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Real and Permanent Minimum Wages*

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Abstract We study heterogeneity in minimum wage policy design and in the employment effects of minimum wage increases. Specifically, we study whether indexing minimum wages to inflation and differences in county-level wages and mobility rates lead to heterogeneous employment effects following minimum wage increases. We find evidence that they do. To the best of our knowledge, this paper is the first to empirically study inflation indexing. Our preferred specifications imply that the disemployment effect of indexing minimum wages to inflation is over 2.5 times the magnitude of the disemployment effect associated with nominal minimum wage increases. We also find variance in the effect of minimum wage increases on employment across low- and high-wage counties – employment in low-wage counties is considerably more sensitive to minimum wage increases than employment in high-wage counties. And we provide preliminary evidence that less mobile counties have larger disemployment effects from minimum wage increases than higher mobility counties.

Keywords: Minimum wage, inflation, price levels.

JEL Classifications: E31, J08, J38.

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1 Introduction

The size of the minimum wage literature is unsurprising given the minimum wage’s importance in assessing different models of the labor market and its prominence in policy debates. It is a credit to today’s economists that, despite hundreds of existing studies¹, in the past decade the minimum wage literature continues to grow, introducing productive debate over new empirical methods (e.g., Dube, Lester, Reich, 2010; Neumark, Salas and Wascher, 2014; Clemens and Wither, 2014; Clemens, 2015; Dube and Zipperer, 2015) and extending minimum wage analysis to study new topics – including, among others, the effect of minimum wages on prices, turnover, and worker performance (Hirsch, Kaufman, and Zelenska, 2015), on poverty (Sabia and Burkhauser, 2010), on where immigrants choose to locate (Orrenius and Zavodny, 2008), on worker flows (Gittings and Schmutte, forthcoming), on job growth (Meer and West, 2015), and even on youth drinking and drunk driving (Sabia, Pitts, and Argys, 2014) – often motivated by a richer understanding of the economics of minimum wages.

We build on these developments by continuing to move the literature beyond “the” employment impacts of minimum wages. This paper studies heterogeneity, both across geography and across policy design. Specifically, this paper asks whether three factors – the indexing of minimum wages to inflation, local wages, and local mobility rates – lead to heterogeneous employment effects of minimum wages.

We find evidence which suggests they do. Our results suggest that indexing produces larger disemployment effects than nominal minimum wage increases. Our preferred specifications imply that the disemployment effect of indexing minimum wages to inflation is over 2.5 times the magnitude of the disemployment effect associated with nominal minimum wage increases. To the best of our knowledge, our paper is the first to empirically study the effects of this minimum-wage policy design. In addition, we find that counties with

¹A recent Google Scholar search found well over 5,000 papers with the exact phrase “minimum wage” in the title of the article.

relatively low wages experience larger disemployment effects than those with higher wages. Our preferred specifications suggest considerable variance in the effect of minimum wage increases on employment across low- and high-wage counties, and suggest that employment in low-wage counties is considerably more sensitive to minimum wage increases than employment in high-wage counties. And we provide preliminary evidence that less mobile counties experience larger disemployment effects of minimum wages than higher-mobility counties.

Given costly capital investment and transition costs, firms may be reluctant to change their labor force specifically and production functions generally in response to a nominal minimum wage increase under the expectation that such an increase will be temporary, eaten away as prices rise (Sorkin 2015). This suggests that indexing minimum wages to inflation – and thereby making them “permanent” – could induce a very different response to minimum wage increases on the part of firms. If firms think they will have to live with higher and growing minimum wages into the long term, they may be much more willing to adjust their production functions, including their labor forces, in response to the increase. In addition, the decision of firms to exit and enter the market may be affected by the prospect of permanently increasing labor costs.

We find that permanent minimum wages do have stronger disemployment effects than nominal minimum wage increases. Our (precisely estimated) estimates for the traditional impact of the minimum wage on employment in the restaurant sector find small negative impacts, ranging from -0.056 to -0.189. Our (precisely estimated) estimates of the impact of the permanent minimum wage on employment range from -0.282 to -0.646.

Lower-wage counties should be expected to respond relatively more strongly to minimum wage increases because their effect will be stronger among areas with lower local wages. While local wages have long been included as a control in many minimum wage studies, to our knowledge, we are the first to explicitly quantify this effect. We find that the disemployment effect of minimum wages is relatively smaller in counties with relatively higher local wages. For example, the county at the 25th percentile of the wage distribution (Madison County,

Iowa) has an employment elasticity of -0.050, whereas the county at the 75th percent of the distribution (Seneca County, New York) has an elasticity of -0.001.

Finally, we study whether lower-mobility counties are differentially affected by minimum wages. Our results are preliminary, but they do provide suggestive evidence that lower-mobility counties (as determined by Chetty et al., 2014) experience stronger disemployment effects from minimum wages than do higher-mobility counties.

2 Related Literature

The economics literature on minimum wages is massive in size, and we do not attempt to survey it here. For excellent surveys, see Neumark and Wascher (2008), Card and Krueger (1995), and Brown (1999). We provide a broad review of the literature that is directly relevant to our paper. Specifically, we survey the literature as it relates to inflation-adjusting minimum wages, how the employment effects of minimum wage increases might vary across counties with different average wages, how employment effects may vary across areas characterized by differing rates of economic mobility, and on empirical strategies.

2.1 “Permanent” Minimum Wages

Economics majors are often surprised by the saw-tooth pattern of inflation-adjusted minimum wages over time. This commonly used graph is a useful heuristic to teach undergraduates the important lesson that inflation erodes nominal quantities over time.

It is less remarked upon both by economists and the policy community that the saw-tooth pattern indicates that the real value of the minimum wage has had a (relatively) flat trend since the 1960s. In other words, in real terms, the minimum wage hasn’t experienced nearly as much of an increase of any sustained length of time as its nominal value suggests.²

This fact has significant implications for interpreting the existing literature on minimum

²The inflation-adjusted trend is obviously sensitive to the measure of inflation used in the calculation. But broadly speaking, the point remains.

wages. Most of the minimum wage literature estimates short-run employment responses – often contemporaneous, within quarter. Short-run responses don’t leave much room for employment effects that are driven by the slower process of substituting capital for labor, or by other adjustments that likely take longer than three months (Baker, Benjamin, and Stranger, 1999; Hamermesh, 1995). Still, the literature’s focus on the short-run response of employment to minimum wage increases is reasonable given relatively high turnover rates and hours flexibility in industries that employ large numbers of minimum wage workers (Brown, Gilroy, and Kohen, 1982; Card and Krueger, 1995).

In addition, the literature’s focus on the short-run response is reasonable if firms expect the minimum wage increase to be temporary, and therefore don’t engage in structural changes to their production functions in response to it. But the employment elasticity of an inflation-adjusted – permanent – minimum wage increase may be very different than the employment elasticity of a nominal, temporary minimum wage increase (Sorkin 2015).

These issues were understood clearly seven decades ago by Richard A. Lester, writing in the *American Economic Review* in March 1946: “From much of the literature the reader receives the impression that methods of manufacture readily adjust to changes in the relative costs of productive factors. But the decision to shift a manufacturing plant to a method of production requiring less or more labor per unit of output because of a variation in wages is not one that the management would make frequently or lightly. Such action involves the sale (at a loss?) of existing facilities not usable under the new method and the purchase of new facilities and equipment to replace those discarded, to say nothing of retraining workers and readapting the whole organization. Such new investment presumably would not be undertaken simply to reduce a current and expected net loss, or *if there was a likelihood that the wage change would only be temporary* or that the cost relationships between factors would be considerably altered again in the near future” (italics ours).

Minimum wage increases have been temporary for the entire existence of modern empirical labor economics – until the last several years. The literature stretching back at least

to Lester suggests that forward-looking firms may react quite differently to a permanent increase in the cost of low-skilled labor than they do to temporary increases. We seek to test that in this paper.

2.2 “Real” Minimum Wages

Economists have been interested in the “bite” of the minimum wage for decades (e.g., Kaitz, 1970) and that interest continues to the present day (Garnero, Kampelmann, and Rycx, 2013; Clemens and Wither, 2014; Clemens, 2015; Hirsch, Kaufman, and Zelenska, 2014). It has been common in the literature to include control variables for macroeconomic conditions, such as overall demand, in order to avoid confounding employment effects from minimum wage increases with other drivers of employment changes. And papers often limit their estimation sample to industries and types of workers for which the minimum wage will plausibly have an effect – e.g., by focusing on employment among teenagers and young adults (Neumark and Wascher, 1992), employment among lesser-skilled workers (Burkhauser, Couch, and Wittenburg, 2000a), or employment among low-wage industries (Dube, Lester, and Reich, 2010).

In addition, the early papers of the “new minimum wage literature” featured debate over how to properly measure changes in the minimum wage itself, out of concern for appropriately capturing its “bite.” Should the Kaitz index be used, or the log of the binding minimum wage in each state (e.g., Neumark and Wascher, 1992; Card, Katz, and Krueger, 1994; Neumark and Wascher, 1994)? Should year effects be included (Burkhauser, Couch, and Wittenburg, 2000b)?

Some authors include a measure of the adult wages, both to capture macroeconomic conditions that would impact youth employment rates and because economic theory suggests it belongs in a labor demand equation (Card and Krueger, 1995; Burkhauser, Couch, and Wittenburg, 2000b). More recent research uses identification strategies that include geographic and time effects to control for these confounding factors.

We take a different approach. Rather than trying to control for the bite – which yields an average effect, giving more weight to regions with a “bigger bite” – we attempt to estimate and quantify the differential employment impact of minimum wage increases across counties, thereby allowing regions with different bites to have different employment effects. This approach is similar to that used by Thompson (2009) who found that teenagers in high-impact regions were more negatively impacted by minimum wage increases than were teenagers in low-impact regions.

Our specification allows the employment effect of the minimum wage to vary across counties with different local wages. This is of interest because it is plausible that the minimum wage has quite different employment effects in lower-wage counties than it does in higher-wage counties, either because of direct differences in wages or because wage differences reflect general differences in prices.

2.3 Minimum Wages and Mobility

Whether relatively vulnerable groups of workers have been disproportionately impacted by minimum wage increases has been a significant question in the minimum wage literature (Burkhauser, Couch, and Wittenburg, 2000a). Today, there is much concern in the public debate over economic mobility, and there is growing evidence that an individual’s environment matters significantly to his economic outcomes (Chetty, Hendren, and Katz, 2015; Chetty et al., 2014).

We seek to test whether the employment effects of the minimum wage vary by the economic mobility of counties, as measured by Chetty et al. (2014). The merits of minimum wage increases are surely driven in part by their employment effects among vulnerable populations, including among populations living in low-mobility areas.

2.4 Empirical Approach

There is currently a lively debate among labor economists over the appropriate econometric strategy for uncovering the employment effects of minimum wage increases. The canonical two-way fixed effects econometric model estimates the employment elasticity by exploiting minimum wage changes across jurisdictions using jurisdiction and time fixed effects. Another strategy can be likened to case studies. In a seminal paper, Card and Krueger (1994) provided a case study of New Jersey’s 1992 minimum wage increase by comparing New Jersey employment with employment in neighboring Pennsylvania, both before and after the increase. Dube, Lester, and Reich (2010) significantly advanced this empirical approach by generalizing it to the entire nation. In their paper, they compare counties that share a border but are located in different states – and whose workers are thus subject to different minimum wage laws – to estimate the employment effect of minimum wage increases. They are unable to find a statistically significant effect of minimum wages on employment.

Concerned about the possibility of heterogeneous trends across states, Dube, Lester, and Reich (2010) also include state-specific linear trends in some of their models. Allegretto, Dube, and Reich (2011) also provides support for the inclusion of state-specific linear trends in minimum wage research designs, which are used in some minimum wage specifications by Gittings and Schmutte (2015) as well.

But because these specifications include hundreds of fixed effects (county-pair-by-period effects, county-pair effects, etc.) and dozens of linear trends, it is natural to ask whether these models are “oversaturated.” In addition, these specifications exclude the many counties that do not lie on a state border, potentially ignoring a significant amount of useful information.

In a paper colorfully titled “Revisiting the Minimum Wage-Employment Debate: Throwing Out the Baby with the Bathwater,” Neumark, Salas, and Wascher (2014) write the following: “We think the central question is whether, out of their concern for avoiding minimum wage variation that is potentially confounded with other sources of employment change, Allegretto, Dube, and Reich (2011) and Dube, Lester, and Reich (2010) have thrown out so

much useful and potentially valid identifying information that their estimates are uninformative or invalid; that is, have they thrown out the baby along with – or worse yet, instead of – the contaminated bathwater? Our analysis suggests they have.”

The inclusion of state-specific linear trends warrants additional attention. It is clearly the case that state minimum wages are not random, and unobserved factors that influence state minimum wages may also influence employment (Allegretto et al., 2015). The canonical two-way fixed effects econometric model – using within-state and within-time-period variation – validly identifies the effect of the minimum wage on employment provided that the “treatment” and “control” states are on “parallel employment trends” prior to the minimum wage increase. Controlling for state-specific trends, then, is intuitive, and may be prudent.

Meer and West (2015) provide evidence that state-specific (really, jurisdiction-specific) time trends bias estimates of the effect of minimum wage increases towards zero. The results estimated by Clemens and Wither (2014) are robust to including state-specific linear time trends, though the authors write that they “share Meer and West’s concern that, because of the dynamics with which minimum wage induced employment losses may unfold, direct inclusion of state-specific trends is not a particularly attractive method for controlling for the possibility of differential changes in the economic conditions of each state over time.” In a separate context – an investigation of whether unilateral divorce laws raise divorce rates – Wolfers (2006) succinctly summarizes the potential problem with including jurisdiction-specific time trends in models designed to estimate the effect of a policy that likely has dynamic effects: “A major difficulty in difference-in-difference analyses involves separating out preexisting trends from the dynamic effects of a policy shock.” Wolfers observes that “state-specific trends may pick up the effects of a policy and not just preexisting trends.”

In this paper, we present results generated on both a county-pair sample and on the traditional all-county sample. In addition, we present results both with and without state-specific linear trends. The presence of the trends is determinative in our analysis of permanent minimum wages, which we discuss in section five.

3 Data

The Quarterly Census of Employment and Wages (QCEW) program, formerly known as the ES-202 program, is a cooperative statistical program administered by the Bureau of Labor Statistics (BLS) and State Employment Security Agencies. The data provide monthly employment levels, quarterly wages, and quarterly establishment counts by industry for the U.S. as a whole and at the state and county levels.

The QCEW data are based on quarterly reports that are submitted by nearly all employers in the U.S., Puerto Rico, and the U.S. Virgin Islands. Included in the employment numbers are workers who are covered by the U.S. Unemployment Insurance system – 97 percent of all wage and salary civilian employment.³

This paper uses county-level QCEW data by industry from the first quarter of 1990 through the third quarter of 2012. Following Dube, Lester, and Reich (2010) (hereafter, DLR), we restrict our data to privately owned restaurants which include the industry groups full-service restaurants and limited-service eating places⁴. Our restaurant earnings variable is the average across the QCEW’s average weekly wage in those industries. To calculate quarterly employment, we take the average across the three months of employment data in each quarter. We then sum across the two industries in our data to obtain total restaurant employment.⁵

We create two samples for our analysis. The first sample is a county-level dataset that includes 3,108 counties in the United States. The second sample consists of 1,178 adjacent

³Workers who are not in the QCEW employment counts include self-employed workers, most agricultural workers on small farms, all members of the Armed Forces, elected officials in most states, most employees of railroads, some domestic workers, most student workers at schools, and employees of certain small nonprofit organizations.

⁴The QCEW uses the North American Industry Classification System (NAICS). From 1990 through 2006 and from 2007 through 2010, the QCEW uses NAICS 2002 and NAICS 2007, respectively. After 2010, the QCEW uses NAICS 2012. Full-service restaurants and limited-service eating places change codes from NAICS 2002/2007 to NAICS 2012; they shift from 7221 to 722511 and 7222 to 722513, respectively. See the robustness section for analyses on other industries: Accommodation and food services (NAICS 72), retail trade (NAICS 44-45), and manufacturing (NAICS 31-33).

⁵In our samples, we exclude observations for which the QCEW’s disclosure code is non-missing; a non-missing disclosure code indicates that the data are suppressed to protect confidentiality.

border-county-pairs; we use the list of county-pairs generously provided by DLR to create this dataset. In both samples, counties have at most 91 quarters of data between the first quarter of 1990 and the third quarter of 2012.⁶ In both samples, Puerto Rico and the U.S. Virgin Islands are excluded from the sample. In the contiguous county sample, Alaska and Hawaii are excluded as they do not border another state. Table 2 reports summary statistics for all relevant variables.

In addition to using data from the QCEW, our analysis uses state minimum wage data and population data. We use government-sourced data and data from DLR to populate our database of minimum wages.⁷ The Census Bureau also provides annual, county-level population estimates. We keep only those estimates that approximate the number of people living in the county as of July 1st of the relevant year.

Our analysis seeks to understand how minimum wages affect employment by taking into account local wage variation, minimum wages that are indexed to inflation, and intergenerational mobility. To measure quarterly local wage variation – relevant in and of itself, and because it proxies for local prices generally – we calculate average county-level wages across all privately owned industries.

Between 1998 and 2006, several states passed legislation that indexed their minimum wages to the rate of price inflation. In our sample, these states are Arizona, Florida, Nevada, Oregon, Washington, Colorado, Missouri, Montana, Vermont, and Ohio.⁸ We use the relevant state government’s website to identify the year and quarter that the inflation adjustment became effective.

To account for intergenerational mobility, we use the rank-rank measure calculated in Chetty et al. (2014). Chetty et al.’s measure is estimated on data from federal income tax

⁶We analyze balanced panels as a robustness check.

⁷In 2004 San Francisco started setting its minimum wage independent of the state of California. We incorporate its minimum wage rates at the county-level. For more information on San Francisco’s minimum wage, see “Minimum Wage Ordinance (MWO),” City and County of San Francisco. Santa Fe, NM and Albuquerque, NM also set their own minimum wages independent of New Mexico. We do not take into account those cities’ minimum wages as they are not set at the county level.

⁸Table 1 reports years between 1999 and 2007; those are the years the legislation became effective.

records for the period from 1996 through 2012: “We use a rank-rank specification similar to that used by Dahl and DeLeire (2008). We rank children based on their incomes relative to other children in the same birth cohort. We rank parents of these children based on their incomes relative to other parents with children in these birth cohorts. We characterize mobility based on the slope of this rank-rank relationship, which identifies the correlation between children’s and parents’ positions in the income distribution.”

This measure computes the percentile rank in the income distribution of the i th child (c_i) and of the i th’s child’s parents (p_i) and regresses the child’s rank against the parent’s rank, generating what Chetty et al. define as “the rank-rank slope,” which measures the relationship between a child’s position in the income distribution and his parents’ position. Parent income is defined as average income over the five years from 1996 to 2000. Child income is defined as average income in the two years, 2011 and 2012, when children are in their early 30s. The rank-rank slope is defined at the county level. See Chetty et al. for a detailed description.

Summary statistics for our data are presented in Table 2. The first two columns report the mean and standard deviation for the all-county sample, whereas the last two columns show the county-pair sample. Across the U.S., the restaurant sector employs about 3,600 people in each county, and those restaurant workers earn \$177 per week. The retail sector employs 4,679 people on average, and pays \$335 a week. The manufacturing sector is even larger, employing 5,667 people, and pays higher wages, average \$634 a week. Over the years 1990-2012, the average minimum wage is \$5.37 per hour.

4 Empirical Methods

We start by following the standard approach in the literature and estimate variants of a difference-in-differences model of the following form:

$$\ln(y_{it}) = \alpha + \beta \ln(MW_{it}) + \delta \ln(pop_{it}) + \phi_i + \tau_t + \epsilon_{it} \quad (1)$$

where y_{it} is either the log of the average weekly wage in the restaurant sector for county i in quarter t or the log of the number of people employed in the restaurant sector. The independent variable of interest is the log of the relevant minimum wage in that county at time t , and the coefficient of interest is β . We include county fixed effects, represented in equation 1 as ϕ_i and quarter fixed effects, τ_t . When estimating employment effects, we also control for the log of county-level population $\ln(pop_{it})$.

We extend these models to allow for heterogeneous impacts of the minimum wage by interacting a variable which captures the characteristic of interest (permanent, local wages, or mobility) with the minimum wage variable. In the permanent treatment, the interaction term captures whether the impact of the minimum wage on wages and employment differs in states which have indexed their minimum wage to inflation. This model specification is:

$$\ln(y_{it}) = \alpha + \beta \ln(MW_{it}) + \gamma_1 [\ln(MW_{it}) * perm_{it}] + \eta perm_{it} + \delta \ln(pop_{it}) + \phi_i + \tau_t + \epsilon_{it} \quad (2)$$

where γ_1 captures the differential impact of a minimum wage policy that has been indexed to inflation.

Similarly, to capture how the impact of the minimum wage policy depends on local wage levels, we interact the minimum wage with a measure of local wages, $wage_{it}$.

$$\ln(y_{it}) = \alpha + \beta \ln(MW_{it}) + \gamma_2 [\ln(MW_{it}) * wage_{it}] + \eta wage_{it} + \delta \ln(pop_{it}) + \phi_i + \tau_t + \epsilon_{it} \quad (3)$$

In this specification, $wage_{it}$ is a continuous variable, whereas the $perm_{it}$ variable above is a dummy variable. Therefore γ_2 estimates the gradient of the relationship between minimum wages and employment as influenced by local wages.

The last characteristic that we study is the level of economic mobility in that county, $mobility_{it}$.

$$\ln(y_{it}) = \alpha + \beta \ln(MW_{it}) + \gamma_3 [\ln(MW_{it}) * mobility_{it}] + \delta \ln(pop_{it}) + \phi_i + \tau_t + \epsilon_{it} \quad (4)$$

This specification does not include the main $mobility_{it}$ term because we only have the county level measure of mobility for one point in time.

There are well-known concerns about the standard difference-in-differences model, arising most generally from the fact that a state’s minimum wage is not randomly assigned. The county effect is a powerful control, holding constant all time-invariant factors for each county. But even still, factors that move (perhaps slowly) over time could drive both lower employment in a state and could influence a state to adopt a higher minimum wage. We test whether this is a concern by computing the time paths of minimum wage effects, which we discuss below.

In addition, we estimate models in the spirit of the innovative research design employed by DLR and estimate specifications similar to those above on a “contiguous-border-county pair” sample. Specifically, we limit the estimation sample to counties that share a common border but that are located in different states (“county pairs”). The analogous specification for this sample is:

$$\ln(y_{ipt}) = \alpha + \beta \ln(MW_{it}) + \delta \ln(pop_{it}) + \phi_i + \tau_t + \epsilon_{ipt} \quad (5)$$

where y_{ipt} represents the employment in the restaurant sector in county i that is part of county-pair p at time t . We estimate variants of this equation as well, which include different combinations of county effects, period effects, county-pair effects, and county-pair-by-period effects.

Whether the county-pair research design is most appropriate is a subject of active debate in the literature. We do not attempt to adjudicate this debate. Rather, for each of the specifications used in the following analysis, we estimate both the standard all-county specification and the county-pair specification.

The identifying assumption in all these models is that there is zero covariance between any residual determinant of employment and the product $\ln(MW_{it}) * C$, where $C \in$

$\{perm, localwages, mobility\}$. One way to assess the validity of this assumption is to analyze the trends in employment before the treatment occurred. This is also helpful in determining whether including state-specific linear trends — designed to correct for pre-treatment trend differences — is appropriate, or whether doing so “throws the baby out with the bathwater” (Neumark, Salas, and Wascher, 2014).

To check, we estimate the model:

$$\ln(y_{ipt}) = \alpha + \sum_{j=-4}^7 [\beta_{-2j} \Delta_2 \ln(MW_{i,t+2j})] + \beta_{-16} \ln(MW_{i,t-16}) + \delta \ln(pop_{it}) + \phi_i + \tau_t + \epsilon_{ipt} \quad (6)$$

This specification provides estimates of the impact of the minimum wage spanning 25 quarters, from 16 quarters after to the minimum wage change to 8 quarters prior. Δ_2 represents a two-quarter different operator, so the coefficients represent cumulative changes to each of the leads and lags of the minimum wage. We estimate this model for both of our samples (all-county and county-pair) and each of our four specifications (base, permanent, local wages, and mobility). For this base specification, with no interactions, the β coefficients are plotted in Figure 1. In the case of the specifications with interactions, the above specification can easily be modified to also analyze the leads and lags of both the interaction term and the main effect of the characteristic of interest ($C \in \{perm, localwages, mobility\}$).

$$\begin{aligned} \ln(y_{ipt}) = & \alpha + \sum_{j=-4}^7 [\beta_{-2j} \Delta_2 \ln(MW_{i,t+2j})] + \beta_{-16} \ln(MW_{i,t-16}) \\ & + \sum_{j=-4}^7 \{ \gamma_{-2j} \Delta_2 [\ln(MW_{i,t+2j}) * C_{i,t+2j}] \} + \gamma_{-16} [\ln(MW_{i,t-16}) * C_{i,t-16}] \\ & + \sum_{j=-4}^7 [\eta_{-2j} \Delta_2 C_{i,t+2j}] + \eta_{-16} C_{i,t-16} \\ & + \delta \ln(pop_{it}) + \phi_i + \tau_t + \epsilon_{ipt} \end{aligned} \quad (7)$$

In this specification, the γ 's capture the cumulative impact of the interaction term on the

outcome. We plot these γ 's for each of the specifications and outcome variables in Figures 2-4.

In these figures, the absence of coefficients that differ statistically significantly from zero before the treatment period lends support to the use of our difference-in-differences technique. The figures also support excluding state-specific linear trends from our all-county models. The vast majority of the graphs seem to show that the impact of the minimum wage policy before it was implemented is not significantly different from zero. We conclude that state linear trends may be “overcontrolling” in our models, capturing the effect of the policy change instead of isolating it. Regardless, for completeness, we present estimates including state-specific linear trends below.

5 Results

Table 3 reports the results of the traditional analysis of the minimum wage, measuring its impact on earnings and employment. Columns 1 through 3 report results estimated on the all-county sample, and columns 4 through 7 report results estimated on the county-pair sample. Model estimates reported in each column include different combinations of control variables, which are reported in the table.

In all specifications, the impact of changes in the minimum wage on earnings is statistically significant with the estimates ranging from 0.178 to 0.294. The bottom panel reports the estimates for the impact of the minimum wage on employment. The results we find are consistent with the previous literature: depending on the combination of control variables, the coefficient on the minimum wage is estimated with or without precision. Precise estimates find employment elasticities in the -0.06 to -0.2 range, broadly consistent with the previous literature.

Our preferred specification estimated on the all-county sample is reported in column 1, which finds an employment elasticity of -0.189. This specification excludes state-specific

linear trends, consistent with the results shown in Figure 1. Our preferred specification estimated on the county-pair sample is reported in column 6, and includes county fixed effects, period fixed effects, and county-pair fixed effects. Using this specification and sample, we find an employment elasticity of -0.135, reasonably close to our preferred all-county estimate.

Our preferred county-pair specification exploits the Card-and-Kruger logic by using within-county-pair variation to estimate the employment effect of minimum wage increases, but, *contra* DLR, does not restrict the effect to be estimated on within-county-pair-*by-period* variation. Estimating the employment elasticity by “comparing” two states in different counties *in the same period* is too restrictive given the potential dynamic effects of the minimum wage – and especially given the potential dynamic effects we are primarily interested in this paper.

5.1 “Permanent” Minimum Wages

Table 4 reports the results of estimating the differential impact of a permanent minimum wage on earnings and employment. The structure of the table is similar to that of Table 3, with columns 1-3 using the all-county sample, and columns 4-7 using the county-pair sample. The coefficient of interest reports the effect of the interaction between the minimum wage and an indicator for whether the minimum wage is indexed to inflation (i.e., is “permanent”). This coefficient is reported in the third row of each panel.

In 4 of the 7 employment specifications, the coefficient of interest is statistically significant and negative. In the specifications with precisely estimated coefficients of interest, the coefficient is larger in magnitude than the coefficient on the minimum wage variable. These estimates suggest that firms’ employment response to a permanent minimum wage may be much larger than their response to a nominal minimum wage increase.

Our preferred all-county specification is reported in column 1, and finds an employment elasticity of -0.162. The coefficient on the interaction term, which captures the additional

effect of inflation indexing, is -0.444. According to these results, the employment effect of inflation indexing is over 2.5 times the employment effect of nominally increasing the minimum wage. Our preferred county-pair specification is again reported in column 6. Here, the employment elasticity is estimated to be -0.126, and the additional impact of indexing the minimum wage to inflation is estimated to be -0.332 – again, the effect of indexing is over 2.5 times as large as the standard employment effect.

It is interesting to note that we find no wage effect of indexing minimum wages to inflation. In the top panel of Table 4 – which reports the effect of permanent minimum wages on earnings – we find that minimum wage increases increase earnings, but that indexing the minimum wage to inflation provides no additional increase in wages. So the employment effects of permanent minimum wages that we find are likely not driven simply by the higher wages that are a consequence of indexing. Instead, they may be driven by the indexing itself – firms may be responding to the permanency of minimum wage increases, knowing that those increases won't be eroded over time by price inflation, by changing their production functions to rely less on workers. This hypothesis is consistent both with the absence of a wage response to indexing, and with the presence of a stronger disemployment effect of indexing relative to nominal increases.

5.2 “Real” Minimum Wages

The results in Table 5 report estimates of how the impact of minimum wage increases may differ according to the local price level. The structure of the table is the same as the previous two, and the coefficient of interest is the third one reported, that on the interaction term between the log of the minimum wage and the local average wage. In all 7 specifications, there is a positive and statistically significant result, indicating that in counties with high average wages the disemployment effect of the minimum is smaller than it is in counties with low average wages. These effects are best understood by examining Figures 5 and 6, which plot the results from specifications 1 and 6, respectively, for all counties in the United

States. The figures demonstrate the considerable heterogeneity in the employment effect of minimum wage increases across counties with different local average wages.

More specifically, we plot $\beta + \gamma_2 * wage_{it}$ – the marginal impact of a change in the minimum wage in a model that includes county-level wages. We interpret this as the county-specific employment elasticity, which incorporates both the average employment elasticity and the additional marginal effect of a county’s average wage.

Using our preferred all-county model (specification 1), we find a county-specific employment elasticity of -0.050 for the county at the 25th percentile of the wage distribution (Madison County, Iowa) and an elasticity of -0.001 for the county at the 75th percentile of the distribution (Seneca County, New York). Using our preferred county-pair model (specification 6), we find an elasticity of -0.170 for the 25th percentile county (Grant County, Minnesota) and -0.090 for the 75th percentile county (Leon County, Florida).

As with our investigation of permanent minimum wages, it is interesting to study the impact of real minimum wages on wages, reported in the top panel of Table 5. We expect there to be a negative coefficient on the interaction term in the earnings regression, if low wage counties see larger increases in the wages of restaurant workers in response to increasing in the minimum wage. However, we find a negative coefficient in only in 3 of the 7 specifications. In the all-county regressions, the models with state-linear trends have insignificant coefficients.

These results suggest that restaurant workers’ wages are similarly impacted across counties (i.e., restaurant workers in high-wage counties see wages increase just as much as restaurant workers in low-wage counties). At the same time, we see larger disemployment effects in low-wage counties. Because the wage results are insignificant, the larger disemployment effects we find are likely not due to larger wage increases in those counties, but instead due to something else. One possible explanation is the ability of firms in those counties to absorb larger wage increases. It could be the case that restaurants in low-wage counties can’t raise prices as much as restaurants in high-wage counties. Restaurants naturally try to respond to minimum wage increases by raising their output prices (Hirsch, Kaufman, and Zelenska,

2014). Restaurants in low wage counties might be less able to do that if the price elasticity of demand is greater in those counties.

Another possibility relates our results to turnover in restaurants. One way firms can absorb higher minimum wages is through lower turnover rates (Hirsch, Kaufaman, and Zelenska, 2014). Turnover is costly. It may be the case that the effect of higher minimum wages on reducing turnover is greater in high-wage counties, thus lowering the disemployment effect. Why? Giuliano’s (2013) findings suggest that in high-wage counties, minimum wage increases draw high quality workers into the workforce, but low-wage counties do not experience similar changes. This mechanism could work to reduce turnover in high-wage counties.

Regardless of the underlying mechanism, our results suggest a positive relationship between the average wage of a county and the impact of minimum wages on employment. That is, counties with low average wages experience a larger disemployment effect in response to minimum wage increases than do counties with high average wages.

5.3 Minimum Wages and Mobility

Table 6 reports the results of estimating equation 5, analyzing how the impact of minimum wages may differ by the local level of economic mobility. The coefficient of interest is that on the interaction term between the log of the minimum wage and the measure of economic mobility, the “rank rank” coefficient. The results presented here are preliminary, and should be interpreted as initial evidence. Our preferred all-county and county-pair specifications find a significantly positive relationship, indicating that counties with high levels of economic mobility experience less of a disemployment effect of the minimum wage, and counties with low levels of economic mobility experience a greater disemployment effect. This is suggestive evidence that the minimum wage may reduce employment opportunities disproportionately in local areas in which residents have a harder time climbing the income ladder.

6 Robustness Checks

Table 7 presents the results using a balanced sample of counties and a broader set of industries. The table presents only the coefficient on the interaction term, when using employment as the dependent variable for each of our treatments (permanent, local wages, and mobility).

The main results discussed above are presented in the first row of each panel of Table 7. The first panel shows the results of the permanent treatment, the second panel displays the results of the real treatment, and the last panel presents the mobility treatment. Comparing the first and second rows of each panel, we see that the employment effects of minimum wage increases are relatively similar when using the balanced sample instead of the unbalanced sample. For the permanent treatment, our preferred specifications shown in Columns 1 and 6 show larger disemployment effects when using the balanced sample.

This paper focuses on restaurant employment. However, other sectors could also be impacted by permanent minimum wage changes or our other treatments. To examine this possibility, we reestimate our employment results using data from other sectors, specifically the manufacturing (NAICS 31-33), retail (NAICS 44-45), and accommodation and food services (ACFS) (NAICS 72) sectors. These results are presented in the third, fourth, and fifth rows of each panel in Table 7.

Focusing on the first panel of Table 7, we find that the permanent minimum wage only has larger disemployment effects in the ACFS sector. The manufacturing and retail sectors do not exhibit any larger disemployment effects in response to permanent minimum wages. In the second panel, we again see that the ACFS sector shows results very similar to the restaurant sector, with positive and significant coefficients in every specification. These results suggest that high-wage counties experience less of a disemployment effect in the ACFS than do low-wage counties. The retail sector finds some negative coefficients, suggesting that high wage counties have larger disemployment effects in response to minimum wage increases. The manufacturing sector shows some evidence of a positive relationship between local prices

and the employment effect of the minimum wage.

The last panel shows the results when conditioning the impact of the minimum wage by the local level of economic mobility. The manufacturing sector shows evidence of a strong negative relationship, suggesting that the manufacturing sector is more strongly impacted by minimum wage increases in counties with high levels of economic mobility. The retail sector shows similar results, though the coefficients are not as large nor are they as precisely estimated. The ACFS sector again finds results similar to those found in the restaurant sector.

7 Conclusion

Rather than focusing on “the” employment effect of increasing the minimum wage, we study heterogeneity in minimum wage policy design and in the employment elasticity across geography. Specifically, we study whether indexing minimum wages to inflation and differences in county-level wages and mobility rates lead to heterogenous employment effects following minimum wage increases.

We find evidence that they do. To the best of our knowledge, this paper is the first to empirically study the increasingly common policy design of indexing the minimum wage to inflation. Our preferred specifications find that the disemployment effect of indexing minimum wages to inflation is over 2.5 times the magnitude of the disemployment effect associated with nominal minimum wage increases. We find considerable variance in the effect of minimum wage increases on employment across low- and high-wage counties – as our Figures 5 and 6 show, employment in low-wage counties is considerably more sensitive to minimum wage increases than employment in high-wage counties. Finally, we provide preliminary evidence that less mobile counties have larger disemployment effects from minimum wage increases than higher mobility counties.

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Table 1: State level adoption of Permanent Minimum Wages

State	Year Adopted
Arizona	2007
Colorado	2007
Florida	2006
Missouri	2007
Montana	2007
Nevada	2007
Ohio	2007
Oregon	2003
Vermont	2007
Washington	1999

Table 2: Descriptive Statistics of QCEW Data, 1990-2012

This table reports descriptive statistics for the QCEW data. The first two columns report the mean and standard deviation for the all-county sample respectively. The second two columns report the mean and standard deviation of the contiguous county-pair sample respectively.

Variable	All-County Sample		County-Pair Sample	
	Mean (1)	SD (2)	Mean (3)	SD (4)
Population, 2000	98,767	314,257	94,004	230,852
Population Density	261	1,734	294	2,348
Land area (square miles)	951	1,303	1,262	2,073
Overall private employment	32,642	120,740	32,437	101,926
Overall private average weekly earnings (\$)	488	167	493	171
Restaurant employment	3,598	9,747	3,424	7,507
Restaurant average weekly earnings (\$)	177	52	177	53
Accommodation and food services employment	4,527	13,382	4,664	13,271
Accommodation and food services average weekly earnings (\$)	196	65	200	71
Retail employment	4,679	14,658	4,518	11,528
Retail average weekly earnings (\$)	335	92	334	92
Manufacturing employment	5,667	18,090	5,396	12,504
Manufacturing average weekly earnings (\$)	634	251	639	253
Minimum wage	5.37	1.15	5.37	1.14
Number of counties	3,108		1,138	
Number of county-pairs	N/A		1,178	
Number of states	51		49	

Table 3: Minimum Wage Effects on Wages and Employment, 1990-2012

This table reports estimates of the effect of the log minimum wage on average weekly wages and employment in the restaurant sectors. Columns 1-3 report the results from the base specification for the all county sample and columns 4-7 report the results for the county-pair sample.

	All County Sample (1)	All County Sample (2)	All County Sample (3)	County Pair Sample (4)	County Pair Sample (5)	County Pair Sample (6)	County Pair Sample (7)
	<u>ln(Earnings)</u>						
ln(minimum wage)	0.219*** (0.030)	0.203*** (0.029)	0.178*** (0.025)	0.228*** (0.027)	0.294*** (0.050)	0.228*** (0.027)	0.206*** (0.029)
	<u>ln(Employment)</u>						
ln(minimum wage)	-0.189** (0.076)	-0.056* (0.028)	0.005 (0.027)	-0.149* (0.087)	0.610 (0.412)	-0.135** (0.066)	-0.028 (0.050)
ln(population)	1.090*** (0.059)	1.116*** (0.040)	1.112*** (0.040)	0.028*** (0.004)	0.787*** (0.111)	0.906*** (0.067)	0.000 (.)
Controls							
County fixed effects	Y	Y	Y	Y		Y	Y
Period fixed effects	Y	Y		Y	Y	Y	
State linear trend		Y	Y				
Census division x period			Y				
County Pair fixed effects					Y	Y	
Pair * period dummies							Y
Observations	174,020	174,020	174,020	131,627	131,627	131,627	131,627

Notes: Robust standard errors, in parentheses, are clustered at the state level for specifications 1-3, and at the state and border segment levels for specifications 4-7.

Table 4: Permanent Minimum Wage Effects on Wages and Employment, 1990-2012

This table reports estimates of the effect of the log minimum wage on average weekly wages and employment in the restaurant sectors. Columns 1-3 report the results from the permanent specification for the all county sample and columns 4-7 report the results for the county-pair sample.							
Variables	All County Sample (1)	All County Sample (2)	All County Sample (3)	County Pair Sample (4)	County Pair Sample (5)	County Pair Sample (6)	County Pair Sample (7)
	<u>ln(Earnings)</u>						
ln(minimum wage)	0.204*** (0.032)	0.203*** (0.031)	0.180*** (0.026)	0.205*** (0.025)	0.252*** (0.045)	0.205*** (0.025)	0.198*** (0.028)
Permanent minimum wage	-0.133 (0.112)	-0.012 (0.109)	-0.029 (0.102)	-0.090 (0.167)	-0.042 (0.168)	-0.090 (0.167)	0.160 (0.117)
Perm min wage * ln(min wage)	0.076 (0.057)	0.006 (0.058)	0.014 (0.054)	0.058 (0.085)	0.042 (0.084)	0.058 (0.085)	-0.077 (0.059)
	<u>ln(Employment)</u>						
ln(minimum wage)	-0.162** (0.064)	-0.042 (0.030)	0.020 (0.033)	-0.162** (0.081)	0.485 (0.441)	-0.126** (0.064)	-0.039 (0.054)
Permanent minimum wage	0.840*** (0.131)	0.046 (0.191)	0.108 (0.227)	0.568** (0.224)	1.405** (0.681)	0.643*** (0.145)	0.149 (0.293)
Perm min wage * ln(min wage)	-0.444*** (0.074)	-0.036 (0.113)	-0.069 (0.132)	-0.282** (0.118)	-0.646* (0.333)	-0.332*** (0.074)	-0.069 (0.151)
ln(population)	1.100*** (0.057)	1.115*** (0.039)	1.111*** (0.039)	0.028*** (0.004)	0.768*** (0.112)	0.910*** (0.067)	0.000 (.)
Controls							
County fixed effects	Y	Y	Y	Y		Y	Y
Period fixed effects	Y	Y		Y	Y	Y	
State linear trend		Y	Y				
Census division x period			Y				
County Pair fixed effects					Y	Y	
Pair * period dummies							Y
Observations	174,020	174,020	174,020	131,627	131,627	131,627	131,627

Notes: Robust standard errors, in parentheses, are clustered at the state level for specifications 1-3, and at the state and border segment levels for specifications 4-7.

Table 5: Real Minimum Wage Effects on Wages and Employment, 1990-2012

This table reports estimates of the effect of the log minimum wage on average weekly wages and employment in the restaurant sectors, controlling for the local price levels. Columns 1-3 report the results from the real specification for the all county sample and columns 4-7 report the results for the county-pair sample.

	All County Sample (1)	All County Sample (2)	All County Sample (3)	County Pair Sample (4)	County Pair Sample (5)	County Pair Sample (6)	County Pair Sample (7)
	<u>ln(Earnings)</u>						
ln(minimum wage)	0.591*** (0.189)	0.380** (0.173)	0.372** (0.159)	0.687*** (0.240)	0.615** (0.274)	0.687*** (0.241)	0.301 (0.254)
ln(avg wage)	0.289*** (0.057)	0.224*** (0.048)	0.212*** (0.046)	0.318*** (0.071)	0.411*** (0.076)	0.318*** (0.071)	0.130* (0.076)
ln(min wage)*ln(avg wage)	-0.057* (0.029)	-0.029 (0.025)	-0.031 (0.025)	-0.072* (0.037)	-0.052 (0.041)	-0.072* (0.037)	-0.016 (0.041)
	<u>ln(Employment)</u>						
ln(minimum wage)	-1.104*** (0.329)	-1.032*** (0.297)	-0.989*** (0.311)	-1.851*** (0.584)	-2.598 (1.594)	-1.956*** (0.429)	-1.990** (0.790)
ln(avg wage)	-0.411*** (0.100)	-0.414*** (0.075)	-0.426*** (0.081)	-0.447** (0.173)	1.533*** (0.542)	-0.575*** (0.125)	-0.515** (0.227)
ln(min wage)*ln(avg wage)	0.142** (0.053)	0.155*** (0.047)	0.157*** (0.049)	0.262*** (0.091)	0.476** (0.235)	0.281*** (0.067)	0.303** (0.124)
ln(population)	1.104*** (0.058)	1.121*** (0.040)	1.118*** (0.040)	0.028*** (0.004)	0.574*** (0.117)	0.920*** (0.063)	0.000 (.)
Controls							
County fixed effects	Y	Y	Y	Y		Y	Y
Period fixed effects	Y	Y		Y	Y	Y	
State linear trend		Y	Y				
Census division x period			Y				
County Pair fixed effects					Y	Y	
Pair * period dummies							Y
Observations	173,882	173,882	173,882	131,627	131,627	131,627	131,627

Notes: Robust standard errors, in parentheses, are clustered at the state level for specifications 1-3, and at the state and border segment levels for specifications 4-7.

Table 6: Minimum Wage Effects on Wages and Employment by Local Mobility, 1990-2012

This table reports estimates of the effect of the log minimum wage on average weekly wages and employment in the restaurant sectors, the effect of the log minimum wage is allowed to vary by a county's mobility using the mobility variable developed in Chetty at al (2014). Columns 1-3 report the results from the real specification for the all county sample and columns 4-7 report the results for the county-pair sample.

	All County Sample (1)	All County Sample (2)	All County Sample (3)	County Pair Sample (4)	County Pair Sample (5)	County Pair Sample (6)	County Pair Sample (7)
	<u>ln(Earnings)</u>						
ln(minimum wage)	0.347*** (0.043)	0.238*** (0.040)	0.208*** (0.033)	0.379*** (0.052)	0.275*** (0.062)	0.379*** (0.052)	0.230*** (0.056)
ln(min wage)*Rankrank	-0.431*** (0.102)	-0.112 (0.069)	-0.093 (0.069)	-0.486*** (0.133)	0.062 (0.096)	-0.486*** (0.133)	-0.077 (0.144)
	<u>ln(Employment)</u>						
ln(minimum wage)	-0.654*** (0.113)	-0.132* (0.070)	-0.083 (0.067)	-0.174 (0.157)	0.007 (0.555)	-0.453*** (0.120)	0.501*** (0.186)
ln(min wage)*Rankrank	1.558*** (0.276)	0.240 (0.181)	0.271 (0.194)	0.080 (0.461)	1.899** (0.815)	1.031*** (0.342)	-1.670*** (0.573)
ln(population)	1.147*** (0.054)	1.129*** (0.039)	1.126*** (0.040)	0.028*** (0.004)	0.857*** (0.110)	0.949*** (0.067)	0.000 (.)
Controls							
County fixed effects	Y	Y	Y	Y		Y	Y
Period fixed effects	Y	Y		Y	Y	Y	
State linear trend		Y	Y				
Census division x period			Y				
County Pair fixed effects					Y	Y	
Pair * period dummies							Y
Observations	172,411	172,411	172,411	131,627	131,627	131,627	131,627

Notes: Robust standard errors, in parentheses, are clustered at the state level for specifications 1-3, and at the state and border segment levels for specifications 4-7.

Table 7: Robustness Checks for Minimum Wage Effects on Employment, 1990-2012

Table 8 reports the effects of the minimum wage on the employment of various industries. Columns 1-3 report the results using the all-county sample and columns 4-7 use the contiguous county sample. In the first panel log minimum wage is interacted with an indicator for an inflation adjusted minimum wage. In the second panel, log minimum wage is interacted with average total wages. In the third panel, log minimum wage is interacted with the mobility variable developed in Chetty et al (2014). Within each panel, rows 1 and 2 use employment in the restaurant sector as the dependent variable. Row 2 reports the results on a balanced sample. In rows 3, 4, and 5, the dependent variable is employment in the manufacturing, retail, and accommodation and food services respectively.

	All County Sample (1)	All County Sample (2)	All County Sample (3)	County Pair Sample (4)	County Pair Sample (5)	County Pair Sample (6)	County Pair Sample (7)
<u>Permanent</u>							
Base Results	-0.436*** (0.078)	-0.034 (0.112)	-0.069 (0.130)	-0.282** (0.118)	-0.646* (0.333)	-0.332*** (0.074)	-0.069 (0.151)
Balanced	-0.455*** (0.082)	-0.013 (0.133)	-0.062 (0.164)	-0.450*** (0.146)	-0.534** (0.264)	-0.490*** (0.110)	-0.018 (0.169)
Manufacturing	0.305 (0.258)	-0.016 (0.204)	-0.070 (0.159)	0.232 (0.267)	0.557 (0.435)	0.191 (0.254)	-0.084 (0.268)
Retail	-0.087 (0.073)	-0.055 (0.081)	0.037 (0.062)	-0.080 (0.151)	-0.374 (0.386)	-0.179 (0.134)	-0.138 (0.136)
Accommodation and Food Services	-0.275*** (0.063)	0.015 (0.110)	0.006 (0.096)	-0.352*** (0.105)	-0.481 (0.304)	-0.390*** (0.080)	-0.178 (0.130)
<u>Real</u>							
Base Results	0.142** (0.053)	0.154*** (0.047)	0.156*** (0.049)	0.262*** (0.091)	0.476** (0.235)	0.281*** (0.067)	0.303** (0.124)
Balanced	0.206*** (0.055)	0.202*** (0.056)	0.207*** (0.059)	0.106 (0.115)	-0.125 (0.248)	0.248*** (0.090)	0.296** (0.134)
Manufacturing	0.275 (0.192)	0.325** (0.152)	0.336** (0.153)	0.283 (0.253)	0.186 (0.318)	0.270 (0.250)	0.545** (0.235)
Retail	-0.103** (0.041)	-0.081* (0.042)	-0.081* (0.042)	-0.005 (0.079)	0.029 (0.193)	-0.050 (0.048)	0.122 (0.105)
Accommodation and Food Services	0.155** (0.066)	0.153** (0.063)	0.163** (0.066)	0.232*** (0.088)	0.532*** (0.194)	0.246*** (0.084)	0.344*** (0.109)
<u>Mobility</u>							
Base Results	1.558*** (0.275)	0.239 (0.181)	0.270 (0.194)	0.080 (0.461)	1.899** (0.815)	1.031*** (0.342)	-1.670*** (0.573)
Balanced	1.630*** (0.287)	0.185 (0.225)	0.245 (0.247)	-0.610 (0.529)	2.882*** (0.989)	0.947** (0.384)	-2.232*** (0.632)
Manufacturing	-3.691*** (0.615)	-1.189*** (0.429)	-1.197** (0.461)	-3.433*** (0.658)	1.705** (0.721)	-3.193*** (0.660)	-0.156 (0.928)
Retail	-0.489** (0.189)	-0.565*** (0.157)	-0.597*** (0.159)	-1.262*** (0.298)	1.271* (0.665)	-0.660*** (0.240)	-1.005*** (0.357)
Accommodation and Food Services	1.384*** (0.272)	0.126 (0.196)	0.168 (0.203)	-0.053 (0.502)	1.722** (0.724)	0.637 (0.444)	-1.877*** (0.632)
<u>Controls</u>							
County fixed effects	Y	Y	Y	Y		Y	Y
Period fixed effects	Y	Y		Y	Y	Y	
State linear trend		Y	Y				
Census division x period dummies			Y				
County Pair fixed effects					Y	Y	
Pair * period dummies							Y

Notes: Coefficients reported are from the interaction term between the minimum wage and the treatment of interest. Robust standard errors, in parentheses, are clustered at the state level for specifications 1-3, and at the state and border segment levels for specifications 4-7.

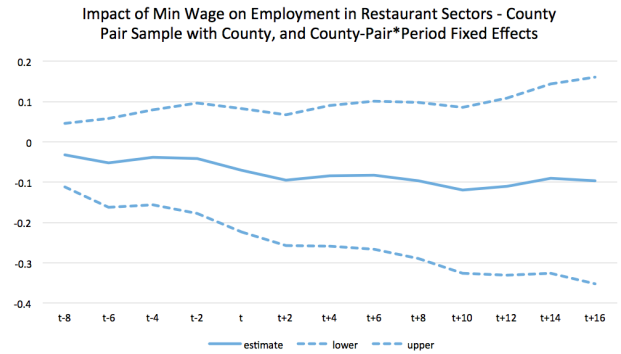
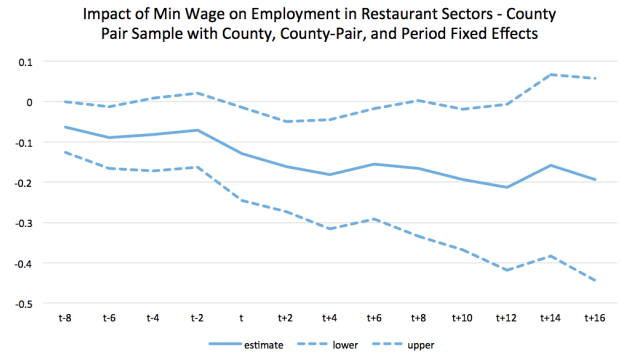
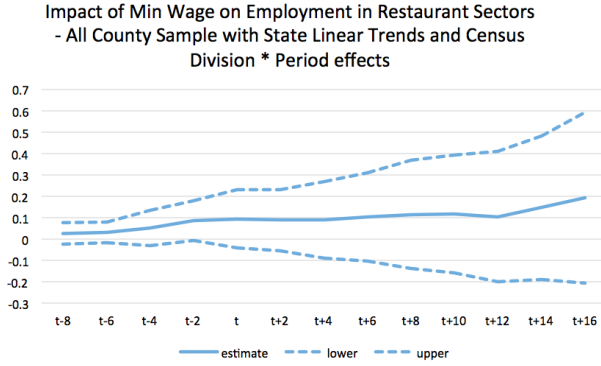
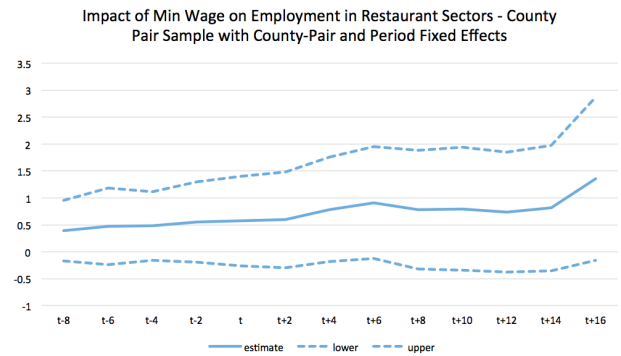
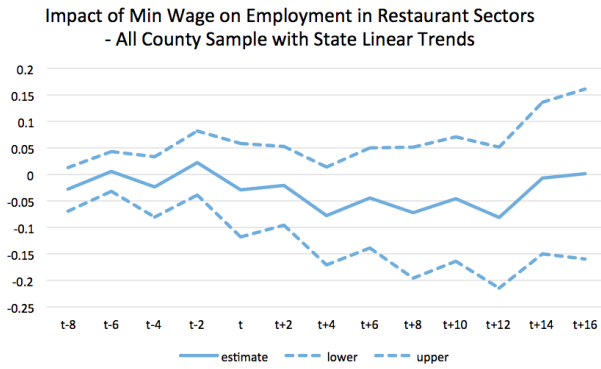
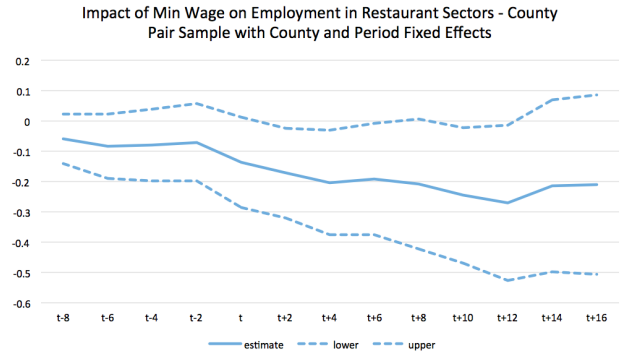
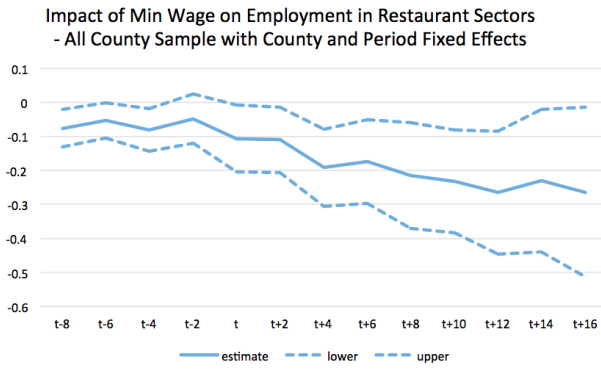


Figure 1: Time Paths of Minimum Wage Effects, by Specification

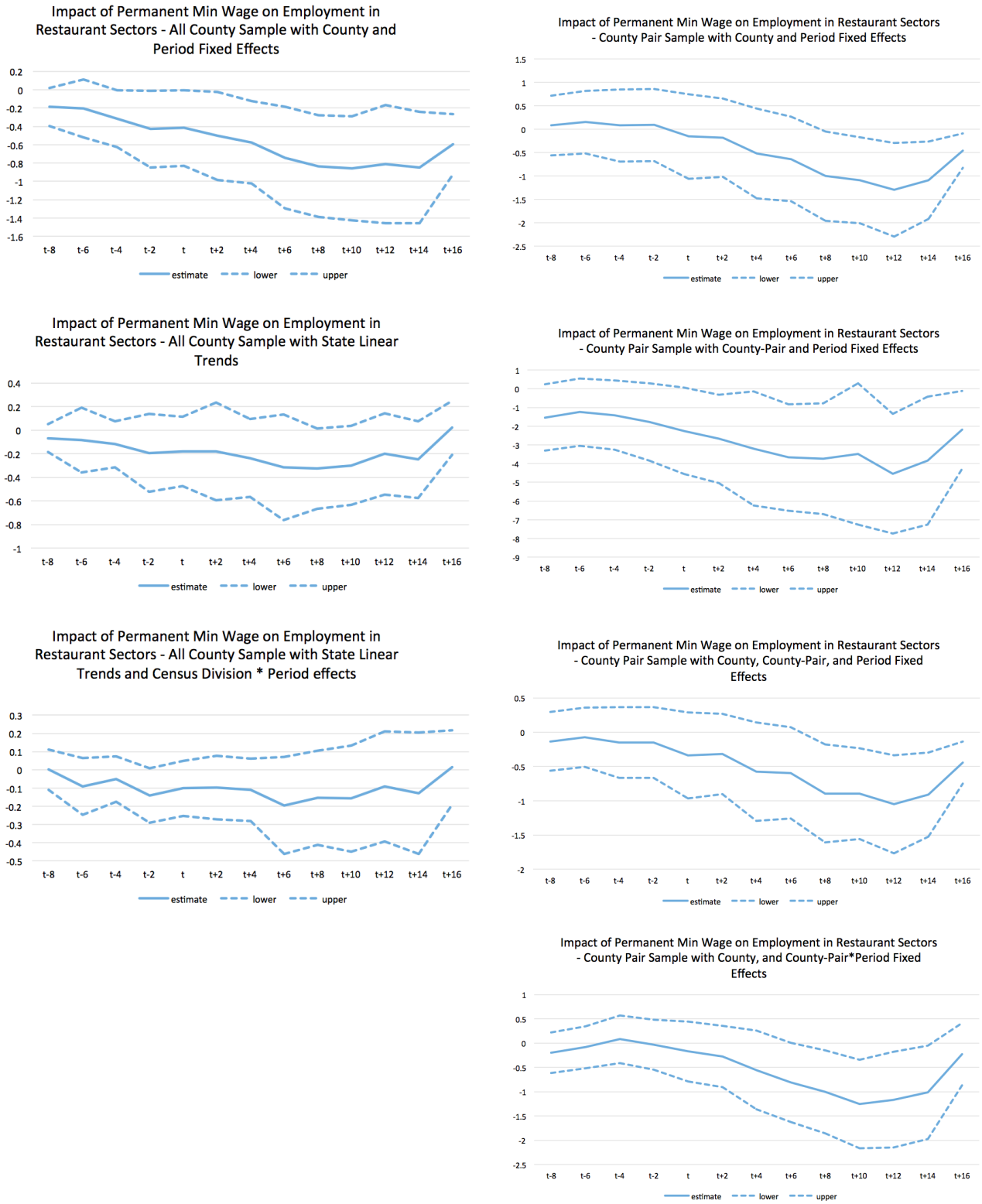


Figure 2: Time Paths of Permanent Minimum Wage Effects, by Specification

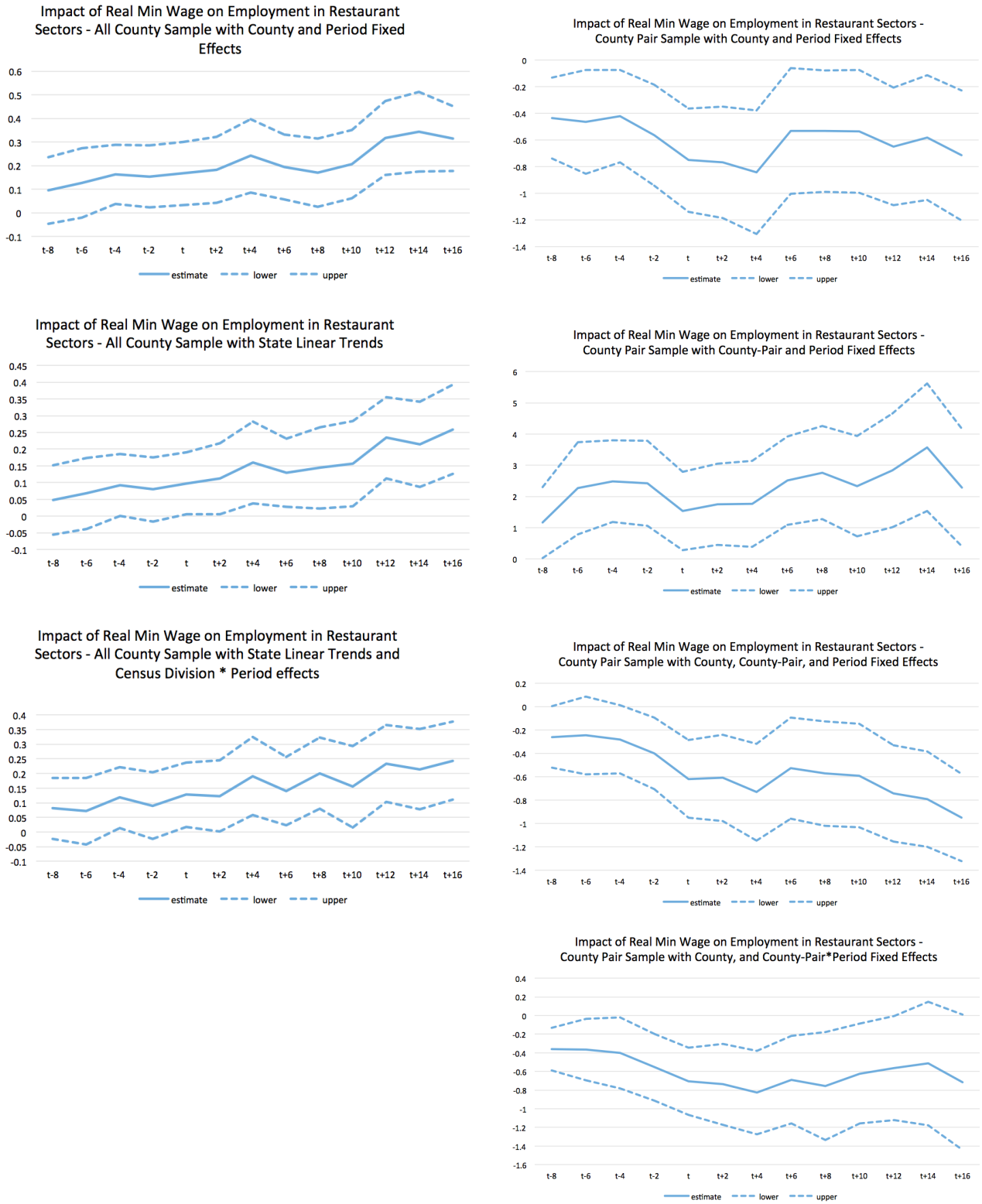


Figure 3: Time Paths of Real Minimum Wage Effects, by Specification

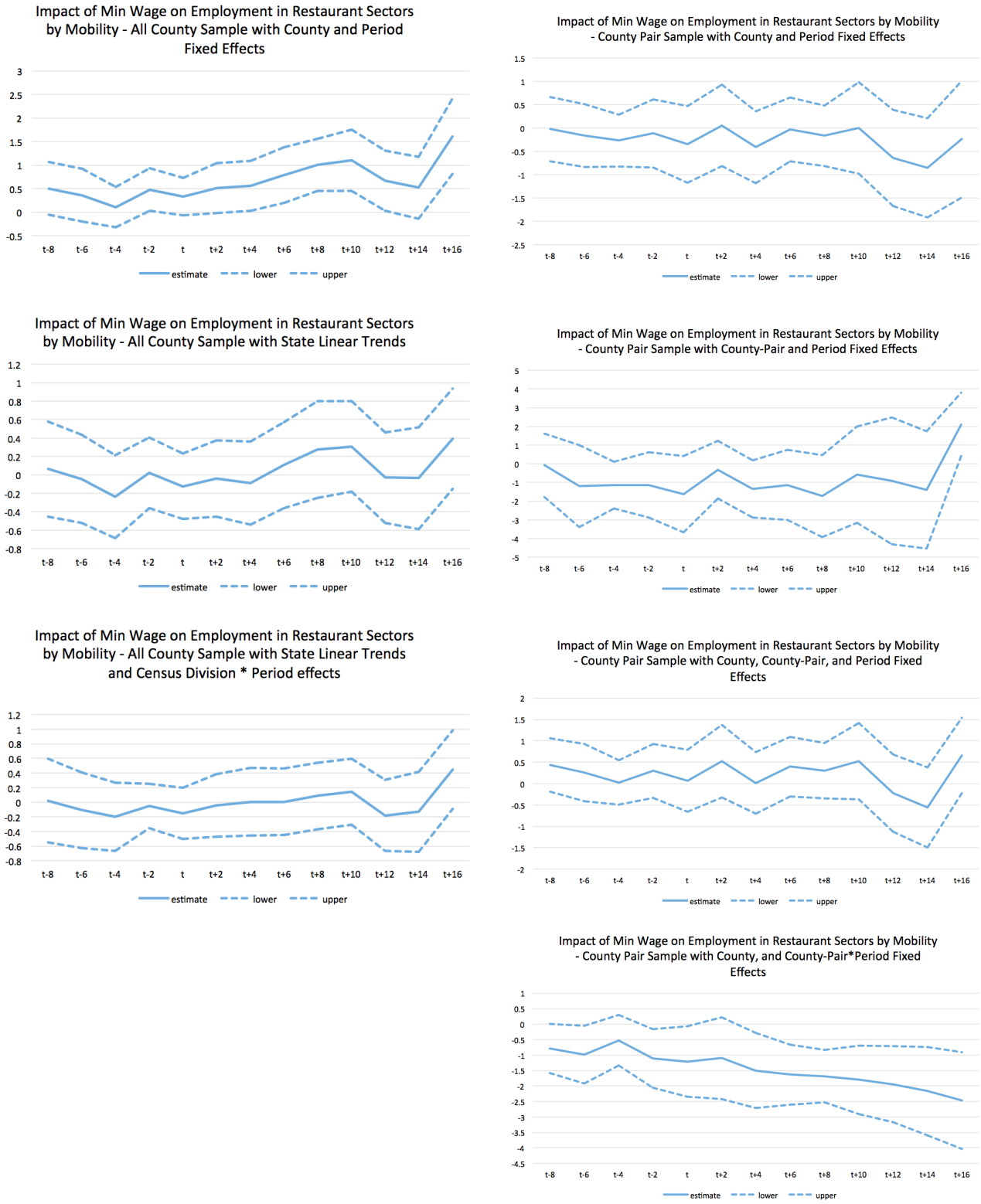


Figure 4: Time Paths of Minimum Wage Effects by Mobility, by Specification

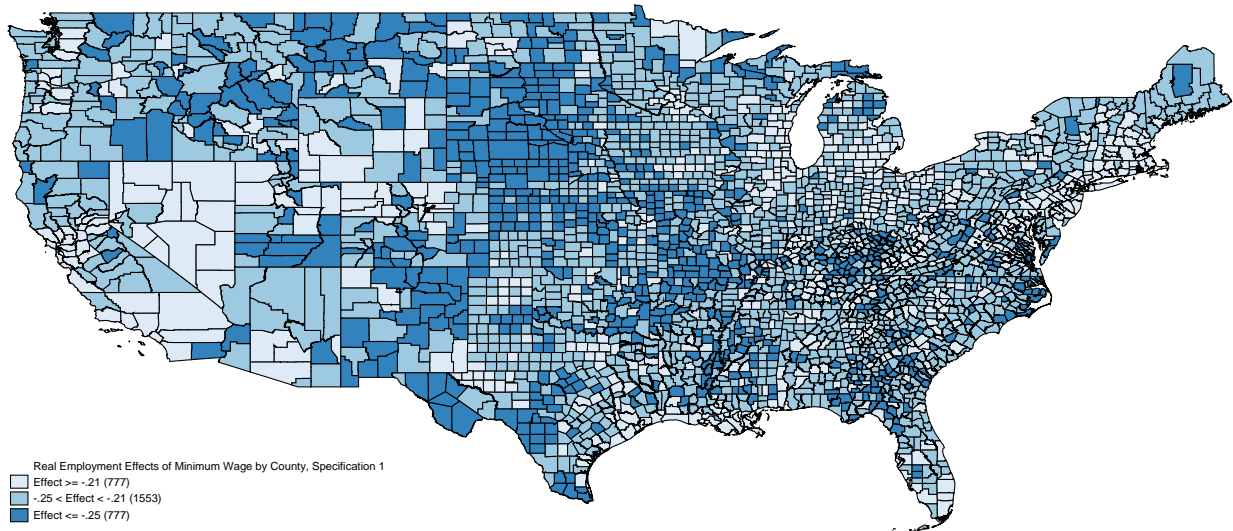


Figure 5: Map of Real Minimum Wage Effects, Specification 1

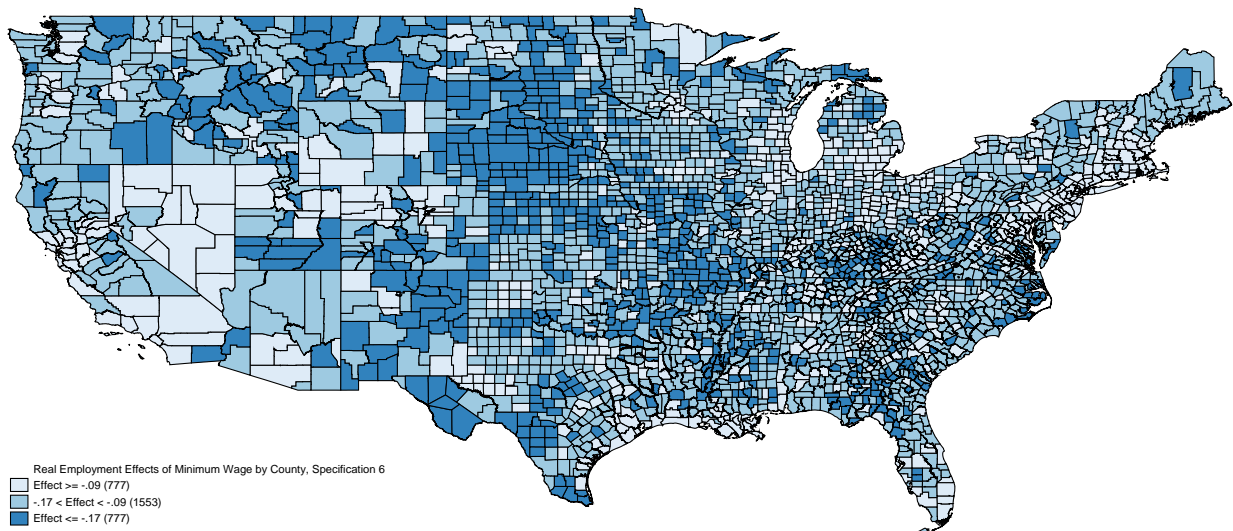


Figure 6: Map of Real Minimum Wage Effects, Specification 6