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EFFECTS OF THE MINIMUM WAGE ON INFANT HEALTH

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ABSTRACT

The minimum wage has increased in multiple states over the past three decades. We examine the impact of the state minimum wage on infant health. Using data on the universe of births in the US over 24 years, we find that an increase in the minimum wage is associated with an increase in birth weight driven by increased gestational length and fetal growth rate. The effect size is meaningful and plausible. We also find an increase in prenatal care use and a decline in smoking during pregnancy, which are some channels through which minimum wage can affect infant health.

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1. Introduction

Changing the minimum wage is one of the most common ways that policymakers use to increase income among low-skilled persons. It is also one of the most controversial. Recently, there has been several relatively large increases in minimum wages. Seattle, San Francisco, Los Angeles, New York and Washington DC all have $15 minimum wage laws on the books. These minimum wage rates are double the current federal level minimum wage, and other states are contemplating similar increases. In 2014, President Obama issued an executive order raising the minimum wage of federal contractors to $10.10. The flurry of recent, legislative activity on the minimum wage and the size of recent minimum wage increases have renewed, once again, the debate over the value of minimum wage statutes.

Proponents of increasing the minimum wage suggest that it would increase earnings and reduce income inequalities. Opponents, however, argue that an increase in the minimum wage will raise employers' cost of labor, decrease employment and raise prices. The debate is fueled by the fairly mixed evidence on the effects of the minimum wage on employment with some studies finding no significant changes in employment, while others finding a modest decline (Congressional Budget Office 2014). Findings related to earnings are more consistent and show that minimum wages raise wages for low-skilled workers.

Notably, potential effects of the minimum wage on non-labor market outcomes such as health are not commonly considered in the debate, which is an oversight, as such effects are important for understanding the full impact of minimum wage policies. Economic theory suggests that an increase in the minimum wage may improve health among workers through an income effect. However, if a higher minimum wage reduces employment for some individuals, this can result in an opposite effect for that group. Effects of the minimum wage on health may be particularly relevant for infants because of the short, but critical period of gestation that influences infant health. Increases in income around the time of pregnancy can affect both maternal health, for example, because of better nutrition and less financial stress, and their babies' health, for example, because of greater amounts of prenatal care and improved maternal health. Indeed, there is growing recognition that improving women's health *prior to conception* is key to decreasing rates and disparities in adverse birth outcomes (Atrash et al., 2008; Johnson et al., 2006). Evidence from other income-enhancing policies including the earned income tax credit (EITC) indicates a positive effect on infant health among poor mothers. Therefore, understanding how minimum wage changes affect infant health is essential for understanding not only short-term consequences, but also potentially long-run impacts on health given the importance of early life status for long-term wellbeing.

We provide one of the first studies of the effects of minimum wages on infant health. Specifically, we evaluate how state-level minimum wages affect birth weight, gestational age, and fetal growth among births of low-educated women in the US between 1989 and 2012. We also examine two potential mechanisms, prenatal care and maternal smoking, that plausibly link the minimum wage to birth outcomes. We use data from birth certificates and a difference-in-differences research design to obtain estimates of the effect of minimum wages on outcomes that are plausibly interpreted as causal.

Results from the study indicate that a $1 increase in the minimum wage during the two-years prior to a birth increases birth weight significantly, but by a very small amount: approximately 4 grams (0.1 percent) among low-educated mothers. However, this average effect masks heterogeneous effects between demographic groups. Effect sizes are larger for younger and/or married mothers than for older and/or unmarried mothers, but all estimates are still quite small relative to the mean. These small estimates of the effect of the minimum wage on birth weight also imply small effects of a change in earnings on birth weight. Our minimum wage estimates suggest that a $1000 change in annual earnings in the two-years prior to birth is associated with an 8.5 gram (0.3 percent) increase in birth weight, which is smaller than, but in the same general magnitude as estimates reported in a study of the effect of the EITC on birth weight (Hoynes et al. 2015). Consistent with these beneficial effects of the minimum wage on birth weight, we also find that a $1 increase in the minimum wage in the two-years prior to birth is associated with significant, but very small improvements in other measures of infant health; a decline in low-birth weight, an increase in fetal growth, and a decline in pre-term birth. In terms of mechanisms, we find that a $1 increase in the minimum wage in the two-years prior to birth is associated with a significant, but small (2 percent) increase in prenatal care and a small (5 percent) decrease in maternal smoking.

2. Related Literature

2.a. Effects of Minimum Wages on Employment and Earnings

The effects of minimum wages on labor market outcomes has been an actively researched topic. Findings, however, are not uniform. A number of studies find evidence that minimum wages have no effect on employment (e.g., Addison, Blackburn, & Cotti, 2012; Dube, Lester, & Reich, 2010; Card & Krueger, 1994). In contrast, others find evidence of a decrease in employment (Neumark, Salas, & Wascher, 2014; Neumark & Wascher, 1992). The Congressional Budget Office (2014) (https://www.cbo.gov/publication/44995) summarized the literature and concluded that past evidence suggests that an increase in the minimum wage will reduce employment slightly—an increase in federal minimum wage to $10.10 from its current level of $7.25 would decrease employment by 0.3 percent.

While the evidence for effects of minimum wages on employment remains mixed, there is consistent evidence suggesting that minimum wages increase earnings for workers.[1] Positive effects on earnings have been reported in several studies for low-educated and low-income individuals and for both males and females (Belman, Wolfson, & Nawakitphaitoon, 2015). The evidence of a positive effect of the minimum wage on income is stronger for females for whom the majority of studies find positive effects on earnings (weekly or hourly). Other research suggests that the increase in earnings among the lowest wage workers, who are the ones most affected by increasing minimum wage rates may not necessarily offset the potential decline in work hours or employment status, and that minimum wage increases may have a net negative effect on average income for this group (Neumark, Schweitzer, & Wascher, 2004). The CBO (2014) report, however, concluded that an increase in the minimum wage to $10.10 would substantially increase wages for approximately 20 million workers and this increase in

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[1] See: Aaronson, Agarwal, and French (2012); Autor, Katz, and Kearney (2008); Card and DiNardo (2002); David, Manning, and Smith (2016); DiNardo, Fortin, and Lemieux (1996); Lee (1999); Lemieux (2002, 2006); Luttmer (2007); Reich and Hall (2001).

income would greatly outweigh the loss in earnings associated with decreased employment.[2] Overall, the evidence on the labor market effects of the minimum wage suggest that minimum wages will raise income.

2.b. Effects of Minimum Wages on Health

The literature studying the effects of the minimum wage on health is sparse. Meltzer and Chen (2011) examined the effect of the minimum wage on body mass index (BMI). They reported a negative association; increases in the real minimum wage between 1968 and 2007 were associated with a decrease in BMI. A paper by Horn, Maclean, and Strain (2017) that used data from the Behavioral Risk Factor Surveillance System (BRFSS) reported mixed evidence. For men, they found that minimum wages were associated with an increase in self-reported fair/poor health, but a decline in the number of days with poor mental health. For women, they found a marginally significant decline in number of days in poor mental health and no other significant effects. McCarrier et al. (2011) also used the BRFSS and found that higher minimum wages were associated with lower levels of unmet medical needs.

There is also some international evidence suggesting positive health benefits for workers. A recent paper by Lenhart (2017a) studied the effects of the introduction of the national minimum wage in the UK in 1999. Estimates indicated that the minimum wage was associated with improvements in self-rated health and reported health conditions, with reductions in financial stress and improved financial well-being implicated as a potential pathway. Exploiting variation in the minimum wage within 24 OECD countries over time and within US states over time, Lenhart (2017b) also reported that higher minimum wages was associated with improved population health.

There are two studies that we are aware of that study the association between minimum wages and infant health. Strully, Rehkopf, and Xuan (2010), which focused on the effects of the EITC on birth weight, also included the minimum wage in the regression analyses. These authors reported that that a $1

[2] There is also some evidence that prices will rise, which will reduce real purchasing power: Aaronson (2001); Basker and Khan (2013); Dube, Naidu, and Reich (2007); MacDonald and Aaronson (2006); MaCurdy (2015); Powers (2009).

increase in the minimum wage was associated with a 3-gram increase in birth weight and 7% decline in the odds of smoking. However, these results were not robust with estimates differing by time period (e.g., significant effect pre-1988 but not post-1998) and samples (excluding California, Indiana, Louisiana, Nebraska, New York, Oklahoma, South Dakota, and Washington). In addition, the significance of the estimates is not clear because standard errors were calculated ignoring likely non-independence of observations within states (Bertrand, Duflo, & Mullainathan, 2004).[3]

The second study is by Komro et al. (2016). This study used data from vital statistics aggregated to the month-state level and a difference-in-differences design to obtain estimates of the effect of the minimum wage on low-birth weight and neonatal mortality. The sample included all births. Estimates indicated that a $1 increase in minimum wage was associated with a 0.07 percentage point (7/100th of a percentage point) decline in low-birth weight.

As the brief summary of the previous literature has shown, there is relatively little research on the effects of the minimum wage on health. This is an important gap in knowledge because earnings increases associated with the minimum wage are comparable to those from other policies that have been more thoroughly studied. Indeed, studies on the EITC suggest that modest increases in income among low-income families can improve children's health. Hoynes, Miller, and Simon (2015) reported that a $1000 increase in net after-tax income, from expansions in the federal EITC, was associated with a 2% to 3% decline in low birth weight. They also find that this positive income effect from the EITC expansion was associated with an increase in prenatal care use and a decline in maternal smoking, which are potential mechanisms for the increase in birth weight. The EITC has also been shown to be correlated with a decline in maternal smoking (Averett & Wang, 2013; Cowan & Tefft, 2012). Strully et al. (2010) found that living in a state that has its own EITC was related to nearly a 15 gram increase in birth weight and 5% decline in smoking odds using 1980-2002 natality data. The state EITC has also been linked to

[3] The study also had other limitations. The regression model included several variables on the causal pathway between minimum wage and infant health such as unemployment rate and poverty indicators.

improved overall child health rating later in childhood including ages 6 to 14 (Baughman & Duchovny, 2016). Positive effects on maternal health including self-reported health rating as well as biomarkers have also been reported (Evans & Garthwaite, 2014), providing further evidence for a potential mechanism through maternal health and health behaviors.

To summarize, we extend the literature on the effects of the minimum wage on health. We focus on infant health because of the critical nature of the prenatal period, which is short and easily linked to the potential income effects of the minimum wage. We use data spanning a 25-year period in which there was substantial variation in minimum wages. We examine multiple infant health and maternal behavioral outcomes, consider multiple measures of the minimum wage, and allow for cumulative effects of the minimum wage effect. Furthermore, while focusing on low-educated mothers who are most likely to be affected by the minimum wage, we examine several subgroups within this population by age, education, race, and marital status.

3. Mechanisms Linking Minimum Wage and Infant Health

Conceptually, an increase in the minimum wage can improve infant health through a positive income effect on maternal health and health behaviors that can have effects on fetal health. As noted above, the majority of studies examining earnings report an increase in hourly or weekly wages following a rise in the minimum wage, with larger effects among women than men (Belman et al., 2015; Congressional Budget Office, 2014). Greater income from an increase in the minimum wage will increase consumption and can have positive or negative effects on health, for example by improving nutrition or increasing consumption of unhealthy goods such as alcohol. Greater income may also increase medical care such as prenatal care services, particularly among those who are in low-paying jobs, likely to be affected by the minimum wage and likely to be without health insurance. Finally, increased income may increase financial security, which may reduce maternal stress, a factor linked to fetal growth (Camacho, 2008). There may be additional effects stemming from these changes, for example, greater financial security, less stress and improved mental health may reduce health behaviors such as smoking that are often used to treat stress (Byrne & Mazanov, 2016; Saffer & Dave, 2005).

On the other hand, the generally positive effects of the minimum wage through increased earnings among workers may be offset by potential declines in employment. Two studies reported employment declines when focusing on low-educated women (Pinoli, 2010; Sabia, 2008). If the minimum wage affects employment, this may also lead to reallocation of time use due to the easing of time constraints and an increase in non-work/leisure time. Greater availability of time, ceteris paribus, may lead to an increase in time-intensive activities, including certain health-promoting behaviors such as preparing healthy meals at home and exercising or obtaining preventive healthcare. However, given the evidence of an increase in earnings relative to the decline in employment it is reasonable to hypothesize a net positive income effect on infant health among low-income women.

An increase in the minimum wage may also reduce reliance on welfare programs such as food stamps (SNAP). There is evidence of a decline in enrollment and expenditures on the Supplemental Nutrition Assistance Program (SNAP) with increasing minimum wage rates (Reich & West, 2015). However, there is no evidence for effects on other welfare program participation such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), Medicaid enrollment, housing assistance programs, and cash assistance programs including Aid to Families with Dependent Children (AFDC) and Temporary Aid to Needy Families (TANF) (Sabia & Nguyen, 2015).

Finally, price effects related to the minimum wage may result in reduced consumption, some of which may have adverse effects on maternal and infant health such as food consumption, grocery shopping and housing improvement. However, evidence suggests very modest increases in prices with the largest effects on restaurants (MaCurdy, 2015).

Overall, the evidence on the effects of the minimum wage on employment, earnings, participation in social welfare programs and prices suggest that the minimum wage will have salutary effects on maternal and infant health. This is because the dominant effect of the minimum wage is to raise incomes of workers. There are small offsetting effects related to employment loss and higher prices, although higher prices may reduce consumption of unhealthy goods as well as healthy products. Thus, we expect that the minimum wage will be positively associated with infant health.

4. Research Design

Our empirical analysis is motivated by the mechanisms just described linking the minimum wage to infant health. We estimate a reduced-form model that directly links the state-level minimum wage to infant health outcomes. The research design is a difference-in-differences approach focusing on the "intention-to-treat" effect of increasing the minimum wage. For each measure of infant health, we estimate the following regression specification:

(1) $$H_{ismt} = \alpha_s + \gamma_m + \theta_t + \delta MW_{smt} + X_{ismt}\Gamma + Z_{st}\Psi + \mu_{ismt}$$

In equation (1), H denotes a specific measure of infant health (e.g., birth weight) or maternal behavior (e.g., prenatal care) for a given birth i occurring in state s, month m, and year t. MW is the average minimum wage two years prior to delivery in the given state and birth month and year. We use a two-year window prior to birth because the effects of the minimum wage may accumulate and may be particularly important because of the growing recognition that preconception health of the mother, which would be influenced by the minimum wage prior to birth, is an important determinant of infant health (Atrash et al., 2008; Johnson et al., 2006). Equation (1) includes time (year θ and month γ) and state fixed effects (α). The vector X represents individual characteristics of the mother such as age, education, marital status, and race/ethnicity; and Z represents a vector of time-varying, state-level factors matched to the birth year. These capture concurrent policy shifts affecting low-educated mothers over the sample period, which prior studies have linked to maternal behavioral health and/or infant health, most notably expansions in the state's earned income tax credit, expansions in Medicaid eligibility, welfare reform, and cigarette taxes (Baughman, 2012; Corman et al., 2013; Currie & Gruber, 1996; Dave et al., 2008; Dave et al., 2010; Evans & Garthwaite, 2014; Howell, 2001; Hoynes et al., 2015; Kaestner & Lee, 2005).[4]

[4] Expansions of the federal earned EITC were also underway over this period. Specifically, an EITC expansion that passed in 1993 and became effective in tax year 1995 raised the maximum credit for all qualifying families and further increased the differential in maximum benefits between families with two or more children relative to those with only one child. In 2001, the income level at which the EITC began to phase out for couples was further increased. These federal expansions, along with shifts in the national price level and other trends, are captured by the year and month (θ and γ) fixed effects

In order to control for other time-varying, state-level unobservable variables, we also include the state-year specific mean of the dependent variable for college-educated, married pregnant women between the ages of 25-44. These women earn wages that make it likely that they would be unaffected by minimum wage policies. Note that this does not amount to using college-educated married pregnant women as a comparison group since we are not constraining the coefficient to be one (as would be the case in a difference-in-difference-in-differences context). We include this variable to control for time-varying, state-specific changes in the outcomes proportionally affecting low- and higher-educated mothers. However, we can assess whether this proportional effect is one-to-one, thereby assessing whether the higher educated group is a valid control within a difference-in-difference-in-differences (DDD) specification. Except for a subset of models for prenatal care and prenatal smoking, we generally reject this restriction, and therefore do not utilize college-educated mothers as a direct comparison group.

The parameter of interest is δ, which captures the reduced-form effect of the increase in the state's effective minimum wage. This effect is identified from the substantial variation in the minimum wage within states over this period (see Figure 1). As noted, we measure the minimum wage as the average minimum wage in the two year period prior to delivery. In some analyses, we allow for separate effects of the minimum wage effective during pregnancy and the minimum wage in the one- or two-year period prior to conception. We think it appropriate to use a longer window than pregnancy to measure the minimum wage because an increase in the minimum wage prior to pregnancy may affect maternal preconception health, as well as allowing families to have more savings and smooth consumption during pregnancy.

We estimate equation (1) for all low-educated women and for several demographic groups defined by age, marital status and education because there may be heterogeneous responses and because different demographic groups are more or less likely to be affected by the minimum wage. Table 1 provides some evidence as to which demographic groups may be more or less affected by the minimum wage. In Table 1, we present the average number of what we refer to as "affected hours" for different demographic groups of low-educated mothers. "Affected hours" are the number of annual hours of work for a family that will be affected by an increase in the minimum wage. It is intended to measure the annual change in family income from a $1 increase in the minimum wage and is a reasonable approximation of exposure to the treatment, which is a change in the minimum wage. To calculate "affected hours", we estimate for each demographic subgroup the average annual work hours for families of that subgroup (e.g. low-educated females aged 18-44 years) including all family members who work and earn an hourly wage that is 1.25 times the minimum wage.[5] This yields an estimate of the change in annual family income that is likely from a $1 increase in minimum wage. It assumes no employment effects, which is reasonable given existing evidence (CBO 2014).

For the full sample of low-educated women, "affected hours" are 477, which implies that a $1 increase in minimum wage would increase annual family income by $477. We also show two alternative measures that calculate affected hours using different rules about who is likely to be affected by the minimum wage: those who earn 1.33 times the minimum wage and those who earn $1 above the minimum wage. The "affected hours" using these alternatives are similar ($558 and $441, respectively). Figures in the first row of Table 1, show that there is some heterogeneity in "exposure" but not that much. Younger women and married women are more likely to be affected by an increase in the minimum wage than older women and single women. This is because young women earn lower wages than older women and married women are more likely to have spouses that may be affected. Thus, young married women have the highest number of "affected hours" and older, single women have the lowest number of "affected hours", and the difference between the two groups represents a $380 difference in the change in annual income from a $1 increase in the minimum wage. We note that we calculated "affected hours" as a rough approximation to measure exposure to an increase in the minimum wage. Besides this differential exposure to minimum wage, there may be heterogeneous responses in infant health and behavior

[5] We use the Current Population Survey (CPS) outgoing rotation files to measure hourly wage and estimate average weekly work hours across all family members earning less than 1.25 times the minimum wage. Then, we multiply the weekly work hours by average annual work weeks from the CPS March files to measure annual "affected hours". For deriving average annual work weeks, we include all family members with implied hourly wage (based on reported annual wage income and annual work hours) less than 1.25 times the minimum wage.

behaviors to income changes across demographic groups so it is not necessarily the case that we expect effect sizes to align with exposure, as measured by "affected hours".

5. Data

5.a. Natality Files

Our data come primarily from information on individual birth records from the Vital Statistics, Natality Files. Detailed information on all individual births occurring in the 50 states and DC are submitted by hospitals to state vital registration offices, which is then reported to the National Center for Health Statistics (NCHS). Information on each birth includes date and place of birth along with the demographic characteristics of the mother, such as age, race, education, marital status, and parity. We use data for the years 1989 through 2012 that cover pregnancies from 1988 through 2012. We begin our analysis in1989 because earlier years did not contain information on certain prenatal behaviors. Given that changes in the minimum wage affect mostly low-educated workers, the primary sample is limited to women with a high-school degree or less between the ages of 18 to 44 (at time of pregnancy). This yields approximately 46 million births for the main analytical sample.

We measure two categories of infant health: 1) birth weight; and 2) gestation. Birth weight is measured as a continuous outcome (grams) and alternately as an indicator for low birth weight (infant was born weighing less than 2,500 grams). Gestational age is measured continuously in weeks, and also as an indicator for whether the infant was born preterm (gestation < 37 weeks).[6]

In order to assess potential mechanisms linking the minimum wage to infant health, we also study key measures of prenatal inputs available in the birth certificate data. First, we use two measures of

[6] Prior to 2014, gestational age of a newborn was based on the date of the last normal menses (LNM). Beginning in 2014, there has been a transition to a new standard based on the obstetric estimate due to some concerns that the LNM measure may have weaker validity due to issues with imperfect maternal recall and other forms of misinterpretation. Martin, Osterman, Kirmeyer, and Gregory (2015) nevertheless find that the two measures were in agreement for the 2013 birth certificates. The obstetric estimate was within 1 week of the LNM estimate for a total of 83.4% of records, and within 2 weeks for 91.4% of all 2013 records.

prenatal smoking: smoking participation and smoking more than 5 cigarettes daily during pregnancy.[7] Birth certificates are generally thought to provide a reasonably reliable source of data on prenatal smoking status for large observational studies (Nielsen et al., 2014), although underreporting of smoking status has been suggested for as much as one-fifth of smokers (Tong et al., 2013). While underreporting can inflate our variance estimates, it is unlikely that it is systematically correlated with the minimum wage, which would bias our estimates of the effect of the minimum wage. We utilize three measures of prenatal care: the number of prenatal care visits, an indicator for whether there were fewer than five prenatal visits over the pregnancy, and the number of months that prenatal care was delayed since the start of pregnancy.[8]

5.b. Minimum Wage

The effective minimum wage in a state is the higher of the state's legislated minimum wage or the federal minimum wage. We obtain these data from the US Department of Labor.[9] Figure 1 shows the considerable variation in the minimum wage across states and over time. Over our sample period (1988-2012), the federal minimum wage increased from $3.35 to $7.25. Among states, which had set a minimum wage that superseded the federal level, the average minimum wage increased from $3.74 to $7.92. Currently, there are 29 states plus DC with minimum wage rates set higher than the federal minimum wage of $7.25/hour, compared with 10 states in 1988. For our main analyses, we use the real ($2012) minimum wage, which is the nominal wage deflated by the consumer price index, but we report results for several other measures in the Appendix and note that estimates are not sensitive to how we measure the minimum wage. Specifically, in some analyses we use the nominal minimum wage and we also follow Card (1992) and Clemens (2015) and normalize the minimum wage by the median wage rate

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[7] These outcomes are not reported by some states (for instance, CA, IN, NY, SD, OK) over all or part of our sample period. We exclude births occurring in these states when analyzing these behaviors. Limiting all analyses to those states with consistent information on smoking does not materially alter our results or conclusions.

[8] We also used other measures of prenatal care, such as first trimester intiation and the Kotelchuck index (estimates not reported in text). Results using these alternative measures are highly similar to those reported in text, in terms of relative magnitudes, significance, and direction of effects.

[9] See: https://www.dol.gov/whd/state/stateminwagehis.htm.

in the state, and refer to this as the "relative minimum wage". The motivation underlying this relative measure is to capture the "bite" of the minimum wage; if the median hourly wage in the state is substantially higher than the minimum wage, then the minimum wage is less binding, and increases in the minimum wage may elicit smaller responses on labor outcomes (Lee, 1999). Therefore, we take the ratio of the nominal minimum wage in the state to the prevailing state-specific median "hourly" wage. The median wage is estimated from annual earnings and work hours from the March CPS. The larger is this ratio, the more binding is the effective minimum wage in the state.[10]

We match the average minimum wage to the birth records by state and over the two-year period prior to the year and month of birth.[11] Specifically, we take the average of the real minimum wage across 3 time points: birth month, 12 months before birth, and 24 month before birth. All other time-varying state variables are matched based on state and year of pregnancy.

5.c. Policy Controls

In addition to the minimum wage, our regression model includes controls for other state policies that may affect infant health. We follow the standard in the welfare reform literature (see for instance Dave, Corman, & Reichman, 2012; Blank, 2002; Kaushal and Kaestner 2001; Schoeni & Blank, 2000) and include dichotomous indicators for whether a given state in a given year had a statewide waiver in place that substantially altered the nature of AFDC with respect to time limits, sanctions, or work requirements. We also include a dichotomous indicator for whether the state had implemented TANF in time period t.[12] Data on whether states had waivers and when they enacted TANF come from U.S. Department of Health & Human Services (1997; 1999). We control for state EITC legislation via three measures: 1) an indicator for whether the state had an EITC program; 2) an indicator for whether this state's EITC is refundable, which means that the state will refund the credit if no taxes are owed; and 3)

[10] To address any potential endogeneity concerns from the minimum wage concurrently affecting the median wage rate in the state, we use the one-year lag of the median wage. In practice, whether we divide by the median wage at time (t) or time (t-1) does not make much of a difference.

[12] For states which implemented an earlier waiver to their AFDC programs, the AFDC indicator is set to 0 when these states later implement TANF.

state EITC as a percentage of federal credit. In the late 1980s through the early 1990s, about one-third to half of the states which offered a tax credit made it refundable. In 2012, virtually all states' (20 out of 24) EITC's were refundable. We obtain information on states' EITC programs from Tax Credits for Working Families, Tax Policy Center of the Urban Institute and Brookings Institution, and the National Conference of State Legislatures.[13] We also control for the Medicaid income eligibility expansions for pregnant women which occurred during the late-1980s through mid-1990s by including the fraction of women who would be eligible for Medicaid in a given state during each period.[14]

5.d. Sample Description

Table 2 presents sample means for births occurring in 1989 through 2012 for subgroups defined by age and marital status. On average, the sample is 26 years old and two-thirds have a high school degree (one-third less than high school). Approximately half the sample is White, 30% Hispanic, 18% Black and the remaining of other racial groups. Birth outcomes (birth weight, low birth weight, preterm birth) are significantly worse among single mothers, particularly older single mothers. The average real minimum wage over this period was $6.97.

6. Results

6.a. Full Sample of Low-educated Mothers

Table 3 presents estimates of the effect of minimum wages on infant health and maternal behaviors. Several measures of infant health are used: birth weight in grams, indicator of low birth weight (<2500 grams), gestational age in weeks, fetal growth (birth weight divided by gestational age) and pre-term birth. Three measures of prenatal care are used: number of visits, an indicator for fewer than 5 visits, and an indicator for first trimester care. Two measures of maternal smoking are used: any prenatal smoking and an indicator of whether mother smoked more than 5 cigarettes daily. Each cell in Table 3 represents the effect of a $1 increase in the real minimum wage.

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[13] See: http://www.taxcreditsforworkingfamilies.org/earned-income-tax-credit/states-with-eitcs/; http://www.taxpolicycenter.org/statistics/state-eitc-based-federal-eitc; http://www.ncsl.org/research/labor-and-employment/earned-income-tax-credits-for-working-families.aspx.

[14] See Dave et al. (2015a, 2015b) for further details on Medicaid eligibility.

Estimates in Table 3 indicate that a $1 increase in the minimum wage is associated with a 4.04 gram (0.1%) increase in birth weight; a 0.09 percentage point (1%) decrease in low-birth weight; and a 0.075 unit (0.1%) increase in fetal growth. All estimates are statistically significant. [15] To provide an idea of what these effects imply in terms of the expected change in annual income, we use the "affected hours" calculations in Table 1 to derive the effect of a $1000 increase in annual family income on outcomes. In Table 1, the "affected hours" for the full sample is 477, or $477 of annual family income. Therefore, we scale the estimates in Table 3 for the full sample by 2.1 ($1000 divided by $477). After scaling estimates in this way, results suggest that a $1000 increase in annual family income is associated with an 8.5 gram (0.2%) increase in birth weight; a 0.2 percentage point (3%) decrease in low-birth weight; and a 0.16 (0.2%) unit increase in fetal growth.

One way to view these scaled estimates is that they are instrumental variables (IV) estimates of the effect of a change in income on infant health. This approach assumes that the earnings effect from a higher minimum wage represents the only causal pathway linking the minimum wage to infant health. Treatment effects calculated this way should be interpreted with caution because small changes in the denominator, which in this case is "affected hours", can lead to large changes in implied IV estimates. Nonetheless, it is a useful exercise to place our minimum wage effect in context and compare it to effects derived from another major income transfer program, namely the federal EITC. Hoynes et al. (2015) examined the effects of expansions in the federal EITC, which also increased income (and employment) among eligible households, on infant health outcomes. They estimate that the effect of a $1000 increase

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[15] Appendix Table A1 reports the coefficients for the full models for birth weight. These estimates generally imply effects consistent with expectations and prior studies. Birth weight increases with the educational attainment of the mother, and is higher among mothers who are white (relative to black or other race), Hispanic, and married. An increase in the state's EITC generosity is positively associated with infant health. We do not find any evidence that expanded Medicaid eligibility is significantly associated with increases in mean birth weight; prior studies have been generally mixed on the effectiveness of these expansions in improving infant health (Currie and Gruber 1996; Howell 2001; Dave et al. 2008). The coefficient of mean birth weight among higher educated mothers is significant with confidence intervals that do not include one, suggesting that higher educated mothers would not be a valid counterfactual within a DDD framework.

in income induced by the EITC expansions on birth weight was 6.4 grams (0.2%) among low-educated single mothers. Thus, our estimate of 8.5 grams (0.2%) for low-educated mothers is very similar.

Higher birth weight may reflect either an improvement in fetal growth and/or an increase in gestational age (reduction in preterm birth), or both. We show estimates of the effect of the minimum wage on gestational age (measured in weeks) and preterm birth in Table 3. Estimates indicate that a $1 increase in the minimum wage is associated with an insignificant and very small increase in gestational age and an insignificant and very small decrease in pre-term birth. Comparing these estimates to those for birthweight suggest that the main explanation of the increase in birth weight is fetal growth, although the increase in birth weight is quite small.

Estimates in Table 3 suggest that the minimum wage is associated with a small improvement in infant health. While several causal channels may underlie these effects, many of which are not observed in the data available, we are able to assess whether the improved infant health is consistent with effects on prenatal care and maternal smoking. Estimates in Table 3 indicate that a $1 increase in the minimum wage is associated with a significant: 0.17 (2%) increase in prenatal care visits; a 0.0034 (5%) decrease in probability of having less than 5 prenatal care visits; and a 1 percentage point (1%) increase in the probability of obtaining care in the first trimester. Estimates also indicate that an increase in the minimum wage is associated with a reduced likelihood of any prenatal smoking and smoking more than 5 cigarettes daily. Effect sizes are modest: a $1 increase in the minimum wage is associated with a 1.4 percentage point (7%) decline in maternal smoking and a 0.9 percentage point (6%) decline in the probability of smoking greater than five cigarettes per day.

Estimates of the effect of the minimum wage on prenatal care and smoking are also consistent with the estimates from the EITC literature. Hoynes et al. (2015) also finds that the federal EITC expansion reductions in prenatal smoking and expansions in prenatal care. They find that a $1000 increase in income (associated with the EITC expansion) reduced the likelihood of prenatal smoking by about one percentage point (4.1% relative to the mean). Our estimates suggest that a $1000 increase in income (associated with the higher minimum wage) also reduced the probability of smoking during pregnancy among low-educated mothers by about three percentage points (16%). Averett and Wang (2013) also find that the income effect induced by the federal EITC expansion reduced maternal smoking.[16]

Appendix Table 2 presents estimates of the effect of the minimum wage on infant health and maternal behaviors from several alternative model specifications that differ by whether we include time-varying, state-specific controls, the mean outcome of college-educated women, and the specifications of year-by-month fixed effects, year-by-demographic factor fixed effects, and state-by-year fixed effects. These additional specifications account for potential identification threats related to non-linear year-by-month trends, differential time trends across demographic groups, and most importantly for our design, differential time trends between states. Estimates from these alternative models are very similar to those in Table 3 and provide evidence that the difference-in-differences design seems valid.

6.b. Heterogeneity of Effects Across Demographic Groups

As suggested in Table 1, there is some differences in "exposure" to a minimum wage increase. In Table 4, we present estimates for different groups of low-educated mothers stratified by age and marital status. Estimates in Table 4 reveal a very noticeable pattern: effect sizes are larger for young (ages 18 to 29) and married mothers and the largest for young, married mothers. This pattern of estimates is consistent with the pattern for "affected hours"—estimates of the effect of the minimum wage are larger for demographic groups with more "affected hours". The one exception is for older (ages 30 to 44) married mothers.

Effect sizes remain quite small even for the groups with larger and statistically significant estimates. Among young (18 to 29) mothers, a $1 increase in the minimum wage is associated with: a 5.41 grams (0.2%) increase in birth weight; a 0.1 percentage point (1%) decrease in probability of having

[16] The implied negative relationship between smoking and income that we and others found suggests that smoking is an inferior good, which is an issue still debated in the literature (e.g., Kenkel, Schmeiser, & Urban, 2014). However, as we described earlier there are other causal mechanisms besides income that links minimum wage to infant health and maternal health behaviors. For example, the increases in prenatal care we observe may decrease maternal smoking because of greater contact with physicians.

a low-birth weight infant; and a 0.1 unit (0.1%) increase in fetal growth. For this group, an increase in the minimum wage is not significantly related to gestational age or pre-term birth. In contrast, estimates in Table 4 indicate that among older (30 to 44) mothers, an increase in the minimum wage has no statistically significant or clinically significant effect on infant health. Among married mothers, a $1 increase in the minimum wage is associated with: a 3.82 grams (0.1%) increase in birth weight; a 0.1 percentage point (1%) decrease in probability of having a low-birth weight infant; a 0.05 unit (0.1%) increase in fetal growth; and a very small (0.014 weeks) increase in gestational age. Finally, as noted earlier and consistent with the estimates just described, the largest estimates in Table 4 are found for younger, married mothers, but effect sizes are relatively similar to those discussed.

In Table 5, we report estimates of the effect of the minimum wage on prenatal care and maternal smoking. For prenatal care, we find that a $1 increase in the minimum wage is associated with a small increase in the number of prenatal care visits and most estimates are statistically significant. There is less heterogeneity across demographic groups in effect sizes than for birth weight and low-birth weight. Estimates suggest that a $1 increase in the minimum wage is associated with between a 0.15 (1%) and 0.25 (2%) increase in the number of prenatal care visits. Estimates also indicate that a higher minimum wage is associated with similarly small improvements in the other two measures of prenatal care. For maternal smoking, estimates show that a higher minimum wage is associated with less smoking. In this case too, estimates are relatively similar across demographic groups and are quite small; a $1 increase in the real minimum wage is associated with approximately a 1.5 percentage point (7%) decrease in maternal smoking.

6.c. Additional Specifications

We conducted additional analyses to assess whether alternative measures of the minimum wage and alternative specifications of the minimum wage yield similar estimates as those reported above. In Appendix Table 3, we report estimates of the effect of the minimum wage on infant health and maternal behaviors using the nominal minimum wage and relative minimum wage (minimum wage divided by median wage). Estimates in Appendix Table 3 are similar to those reported in Table 3. For example, a $1 change in the nominal minimum wage, which represents a 20% increase, is associated with a 5.6 gram increase in birth weight. In Table 3, estimates indicate almost the exact same result: a 20% increase in the real minimum wage is associated with a 5.6 gram increase. Other estimates in Appendix Table 3 are also similar to the analogous estimates in Table 3. In sum, the way the minimum wage is measured does not affect estimates.

In Appendix Table 4, we present estimates of the effect of the minimum wage on infant health and maternal behaviors for models that allow the minimum wage to have different effects prior to and during pregnancy. We show results for two specifications that differ by whether we measure the minimum wage during one-year or during two-years prior to pregnancy. Estimates in Appendix table 4 show an interesting pattern. The minimum wage during pregnancy is significantly and positively associated with birth weight, gestational age, and fetal growth and negatively associated with pre-term birth. The minimum wage prior to pregnancy has little effect on these outcomes. For these outcomes, estimates associated with the minimum age during pregnancy are approximately the same as those reported in Table 3. In the case of low-birth weight, however, the minimum wage during pregnancy and the minimum wage prior to pregnancy have approximately the same effect. This implies that the estimate of the effect of the minimum wage in Table 3 reflects a cumulative effect of the minimum wage on low-birth weight. For prenatal care, the minimum wage during pregnancy is positively and significantly associated with the number of visits. In contrast, it is the minimum wage prior to pregnancy that is negatively associated with maternal smoking. While we do not have ready explanations for this pattern of results, as there are a variety of explanations that are consistent with these findings, the upshot is that it is not only the contemporaneous minimum wage that can influence infant health, but also the cumulative and prior minimum wage that can affect maternal health and maternal financial status that can have lasting effects on infant health.

6.d. Compositional Changes and a Falsification Analysis

In this section, we address two issues: whether the minimum wage is associated with changes in the composition of mothers and whether we find any effect of the minimum wage on infant health and maternal behaviors of college educated women who are arguably unaffected. We examine potential composition selection by directly estimating whether the minimum wage has affected maternal characteristics. Specifically, using the individual-level data, we estimate regressions testing whether the minimum wage affected the probability that a given birth occurs to a mother who is lower vs. higher educated, married vs. single, white, black or other race, and younger vs. older. We find a slight increase in the probability (about 2 percentage points) of married mothers and slight decline in probability (0.4 percentage points) of age 25-29 years with higher minimum wage. The estimates however do not point to any substantial changes in the composition of births. We continue to find improvements in infant health even when we stratify based on marital status and/or age (as discussed above).

The final analysis we discuss is a falsification test. We re-estimated the models underlying Table 3 using a sample of college educated mothers ages 25 to 44. We restricted the sample to those 25 and older because we required mothers to have a college degree to be included in the sample. This group of women is largely unaffected by the minimum wage, for example, the "affected hours" for this group is 189 (Table 1), and therefore, we expect to find no association between the minimum wage and infant health and maternal behaviors. Estimates for this sample of college educated mothers are shown in Table 7. All estimates but one in Table 7 are statistically insignificant and all are very small both relative to the mean for the sample and relative to estimates in Table 3. Overall, estimates in Table 7 provide evidence to support the validity of the difference-in-differences research design and are consistent with estimates in Appendix Table 2 that show that our primary set of estimates is not materially affected by model specification.

7. Conclusion

The debate over the merits of a minimum wage and over the level of the minimum wage have been frequent and ongoing for decades. Most of that debate is focused on the labor market effects of the minimum wage with employment being the most oft debated outcome. However, the increase in income associated with the minimum wage, which is widely acknowledged for all but the least skilled persons, may have benefits in other domains. Here we examined whether the minimum wage affected infant health.

Our results suggest a small, significant and beneficial effect of a minimum wage increase on birth weight and the probability of low-birth weight. Estimates suggest that an increase in the minimum wage that causes a $1000 increase in annual household income is associated with a 8.5 gram (0.3% relative to the mean) increase in birth weight and 0.2 percentage point (2.5%) decrease in low birth weight. We found similar effect sizes for other demographic groups with slightly larger effects observed for younger and married mothers. Results also identified two potential pathways that are consistent with the beneficial effect of the minimum wage on infant health: greater prenatal care and reduced maternal smoking. Again, the effect of the minimum wage on these health behaviors is relatively small, but significant. For example, an increase in the minimum wage that causes a $1000 increase in income increased the number of prenatal care visits by 3%.

Our findings are broadly consistent with estimates of the effect of the EITC on infant health, which is another policy that affects incomes of low-wage workers. Thus, there is a growing body of evidence that labor market policies that enhance wages can affect wellbeing in broader ways than often considered. These “other” effects of the minimum wage should enter the debate over its merits.

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Figure 1. Changes in State Minimum Wages over Time

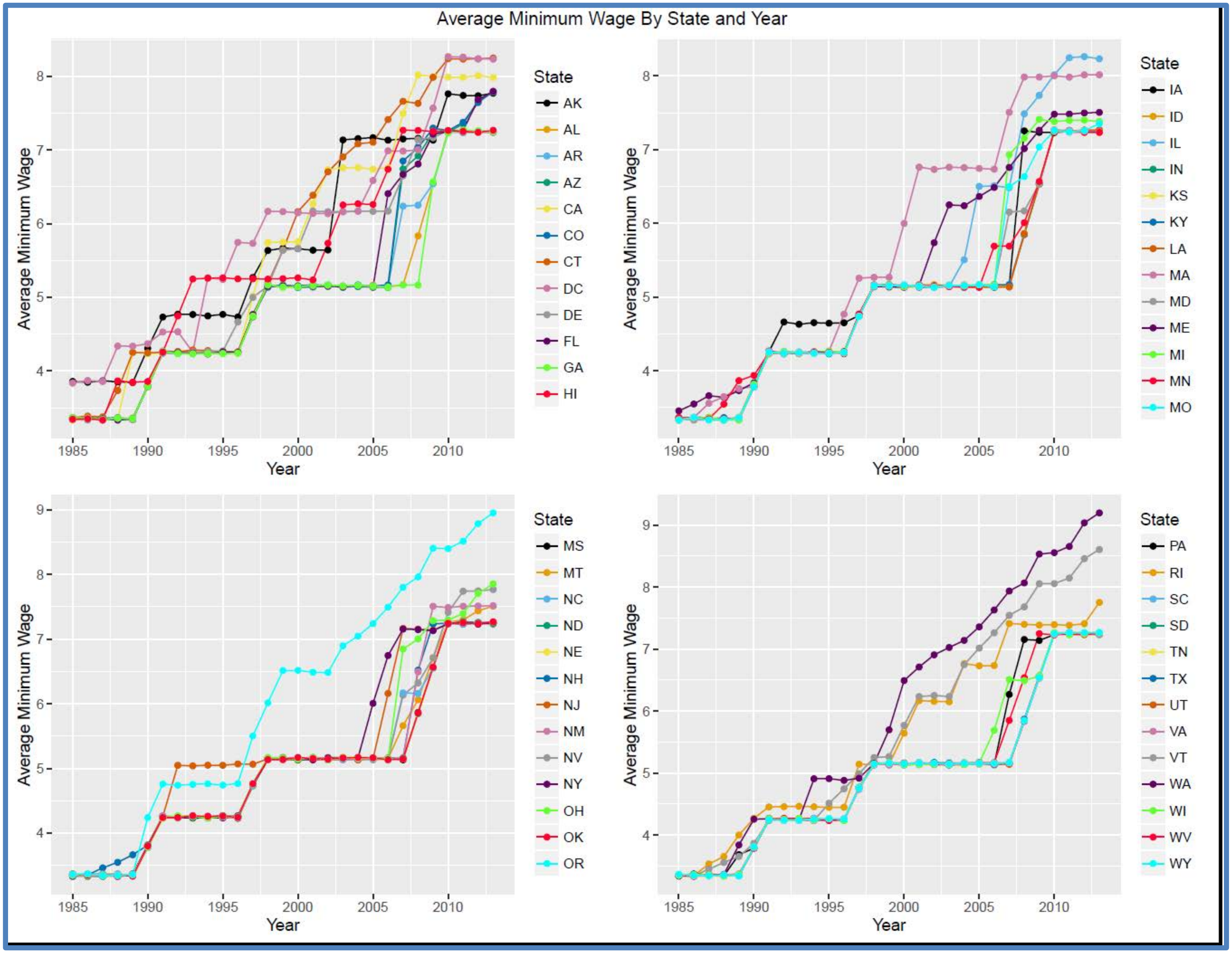

Table 1. "Affected Hours": Average Annual Work Hours Affected by an Increase in Minimum Wage for Low-Educated and College Educated Women

	Low Educated (High School or Less)									College Educated
						Age 18-29		Age 30-44		Age 25-44
	Age 18-44	Age 18-29	Age 30-44	Married	Single	Married	Single	Married	Single	
Annual Working Hours for wage <1.25*Minimum Wage	477	568	400	537	496	652	449	660	280	189
Annual Working Hours for wage <1.33*Minimum Wage	558	661	470	628	572	760	527	755	332	222
Annual Working Hours for wage <(Minimum Wage+$1)	441	523	371	502	455	609	418	609	255	171

Notes: "Affected hours" represents the average annual work hours that will likely be affected by an increase in the minimum wage in each group. These hours were calculated using the CPS Earner Study data based on the following steps. First, we identified all census families including at least one low- educated female aged 18-44 years. Second, for each of these census families, we identified all family members (paid on an hourly basis or not) whose reported or estimated hourly wage was less than 1.25 times the state minimum wage in a given year (or alternatively less than 1.33*minimum wage; or less than minimum wage plus $1). Third, we derived a family-level weekly affected hours by summing the weekly work hours across all those family members identified in the prior step (0 week hours assigned for other family members). Fourth, we averaged family-level affected weekly work hours across families and multiplied that average by average annual work weeks which estimated from the CPS March Supplement data (following to the first and second step for weekly hours). For each demographic subgroup, a family was selected if there was at least one female with these demographic characteristics.

Table 2. Sample Means, Births in 1989-2012 to Low-Educated (High school or Less) Women

Sample						Age 18-29		Age 30-44	
	Overall	Age 18-29	Age 30-44	Married	Single	Married	Single	Married	Single
Outcomes									
Birth weight (grams)	3268.55	3258.39	3300.41	3333.63	3193.82	3327.22	3194.42	3347.47	3190.56
Low birth weight	0.08	0.08	0.09	0.07	0.10	0.06	0.10	0.07	0.12
Fetal growth (birth weight / gestational age in week)	84.06	83.68	85.27	85.51	82.40	85.15	82.31	86.28	82.92
Gestation (weeks)	38.77	38.84	38.57	38.90	38.63	39.00	38.69	38.68	38.31
Preterm birth	0.12	0.12	0.13	0.11	0.14	0.10	0.14	0.12	0.17
Prenatal care visits	10.79	10.72	11.01	11.27	10.24	11.22	10.25	11.37	10.16
1st Trimester Care	0.75	0.73	0.79	0.80	0.69	0.79	0.68	0.82	0.71
Prenatal care visits < 5 visits	0.07	0.07	0.07	0.05	0.10	0.05	0.10	0.04	0.11
Months delayed prenatal care	3.06	3.11	2.90	2.78	3.38	2.82	3.38	2.69	3.41
Any prenatal smoking	0.19	0.20	0.17	0.15	0.24	0.16	0.23	0.13	0.26
Smoking >5 cigarettes daily	0.14	0.15	0.13	0.12	0.17	0.13	0.16	0.11	0.19
Minimum Wage Measures									
Average Nominal MW over 2 yrs prior to birth	5.23	5.21	5.30	5.09	5.39	5.03	5.37	5.21	5.51
Average Real (in 2012$) MW over 2 yrs prior to birth	6.97	6.96	7.03	6.95	7.00	6.93	6.98	7.01	7.08
Average Nominal MW over pregnancy	5.26	5.24	5.34	5.10	5.44	5.04	5.42	5.24	5.57
Average Relative Nominal MW over 2 yrs prior to birth	0.44	0.44	0.43	0.44	0.43	0.44	0.43	0.43	0.43
Demographic Characteristics									
Age	25.57	23.02	33.65	27.00	23.92	23.95	22.14	33.66	33.64
Less than high school	0.37	0.38	0.33	0.31	0.43	0.32	0.43	0.28	0.43
High school graduate	0.63	0.62	0.67	0.69	0.57	0.68	0.57	0.72	0.57
White	0.48	0.48	0.47	0.58	0.36	0.59	0.37	0.55	0.29
Black	0.18	0.19	0.15	0.08	0.30	0.07	0.30	0.09	0.28
Other race	0.05	0.04	0.06	0.05	0.04	0.05	0.04	0.07	0.05
Hispanic	0.30	0.29	0.32	0.29	0.30	0.29	0.29	0.30	0.38
Married	0.54	0.48	0.70	1.00	0.00	1.00	0.00	1.00	0.00
State Policy Controls									
Cigarette excise tax	57.47	55.95	62.30	52.46	63.24	49.59	61.88	58.71	70.70
State EITC	0.19	0.18	0.21	0.16	0.21	0.15	0.21	0.19	0.24
State refundable EITC (State EITC=1)	0.15	0.15	0.18	0.13	0.18	0.12	0.18	0.16	0.21
% of Federal EITC (State EITC=1)	3.13	2.96	3.70	2.75	3.58	2.44	3.44	3.43	4.34
AFDC Waiver	0.07	0.07	0.08	0.08	0.06	0.08	0.06	0.08	0.07
TANF	0.60	0.59	0.60	0.54	0.66	0.52	0.66	0.57	0.67
Medicaid eligibility fraction	0.47	0.47	0.48	0.47	0.48	0.46	0.48	0.48	0.49
Observations	45295963	34430599	10865364	24237020	21058943	16622758	17807841	7614262	3251102

Table 3. Estimates of the Effect of a One Dollar Increase in the Real Minimum Wage ($2012) on Infant Health and Maternal Health Behaviors, Infants Born in 1989-2012 to Low-Educated Women

	Estimate of Effect of Minimum Wage	Standard Error	Implied IV Estimate of Effect of $1000 Income	Sample Mean
Birth weight (grams)	4.04***	(1.16)	8.468	3268.55
Low birth weight	-0.00090**	(0.00043)	-0.002	0.08
Fetal growth	0.075***	(0.025)	0.160	84.06
Gestation Weeks	0.0073	(0.0075)	0.015	38.77
Preterm (Weeks<37)	-0.0015	(0.00077)	-0.003	0.12
# Prenatal Visits	0.17**	(0.074)	0.359	10.79
1st Trimester Care	0.010**	(0.004)	0.021	0.75
Prenatal Care Visits <5	-0.0034*	(0.0018)	-0.007	0.07
Any Prenatal Smoking	-0.014***	(0.0031)	-0.030	0.19
Smoking>5 Cigs. Daily	-0.0091***	(0.0029)	-0.019	0.14

Notes: Estimates from OLS regressions are reported in column 1. Standard errors are adjusted for arbitrary correlation in the errors across observations within each state, and reported in parentheses in column 2. Each estimate in column 1 represents the effect of a $1 increase in the real minimum wage in 2012 dollars averaged over 2 years prior to birth. Regression models include state, year, and month of birth fixed effects. Models also include the following individual-specific covariates: dummy variable indicators for age, race, ethnicity, marital status, and educational attainment; and the following state-specific covariates: employment-to-population ratio, unemployment rate, mean wage rate for males, mean wage rate for females, indicator for state EITC, indicator for refundable state EITC, state EITC as a % of federal EITC, indicator for AFDC waiver, indicator for TANF, fraction of pregnant women eligible for Medicaid, and the mean outcome rate among married college-educated mothers ages 25-39. Sample sizes range from 41.42 million to 43.94 million observations. Asterisks denote statistical significance as follows: *** p-value ≤ 0.01; ** 0.01 < p-value ≤ 0.05

Table 4. Estimates of the Effect of a One Dollar Increase in the Real Minimum Wage ($2012) on the Health of Infants Born to Low Educated Women in 1989-2012 By Age and Marital Status

					Age 18-29		Age 30-44	
Birth weight (grams)	Age 18-29	Age 30-44	Married	Single	Married	Single	Married	Single
Minimum wage	5.41***	-0.91	3.82***	2.56	6.19***	3.06**	-1.25	-4.08
	(1.39)	(2.00)	(1.04)	(1.46)	(1.22)	(1.39)	(1.96)	(3.37)
Implied IV Estimate Effect of $1000 Income	9.531	-2.279	7.115	5.164	9.497	6.814	-1.900	-14.559
Sample mean	3258.39	3300.41	3333.63	3193.82	3327.22	3194.42	3347.47	3190.56
Low birth weight								
Minimum wage	-0.00099**	-0.00039	-0.00097***	-0.00044	-0.0012***	-0.00042	-0.00055	0.0010
	(0.00045)	(0.00068)	(0.00033)	(0.00058)	(0.00033)	(0.00056)	(0.00053)	(0.0012)
Implied IV Estimate Effect of $1000 Income	-0.002	-0.001	-0.002	-0.001	-0.002	-0.001	-0.001	0.004
Sample mean	0.08	0.09	0.07	0.10	0.06	0.10	0.07	0.12
Fetal growth								
Minimum wage	0.10***	-0.019	0.054**	0.063**	0.10***	0.064**	-0.048	-0.037
	(0.028)	(0.046)	(0.022)	(0.030)	(0.021)	(0.029)	(0.045)	(0.073)
Implied IV Estimate Effect of $1000 Income	0.18	-0.05	0.10	0.13	0.15	0.14	-0.07	-0.13
Sample mean	83.68	85.27	85.51	82.40	85.15	82.31	86.28	82.92
Gestation Weeks								
Minimum wage	0.011	-0.0042	0.014**	-0.0019	0.019**	0.0026	0.0055	-0.030**
	(0.0082)	(0.0085)	(0.0068)	(0.011)	(0.0074)	(0.010)	(0.0082)	(0.012)
Implied IV Estimate Effect of $1000 Income	0.020	-0.011	0.027	-0.004	0.029	0.006	0.008	-0.106
Sample mean	38.84	38.57	38.90	38.63	39.00	38.69	38.68	38.31
Preterm (Weeks<37)								
Minimum wage	-0.0014	-0.0019	-0.0026***	0.000086	-0.0028***	0.000058	-0.0026**	0.00060
	(0.00076)	(0.00098)	(0.00080)	(0.00094)	(0.00079)	(0.00092)	(0.00099)	(0.0012)
Implied IV Estimate Effect of $1000 Income	-0.003	-0.005	-0.005	0.000	-0.004	0.000	-0.004	0.002
Sample mean	0.12	0.13	0.11	0.14	0.10	0.14	0.12	0.17

Notes: Coefficients from OLS models are reported. Each cell represents the effect of a $1 increase in the real minimum wage in 2012 dollars (based on an average of real minimum wage at birth, one year before birth, and two years before birth). Standard errors are adjusted for arbitrary correlation in the errors across observations within each state, and reported in parentheses. The models control for the state, year, and month of birth fixed effects. Models also include the following individual-specific covariates: indicators for age, race, ethnicity, marital status, and educational attainment; and the following state-specific covariates: employment-to-population ratio, unemployment rate, mean wage rate for males, mean wage rate for females, indicator for state EITC, indicator for refundable state EITC, state EITC as a % of federal EITC, indicator for AFDC waiver, indicator for TANF, fraction of pregnant women eligible for Medicaid, and the mean outcome rate among married college-educated mothers ages 25-39. Sample sizes range from 3.24 million to 33.26 million observations. Asterisks denote statistical significance as follows: *** p-value ≤ 0.01; ** 0.01 < p-value ≤ 0.05.

Table 5. Estimates of the Effect of a One Dollar Increase in the Real Minimum Wage ($2012) on Prenatal Care and Maternal Smoking of Low Educated Women in 1989-2012 By Age and Marital Status

					Age 18-29		Age 30-44	
# Prenatal Visits	Age 18-29	Age 30-44	Married	Single	Married	Single	Married	Single
Minimum wage	0.15**	0.21***	0.17**	0.16	0.16**	0.13	0.18***	0.25***
	(0.076)	(0.066)	(0.066)	(0.087)	(0.070)	(0.085)	(0.058)	(0.088)
Implied IV Estimate Effect of $1000 Income	0.272	0.529	0.317	0.317	0.239	0.299	0.272	0.884
Sample mean	10.72	11.01	11.27	10.24	11.22	10.25	11.37	10.16
1st Trimester Care								
Minimum wage	0.0085**	0.015***	0.011***	0.0080	0.0097**	0.0061	0.013***	0.016***
	(0.0041)	(0.0038)	(0.0037)	(0.0046)	(0.0038)	(0.0046)	(0.0034)	(0.0045)
Implied IV Estimate Effect of $1000 Income	0.01	0.04	0.02	0.02	0.01	0.01	0.02	0.06
Sample mean	0.73	0.79	0.80	0.69	0.79	0.68	0.82	0.71
Prenatal Care Visits <5								
Minimum wage	-0.0025	-0.0058***	-0.0039**	-0.0024	-0.0032**	-0.0014	-0.0049***	-0.0062**
	(0.0018)	(0.0018)	(0.0015)	(0.0025)	(0.0015)	(0.0023)	(0.0015)	(0.0030)
Implied IV Estimate Effect of $1000 Income	-0.004	-0.014	-0.007	-0.005	-0.005	-0.003	-0.007	-0.022
Sample mean	0.07	0.07	0.07	0.05	0.10	0.05	0.10	0.04
Any Prenatal Smoking								
Minimum wage	-0.015***	-0.010***	-0.012***	-0.018***	-0.010***	-0.020***	-0.014***	-0.00024
	(0.0036)	(0.0029)	(0.0024)	(0.0047)	(0.0028)	(0.0052)	(0.0028)	(0.0087)
Implied IV Estimate Effect of $1000 Income	-0.027	-0.025	-0.022	-0.036	-0.016	-0.045	-0.021	-0.001
Sample mean	0.20	0.17	0.15	0.24	0.16	0.23	0.13	0.26
Smoking>5 Cigs. Daily								
Minimum wage	-0.0094***	-0.0073**	-0.0054	-0.013***	-0.0038	-0.014***	-0.0077***	-0.0065
	(0.0028)	(0.0034)	(0.0032)	(0.0046)	(0.0037)	(0.0044)	(0.0027)	(0.0068)
Implied IV Estimate Effect of $1000 Income	-0.017	-0.018	-0.010	-0.027	-0.006	-0.032	-0.012	-0.023
Sample mean	0.15	0.13	0.12	0.17	0.13	0.16	0.11	0.19

Notes: Coefficients from OLS models are reported. Each cell represents the effect of a $1 increase in the real minimum wage in 2012 dollars (based on an average of real minimum wage at birth, one year before birth, and two years before birth). Standard errors are adjusted for arbitrary correlation in the errors across observations within each state, and reported in parentheses. The models control for the state, year, and month of birth fixed effects. Models also include the following individual-specific covariates: indicators for age, race, ethnicity, marital status, and educational attainment; and the following state-specific covariates: employment-to-population ratio, unemployment rate, mean wage rate for males, mean wage rate for females, indicator for state EITC, indicator for refundable state EITC, state EITC as a % of federal EITC, indicator for AFDC waiver, indicator for TANF, fraction of pregnant women eligible for Medicaid, and the mean outcome rate among married college-educated mothers ages 25-39. Sample sizes range from 2.81 million to 33.26 million observations. Asterisks denote statistical significance as follows: *** p-value ≤ 0.01; ** 0.01 < p-value ≤ 0.05.

Table 6. Estimates of the Effect of a One Dollar Increase in the Real Minimum Wage ($2012) on Maternal Characteristics

Dependent Var.	LTHS	HS	LTHS	Maternal Age	Ages 18-24	Ages 25-29	Ages 30-34	Ages 35-44	White	Black	Other Race	Married
Sample	All Mothers	All Mothers	HS or Below	HS or Below	HS or Below	HS or Below	HS or Below	HS or Below	HS or Below	HS or Below	HS or Below	HS or Below
Minimum Wage	-0.0116	0.0084	-0.0154	0.067	-0.0029	-0.0040**	0.0027	0.0041	0.0071	-0.003	-0.0042	0.0238**
	(0.0067)	(0.0059)	(0.0095)	(0.0771)	(0.0061)	(0.0019)	(0.0042)	(0.0026)	(0.0072)	(0.0043)	(0.0035)	(0.0098)
Observations	83607497	83607497	42788932	42788932	42788932	42788932	42788932	42788932	42788932	42788932	42788932	42788932

Notes: Coefficients from OLS models are reported. Each cell represents the effect of a $1 increase in the real minimum wage in 2012 dollars. Standard errors are adjusted for arbitrary correlation in the errors across observations within each state, and reported in parentheses. The models control for the state, year, and month of birth fixed effects. Models also include the following individual-specific covariates (when different from dependent variable): indicators for age, race, ethnicity, marital status, and educational attainment; and the following state-specific covariates: employment-to-population ratio, unemployment rate, mean wage rate for males, mean wage rate for females, indicator for state EITC, indicator for refundable state EITC, state EITC as a % of federal EITC, indicator for AFDC waiver, indicator for TANF, fraction of pregnant women eligible for Medicaid, and the mean outcome rate among married college-educated mothers ages 25-39. Asterisks denote statistical significance as follows: *** p-value ≤ 0.01; ** 0.01 < p-value ≤ 0.05.

Table 7. Estimates of the Effect of a One Dollar Increase in the Real Minimum Wage ($2012) on Infant Health, Prenatal Care and Maternal Smoking of Women with College or Higher Education Giving Birth in 1989-2012

	Estimate of Effect of Minimum Wage	Standard Error	Implied IV Estimate of Effect of $1000 Income	Sample Mean
Birth weight (grams)	2.02	(1.79)	10.688	3376.53
Low birth weight	0.000010	(0.00047)	0.000	0.06
Fetal growth	0.0062	(0.041)	0.033	86.70
Gestation Weeks	0.021	(0.013)	0.111	38.83
Preterm (Weeks<37)	-0.00012	(0.0012)	-0.001	0.10
# Prenatal Visits	0.15	(0.081)	0.794	12.25
1st Trimester Care	0.0075	(0.0046)	0.040	0.93
Prenatal Care Visits <5	-0.0019**	(0.00089)	-0.010	0.01
Any Prenatal Smoking	-0.0029	(0.0020)	-0.015	0.02
Smoking>5 Cigs. Daily	0.00074	(0.0079)	0.004	0.02

Notes: Estimates from OLS regressions are reported in column 1. Standard errors are adjusted for arbitrary correlation in the errors across observations within each state, and reported in parentheses in column 2. Each estimate in column 1 represents the effect of a $1 increase in the real minimum wage in 2012 dollars averaged over 2 years prior to birth. Regression models include state, year, and month of birth fixed effects. Models also include the following individual-specific covariates: dummy variable indicators for age, race, ethnicity, marital status, and educational attainment; and the following state-specific covariates: employment-to-population ratio, unemployment rate, mean wage rate for males, mean wage rate for females, indicator for state EITC, indicator for refundable state EITC, state EITC as a % of federal EITC, indicator for AFDC waiver, indicator for TANF, fraction of pregnant women eligible for Medicaid, and the mean outcome rate among married college-educated mothers ages 25-39. Sample sizes range from 19.63 million to 20.44 million observations. Asterisks denote statistical significance as follows: *** p-value ≤ 0.01; ** 0.01 < p-value ≤ 0.05

Appendix Table 1. Full Regression Results from Primary Model Specification for Low Educated Women Giving Birth in 1989-2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Birthweight	Low birthweight	Fetal growth	Gestation (weeks)	Preterm (Weeks<37)	#Prenatal Visits	1st Trimester Care	Prenatal Care Visits <5	Months delayed prenatal care	Any Prenatal Smoking	Smoke>5 cigs
Minimum Wage	4.03914***	-0.00090**	0.07505***	0.00732	-0.00147*	0.17121**	0.01004**	-0.00336*	-0.08333***	-0.01441***	-0.00914***
	(1.16154)	(0.00043)	(0.02534)	(0.00754)	(0.00077)	(0.07356)	(0.00403)	(0.00176)	(0.02249)	(0.00314)	(0.00288)
Maternal Age											
Age 2	30.11924***	0.00303***	0.99323***	-0.11704***	0.00381***	0.12524***	0.04031***	0.00125	-0.12691***	0.02234***	0.02693***
	(4.02077)	(0.00098)	(0.08696)	(0.01078)	(0.00094)	(0.02501)	(0.00238)	(0.00159)	(0.01293)	(0.00306)	(0.00290)
Age 3	29.94018***	0.01320***	1.31920***	-0.29501***	0.01728***	0.13714***	0.04982***	0.00293	-0.14591***	0.01767***	0.02671***
	(5.77673)	(0.00144)	(0.13241)	(0.01353)	(0.00119)	(0.04036)	(0.00341)	(0.00229)	(0.01861)	(0.00402)	(0.00369)
Age 4	1.39743	0.03143***	1.06982***	-0.54668***	0.04213***	0.05843	0.03354***	0.01179***	-0.04584	0.01328***	0.02477***
	(6.76577)	(0.00194)	(0.17164)	(0.01196)	(0.00142)	(0.06189)	(0.00459)	(0.00328)	(0.02760)	(0.00430)	(0.00422)
High School	47.40308***	-0.01205***	1.13473***	0.02207**	-0.01042***	0.88472***	0.07437***	-0.04679***	-0.41027***	-0.10953***	-0.08933***
	(4.91052)	(0.00164)	(0.11757)	(0.01018)	(0.00125)	(0.08143)	(0.00792)	(0.00506)	(0.03851)	(0.01079)	(0.00922)
Race/Ethnicity											
Black	-179.72625***	0.05111***	-3.56465***	-0.61791***	0.06154***	-1.11542***	-0.07787***	0.05520***	0.42368***	-0.17955***	-0.15982***
	(5.24839)	(0.00153)	(0.11850)	(0.01533)	(0.00172)	(0.04697)	(0.00481)	(0.00369)	(0.02169)	(0.01183)	(0.01110)
Other Race	-55.29156***	-0.00384**	-1.07748***	-0.13352***	0.01090***	-1.09137***	-0.10299***	0.03265***	0.44430***	-0.15829***	-0.13266***
	(13.60465)	(0.00160)	(0.32777)	(0.02611)	(0.00239)	(0.09870)	(0.00657)	(0.00482)	(0.02646)	(0.01174)	(0.00861)
Hispanic	69.10092***	-0.02626***	1.85548***	-0.02327	0.00121	-0.86457***	-0.09742***	0.01582*	0.41582***	-0.24805***	-0.19453***
	(11.88001)	(0.00335)	(0.27826)	(0.03291)	(0.00374)	(0.16433)	(0.01330)	(0.00822)	(0.05732)	(0.02596)	(0.02129)
Married	80.37903***	-0.02243***	1.80840***	0.13447***	-0.02368***	0.69012***	0.07341***	-0.03809***	-0.42002***	-0.12747***	-0.08571***
	(5.47638)	(0.00167)	(0.13873)	(0.00914)	(0.00141)	(0.03088)	(0.00267)	(0.00138)	(0.01231)	(0.01104)	(0.00861)
Cigarette excise tax	0.07704***	-0.00002**	0.00147***	0.00028***	-0.00002**	0.00031	0.00003	-0.00002	-0.00006	0.00001	0.00003
	(0.01785)	(0.00001)	(0.00040)	(0.00009)	(0.00001)	(0.00079)	(0.00006)	(0.00002)	(0.00026)	(0.00010)	(0.00007)
State EITC	-9.14184	0.00259	-0.16425**	-0.03129	0.00153	-0.24940	0.00217	0.00605	0.08976	-0.00478	-0.00443
	(5.75967)	(0.00228)	(0.08034)	(0.04199)	(0.00272)	(0.19405)	(0.01168)	(0.00885)	(0.08909)	(0.00950)	(0.00771)
State EITC	6.77476	-0.00280	0.08643	0.04950	-0.00138	0.02273	-0.00681	-0.00203	-0.03791	-0.00534	-0.00731
Refundable	(4.80928)	(0.00211)	(0.06502)	(0.03464)	(0.00231)	(0.10479)	(0.00994)	(0.00522)	(0.05433)	(0.01221)	(0.01225)
State EITC	0.57364*	-0.00016	0.00737*	0.00367*	-0.00022*	0.01672**	0.00019	-0.00051	-0.00600*	-0.00007	-0.00022
(% of Federal EITC)	(0.29879)	(0.00011)	(0.00372)	(0.00211)	(0.00012)	(0.00721)	(0.00039)	(0.00035)	(0.00348)	(0.00049)	(0.00043)
AFDC Waiver	-1.04871	0.00081*	-0.01242	0.00347	0.00021	-0.08489	-0.00173	0.00382**	0.04191*	0.02870**	0.02043*
	(1.30462)	(0.00045)	(0.02377)	(0.00764)	(0.00065)	(0.05857)	(0.00371)	(0.00167)	(0.02247)	(0.01402)	(0.01035)
TANF	-1.19185	0.00030	-0.01567	-0.00919	0.00088	-0.07859	-0.00617*	0.00299	0.03348	0.01505	0.01071
Implementation	(2.27910)	(0.00063)	(0.04773)	(0.00858)	(0.00096)	(0.09115)	(0.00314)	(0.00191)	(0.02408)	(0.01260)	(0.00769)
Medicaid eligibility	-8.62878	-0.00218	-0.23779	0.02841	-0.00523	-0.39500	-0.02645	0.00273	-0.00005	0.04519	0.03454
for pregnant women	(12.24710)	(0.00462)	(0.27628)	(0.05687)	(0.00627)	(0.64652)	(0.03805)	(0.02301)	(0.23772)	(0.02883)	(0.02821)
Mean outcome among	0.47763***	0.22642***	0.36093***	0.71103***	0.58939***	0.80726***	1.83759***	1.45497***	1.19573***	0.57838**	0.94822***
married college	(0.06544)	(0.05763)	(0.05659)	(0.04788)	(0.06657)	(0.08873)	(0.10160)	(0.31368)	(0.04571)	(0.22675)	(0.00715)
graduate mothers											
N	43937610	43937610	43937358	43937419	43937695	43934570	43934739	43934570	43934739	41418812	42028755

Notes: All regressions include state, year, and month of birth fixed effects.

Appendix Table 2. Estimates of the Effect of a One Dollar Increase in the Real Minimum Wage on the Health and Maternal Health Behaviors, Infants Born to Low Educated Women in 1989-2012

	Alternative Model Specifications				
Outcomes	(1)	(2)	(3)	(4)	(5)
Birthweight	5.78***	4.04***	3.81***	3.77***	4.29***
	(1.60)	(1.16)	(1.22)	(1.13)	(1.17)
Low birthweight	-0.0013***	-0.00090**	-0.00083	-0.00075	-0.00096**
	(0.00044)	(0.00043)	(0.00046)	(0.00037)	(0.00040)
Fetal growth	0.077**	0.075***	0.070**	0.060**	0.089***
	(0.034)	(0.025)	(0.027)	(0.024)	(0.030)
Gestation Weeks	0.037***	0.0073	0.0066	0.010	0.011
	(0.011)	(0.0075)	(0.0077)	(0.0071)	(0.0060)
Preterm (Weeks<37)	-0.0026**	-0.0015	-0.0014	-0.0019**	-0.0013
	(0.0013)	(0.00077)	(0.00083)	(0.00073)	(0.00081)
# Prenatal Visits	0.31**	0.17**	0.17**	0.17**	0.052**
	(0.12)	(0.074)	(0.076)	(0.068)	(0.021)
1st Trimester Care	0.029**	0.010**	0.0098**	0.010***	0.0042
	(0.012)	(0.0040)	(0.0043)	(0.0038)	(0.0026)
Prenatal Care Visits <5	-0.0077***	-0.0034	-0.0032	-0.0038**	-0.0025***
	(0.0027)	(0.0018)	(0.0019)	(0.0017)	(0.00073)
Any Prenatal Smoking	-0.019***	-0.014***	-0.015***	-0.013***	-0.0070
	(0.0043)	(0.0031)	(0.0033)	(0.0029)	(0.0045)
Smoke>5 cigs	0.0049	-0.0091***	-0.0095***	-0.0077**	-0.0046**
	(0.011)	(0.0029)	(0.0031)	(0.0032)	(0.0018)
Model Specifications					
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year and Month of Birth Fixed Effects	Yes	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes
State Controls	No	Yes	Yes	Yes	Yes
Mean Outcome of Married/College Mothers	No	Yes	Yes	Yes	Yes
Year*Month Fixed Effects	No	No	Yes	No	No
Demographic*Year Fixed Effects	No	No	No	Yes	No
State*Year Fixed Effects	No	No	No	No	Yes

Notes: Estimates from OLS regressions are reported in each cell with standard errors in parentheses. Standard errors are adjusted for arbitrary correlation in the errors across observations within each state. Each estimate represents the effect of a $1 increase in the real minimum wage in 2012 dollars averaged over 2 years prior to birth. Sample sizes range from 41.42 million to 43.94 million observations. Asterisks denote statistical significance as follows: *** p-value ≤ 0.01; ** 0.01 < p-value ≤ 0.05; * 0.05 < p-value ≤ 0.10.

Appendix Table 3. Estimates of the Effect of the Nominal Minimum Wage and Relative Minimum Wage on Infant Health and Maternal Health Behaviors, Infants Born in 1989-2012 to Low-Educated Women

	Nominal Minimum Wage	Relative Minimum Wage	Sample Mean
Birth weight (grams)	5.60***	8.63***	3268.55
	(1.53)	(1.98)	
Low birth weight	-0.0014**	-0.0022***	0.08
	(0.0006)	(0.0007)	
Fetal growth	0.099***	0.15***	84.06
	(0.033)	(0.046)	
Gestation Weeks	0.012	0.025**	38.77
	(0.0093)	(0.011)	
Preterm (Weeks<37)	-0.0020*	-0.0030**	0.12
	(0.0010)	(0.0011)	
# Prenatal Visits	0.25**	0.31**	10.79
	(0.11)	(0.13)	
1st Trimester Care	0.014**	0.014**	0.75
	(0.0058)	(0.0070)	
Prenatal Care Visits <5	-0.0055*	-0.0078**	0.07
	(0.0029)	(0.0033)	
Any Prenatal Smoking	-0.021***	-0.021***	0.19
	(0.0057)	(0.0059)	
Smoking>5 Cigs. Daily	-0.013***	-0.013***	0.14
	(0.0042)	(0.0039)	

Notes: Estimates from OLS regressions are reported in column 1. Standard errors are adjusted for arbitrary correlation in the errors across observations within each state, and reported in parentheses. Regression models include state, year, and month of birth fixed effects. Models also include the following individual-specific covariates: dummy variable indicators for age, race, ethnicity, marital status, and educational attainment; and the following state-specific covariates: employment-to-population ratio, unemployment rate, mean wage rate for males, mean wage rate for females, indicator for state EITC, indicator for refundable state EITC, state EITC as a % of federal EITC, indicator for AFDC waiver, indicator for TANF, fraction of pregnant women eligible for Medicaid, and the mean outcome rate among married college-educated mothers ages 25-39. Sample sizes range from 41.42 million to 43.94 million observations. Asterisks denote statistical significance as follows: *** p-value ≤ 0.01; ** 0.01 < p-value ≤ 0.05

Appendix Table 4. Estimates of the Effect of a One Dollar Increase in the Real Minimum Wage ($2012) on Infant Health and Maternal Health Behaviors Considering Alternative Timings of the Minimum Wage

Outcome	Birthweight	Low birthweight	Fetal growth	Gestation (weeks)	Preterm (Weeks<37)	#Prenatal Visits	1st Trimester Care	Prenatal Care Visits <5	Any Prenatal Smoking	Smoke>5 cigs
Panel A										
Avg. MW (pregnancy)	3.94**	-0.00060	0.070**	0.014*	-0.0019**	0.19*	0.010	-0.0042*	-0.0053	0.00074
	(1.54)	(0.00037)	(0.031)	(0.0077)	(0.00073)	(0.098)	(0.0061)	(0.0022)	(0.0039)	(0.0047)
Avg. MW (1 yr. prior to pregnancy)	1.43*	-0.00067*	0.022	-0.0013	-0.000037	0.048	0.0033	-0.00070	-0.016**	-0.014***
	(0.76)	(0.00036)	(0.022)	(0.0054)	(0.00047)	(0.031)	(0.0022)	(0.0011)	(0.0060)	(0.0046)
Panel B										
Avg, MW (pregnancy)	4.22***	-0.00070*	0.076**	0.014*	-0.0021**	0.19*	0.011	-0.0048*	-0.0031	0.0023
	(1.55)	(0.00039)	(0.031)	(0.0080)	(0.00083)	(0.11)	(0.0066)	(0.0026)	(0.0042)	(0.0052)
Avg. MW (2 yrs. prior to pregnancy)	1.42	-0.00066*	0.016	-0.0012	0.000046	0.056	0.0039	-0.00089	-0.022**	-0.019***
	(0.97)	(0.00038)	(0.026)	(0.0071)	(0.00053)	(0.037)	(0.0030)	(0.0013)	(0.0086)	(0.0068)
Sample Mean	3268.55	0.08	84.06	38.77	0.12	10.79	0.75	0.07	0.19	0.14