifications in Table 8.

Next, we explore possible mechanisms for the results described so far. Minimum wage increases could decrease employment via reduced labor demand due to higher labor costs or reduced labor supply via income effects. The results for employment are consistent with neither of these hypotheses. Instead, our results suggest that substitution effects via higher wages are the dominant force. Borgschulte and Cho (2020) and Fang and Gunderson (2009) also find increased employment of older workers after increases in minimum wages.

As described in Section 2.3, the claiming results are consistent with both an employment channel mechanism, in which individuals delay claiming retirement benefits because they continue working longer, and a mechanism involving the interaction between minimum wages and the Social Security earnings test, in which individuals delay claiming because higher minimum wages push their earnings across or further beyond the earnings test threshold thus reducing the immediate return to claiming. We distinguish between these mechanisms by exploiting the removal of the post-FRA Social Security earnings test in the year 2000. Splitting our sample of analysis into pre- vs post-FRA and pre- vs post-2000, three of the four groups are subject to a Social Security earnings test. We add a post-FRA variable, post-2000 variable, and interaction between the two variables into our model and then also interact them with the log minimum wage.

The results are shown in column (1) of Table 9. The full marginal change in the probability of claiming after a change in the minimum wage for each of the four age-by-time groups are shown at the bottom of the table based on the linear combination of the appropriate coefficients in the top of the table. The marginal change is negative and statistically significant for all three of the groups that are subject to an earnings test. For the post-FRA, post-2000 group, the result is actually the opposite: a change in the minimum wage is associated with a statistically significant increase in claiming retirement benefits. This finding is similar to research showing that the removal of the post-FRA earnings test in 2000 accelerated retirement benefit claiming for individuals who had reached their FRA (Gruber and Orszag, 2003; Loughran and Haider, 2005; Song and Manchester, 2007).

Column (2) of Table 9 implements the same mechanism test, but for employment rather than the claiming model. As described earlier, the earnings test threshold is not explicitly associated with the extensive margin of labor supply. We therefore do not expect the post-FRA, post-2000 group to show a different result for the relationship between minimum wages and employment. The results are consistent with this hypothesis. The marginal change in the probability of employment after an increase in the minimum wage is positive for all four groups. The pre-2000 groups show smaller changes that are not statistically significant, but this is potentially explained by prior work suggesting that effects of minimum wages differ between the 1980s through early-1990s time period versus later time periods (Cengiz et al., 2019).[20]

These results suggest that the mechanism driving delays in retirement claiming is the interaction between minimum wages and the Social Security earnings test. Individuals in the post-FRA, post-2000 group who are not exposed to an earnings test are still more likely to be employed after changes in the minimum wage, just like individuals who are exposed to an earnings test. But unlike the other individuals, they do not delay claiming of retirement

[20] The nature of minimum wage policy was different in the 1980s and 1990s than today in terms of the value of the minimum wage relative to median wages and the relative frequency of state versus federal minimum wage changes. The poolability of 1980s-1990s and 2000s-onward data for minimum wage analysis is beyond the scope of this paper, but merits future work.

benefits.

5.5 Joint claiming and labor supply outcomes

Table 10 shows results for the relationship between minimum wages and joint claiming and employment outcomes. We combine these outcomes to define partial retirement and full retirement as defined in Section 2.3. Columns (1)-(2) report hazard models for the first incidence of full retirement. The coefficient is -0.13 and statistically significant, suggesting a 1.3 percentage point reduction in the probability of fully retiring in a given month after a 10% increase in the minimum wage. This corresponds to a 10% decrease from the sample mean of the annual full retirement variable in the hazard sample.

However, retirement is not an absorbing state. An individual can move in and out of retirement over time. We therefore report balanced panel regression results for full and partial retirement in columns (3)-(4) and (5)-(6), respectively. These results show changes in the likelihood of spending time in each retirement state after a minimum wage change. For the preferred specification with person fixed effects, a 10% increase in the minimum wage is associated with a 2.5 percentage point reduction in the probability of full retirement and a 1.37 percentage point increase in the probability of partial retirement in a given month after the minimum wage change. This corresponds to a 6% decrease from the sample mean for full retirement and a 6% increase from the sample mean for partial retirement. Minimum wages thus appear to reduce the amount of time that individuals spend in full retirement. That is, time spent not working and having claimed retirement benefits. This time is partly shifted toward partial retirement. That is, time spent working after claiming retirement benefits, but at a significantly reduced amount of annual earnings relative to their highest earning year in the data.

6 Conclusion

We used linked survey data, administrative Social Security retirement data, and administrative earnings data to test the relationship between minimum wages, retirement benefit claiming, and labor supply. Our data allows us to track individuals over many years so that we can account for individual-level confounders and examine the exact timing of retirement benefit claiming and exit from employment.

We find that increases in the minimum wage are associated with delayed claiming of retirement benefits and that the delay lasts six months on average. The claiming delay appears to be due to the interaction between minimum wages and the Social Security earnings test. This mechanism is consistent with several papers showing that the Social Security earnings test causes individuals to delay claiming retirement benefits (Gruber and Orszag, 2003; Loughran and Haider, 2005; Song and Manchester, 2007). We also find that increases in the minimum wage are associated with increased employment among retirement-age individuals, consistent with Borgschulte and Cho (2020) and Fang and Gunderson (2009), and consistent with substitution effects associated with a higher wage when an individual contemplates the work versus retirement decision.

The results speak to the comprehensive financial impact of increases in the minimum wage. Delays in retirement benefit claiming are seen as beneficial for the financial well-being of individuals. Choosing to delay the claiming of retirement benefits increases the monthly payment once benefits are claimed. The amount of the increase for each month of delay depends on year of birth and whether the delay occurs before or after reaching the FRA, but is generally around one-half of one percent. Delaying the claiming of retirement benefits by six months would therefore increase the monthly payment by approximately 3%. Furthermore, continuing to work while of retirement age, even after claiming retirement benefits, can also increase the monthly payment if their annual earnings are among their 35 highest earning years. Thus, minimum wage increases appear to improve the financial stability of low-wage workers not only by increasing their earnings via higher wages while they are working, but also by increasing their OASDI retirement benefit payments via delayed claiming and additional years of earnings. The results also suggest that minimum wage increases may benefit the Social Security system by encouraging delayed retirement claiming and more work later in life.

References

Allegretto, Sylvia A, Arindrajit Dube, and Michael Reich. 2011. "Do Minimum Wages Really Reduce Teen Employment? Accounting for Heterogeneity and Selectivity in State Panel Data." Industrial Relations: A Journal of Economy and Society, 50(2): 205–240.

Allegretto, Sylvia A, Arindrajit Dube, Michael Reich, and Ben Zipperer. 2017. "Credible Research Designs for Minimum Wage Studies: A Response to Neumark, Salas, and Wascher." Industrial and Labor Relations Review, 70(3): 559–592.

Ameriks, John, Joseph S. Briggs, Andrew Caplin, Minjoon Lee, Matthew D. Shapiro, and Christopher Tonetti. 2020. "Older Americans Would Work Longer If Jobs Were Flexible." American Economic Journal: Macroeconomics, 12(1): 174–209.

Behaghel, Luc, and David M Blau. 2012a. "Framing social security reform: Behavioral responses to changes in the full retirement age." American Economic Journal: Economic Policy, 4(4): 41–67.

Behaghel, Luc, and David M. Blau. 2012b. "Framing Social Security Reform: Behavioral Responses to Changes in the Full Retirement Age." American Economic Journal: Economic Policy, 4(4): 41–67.

Benedetto, Gary, Jordan C Stanley, and Evan Totty. 2018. "The Creation and Use of the SIPP Synthetic Beta v7.0." U.S. Census Bureau CES technical notes series 18-03.

Ben-Porath, Yoram. 1967. "The Production of Human Capital and the Life Cycle of Earnings." Journal of Political Economy, 75(4, Part 1): 352–365.

Blundell, Richard, Eric French, and Gemma Tetlow. 2016. "Retirement Incentives and Labor Supply." Handbook of the Economics of Population Aging, 1: 457–566.

Borgschulte, Mark, and Heepyung Cho. 2020. "Minimum Wages and Retirement." Industrial and Labor Relations Review, 73(1): 153–177.

Brochu, Pierre, David A. Green, Thomas Lemieux, and James Townsend. 2018. "The Minimum Wage, Turnover, and the Shape of the Wage Distribution." Unpublished working paper. Available at: https://www.fss.ulaval.ca/sites/fss.ulaval.ca/files/fss/evenements/bglt_jan_2018_0.pdf.

Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and Ben Zipperer. 2019. "The Effect of Minimum Wages on Low-Wage Jobs: Evidence from the United States Using a Bunching Estimator." Quarter Journal of Economics, 134(3): 1405–âĂŞ1454.

Clemens, Jeffrey, and Michael Wither. 2019. "The Minimum Wage and the Great Recession: Evidence on Effects of the Employment and Income Trajectories of Low-Skilled Workers." Journal of Public Economics, 170: 53–67.

Coile, Courtney, and Phillip B Levine. 2010. Reconsidering Retirement: How Losses and Layoffs Affect Older Workers. Brookings Institution Press.

Deshpande, Manasi, Itzik Fadlon, and Colin Gray. 2020. "How Sticky is Retirement Behavior in the U.S.? Responses to Changes in the Full Retirement Age." NBER Working Paper No. 27190.

Dube, Arindrajit, T William Lester, and Michael Reich. 2010. "Minimum Wage Effects Across State Borders: Estimates using Contiguous Counties." The Review of Economics and Statistics, 92(4): 945–964.

Engelhardt, Gary V., and Anil Kumar. 2014. "Taxes and the Labor Supply of Older Americans: Recent Evidence from the Social Security Earnings Test." National Tax Journal, 67(2): 443–458.

Fang, Tony, and Morley Gunderson. 2009. "Minimum Wage Impacts on Older Workers: Longitudinal Estimates from Canada." British Journal of Industrial Relations, 47(2): 371–387.

French, Eric, and John Bailey Jones. 2011. "The Effects of Health Insurance and Self-Insurance on Retirement Behavior." Econometrica, 79(3): 693–732.

Friedberg, Leora. 2000. "The Labor Supply Effects of the Social Security Earnings Test." The Review of Economics and Statistics, 82(1): 48–63.

Gelber, Alexander M., Damon Jones, and Daniel W. Sacks. 2020. "Estimating Earnings Adjustment Frictions: Method and Evidence from the Social Security Earnings Test." American Economic Journal: Economic Policy, 12(1): 31–31.

Gelber, Alexander M., Damon Jones, Daniel W. Sacks, and Jae Song. 2018. "Using Non-Linear Budget Sets to Estimate Extensive Margin Responses: Method and Evidence from the Social Security Earnings Test." NBER Working Paper No. 23362.

Gelber, Alexander M., Damon Jones, Daniel W. Sacks, and Jae Song. 2020. "The Employment Effects of the Social Security Earnings Test." Journal of Human Resources, forthcoming.

Giandrea, Michael D., Kevin E. Cahill, and Joseph F. Quinn. 2009. "Bridge Jobs: A Comparison Across Cohorts." Research on Aging, 31(5): 549–576.

Gopalan, Radhakrishnan, Barton Hamilton, Ankit Kalda, and David Sovich. 2020. "State Minimum Wages, Employment, and Wage Spillovers: Evidence from Administrative Payroll Data." Journal of Labor Economics, forthcoming.

Gorodnichenko, Yuriy, Jae Song, and Dmitriy Stolyarov. 2013. "Macroeconomic Determinants of Retirement Timing." National Bureau of Economic Research Working Paper No. 19638.

Gruber, Jonathan, and Peter Orszag. 2003. "Does the Social Security Earnings Test Affect Labor Supply and Benefit Receipt?" National Tax Journal, 56: 755–773.

Haaga, Owen, and Richard W Johnson. 2012. "Social Security Claiming: Trends and Business Cycle Effects." Center for Retirement Research WP 2012-5.

Lazear, Edward P. 1979. "Why is there Mandatory Retirement?" Journal of Political Economy, 87(6): 1261–1284.

Lopresti, John W., and Kevin J. Mumford. 2016. "Who Benefits from a Minimum Wage Increase?" Industrial and Labor Relations Review, 69(5): 1171–1190.

Lordan, Grace, and David Neumark. 2018. "People Versus Machines: The impact of Minimum Wages on Automatable Jobs." Labour Economics, 52: 40–53.

Loughran, David, and Steven Haider. 2005. "Do the Elderly Respond to Taxes on Earnings?" RAND Working Paper Series WR 223.

Maestas, Nicole, Kathleen J Mullen, David Powell, Jeffrey B Wenger, and Till Von Wachter. 2017. "Working Conditions in the United States: Results of the 2015 American Working Conditions Survey." RAND Research Report.

Neumark, David. 2017. "The Employment Effects of Minimum Wages: Some Questions We Need to Answer." NBER Working Paper No. 23584.

Neumark, David. 2018. "The Econometrics and Economics of the Employment Effects of Minimum Wages: Getting from Known Unknowns to Known Knowns." NBER Working Paper No. 25043.

Neumark, David, JM Ian Salas, and William Wascher. 2014a. "More on Recent Evidence on the Effects of Minimum Wages in the United States." IZA Journal of Labor policy, 3(1): 24.

Neumark, David, JM Ian Salas, and William Wascher. 2014b. "Revisiting the Minimum Wage-Employment Debate: Throwing Out the Baby with the Bathwater?" Industrial and Labor Relations Review, 67(3_suppl): 608–648.

Nyce, Steven, Sylvester J. Schieber, John B. Shoven, Sita Nataraj Slavov, and David A. Wise. 2013. "Does Retiree Health Insurance Encourage Early Retirement?" Journal of Public Economics, 104: 40–51.

Ruhm, Christopher J. 1990. "Bridge Jobs and Partial Retirement." Journal of Labor Economics, 8(4): 482–501.

Rutledge, Matthew S., and Gal Wettstein. 2020. "Is Nontraditional Work at Older Ages Associated with Better Retirement Security?" Center for Retirement Research WP 2020-13.

Shoven, John B., and Sita Nataraj Slavov. 2014. "The Role of Retiree Health Insurance in the Early Retirement of Public Sector Employees." Journal of Health Economics, 38: 99–108.

Song, Jae G., and Joyce Manchester. 2007. "New Evidence on Earnings and Benefit Claims Following Changes in the Retirement Earnings Test in 2000." Journal of Public Economics, 91: 669–700.

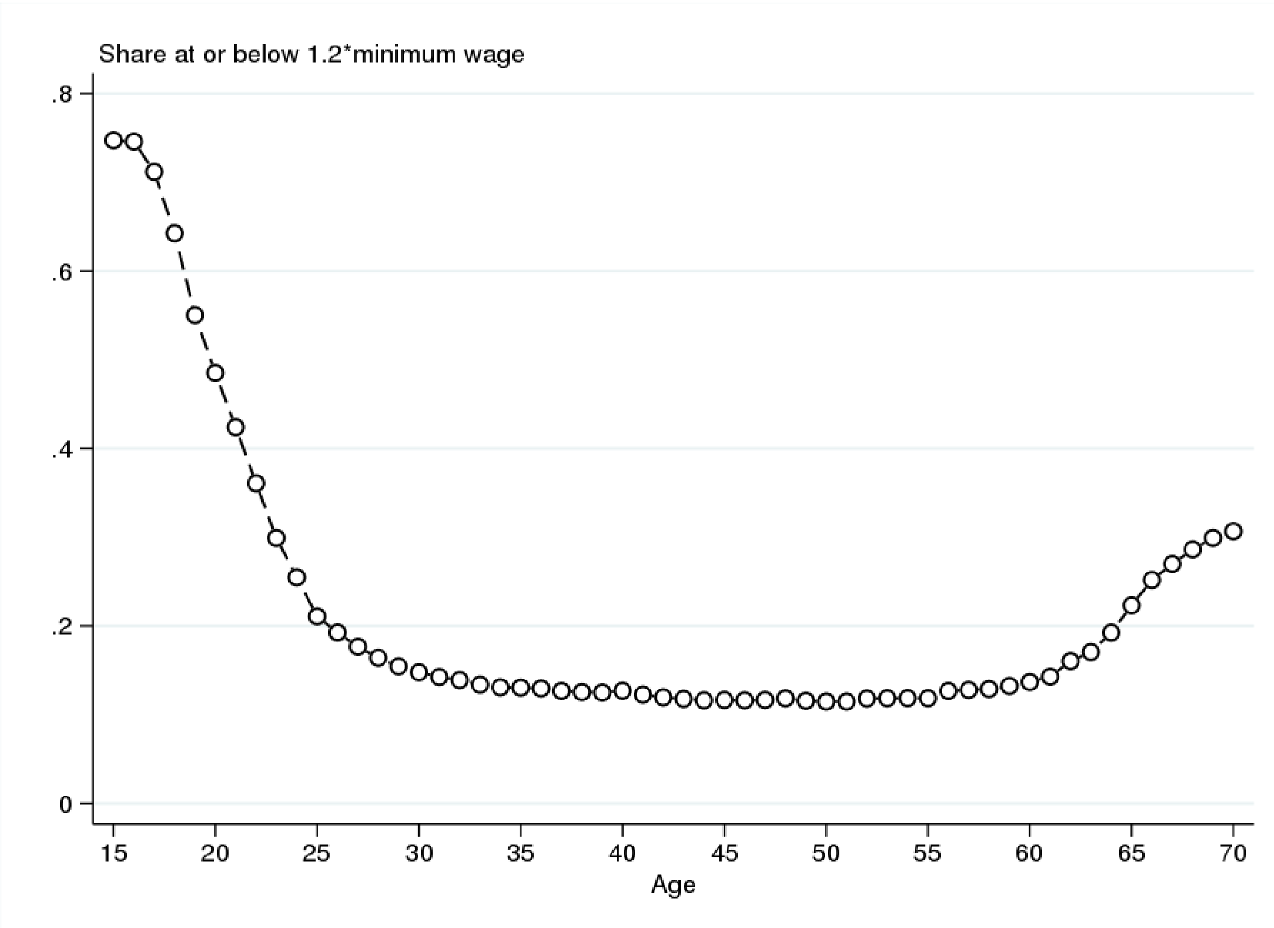
Totty, Evan. 2017. "The Effect of Minimum Wages on Employment: A Factor Model Approach." Economic Inquiry, 55(4): 1712–1737.

Vaghul, Kavya, and Ben Zipperer. 2016. "Historical State and Sub-State Minimum Wage Data." Washington Center for Equitable Growth Working Paper.

Wettstein, Gal. 2020. "Retirement Lock and Prescription Drug Insurance: Evidence from Medicare Part D." American Economic Journal: Economic Policy, 12(1): 389–417.

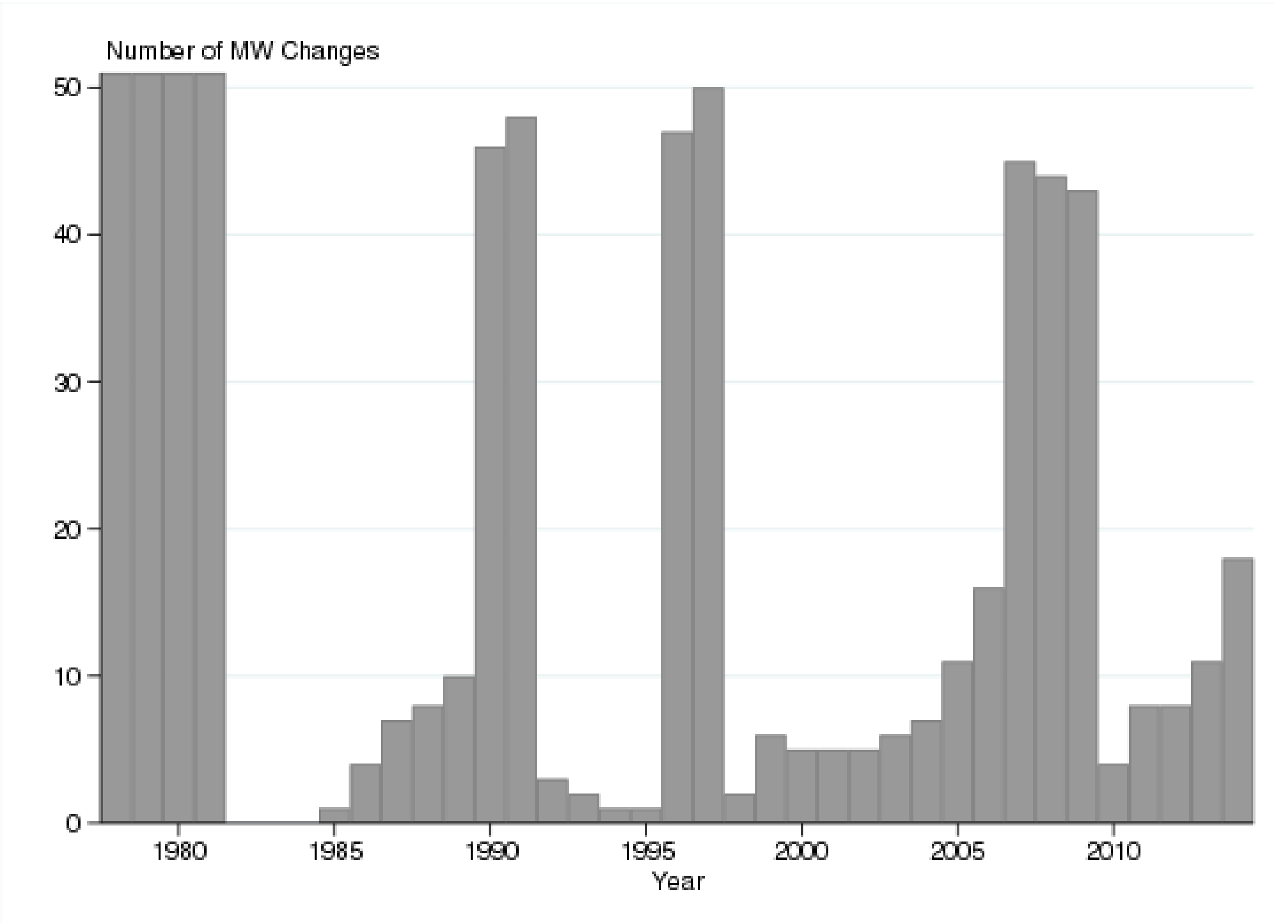
7 Figures and Tables

Figure 1: Share of Workers Earning Near Minimum Wage By Age



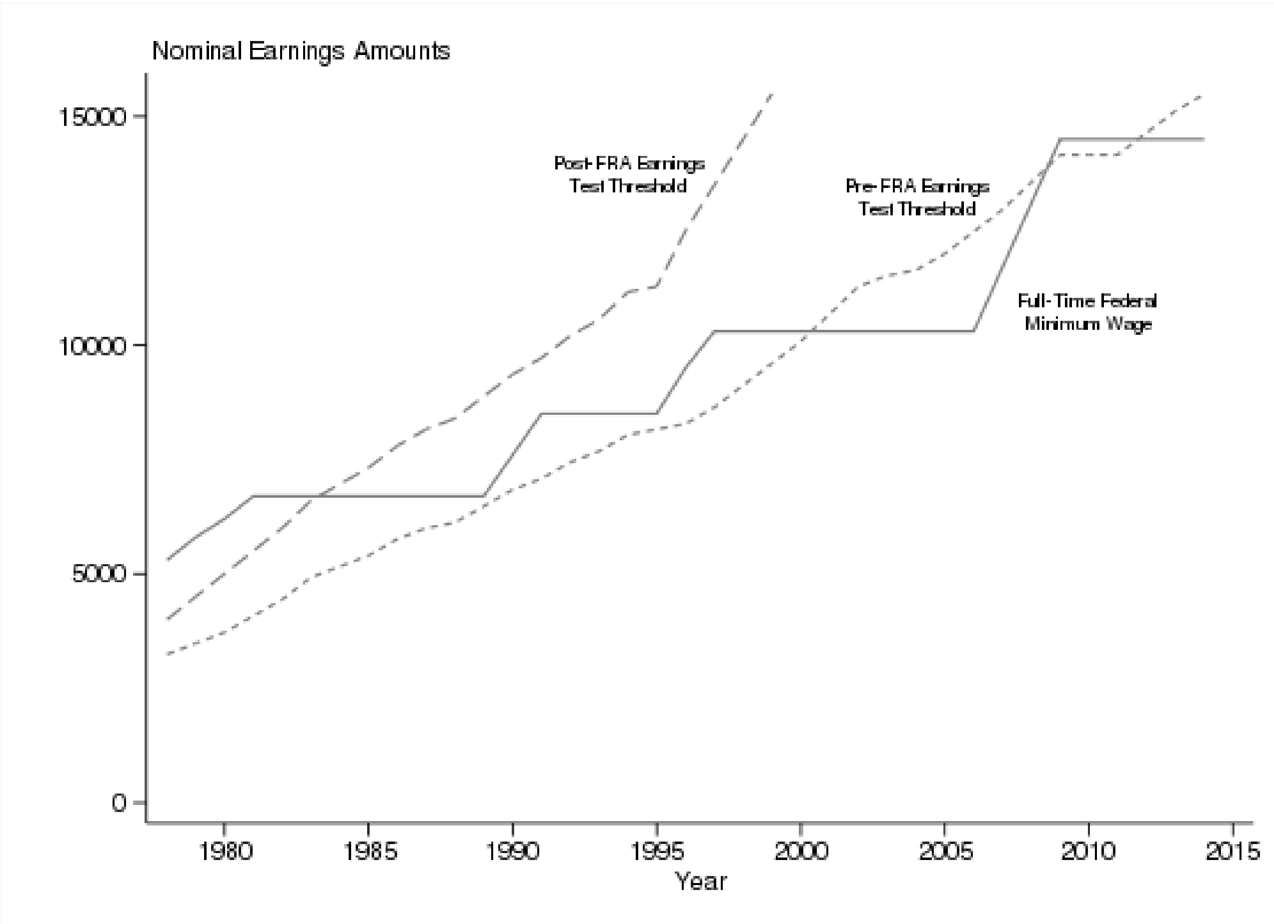
Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.
Note: Share of person-month wage observations less than or equal to 120% of the minimum wage in the SIPP Gold Standard File, by age.

Figure 2: Distribution of Minimum Wage Change Events



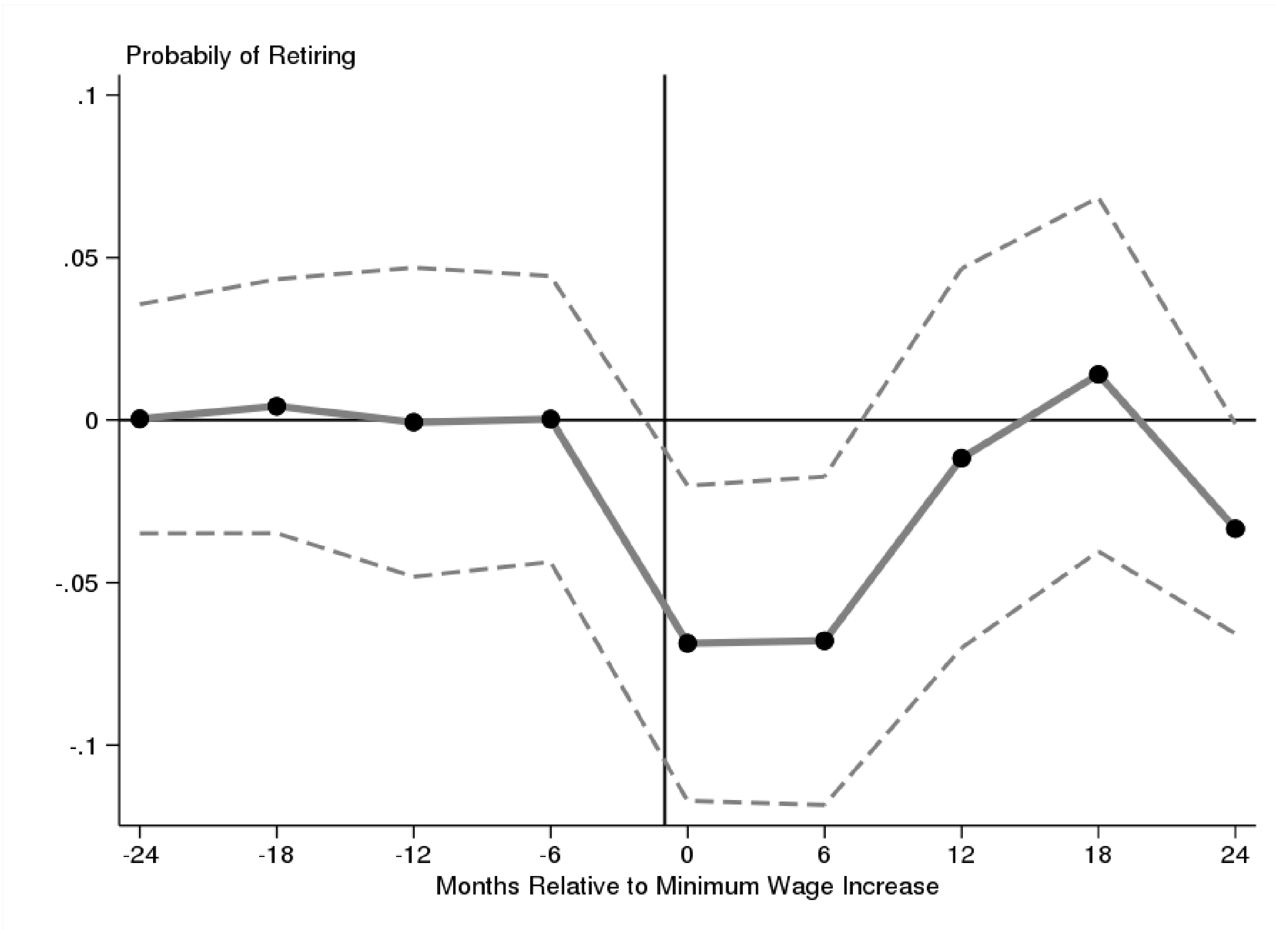
Source: Minimum wage data from Vaghul and Zipperer (2016).
Note: Number of states (including District of Columbia) with a change in the binding minimum wage from 1978-2014. The binding minimum wage is the higher of the state and federal minimum wage.

Figure 3: Comparison of Full-Time Minimum Wage and Social Security Earnings Test Amounts Over Time



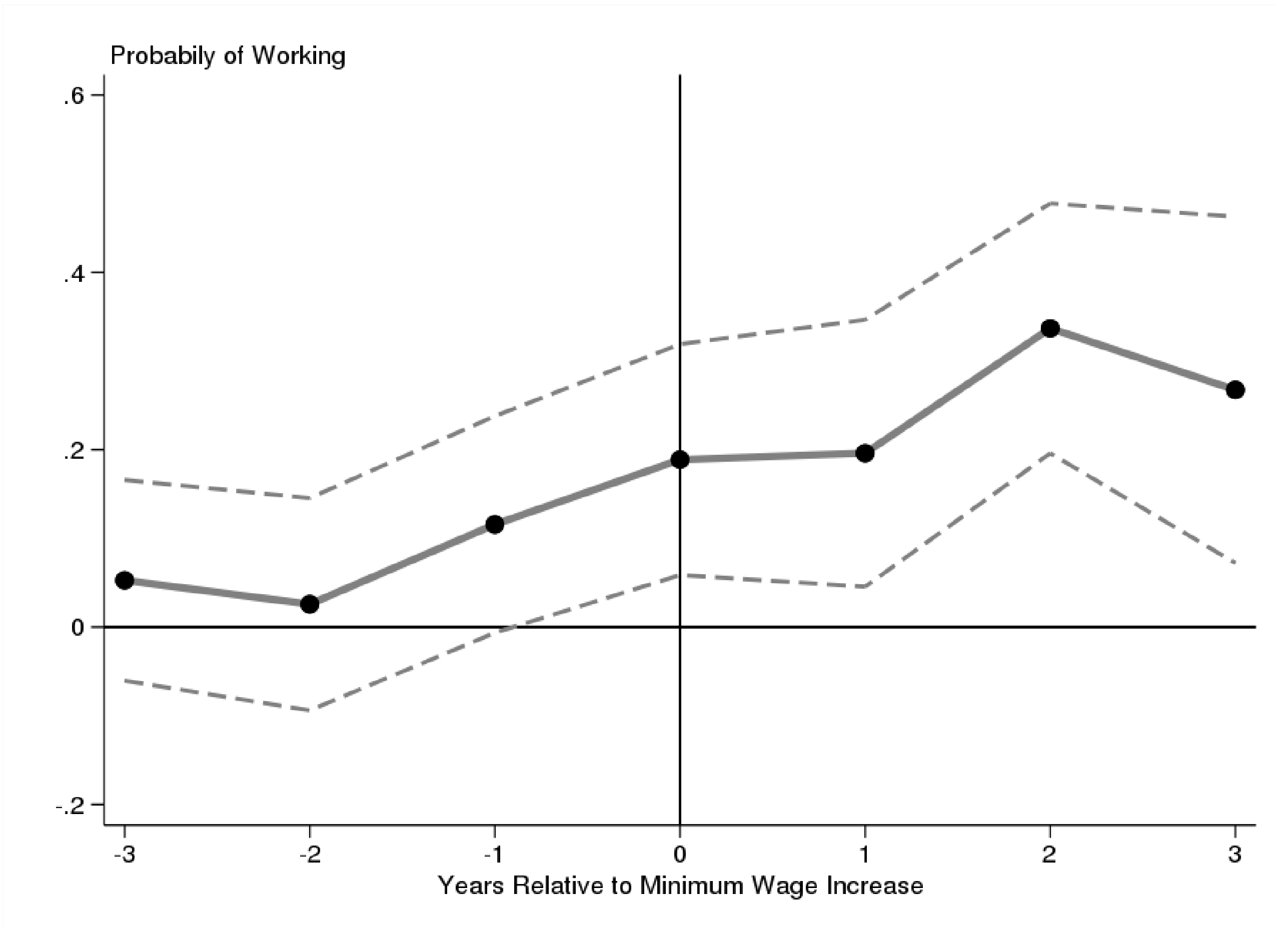
Source: Minimum wage data from Vaghul and Zipperer (2016). Earnings test threshold data from ssa.gov/OACT/COLA/rteahistory.html and ssa.gov/OACT/COLA/rtea.html.
Note: Full-time minimum wage earnings are based on working for the federal minimum wage, 40 hours per week, 50 weeks out of the year. Pre-FRA earnings test threshold amounts for 2000 onward are based on the threshold amounts for years before the year in which the individual reaches FRA.

Figure 4: Distributed Lag Model: Hazard Model for OASDI Retirement Benefit Claiming



Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.
Note: The dots are OLS regression coefficients from a hazard model for retirement benefit receipt with a distributed-lag in the log of the minimum wage. The dashed lines are 90% confidence intervals based on standard errors clustered at the state level.

Figure 5: Distributed Lag Model: Employment



Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.
Note: The dots are OLS regression coefficients from a balanced panel model for employment (presence of positive earnings reported to the IRS) over ages 62-70 with a distributed-lag in the log of the minimum wage. The dashed lines are 90% confidence intervals based on standard errors clustered at the state level.

Table 1: Summary Statistics

	(1)	(2)	(3)	(4)
	Labor Supply Sample		Benefit Claiming Sample	
	Mean	SD	Mean	SD
Time-Invariant Variables				
Received Retirement Benefits by Age 70	-	-	0.912	0.283
Age at First Receipt	-	-	65.1	1.59
Male	0.378	0.485	0.408	0.492
White	0.837	0.369	0.839	0.368
Black	0.127	0.333	0.135	0.341
Other Race	0.0357	0.185	0.0264	0.16
Hispanic	0.0716	0.258	0.0717	0.258
Less than HS Degree	0.310	0.463	0.290	0.454
HS Degree	0.371	0.483	0.365	0.482
Some College	0.207	0.405	0.231	0.422
Bachelor's Degree	0.0673	0.251	0.0704	0.256
More than Bachelor's	0.0447	0.207	0.0437	0.204
Never Married	0.0523	0.223	0.0556	0.229
Currently Married	0.609	0.488	0.605	0.489
Widowed or Divorced	0.339	0.473	0.339	0.474
Birth Year	1930	7.46	1930	8.76
Health Insurance Coverage	0.876	0.329	0.876	0.33
Employer-Provided Insurance	0.297	0.457	0.351	0.477
Defined Benefit Pension	0.0513	0.221	0.0556	0.229
Defined Coverage Pension 2	0.0327	0.178	0.0402	0.196
Total Net Worth	166,000	578,000	161,000	569,000
Non-Housing Wealth	94,200	55,4000	91,700	544,000
Individuals	3,000		3,100	
Time-Varying Variables				
Has Received Retirement Benefits	-	-	0.0414	0.1992
Employed	0.679	0.467	-	-
Full-Time Employment	0.199	0.399	-	-
Part-Time Employment	0.276	0.447	-	-
Fully Retired	0.402	0.490	-	-
Partially Retired	0.221	0.415	-	-
Log Minimum Wage	4.92	1.24	4.94	1.37
Unemployment Rate	5.90	1.84	6.04	1.95
Inflation-Adjusted Annual IRS Earnings	7,640	47,300	16,000	99,100
Observations	27,000		68,500	

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003, CBDRB-FY20-CED001-B0005.

Note: Summary statistics are shown separately for the two main samples used in the analysis. The top part of the table shows cross-section mean and standard deviation for the time-invariant variables used in the model, as well as two descriptive retirement variables in the first two rows. The bottom part shows the statistics for the time-varying variables over the full panel sample.

Table 2: Short-Run Labor Market Outcomes

	(1) Employed	(2) Employed	(3) Log Wage	(4) Log Wage	(5) Log Earnings	(6) Log Earnings	(7) Log Hours	(8) Log Hours
Treat*Post	0.00479	0.0162	0.112***	0.0875*	0.0934***	0.0717**	0.000961	-0.00203
	(0.0254)	(0.0244)	(0.0329)	(0.0459)	(0.0218)	(0.0342)	(0.0247)	(0.0261)
Observations	96,000	96,000	31,000	31,000	34,000	34,000	34,000	34,000
Person, Time, Age Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	Yes	No	Yes	No	Yes	No	Yes

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.

Note: Each column reports the OLS coefficient from a balanced person-month panel model for the given outcome over a 19-month window from six months before to 18 months after a minimum wage change. Standard errors are clustered at the state level and shown in parentheses. The Treat variable is equal to one for individuals who were exposed to a minimum wage change while in the SIPP. The Post variable is equal to one in the period of the minimum wage change and periods after the change. Time fixed effects are at the year-month level. Age fixed effects are in years. Covariates include the log of the state-year unemployment rate and the log of the state-year population. Additional controls include state-specific time trends and Census Division-by-period fixed effects.

Table 3: Falsification: Short-Run Labor Market Outcomes

	(1) Employed	(2) Employed	(3) Log Wage	(4) Log Wage	(5) Log Earnings	(6) Log Earnings	(7) Log Hours	(8) Log Hours
Treat*Post	-0.00518	-0.00903	0.00381	-0.0170	0.00647	-0.0208	0.00562	-0.00285
	(0.0190)	(0.0172)	(0.0156)	(0.0138)	(0.0165)	(0.0175)	(0.00852)	(0.0104)
Observations	92,000	92,000	46,000	46,000	49,500	49,500	48,500	48,500
Person, Time, Age Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	Yes	No	Yes	No	Yes	No	Yes

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.
Note: The regressions are the same as Table 2, except the results are based on a falsification sample. The falsification sample is individuals whose average wage prior the first minimum wage change observed in the SIPP was $5-$10 above the minimum wage instead of less than or equal to $2 above the minimum wage.

Table 4: Hazard Models for OASDI Retirement Benefit Claiming

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS Hazard		Probit Hazard		Logit Hazard		CLogLog Hazard	
Log Minimum Wage	-0.0351**	-0.0380***	-0.0232**	-0.0176**	-0.0198**	-0.0148**	-0.0168**	-0.0125**
	(0.0151)	(0.0139)	(0.0095)	(0.0070)	(0.0080)	(0.0060)	(0.0072)	(0.0058)
Month of FRA		0.515***		0.0633***		0.0459***		0.0428***
		(0.0240)		(0.0048)		(0.00394)		(0.0037)
Observations	68,500	68,500	68,500	68,500	68,500	68,500	68,500	68,500
State, Time, Age Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes	No	Yes	No	Yes

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.

Note: Each column reports regression results for benefit claiming hazards based on a person-month panel. The dependent variable is equal to zero in months prior to first receipt of OASDI retirement benefits and one in the month of receipt. Individuals drop out of the sample after the month in which they first receive benefits, or once they reach the month in which they turn 70. Standard errors are clustered at the state level and shown in parentheses. Time fixed effects are at the year-month level. Age fixed effects are in months. Covariates include an indicator for the month in which the individual reached FRA, the log of the state-year unemployment rate, sex, race, Hispanic status, highest education level, health insurance coverage, health insurance coverage through employer, defined-benefit pension, defined-contribution pension, marital status, removal of the post-FRA Social Security earnings test in 2000, total net worth, non-housing wealth, annual IRS earnings, and birth year fixed effects.

Table 5: Falsification: Hazard Models for OASDI Retirement Benefit Claiming

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS Hazard		Probit Hazard		Logit Hazard		CLogLog Hazard	
Log Minimum Wage	0.0047	0.0142*	0.0026	0.0056	0.0021	0.0052	0.0014	0.0042
	(0.0083)	(0.0081)	(0.0056)	(0.0047)	(0.0043)	(0.0038)	(0.0042)	(0.0035)
Month of FRA		0.542***		0.0512***		0.0360***		0.0312***
		(0.0146)		(0.0021)		(0.0018)		(0.0016)
Observations	95,500	95,500	95,500	95,500	95,500	95,500	95,500	95,500
State, Time, Age Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	No	Yes	No	Yes	No	Yes	No	Yes

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.
Note: The regressions are the same as Table 4, except the results are based on the falsification sample.

Table 6: Labor Supply - Presence and Amount of IRS Earnings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Any Employment			Full-Time Employment			Part-Time Employment		
Log Minimum Wage	0.214***	0.175***	0.151***	0.207**	0.160**	0.112*	0.106	0.113*	0.111*
	(0.0654)	(0.0646)	(0.0429)	(0.0849)	(0.0755)	(0.0660)	(0.0897)	(0.0678)	(0.0640)
Year of FRA		0.00652	0.00658		-0.00111	-0.00115		0.00534	0.00536
		(0.00891)	(0.00890)		(0.00635)	(0.00632)		(0.0123)	(0.0123)
Observations	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
State, Year, Age Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Person Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.

Note: Each column reports OLS regression results based on a balanced person-year panel over ages 62-70. The dependent variable in columns (1)-(2) is equal to one if the individual had any earnings reported to the IRS and zero otherwise. The dependent variable in columns (3)-(4) is equal to one if the individual had inflation-adjusted earnings equal to at least 50% of their lifetime max dating back to 1951 and zero otherwise. The dependent variable in columns (5)-(6) is equal to one if the individual had inflation-adjusted earnings of less than 50% of their lifetime max but more than $5,000 and zero otherwise. Standard errors are clustered at the state level and shown in parentheses. Time fixed effects are at the year level. Age fixed effects are in years. Covariates include an indicator for the year in which the individual reached FRA, the log of the state-year unemployment rate, sex, race, Hispanic status, highest education level, health insurance coverage, health insurance coverage through employer, defined-benefit pension, defined-contribution pension, marital status, removal of the post-FRA Social Security earnings test in 2000, total net worth, non-housing wealth, and birth year fixed effects. The person fixed effects specification retains the indicator for the year in which the individual reached FRA, the log of the state-year unemployment rate, and removal of the post-FRA Social Security earnings test in 2000; the other covariates drop out of the model. State fixed effects also drop out of the model.

Table 7: Falsification: Labor Supply - Presence and Amount of IRS Earnings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Any Employment			Full-Time Employment			Part-Time Employment		
Log Minimum Wage	-0.0691	-0.0592	0.00184	0.0482	0.0937	0.0635	-0.129**	-0.144***	-0.0651*
	(0.0573)	(0.0612)	(0.0587)	(0.0966)	(0.0982)	(0.0681)	(0.0504)	(0.0474)	(0.0356)
Year of FRA		0.0129*	0.0127*		0.000807	0.000886		0.00939	0.00924
		(0.00734)	(0.00731)		(0.00837)	(0.00837)		(0.00914)	(0.00913)
Observations	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000	23,000
State, Year, Age Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Person Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.
Note: The regressions are the same as Table 6, except the results are based on the falsification sample.

Table 8: Robustness Checks for Time and Geographic Heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Claiming Hazard				Any Employment		
Log Minimum Wage	-0.0396***	-0.0441**	-0.0462**	-0.0475**	0.154***	0.163***	0.197***	0.189***
	(0.0142)	(0.0176)	(0.0194)	(0.024)	(0.0488)	(0.0452)	(0.0582)	(0.0599)
Observations	68,500	68,500	68,500	68,500	27,000	27,000	27,000	27,000
State, Time, Age Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Person Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
State Linear Time Trends	Yes	No	No	Yes	Yes	No	No	Yes
Age-by-Time Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Region-by-Time Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0005.
Note: The regressions are the same as column (2) of Table 4 and column (3) of Table 6, except with additional fixed effects as indicated in the table. Region corresponds to the four Census Regions.

Table 9: Claiming Result Mechanism: Interaction with Pre- and Post-FRA

	(1) Claiming Hazard	(2) Any Employment
Log Minimum Wage	-0.0633***	0.0870
	(0.0215)	(0.0710)
Log Minimum Wage * post-FRA	-0.0277***	0.0107
	(0.0037)	(0.0126)
Log Minimum Wage * post-2000	0.0105	0.161
	(0.0225)	(0.1080)
Log Minimum Wage * post-FRA * post-2000	0.129***	-0.129
	(0.0277)	(0.0909)
Observations	68,500	27,000
State, Time, and Age Fixed Effects	Yes	Yes
Covariates	Yes	Yes
Person Fixed Effects	No	Yes
Log Minimum Wage Marginal Effect:		
pre-FRA, pre-2000	-0.0633***	0.0870
post-FRA, pre-2000	-0.0910***	0.0977
pre-FRA, post-2000	-0.0528***	0.2480***
post-FRA, post-2000	0.0485**	0.1300**

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0005.
Note: The regressions are the same as column (2) of Table 4 and column (3) of Table 6, except with controls for post-FRA, post-2000, their interaction, and the interaction of all three with the log minimum wage variable. "post-FRA" includes the month/year in which the FRA was reached. "post-2000" includes the year 2000. Marginal effects at the bottom of the table are based on linear combinations of the coefficients shown above.

Table 10: Joint Claiming and Labor Supply: Retirement

	(1)	(2)	(3)	(4)	(5)	(6)
	Full Retirement Hazard		Full Retirement 62-70		Partial Retirement 62-70	
Log Minimum Wage	-0.130**	-0.127*	-0.296***	-0.250***	0.122	0.137**
	(0.0582)	(0.0705)	(0.110)	(0.0722)	(0.0749)	(0.0586)
Observations	16,000	16,000	27,000	27,000	27,000	27,000
State, Time, and Age Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	No	Yes	Yes	Yes	Yes	Yes
Person Fixed Effects	No	No	No	Yes	No	Yes

Source: U.S. Census Bureau Gold Standard File, CBDRB-FY20-CED001-B0003.
Note: This table combines claiming and employment outcomes. We define "full retirement" as having claimed retirement benefits and not employed full-time or part-time, as defined in Table 6. We define "partial retirement" as having claimed retirement benefits and employed part-time. Standard errors are clustered at the state level and shown in parentheses. Columns (1)-(2) report OLS regression results from hazard models for full retirement: an individual drops out of the sample after the first year in which they are fully retired, or once they reach the year in which they turn 71. Columns (3)-(6) report OLS regression results from balanced panel models over ages 62-70. See Table 6 for additional information about the controls.