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The Local Aggregate Effects of Minimum Wage Increases

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System Working Paper 17-25
November 2017

This paper was originally published as *Working Paper No. 17-8* by the Federal Reserve Bank of Boston. This paper may be revised. The most current version is available at https://www.bostonfed.org/publications/research-department-working-paper.aspx.

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Working Papers

FEDERAL RESERVE BANK OF BOSTON™

No. 17-8

The Local Aggregate Effects of Minimum Wage Increases

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Abstract

This paper examines the effect of minimum wage changes on local aggregate inflation and consumption growth. The paper utilizes variation in state-level minimum wages across locations and finds that minimum wage increases have a relatively modest effect on both city-level inflation and spending growth over the years following the change. The most noticeable effects are for food consumed at home and away from home—industries that typically employ a large share of low-wage and minimum-wage workers. Interestingly, consumers adjust their *real* food consumption when minimum wages rise, suggesting that some workers benefit from minimum wage changes.

JEL Classifications: E21, E31, E64

Keywords: minimum wage increases; prices; consumption; local aggregate effects

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The authors extend special thanks to Giovanni Olivei for helpful suggestions and to Sarah Morse for excellent research assistance.

This version: August, 2017

1 Introduction

The minimum wage is one of the most popular, contentious, and frequently adjusted economic policies in the United States. Since its introduction at the federal level in 1938, the national minimum wage has been raised 22 times. State-level minimum wage changes have occurred more frequently—especially recently—with 19 states raising their minimum wages in 2017 alone (following 17 state-level increases in 2016). The goal of the minimum wage is to reduce poverty by raising the return to employment for low-wage workers. However, in a competitive labor market a minimum wage that is above the market-clearing wage lowers employment (although in a monopsonistic labor market it can raise employment). A voluminous empirical literature has largely concluded that, within the range experienced in the United States, a higher minimum wage leads at most to small reductions in low-wage employment and minimal reductions in overall rates of poverty (see, Card and Krueger 1994). However, this literature has largely overlooked the fact that the level of the minimum wage should, through general equilibrium adjustment, have effects beyond the labor market. Additionally, changes in the minimum wage could also cause fluctuations as local economies adjust to the changed regulations.

In this paper, we measure the dynamic effects of changes in city-level minimum wages on city-level prices and consumer spending; cities are defined as metropolitan statistical areas (MSAs). We find that city-level (overall) inflation increases modestly not only in the year that the minimum wage change goes into effect, but by a similar amount in the following year. This slow local-aggregate price adjustment comes from rapid adjustment in the prices for goods, such as food away from home, which are produced using a larger share of low-wage workers, and slower (and typically smaller price adjustments) for goods produced using fewer local low-wage workers. Price adjustments are also larger and more rapid in cities where ex ante there are more workers earning at or near the minimum wage, consistent with bigger increases in the cost of living in these cities that, in turn, potentially offset more of the real income effects from increases in minimum wages. Besides the price effect, we find changes in nominal consumption from increases in minimum wages that, while not always precisely estimated, are generally in line with the changes in prices. Notably, however, food consumption increases are well measured and appear larger than the food price increases, suggesting that equilibrium aggregate income effects exceed substitution effects and lead to increases in real food consumption. Examining approximate real food consumption data directly confirms this result.

We also find evidence that durable goods purchases increase *in advance* of an increase in the minimum wage—a result that is consistent with minimum wage hikes relaxing borrowing constraints for some households wishing to purchase bigger ticket items (see Dettling and Hsu 2017). This result is also consistent with intertemporal substitution in the purchase of durable goods: consumption expenditures on durable goods increase prior to the minimum wage change in anticipation that durable goods prices will rise due to higher (retail) sales costs when the minimum wage change takes effect.[1]

We reach these conclusions by using the variation in minimum wages across states and over time. In particular, we compile a dataset of state-level minimum wage changes along with state-level nominal consumption data and city-level price (CPI) data. Where relevant, we population weight the state-level data to conform to the relevant city-level boundaries, which are based on the geography that the Bureau of Labor Statistics (BLS) uses to construct their MSA-level CPI indices. In addition, the consumption and price data are available on a fairly disaggregated basis, allowing us to analyze sector-specific price and spending effects. We also investigate how our identified minimum wage effects vary based on the relative share of low-wage workers in a given location.

Using this annual panel data, we trace the minimum wage effects by regressing inflation rates and consumption growth on contemporaneous, lead, and lag changes in minimum wages. The estimates measure how local economic outcomes respond to changes in the minimum wage in the years before and after the minimum wage change. One concern with such an approach is that a state with a high long-run growth rate (for example, California) may raise its minimum wage more than a low-growth state due to increases in relative wages and costs of living. As a result, the longer-term impact of the policy change measures not the effect of the minimum wage on the real economy, but rather the effect of higher average growth in that state. To avoid such a situation, we condition our analysis on the long-run growth rate in each locality by including location fixed effects in our regressions.[2] Further, we include aggregate time effects so that in any period we are identifying the effects of the minimum wage change by comparing localities with different histories of minimum wage changes.

It is also possible that minimum wage changes are to some extent predicated on transient local economic conditions, so that the estimated effect not only captures the impact of an increase in the minimum wage, but also the effect of the economic conditions that lead to this change.[3] However, our findings are robust to controlling for several

[1]Minimum-wage workers are often involved in the sale of durable goods at retailers, even though such goods are often produced by higher-skilled laborers.

[2]Our results are similar without such a control.

[3]A significant bias of this type is also inconsistent with our findings that minimum wage increases

measures of local economic conditions. In particular, we construct a Bartik-style measure of local employment growth that, by construction, captures changes in local economic conditions that are orthogonal to changes in the local minimum wage and MSA-specific factors.

Returning to our findings, quantitatively, an increase in the minimum wage leads to modest but statistically significant higher city-level prices: a 10 percent increase in the minimum wage increases the local-aggregate CPI by 0.1 percentage point in the year following the increase. This city-level inflation effect is persistent, and the total price effect of the minimum wage increase—taking into account the lead and the lag change—amounts to 0.3 percentage point rise in prices for a 10 percent increase in the minimum wage.

Second, we find that price increases are larger, more rapid, and more significant—across expenditure categories and cities—where the share of low-wage workers is greater. These are the same locales where the cost increases caused by a higher minimum wage are larger. Across cities, we find that for a 10 percent increase in minimum wages, food away from home (food away) inflation rises 1.1 percentage points in areas with a one-standard deviation higher share of low-wage workers, as compared to prices rising 0.6 percentage points for this same food category in areas with an average share of low-wage workers. Across expenditure categories, we find similar evidence. Price adjustment is larger and more rapid, for goods and services that are produced using a larger share of local, low-wage workers such as food consumed at home (food at home).[4] These results are most closely related to Aaronson (2001) and Card and Krueger (1994)'s analyses of relative local restaurant prices in the months following an increase in the minimum wage, and to MaCurdy (2015)'s analysis of the distributional effects (through prices and wages) of minimum wage changes.

Third, minimum wage increases also affect aggregate consumer spending, presumably directly through income and employment, but also through relative prices and other channels as the local economy adjusts to the higher minimum wage. For food away from home, we show that minimum wage increases lead to nominal spending increases that are larger than the price increases, suggesting that consumers raise the real quantity

have the largest effects for goods and cities that employ more workers earning at or near the minimum wage.

[4]The Bureau of Labor Statistics defines food away from home as all food purchases at restaurants, concession stands, vending machines, fast food establishments and other similar food purveyors, while food at home refers to expenditures at grocery stores excluding nonfood items. For more details see: https://www.bls.gov/cex/csxgloss.htm.

of food that they consume at home and away when minimum wages rise. Analyzing (imperfect) constructed real spending data confirms this result. Spending also goes up on other nominal consumption components, but the gains are less precisely estimated, and are roughly in line with the observed change in prices.

Finally, we find that spending on durable goods increases in advance of the minimum wage change—a result that is consistent with minimum wage increases leading to improved credit availability for low-income workers. This result is also broadly consistent with intertemporal substitution behavior by households in anticipation of real income gains from the minimum wage increase.

Our estimate that inflation rises 0.3 percentage points cumulatively in response to a 10 percent increase in minimum wages is consistent with early work by Wolff and Nadiri (1981), who find that a 10–25 percent increase in the minimum wage raises prices by 0.3 to 0.4 percentage points, a relatively modest effect. Lemos (2004) found that minimum wage increases in Brazil had similarly small price effects.[5]

Our results on the importance of the share of low-wage workers—across cities and in goods production—are consistent with the existing literature that focuses on the employment effects of minimum wage changes for teenage and/or fast-food workers or restaurant-industry price changes (see, for example, Aaronson, French, and MacDonald 2008; Card and Krueger 1994). Similarly, Aaronson, Agarwal, and French (2012) examine the household income changes that occur in response to minimum wage changes for households with minimum-wage workers, but that do not occur for households with no minimum-wage workers. In addition, Aaronson (2001) examines the relationship between minimum wage changes and restaurant-price inflation *relative* to CPI inflation, not the local-aggregate effects of minimum wage changes. MaCurdy (2015) further shows that a minimum wage increase is an ineffective method to help the working poor because increases in the national minimum wage raise consumer prices across goods in a way that is more regressive than a typical state-level sales tax increase. MaCurdy (2015) also finds that the earnings gained from an increase in the minimum wage end up being evenly split across the income distribution. We focus on the price and spending effects of minimum wage changes and not the employment effects because the latter has been extensively researched in the literature and typically the effects are found to be small, even for teenage employees and other low-wage worker groups (for recent examples, see Neumark, Salas, and Wascher 2014; Dube, Lester, and Reich 2016).

[5]However, as emphasized in Lemos (2008), there has been relatively little work on the relationship between minimum wage changes and consumer prices.

The remainder of the paper proceeds as follows. Section 2 discusses minimum wage changes in the United States along with our other data, Section 3 highlights our empirical approach, and Section 4 presents our results. Section 5 concludes.

2 Data

2.1 Minimum Wage Changes in the United States

Since its inception in 1938 as part of the Fair Labor Standards Act, policymakers at the federal, state, and local levels have debated the appropriate level of the minimum wage and often legislated changes. Quite recently, higher minimum wages were a topic during the 2016 presidential primaries and general election, and in many states various interest groups have been pushing for higher wages for low-wage workers—a "living wage" of $15 per hour over a few years In response to some of these pressures, California and New York passed legislation in 2016 to gradually raise their minimum wages to $15 per hour. While minimum wages at the federal level (currently $7.25 per hour, and unchanged since 2009) serve as a floor for workers' wages (and the minimum wage in some states), many states set higher local minimum wages, with the result that there is fairly substantial variation in the current minimum wages across states.[6] As of January 2017, minimum wages ranged from $7.25 per hour in states that follow the federal minimum wage rule like Pennsylvania, Texas, and Utah to $11.00 per hour in Massachusetts and Washington State. In the District of Columbia, the minimum wage is $11.50 an hour.[7] In addition, while minimum wage changes are infrequent—especially at the federal level—they have recently increased in frequency at the state level. Nineteen states raised their minimum wages in early 2017, while 17 states increased their minimum wage in early 2016.[8]

Historical data on state minimum wages comes from three primary sources: the Tax Policy Center (TPC), the U.S. Department of Labor (U.S. DOL), and various state departments of labor (state DOL). The TPC has minimum wage data by state from 1983

[6]Some cities such as Seattle have city-specific minimum wages that supersede state-level minimum wages. We focus on state-level minimum wages since city-level data are limited, especially historically.

[7]For additional details see: Drew Desilver "5 Facts About the Minimum Wage," Pew Research Center, January 4, 2017; available at: http://www.pewresearch.org/fact-tank/2017/01/04/5-facts-about-the-minimumwage/.

[8]Minimum wage changes in a number of states (two states in 2016 and seven states in 2017) were very small, automatic increases tied to the cost-of-living. For more details on the most recent minimum wage changes see "Higher Minimum Wage May Have Losers," *New York Times* January 10, 2017; available at: https://www.nytimes.com/interactive/2017/01/05/business/economy/state-minimumwages.html.

to 2014—these data include the exact dates when the minimum wage changes took effect. The U.S. DOL provides historical data on state minimum wages starting in 1968, but lacks information on the effective dates of the minimum wage changes. In addition, 22 state DOL responded to our requests for information about their minimum wages changes over time. Our final minimum wage dataset combines information from all three sources and when possible accounts for the actual dates that the minimum wages changed. Since our final unit of analysis is a year, we take the average annual minimum wage in states that have more than one minimum wage change in a year. Alternative approaches, such as taking the first or last minimum wage value of the year by state, yield very similar results.

Figure 1 plots the federal minimum wage (red line) along with the average minimum wage across states (black line), as well as the range of minimum wages across states in each year. The blue boxes in the figure denote the interquartile range of the state-level minimum wage distribution. The figure demonstrates how the federal minimum wage acts as a floor for state-level minimum wages. Figure 1 also shows that the dispersion of minimum wages across states has increased somewhat over time. In our analysis, we focus on changes in the *effective* minimum wage in each state (hereafter minimum wage), which is the maximum between the posted state minimum wage and the federal minimum wage in each year.

2.2 Additional Data Sources

The BLS publishes CPI data for 27 metropolitan areas (hereafter cities or CPI MSAs) at various frequencies (monthly, bimonthly, semiannual, and annual).[9] For consistency across locations and over time, we convert all data to an annual frequency by taking the average of the higher-frequency data where applicable. We calculate inflation as the percent change in the annualized CPI data. In addition, while the data for many cities (CPI MSAs) start in 1970, a few locations have data starting more recently, such as Phoenix, AZ (2003). For our analysis, we construct an unbalanced panel of the available inflation data.

State-level nominal personal consumption expenditure (PCE) data come from the Bureau of Economic Analysis (BEA). These state-level data measure household purchases of goods and services and purchases by nonprofit institutions serving households. The

[9]The BLS CPI MSA boundaries do not necessarily match the boundaries used by the Census Bureau for all locations. The appendix contains a full list of these metropolitan areas.

nominal spending data, which are based on information from the Economic Census, the Quarterly Census of Employment and Wages, and other state-level data sources, cover 16 standard PCE categories.[10]

We are also interested in the effect of minimum wage changes in a city on real consumption spending, but the state-level price data that the BEA uses to construct real state-level PCE data are interpolated over time and space from very limited information sources.[11] Were we concerned with longer-term trends, the state-level PCE deflators might be useful, but we are particularly interested in identifying higher-frequency (annual) movements in real spending. Thus, we construct approximate real consumption data for select spending categories where the nominal PCE data and CPI price categories line up reasonably well (see Section 4.3 for more details). The CPI has excellent price data, so the approximation underlying this approach comes from assuming that the weights used to aggregate price changes across different subcategories of goods and services are the same in the PCE data as in the CPI.

Finally, minimum wage changes are likely to be more relevant and binding in locations with a larger share of low-wage workers. Therefore we calculate the share of workers in each state that have hourly earnings (or effective hourly earnings if they are salaried) that are within 110 percent or less of the effective minimum wage in that state by using wage information from the March Current Population Survey (CPS) supplement. We convert these state-level measures to city-level data using the weighting approach discussed in Section 2.4. Alternative wage cut-offs as well as alternative approaches for classifying low-wage workers yield similar results.

2.3 Local Employment Growth

We construct a Bartik-style measure of local employment growth (hereafter Bartik growth) to control for local business cycle conditions. The Bartik approach captures shocks to local demand based on changes in employment by industry at the national level and the shares of employment by industry in a given location (see Bartik 1991, for more details). Employment data by state and industry come from the BEA, and we focus on the largest industries (2-digit NAICS codes) for our analysis. To ensure that local

[10]The BEA assigns the local spending data to a household's state of residence, regardless of where the expenditures occurred. More information on these data is available at: https://www.bea.gov/newsreleases/regional/pce/pce_newsrelease.htm.

[11]For more information on the BEA's regional price indices see: https://www.bea.gov/regional/pdf/RPP2016¯methodology.pdf.

changes in employment—especially in large states—do not unduly influence the measure of national employment growth, we exclude employment growth in state i from the measure of national employment growth used to calculate the Bartik growth rate for state i.[12] Finally, for MSAs that span multiple states we convert the state-level Bartik growth data to city-level data using the population-based weighting approach that we describe next.

2.4 Reconciling Different Data Geographies

While much previous research has studied outcomes at the state level, we are interested in local aggregate equilibrium effects. Markets for labor and a substantial fraction of consumption are defined by commuting distances and are better measured by MSA-level (city-level) data. Therefore, we conduct most of our analysis at the MSA level by constructing city-level measures of effective minimum wages. We follow the city boundaries used by the BLS for constructing their MSA-level CPI price data. A number of these cities, like New York and Philadelphia, contain suburbs that extend across state lines.

The BLS provides data on the counties within the boundaries of each CPI MSA, and we therefore convert the state-level data to city-level data using county-level population information as weights. In particular, we determine the share of the population belonging to each state in each CPI-MSA. We then population weight the relevant state-level price and other data to generate boundary-consistent city-level measures. We follow this approach both to construct minimum wage, nominal consumption, and low-wage worker data as well as to incorporate additional state-level data, such as the Bartik growth data, into our analysis. Alternative data weighting schemes, such as assigning the minimum or maximum minimum wage among the states within a given MSA's boundaries, yield similar results.

2.5 Sample Period and Relevant Summary Statistics

The breadth of our analysis is dictated by the 27 MSA locations for which the BLS publishes price data (see the Appendix for the complete list of these locations). State-level price information—especially in terms of consumer prices—is not readily available, and even if it were, the MSA-level data are likely preferable for our analysis since MSAs

[12] This approach has been used by Paciorek (2013) and others.

tend to be more consistent with local labor market boundaries than state-wide data. On average, the CPI MSAs in our sample cover roughly half of the U.S. population and most of the population living in or near cities.[13]

Our baseline sample period runs from 1999 through 2014 and is determined by the availability of the PCE data (starting in 1997), industry employment data (growth rates starting in 1999), and county-level population data (available through 2014). The Appendix includes estimates of the effect of minimum wage changes on inflation using all the available CPI and minimum wage data (1983–2014).[14]

To further place minimum wage changes over time in context, Figure 2 shows the number of CPI MSAs with a minimum wage change in a given year. Not surprisingly, most minimum wage changes occur in years when the federal minimum wage increases. However, many states adjust their minimum wage at other times, thus generating variation in the number of CPI MSAs with a minimum wage change within and across years. There are 160 specific changes in the minimum wage across 34 states *excluding* changes in the federal minimum wage during our sample period.[15]

On average, state minimum wages rose 6.9 percent between 1997 and 2014 (conditional on a change occurring) with a standard deviation of 5.3 percent. The largest increase was about 39 percent in Pennsylvania in 2007, while the minimum wage declined a touch in Colorado in 2010.[16] Across the CPI MSAs in our sample, the mean gain in average minimum wages was 6.2 percent (conditional on a change occurring) with a standard deviation of 6.1 percent. Figure 2 further highlights that state-driven changes in the minimum wage, and hence fluctuations in minimum wages across CPI MSAs, have become more frequent recently. All of this variation across locations helps us identify the effect of minimum wage changes on inflation and nominal consumption growth.

There is also reasonable variation in nominal consumption growth and inflation across our CPI MSAs. Total CPI inflation ranges from –2.6 percent to 5.8 percent, with a mean of 2.4 percent and a standard deviation of 1.2 percent, while total nominal consumption

[13]According to a 2015 Census Bureau report, 62.7 percent of the U.S. population lives in a city. See https://www.census.gov/newsroom/press-releases/2015/cb15-33.html.

[14]These estimates do not include controls for local economic conditions since the Bartik growth data are only available starting in 1999.

[15]Including changes in the federal minimum wage in 2007, 2008, and 2009, there are 247 minimum wage changes across all 50 states and the District of Columbia from 1999–2014.

[16]The jump in the minimum wage in Pennsylvania in 2007 was due to a state-level change effective on January 1, followed by a change in the federal minimum wage in July. The largest minimum wage change in our sample that is not tied to a federal minimum wage change is an 18.5 percent increase in New Jersey in 2006. Colorado's minimum wage edged down slightly in 2010 due to automatic inflation indexation.

growth ranges from –3.5 percent to 10.4 percent, with a mean of 4.5 percent and a standard deviation of 2.4 percent.[17] Finally, Figure 3 shows data on the share of low-wage workers over time (left panel) as well as the average low-wage worker share by state (right panel). There is substantial variation in the share of low-wage workers both across states and over time, with the shares ranging from around 10 percent in states like Nevada and Virginia to closer to 20 percent in states like Mississippi and Montana. The average low-wage share across states also moves around over time, and there is noticeable variation across states in most years.

3 Empirical Framework

Our empirical strategy is to examine the relationship between inflation (or PCE growth) and minimum wage changes by estimating the following reduced-form relationship:

$$\Delta x_{i,t}^{k} = \alpha_i + \nu_t + \sum_{j=-J_1}^{J_2} \beta(j)\Delta w_{i,t-j} + \eta\, y_{i,t} + e_{i,t}. \tag{1}$$

Here Δx_{it}^{k} is the (annualized) percent change in CPI prices (PCE growth) for a given price (consumption) category k (for example, food away from home) in MSA i between time t and $t-1$;[18] $\Delta w_{i,t}$ is the percent change in the minimum wage (MWPC) for CPI MSA i between time t and $t-1$; α_i captures time-invariant differences across CPI MSAs, including differences in long-run inflation rates; v_t is a time fixed effect that captures macroeconomic trends across all CPI MSAs; y_{it} is a measure of local economic conditions; and J_2 and J_1 denote the number of lags and leads, respectively, of the MWPC.

We estimate equation (1) from 1999 to 2014 given data availability. Our baseline results include one lead ($J_1 = 1$) of the MWPC and one lag (J_2=1). The lead of the MWPC captures any anticipatory effects of the policy change, while the lag helps determine the persistence of the minimum wage effect. We are interested in both the initial effect of the change in the minimum wage, $\beta(0)$, and the total effect, $\sum_{j=-1}^{1}\beta(j)$.[19]

[17] Table A.3 in the Appendix provides summary statistics for the relevant components of nominal consumption growth and inflation.

[18] Not all of the components of consumption and inflation overlap.

[19] Our estimation approach is similar to Aaronson (2001), who examines the impact of minimum wage changes on prices in the restaurant industry. However, Aaronson's estimates capture the *relative* effect of minimum wage changes on restaurant price inflation since his empirical setup controls for overall inflation. In comparison, we are interested in the local aggregate effect of minimum wage changes on overall inflation. Our empirical framework is most similar to that in Lemos (2004).

We include a control for local economic conditions in equation (1), y_{it}, to capture time-varying, MSA-specific factors that might affect inflation or PCE growth, but that are independent of the effect of the minimum wage change. The choice of the control used to measure local economic conditions is important, since local demand conditions may spur changes in the minimum wage or minimum wage changes may affect the local economy. We use local employment growth as captured by our Bartik growth instrument as our measure of y_{it}, since it is arguably exogenous with respect to changes in the minimum wage. The industry share of employment within a state is relatively fixed over time, and national employment growth by industry should be independent of a given's state's minimum wage.[20] In addition, the existing literature shows that the employment effect of minimum wages changes is limited at best. With Bartik growth as a control variable, the estimated minimum wage effect, $\sum_{j=-1}^{1}\beta(j)$, captures the pass-through of minimum wage changes to inflation or nominal consumption growth that is orthogonal to changes in local economic conditions. In the end, however, our choice of control for local economic conditions has little effect on the estimated minimum wage effects; for example, including the local employment-to-population ratio or not having any controls for local conditions yield very similar results.[21]

A potential concern with our estimation approach is reverse causality—minimum wages may rise in order to keep up with higher prices, especially in states that index their minimum wage to the annual change in the cost-of-living. Such indexing, however, is a relatively new approach and currently only 10 states follow such a policy.[22] In the last few years, minimum wage changes due to inflation indexation also have been quite small compared to changes in states that do not index their minimum wages.[23] In addition, unlike in Brazil where minimum wage changes are solely determined at the national level, and historically have been tied to large fluctuations in aggregate inflation, we have both cross-sectional and time-series variation in minimum wage changes. This variation helps us identify the effect of minimum wages on prices, since most of the legislated changes in

[20]It is possible that the national employment growth data may be less exogenous in years when a large number of states change their minimum wage. However, our results are very similar if we exclude years from our sample when twelve or more states change their minimum wages.

[21]This is likely due to the fact that minimum wage changes have little effect on employment.

[22]These states include Arizona, Colorado, Florida, Missouri, Montana, Nevada, New Jersey, Ohio, South Dakota, and Washington State. An eleventh state, Alaska, indexed its minimum wage to inflation for a year starting in August 2002. In addition, Washington State began indexing its minimum wage in 1999—much earlier than the other states.

[23]See "Higher Minimum Wage May Have Losers," *New York Times* January 10, 2017; available at: https://www.nytimes.com/interactive/2017/01/05/business/economy/state-minimumwages.html.

minimum wages at the state-level are not necessarily enacted in response to inflationary pressures.

Finally, in some specifications we allow for the effect of the minimum wage change to be larger the more workers it affects in a city. To do this, we include an interaction between the minimum wage change and the share of low-wage workers in the CPI MSA.[24] This approach tests whether there is a differential inflation or consumption effect in locations with a greater share of low-wage workers. These individuals are the ones most likely to be affected by a given change in the minimum wage. Since the share of low-wage workers in a location is arguably driven by long-run factors such as the composition of an MSA's industrial base, consistent identification of this heterogeneity requires even weaker assumptions than are required to identify the average effect of a minimum wage change.[25]

4 Results

4.1 Minimum Wage Changes and Inflation

Table 1 shows estimates of the effect of minimum wage changes on inflation.[26] The estimates in the first row represent the *impact* effect of the policy change—that is, the change in prices in the year that the minimum wage hike goes into effect. In particular, a 10 percent increase in the minimum wage is associated with an overall (all-items) inflation rate that is 8 basis points higher relative to the preceding year. This effect is not precisely estimated and is quite small, especially given that a 10 percent minimum wage increase is nearly double the average MWPC in our sample. However, the increase in inflation is not evenly distributed across all goods and services. In particular, minimum wage changes have the largest measured impact on food prices—especially food away from home (column 8). A 10 percent increase in the minimum wage leads to prices on food away from home that are about 0.3 percent higher. This effect is more substantial and precisely estimated than the impact effects for any of the other CPI components. A particularly strong food away inflation effect is consistent with restaurants typically employing a

[24]We calculate the share of minimum-wage workers based on the minimum wage that prevailed as of time $t-1$ (see equation 1).

[25]Indeed, Lemos (2004) uses the low-wage share as an instrument in her analysis of Brazilian minimum wage changes.

[26]For brevity we only report the most relevant results for the available CPI (or PCE) components.

lot of minimum-wage workers, and thus facing relatively greater cost pressures when minimum wages rise. If there was a complete pass-through in costs and no change in employment, this estimated coefficient would imply a 3 percent gross revenue share for low-wage workers. Looking at the other CPI categories, there is also a substantial increase in inflation for household furnishings, but this increase is not statistically distinguishable from there being no effect.

Table 1 also shows estimates of the relationship between price increases and local economic conditions as captured by the Bartik growth variable. In general, higher employment growth leads to greater inflation. This effect is quite large for durable and nondurable goods as well as household furnishings. For example, the Bartik coefficient in the durable goods specification suggests that 1 percent higher predicted local employment growth leads to 1.2 percentage points higher durable goods inflation. The employment effects are also much larger than the minimum wage effects on prices.[27] However, including the Bartik growth measure has little effect on our estimates of the minimum wage effects. Indeed, our results are nearly identical when we exclude the control for local economic conditions (see Table A.1 in the Appendix).

Table 1 also reports the estimated coefficients for the lead and lag of the percent change in the minimum wage, which capture any changes in prices that occur the year before in anticipation of the coming change in the minimum wage (lead) and in the second year after the change (lag).[28] The memo lines of the table summarize the overall effect of a change in the minimum wage taking into account the lead and lag effects. In particular, the "two-year effect" includes the contemporaneous and *lagged* minimum wage estimates to measure the cumulative impact of a minimum wage increase on prices, while the "total effect" is the two-year effect plus any anticipatory effect (the p-values for these estimates are in the square brackets). These two summary measures are similar in magnitude since there is little movement of prices in anticipation of the increase in the minimum wage.[29] We include both measures for completeness.

The estimates suggest that a 10 percent increase in the minimum wage causes the

[27]The estimated Bartik growth effects are substantially larger than the employment growth effect estimates obtained using actual employment growth in a given city (not shown). Some of this difference is likely due to attenuation bias since actual employment growth is likely endogenous. The Bartik growth variable also controls for something slightly different than actual employment growth, so we would not expect the coefficient to be the same even if there was no endogeneity.

[28]Additional lags (not shown) tend to be economically and statistically insignificant and have little impact on our overall findings.

[29]Nondurable prices fall in advance of the minimum wage increase, but this could just be noise in the data.

price of food away from home to rise by 0.4 percentage points after two years, the majority of which is the 0.3 percentage point first-year (impact) effect. Thus, the effect of the minimum wage increase on restaurant inflation is rapid and is largely transitory. (Including any anticipatory food away effect has little bearing on this finding other than introducing noise.) The rise in prices that follow increases in the minimum wage are slower to feed through to prices outside of the food (at home and away) sector. Core CPI inflation, which excludes food and energy, rises only 0.1 percentage point in year after a 10 percent increase in the minimum wage. Core prices gain 0.25 percentage points cumulatively, and the total effect is about the same as the effect for food away from home. Total CPI prices increase a bit less, and both the total and core CPI estimated price effects have p-values greater than 0.1. These effects are larger, but not necessarily more precisely estimated, in MSAs with a greater share of low-wage workers, as we shall discuss in Section 4.4.

The increase in the overall price level is primarily driven by slowly responding prices in the service sector. This finding is consistent with many service sector industries, such as personal care services, which tend to employ low- or minimum-wage workers. Durable goods prices are also cumulatively higher, due perhaps to the retail component of durable goods prices (low-wage workers sell durable goods in stores) or to increased demand, as we discuss later in section 4.3.

To provide more perspective, we use our estimates to calculate the effect of the average 6 percent increase in the minimum wage during our sample period, as well as an extreme case of a jump in the federal minimum wage from $7.25 per hour to $15.00 per hour or about 107 percent. The cumulative price level increase in response to the average minimum wage increase is fairly benign—core CPI prices rise about 5 basis points on impact and about 20 basis points cumulatively. The hypothetical more than doubling of the federal minimum wage results in about 0.85 percentage point higher inflation on impact and more than 3.5 percentage points higher prices in the second year (from the cumulative effect of higher inflation in each year). On the one hand, this implied effect is overestimated since many states already have minimum wages that are much higher than the current federal minimum wage, so the average increase across all states due to such a change in the federal minimum wage would be significantly less than 107 percent. On the other hand, our estimates represent a lower bound on the price increase associated with a large increase in the minimum in some states, as the magnitude of the price effect likely rises with the size of the minimum wage change and the greater number of workers affected. Still, it is important to keep these potential local aggregate inflation effects in mind when thinking about the implications of a broad-based increase in minimum wages in the United States.

4.2 Minimum Wage Changes and Nominal Consumption Growth

Table 2 reports estimates of the effect an increase in the minimum wage has on nominal consumption growth rather than inflation.[30] Consistent with our findings for prices, we find the largest, most precisely estimated effects of a minimum wage increase on food away expenditures. In particular, a 10 percent increase in the minimum wage raises nominal food away consumption by nearly 0.8 percentage point. There are also relatively large and positive, but imprecisely estimated, impact effects for nondurables, and food and beverages consumed at home. In addition, the cumulative increase in food at home consumption is precisely estimated and of similar magnitude to the impact (and cumulative) effect for food away. Consumption of services also increases slightly.

Nondurable expenditures rise along with the increase in food spending, while the gain in services consumption is consistent with a number of service-providing companies employing substantial numbers of low-wage workers. Total consumption (column 1) and durable consumption (column 2) also increase on impact but these effects are imprecisely estimated. Consumption growth is also positively related to local economic conditions, with the estimated effects somewhat larger than those for inflation.[31]

In addition, the food away and food at home consumption effects are much larger than the respective food price effects, suggesting that nominal food consumption increases more than the amount that would be implied by higher prices alone. That is, consumers appear to adjust the *quantity* of food that they consume when the minimum wage rises, with the effect on food away from home being more immediate and the effect on food at home occurring over time.[32] Since restaurant spending is a discretionary purchase and a relative luxury—especially for lower-wage earners—it is not terribly surprising that spending on this category increases when incomes rise. The increase in the quantity of food at home spending suggests that lower-income households may have been spending less on food than they desired (out of necessity) prior to the minimum wage change, or

[30]The sample size for the PCE results is slightly larger than for the CPI inflation results because one CPI MSA (Phoenix, AZ) only has price data starting in 2003.

[31]Again, controlling for economic conditions has little effect on our minimum wage results.

[32]Nondurable goods consumption also increases—consistent with the gains in food consumption—although the effects are smaller and not precisely estimated.

that they shift their food consumption basket toward more expensive products. This pattern suggests that some workers are better off when minimum wages rise—a finding that contradicts MaCurdy (2015)'s claim that minimum wage policy changes provide little benefit to the poor.

The minimum wage effects for the other consumption categories are similar in size to the inflation effects, suggesting that the quantity adjustment for food consumption spending is somewhat unique. Overall, this finding highlights an interesting potential behavioral response by consumers to increases in the minimum wage. We examine households' real consumption response to minimum wage changes more directly in Section 4.3.

The results in Table 2 further show that consumers increase their nominal spending on durable goods in anticipation of a minimum wage change (p-value 0.147). This finding is consistent with recent research by Dettling and Hsu (2017) suggesting that minimum wage increases help relax credit constraints. Since minimum wage changes are announced in advance, minimum-wage workers may have a somewhat easier time financing purchases of durable goods after the announcement. Similarly, Aaronson, Agarwal, and French (2012) find that higher minimum wages increase automobile sales. In comparison, there is a lag in the price increase for durable goods, which suggests that durable prices may adjust slowly to the increase in demand.

4.3 Minimum Wage Changes and Real Consumption Growth

Our baseline price and nominal spending results imply that consumers increase their *real* consumption of food away from home in response to a minimum wage increase (nominal consumption rises more than the increase in prices). As we discussed in Section 2, the BEA's data on state-level real consumption expenditures are unreliable. We instead construct approximate measures of real consumption using the BEA's nominal consumption data along with the CPI inflation data for categories where there is reasonable overlap between the spending and price data. In particular, the CPI and PCE coverage for food away, food at home, and durables are reasonably similar. We construct real consumption as the difference between annual nominal PCE growth and annual inflation for these categories. Despite the fact that the treatment of some goods and services, notably housing and health care, are quite different between the NIPA and CPI, we also combine CPI and nominal PCE data to study total real consumption spending. As noted in Section 2, these measures of real consumption expenditures are imperfect primarily due to the BLS and BEA using different weights to construct the CPI and PCE data, respectively.

Table 3 reports estimates of our baseline specification where we use these real consumption categories as the dependent variable. The results confirm our earlier conjecture that households increase the quantity of food that they consume away from home in response to an increase in the minimum wage. In particular, real spending on food away increases about 0.5 percent for a 10 percent increase in the minimum wage. Real consumption of food at home also increases—especially on a cumulative basis and perhaps even a bit in advance of the minimum wage change.

These results raise two questions. First, how do price increases lead to more real consumption of these two food categories? Ultimately, the increase in the minimum wage affects the local economy in many ways. Spending on food presumably rises because a minimum wage increase leads to higher consumption spending since low-wage workers now have higher incomes. In particular, lower income individuals who benefit from an increase in the minimum wage tend to spend a higher share of their budget on food. As a result, they spend more money on food despite the higher prices (the income effect outweighs the substitution effect from higher prices). The second question is why, if these consumers' food price elasticities are so low, were restaurants and other food stores not raising prices already? The answer again concerns equilibrium effects. In a competitive industry, the elasticity of demand for a single firm increasing its price can be very large (infinite in theory), even when the elasticity of demand for an industry-wide increase is very low. Our results suggest a low elasticity for an industry-wide food price increase.

There is also some evidence that spending on real durable goods increases in advance of the minimum wage change, but again the effect is not precisely estimated. In contrast, overall real PCE growth is unaffected by a change in the minimum wage—a finding that is consistent with overall inflation and overall nominal PCE growth rising by similar amounts.

4.4 Are the Effects Bigger When More Workers are Affected?

If a minimum wage change affects a limited number of workers, then we would expect a given minimum wage increase to have a relatively small impact on prices and consumption. In contrast, when the minimum wage change affects many workers we would expect a given minimum wage change to have a larger effect. The number of workers that are impacted depends on both the left tail of the wage distribution in a given city and the level of the minimum wage. We do not observe the wage distribution absent any minimum wage, and we also know that minimum wage increases affect wages above the minimum wage (spillover effects) as well as those that would be below it absent the wage floor.

Table 4 reports results of regressions that allow the effect of a change in the minimum wage to vary with the share of low-wage workers by location. The upper panel shows results for prices (inflation), while the lower panel shows results for (nominal) consumption growth. Rather than show all the estimates for both the direct minimum wage effects and the incremental (interaction) effects for low-wage workers, we report only the contemporaneous (impact) effects and then the respective cumulative effects. The heterogenous treatment effect (HTE) has been standardized so that its coefficient can be interpreted as the differential effect of the minimum wage change for locations with a one standard deviation larger share of low-wage workers relative to the mean. As noted, we measure the share of low-wage workers as the share of workers in an MSA with wages below 110 percent of the effective minimum wage at beginning of the period over which the minimum wage change is measured, $t-1$, to avoid potential endogeneity. Alternative approaches to measuring the share of low-wage workers yield very similar results.

In general, prices rise more on impact in locations with a greater share of low-wage workers (upper panel). This finding is consistent with labor costs increasing more in locations with a greater proportion of low-wage workers, leading firms in these locations to raise their prices more to offset their higher costs. However, even though these HTEs are positive on impact and similar in size or slightly larger than the direct minimum wage effects, they are not very precisely estimated. An exception is the HTE for durable goods prices, which is rather large–especially compared to the small direct durable goods price effect—but the HTE is only significant at the 10 percent level. Interestingly, there is no parallel HTE for durable goods consumption (lower panel), so perhaps the prices of durable goods across all locations are catching up to the large (direct) increase in durable consumption spending that occurs in advance of the minimum wage change.

In terms of cumulative price effects, we find a nontrivial (total) HTE for food at home, food away from home, and a related effect for nondurable goods. These results lend credence to our main findings. Were it not the case that when the minimum wage change directly impacts more workers, the effects were larger, then we would be concerned that our baseline correlation might be picking up a lower frequency trend or an endogeneity between minimum wage changes and expected economic performance.

In addition, the increase in durable goods prices in areas with a larger share of low-wage workers persists, and there is somewhat of an anticipatory effect as well since the total HTE is a bit larger than the two-year effect. Again, this finding is broadly consistent with minimum wage increases relaxing credit constraints, especially for low-income workers. The cumulative HTE for the other CPI categories are positive (except for household furnishings) but are not precisely estimated. In addition, once we control for HTE, the direct inflation effects of the MWPC are similar to what we observe in our baseline estimates. Incorporating HTE into the analysis also aides in identifying some of the direct minimum wage effects, as the precision of the estimates increases for some categories. Overall, the CPI results presented in Table 4 suggest that minimum wage changes have larger price effects in industries that employ a larger share of low-wage workers, as well as in locations with a greater concentration of such workers.

In comparison to the price effects, the nominal consumption estimates in the lower panel of Table 4 are much less precisely estimated. The point estimates on impact are similar to those for prices for both food categories, but are a little lower (economically but not statistically) for the remaining categories.

That said, the average effects of minimum wage changes on consumption are similar to what we observe in our baseline estimates even after adding this control. The response of food away spending in the first year and cumulatively remains strong, and there continues to be a relatively large anticipatory spending effect for durable goods to the minimum wage change. There is also a similar sized, anticipatory durable consumption effect in areas with a greater share of low-wage workers, but this effect also is not precisely estimated.

While the standard errors are large, we do not see much evidence of an HTE effect on consumption that is consistent with the observed rise in prices for areas with a greater proportion of low-wage workers. Perhaps low-wage workers do not purchase enough of the goods and services that experience a differential price increase for us to also observe a differential spending effect. Alternatively, the data may be too aggregated to completely tease out the HTE for consumption.

4.5 Robustness: Controlling for Unobserved Factors

In this section we return to our main estimates and consider alternative controls for regional economic conditions. A potential concern is that, while there is a lot of variation in minimum wages across the United States, minimum wage levels and policy changes may not be randomly distributed across states or time. States and/or regions of the country may differ along dimensions other than their minimum wage policies, so there are potential drawbacks to using MSA-level (or state-level) data to estimate the effects of minimum wage changes. In particular, unobserved regional or national factors that are correlated with inflation or consumption may also drive changes in minimum wages. Two-way fixed effects models (with a fixed effect for each year and for each MSA or state)—like in our baseline specification—have been the traditional approach used in the literature to deal with these confounding factors. However, such models do not control for any type of pre-existing, location-specific trends in the explanatory variable of interest (for example, employment growth). Indeed, much of the recent debate in the minimum wage and employment literature focuses on whether one should control for pre-existing trends in the data or whether doing so "throws away" too much valid identifying information—see, for example, the debate between Neumark, Salas, and Wascher (2014) and Allegretto et al. (2017). Typically, controlling for pre-trends in a two-way fixed effects model lowers the estimated employment effect of a given minimum wage increase.

Totty (forthcoming) approaches controlling for unobserved factors somewhat differently by relying on factor model estimators (interactive effects as opposed to additive effects) following the work of Pesaran (2006) and Bai (2009). In a macroeconomic setting, interactive fixed effects capture common shocks with potential heterogeneous effects on the cross-sectional unit being analyzed. Bai (2009) estimates the common (shocks) factors (and factor loadings) directly, and one difficulty in implementing his method is choosing the correct number of factors.[33] In contrast, Pesaran (2006) uses additional regressors to proxy for the common factors. His estimator calls for the inclusion of the cross-sectional averages of the dependent and independent variables as additional controls.

We check the robustness of our results to unobserved factors using two alternative estimation approaches: (1) including census region-by-period fixed effects instead of just time fixed effects in our baseline estimates; (2) using the estimator proposed by Bai (2009).[34] The results in Table 5 Panel A incorporate region-by-period fixed effects in our estimates, in addition to the CPI-MSA fixed effects.[35] The estimated impact of a

[33]In Bai (2009), the estimation model is $Y_{it} = X_{it}'\beta + u_{it}$ and $u_{it} = \lambda_i' F_t + \epsilon_{it}$, where λ_i' is a vector of factor loadings and F_t is a vector of common factors. The two-way fixed effects model is a special case of this more general interactive effects model with $F_t = \left[\begin{smallmatrix} 1 \\ v_t \end{smallmatrix}\right]$, and $\lambda_i = \left[\begin{smallmatrix} \alpha_i \\ 1 \end{smallmatrix}\right]$.

[34]The method in Pesaran (2006) requires a large N and a large T setting, and may not be best suited for our relatively small panel.

[35]MSA or state-specific time trends are often added as well if the independent variable is in levels.

minimum wage change on food prices barely changes when including these additional controls; however, we obtain larger (and statistically significant) minimum wage effects for the broader CPI categories (all, all excluding energy, and core) and services—more consistent with the regressions that allowed for HTE. Nevertheless, the estimated effects of minimum wage increases on local-aggregate prices remain small. The largest estimated price effect (including leads and lags) is for services: a 10 percent increase in the minimum wage leads to services that are priced about 0.8 percentage points higher over a two-year period.[36]

The results using the proposed estimator by Bai (2009) are reported in Panel B of Table 5. We use four common factors in the regressions to avoid over-identification, but the results are not very sensitive to the exact number of factors used (particularly for the food inflation categories).[37] The estimated impact of minimum wage changes on food away prices are of very similar magnitude to our previous estimates for the two-year period. The main difference compared to our baseline results is that we now obtain a more distributed effect over the year following a minimum wage increase.

Applying these methods to the consumption growth regressions, shown in Table 6, does not really affect our conclusions. The estimated effect of minimum wage changes on food spending are remarkably similar to our baseline specification. In addition, the effects of a minimum wage increase on food spending do not become smaller when using these alternative methods.

5 Conclusion

While there has been much debate about the effect of minimum wage increases on the economy, and especially employment, the estimated effects are typically small. In this paper, we focused on the less-studied relationship between minimum wage increases and inflation, and minimum wage increases and consumption. We find small but significant effects of minimum wage changes on prices and household spending. Prices and consumption increase, especially in economic sectors such as food and services where firms tend to employ a large number of minimum- and low-wage workers. This finding suggests that when minimum wages rise, companies at least partially offset their higher labor costs by

Since our independent variable (inflation or consumption growth) is already a growth rate, the MSA-level fixed effects should capture pre-existing, MSA-specific growth trends.

[36]This larger effect contrasts with the typical smaller effects obtained when including region by period fixed effects with employment as the outcome of interest.

[37]We use the *regife* command in Stata to implement Bai (2009).

increasing their prices. We also find that households increase the *quantity* of food that they consume at home and away from home when the minimum wage rises, suggesting the possibility of some behavioral responses to increases in the minimum wage.

Besides focusing on inflation and consumption, our research contributes to the minimum wage literature by examining the broader but local aggregate implications of minimum wage changes. The effect that minimum wage increases have on the macroeconomy is likely going to become more relevant as more local governments debate raising minimum wages. Indeed, we have already observed many states starting or continuing to raise their minimum wages toward $15 per hour. When thinking about the impact of higher minimum wages on the overall economy, one should keep in mind that while the estimated price and spending effects are relatively small, these are based on historical changes in the minimum wage that are also not large (averaging about 6 percent annually, conditional on a change occurring).

There is some concern that there could be so-called threshold effects associated with increases in the minimum wage. That is, the effect of the minimum wage on the economy will be differentially (nonlinearly) larger when the size of the change in the minimum wage increase or the level of the minimum wage itself grows. Indeed, Jardim et al. (2017) find some evidence of threshold effects when examining recent changes in the city-level minimum wage in Seattle. By taking into account the share of low-wage workers in a given location, we effectively upweight the impact of the minimum wage change. We do not find a big effect, however, which argues against the presence of large threshold effects in the observed range of minimum wages changes (relative to market wages) in our analysis. Note as well, that so far states have continued to increase their minimum wages at a gradual pace. This does not mean, however, that minimum wage changes will continue to be small. Should the changes become much larger, the local aggregate inflation (and consumption) implications of these changes could be more substantial and may require more attention from monetary policymakers.

References

Aaronson, Daniel. 2001. "Price Pass-Through and the Minimum Wage." *Review of Economics and Statistics* 83(1): 158–169.

Aaronson, Daniel, Sumit Agarwal, and Eric French. 2012. "The Spending and Debt Response to Minimum Wage Hikes." *American Economic Review* 102(7): 3111–3139.

Aaronson, Daniel, Eric French, and James MacDonald. 2008. "The Minimum Wage, Restaurant Prices, and Labor Market Structure." *Journal of Human Resources* 43(3): 688–720.

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

Bai, Jushan. 2009. "Panel Data Models with Interactive Fixed Effects." *Econometrica* 77(4): 1229–1279.

Bartik, Timothy. 1991. *Who Benefits from State and Local Economic Development Policies?* Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

Card, David, and Alan B. Krueger. 1994. "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania." *American Economic Review* 84(4): 772–793.

Dettling, Lisa J., and Joanne W. Hsu. 2017. "Minimum Wages and Consumer Credit: Impacts on Access to Credit and Traditional and High-Cost Borrowing." Finance and Economics Discussion Series 2017-010. Washington, DC: Board of Governors of the Federal Reserve System.

Dube, Arindrajit, T. William Lester, and Michael Reich. 2016. "Minimum Wage Shocks, Employment Flows, and Labor Market Frictions." *Journal of Labor Economics* 34(3): 663–704.

Jardim, Ekaterina, Mark C. Long, Robert Plotnick, Emma van Inwegen, Jacob Vigdor, and Hilary Wething. 2017. "Minimum Wage Increases, Wages, And Low-Wage Employment: Evidence From Seattle." Working Paper 23532. Cambridge, MA: National Bureau of Economic Research.

Lemos, Sara. 2004. "Minimum Wage Policy and Employment Effects: Evidence from Brazil." *Economia* 5(1): 219–266.

Lemos, Sara. 2008. "A Survey of the Effects of the Minimum Wage on Prices." *Journal of Economic Surveys* 22(1): 187–212.

MaCurdy, Thomas. 2015. "How Effective Is the Minimum Wage at Supporting the Poor?" *Journal of Political Economy* 123(2): 497–545.

Neumark, David, J.M. Ian Salas, and William Wascher. 2014. "Revisiting the Minimum Wage-Employment Debate: Throwing Out the Baby with the Bathwater?" *ILR Review* 67(Supplement 3): 608–648.

Paciorek, Andrew. 2013. "Supply Constraints and Housing Market Dynamics." *Journal of Urban Economics* 77: 11–26.

Pesaran, M. Hashem. 2006. "Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure." *Econometrica* 74(4): 967–1012.

Totty, Evan. Forthcoming. "The Effect of Minimum Wages on Employment: A Factor Model Approach." *Economic Inquiry*.

Wolff, Edward N., and Ishaq Nadiri. 1981. "A Simulation Model of the Effect of an Increase in the Minimum Wage on Employment, Output and the Price Level." In *Report of the Minimum Wage Study Commission, Vol. VI: The Minimum Wage and the Macro Economy*, 217–232. Washington, DC: U.S. Government Printing Office.

Table 1: Baseline: Minimum Wage Changes and Inflation

	(1) All	(2) All x Energy	(3) Core	(4) Dur	(5) Nondur	(6) Serv	(7) Food at Home	(8) Food Away	(9) HH Furnish
Pct. Chg. Min. Wage (t)	0.008	0.010	0.008	–0.000	0.007	0.009	0.002	0.030**	0.031
	(0.008)	(0.009)	(0.011)	(0.013)	(0.007)	(0.012)	(0.015)	(0.011)	(0.020)
Pct. Chg. Min. Wage (t–1)	0.011	0.014	0.016	0.033*	–0.002	0.009	–0.009	0.011	0.037
	(0.010)	(0.010)	(0.012)	(0.017)	(0.013)	(0.015)	(0.015)	(0.017)	(0.032)
Pct. Chg. Min. Wage (t+1)	0.006	0.007	0.008	0.007	–0.018*	0.015	–0.008	0.002	0.014
	(0.012)	(0.012)	(0.013)	(0.020)	(0.010)	(0.016)	(0.011)	(0.012)	(0.023)
Bartik Emp. Growth	0.237	0.167	0.161	1.204***	0.654**	–0.238	0.240	-0.019	1.425*
	(0.349)	(0.326)	(0.348)	(0.389)	(0.294)	(0.524)	(0.284)	(0.427)	(0.722)
Memo:									
Two-year Min. Wage Effect†	0.020	0.023	0.025	0.033	0.005	0.018	–0.006	0.041	0.068
P-value	[0.191]	[0.137]	[0.150]	[0.122]	[0.779]	[0.417]	[0.725]	[0.063]	[0.092]
Total Min. Wage Effect‡	0.025	0.030	0.033	0.040	–0.014	0.033	–0.014	0.043	0.082
P-value	[0.242]	[0.177]	[0.162]	[0.173]	[0.526]	[0.279]	[0.542]	[0.132]	[0.074]
Observations	401	401	401	401	401	401	401	401	401
Adjusted R^2	0.647	0.343	0.291	0.474	0.898	0.425	0.696	0.317	0.255

Notes: The estimates are based on the baseline equation $\Delta x^k_{i,t} = \alpha_i + \nu_t + \sum_{j=-1}^{1} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$ where the dependent variable is inflation (price growth) for the CPI category indicated at the top of each column. The annual data cover 1999–2014. The estimates include location (CPI MSA) fixed effects as well as year effects. The percent change in the minimum wage when a CPI MSA spans different states is calculated based on the average (population-weighted) minimum wage in each location and year as discussed in the text. † Cumulative effect of the minimum wage change measured over two years (sum of contemporaneous and lagged effects). ‡ The total effect of the minimum wage change including any anticipatory effect (sum of contemporaneous, lagged, and lead effects). Standard errors clustered by CPI MSA are in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

Table 2: Minimum Wage Changes and Nominal Consumption Growth

	(1) Total PCE	(2) Core PCE	(3) Dur.	(4) Nondur.	(5) Serv.	(6) Food at Home	(7) Food Away
Pct. Chg. Min. Wage (t)	0.013	0.005	0.012	0.023	0.013	0.027	0.076***
	(0.011)	(0.011)	(0.035)	(0.017)	(0.008)	(0.017)	(0.011)
Pct. Chg. Min. Wage (t–1)	0.006	0.005	0.019	0.013	0.000	0.026	–0.002
	(0.014)	(0.014)	(0.032)	(0.018)	(0.009)	(0.018)	(0.022)
Pct. Chg. Min. Wage (t+1)	0.008	0.008	0.060	0.009	–0.007	0.025	0.003
	(0.015)	(0.014)	(0.040)	(0.016)	(0.012)	(0.020)	(0.026)
Bartik Emp. Growth	0.641*	0.568	3.349***	1.028**	–0.094	1.187***	–0.327
	(0.338)	(0.348)	(0.722)	(0.431)	(0.319)	(0.406)	(0.493)
Memo:							
Two-year Min. Wage Effect†	0.020	0.010	0.030	0.036	0.013	0.053	0.074
P-value	[0.366]	[0.661]	[0.610]	[0.215]	[0.380]	[0.096]	[0.012]
Total Min. Wage Effect‡	0.027	0.017	0.090	0.045	0.005	0.078	0.076
P-value	[0.333]	[0.526]	[0.288]	[0.203]	[0.786]	[0.049]	[0.099]
Observations	405	405	405	405	405	405	405
Adjusted R^2	0.862	0.833	0.794	0.859	0.868	0.604	0.735

Notes: The estimates are based on the baseline equation $\Delta x^k_{i,t} = \alpha_i + \nu_t + \sum_{j=-1}^{1} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$, where the dependent variable is the percent change in consumption growth for the expenditure category indicated at the top of each column. The annual data cover 1999–2014. Core PCE excludes food and energy consumption. The estimates include location (CPI MSA) fixed effects as well as year effects. The percent change in the minimum wage when a CPI MSA spans different states is calculated based on the average (population-weighted) minimum wage in each location and year as discussed in the text. † Cumulative effect of the minimum wage change measured over two years (sum of contemporaneous and lagged effects); ‡ The total effect of the minimum wage change including any anticipatory effect (sum of contemporaneous, lagged, and lead effects). Standard errors clustered by CPI MSA are in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

Table 3: Minimum Wage Changes and Real Consumption Growth

	(1) Real PCE	(2) Real Core PCE	(3) Durables	(4) Services	(5) Food Away	(6) Food at Home
Pct. Chg. Min. Wage (t)	0.010	0.000	0.016	0.007	0.051***	0.030
	(0.010)	(0.013)	(0.039)	(0.011)	(0.014)	(0.020)
Pct. Chg. Min. Wage (t–1)	–0.007	–0.014	–0.020	–0.011	–0.016	0.027
	(0.014)	(0.013)	(0.036)	(0.014)	(0.029)	(0.024)
Pct. Chg. Min. Wage (t+1)	0.002	–0.001	0.051	–0.023	0.002	0.029
	(0.017)	(0.019)	(0.045)	(0.018)	(0.031)	(0.018)
Bartik Emp. Growth	1.060**	1.055*	4.049***	0.716	0.748	1.089**
	(0.504)	(0.540)	(1.083)	(0.492)	(0.657)	(0.462)
Memo:						
Two-year Min. Wage Effect†	0.003	–0.014	–0.004	–0.004	0.035	0.057
P-value	[0.872]	[0.490]	[0.954]	[0.836]	[0.309]	[0.057]
Total Min. Wage Effect‡	0.005	–0.014	0.047	–0.027	0.037	0.086
P-value	[0.846]	[0.603]	[0.615]	[0.326]	[0.485]	[0.009]
Observations	402	402	402	402	402	402
Adjusted R^2	0.716	0.743	0.739	0.639	0.709	0.450

Notes: The estimates are based on the baseline equation $\Delta x^k_{i,t} = \alpha_i + \nu_t + \sum_{j=-1}^{1} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$, where the dependent variable is the percent change in real consumption growth for the expenditure category indicated at the top of each column. The annual data cover 1999–2014. Core PCE excludes food and energy consumption. The estimates include location (CPI MSA) fixed effects as well as year effects. The percent change in the minimum wage when a CPI MSA spans different states is calculated based on the average (population-weighted) minimum wage in each location and year as discussed in the text. † Cumulative effect of the minimum wage change measured over two years (sum of contemporaneous and lagged effects); ‡ The total effect of the minimum wage change including any anticipatory effect (sum of contemporaneous, lagged, and lead effects). Standard errors clustered by CPI MSA are in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

Table 4: Robustness: Controlling for the Share of Low-Wage Workers

Panel A: Inflation Results

	(1) All	(2) All x Energy	(3) Core	(4) Dur	(5) Nondur	(6) Serv	(7) Food at Home	(8) Food Away	(9) HH Furnish
Pct. Chg. Min. Wage (t)	0.015*	0.017*	0.016	0.010	0.014*	0.014	0.009	0.034**	0.038*
	(0.007)	(0.009)	(0.010)	(0.012)	(0.008)	(0.012)	(0.016)	(0.013)	(0.022)
Heterogenous Treatment Effect [HTE] (t)	0.019	0.024*	0.027*	0.034*	0.010	0.022	0.010	0.016	0.031
	(0.014)	(0.013)	(0.015)	(0.018)	(0.015)	(0.021)	(0.015)	(0.019)	(0.029)
Bartik Emp. Growth	0.194	0.111	0.104	1.130***	0.607*	–0.276	0.184	–0.071	1.408*
	(0.365)	(0.342)	(0.366)	(0.400)	(0.308)	(0.548)	(0.276)	(0.436)	(0.727)
Memo:									
Two-year Min. Wage Effect†	0.028	0.033	0.034	0.046	0.021	0.022	0.010	0.049	0.068
P-value	[0.057]	[0.031]	[0.041]	[0.031]	[0.202]	[0.313]	[0.611]	[0.053]	[0.154]
Total Min. Wage Effect‡	0.028	0.033	0.034	0.046	0.021	0.022	0.010	0.049	0.068
P-value	[0.057]	[0.031]	[0.041]	[0.031]	[0.202]	[0.313]	[0.611]	[0.053]	[0.154]
Two-year HTE†	0.032	0.040	0.040	0.052	0.048	0.022	0.049	0.032	0.011
P-value	[0.204]	[0.110]	[0.144]	[0.104]	[0.017]	[0.535]	[0.046]	[0.207]	[0.841]
Total HTE‡	0.039	0.050	0.049	0.065	0.052	0.028	0.064	0.055	–0.010
P-value	[0.203]	[0.090]	[0.136]	[0.033]	[0.021]	[0.517]	[0.071]	[0.094]	[0.880]
Observations	401	401	401	401	401	401	401	401	401
Adjusted R^2	0.648	0.350	0.295	0.476	0.900	0.423	0.699	0.319	0.252

Panel B: Consumption Growth Results

	(1) PCE	(2) Core	(3) Dur	(4) Nondur	(5) Serv	(6) Food at Home	(7) Food Away
Pct. Chg. Min. Wage (t)	0.008	0.000	0.006	0.014	0.010	0.021	0.070***
	(0.012)	(0.011)	(0.038)	(0.017)	(0.008)	(0.018)	(0.013)
Heterogenous Treatment Effect [HTE] (t)	0.003	–0.001	–0.028	0.018	–0.001	0.011	0.012
	(0.011)	(0.011)	(0.031)	(0.016)	(0.009)	(0.021)	(0.015)
Bartik Emp. Growth 0.633*	0.572	3.397***	1.012**	–0.094	1.173***	–0.369	
	(0.345)	(0.363)	(0.692)	(0.437)	(0.339)	(0.404)	(0.480)
Memo:							
Two-year Min. Wage Effect†	0.016	0.007	0.030	0.030	0.011	0.049	0.068
P-value	[0.492]	[0.760]	[0.638]	[0.335]	[0.471]	[0.165]	[0.029]
Total Min. Wage Effect‡	0.022	0.012	0.077	0.041	0.002	0.074	0.069
P-value	[0.477]	[0.679]	[0.370]	[0.286]	[0.931]	[0.082]	[0.161]
Two-year HTE†	–0.011	–0.018	–0.058	–0.008	–0.010	–0.007	0.005
P-value	[0.611]	[0.452]	[0.305]	[0.773]	[0.597]	[0.815]	[0.796]
Total HTE‡	0.007	–0.001	–0.012	–0.001	0.003	0.003	0.030
P-value	[0.840]	[0.983]	[0.866]	[0.973]	[0.911]	[0.935]	[0.343]
Observations	405	405	405	405	405	405	405
Adjusted R^2	0.863	0.834	0.796	0.859	0.868	0.602	0.735

Notes: The estimates are based on the baseline equation $\Delta x^k_{i,t} = \alpha_i + \nu_t + \sum_{j=-1}^{1} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$. where the dependent variable is inflation (top panel) or the percent change in consumption growth (panel B) for the category noted at the top of each column. The annual data cover 1999–2014. Core PCE excludes food and energy consumption. The estimates include location (CPI MSA) fixed effects as well as year effects. The percent change in the minimum wage when a CPI MSA spans different states is calculated based on the average (population-weighted) minimum wage in each location and year as discussed in the text. † Cumulative effect of the minimum wage change measured over two years (sum of contemporaneous and lagged effects); ‡ The total effect of the minimum wage change including any anticipatory effect (sum of contemporaneous, lagged, and lead effects). Standard errors clustered by CPI MSA are in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

Table 5: Minimum Wage Changes and Inflation. Further Robustness Analysis

	(1) All	(2) All x Energy	(3) Core	(4) Dur	(5) Nondur	(6) Serv	(7) Food Home	(8) Food Away	(9) HH Furn.
	Panel A: Region × Year Fixed Effects and CPI-MSA Fixed Effects								
Pct. Chg. Min. Wage (t)	0.018*	0.024**	0.025*	0.002	0.008	0.026	–0.002	0.033**	0.026
	(0.010)	(0.011)	(0.013)	(0.014)	(0.008)	(0.016)	(0.015)	(0.012)	(0.028)
Pct. Chg. Min. Wage (t–1)	0.023**	0.025**	0.030**	0.026*	0.001	0.030*	–0.008	0.011	0.036
	(0.010)	(0.011)	(0.013)	(0.015)	(0.012)	(0.016)	(0.016)	(0.015)	(0.030)
Pct. Chg. Min. Wage (t+1)	0.011	0.014	0.018*	–0.003	–0.015	0.025	–0.011	0.003	–0.007
	(0.010)	(0.009)	(0.010)	(0.019)	(0.010)	(0.018)	(0.012)	(0.015)	(0.024)
Bartik Emp. Growth	0.289	0.136	0.192	1.337***	0.531*	–0.066	0.039	–0.484	1.970***
	(0.430)	(0.406)	(0.431)	(0.343)	(0.294)	(0.631)	(0.354)	(0.486)	(0.611)
Memo:									
Two-year Min. Wage Effect†	0.041	0.049	0.055	0.028	0.009	0.056	–0.009	0.044	0.062
P-value	[0.016]	[0.014]	[0.015]	[0.073]	[0.569]	[0.057]	[0.603]	[0.062]	[0.151]
Total Min. Wage Effect‡	0.051	0.064	0.073	0.025	–0.006	0.081	–0.020	0.048	0.056
P-value	[0.017]	[0.009]	[0.007]	[0.339]	[0.766]	[0.044]	[0.325]	[0.113]	[0.288]
R^2	0.736	0.507	0.463	0.600	0.931	0.561	0.783	0.462	0.436
	Panel B: Common Factor Model. Bai (2009)								
Pct. Chg. Min. Wage (t)	–0.005	–0.002	–0.012	–0.007	0.005	–0.017	0.001	0.019*	0.003
	(0.011)	(0.014)	(0.016)	(0.019)	(0.011)	(0.014)	(0.017)	(0.010)	(0.033)
Pct. Chg. Min. Wage (t–1)	–0.010	–0.013	–0.011	–0.008	–0.006	–0.023	–0.011	0.028*	0.047*
	(0.012)	(0.009)	(0.009)	(0.020)	(0.011)	(0.017)	(0.022)	(0.016)	(0.023)
Pct. Chg. Min. Wage (t+1)	0.006	0.005	0.004	–0.005	–0.016	0.013	–0.018	–0.000	–0.027
	(0.011)	(0.011)	(0.012)	(0.021)	(0.013)	(0.018)	(0.014)	(0.014)	(0.030)
Bartik Emp. Growth	–0.160	0.118	–0.240	–0.208	0.757***	–0.696**	0.217	0.064	–0.049
	(0.147)	(0.109)	(0.215)	(0.316)	(0.149)	(0.303)	(0.148)	(0.144)	(0.308)
Memo:									
Two-year Min. Wage Effect†	–0.015	–0.015	–0.022	–0.015	–0.002	–0.010	–0.002	0.046	0.050
P-value	[0.380]	[0.391]	[0.241]	[0.625]	[0.721]	[0.096]	[0.905]	[0.013]	[0.226]
Total Min. Wage Effect‡	–0.009	–0.011	–0.019	–0.020	–0.018	–0.028	–0.010	0.046	0.023
P-value	[0.671]	[0.662]	[0.476]	[0.534]	[0.378]	[0.434]	[0.574]	[0.048]	[0.669]
Observations	401	401	401	401	401	401	401	401	401

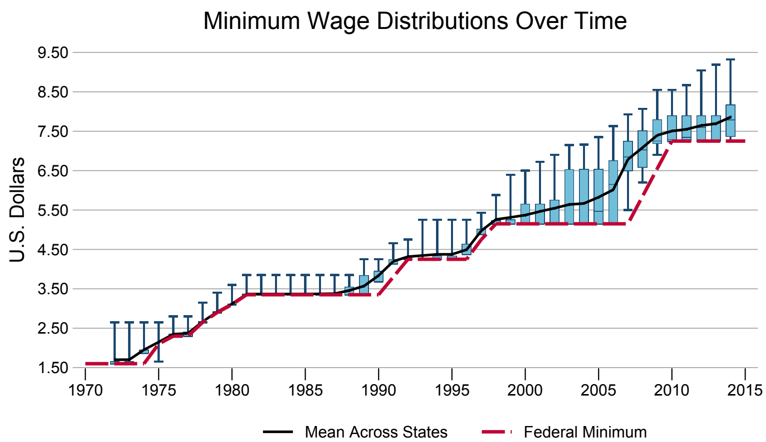
Notes: The estimates in Panel A are based on the baseline equation $\Delta x^k_{i,t} = \alpha_i + \lambda_l \times \nu_t + \sum_{j=-1}^{1} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$, where the dependent variable is inflation for the category noted at the top of each column, and l denotes a census region. The annual data cover 1998–2014. Core PCE excludes food and energy consumption. Estimates include location (CPI MSA) fixed effects as well as region × year fixed effects. The percent change in the minimum wage when a CPI MSA spans different states is calculated based on the average (population-weighted) minimum wage in each location and year as discussed in the text. MSA employment growth is instrumented using a Bartik instrument. The estimates in Panel B are based on Bai's (2009) estimator: $\Delta x^k_{i,t} = \lambda_i' F_t + \sum_{j=-J_1}^{J_2} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$, using four common factors. † Cumulative effect of the minimum wage change measured over two years (sum of contemporaneous and lagged effects); ‡ The total effect of the minimum wage change including any anticipatory effect (sum of contemporaneous, lagged, and lead effects). Standard errors clustered by CPI MSA are in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

Table 6: Minimum Wage Changes and Consumption. Robustness Analysis

	(1) Total PCE	(2) Core PCE	(3) Dur.	(4) Nondur.	(5) Serv.	(6) Food at Home	(7) Food Away
	Panel A: Region × Year Fixed Effects and CPI-MSA Fixed Effects						
Pct. Chg. Min. Wage (t)	0.026**	0.018*	0.022	0.030**	0.022**	0.024	0.086***
	(0.009)	(0.010)	(0.033)	(0.012)	(0.009)	(0.014)	(0.009)
Pct. Chg. Min. Wage (t–1)	–0.000	–0.002	–0.021	0.002	0.003	0.025	–0.001
	(0.017)	(0.017)	(0.033)	(0.022)	(0.013)	(0.023)	(0.030)
Pct. Chg. Min. Wage (t+1)	0.031*	0.033*	0.108**	0.027	0.014	0.041	0.034
	(0.018)	(0.018)	(0.046)	(0.018)	(0.015)	(0.025)	(0.029)
Bartik Emp. Growth	0.127	0.089	2.300***	0.293	–0.369	0.668	–0.740*
	(0.338)	(0.362)	(0.684)	(0.525)	(0.326)	(0.436)	(0.386)
Memo:							
Two-year Min. Wage Effect†	0.025	0.017	0.001	0.032	0.025	0.050	0.084
P-value	[0.295]	[0.517]	[0.986]	[0.257]	[0.194]	[0.121]	[0.019]
Total Min. Wage Effect‡	0.057	0.050	0.109	0.059	0.039	0.090	0.118
P-value	[0.079]	[0.141]	[0.200]	[0.055]	[0.162]	[0.025]	[0.015]
Adjusted R^2	0.889	0.864	0.847	0.875	0.882	0.642	0.782
	Panel B: Common Factors Model. Bai (2009)						
Pct. Chg. Min. Wage (t)	0.005	–0.003	0.020	0.015	0.010	0.006	0.087***
	(0.010)	(0.012)	(0.035)	(0.014)	(0.012)	(0.015)	(0.017)
Pct. Chg. Min. Wage (t–1)	–0.020	–0.015	0.015	–0.007	–0.005	0.013	–0.017
	(0.014)	(0.013)	(0.029)	(0.021)	(0.011)	(0.017)	(0.023)
Pct. Chg. Min. Wage (t+1)	–0.002	–0.009	0.048*	0.001	–0.018*	0.009	0.009
	(0.010)	(0.012)	(0.028)	(0.021)	(0.009)	(0.025)	(0.023)
Bartik Emp. Growth	–0.202	–0.079	1.459***	0.589	0.002	0.309	1.811***
	(0.346)	(0.265)	(0.478)	(0.352)	(0.281)	(0.289)	(0.499)
Memo:							
Two-year Min. Wage Effect†	–0.015	–0.018	0.035	0.009	0.006	0.019	0.070
P-value	[0.455]	[0.395]	[0.430]	[0.653]	[0.789]	[0.360]	[0.036]
Total Min. Wage Effect‡	–0.016	–0.027	0.083	0.010	–0.013	0.028	0.079
P-value	[0.534]	[0.354]	[0.155]	[0.761]	[0.606]	[0.239]	[0.138]
Observations	405	405	405	405	405	405	405

Notes: The estimates in Panel A are based on the baseline equation $\Delta x^k_{i,t} = \alpha_i + \lambda_l \times \nu_t + \sum_{j=-1}^{1} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$, where the dependent variable is the percent change in nominal consumption growth for the category noted at the top of each column, and l denotes a census region. The annual data cover 1998–2014. The estimates include location (CPI MSA) fixed effects as well as region × year fixed effects. The percent change in the minimum wage when a CPI MSA spans different states is calculated based on the average (population-weighted) minimum wage in each location and year as discussed in the text. MSA employment growth is instrumented using a Bartik instrument. The estimates in Panel B are based on Bai's (2009) estimator: $\Delta x^k_{i,t} = \lambda_i' F_t + \sum_{j=-1}^{1} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$, using four common factors. † Cumulative effect of the minimum wage change measured over two years (sum of contemporaneous and lagged effects); ‡ The total effect of the minimum wage change including any anticipatory effect (sum of contemporaneous, lagged, and lead effects). Standard errors clustered by CPI MSA are in parentheses: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

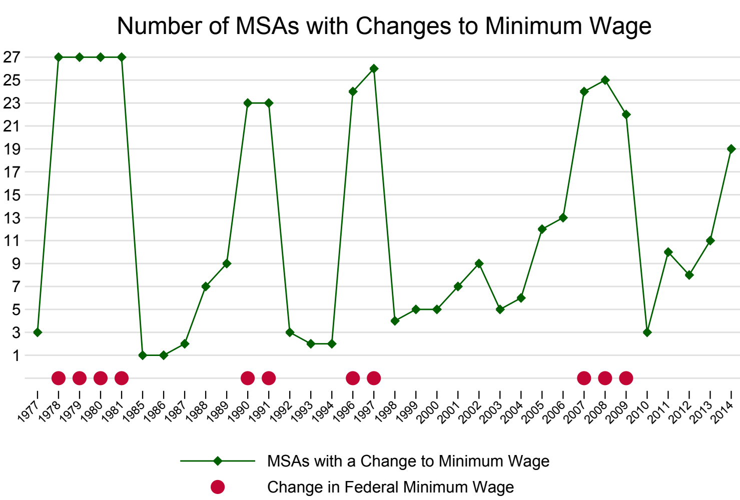
Figure 1: The Effective (Nominal) Minimum Wage over Time



Note: The bars indicate the 25th, 50th, and 75th percentiles of the minimum wage across all 50 states, and the whiskers indicate minimum and maximum values.

Source: Minimum wage data come from the Tax Policy Center (Urban Institute and Brookings Institution) and Federal and State Departments of Labor.

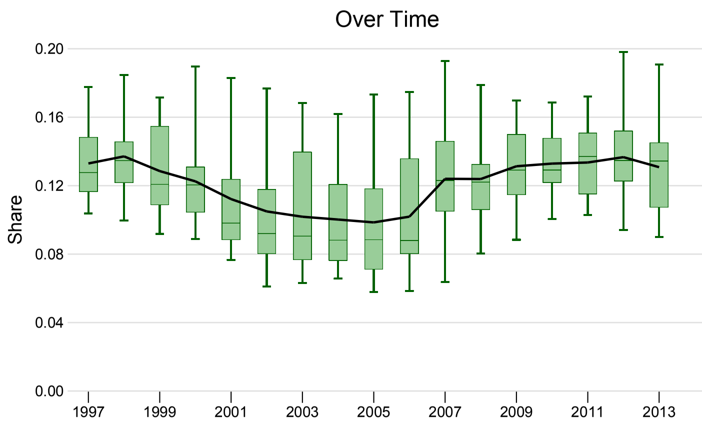
Figure 2: The Timing of Minimum Wage Changes



Source: Minimum wage data come from the Tax Policy Center (Urban Institute and Brookings Institution) and federal and state departments of labor.

Figure 3: Share of Low-Wage Workers

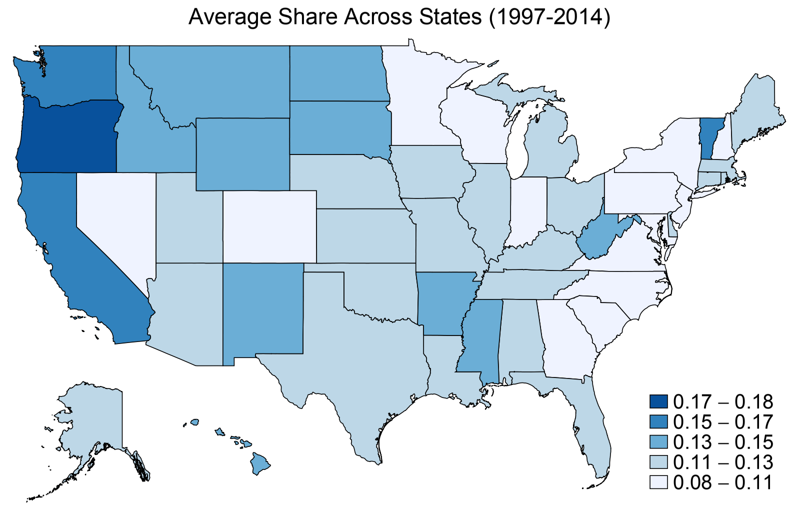
Over Time



Note: The box and whiskers show the interquartile range, minimum, and maximum low-wage worker share across workers in a location.

Source: Authors' calculations using the Current Population Survey (CPS).

Average Share Across States (1997–2014)



Source: Authors' calculations using Current Population Survey (CPS) data.

A Appendix

List of Metropolitan Statistical Areas with CPI Data

(1) Anchorage, (2) Atlanta, (3) Boston-Brockton-Nashua, (4) Chicago-Gary-Kenosha, (5) Cincinnati-Hamilton, (6) Cleveland-Akron, (7) Dallas-Fort Worth, (8) Denver-Boulder-Greeley, (9) Detroit-Ann Arbor-Flint, (10) Honolulu, (11) Houston-Galveston-Brazoria, (12) Kansas City, (13) Los Angeles-Riverside-Orange County, (14) Miami-Fort Lauderdale, (15) Milwaukee-Racine, (16) Minneapolis-St. Paul, (17) New York-Northern New Jersey-Long Island, (18) Philadelphia-Wilmington-Atlantic City, (19) Phoenix-Mesa, (20) Pittsburgh, (21) Portland-Salem, (22) San Diego, (23) San Francisco-Oakland-San Jose, (24) Seattle-Tacoma-Bremerton, (25) St. Louis, (26) Tampa-St. Petersburg-Clearwater, and (27) Washington-Baltimore.

CPI Results without Bartik Employment Growth

Table A.1: Baseline: Minimum Wage Changes and Inflation. No Control for Economic Conditions

	(1) All	(2) All	(3) Core	(4) Dur	(5) Nondur	(6) Serv	(7) Food at Home	(8) Food Away	(9) HH Furnish
Pct. Chg. Min. Wage (t)	0.009	0.011	0.009	–0.003	0.007	0.011	0.006	0.032***	0.032
	(0.007)	(0.009)	(0.010)	(0.013)	(0.007)	(0.012)	(0.015)	(0.010)	(0.020)
Pct. Chg. Min. Wage (t–1)	0.014	0.017	0.019	0.031*	–0.001	0.014	–0.002	0.016	0.041
	(0.011)	(0.011)	(0.013)	(0.018)	(0.013)	(0.015)	(0.014)	(0.015)	(0.036)
Pct. Chg. Min. Wage (t+1)	0.006	0.007	0.008	0.003	–0.017*	0.016	–0.003	0.002	0.014
	(0.011)	(0.011)	(0.013)	(0.020)	(0.010)	(0.015)	(0.011)	(0.011)	(0.022)
Memo:									
Two-year Min. Wage Effect†	0.023	0.028	0.028	0.028	0.006	0.025	0.004	0.047	0.073
P-value	[0.117]	[0.070]	[0.096]	[0.201]	[0.738]	[0.260]	[0.799]	[0.017]	[0.105]
Total Min. Wage Effect‡	0.029	0.034	0.036	0.031	–0.012	0.040	0.002	0.050	0.086
P-value	[0.136]	[0.086]	[0.096]	[0.280]	[0.611]	[0.146]	[0.938]	[0.046]	[0.091]
Observations	424	424	424	424	424	424	424	424	424
Adjusted R^2	0.642	0.332	0.286	0.448	0.895	0.413	0.663	0.305	0.254

Notes: The estimates are based on the baseline equation $\Delta x^k_{i,t} = \alpha_i + \nu_t + \sum_{j=-1}^{1} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$, where the dependent variable is inflation (price growth) for the CPI category indicated at the top of each column. The annual data cover 1997–2014. The estimates include location (CPI MSA) fixed effects as well as year effects. The percent change in the minimum wage when a CPI MSA spans different states is calculated based on the average (population-weighted) minimum wage in each location and year as discussed in the text. † Cumulative effect of the minimum wage change measured over two years (sum of contemporaneous and lagged effects); ‡ The total effect of the minimum wage change including any anticipatory effect (sum of contemporaneous, lagged, and lead effects). Standard errors clustered by CPI MSA are in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

CPI Results Using All Available Data

Table A.2: Minimum Wage Changes and Inflation. Full Sample

	(1) All	(2) All	(3) Core	(4) Dur	(5) Nondur	(6) Serv	(7) Food at Home	(8) Food Away	(9) HH Furnish
Pct. Chg. Min. Wage (t)	0.015**	0.017**	0.015	0.004	0.016**	0.016	0.011	0.046***	0.043**
	(0.007)	(0.008)	(0.009)	(0.012)	(0.007)	(0.009)	(0.014)	(0.013)	(0.020)
Pct. Chg. Min. Wage (t-1)	0.015	0.019*	0.024*	0.022	–0.008	0.023*	–0.023	0.018	0.035
	(0.010)	(0.010)	(0.012)	(0.015)	(0.010)	(0.014)	(0.014)	(0.014)	(0.034)
Pct. Chg. Min. Wage (t+1)	0.013*	0.015*	0.016*	–0.003	–0.011	0.027***	0.008	0.006	–0.002
	(0.007)	(0.007)	(0.008)	(0.013)	(0.010)	(0.010)	(0.011)	(0.011)	(0.022)
Memo:									
Two-year Min. Wage Effect†	0.030	0.036	0.039	0.026	0.009	0.039	–0.011	0.064	0.078
P-value	[0.028]	[0.013]	[0.016]	[0.167]	[0.522]	[0.045]	[0.490]	[0.008]	[0.080]
Total Min. Wage Effect‡	0.043	0.050	0.056	0.023	–0.002	0.066	-0.003	0.070	0.075
P-value	[0.012]	[0.006]	[0.006]	[0.301]	[0.906]	[0.005]	[0.874]	[0.010]	[0.179]
Observations	767	767	767	767	767	767	767	767	767
Adjusted R^2	0.644	0.584	0.564	0.662	0.867	0.436	0.630	0.299	0.278

Notes: The estimates are based on the baseline equation $\Delta x^k_{i,t} = \alpha_i + \nu_t + \sum_{j=-1}^{1} \beta(j)\Delta w_{i,t-j} + \eta y_{i,t} + e_{i,t}$, where the dependent variable is inflation (top panel) or the percent change in consumption growth (panel B) for the category noted at the top of each column. The annual data cover 1983–2014. Core PCE excludes food and energy consumption. The estimates include location (CPI MSA) fixed effects as well as year effects. The percent change in the minimum wage when a CPI MSA spans different states is calculated based on the average (population-weighted) minimum wage in each location and year as discussed in the text. † Cumulative effect of the minimum wage change measured over two years (sum of contemporaneous and lagged effect); ‡ The total effect of the minimum wage change including any anticipatory effect (sum of contemporaneous, lagged effect, and lead effect). Standard errors are in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

Additional Summary Statistics

Table A.3: Summary Statistics: CPI Inflation and Its Components

	Total	Less Energy	Core	Dur.	Nondur.	Serv.	Food at Home	Food Away	HH Furnishing
Min	–2.643	–0.716	–1.190	–5.740	–6.754	–1.196	–2.037	–1.715	–5.787
Max	5.845	5.349	5.478	8.279	9.080	8.012	8.545	7.826	7.541
p50	2.564	2.128	2.011	-0.827	3.273	2.732	2.337	2.719	0.105
Mean	2.443	2.155	2.065	-0.769	2.901	2.804	2.540	2.817	0.017
sd	1.238	0.921	0.998	1.666	2.569	1.399	1.944	1.245	2.151

Table A.4: Summary Statistics: PCE Growth and Its Components

	Total	Core	Dur.	Nondur.	Serv.	Food at Home	Food Away	Housing
Min	–3.467	–2.456	–13.001	–7.012	–1.200	–3.446	–4.895	–0.893
Max	10.407	10.402	13.199	12.888	10.476	11.315	12.326	10.478
p50	4.515	4.380	4.059	5.018	4.793	4.102	4.484	4.570
Mean	4.505	4.455	3.222	4.584	4.666	3.917	4.497	4.541
sd	2.413	2.231	4.931	3.362	2.093	2.416	2.868	2.242