Title
Parental Labor Supply: Evidence from Minimum Wage Changes. Working Paper #103-19

Authors
Godoey, Anna
Reich, Michael
Allegretto, Sylvia

Publication Date
2019-04-01

IRLE
Institute for Research on Labor and Employment

IRLE WORKING PAPER
#103-19
April 2019

Parental Labor Supply: Evidence from Minimum Wage Changes

Anna Godøy, Michael Reich and Sylvia A. Allegretto

Cite as: Anna Godøy, Michael Reich and Sylvia A. Allegretto (2019). "Parental Labor Supply: Evidence from Minimum Wage Changes". IRLE Working Paper No. 103-19.
http://irle.berkeley.edu/files/2019/04/Parental-Labor-Supply-Evidence-from-Minimum-Wage-Changes.pdf

Berkeley
UNIVERSITY OF CALIFORNIA

Parental Labor Supply:
Evidence from Minimum Wage Changes *

Anna Godøy[†] Michael Reich[‡] Sylvia Allegretto[§]

April 29, 2019

Abstract

Declining labor force participation rates among less-educated individuals in the U.S. have been attributed to various causes, including skill-biased technical change, demand shocks induced by international competition, looser eligibility requirements for disability insurance, the opioid epidemic and the nature of child care and family leave policies. In this paper, we examine how the labor supply of parents of dependent children respond to minimum wage changes. We implement an event study framework and document a sharp rise in employment and earnings of parents after state minimum wage increases. We further show that these effects are concentrated among jobs that pay the minimum wage or slightly higher – high wage employment remains unaffected. Panel models find corresponding drops in welfare receipts, moreover, for single mothers, effects are larger for mothers of preschool age children. The results are consistent with a simple labor supply model in which means-tested transfers and fixed costs of work in the form of paid childcare create barriers to labor market entry for parents of dependent children. Minimum wage increases then enable higher rates of parental labor force participation, resulting in significant reductions in child poverty. We find no evidence of employment crowd-out among non-parents, suggesting potential overall welfare gains from higher minimum wages.

Keywords: Minimum wage, labor supply

*We are grateful to the Robert Wood Johnson Foundation for research support and to David Card, Hilary Hoynes, Patrick Kline, Carl Nadler, Jesse Rothstein, and participants at the UC Berkeley labor lunch for valuable comments.

[†]IRLE, University of California, Berkeley. anna.godoy@berkeley.edu

[‡]IRLE, University of California, Berkeley. mreich@econ.berkeley.edu

[§]IRLE, University of California, Berkeley. allegretto@berkeley.edu

1 Introduction

In the past twenty years, female labor force participation in the U.S. has declined, particularly among women without a college degree, reversing previous decades of steady growth. Male labor force participation has also continued to decline. These declines have been attributed to various causes, including skill-biased technical change, demand shocks induced by international competition, looser eligibility requirements for disability insurance, the opioid epidemic and the nature of child care and family leave policies. Meanwhile, during this period, real wages have declined for workers without a college degree, as has the federal minimum wage. Are these trends related?

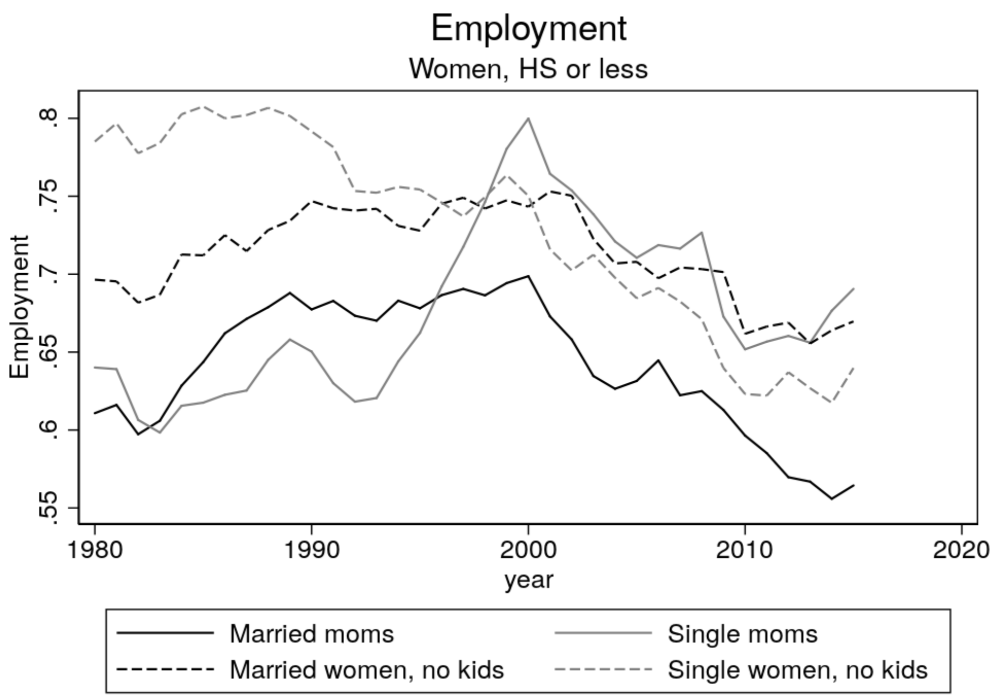
We investigate this question here by considering the effects of state and federal minimum wage increases on labor force participation among one group-- low-educated parents of children 17 and younger. We find that minimum wage increases lead to greater labor supply among single mothers and married fathers, but not significantly among married mothers. The increase among single mothers occurs on the extensive margin while the increase among married fathers occurs on the extensive and intensive margins.

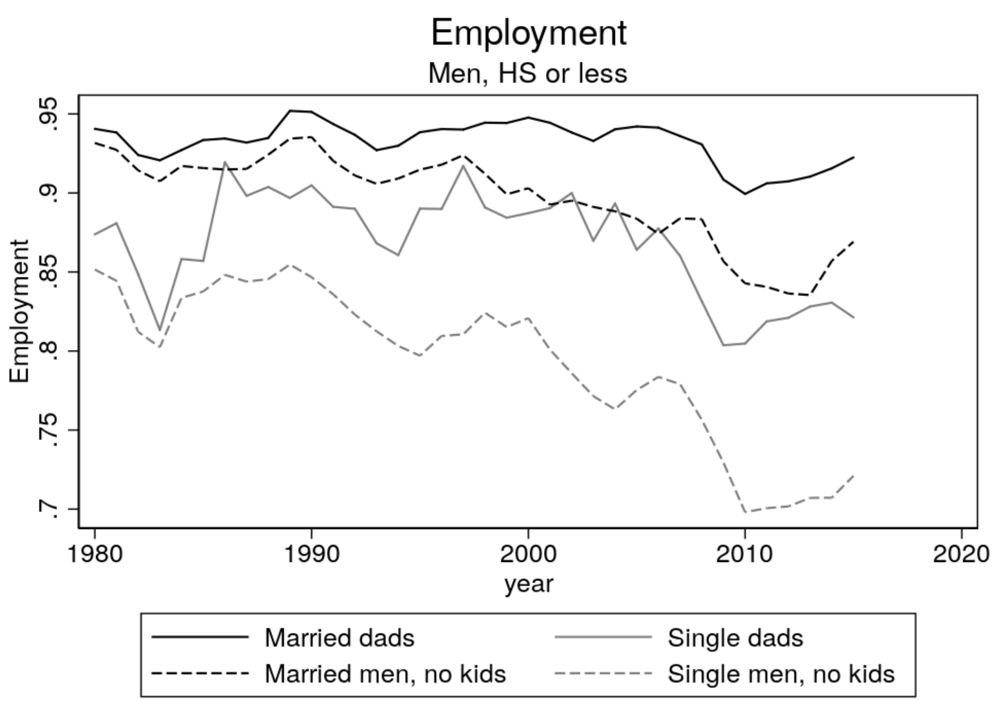
We show that these results are consistent with labor supply models that feature means-tested cash transfers to non-workers, fixed costs of child care and unitary family labor supply strategies. In frictional labor markets, induced increases in parental labor supply can help explain the lack of aggregate employment effects of minimum wages. The positive employment effects for parents and the benefits for their children represent unrecognized welfare gains of minimum wages.

Figure 1 plots average employment rates since 1980 for less educated adults age 20-55, by gender and presence of children. For women with children, employment rises during the first part of the sample period. This increase is especially remarkable for unmarried mothers. After the 1990s era welfare reform and the expansions of the EITC, employment rates for this group increased from just over 60 percent to close to 80 percent. Starting in 2000, employment rates have fallen steadily for all groups of women. For men, the picture looks different: a divergence in participation rates between married men with children and men without dependent children. The level differences between these two groups of men are also striking. Employment rates among married men with children have remained high, staying above 90 percent.

These patterns seem inconsistent with frequently offered explanations for declining labor force participation rates among less-educated individuals, including skill-biased techni-

Figure 1: Employment, 1980-2015





3

Note: Figure plots average employment rates for adults age 20-55, with a high school degree or less (source: CPS ASEC).

cal change, demand shocks induced by international competition, looser eligibility requirements for disability insurance, the opioid epidemic and the deficiencies in U.S. child care and family leave policies. In this paper, we leverage variation in minimum wage changes to consider whether wages might explain these patterns. Recent research by Cengiz et al. (2019) indicates that higher minimum wages does not reduce the overall number of low wage jobs. Their conclusion that employment effects for most workers are small to negligible raises its own puzzle. Why, when labor costs increase, don't employers respond by reducing labor demand? One view is that the lack of disemployment effects can be explained by anomalies in low wage labor markets, e.g. search frictions and monopsony power. In this paper, we consider the possibility that the estimated null effect could reflect a combination of supply and demand effects.

Using publicly available data, we show that minimum wages have no significant effect on employment for overall low wage employment, a result that is consistent with recent literature. However, this changes when we distinguish by the presence of children. Specifically, we find significant positive employment effects for married fathers and single mothers.

A considerable literature, beginning with Ashenfelter et al. 1974 and surveyed most recently by Blundell et al. (2016) examines family labor supply models. A related literature (for example, Angrist & Evans 1998) examines the interactions between number of children and labor supply, but does not examine wage elasticities. Still another literature examines the effects of child care subsidies on labor supply (see, e.g., Havnes & Mogstad 2011). However, minimum wage effects on labor supply have rarely been examined. Our paper is the first to examine minimum wage effects specifically on the labor supply of parents.

Our paper relates to a large literature that examines labor supply effects of the EITC and other tax reforms (see, e.g., Eissa & Liebman 1996, Meyer & Rosenbaum 2001). There is a consensus in the literature that the EITC has significantly increased the labor supply of single mothers. Effects are concentrated on the extensive margin, with estimated participation elasticities ranging from 0.69-1.17 (Hotz & Scholz 2003). The EITC phases out at higher earnings, leading theoretically to negative effects on the intensive margins. However, the EITC literature generally does not find intensive margin effects (Chetty et al. (2013) constitute a weak exception; they find small positive effects).

For married couples, EITC eligibility is determined based on family income, implying employment disincentives for secondary earners. Eissa & Hoynes (2004) estimate a negative effect of the EITC on family labor supply of married couples – while married men experienced small positive employment effects, married women significantly reduced their employment.

There is a very large literature on the employment effects of the minimum wage, often focusing on affected groups such as teens or restaurant workers. This literature finds mixed results. The literature on the impact of minimum wages on parents specifically is much smaller. Page et al. (2005) find that higher minimum wages increase welfare caseload, implying negative employment effects. Dube (2019) estimates an elasticity of poverty with respect to the minimum wage of around -0.3 for single mothers. Meanwhile Sabia (2008) finds that the minimum wage has large negative effects on the employment of low skill single mothers, leading to positive effects on poverty.

With some notable exceptions (Borgschulte & Cho 2018, Agan & Makowsky 2018), discussions of minimum wage effects on employment have been less concerned with supply side explanations. This may reflect a consensus that male labor supply elasticities were close to zero. However, estimated female labor supply elasticities are sizably positive, including for low-wage women, as the EITC literature has shown. Research on retirement decisions indicate that labor supply of elderly workers is responsive to economic incentives (Blundell et al. 2016). Moreover, estimated labor supply elasticities of low-wage men are also sizably positive: A classic paper by Juhn et al. (1991) estimated a male partial labor supply elasticity of 0.299 for the lowest wage decile, implying a long-run (uncompensated) elasticity of 0.4, when evaluated at their mean employment rate. The partial labor supply elasticity for the second decile was .232.

To fix ideas, we first present a simple model of family labor supply. Families with children have two distinct characteristics relative to adults without children. First, they may be eligible for means-tested transfers. Second, they may face fixed costs of employment in the form of childcare. As a result, families with children may experience kinks and non-convexities in their budget constraints. Small increases in wages will then induce significant labor supply effects, where affected workers go from nonparticipation to supplying a large number of working hours.

Our empirical analysis follows the standard approach to identification in exploiting variation in state minimum wage policies, which allows for the estimation of panel models with state and year fixed effects. These models find no significant effects of minimum wages on overall low wage employment, nor for a number of demographic groups. Restricting the sample to parents of minor children, we find significant positive effects on employment of married fathers and single mothers. While effects for single mothers are concentrated on the extensive margin, married fathers also increase their hours conditional on working.

Extended models find corresponding reductions in welfare receipt and the share who report staying home with children. Finally, our models find no significant effects in the labor supply of married mothers, suggesting that any positive effects for this group are roughly canceled out by indirect wealth effects through their husbands' increased earnings.

The fundamental assumption in these models is that the implementation of state minimum wage policies is uncorrelated with other drivers of earnings and employment outcomes. To assess this assumption empirically, we implement an event study approach that model the path of labor market outcomes in the years leading up to and immediately after minimum wage increases. These models lend support to the validity of our identification strategy: while the estimates indicate significant effects of minimum wages on employment and earnings in the years after policy changes, the models find no effects on outcomes in the years prior to minimum wage hikes. Moreover, our analysis indicates that the results are driven by jobs that pay close to the minimum wage, with no effects on high wage employment. The results are robust to a range of specification choices, including controls for division by year fixed effects.

The positive employment response of parents translates to significant effects on child poverty. A ten percent increase in the minimum wage increases the probability that children of mothers with high school or less have at least one working parent by 4%. Child poverty in this group is reduced by 5.9%. Effects are concentrated among younger children. Given the strong connection between child poverty and later-life outcomes, these results point to potentially significant downstream effects of minimum wages.

We have organized the rest of the paper as follows: Section 2 first presents a simple theoretical labor supply model, then introduces our empirical strategy and the data. Section 3 presents the estimated results for overall employment. Section 4 presents our main results on parents, together with a battery of robustness and specification tests. Section 5 concludes.

2 Methods and data

2.1 Simple theory models of family labor supply

With standard (convex) preferences, we would typically expect small changes in wages to have only small effects on labor supply. However, when institutional factors give rise to kinks and nonconvexities in the budget constraint, a small wage increase can induce larger shifts in employment even in standard labor supply models (Blundell & MaCurdy 1999). In this section, we propose that parents of dependent children face two distinct factors that make them more likely to experience such nonstandard budget sets.

First, parents of minor children may be eligible for means-tested transfers to a greater extent than adults without dependents. This includes not only cash transfers (AFDC/TANF), but also in-kind transfers and programs such as WIC, childcare subsidies/Head Start and government-sponsored health insurance. The way these programs depend on income is complex and changes over time: For instance, TANF recipients are typically required to meet work requirements, while other programs may exhibit sharp cutoffs in eligibility at set income levels, leading to so-called benefit cliffs. In Appendix A, we present a simple descriptive analysis of the relationship between family earnings and program participation.

A second source of nonconvexities is fixed costs of work (Heim & Meyer 2004). These costs could include childcare costs (assuming childcare costs are not perfectly proportional to hours worked) as well as nonmonetary costs (stress and worry about coordinating work and family). We argue that these fixed costs of work are typically larger for parents than for adults without children. Moreover, fixed costs should be the largest for parents of younger children (preschool age) compared to parents whose youngest child is school age.

In this section, we introduce a simple model of labor supply that incorporates these two institutional features, albeit in a very basic way.[1] We begin by characterizing the employment decision of a single parent, contrasting it with that of a single worker with no dependents. We then consider the case of a two-parent household.

Single parents

Means-tested transfers are modeled as a cash welfare program with a guaranteed benefit level G_i, where eligibility is conditional on having a dependent child, and benefits are reduced 1 to 1 with each dollar of earned income:

$$B_i = \max(G_i - w_i h, 0)$$

Given the 100% benefit reduction rate, it is never optimal for a worker to supply between

[1] An important simplification of the model is that it abstracts entirely from the existence of the earned income tax credit (EITC), one of the largest anti-poverty programs targeting families. The EITC increases the return to market work for people on the phase-in range, however there may be negative effects at higher wages. In particular, as EITC is tested against family earnings, standard models predict potential negative effects of the EITC on secondary earners (Eissa & Hoynes 2004).

0 and the break-even number of hours $h^{BE} = G_i/w_i$. This implies that cash benefits will either be $B_i = G_i$ (and $h^* = 0$) or $B_i = 0$ (with $h^* > h^{BE}$).

To capture fixed costs of work, the model follows closely the approach in the EITC literature (Heim & Meyer 2004, Eissa et al. 2008), and let

$$q_i \geq 0$$

denote a fixed cost of work drawn from a distribution $P(q)$. Some parents may have access to unpaid childcare from family, friends or neighbors, meaning $q_i = 0$. For people without children, assume $q_i = 0$.[2] This approach extends to the more general case where $Q(h)$ is increasing but concave in hours; the crucial assumption is that there is a fixed cost element to childcare costs, rather than a proportional increase in hours work. In Appendix A, we use data from the CPS to assess this empirically: we find that childcare costs tend to be high even for small part time jobs, in particular for single mothers, for whom the fixed cost element appears to be substantial.

Workers choose hours h to solve the maximization problem

$$\max_h v_i(c, h)$$

such that

$$c = c_0 + w_i h + B_i - q_i \times 1(h > 0)$$

Here, $v_i(c, h)$ is a standard utility function. We solve this problem in two steps. The first step solves for the optimal number of hours worked, conditional on participation. The second step compares utility from participation with nonparticipation.

Conditional on participation, optimal consumption and leisure are given by the first-order conditions

$$w_i = -\frac{v_{i2}(c^*, h^*)}{v_{i1}(c^*, h^*)}$$

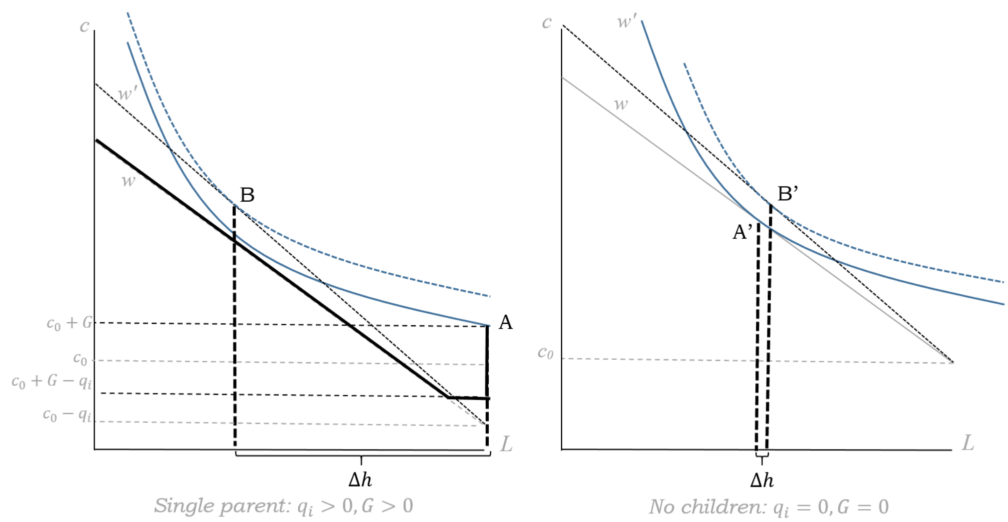
Individual i will supply hours h^* if

$$v_i(c^*, h^*) > v_i(c_0 + G_i, 0)$$

$$v_i(c_0 + w_i h^* - q_i, h^*) > v_i(c_0 + G_i, 0)$$

[2]This is a simplification - in practice fixed costs of work are not limited to workers with children, e.g. commuting costs typically affect most workers (Senesky 2003). Mas & Pallais (2017) show that willingness to pay for flexible workplace arrangements increase with commuting time.

Figure 2: Labor supply decision with means-tested transfers fixed cost of work



Note: Figure illustrates a simple labor supply model with and without fixed childcare costs and means-tested transfers. L represents the number of hours available for leisure and home production.

And 0 hours otherwise.

For a given combination of $G_i, q_i > 0$, there is a threshold wage $\bar{w}$ such that

$$v_i(c_0 + \bar{w}h^* - q_i, h^*) = v_i(c_0 + G_i, 0)$$

When the offered wage increases from just below $\bar{w}$ to just above $\bar{w}$, people with a fixed cost of work q_i and benefit level G_i will switch from supplying 0 hours of work to supplying h^* hours of work.

Figure 2 illustrates this graphically. The panel on the left depicts the labor supply decision of a single parent with fixed cost of work q and means tested transfers G, while the panel on the right illustrates the choice of a person with no children. In the panel on the left, the solid black line represents the binding budget constraints of parents. The fixed costs of work q leads to a discontinuity in the budget constraint. In addition, the 100% benefit reduction rate of the means-tested transfer lead to the budget constraint being flat at low h.

At wage w just below $\bar{w}$, the parent is out of the labor force, at point A. At the new, higher minimum wage w', it is optimal for the parent to work, supplying h^* hours of labor. For non-parents, predicted labor supply effects are small, and of ambiguous direction. In particular, the model does not predict the same effects on the participation margin.

Married parents

We propose a sequential decision making model, where the husband (primary earner) makes his labor supply decision first, without taking into account the choice of the wife (secondary earner).[3] The wife then makes her decision, considering the primary earner's labor income as unearned income.

For couples, transfers are means-tested against the family's total income. Childcare costs are incurred only if the both parents are working. To simplify further, we assume that spouses have similar preferences over consumption and working hours, implying that if wages are too low to induce the husband to work, the wife will also not work.

The husband maximizes utility

$$\max_h v_i(c^H, h^H)$$

such that

$$c^H = c_0 + w_i h^H + B_i$$

Conditional on participation, hours are given by the first order conditions as before. From the participation constraint, the husband's reservation wage $\bar{w}^H$ is given by

$$v_i(c_0 + \bar{w}_i^H h^{H*}, h^{H*}) = v_i(c_0 + G_i, 0)$$

That is, for married fathers, the model generates labor supply responses qualitatively similar to that of single mothers: When the wage increases from just below $\bar{w}$ to just above $\bar{w}$,

The wife then makes her labor supply decision, maximizing utility

$$\max_h v_i(c^W, h^W)$$

subject to her budget constraint

$$c^W = c^H + w_i h^W - q_i \times 1(h^W > 0)$$

[3]While we use the terms husband and wife, we could more generally think of the primary earner as the person in the couple who can get the highest wage.

The wife will work only if her income net of childcare costs is sufficient to satisfy the participation constraint.

$$v_i(c^H + w_i h^{W*} - q_i, h^*) > v_i(c^H, 0)$$

Means-tested transfers enter in her decision only through c^H: given our definitions of primary/secondary earner and our assumptions on preferences together with the 100% benefit reduction rate, it will never be optimal for the wife to work if the husband isn't working; once the husband is working, the family is by definition no longer eligible for benefits. The predictions of the model on effects of a small wage increase are less clear cut for secondary earners: Keeping c^H constant, higher wages should increase labor supply of married women as they are able to overcome fixed childcare costs. However, unlike for single women, higher wages may increase c^H if the husband is working a minimum wage job. Market wages then enter into both sides of the participation constraint. This kind of spillover/wealth effect makes the model's prediction for married women theoretically ambiguous.

Discussion - demand side

This simple models abstracts from effects of the minimum wage on labor demand. Standard economic theory implies that higher minimum wages will reduce labor demand. However, even if this is the case, it is not clear that employers will reduce demand for workers who are parents; there may be crowding out of other workers.

Meanwhile, predictions from alternative models are less clear cut, e.g. models with monopsony power (Manning 2003, Naidu & Posner 2018) suggest higher minimum wages could raise firm labor demand. Giuliano (2013) documents positive employment effects of higher minimum wages for teenage workers that are consistent with these noncompetitive models.

2.2 Empirical models

Our empirical strategy leverages state variation in minimum wages over time. In this section, we first present our preferred panel models. A key identifying assumption in these models is that, conditional on the included covariates, the timing of state minimum wages is uncorrelated with other unobserved drivers of the outcomes of interest. To investigate this assumption empirically, we then present a set of event study type specifications that model the dynamic responses of employment and earnings around the time of minimum wage increases. These models will serve a dual purpose, analyzing the validity of our empirical strategy, as well as providing a first indication of the presence of treatment effects.

Panel models

We estimate panel models of labor market outcomes using state variation in minimum wages over time. Our baseline model controls for a vector of demographic and state characteristics, as well as state and year fixed effects. For individual i in state s year t:

$$y_{it} = \theta_t + \theta_s + \mu_s t + X_{it}\beta + logmw_{st}\gamma + \varepsilon_{it} \tag{1}$$

where X_{ist} is a vector of control variables that includes individual demographics and time-varying state characteristics. This includes age, education, race/ethnicity, marital status (for the pooled sample), and the number of children in the family. To capture federal policy changes to the EITC, the model includes calendar time indicator variables interacted with indicator variables for number of children (assumed flat after the fourth child). The model controls for log state population, log maximum SNAP and AFDC/TANF benefits for a family of 3, TANF implementation and AFDC waivers.

Cengiz et al. (2019) show that, in their sample, estimates from a model similar to equation (1) yields biased estimates due to spurious employment shocks affecting workers at the top of the distribution. To address this, we restrict our baseline estimation sample to low-wage workers and the non-employed, excluding workers whose hourly wage is at least $15 or higher in inflation-adjusted terms (2016 dollars).

The fundamental assumption in these panel models is that conditional on the set of control variables, changes in the minimum wage are uncorrelated with local trends in labor market outcomes. To test this assumption, we implement an event study approach estimating trends in outcomes in the years leading up to minimum wage changes. The simple intuition behind these models is that minimum wage increases should have no effect on earnings and employment in the years preceding minimum wage changes.

The event study models serve as a test of parallel pre-trends. While a finding of parallel pretrends yields support to the identification strategy, parallel trends could still fail if there are contemporaneous shocks, i.e. if positive shocks to labor demand happen at the same time as changes to minimum wage policies.

To further assess the plausibility of our identification strategy, we implement two additional falsification tests. First, we estimate panel models on a placebo sample of college-educated parents with a four year degree. This is a group of women who are highly unlikely to work minimum wage jobs, meaning any effects on this group are likely spurious and indicative of a problem with our identification strategy. Similarly, there should be no effect on high wage employment. To test this, we estimate models of employment by wage bins. If the estimated effects reflect causal impacts of minimum wages, employment effects should be concentrated among jobs that pay around minimum wage levels (taking spillovers into account), with no effect on employment in high wage jobs.

Event study models

Over our sample period, all states raised their minimum wages several times, with events varying in size and frequency.

We define events as year-on-year changes in the state minimum wage of $0.25 or more. Moreover, in order to obtain meaningful estimates of pretrends, we require that the state not change its minimum wage for at least 2 years before the increase, allowing for smaller incremental changes (indexing) only.

This yields 195 events total. All states experience multiple events, between 3 and 8 per state. The median state has 3 events. We include up to 10 years of data for each event, 5 years of pre-increase and 4 years of post-increase data. The baseline sample is not balanced in event time.

For each event $\tilde{s}$, event year $t^*_{\tilde{s}}$, define event time indicators

$$\pi_{k(\tilde{s},t)} = 1(t - t^*_{\tilde{s}} = k)$$

To strengthen identification, we bin event time at -5:

$$\pi_{-5(\tilde{s},t)} = 1(t - t^*_{\tilde{s}} \leq -5)$$

The model incorporates variation in the magnitude of minimum wage changes by interacting event time with a measure of the total minimum wage change over the period. Let

$$\delta_{\tilde{s}} = log(MW^{max}_{\tilde{s}}) - log(MW^{min}_{\tilde{s}})$$

denote the aggregate change in state minimum wage over the event period, including any phase-ins. The regression model can then be written.

$$y_{it} = \theta_t + \theta_{\tilde{s}} + X_{it}\beta + \sum_{k=-5, k\neq -1}^{5} \left(\delta_{\tilde{s}} \times \pi_{k(i,t)}\right) \rho^k + \varepsilon_{it}$$

The principal parameters of interest is the vector of coefficients ρ^k, capturing the effects on outcomes observed k years after the minimum wage increase. These coefficients are only identified relative to each other, the reference period is set to $k = -1$, that is, the last year before the initial minimum wage increase.

This model serves a dual purpose. First, it sheds light on the validity of our empirical approach, in particular of whether the parallel trends assumption holds. Second, if the model passes pretrends tests, the estimated coefficients for the period post implementation give an indication of the size of the effect, if any, on the outcome of interest.

If the assumptions of our models hold, there should be no effects on outcomes observed before the minimum wage goes up. If the minimum wage has a contemporaneous effect on labor market outcomes, we should see a discontinuous jump at $k = 0$. If, on the other hand, outcomes change smoothly around minimum wage outcomes, the models do not adequately control for underlying state-specific trends in labor market outcomes. When interpreting the trajectory of coefficients for $k > 0$, it is important to keep in mind that the minimum wage is allowed to increase during the post period, either through staggered phase-ins or through implementation of new policies.

2.3 Sample

The main data source is the CEPR extracts from the Current Population Survey Annual Social and Economic Supplement (CPS ASEC), covering the years 1980-2015 (i.e. the 1981 to 2016 CPS ASEC files, where respondents answer questions on the preceding years). We retain individuals ages 15-55. The dataset includes a rich set of demographic variables, such as age, education, marital status, race and ethnicity, and age and number of children in the household. Individuals are assigned children in family only if head of subfamily/head or spouse in household. While studies of employment effects of minimum wages typically use the CPS-MORG, we believe the CPS ASEC is better suited for the analysis in the present paper for several reasons. Crucially, publicly available extracts of the CPS-MORG do not have consistent information on respondents' dependent children for all survey years.

In addition, the ASEC contains information about respondents' stated reasons for not working as well as information about income from welfare and public assistance. As a robustness check, our empirical analysis will include auxiliary analyses of employment effects estimated on the MORG.

Employment is measured as a binary indicator variable equal to one if the woman worked at all during the previous calendar year. In addition, the survey gives information on the intensive margin of work – weeks worked per year and hours worked per week. For individuals who did not work, the survey has information on the reasons for not working. We include an indicator variable equal to one if an individual reported not working due to family responsibilities.

Earnings measures include income from wages and salaries and self-employment – personal earnings for singles and family earnings for married persons. Nominal variables are adjusted for inflation using the CPI-RS. Earnings and other income variables are transformed using the inverse hyperbolic sine function. In addition, the sample includes data on various forms of public assistance and welfare.

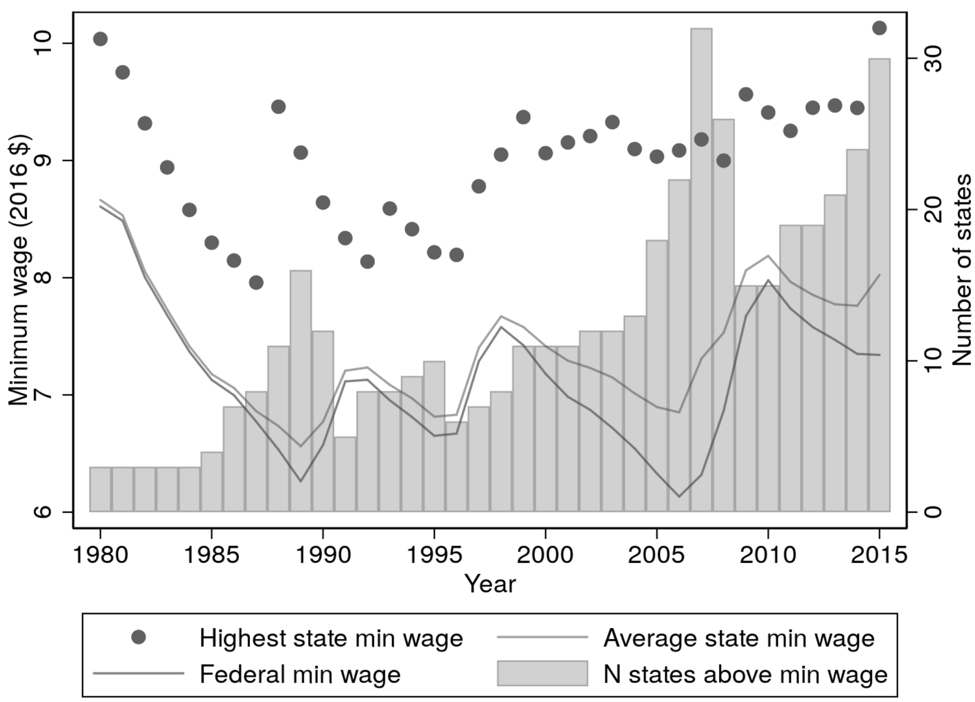
The sample is merged to data on state level covariates that vary over time. We include the state population, the state maximum SNAP and AFDC/TANF benefits for a family of 3. To capture the effect of welfare reform, we include controls for TANF implementation and whether the state had a major waiver in place before TANF. The main variable of interest is the average annual minimum wage (Vaghul & Zipperer 2016).

The primary variable of interest in our models is the state minimum wage. Figure 3 illustrates the variation in minimum wages over the sample period. As the figure illustrates, there is considerable variation in minimum wages, in particular in the last half of the sample period, as an increasing number of states implement minimum wages that are above the federal minimum.

2.4 Descriptives

Table 1 shows characteristics of workers who earn close to the minimum wage: Column (1) shows sample means of workers who earn less than the minimum wage, while column (2) presents characteristics of workers who earn up to 110% of the applicable minimum wage. The two columns yield a similar picture: teenagers - workers aged 15-19 - make up just under 30% of minimum wage workers, while just about half of all minimum wage workers can be classified as prime-aged (age 25 or older). Over the sample period, teens make up

Figure 3: Minimum wage policies, 1980-2015



Note: Figure shows variation in state minimum wage policies over the sample period. Source: Vaghul & Zipperer (2016).

a declining share of minimum wage workers. In 1980, 31% of all minimum wage workers were aged 19 or under; by 2015 this number had dropped by nearly half to just under 17%.

Table 1: Characteristics of minimum wage workers

	(1)	(2)	(3)	(4)
Teens	0.265	0.253	0.292	0.215
Age 20+	0.735	0.747	0.708	0.785
Age 25+	0.490	0.502	0.471	0.531
No children	0.700	0.694	0.689	0.698
Parent	0.300	0.306	0.311	0.302
Mothers	0.224	0.229	0.239	0.220
Fathers	0.076	0.077	0.072	0.082
Unmarried 1+ child	0.094	0.095	0.080	0.110
Single mothers	0.083	0.084	0.073	0.095
Single fathers	0.011	0.011	0.007	0.015
Married 1+ child	0.206	0.211	0.231	0.193
Married mothers	0.141	0.145	0.166	0.125
Married fathers	0.065	0.066	0.065	0.068
Observations	326300	401016	196700	204316
Threshold	MW $\times 1$	MW $\times 1.1$	MW $\times 1.1$	MW $\times 1.1$
Years	All	All	1982-1996	1997 - 2015

Source: CPS ASEC. Weighted using the March person weights.

One in three minimum wage workers have children. Of these, a majority are married: just under one quarter of all minimum wage workers are married with minor children. Consistent with women being over-represented in low wage jobs, parents earning the minimum wage are more likely to be female. The share of parents stays remarkably similar over the sample period.

3 CPS analysis by demographic groups

The minimum wage workforce is remarkably diverse: while teens are a disproportionately large share of minimum wage workers, most minimum wage workers are adults, and a significant proportion of minimum wage workers are supporting children. The economic circumstances of a teenager working part time and a parent supporting a family are clearly different: the parent may have access to means-tested welfare, they may face fixed costs of employment in the form of paid childcare. As discussed above, these aspects predict potential heterogeneous responses to labor supply.

Table 2 shows estimated effects of the minimum wage on overall employment as well as for selected demographic groups. Column (1) shows estimates for the full population, including high wage workers. For the population as a whole, as well as for several of the subsamples we study, minimum wage workers make up a small share of the total workforce. As pointed out by (Cengiz et al. 2019), estimating the twoway fixed effects on the full population in this way runs the risk of correlated shocks affecting employment at the top of the earnings distribution biasing the estimates. To address this, column (2) presents a second set of estimates, where the estimation sample is limited to individuals who are either non-employed or earning no more than $15 per hour (in 2016 $).[4]

The first 6 rows of table 2 correspond to the demographic slices studied in Cengiz et al. (2019). Our models fail to find significant positive or negative effects on employment for these groups, with one weak exception: We find a marginally significant positive employment response for people with high school or less. However this effect becomes insignificant once high wage workers are excluded from the estimation sample, which suggests the effect may be spurious.

The last 4 rows of Table 2 shows estimates when the sample is split by presence of children. This affects results considerably: estimated employment effects are close to zero for people without minor children, parents of minor children experience statistically significantly positive effects on the probability of working. For the full sample, a ten percent increase in the minimum wage predicts a 0.2 percentage point increase in employment rates for this group. Estimated effect sizes are similar for mothers and fathers, though the effect for mothers is not statistically significant in the pooled sample.

Excluding high wage workers, the estimated positive employment effects for parents become larger and more significant. This suggests that the estimates are not driven by spurious shocks at the high end of the wage distribution.

To obtain elasticities of employment with respect to the minimum wage, we divide the point estimates from table 2 by average group employment rates. This allows for a more straightforward comparison of employment responses across groups that differ in their labor

[4]The $15 threshold, while arbitrary, is chosen to be high enough that changes in the minimum wage do not affect the probability of being excluded from the low wage sample. As illustrated in Figure 3, state minimum wages stayed under $10 per hour throughout the sample period, meaning the minimum wage would have to have spillovers to wages greater than 150% of the minimum wage in order to induce this kind of compositional shifts.

Table 2: Minimum wage employment effects, by subgroup

	(1) Full sample	(2) Exclude $15+
All	0.0116	0.0229
	(0.0109)	(0.0179)
LTHS	-0.0146	-0.0164
	(0.0255)	(0.0257)
Max HS	0.0274*	0.0298
	(0.0148)	(0.0203)
Teens	-0.00477	-0.0137
	(0.0212)	(0.0232)
Women	0.0103	0.0221
	(0.0124)	(0.0179)
Black or Hispanic	0.0217	0.0341
	(0.0192)	(0.0237)
No children	0.00216	-0.00307
	(0.0126)	(0.0180)
1+ child	0.0256**	0.0706***
	(0.0127)	(0.0231)
Mothers	0.0280	0.0653**
	(0.0187)	(0.0254)
Fathers	0.0200**	0.0750***
	(0.00965)	(0.0278)

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals aged 15-55 (unless otherwise noted). The dependent variable is an indicator equal to one for individuals who reported working at some time during the year. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Table 3: Minimum wage elasticities, by subgroup

	(1) Full sample	(2) Exclude $15+	(3) CDLZ Bunching	(4) CDLZ aggregate
All	0.015	0.037	0.024	0.016
LTHS	-0.028	-0.036	0.097	0.178*
Max HS	0.04*	0.052	0.061	0.041
Teens	-0.011	-0.034	0.125	0.128
Women	0.014	0.038	0.025	–0.006
Black or Hispanic	0.031	0.06	–0.005	–0.004
No children	0.003	-0.005		
1+ child	0.031**	0.109***		
Mothers	0.039	0.114**		
Fathers	0.021**	0.09***		

Notes: Table shows selected elasticities of employment with respect to the minimum wage. Columns (1) and (2) present estimates from table 2, divided by sample employment rates. Columns (3) and (4) show estimated elasticities from Cengiz et al. (2019) (Table A2).

force attachments. In addition, this will allow us to compare our estimates to those found in the literature. Results from this exercise are presented in table 3.

To be clear, the estimated elasticities refer to somewhat different definitions of employment: Cengiz et al analyze the CPS-MORG, which asks about employment in a given week, while our analysis uses the CPS ASEC, where respondents are asked about employment at any time during the previous year. As we use a wider definition of employment, we wouldn't necessarily expect the estimated elasticities to be the same. Still, comparing the estimated elasticities in columns (1) and (2) with those reported by Cengiz et al. (2019), reproduced in columns (3) and (4), the overall picture appears to be largely similar. For completeness, we have estimated similar models using the CPS-MORG, though estimating models separately for parents and people without children using the MORG is complicated by missing data on children for 1993-1999. These models, presented in Appendix Table B1, indicate a pattern that is very similar to the estimated effects using the CPS-ASEC: employment effects are positive and significant for less educated parents, while effects for people with no children are small and not significantly different from zero.

Meanwhile, the estimated employment elasticities with respect to the minimum wage for parents of minor children are much larger than for people without children. This is consistent with a positive labor supply response to higher wages. However, the effect could also be spurious, if higher state minimum wages are correlated with unobserved drivers of family labor supply.

4 Results for parents earnings, employment and hours

Estimates presented in the previous section point to the possibility that parents respond differently to higher minimum wages compared to people without children. In this section, examine this relationship in more detail.

4.1 Main results

Table 4: Effects on parents' employment

	(1) Max HS	(2) Max HS	(3) BA+
Single mothers			
Log min wage	0.0768**	0.0836*	0.0135
	(0.0342)	(0.0416)	(0.0404)
Sample avg	0.660	0.589	0.913
Married mothers			
Log min wage	0.0320	0.0523*	-0.0104
	(0.0270)	(0.0272)	(0.0262)
Sample avg	0.643	0.554	0.781
Married fathers			
Log min wage	0.0479**	0.100**	-0.0170**
	(0.0210)	(0.0417)	(0.00670)
Sample avg	0.933	0.848	0.976
N	282548	125513	190102
Hourly wage	All	Exclude $15+	All

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals aged 15-55. The dependent variable is an indicator equal to one for individuals who reported working at some time during the year. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Table 4 presents estimated effects of log minimum wage for parents by education. We separate the sample further, estimating effects for single mothers, married mothers and married fathers separately.[5] The first two columns of Table 4 show results for parents with a high school degree or less:column (1) includes the full sample, while column (2) excludes workers with hourly wages exceed \$15 in 2016 dollars. For single mothers, both models find positive effects of minimum wages on employment. Excluding high wage workers, the point estimate increases slightly, while losing some precision. For married mothers, the estimated effect is not significant in the full sample; excluding high wage workers, the point estimate becomes marginally significant.

For fathers, both models find significant positive employment responses; point estimates are notably higher when low wage workers are excluded from the sample. This difference could in part reflect the relatively low exposure rate of less educated fathers to minimum wages. However, it could also reflect a downward bias in the full sample estimate arising from negative shocks at the top of the income distribution, as discussed in Cengiz et al. (2019).

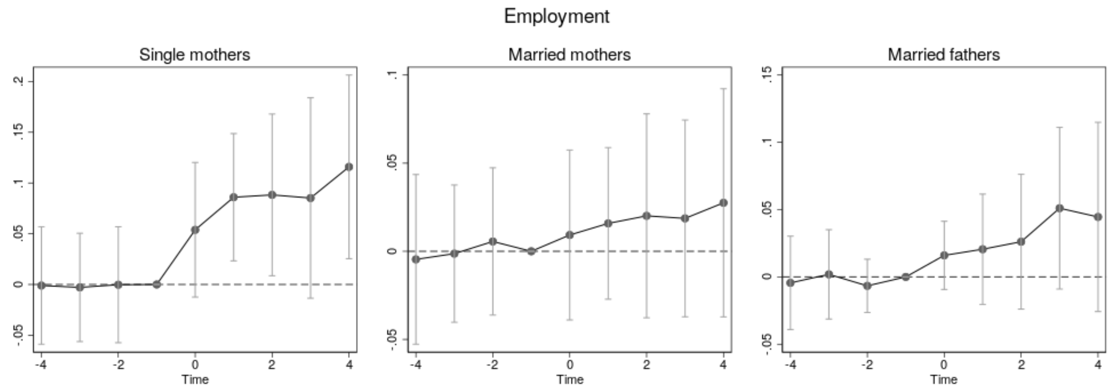
Column (3) of Table 4 presents estimates from models estimated on a sample of parents with at least a bachelor's degree. This provides a placebo exercise: any effects of the minimum wage on employment should be concentrated among people with low levels of education. People with a bachelor's degree or higher meanwhile are unlikely to be working minimum wage jobs, and as such, we wouldn't expect there to be any employment response for this group. Minimum wages have no significant effects on the employment rates of more educated mothers. For fathers, we estimate a statistically significant negative effect. To summarize, the lack of positive effects for the placebo sample provides some reassurance that the positive estimates for less educated parents represent causal effects of minimum wages rather than unobserved shocks.

Next, we turn to the presentation of the event study results. Figures 4 shows results from the estimated event study. If the parallel trends assumption holds, we would expect outcomes to trend in parallel in the years leading up to the minimum wage increase. In the event study framework, this should translate to estimated event time coefficient being close to zero in the years leading up to the policy change. Moreover, we would expect any employment response to the higher minimum wage to show up as a discontinuous shift in the path of estimated event time coefficients at time zero.

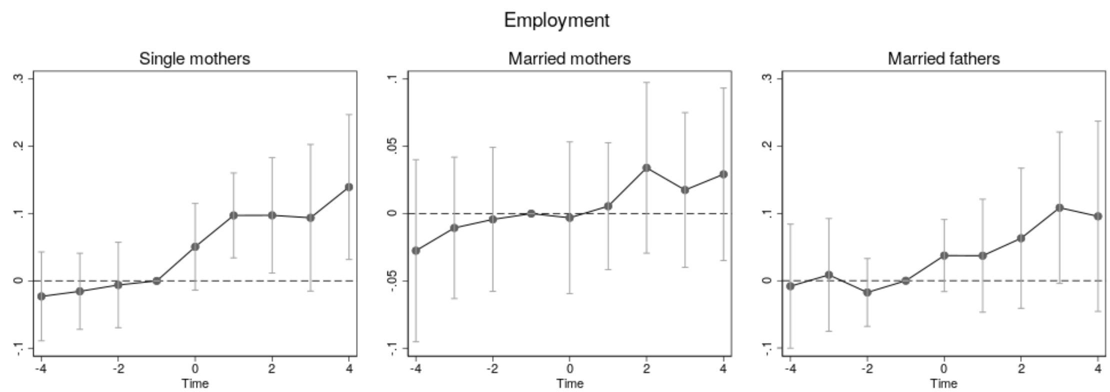
For single mothers and married fathers, the estimated event study models indicate flat

[5] We do not include unmarried fathers as the sample size is small.

Figure 4: Event study, scaled, employment



(a) All HS or less



(b) Exclude $15+

Notes: Figure plots selected coefficients from event study models with 95% confidence intervals. Models control for event, year fixed effects, state linear time trends, individual demographics, state level policies and year by number of children fixed effects. Standard errors clustered at the state level.

pretrends. Both groups exhibit a jump in estimated event time coefficients at time zero, indicating a positive response. For married women, however, the event study models are more troubling: the estimated event time paths appears to trend upward in the years leading up to the policy change, with no clear break in trend around time zero.

So far, results have focused on the participation margin. To consider effects on the intensive margin, table 5 shows estimated effects on weekly hours, annual weeks and estimated annual hours, estimated on a sample of less educated workers.[6] For married fathers, the model finds significant intensive margin employment effects: weekly hours worked increases significantly among the employed. The estimated effects are relatively small. A ten percent increase in the minimum wage predicts an additional 11 hours worked among employed fathers, or a 0.5 percent increase relative to the mean. However, these models should be interpreted with caution as they are estimated on the endogenous sample of parents who choose to work.

To analyze intensive margin effects further, we implement a decomposition exercise similar to the one in Chetty et al (2011). We assume the extensive margin entrants work the average number of hours in the sample, conditional on working. For married fathers, this is 2114 hours per year. Using the estimate from table 4 (0.048), the extensive margin then accounts for 101 hours, or 52% of the estimated annual hours effect (196). That is, for fathers, the hours effect appears to be driven by a combination of extensive and intensive margin effects.[7]

Table 5 also shows effects on income and poverty. Row 4 shows effects on total personal earned income, adjusted for inflation. The picture is somewhat mixed: while point estimates are positive for all groups, effects are statistically significant only for single mothers. [8]. This income effect appears to be driven in large part by the participation margin: conditional on employment the estimate is no longer statistically significantly different from zero. Meanwhile, the lack of significant effects on average incomes could mask distributional effects, as we expect minimum wages to primarily increase earnings at the low end of the distribution. Row (5) presents effects on family poverty - the minimum wage signif-

[6] Estimating the models on a subsample excluding workers earning less than $15/hour (in 2016 dollars) yields qualitatively similar results, see Appendix table B4

[7] A similar exercise for single mothers finds no significant intensive margin effects - 110% of the estimated effect on annual hours can be accounted for by extensive margin entrants.

[8] This may in part reflect the excess weight put on higher incomes in this regression. When we exclude high wage workers, we obtain significant positive effects for incomes of married fathers (see Appendix table B4)

Table 5: Impacts of minimum wages on hours, income and poverty

	(1) Single mothers	(2) Married mothers	(3) Married fathers	(4) Single mothers	(5) Married mothers	(6) Married fathers
Hours per week						
Log min wage	2.478*	0.903	3.519***	0.906	-0.117	1.599***
	(1.259)	(1.264)	(1.174)	(1.277)	(0.474)	(0.568)
Sample avg	24.70	22.87	40.74	36.47	34.72	43.44
Weeks per year						
Log min wage	1.915	0.431	3.251**	0.103	-0.856	1.064
	(1.826)	(1.730)	(1.550)	(1.166)	(0.763)	(0.876)
Sample avg	28.64	28.20	45.35	42.28	42.80	48.36
Hours per year						
Log min wage	111.3*	19.57	196.4**	39.18	-31.79	109.0**
	(57.68)	(59.01)	(87.14)	(60.94)	(36.03)	(54.10)
Sample avg	1046.6	984.9	1971.9	1585.6	1531.3	2114.1
Earned income ($1000)						
Log min wage	3.490**	1.687	1.961	3.675	2.088	0.00610
	(1.409)	(1.428)	(2.507)	(2.204)	(1.334)	(2.081)
Sample avg	13.90	13.83	41.61	21.06	21.49	44.41
Poverty						
Log min wage	-0.118***	-0.0442*	-0.0472***	-0.0942*	-0.00883	-0.0275*
	(0.0387)	(0.0226)	(0.0168)	(0.0512)	(0.0226)	(0.0152)
Sample avg	0.515	0.140	0.133	0.368	0.0749	0.110
N	131283	298112	282548	87072	192573	263849
Sample	Full	Full	Full	Working	Working	Working

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals aged 15-55 with high school or less. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

icantly reduces poverty among less educated parents. In absolute terms, effects are larger for single mothers; however the relative reduction in poverty rates is larger for married parents, who exhibit lower baseline poverty rates.

4.2 Robustness

Our baseline model includes state and year fixed effects and a linear time trend. Appendix tables B2 and B3 shows results from three alternative model specifications: a more parsimonious model omitting the state time trends, and two more saturated models adding quadratic time trends, and one adding census division by year fixed effects. Results are qualitatively consistent across the three models.

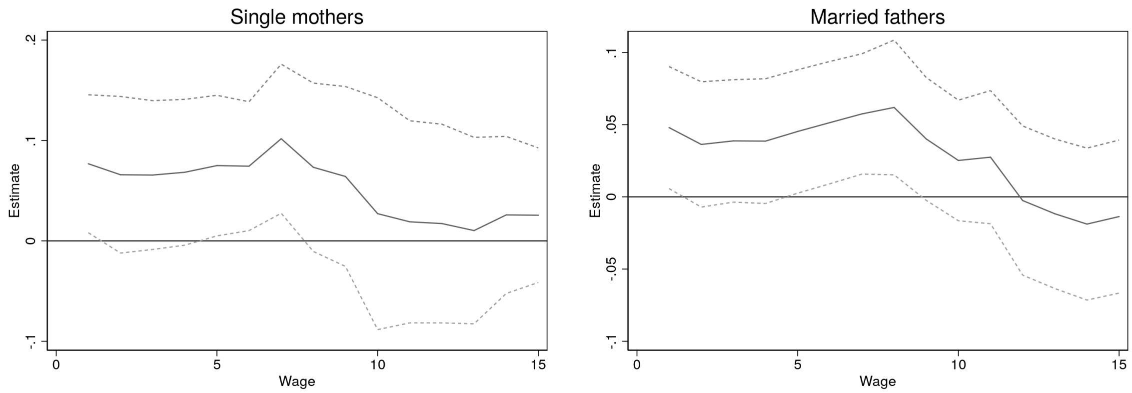
To further examine whether these effects are in fact caused by the minimum wage, we estimate a series of models in which the dependent variable is employment by wage bin. These models provide a falsification test: any employment effect should be concentrated among jobs that pay minimum wage or slightly higher; positive employment effects among high paying jobs would indicate a spurious correlation.

Using the data on average hours worked per week together with weeks worked last year, we derive a measure of hourly wages. This is then used to define two sets of indicator variables. First, we construct "open-ended" wage bins: indicator variables equal to one if the person is earning at least h dollars per hour, and zero otherwise. The second set of indicator variables are equal to one if an individual is working and earning between h and $h + 1$ dollars, 0 otherwise. If effects are driven by the minimum wage, employment should be most affected in the region of new minimum wages.

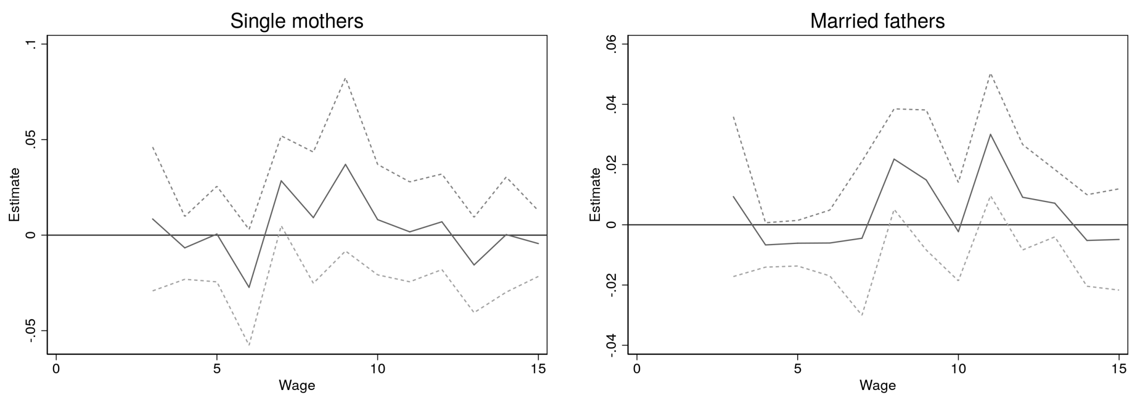
These variables provide the basis for falsification tests: the employment effect should be concentrated among jobs that pay minimum wage or slightly higher. Estimated minimum wage effects on employment should grow smaller and disappear when we exclude more low-wage workers. Positive employment effects among high paying jobs would indicate a spurious correlation.

Models are estimated separately for single mothers and married fathers - the two groups for which we estimated significant employment effects. Results are presented in figure 5. The upper panel (a) plots estimated coefficients from the "open-ended" wage bin variables. The points furthest left are the estimated effects on employment (corresponding to the estimates in table 4). The figure then plots estimates excluding employment in progressively higher wages, i.e. up to and including 15 dollars/hour. For both groups, the figures indicate

Figure 5: Wage bin models



(a) Excluding low wage employment



(b) Employment by wage bin

Note: Figure plots estimated coefficients of the log minimum wage with 95% confidence intervals. In the panel on the left the dependent variables are indicator variables for employment ignoring jobs that pay an hourly wage below threshold wages. In the panel on the right the dependent variables are indicator variables of employment by hourly wage (grouped using 1 dollar bins). All models control for state and year fixed effects, state linear time trends, individual demographics, state level policies and year by number of children fixed effects. Standard errors clustered at the state level.

that employment effects remain stable when excluding very low paying jobs, up to around 6 or 7 dollars. The minimum wage (in 2016 dollars) was above $6 for the entire period. In the absence of measurement error, these very low wage jobs could be jobs that are not covered by the minimum wage, such as tipped workers. The effect starts falling when we exclude jobs that pay less than 8 dollars per hour for single mothers, and 9 dollars per hour for married fathers. Excluding jobs that pay 10 dollars per hour or less, the models finds no significant effect of the minimum wage on employment for either group, indicating that the minimum wage policies are uncorrelated with spurious drivers of employment changes at higher wage levels.

Panel (b) shows estimated coefficients from the "closed" wage bins, modeling employment to population ratios by wage bin. Again, if the employment and earnings effects are really driven by minimum wage policies, we would expect effects to be concentrated in the region of minimum wages, which range between 6 and (just over) 10 dollars over this period (2016 dollars). While the effects are imprecisely estimated, that is exactly the pattern we find. For single mothers, the positive employment effects are primarily found for jobs paying between 7 and 10 dollars. For fathers, employment increases significantly for jobs paying 8-9 dollars, in addition, the models indicates spillover effects for higher paying jobs in the 10-12 $ region. The differential pattern in spillover effects lines up with Cengiz et al. (2019) finding that wage spillovers primarily affect incumbent workers (and not new entrants), consistent with firms seeking to preserve their internal wage structure. Married fathers have higher baseline employment rates and should be more likely to be affected by spillovers.

A potential threat to identification comes from endogenous sample selection. Bullinger (2017)'s finding that minimum wages reduce teen births suggests we should take this threat seriously. If the minimum wage affects the probability that low wage workers have at least one child, the estimated effects could be biased, reflecting compositional changes in the population of parents. To address this question, we use data on the age of the family's oldest child to calculate the year each person first became a parent.[9] We then re-estimate our event study model on the subsample of parents whose first child was born before the minimum wage increase. Results from this exercise, shown in Appendix figure B4 find that effects are robust to this exclusion - the event study model remains essentially unchanged, if anything, effects are slightly larger, especially for married mothers.

[9] To be precise, we use the age of their oldest child aged 17 or younger.

4.3 Mechanisms and extensions

We suggest two mechanisms: First, parents with dependent children may have access to means-tested transfers; the relatively high phase-out rates and associated cliff effects could give rise to kinks and nonconvexities in the budget set. Second, parents, especially single parents, may face fixed costs of work in the form of childcare. Higher minimum wages may enable parents to overcome these costs and enter the labor force.

If the first of the two hypothesized mechanisms holds, positive employment effects should be accompanied by corresponding negative effects on means-tested transfers. To investigate this, we use data from the CPS-ASEC on family income from public assistance or welfare. Table 6 shows estimated effects on welfare receipt of low wage, less educated parents.[10] In the models presented in the first row, the dependent variable is an indicator equal to one if the family received any income from public assistance or welfare, while the models in the second row show effects on the total annual amount of family income from public assistance or welfare (in $2016 dollars). As before, models are estimated separately for single mothers, married mothers and married fathers. However, when interpreting between-group differences, we should keep in mind that welfare receipt is measured at the family level, and not attributed to each individual.

Higher minimum wages significantly reduces welfare receipt for all three groups.[11] In absolute terms, the effect is larger for single mothers than for married parents, however married parents have larger reductions relative to the mean. Single mothers have relatively high baseline rates of benefit receipts: during the sample period, 26% of the single mothers in our sample received some income from public assistance or welfare, compared to just over 4% for married mothers and married fathers. Row 2 shows a corresponding reduction in average welfare payments: patterns are similar with the largest absolute effect observed for single mothers. To summarize, we find significant negative effects of minimum wages on welfare receipt, suggesting that access to means tested transfers and the resulting kinks in families' budget constraints could be a plausible mechanism explaining the positive employment effects.

Next, to analyze the role of childcare responsibilities, we exploit the fact that in the

[10]Estimating models on the full sample of less educated parents without wage restrictions, including high wage workers, yields very similar results, see Appendix table 6.

[11]The significant reduction in welfare receipt for married mothers may at first glance seem at odds with the lack of employment effects for this group, however it is worth keeping in mind that many women in this group will be married to affected men, given patterns in assortative mating.

Table 6: Mechanisms - Welfare and family

	(1) Single mothers	(2) Married mothers	(3) Married fathers
Welfare (any)			
Log min wage	-0.116***	-0.0546***	-0.0515***
	(0.0295)	(0.0164)	(0.0143)
Sample avg	0.264	0.0438	0.0408
Welfare amount (2016$)			
Log min wage	-1177.3**	-491.7***	-442.4***
	(440.6)	(161.1)	(156.4)
Sample avg	1666.0	281.7	256.1
Nonwork - family			
Log min wage	-0.0840***	-0.00794	-0.0150***
	(0.0296)	(0.0244)	(0.00513)
Sample avg	0.201	0.315	0.00704
Nonwork - unable to find work			
Log min wage	-0.00978	-0.00788**	-0.0141
	(0.0134)	(0.00365)	(0.0109)
Sample avg	0.0314	0.00974	0.0130
N	131283	298112	282548

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals with high chool or less, aged 15-55. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

ASEC respondents reporting that they did not work the previous year are queried for the reason why. Using this information, we estimate effects of the minimum wage on the probability that a person responds that they did not work in order to take care of home and family. Results from this exercise are shown in row 3 of table 6.

We find that both single mothers and married fathers are less likely to stay at home to take care of families when the minimum wage goes up. Again, the absolute effect is larger for single mothers, however their average rate is much higher: 20% of single mothers in our sample are staying out of the labor force in order to care for their families, while the same is true for less than one percent of married fathers.

For comparison, row 4 shows estimated effects on the probability that a respondent was out of work due to being unable to find a job. If we find a similar negative effect on these outcomes, we might be worried that the estimated positive employment effects for fathers and single mothers reflect an unobserved positive shift in labor demand. However, the models find no significant on either of these groups. There is, however, a significant negative effect for married mothers; this is consistent with the finding from the event study model that employment for this group exhibited a non-zero pre-trend, indicating possible upward bias in employment effects for this group.

For single mothers and married fathers meanwhile, the reduction in family-related non-work points to the role of childcare responsibilities in explaining the differential employment response of these groups. To assess this further, we estimate models by age group (Table 7).[12] To the extent that higher minimum wages enable workers to overcome barriers associated with high costs of paid childcare, effects should be concentrated among parents of preschool age children. For single mothers, this is indeed what we find: employment effects for this group appear to be driven entirely by mothers of preschool age children. We have estimated models separately for mothers whose youngest child is aged 0-2 and 3-5, and find that results are fairly similar for both groups.[13] For single mothers with older children, estimated effects on employment are smaller and not statistically significant.

The sample, covering data from 1980-2015, spans a period with significant changes to safety net programs targeting families with children. To assess the impact of these changes on our findings, we have estimated the panel models separately on pre- and post welfare

[12]Appendix table B8 presents models estimated on a sample excluding high wage workers. Results are qualitatively similar.

[13]These results suggest that differences in maternal age are not confounding the results in Table 7. Moreover, the fact that effects are not larger for older children suggest that effects are not driven by unobserved variation in expansion of subsidized pre-K across states.

Table 7: Employment effects, by age of youngest and time period

	(1) Single mothers	(2) Married mothers	(3) Married fathers
Youngest age 0-5			
Log min wage	0.120**	0.0162	0.0273
	(0.0492)	(0.0379)	(0.0218)
Sample avg	0.586	0.568	0.942
Youngest age 6-17			
Log min wage	0.0191	0.0356*	0.0644***
	(0.0451)	(0.0194)	(0.0235)
Sample avg	0.717	0.690	0.926
1980-1996			
Log min wage	-0.0537	0.0446	0.0137
	(0.0847)	(0.0587)	(0.0180)
Sample avg	0.620	0.651	0.935
1997-2015			
Log min wage	0.0975***	0.00181	0.0481**
	(0.0359)	(0.0280)	(0.0218)
Sample avg	0.697	0.633	0.930

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals with high chool or less, aged 15-55. The dependent variable is an indicator equal to one for individuals who reported working at some time during the year. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

reform samples. Results from this exercise are shown in rows 3 and 4 of table 7. For both mothers and fathers, the employment effects occur mainly in the post-welfare reform period: in the 1980-1996 sample, the models find no significant effects. Additional models show that the negative effects of minimum wages on parental welfare receipt reported in table 6 are similarly driven by the post welfare reform period (see Appendix tables B5).[14]

The positive effects on employment points to an important labor supply response to higher minimum wages. However, the higher wage costs faced by employers could also give rise to negative labor demand effects, especially if firms are unable to fully pass costs on to consumers. We note first that if there are negative labor demand effects of higher minimum wages, our estimated employment effects will underestimate the true supply effect. Moreover, if there are negative demand effects, we should expect to see an increase in the proportion of respondents who report being unable to find work, however, table 6 failed to find evidence of such effects. In addition, our estimates in Table 2 indicate that on average, the employment effect on less educated people with no children is close to zero, suggesting any negative spillover effects are small in magnitude.

In principle, the large positive effects we estimate for parents could mask heterogeneous responses for different subgroups, in particular, we may be concerned that employers substitute away from less skilled workers. That is, there could be negative demand effects on disadvantaged groups, e.g. parents who have not completed high school. To examine these questions, we have estimated models by race, education and age (see Appendix tables B6 and B7).

These models find substantial heterogeneity across demographic groups. Analyzing effects by race and ethnicity, effects are larger for African Americans than for whites and Hispanics respectively. The model also finds larger effects for high school graduates – for those who have not completed high school, effects are not statistically significant, though still positive. The patterns of race and education hold for both married fathers and single mothers, however, when running models by age group, results differ by gender. For single mothers, effects are significant only for the youngest age – this could at least in part reflect

[14] During the post-welfare reform period, we estimate statistically significant negative effects on both rates of welfare receipt and average annual income from public assitance and welfare. Event-study models (not shown) indicate parallel pretrends and discontinuous shifts at the time of minimum wage increase, consistent with these effects being causal. During the pre-reform period meanwhile, we find no significant effects on the rate of welfare receipt. We estimate a positive effect on the amount of welfare income received by married parents, however there is no corresponding upward shift in event study models, indicating the effect is likely spurious.

that younger women tend to have younger children, reflect that this demographic is more likely to work minimum wage jobs. However, for married fathers, we estimate significant positive effects for the two older age groups (men aged 35-55). The subgroup analysis fails to uncover negative effects on any of the groups.

4.4 Effects on children

The positive effect of minimum wages on parental employment has implications for child poverty: as parents are induced to enter the labor force, we would expect to see child poverty rates decline. To quantify the impact on children, we use data from the CPS ASEC on children age 0-17. We focus on children of less educated mothers, i.e. women who have at most a high school diploma. The models analyze two outcomes. The first is an indicator variable equal to one if the child has at least one parent in the labor force. The second is an indicator of family poverty status. Results are presented in table 8.

Our estimates indicate that the minimum wage significantly improve the economic situation of children of less educated parents. Higher minimum wages increase the probability that children have at least one parent in the labor force. As a result, we see significant reductions in poverty: A ten percent increase in the minimum wage reduces poverty among children of less educated parents by 0.6 percentage points on average. Table 8 indicates heterogeneous impacts: consistent with the patterns of our estimated parental labor supply responses, we see the largest reductions in poverty for children of single parents and preschool age children.

These results are encouraging for several reasons. Reducing child poverty is an important policy objective in itself. Childhood poverty is a strong predictor of negative outcomes later in life, suggesting further positive downstream effects. Moreover, our results indicate that higher minimum wages reduce child poverty rates while at the same time shifting parents from welfare to work. A number of recent papers (Dahl et al. 2014, Hartley et al. 2017, Dahl & Gielen 2018) suggests there may be a causal intergenerational link in welfare receipt: children who grow up in families where parents receive public assistance instead of working experience higher rates of adult welfare receipt and lower employment rates as a result. Our findings then suggests that increasing the minimum wage may raise employment not just of directly affected parents, but also, at a later date increase employment rates of their children.

Table 8: Impact of minimum wages on child outcomes

	(1) Working parent	(2) Poverty
All		
Log min wage	0.0448*	-0.0587**
	(0.0235)	(0.0278)
Sample avg	0.855	0.309
Single parents		
Log min wage	0.0391	-0.111**
	(0.0635)	(0.0479)
Sample avg	0.629	0.590
Married parents		
Log min wage	0.0373**	-0.0313
	(0.0151)	(0.0271)
Sample avg	0.955	0.184
Age 0 - 5		
Log min wage	0.0741***	-0.0968***
	(0.0248)	(0.0273)
Sample avg	0.819	0.371
Age 6+		
Log min wage	0.0282	-0.0387
	(0.0274)	(0.0315)
Sample avg	0.872	0.278

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on children of less educated mothers (high school or less). "Working parent" indicates at least one parent worked last year. "Poverty" is an indicator variable equal to one if the family income is below the poverty line. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), age, state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

4.5 Discussion

Our estimated panel models indicate significant positive effects of higher minimum wages on labor supply of parents. To compare these estimates to the literature, we have scaled the estimated coefficients of the minimum wage on participation and annual hours by the sample average of each variable to obtain elasticities with respect to the minimum wage. However, only some workers earn the minimum wage; higher earning workers are not affected. To account for this, we scale these numbers with the share of workers in each estimation sample that earn the minimum wage or less. Appendix table B10 summarizes this exercise. For single mothers, we calculate an elasticity of participation with respect to the minimum wage of 0.12. On average, 25% of working single mothers in our sample earned the minimum wage or less. The estimated employment effect thus implies an elasticity of participation with respect to wages of 0.47. This is somewhat larger than the estimates reported by Juhn et al. (1991) but less than the typical participation elasticities estimated in the EITC literature (Hotz & Scholz 2003). The estimated elasticity of annual hours with respect to the wage is 0.43; the similarity of these two elasticities is consistent with our earlier result that hours effects among single mothers are driven almost entirely by extensive margin entrants. For married mothers, our preffered models find no significant effects on employment.

For married fathers, we estimate participation and hours elasticities with respect to the minimum wage of 0.05 and 0.10 respectively. This difference is consistent with our findings of intensive margin response for this group. These numbers may seem small, however, only a small share (15%) of married fathers have an estimated hourly wage equal to or less than the statutory minimum wage. Our estimates thus indicate fairly large employment elasticities with respect to wages: we calculate a participation (hours) elasticity with respect to wages of 0.35 (0.67). The literature provides few direct benchmarks for comparison. Juhn et al. (1991) estimate an elasticity of employment (share of year employed) among men in the lowest earnings quintile of 0.4; our estimated hours elasticity of 0.67 exceeds this. More recently, Miller et al. 2017, analyzing experimental data from the Paycheck Plus EITC expansion, estimate partial labor supply elasticities for low-wage men without children of around 0.06 (Katz 2017). Eissa & Hoynes (2004) meanwhile estimate an elasticity of participation for married men of 0.032, using variation in the EITC, a much smaller effect. We do not find any evidence of employment crowd-out among non-parents.

The differences between our estimates and those found in the literature could reflect several factors, including institutional differences between the EITC and the minimum wage as two policies that raise after-tax wages of low wage workers. The EITC is paid lump-sum with a lag, meaning a higher EITC may have a smaller impact on overcoming fixed costs of work in the presence of imperfect borrowing. The EITC phases out at higher earnings; with eligibility for the credit determined based on household income, this gives rise to potential negative effects on the intensive margin (though such effects are difficult to identify empirically) and negative participation effects among secondary earners.

The differences could also reflect different sample periods. The data used in this paper cover a period of 35 years from 1980 to 2015. Models presented in table 7 indicated that the results were almost entirely driven by observations in the second half of this period. When estimating the model on data from 1980-1996 only, we estimated no significant effects, and some point estimates were even negative. This difference could reflect institutional factors, such as the passage of PRWORA, that changed the participation incentives for many low income families. However, it is also consistent with Cengiz et al. (2019)'s finding that employment shocks in the 1980s correlate with later state minimum wage changes, potentially leading to negative bias in estimates of employment effects of minimum wages. [15]

[15] The different effect by sample period could also explain differences between our findings and existing literature. We note that our findings contrast strongly with the conclusions of Sabia (2008) that found significant negative effect on employment of single mothers. This difference may seem puzzling given that both Sabia's paper and our own relies on the CPS ASEC. Meanwhile, the two papers differ regarding sample period (Sabia uses 1999-2004 only, we retain 1980-2015), sample selection criteria (Sabia excludes high school graduates as well as women who are not head of household) as well as functional form (Sabia's preferred specification includes state quadratic time trends). In appendix Table B11, we illustrate how our estimates change when we change our analysis according to each of these variables. Our quasi-replication of Sabia's preferred sample yields a statistically significant estimate of -0.26, close to Sabia's estimate of -0.31. (For consistency, we have retained our original set of covariates rather than Sabia's, as a results, estimates are expected to differ.) Meanwhile, our analysis finds that this negative effect is not robust to changing functional form and sample restriction, indicating that the negative relationship uncovered by Sabia may not hold more generally.

Our results on welfare receipt similarly contradict earlier research by Page et al. (2005)on the impact of minimum wage on research caseloads. The authors find that higher minimum wages increase welfare caseloads, though as the authors point out results are sensitive to choice of sample period. We note that we find a positive relationship between minimum wages and the dollar amount of welfare received by married parents during the pre-PRWORA period, however, event-study models fail to establish that these are causal impacts.

5 Conclusions

The discussion of employment effects of minimum wages tends to focus on the demand side, in particular, whether a downward sloping demand curve will cause employment to fall when the minimum wage is increased. Implicit in this discussion is the assumption that labor supply effects are small enough to be safely ignored. In this paper, we argue that this is not necessarily the case for all group of workers. In particular, if childcare costs and other fixed cost of employment may make it unprofitable to work very few hours, high participation may result from a higher offered wage rate.

We document large positive effects of the minimum wage on parental employment and earnings. Consistent with predictions of simple labor supply models, we find that effects are larger for fathers and single mothers - effects for married mothers are more muted. Event study type models that explicitly model dynamics of these outcomes around minimum wage changes establish parallel pretrends, indicating that the parallel trends assumption holds. Moreover, effects are larger for mothers of young children, where childcare costs are typically highest. We do not find any evidence of crowding out of non-parents, indicating that higher minimum wages could lead to substantial welfare gains.

The minimum wage workforce is remarkably diverse, with workers facing different economic circumstances, potentially leading to heterogeneous employment responses to higher minimum wages. In this paper, we have documented significant positive employment effects among parents of minor children. Our analysis focused on individuals aged 15-55 with no education beyond high school, and who have at least on dependent child. This definition covers 30 million individuals annually during the sample period: 77% of these or were working, with a majority (13 million) of these employed in relatively low wage jobs with estimated hourly wages of $15 or less (in 2016 dollars).

Over the last twenty years, low skilled workers have faced stagnating wages coupled with higher costs of childcare. In this context, our findings point to an important role of wages in raising parental employment rates. Although median real wages have been stagnant for four decades, they could begin to grow again. Our results suggest that labor force growth would then increase faster as well. Higher parental employment in turn leads to significant reductions in child poverty. There is a well-established relationship between childhood poverty and adult outcomes (see, e.g., Dahl & Lochner 2012). Raising the wage floor could potentially lead to downstream effects on child outcomes, through positive effects on the economic stability of low income families. Higher minimum wages have also been shown to improve adult mental and physical health outcomes (Dow et al. 2019, Leigh et al. 2019), which may also increase labor supply. More research into such downstream outcomes is required to get a more complete understanding of the policy implications of the minimum wage.

References

Agan, A. & Makowsky, M. (2018), The minimum wage, eitc, and criminal recidivism, Working Paper 25116, National Bureau of Economic Research.

Angrist, J. D. & Evans, W. N. (1998), 'Children and their parents' labor supply: Evidence from exogenous variation in family size', *The American Economic Review* **88**(3), 450–477.

Ashenfelter, O., Heckman, J. et al. (1974), 'The estimation of income and substitution effects in a model of family labor supply', *Econometrica* **42**(1), 73–85.

Blundell, R., French, E. & Tetlow, G. (2016), Retirement incentives and labor supply, *in* 'Handbook of the economics of population aging', Vol. 1, Elsevier, pp. 457–566.

Blundell, R. & MaCurdy, T. (1999), Labor supply: A review of alternative approaches, *in* 'Handbook of labor economics', Vol. 3, Elsevier, pp. 1559–1695.

Borgschulte, M. & Cho, H. (2018), Minimum wages and retirement, Discussion paper, Institute for the Study of Labor (IZA).

Bullinger, L. R. (2017), 'The effect of minimum wages on adolescent fertility: a nationwide analysis', *American journal of public health* **107**(3), 447–452.

Cengiz, D., Dube, A., Lindner, A. & Zipperer, B. (2019), 'The effect of minimum wages on low-wage jobs', *The Quarterly Journal of Economics* .

Chetty, R., Friedman, J. N. & Saez, E. (2013), 'Using differences in knowledge across neighborhoods to uncover the impacts of the eitc on earnings', *American Economic Review* **103**(7), 2683–2721.

Dahl, G. B. & Gielen, A. C. (2018), Intergenerational spillovers in disability insurance, Working Paper 24296, National Bureau of Economic Research.

Dahl, G. B., Kostøl, A. R. & Mogstad, M. (2014), 'Family welfare cultures', *The Quarterly Journal of Economics* **129**(4), 1711–1752.

Dahl, G. B. & Lochner, L. (2012), 'The impact of family income on child achievement: Evidence from the earned income tax credit', *American Economic Review* **102**(5), 1927–56.

Dow, W. H., Godøy, A., Lowenstein, C. & Reich, W. (2019), Deaths of despair: Effects of minimum wages and the eitc, Working Paper 25787, National Bureau of Economic Research.

Dube, A. (2019), 'Minimum wages and the distribution of family incomes', *American Economic Journal: Applied* .

Eissa, N. & Hoynes, H. W. (2004), 'Taxes and the labor market participation of married couples: the earned income tax credit', *Journal of public Economics* **88**(9-10), 1931–1958.

Eissa, N., Kleven, H. J. & Kreiner, C. T. (2008), 'Evaluation of four tax reforms in the united states: Labor supply and welfare effects for single mothers', *Journal of Public Economics* **92**(3-4), 795–816.

Eissa, N. & Liebman, J. B. (1996), 'Labor supply response to the earned income tax credit', *The quarterly journal of economics* **111**(2), 605–637.

Giuliano, L. (2013), 'Minimum wage effects on employment, substitution, and the teenage labor supply: Evidence from personnel data', *Journal of Labor Economics* **31**(1), 155–194.

Hartley, R., Lamarche, C. & Ziliak, J. P. (2017), 'Welfare reform and the intergenerational transmission of dependence', (10942).

Havnes, T. & Mogstad, M. (2011), 'Money for nothing? universal child care and maternal employment', *Journal of Public Economics* **95**(11-12), 1455–1465.

Heim, B. T. & Meyer, B. D. (2004), 'Work costs and nonconvex preferences in the estimation of labor supply models', *Journal of Public Economics* **88**(11), 2323–2338.

Hotz, V. J. & Scholz, J. K. (2003), The earned income tax credit, *in* 'Means-tested transfer programs in the United States', University of Chicago press, pp. 141–198.

Juhn, C., Murphy, K. M. & Topel, R. H. (1991), 'Why has the natural rate of unemployment increased over time?', *Brookings Papers on Economic Activity* **1991**(2), 75–142.

Katz, L. F. (2017), 'Comment to "Where have all the workers gone? An inquiry into the decline of the US labor force participation rate" by Alan Krueger', *Brookings papers on economic activity* **2017**(2), 1.

Leigh, J. P., Leigh, W. A. & Du, J. (2019), 'Minimum wages and public health: A literature review.', *Preventive medicine* **118**.

Manning, A. (2003), *Monopsony in motion: Imperfect competition in labor markets*, Princeton University Press.

Mas, A. & Pallais, A. (2017), 'Valuing alternative work arrangements', *American Economic Review* **107**(12), 3722–59.

Meyer, B. D. & Rosenbaum, D. T. (2001), 'Welfare, the earned income tax credit, and the labor supply of single mothers', *The quarterly journal of economics* **116**(3), 1063–1114.

Miller, C., Katz, L. F., Azurdia, G., Isen, A. & Schultz, C. B. (2017), 'Expanding the earned income tax credit for workers without dependent children: Interim findings from the paycheck plus demonstration in new york city', *New York: MDRC, September* .

Naidu, S. & Posner, E. A. (2018), 'Labor monopsony and the limits of the law'.

Page, M. E., Spetz, J. & Millar, J. (2005), 'Does the minimum wage affect welfare caseloads?', *Journal of Policy Analysis and Management* **24**(2), 273–295.

Sabia, J. J. (2008), 'Minimum wages and the economic well-being of single mothers', *Journal of Policy Analysis and Management* **27**(4), 848–866.

Senesky, S. (2003), 'Labor supply and endogenous wages: an empirical analysis using commuting time', *University of California Irvine: Working Paper* .

Vaghul, K. & Zipperer, B. (2016), 'Historical state and sub-state minimum wage data', *Washington Center for Equitable Growth* .

Appendix A: Childcare costs and means-tested transfers - descriptive evidence

The simple labor supply model illustrates how fixed costs of employment can make it unprofitable to be employed in jobs that offer few hours , which in turn could lead to significant participation effects of higher wages. The literature is typically ambiguous on the exact nature of these costs: the term could encompass non-monetary costs, such as the stress of preparing for work. In this section, we examine one particular source of fixed costs of work, namely childcare. First, we examine the extent to which childcare costs represent a fixed cost of work for mothers, that is, are childcare costs concave in hours worked. Second, we analyze how this pattern differs between single and married mothers.

To examine this, we use data from the 2011-2016 Annual Social and Economic Supplement (ASEC) of the Current Population Survey (the "March CPS"), covering the years 2010-2015. This data includes information on annual childcare costs, as well as weekly hours worked and weeks worked per year. We retain all women with at most a high school degree, who have at least one child younger than 6 and reported working between 1 and 49 hours per week. We further divide this sample into groups defined by weekly hours in five hour bins and marital status. Measures of childcare utilization are then calculated for each cell.

Figure A1 plots childcare and hours worked. Panel (a) shows the share of women who report paying for childcare. For both single and married mothers, the share that pays for childcare is increasing in hours worked, though the increase is less than proportional. Meanwhile, this pattern appears to vary with marital status. For jobs that are approximately full time (35-40 hours), married and single mothers are equally likely to pay for childcare. Among mothers working 15 hours per week or less, the figure reveals a significant discrepancy: the part-time married mothers are much less likely to pay for childcare compared to the part-time single mothers. A simple linear probability model of paying for childcare (controlling for age) shows that this difference is statistically significant.

Panel (b) plots average childcare costs and hours worked. A similar pattern emerges: while childcare costs are increasing in hours work, the increase is less than proportional. This is particularly true for unmarried mothers - women in this group who work 15 hours or less report annual childcare expenses of 943 dollars, compared to 1275 dollars for unmarried mothers who work 35-40 hours a week.[16]

Panel (c) shows the childcare costs and hours worked including only women with positive childcare expenses. This figure illustrates that conditional on paying, childcare costs are relatively high for both single and married parents. Conditional on paying for childcare, childcare costs appear to increase only slightly with hours worked, in particular for single mothers.

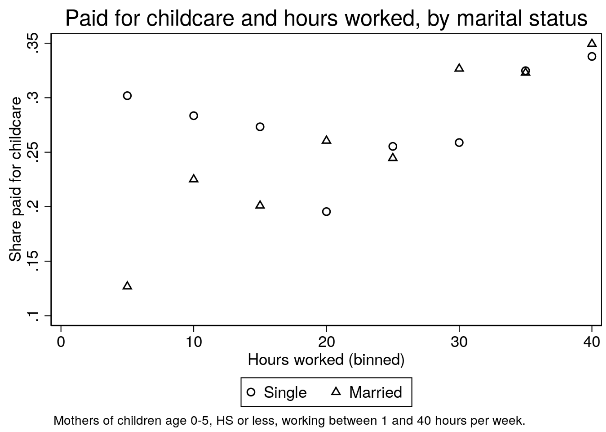
To summarize, the fixed cost element of childcare costs appears to be substantial for many women, in particular for single mothers. This makes it unprofitable to work very few hours. In this context, our simple labor supply model predicts potentially large positive labor supply effects for single mothers.

In addition to childcare costs, the simple theory model also points to the role of means-tested transfers in shaping families labor supply responses to higher wages. Figure A2 illustrates the relationship between family income and program participation. The figure plots average participation of parents of minor children with high school or less for 3 key means-tested programs: welfare or public assistance, food stampls/SNAP and government-provided health insurance/Medicaid. To construct this figure, the sample is divided in 20 approximately equally large bins, using total family earnings adjusted for inflation. We then calculate average earnings and program participation rate in each bin. As the passage of the Personal Responsibility and Work Opportunity Act (PRWORA) in 1996 introduced major changes to the welfare system, we plot figures separately for the pre- and post PRWORA period.

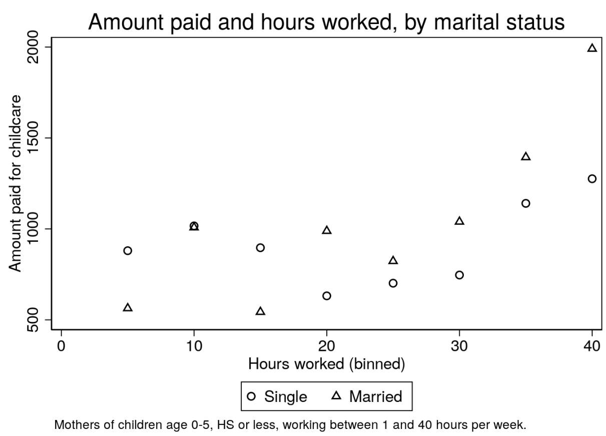
The figure illustrates that a significant share of parents with zero or very low earnings receive some means-tested transfers. The relationship between income and program participation varies by type of program as well as by time period. In particular, public assistance and welfare tends to be concentrated among families with zero or very low earnings, while SNAP and food stamps reaches families further up in the earnings distribution.

[16]These averages include women who report zero childcare expenses.

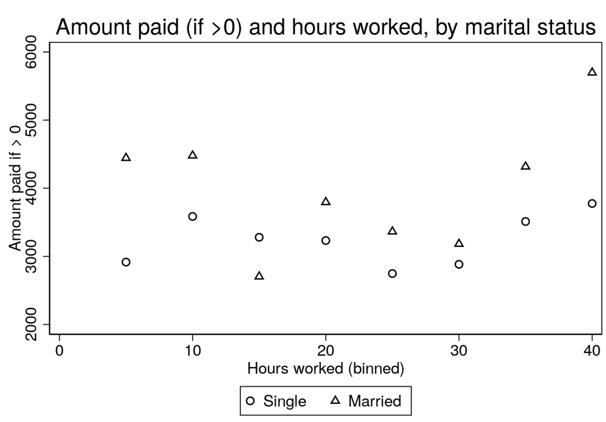
Figure A1: Childcare spending and hours worked



(a) Share paid for childcare



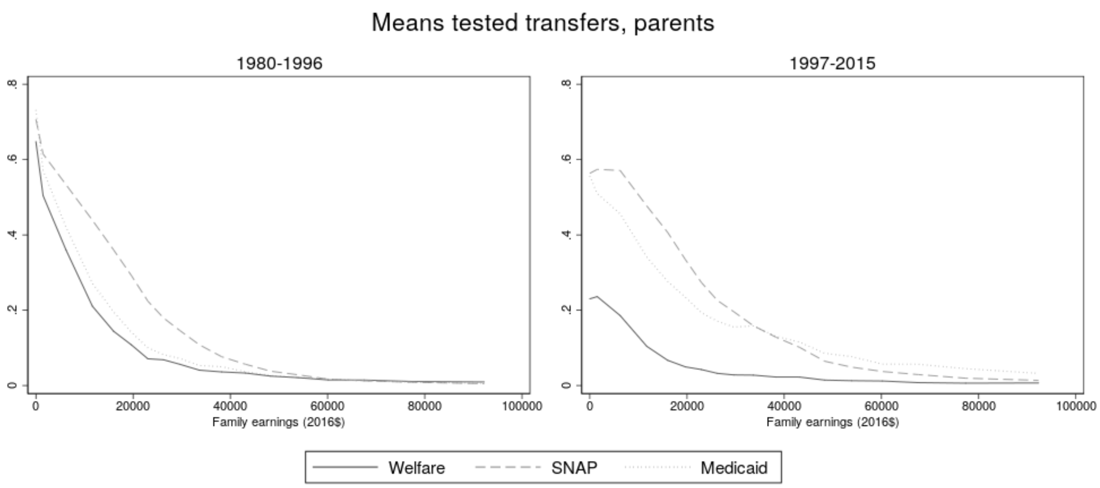
(b) Amount paid for childcare



(c) Amount paid for childcare (if >0)

Notes: Figure plots childcare use and average childcare spending by average weekly hours worked in 5 hour bins. The sample includes women with at most a high school degree, working between 1 and 40 hours a week, who have at least one child younger than 6. The figures indicate childcare spending increases less than one to one with hours worked, in particular for unmarried mothers. Source: March CPS

Figure A2: Means-tested transfers, parents



Notes: Figure plots program participation rates for parents of minor children, with high school or less, by ventile of family earnings distribution (adjusted for inflation).

Appendix B: supplementary tables and figures

Table B1: Employment, CPS MORG

	(1) Full sample	(2) Exclude \$15+
All	0.0162	0.0370*
	(0.0141)	(0.0206)
LTHS	-0.00952	-0.00298
	(0.0178)	(0.0193)
Max HS	0.0208	0.0364*
	(0.0155)	(0.0208)
Teens	0.00695	0.00490
	(0.0302)	(0.0289)
Women	0.0126	0.0384**
	(0.0124)	(0.0180)
Black or Hispanic	0.0215	0.0404
	(0.0207)	(0.0281)
No children	0.00697	0.0221
	(0.0146)	(0.0188)
1+ child	0.0237*	0.0658***
	(0.0119)	(0.0170)
Mothers	0.0188	0.0574***
	(0.0136)	(0.0163)
Fathers	0.0281	0.0801**
	(0.0181)	(0.0311)

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models of employment estimated on individuals aged 16-55 (unless otherwise noted). Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: NBER extracts of the CPS MORG, years 1984 - 2015; last 4 rows exclude years 1993-1999 as information on children not available in the NBER extracts of the CPS MORG for those years.

Table B2: Effects on parents' employment - $15 or less

	(1) TWFE	(2) Qtrend	(3) DYFE
Single mothers			
Log min wage	0.231***	0.0803*	0.138**
	(0.0583)	(0.0439)	(0.0674)
Sample avg	0.589	0.589	0.589
Married mothers			
Log min wage	0.102***	0.0655**	0.0909
	(0.0309)	(0.0255)	(0.0544)
Sample avg	0.554	0.554	0.554
Married fathers			
Log min wage	0.188***	0.0949**	0.0805
	(0.0508)	(0.0427)	(0.0484)
Sample avg	0.848	0.848	0.848
Fixed effects	Year	Year	Division × year
Trend	None	Quadratic	Linear

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from alternative panel model specifications estimated on individuals aged 15-55 with high school or less, excluding workers with estimated hourly wages of $15 or higher. The dependent variable is an indicator equal to one for individuals who reported working at some time during the year. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Table B3: Effects on parents' employment

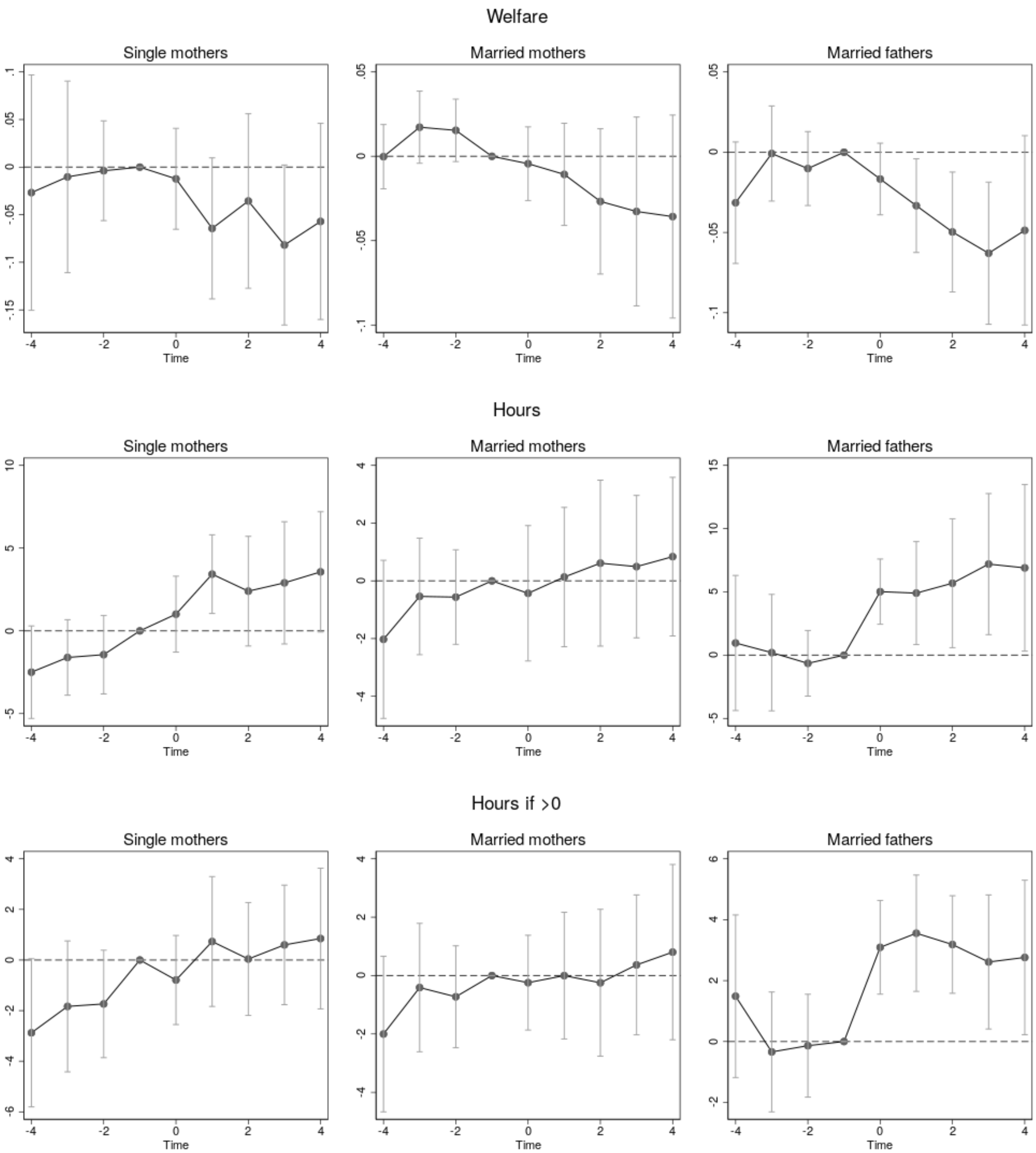
	(1) TWFE	(2) Qtrend	(3) DYFE
Single mothers			
Log min wage	0.193***	0.0749**	0.0970*
	(0.0479)	(0.0358)	(0.0533)
Sample avg	0.660	0.660	0.660
Married mothers			
Log min wage	0.0623*	0.0449*	0.0735
	(0.0361)	(0.0241)	(0.0486)
Sample avg	0.643	0.643	0.643
Married fathers			
Log min wage	0.0676**	0.0482**	0.0350
	(0.0266)	(0.0212)	(0.0231)
Sample avg	0.933	0.933	0.933
Fixed effects	Year	Year	Division × year
Trend	None	Quadratic	Linear

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

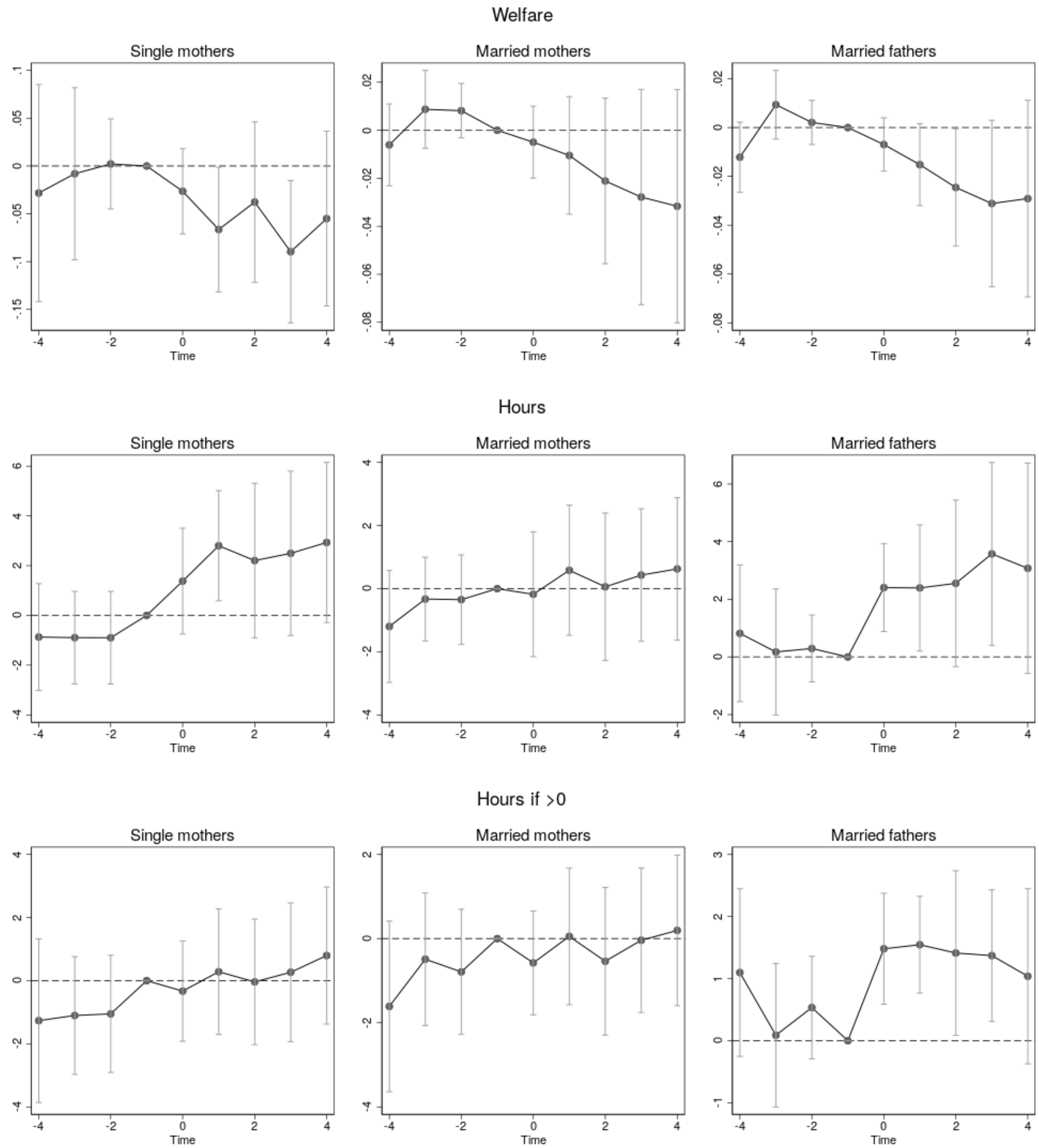
Notes: Table shows selected estimates from alternative panel model specifications estimated on individuals aged 15-55 with high school or less. The dependent variable is an indicator equal to one for individuals who reported working at some time during the year. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Figure B1: Event study, scaled, excluding high wage workers



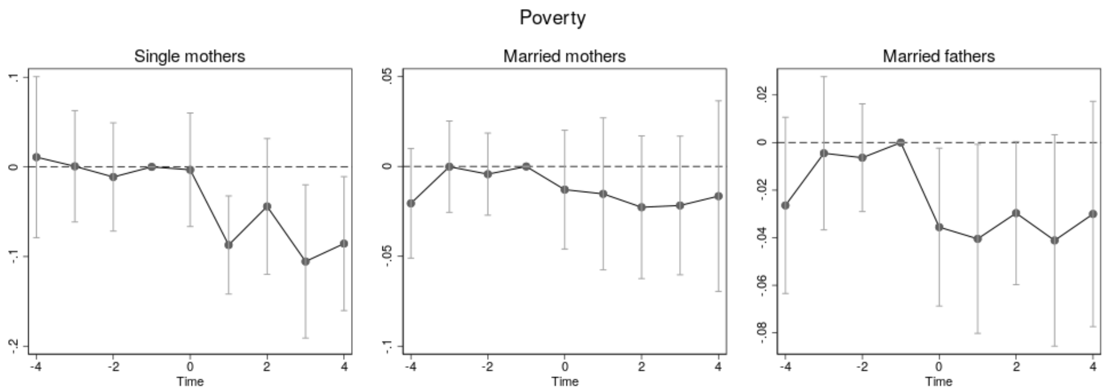
Notes: Figure plots selected coefficients from event study models with 95% confidence intervals. Models control for event, year fixed effects, state linear time trends, individual demographics, state level policies and year by number of children fixed effects. Standard errors clustered at the state level.

Figure B2: Event study, scaled, all less educated workers

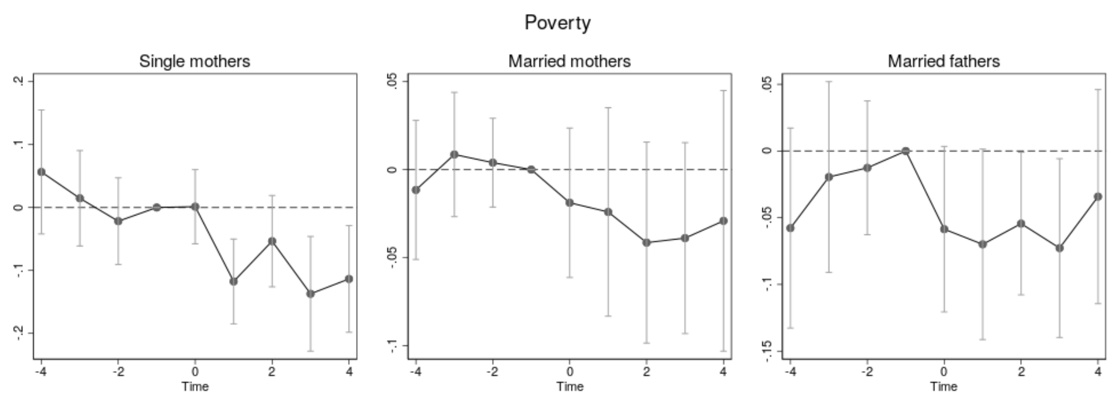


Notes: Figure plots selected coefficients from event study models with 95% confidence intervals. Models control for event, year fixed effects, state linear time trends, individual demographics, state level policies and year by number of children fixed effects. Standard errors clustered at the state level.

Figure B3: Event study models of poverty, scaled



(a) Full sample, HS or less



(b) Excluding $15+

Notes: Figure plots selected coefficients from event study models with 95% confidence intervals. Dependent variable equal to one if family income less than 100% of the poverty line. Models control for event, year fixed effects, state linear time trends, individual demographics, state level policies and year by number of children fixed effects. Standard errors clustered at the state level.

Table B4: Impacts of minimum wages on hours, income, poverty

	(1) Single mothers	(2) Married mothers	(3) Married fathers	(4) Single mothers	(5) Married mothers	(6) Married fathers
Hours per week						
Log min wage	2.392	1.770	6.886***	0.792	0.499	2.831***
	(1.622)	(1.151)	(1.919)	(1.528)	(0.748)	(0.785)
Sample avg	21.99	19.69	37.80	36.19	34.51	44.06
Weeks per year						
Log min wage	2.135	1.502	6.402***	0.556	-0.0968	1.861*
	(1.973)	(1.581)	(2.373)	(1.487)	(1.341)	(1.092)
Sample avg	24.98	23.77	40.36	41.12	41.66	47.04
Hours per year						
Log min wage	122.4	73.67	374.5***	57.13	26.39	199.9***
	(74.88)	(58.01)	(123.1)	(80.07)	(63.22)	(65.41)
Sample avg	899.8	819.3	1776.5	1528.4	1479.5	2095.8
Earned income ($1000)						
Log min wage	1.138	1.276*	5.233**	0.715	1.632	3.204
	(0.683)	(0.754)	(2.391)	(0.998)	(1.394)	(2.036)
Sample avg	8.544	7.977	22.01	14.51	14.40	25.46
Poverty						
Log min wage	-0.121**	-0.0664**	-0.0713***	-0.100	-0.0315	-0.0449*
	(0.0500)	(0.0305)	(0.0219)	(0.0778)	(0.0415)	(0.0242)
Sample avg	0.605	0.171	0.283	0.467	0.101	0.251
N	107940	238594	125513	63729	133055	106814
Sample	Full	Full	Full	Working	Working	Working

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals aged 15-55 with high school or less, excluding workers with estimated hourly wages of $15 or higher. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Table B5: Welfare, pre and post PRWORA

	(1) Single mothers	(2) Married mothers	(3) Married fathers
Outcome: Welfare (any)			
1980 - 1996	-0.0640	0.0139	0.00542
	(0.0674)	(0.0221)	(0.0169)
Sample mean	0.394	0.0559	0.0560
1997-2015	-0.0791**	-0.0554***	-0.0569***
	(0.0374)	(0.0190)	(0.0158)
Sample mean	0.144	0.0279	0.0242
Outcome: Welfare amount (2016$)			
1980 - 1996	-333.2	383.0**	479.4**
	(662.5)	(188.5)	(212.5)
Sample mean	2760.4	395.3	386.7
1997-2015	-612.5**	-383.1***	-359.4***
	(257.3)	(122.9)	(109.1)
Sample mean	647.0	133.0	112.8

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals with high chool or less, aged 15-55. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Table B6: Race, ethnicity, education, age - all less educated workers

	(1) White	(2) Black	(3) Hispanic	(4) LTHS	(5) HSgrad	(6) Age1524	(7) Age2534	(8) Age3544	(9) Age4555
Sample: single mothers									
Employment									
Log min wage	0.0805	0.226***	0.0463	0.0301	0.0908**	0.222***	-0.00671	0.0754	0.0944
	(0.0669)	(0.0803)	(0.0575)	(0.0563)	(0.0396)	(0.0761)	(0.0530)	(0.0584)	(0.0693)
Annual hours									
Log min wage	184.6	299.5**	20.92	67.40	131.2*	346.1**	52.97	61.97	110.1
	(129.0)	(129.5)	(132.4)	(121.7)	(76.27)	(141.6)	(91.23)	(108.0)	(132.5)
Sample: married mothers									
Employment									
Log min wage	0.0556	0.134	-0.0260	-0.0174	0.0412	-0.0350	0.0584	-0.00669	0.0706
	(0.0384)	(0.0931)	(0.0345)	(0.0323)	(0.0317)	(0.0896)	(0.0415)	(0.0421)	(0.0454)
Annual hours									
Log min wage	69.70	103.5	-92.34	-94.03	53.07	-170.7	127.7	-58.57	46.76
	(75.92)	(192.2)	(70.29)	(76.15)	(63.16)	(127.3)	(76.89)	(114.9)	(91.70)
Sample: married fathers									
Employment									
Log min wage	0.0398*	0.179*	0.00611	0.0500	0.0456*	-0.0265	-0.00180	0.0806***	0.0618*
	(0.0201)	(0.0994)	(0.0397)	(0.0338)	(0.0236)	(0.0484)	(0.0271)	(0.0226)	(0.0314)
Annual hours									
Log min wage	130.2	631.4**	118.6	219.7**	167.2*	369.9**	62.18	257.2**	195.4*
	(79.98)	(299.8)	(124.9)	(102.8)	(95.80)	(139.0)	(98.23)	(108.1)	(103.3)

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals with high chool or less, aged 15-55.Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Table B7: Race, ethnicity, education, age - less educated, low wage workers

	(1) White	(2) Black	(3) Hispanic	(4) LTHS	(5) HSgrad	(6) Age1524	(7) Age2534	(8) Age3544	(9) Age4555
Sample: single mothers									
Employment									
Log min wage	0.0730	0.225**	0.0605	0.0286	0.0997*	0.221**	0.00496	0.0489	0.128
	(0.0861)	(0.0889)	(0.0650)	(0.0624)	(0.0529)	(0.0841)	(0.0663)	(0.0743)	(0.0783)
Annual hours									
Log min wage	188.1	289.0**	48.10	46.97	155.1	319.3**	81.71	47.49	111.0
	(146.1)	(138.6)	(167.3)	(134.4)	(103.0)	(153.4)	(109.3)	(134.0)	(147.7)
Sample: married mothers									
Employment									
Log min wage	0.0782	0.0696	-0.0169	-0.00181	0.0574*	0.0318	0.118**	-0.0320	0.0880
	(0.0471)	(0.0996)	(0.0396)	(0.0351)	(0.0330)	(0.0947)	(0.0465)	(0.0480)	(0.0526)
Annual hours									
Log min wage	139.1	-96.32	-57.67	-49.38	107.7	-62.02	232.8**	-72.69	95.62
	(103.4)	(177.4)	(61.79)	(75.75)	(69.19)	(126.6)	(95.56)	(104.6)	(123.7)
Sample: married fathers									
Employment									
Log min wage	0.109**	0.131	0.0244	0.0875*	0.110**	-0.0893	0.00887	0.160***	0.173***
	(0.0514)	(0.156)	(0.0654)	(0.0485)	(0.0542)	(0.0743)	(0.0565)	(0.0498)	(0.0569)
Annual hours									
Log min wage	424.3**	727.6*	107.7	318.5**	415.3***	217.9	114.6	535.1***	475.6***
	(173.3)	(379.4)	(174.2)	(129.4)	(154.9)	(191.8)	(128.3)	(182.4)	(170.8)
Observations	69314	10497	39458	49261	76252	10190	42816	44439	28068

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals with high chool or less, aged 15-55, excluding workers with hourly wages of $15 or higher. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Table B8: Employment effects, by age of youngest and time period

	(1) Single mothers	(2) Married mothers	(3) Married fathers
Youngest age 0-5			
Log min wage	0.121**	0.0540	0.0347
	(0.0553)	(0.0405)	(0.0450)
Sample avg	0.534	0.481	0.880
Youngest age 6-17			
Log min wage	0.0233	0.0413*	0.161***
	(0.0530)	(0.0221)	(0.0477)
Sample avg	0.637	0.602	0.819
1982-1996			
Log min wage	-0.0518	0.0630	0.0400
	(0.0867)	(0.0705)	(0.0443)
Sample avg	0.550	0.573	0.850
1997-2015			
Log min wage	0.0950**	-0.00455	0.0939**
	(0.0422)	(0.0276)	(0.0405)
Sample avg	0.627	0.527	0.845

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals with high chool or less, aged 15-55, excluding workers with hourly wages of $15 or higher. The dependent variable is an indicator equal to one for individuals who reported working at some time during the year. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Table B9: Mechanisms - Welfare and family, excluding high wage workers

	(1) Single mothers	(2) Married mothers	(3) Married fathers
Welfare (any)			
Log min wage	-0.117***	-0.0634***	-0.0842***
	(0.0382)	(0.0179)	(0.0209)
Sample avg	0.306	0.0516	0.0728
Welfare amount (2016$)			
Log min wage	-1180.5**	-596.2***	-784.7***
	(485.5)	(177.6)	(230.0)
Sample avg	1948.5	336.9	485.6
Nonwork - family			
Log min wage	-0.0957**	-0.0196	-0.0329***
	(0.0393)	(0.0271)	(0.0109)
Sample avg	0.243	0.393	0.0159
Nonwork - unable to find work			
Log min wage	-0.0135	-0.0114**	-0.0253
	(0.0166)	(0.00477)	(0.0221)
Sample avg	0.0379	0.0122	0.0294
N	107940	238594	125513

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from baseline panel models estimated on individuals with high chool or less, aged 15-55, excluding workers with hourly wages of $15 or higher. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPS ASEC.

Figure B4: Event study, first child born before MW increase

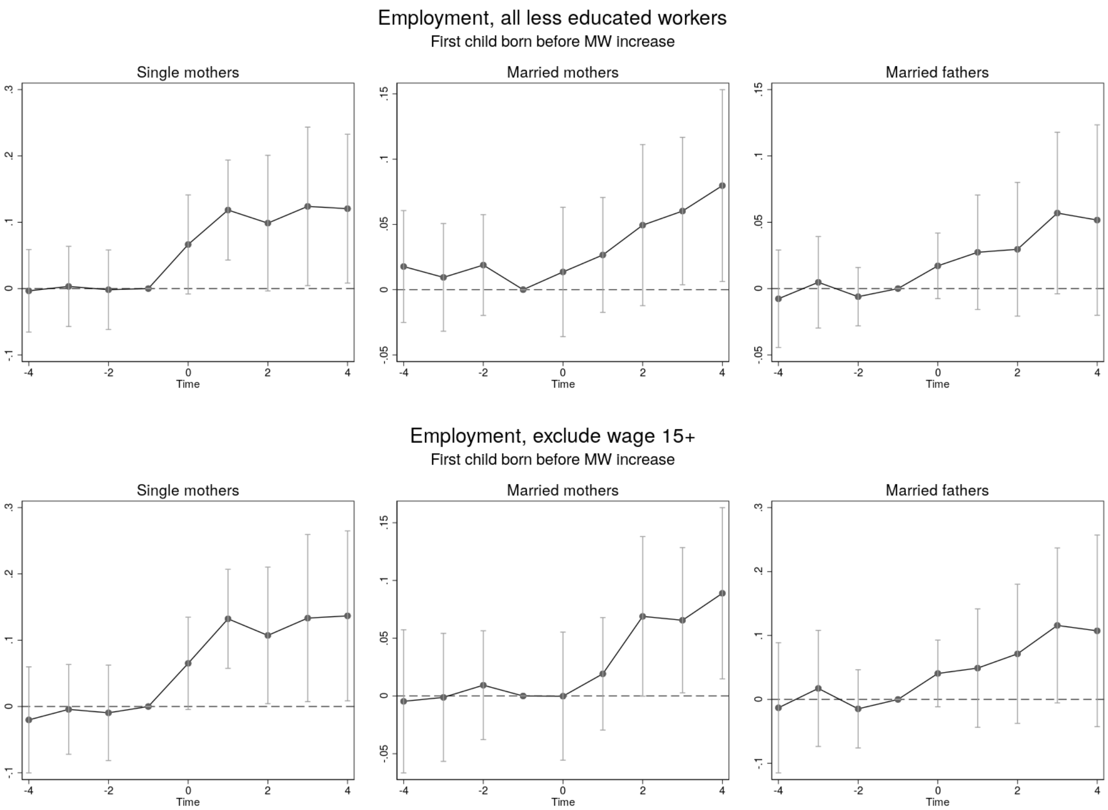


Table B10: Employment elasticities calculations

	(1) Single mothers	(2) Married mothers	(3) Married fathers
Employment			
Coefficient log min wage	0.0768**	0.0320	0.0479**
	(0.0342)	(0.0270)	(0.0210)
Sample mean	0.663	0.646	0.934
Workers wage≤MW	0.246	0.233	0.148
El wrt MW	0.116	0.0496	0.0513
El wrt wage	0.471	0.213	0.346
Annual hours			
Coefficient log min wage	111.3*	19.57	196.4**
	(57.68)	(59.01)	(87.14)
Sample mean	1060.3	990.3	1978.8
Workers wage≤MW	0.246	0.233	0.148
El wrt MW	0.105	0.0198	0.0993
El wrt wage	0.427	0.0849	0.669
Observations	131283	298112	282548

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status), state and year fixed effects and state linear time trends. Standard errors clustered at the state level. Source: CPER extracts of the CPS ASEC.

Table B11: Employment effects, single mothers

	(1) TWFE	(2) LT	(3) QT
(0) Full sample	0.193***	0.0768**	0.0749**
	(0.0479)	(0.0342)	(0.0358)
(1) Less than HS only	0.213***	0.0301	0.0274
	(0.0672)	(0.0563)	(0.0662)
(2) 1991-2004 only	0.0685	-0.131	-0.0982
	(0.0565)	(0.0876)	(0.0729)
(3) Head of household only	0.203***	0.0806	0.0820*
	(0.0584)	(0.0497)	(0.0459)
(4) Sabia (2008) sample	-0.0171	-0.171	-0.264**
	(0.105)	(0.182)	(0.129)
State trend	None	Linear	Quadratic

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Table shows selected estimates from panel models estimated on single mothers, aged 15-55, with high chool or less (unless otherwise noted). The dependent variable is an indicator equal to one for individuals who reported working at some time during the year. Models include controls for state characteristics (log state population, AFDC/TANF and SNAP benefit levels, TANF implementation, major AFDC waiver), demographics (age, education, race and ethnicity, marital status, number of children, number of children interacted with calendar year), state and year fixed effects. Standard errors clustered at the state level. "Sabia sample" incorporates all restrictions (1) - (3), retaining single mothers with no high school degree, using the years 1991 to 2004 only, excluding women who were not head of household. Source: CPS ASEC.