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# ABSTRACT

## Minimum Wage Analysis Using a Pre-Committed Research Design: Evidence through 2016[1]

This paper presents results from the first year of a multi-year, pre-committed research design for analyzing recent state-level minimum wage changes. Through 2015 and 2016, we estimate that relatively large statutory minimum wage increases have reduced employment among low-skilled population groups by just under 1.5 percentage points. Our estimates of the effects of smaller minimum wage increases are more variable and include both moderately large positive values and modest negative values. Our estimates of the effects of increases linked to inflation-indexing provisions are also quite variable, taking a small positive value on average across specifications. Results including 2016 diverge nontrivially when we compare estimates using the American Community Survey (ACS) to estimates using the Current Population Survey (CPS), with estimates tending to be more negative in the ACS. Analysis of future data will be needed to determine whether this difference across surveys is most appropriately attributed to sampling variations or to some other cause.

**JEL Classification:** J08, J23, J38
**Keywords:** minimum wages, employment, pre-commitment

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[1] We thank Duncan Hobbs for excellent research assistance.

In the years following the Great Recession, there was a pause in both state and federal efforts to increase minimum wages. In more recent years, a significant number of state-level minimum wage increases have taken place. This recent policy environment offers an opportunity to conduct relatively transparent labor market analyses using standard program evaluation methods.

In Clemens and Strain—CS hereafter—(2017), we identified the unfolding policy environment as an opportunity to conduct analyses that are constrained by pre-committed research designs. We thus developed and refined our pre-commitment plan (in CS, 2017; forthcoming) while analyzing household survey data that extended from 2011 through 2015.[2] The current paper is the first of several updates we have pre-committed to undertake. The current paper's update is incremental in that it extends our previous analysis to incorporate data from 2016. The future analyses to which we have committed will incorporate data from the remainder of the decade.

Recent state minimum wage changes invite analysis using relatively transparent program evaluation methods. Over the period we consider, just under half of the states enacted no minimum wage changes.[3] Among the remainder, increases varied in both magnitude and forecastability, as several states' minimum wage rates have long been indexed for inflation. Our pre-commitment plan incorporates these dimensions of nuance through its division of states into (mutually exclusive and collectively exhaustive) policy groupings for use within standard

[2] The results from these papers found that relatively large minimum wage increases reduced employment among low-skilled workers by approximately 1 percentage point, with smaller effects for smaller increases.

[3] On a January-to-January basis, one-time or multiphase statutory minimum wage changes were enacted by one state from 2012 to 2013, four from 2013 to 2014, 17 from 2014 to 2015, and 16 from 2015 to 2016. Among those implementing new statutory increases between January 2013 and January 2016, the average combined increase was $1.51 (20 percent). Over this same time period, the minimum wage rose by an average of $0.38 (5 percent) across nine states that were indexing their minimum wage rates annually for inflation. Between inflation-indexed increases and new statutory increases, 22 states increased their minimum wage rates between January 2016 and January 2017.

difference-in-differences and triple-difference analyses. In addition to baseline analyses, our pre-commitment plan incorporates sets of robustness checks that are designed to investigate the relevance of several setting-specific sources of potential bias.

The set of methods we implement has formed the basis of recent peer-reviewed findings on topics including the effects of school funding on student performance (Jackson, Johnson, and Persico, 2015), policies designed to expand female school enrollment in India (Muralidharan and Prakash, 2017), and the effects of the Affordable Care Act's key provisions (Simon, Soni, and Cawley, 2016; Courtmanche et al., 2017). They have also been used in several recent minimum wage analyses (e.g., Sabia, Burkhauser, and Hansen, 2012; Clemens and Wither, 2014; and Hoffman, 2014). In the studies referenced above, standard program evaluation methods were selected on an *ex post* rather than pre-committed basis. The current project's use of these methods on a pre-committed basis reduces the otherwise substantial problem of "researcher degrees of freedom," which has contributed to problems of reproducibility across several domains of social science research (Gelman and Loken, 2013).

Our reading of the evidence through 2016 is as follows. First, we estimate that relatively large increases in statutory minimum wages have reduced employment among low-skilled population groups by just under 1.5 percentage points. Second, our estimates of the effects of relatively small minimum wage increases are mixed, as they include both moderately large positive values and modest negative values. Third, our estimates of the effects of increases linked to inflation-indexing provisions are also quite variable, taking a small positive value on average across specifications.

The remainder of this paper proceeds as follows. Section II provides further background regarding the minimum wage changes we analyze. Section III discusses the primary data sources

we use. Section IV then describes the regression specifications we implement, and Section V presents the results.[4] Section VI relates our estimates to the interpretive framework we sketched in the context of our pre-commitment plan (CS, 2017). We conclude by discussing the issues to which we will pay closest attention as we incorporate data from 2017 and beyond into our analysis.

## Section II: Background on State Minimum Wage Changes Between 2011 and 2016

Our analysis plan calls for dividing states across policy groupings based on the minimum wage changes they have enacted over recent years. More specifically, we divide states into four groups and require that each state be in one and only one group: (1) those that have implemented no minimum wage changes, (2) those whose minimum wage changes are driven by long-standing inflation-indexation provisions, (3) those that have enacted small cumulative increases through recent legislation, and (4) those that have enacted large cumulative increases through recent legislation. While the first of these groups (i.e., the states with no minimum wage changes) is straightforward to define, there is discretion in our allocation of states across the latter three groupings. The analysis presented below considers two groupings of the remaining states.

When allocating states across policy groupings, discretion arises along several dimensions. The first is the precise cutoff we use to distinguish between "large" and "small" changes. The second involves time horizons: One of the objectives of our analysis plan is to capture any dynamic lags associated with minimum wage changes' effects. We thus consider

[4] Because this paper reports results from a pre-commitment plan, the text of our summaries of the research design, data sources, and policy context overlap significantly with the text of the papers in which we developed the analysis.

divisions of states into those with "large" and "small" changes as of January 2015 and with "large" and "small" changes as of January 2016. This helps us explore the relevance of the amount of time that has elapsed since the bulk of a state's minimum wage changes have been implemented.

An additional dimension of discretion involves states that have historically maintained provisions to index their minimum wage rates to inflation, but that have more recently implemented new statutory minimum wage changes. Our "inflation indexation" designation is intended to capture states whose minimum wage changes have long been forecastable by firms. We thus shift states from "inflation indexation" status to "statutory" status if and when they implement a newly legislated increase. Washington state, for example, will shift into "statutory" status in our next wave of analysis, which will incorporate data from 2017.[5]

Our groupings of states are designed to both maintain our analysis plan's transparency and to allow for economic dynamics in the effects of this period's minimum wage changes.[6] The first grouping is thus unchanged from the analyses in CS (2017; forthcoming). For this grouping, we describe states as having "indexed" minimum wage changes if their minimum wage rates have risen in accordance with inflation-indexation provisions and have not been increased through new legislation. We describe states as having "large" statutory changes if the changes

[5] Sub-state minimum wage changes are also of interest. Our current designations focus exclusively on state-level changes. While we have not explicitly taken sub-state changes into account, we have conducted our analyses with an eye on their potential relevance for interpreting our results. Differences in sub-state minimum wage changes are relevant, for example, for interpreting the precise amount of minimum wage variation underlying any differential employment changes that we estimate.

[6] The dynamic effects we have in mind include effects on job *growth*, as emphasized by Meer and West (2016), and effects that will tend to unfold over cycles of firm birth and death, as emphasized in Sorkin (2015) and Aaronson, French, Sorkin, and To's (2018) analyses of new firms' production technology choices.

enacted between January 2013 and January 2015 were greater than or equal to $1 and as "small" statutory changes if less than $1.

Our second grouping incorporates information about minimum wage changes enacted between January 2015 and January 2016. Notably, all states that enacted minimum wage changes between January 2015 and January 2016 were among those that had enacted minimum wage changes between January 2013 and January 2015. Incorporating information on the more recent minimum wage changes can thus reorganize states across "treatment" groups, but does not shift states out of the group that had enacted no changes. When we incorporate all changes enacted from January 2013 and January 2016, roughly half of the states with new statutory minimum wage changes had enacted changes equal to or greater than $1.50. We thus use $1.50 as the more recent cutoff between states with "large" and "small" increases.

Tables 1 and 2 present the full divisions of states associated with the policy groupings we use. Several states shift between the "large" and "small" change groups as we move from the grouping based on changes enacted through January 2015 to the grouping that incorporates changes enacted between January 2015 and January 2016. Minnesota and Nebraska shift from the "small" change group to the "large" change group, while New Jersey and South Dakota shift from the "large" change group to the "small" change group. This change in the groupings involves a modest but economically interesting shift in the dynamics of the policy effects the groups will track. Minnesota and Nebraska are states that have enacted larger minimum wage changes than New Jersey and South Dakota in total. However, New Jersey and South Dakota's initial minimum wage changes were larger and have been in effect for longer. Any effects these minimum wage changes may have had on firms' investment decisions will thus have had longer

to take effect. Figures 1 and 2 illustrate the dynamics of the changes in the average effective minimum wage rates across the groupings described in Tables 1 and 2.

## Section III: Data Sources

Our primary data sources are the American Community Survey (ACS) and the Current Population Survey (CPS). The ACS is the largest publicly available household survey data set containing the information required for our analysis, while the CPS is the most conventional resource for estimating standard employment statistics across geographic areas and demographic groups. As summarized in CS (forthcoming), Kromer and Howard (2010) provide detailed documentation of differences between the sampling procedures and employment questions posed in the ACS relative to the smaller and more commonly analyzed CPS.[7]

Tables 3 and 4 present summary statistics on the primary ACS and CPS samples we analyze. The first sample, described in columns 1 and 2 of each table, consists of individuals ages 16 to 25 with less than a completed high school education. The second sample, which is described in columns 3 and 4, consists of all individuals ages 16 to 21. Because the analysis in this paper is a straightforward extension of analyses from our prior work, we do not presently describe our analysis samples in further detail.

[7] As summarized in our previous work, "The sampling universes of the ACS and CPS differ in that the ACS includes individuals residing in institutionalized group quarters while the CPS does not. The inclusion of these individuals in our primary analysis samples does not materially affect our results. Respondents to both surveys answer questions describing their employment status over the course of a reference week. In the ACS, the reference week is the previous calendar week; in the CPS, the reference week is the week containing the 12th day of the month. Kromer and Howard (2010) document that improvements to the ACS's employment questions, first implemented in 2008, significantly improved the comparability of estimates generated using the two surveys."

We supplement the ACS and CPS household survey data with data on macroeconomic covariates that may be relevant as control variables. Specifically, we investigate the relevance of departures in economic conditions across our policy groupings, which could bias our estimates, by tracking indicators of the performance of state-level housing markets, state aggregate income, and labor markets. We proxy for variations in the recovery of the housing market using a statewide median house price index from the Federal Housing Finance Agency (FHFA). We proxy for aggregate economic performance using data on aggregate state income *per capita* from the Bureau of Economic Analysis (BEA). Finally, we proxy for variations in broader labor market developments using employment among skill groups that are not directly affected by the minimum wage.

Figure 3 presents time series on aggregate income (Panel A) and the median house price index (Panel B) separately across the policy regimes we analyze. That is, it presents these series separately for states that enacted large minimum wage increases, small minimum wage increases, inflation-indexed minimum wage increases, and no minimum wage increases. The figure, which we discuss momentarily, thus presents two series that are relevant for gauging differences in the macroeconomic conditions facing the groups of states we analyze. Figures 4 (ACS) and 5 (CPS) present additional evidence on the evolution of employment among prime-aged adults (Panel D) and among a group consisting of young individuals with high school degrees and individuals over age 30 with less than a completed high school degree (Panel C). The latter individuals thus have education and/or experience modestly beyond that obtained by most minimum wage workers. Additional tabulations of the data underlying Figures 3, 4, and 5 can be found in Tables 5 and 6.

The house price index reveals that the housing recovery was quite strong in states that had, between January 2013 and January 2015, enacted minimum wage increases exceeding $1. Median house prices rose by roughly 23 percent in this group of states from the 2011–2013 base period through 2015-2016. They rose by roughly 26 percent in states that index their minimum wage rates for inflation. Across states that either did not increase their minimum wage rates or that enacted small minimum wage increases, median house prices rose by an average of roughly 13 percent. The BEA's income data show that *per capita* incomes grew between $2,000 and $2,500 more in states that enacted minimum wage changes exceeding $1 than in all other groups of states. Underlying macroeconomic conditions thus appear to have improved to a greater degree in states that enacted large minimum wage changes than in other states. Similar differences prevail when we allocate states based on the minimum wage changes enacted through January 2016.

The employment series similarly suggest that underlying economic conditions were moderately stronger in states that enacted minimum wage increases relative to other states. Prime-age employment, for example, grew by an average of 2.6 percentage points in states that either enacted minimum wage changes exceeding $1 or that index their minimum wage rates for inflation. Across states that enacted no minimum wage increases, prime-age employment increased by a more modest average of 1.9 percentage points.

The remaining panels of Figures 5 and 6 display employment trends among the skill groups in our primary analysis samples. As summarized in Table 5, employment among individuals ages 16 to 25 with less than a completed high school education expanded 1.1 percentage points less in states that enacted minimum wage changes exceeding $1 than in states that enacted no minimum wage increase as measured in the ACS. In the CPS, the measured

difference was –1.9 percentage points. Among all individuals ages 16 to 21, the difference measured in the ACS is –0.8 percentage points while the difference measured in the CPS is 0.2 percentage points.

Employment changes among individuals in states with small minimum wage changes exhibit a substantial divergence when comparing ACS and CPS data. In the ACS data, employment among individuals in low-skilled groups rose very modestly less in these states relative to individuals in states that enacted no minimum wage changes. In the CPS data, by contrast, employment among individuals in low-skilled groups rose nontrivially more in these states than in states that enacted no minimum wage changes. These variations both across skill groups and across data sources foreshadow relevant sources of instability and uncertainty in the regression specifications we implement below.

## Section IV: Framework for Estimating the Effects of Recent Minimum Wage Changes

This section presents our regression framework for estimating the effects of recent minimum wage increases. The framework is the same as that described in the pre-commitment plan outlined in CS (2017, forthcoming). The remaining text of this section is largely unchanged from our prior work.

We take a standard program evaluation approach in which we divide states into groups based on the minimum wage policy changes they have implemented over the time period we analyze. We then estimate standard difference-in-differences and triple-difference specifications to identify differential changes in employment among low-skilled individuals and young

individuals across groups of states. Our basic difference-in-differences specification is presented in equation (1) below:

$$Y_{i,s,t} = \sum_{p(t)\neq 0} \beta_{p(t)} Policy_s \times Post_{p(t)} + \alpha_{1s}\, State_s + \alpha_{2t}\, Time_t + X_{i,s,t}\,\gamma + \varepsilon_{i,s,t}, \qquad (1)$$

where $Y_{i,s,t}$ is a binary indicator of the employment of individual *i*, living in state *s*, in year *t*. We estimate equation (1) on samples restricted to the population groups most likely to be affected by the minimum wage. These groups consist of young adults (individuals ages 16 to 21) and individuals ages 16 to 25 with less than a completed high school education.

Like any standard difference-in-differences specification, equation (1) controls for sets of state and time fixed effects. The vector *X* contains sets of control variables that vary across the specifications we estimate. In various specifications, it contains the median house price index, the log of aggregate personal income per capita, the employment rate among individuals with moderately higher skill levels than the individuals in the analysis sample, and individual-level demographic characteristics.

We use $Policy_s$ to represent binary indicators for whether a state fits into a given policy group. As discussed above, we differentiate among states that increased their minimum wage rates due to inflation-indexing provisions, states that enacted relatively large statutory increases in total, and states that enacted relatively small statutory increases in total.

The coefficients of interest are the $\beta_{p(t)}$ on the interaction between $Policy_s$ and $Post_{p(t)}$. For all the estimates we present, we treat 2014 as a transition year and thus exclude it from the sample. Our initial specifications update the estimates from CS (2017; forthcoming) by simply adding 2016 to the sample. For this analysis, $Post_{p(t)}$ is an indicator for observations that occur

in either 2015 or 2016. $\beta_{p(t)}$ thus describes differential changes in employment from a base period consisting of 2011, 2012, and 2013 through a post period consisting of 2015 and 2016. In subsequent analysis we exclude both 2014 and 2015 from the sample so that $\beta_{p(t)}$ describes differential changes in employment from a base period consisting of 2011, 2012, and 2013 through a post period consisting of 2016.

The coefficient $\beta_{p(t)}$ is an estimate of the causal effect of states' minimum wage policy changes on employment under standard, but nontrivial, assumptions. The key assumption is that employment among low-skilled groups would, in the absence of the minimum wage changes we analyze, have evolved similarly across the various groups of states. We investigate threats to this assumption in multiple ways. First, we investigate the robustness of our estimates to changes in the variables used to control for variations in economic conditions. That is, we examine whether our estimates are robust to including no such controls, to controlling for the housing market's evolution, to controlling for the log of per capita income, and to controlling for changes in employment among individuals in moderately higher skill groups.

Second, we estimate a triple-difference extension of equation (1). The triple-difference framework is described by equation (2):

$$Y_{i,s,t} = \sum_{p(t)\neq 0} \beta_{p(t)} Policy_s \times Post_{p(t)} \times Target_i + \alpha_{1s}\, State_s + \alpha_{2t}\, Time_t + \alpha_{3g}\, Target_g + \alpha_{4st}\, State_s \times Time_t + \alpha_{5gs}\, State_s \times Target_g + \alpha_{6gt}\, Time_t \times Target_g + X_{i,s,t}\,\gamma + \varepsilon_{i,s,t} \quad (2)$$

Equation (2) augments equation (1) with three sets of two-way fixed effects. These include group-by-time-period effects, group-by-state effects, and state-by-time-period effects. These

controls account for differential changes in employment across skill groups over time, cross-state differences in the relative employment of the "target" group relative to other skill groups at baseline, and time varying differences in states' economic conditions.

The implications of the triple-difference model's state-by-time-period effects depend on which skill groups are included in the sample. The inclusion of state-by-time-period effects enables the specification to control flexibly for economic factors that vary across states and over time. More specifically, they control for such factors as they manifest themselves through employment changes among the individuals included in the sample as "within-state control groups." In the triple-difference specifications presented below, the within-state control group consists of the full "prime-age" population (ages 26 to 54).

**Section V: Regression Estimates of Recent Minimum Wage Changes' Effects**

This section discusses our estimates of the effects of recent minimum wage changes on employment outcomes through 2016. The estimates reported in the tables include permutations of specifications across the following dimensions: (1) ACS or CPS data; (2) analysis samples consisting of individuals ages 16 to 25 with less than a completed high school education (low-skilled workers) or samples consisting of all individuals ages 16 to 21 (young workers); (3) difference-in-differences specifications described by equation (1) or triple-difference specifications described by equation (2); (4) a "post" period consisting of both 2015 and 2016 or a "post" period consisting solely of 2016; and (5) the barrier between "large" and "small" changes based on changes enacted through January 2015 or based on changes enacted through January 2016.

Rather than discuss results on an estimate-by-estimate basis, we summarize the patterns we observe across the various specifications. First, large statutory minimum wage changes are, on average, associated with an employment decline of around 1.5 percentage points among low-skilled individuals. The statistical significance of point estimates for this policy group are almost uniformly statistically distinguishable from zero in our ACS triple-difference specifications. The difference-in-differences estimates are of varying statistical significance, but consistently negative, averaging around –1.5 percentage points, in both the ACS and CPS results. Among young adults, the average estimated effect of large statutory increases tends toward zero in the CPS. In the ACS, we find estimates averaging just under –1.5 percentage points.

Second, estimates for small statutory minimum wage changes are highly variable for both the young and low-skill groups. They range from being statistically significant and negative in a minority of ACS specifications to being statistically significant and positive in many of our CPS specifications. This discrepancy between ACS and CPS estimates is the most substantial we have encountered. Future data will be important for shedding light on whether the discrepancy is likely a product of sampling variations or other factors.

Third, estimates of the effects of increases linked to inflation-indexing provisions are also quite variable, taking a modest positive value on average across specifications. For this group, difference-in-differences specifications estimated in the ACS frequently yield statistically significant and positive estimates. Triple-difference ACS specifications are positive, economically modest, and uniformly statistically indistinguishable from zero. In the CPS, both difference-in-differences and triple-difference specifications are, with a single exception, statistically indistinguishable from zero and average a very small positive value.

## Section VI: Discussion and Conclusion

Several aspects of the estimates summarized above merit further discussion. First, our analysis thus far incorporates ACS and CPS data through the 2016 calendar year. The analysis should thus be viewed as capturing relatively short-run effects of recent minimum wage changes. Many states' minimum wage changes had yet to be fully phased in as of the December 2016 conclusion of our analysis window. Medium and long-run analyses of this period's minimum wage changes will thus require several additional years of data.

Second, our analysis to date suggests that large and small minimum wage changes may have qualitatively different effects. Our estimates of the short-run effects of relatively large minimum wage changes are regularly negative, statistically distinguishable from zero, and nontrivial in economic magnitude. By contrast, our estimates of the short-run effects of relatively small minimum wage changes are positive as often, if not slightly more often, as they are negative.

In CS (2017), we sketched a simple economic framework for analyzing minimum wage changes' effects. Notably, that framework highlighted that small minimum wage changes have the capacity to improve low-skilled individuals' earnings opportunities without closing off employment opportunities. If modest minimum wage changes stimulate labor market entry, our framework highlights that their employment effects may indeed be positive. Large minimum wage changes, by contrast, will result in minimum wage rates that exceed the value of what many workers are able to produce and will thus reduce their employment opportunities. Our framework can thus quite readily reconcile the qualitative differences we observe in the effects of large minimum wage changes relative to small minimum wage changes. Empirically, this is

consistent with the findings of Jardim et al. (2017) in the context of minimum wage changes enacted by the city of Seattle.

Third, we find qualitative differences when comparing our estimates of the effects of large statutory minimum wage changes and minimum wage changes in states that index their minimum wage rates for inflation. The estimated effects of inflation-indexed minimum wage changes are often positive. Motivated by insights from Brummund and Strain (2017), our analysis plan allows for the potential importance of differences between newly legislated minimum wage changes and minimum wage changes driven by long-standing inflation-indexation provisions. Specifically, firms' investment decisions may have responded to inflation-indexation provisions when these provisions were initially enacted. Contemporaneous responses to each year's inflation-indexed update may thus be driven predominantly by low-skilled individuals' labor supply decisions. Firms' labor demand responses may have unfolded, at least in part, over previous years.

We conclude by emphasizing that on all counts our interpretation of the evidence is tempered by its short-run nature and by the variations we observe when comparing estimates across specifications as well as across the ACS and CPS samples. As we observed in Clemens and Strain (2017), analyses of additional years of data will be important on two fronts. First, additional data will help clarify the extent to which differences we observe when comparing ACS and CPS estimates are driven by sampling variations. Second, subsequent years of data will provide much needed evidence on the medium-to-long-run effects of this period's minimum wage changes.

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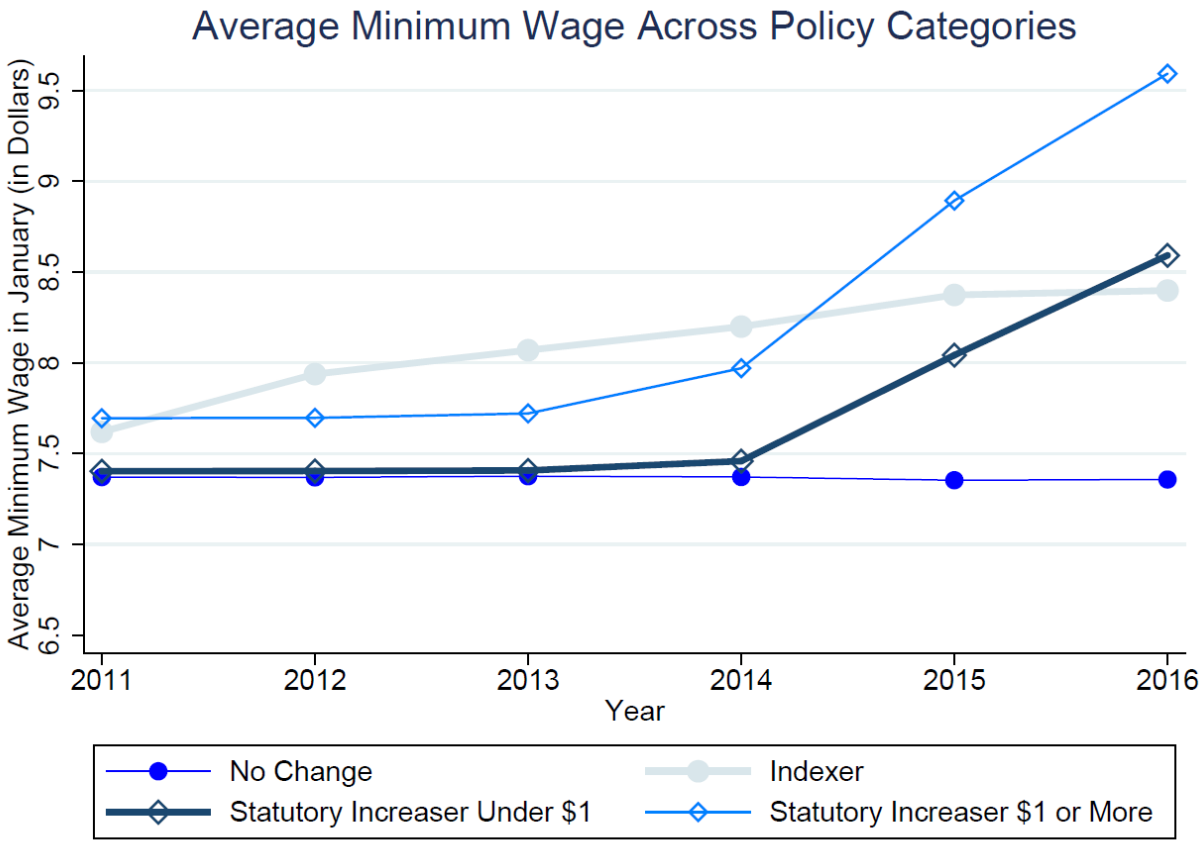


**Figure 1. Average Minimum Wage Across Policy Categories:** This figure plots the average annual effective minimum wage for states in each of our four policy categories from January 2011 to January 2016. States are defined as statutory increasers under $1 if the combined statutory increase in their minimum wage between January 2013 and January 2015 was under $1. States are defined as statutory increasers of $1 or more if the combined statutory increase in their minimum wage was $1 or greater. Indexers are states that index their minimum wage to inflation. The effective minimum wage is defined as the maximum of the state and federal minimum wage. Data on minimum wage rates come from the US Department of Labor. Data on minimum wage policies come from the National Conference of State Legislatures. Averages are weighted by state population.

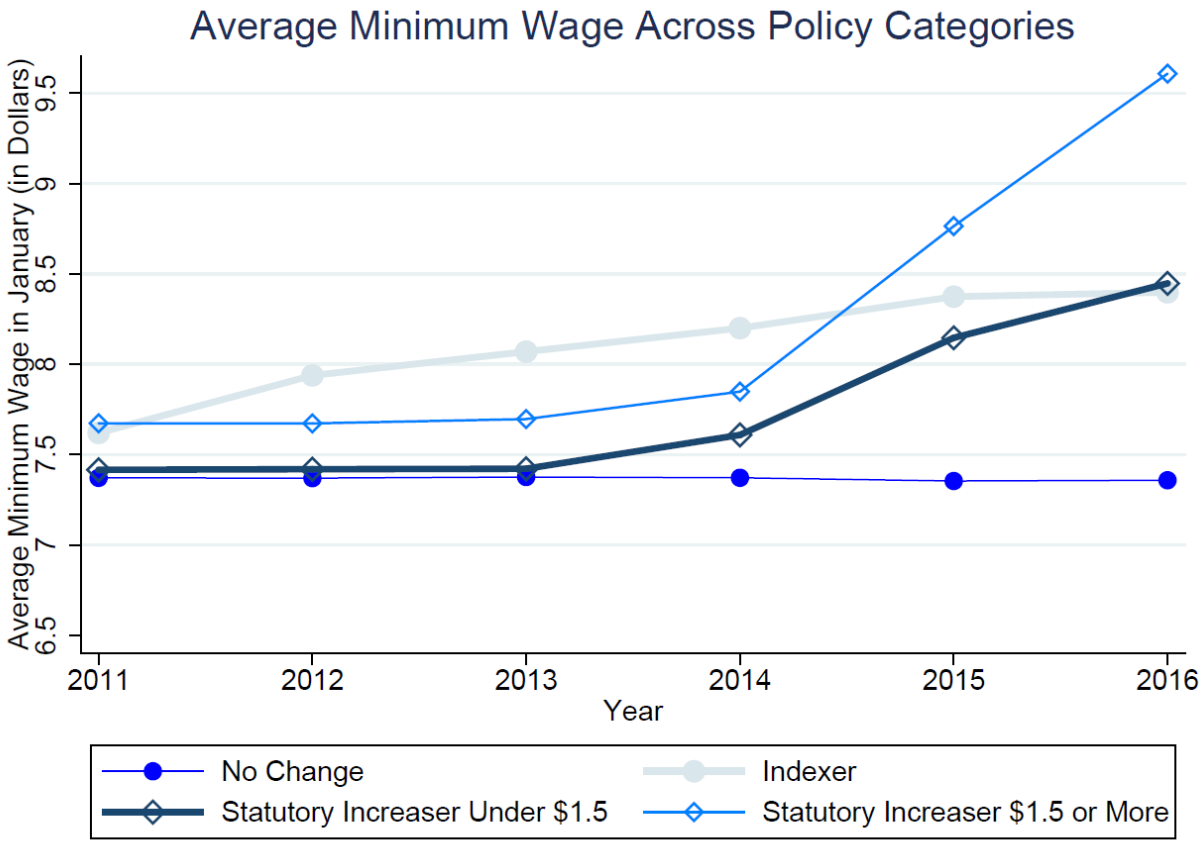


**Figure 2. Average Minimum Wage Across Policy Categories:** This figure plots the average annual effective minimum wage for states in each of our four policy categories from January 2011 to January 2016. States are defined as statutory increasers under $1.5 if the combined statutory increase in their minimum wage between January 2013 and January 2016 was under $1.5. States are defined as statutory increasers of $1.5 or more if the combined statutory increase in their minimum wage was $1.5 or greater. Indexers are states that index their minimum wage to inflation. The effective minimum wage is defined as the maximum of the state and federal minimum wage. Data on minimum wage rates come from the US Department of Labor. Data on minimum wage policies come from the National Conference of State Legislatures. Averages are weighted by state population.

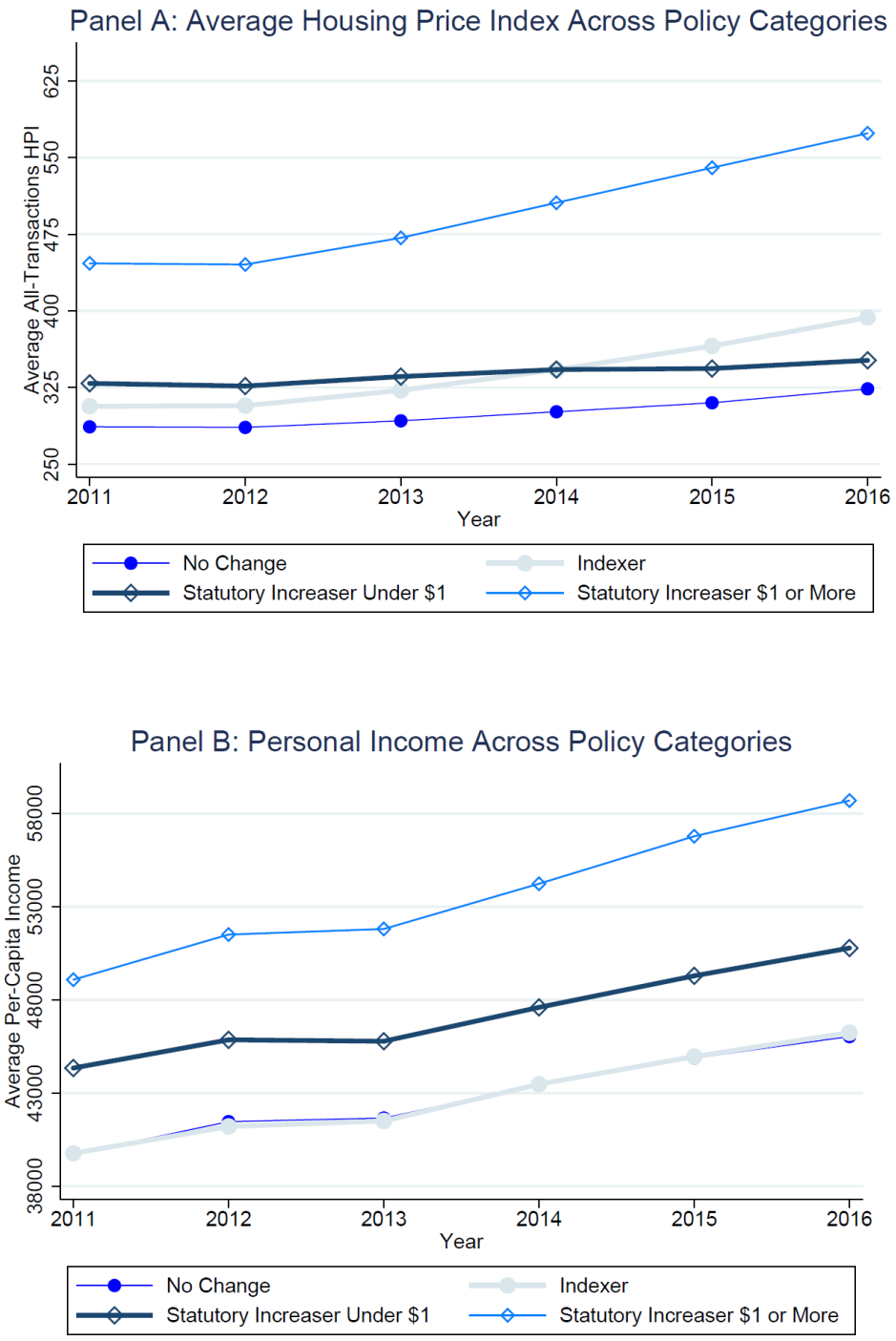


**Figure 3. Macroeconomic Time Series Across Policy Categories:** Panel A plots the average housing price index variable for each of our four policy categories from 2011 to 2016. Housing price index data come from the Federal Housing Finance Agency. Panel B plots average per capita income for each of our four policy categories from 2011 to 2016. Data on average per capita income come from the Bureau of Economic Analysis. States are defined as statutory increasers under $1 if the combined statutory increase in their minimum wage between January 2013 and January 2015 was under $1. States are defined as statutory increasers of $1 or more if the combined statutory increase in their minimum wage was $1 or greater. Indexers are states that index their minimum wage to inflation. Averages are weighted by state population.

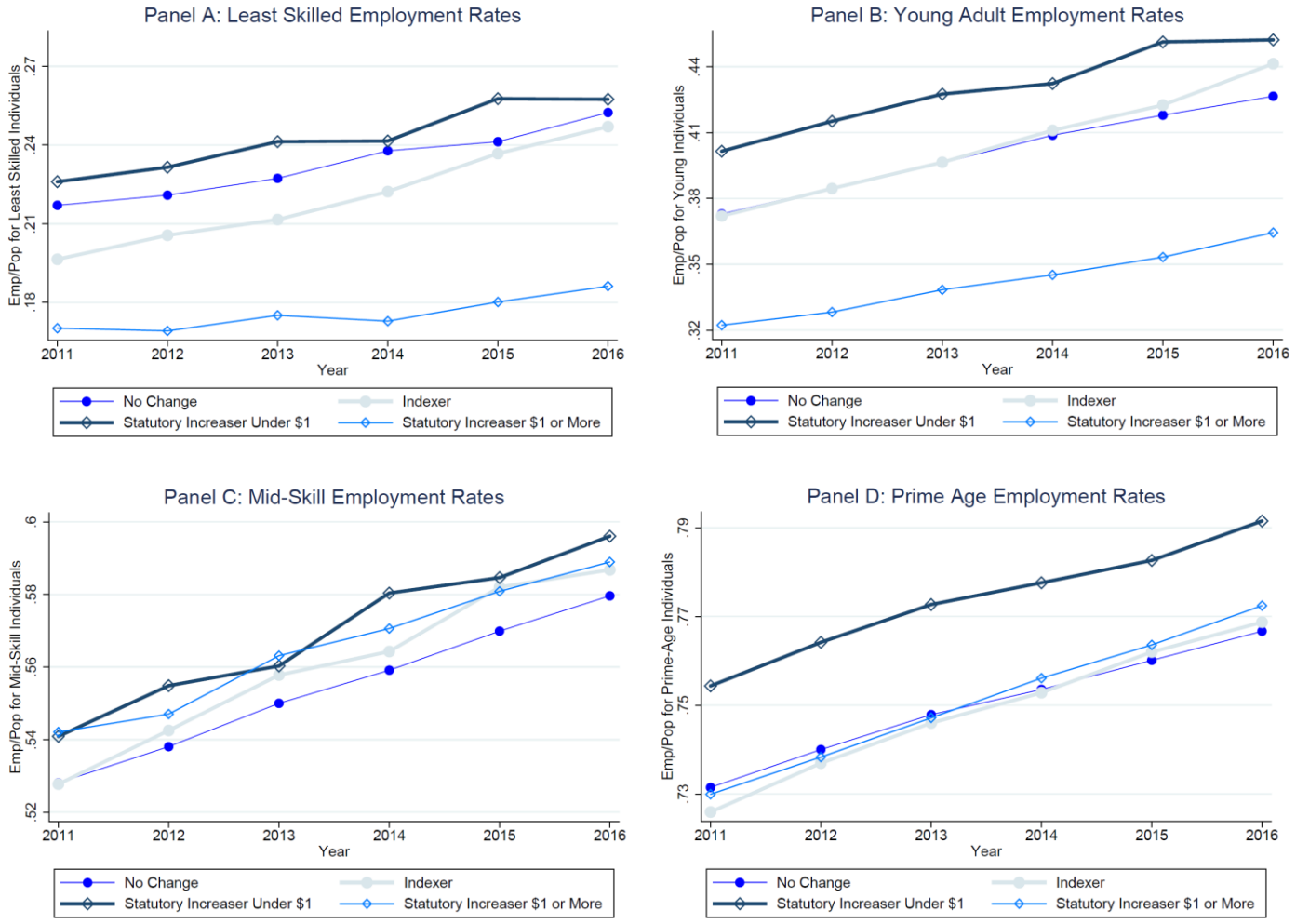


**Figure 4. Employment Series in the ACS**: This figure plots average annual employment rates for each of our four policy groups, broken out across four subsamples, from 2011 to 2016. Panel A plots employment rates for least-skilled individuals, defined as individuals ages 16 to 25 without a completed high school education. Panel B plots employment rates for young adults, defined as individuals ages 16 to 21. Panel C plots employment rates for mid-skill individuals, defined as individuals ages 22 to 30 years old with a high school degree and high school dropouts between the ages of 30 and 65. Panel D plots employment rates for prime-age individuals, defined as individuals between the ages of 26 and 54. Employment data come from the American Community Survey (ACS). States are defined as statutory increasers under $1 if the combined statutory increase in their minimum wage between January 2013 and January 2015 was under $1. States are defined as statutory increasers of $1 or more if the combined statutory increase in their minimum wage was $1 or greater


**Figure 5. Employment Series in the CPS:** This figure plots average annual employment rates for each of our four policy groups, broken out across four subsamples, from 2011 to 2016. Panel A plots employment rates for least-skilled individuals, defined as individuals ages 16 to 25 without a completed high school education. Panel B plots employment rates for young adults, defined as individuals ages 16 to 21. Panel C plots employment rates for mid-skill individuals, defined as individuals ages 22 to 30 years old with a high school degree and high school dropouts between the ages of 30 and 65. Panel D plots employment rates for prime-age individuals, defined as individuals between the ages of 26 and 54. Employment data come from the Current Population Survey (CPS). States are defined as statutory increasers under $1 if the combined statutory increase in their minimum wage between January 2013 and January 2015 was under $1. States are defined as statutory increasers of $1 or more if the combined statutory increase in their minimum wage was $1 or greater. Indexers are states that index their minimum wage to inflation. Averages are weighted by state population.

**Table 1: List of States with Statutory Minimum Wage Increases and Inflation-Indexed Increases Using Changes from 2013 to 2015 and $1 Cutoff**

| Statutory increasers of $1 or more | Statutory increasers under $1 |
|---|---|
| Alaska | Arkansas |
| California | Connecticut |
| District of Columbia | Delaware |
| Massachusetts | Hawaii |
| New Jersey | Maryland |
| New York | Michigan |
| Rhode Island | Minnesota |
| South Dakota | Nebraska |
| | West Virginia |
| Indexers | |
| Arizona | |
| Colorado | |
| Florida | |
| Missouri | |
| Montana | |
| Ohio | |
| Oregon | |
| Vermont | |
| Washington | |

Notes: Data on minimum wage indexing provisions come from the National Council of State Legislatures. The states labeled as indexers link annual updates to their effective minimum wage rates to a measure of inflation. Data on minimum wage changes come from the US Department of Labor. States are counted as statutory increasers of under $1 if the combined statutory increase in the minimum wage from January 2013 through January 2015 was under $1. States are counted as statutory increasers of $1 or more if the combined statutory increase in the minimum wage was $1 or more.

**Table 2: List of States with Statutory Minimum Wage Increases and Inflation-Indexed Increases Using Changes from 2013 to 2016 and $1.5 Cutoff**

| Statutory increasers of $1.5 or more | Statutory increasers under $1.5 |
|---|---|
| Alaska | Arkansas |
| California | Connecticut |
| District of Columbia | Delaware |
| Massachusetts | Hawaii |
| Minnesota | Maryland |
| Nebraska | Michigan |
| New York | New Jersey |
| Rhode Island | South Dakota |
| | West Virginia |
| Indexers | |
| Arizona | |
| Colorado | |
| Florida | |
| Missouri | |
| Montana | |
| Ohio | |
| Oregon | |
| Vermont | |
| Washington | |

Notes: Data on minimum wage indexing provisions come from the National Council of State Legislatures. The states labeled as indexers link annual updates to their effective minimum wage rates to a measure of inflation. Data on minimum wage changes come from the US Department of Labor. States are counted as statutory increasers of under $1.5 if the combined statutory increase in the minimum wage from January 2013 through January 2016 was under $1.5. States are counted as statutory increasers of $1.5 or more if the combined statutory increase in the minimum wage was $1.5 or more.

**Table 3: Sample Summary Statistics: ACS and Supplemental Data for 2011–13 and 2015–16**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Years | 2011–13 | 2015–16 | 2011–13 | 2015–16 |
| Skill Groups | Ages 16 to 25 w/ < High School | | Ages 16 to 21 | |
| Employment | 0.225 | 0.249 | 0.374 | 0.412 |
| | (0.417) | (0.432) | (0.484) | (0.492) |
| Age | 17.90 | 17.72 | 18.58 | 18.55 |
| | (2.444) | (2.338) | (1.704) | (1.709) |
| Black | 0.166 | 0.159 | 0.153 | 0.148 |
| | (0.372) | (0.365) | (0.360) | (0.355) |
| High School Degree | 0 | 0 | 0.343 | 0.351 |
| | (0) | (0) | (0.475) | (0.477) |
| Some College Education | 0 | 0 | 0.247 | 0.245 |
| | (0) | (0) | (0.431) | (0.430) |
| House Price Index | 326.8 | 382.3 | 331.3 | 388.0 |
| | (100.5) | (118.4) | (102.2) | (120.9) |
| Income per Capita (1,000s) | 43.48 | 48.48 | 43.72 | 48.80 |
| | (6.264) | (7.140) | (6.360) | (7.265) |
| Effective Minimum Wage | 7.531 | 8.054 | 7.536 | 8.086 |
| | (0.422) | (0.865) | (0.424) | (0.880) |
| Observations | 346,135 | 213,588 | 774,438 | 495,602 |

Notes: This table reports summary statistics for our two sample groups. Columns 1 and 2 report averages and standard errors (in parenthesis) of each of the variables for our subsample of low-skill individuals, defined as individuals ages 16 to 25 with less than a high school education. Columns 3 and 4 report averages and standard errors (in parenthesis) for our subsample of young adult individuals, defined as individuals ages 16 to 21. Entries for employment, age, race, and education summarize data from the American Community Survey (ACS). The house price index variable uses data from the Federal Housing Finance Agency (FHFA). The income per capita variable uses data from the Bureau of Economic Analysis (BEA). The effective minimum wage variable uses data from the Bureau of Labor Statistics (BLS).

**Table 4: Sample Summary Statistics: CPS and Supplemental Data for 2011–13 and 2015–16**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Years | 2011–13 | 2015–16 | 2011–13 | 2015–16 |
| Skill Groups | Ages 16 to 25 w/ < High School | | Ages 16 to 21 | |
| Employment | 0.234 | 0.254 | 0.360 | 0.389 |
| | (0.424) | (0.435) | (0.480) | (0.488) |
| Age | 17.97 | 17.80 | 18.50 | 18.47 |
| | (2.423) | (2.312) | (1.730) | (1.738) |
| Black | 0.164 | 0.160 | 0.155 | 0.153 |
| | (0.370) | (0.367) | (0.362) | (0.360) |
| High School Degree | 0 | 0 | 0.223 | 0.235 |
| | (0) | (0) | (0.416) | (0.424) |
| Some College Education | 0 | 0 | 0.299 | 0.289 |
| | (0) | (0) | (0.458) | (0.453) |
| House Price Index | 328.7 | 383.8 | 332.7 | 389.3 |
| | (101.4) | (118.0) | (103.1) | (120.5) |
| Income per Capita ($1,000s) | 43.58 | 48.57 | 43.82 | 48.91 |
| | (6.334) | (7.199) | (6.423) | (7.226) |
| Effective Minimum Wage | 7.537 | 8.084 | 7.543 | 8.114 |
| | (0.423) | (0.876) | (0.426) | (0.888) |
| Observations | 197,386 | 122,273 | 365,354 | 229,232 |

Notes: This table reports summary statistics for our two sample groups. Columns 1 and 2 report averages and standard errors (in parenthesis) of each of the variables for our subsample of low-skill individuals, defined as individuals ages 16 to 25 with less than a high school education. Columns 3 and 4 report averages and standard errors (in parenthesis) for our subsample of young adult individuals, defined as individuals ages 16 to 21. Entries for employment, age, race, and education summarize data from the Current Population Survey (CPS). The house price index variable uses data from the Federal Housing Finance Agency (FHFA). The income per capita variable uses data from the Bureau of Economic Analysis (BEA). The effective minimum wage variable uses data from the Bureau of Labor Statistics (BLS).

**Table 5: Unadjusted Differences Across Policy Regimes Using ACS Data and $1 Cutoff**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | 2011–13 | 2015–16 | Change | Change Relative to Non-Increasers |
| Young Adult Employment | | | | |
| Non-Increasers | 0.385 | 0.422 | 0.037 | |
| Indexers | 0.384 | 0.432 | 0.048 | 0.011 |
| Increase < $1 | 0.415 | 0.452 | 0.037 | 0.000 |
| Increase >= $1 | 0.330 | 0.359 | 0.029 | -0.008 |
| Low-Skill Employment | | | | |
| Non-Increasers | 0.239 | 0.262 | 0.023 | |
| Indexers | 0.222 | 0.262 | 0.040 | 0.017 |
| Increase < $1 | 0.246 | 0.275 | 0.029 | 0.006 |
| Increase >= $1 | 0.188 | 0.200 | 0.012 | -0.011 |
| Prime-Age Employment | | | | |
| Non-Increasers | 0.751 | 0.770 | 0.019 | |
| Indexers | 0.746 | 0.772 | 0.026 | 0.007 |
| Increase < $1 | 0.768 | 0.792 | 0.024 | 0.005 |
| Increase >= $1 | 0.748 | 0.774 | 0.026 | 0.007 |
| Mid-Skill Employment | | | | |
| Non-Increasers | 0.576 | 0.608 | 0.032 | |
| Indexers | 0.583 | 0.622 | 0.039 | 0.007 |
| Increase < $1 | 0.575 | 0.617 | 0.042 | 0.010 |
| Increase >= $1 | 0.590 | 0.618 | 0.028 | -0.004 |
| House Price Index | | | | |
| Non-Increasers | 274.4 | 311.7 | 37.3 | |
| Indexers | 291.2 | 366.4 | 75.2 | 37.9 |
| Increase < $1 | 303.0 | 341.2 | 38.2 | 0.9 |
| Increase >= $1 | 457.0 | 561.7 | 104.7 | 67.4 |
| Income per Capita ($1,000s) | | | | |
| Non-Increasers | 40.64 | 45.17 | 4.53 | |
| Indexers | 40.68 | 45.41 | 4.73 | 0.20 |
| Increase < $1 | 44.52 | 49.22 | 4.7 | 0.17 |
| Increase >= $1 | 50.1 | 57.09 | 6.99 | 2.46 |

Notes: This table reports employment rates for each our of our four policy groups (non-increasers, indexers, increase < $1, and increase >= $1) broken out across four types of individuals: young adults, low-skill, prime-age, and mid-skill. Young adults are defined as individuals ages 16 to 21. Low-skill adults are those ages 16 to 25 without a completed high school education. Prime-age adults are defined as individuals between the ages of 26 and 54. Mid-skill individuals are those ages 22 to 30 years old with a high school degree, or high school dropouts between the ages of 30 and 65. This table also reports mean values of economic control variables (house price index and income per capita) for each of our four policy groups. The employment variables are constructed using ACS data, the income per capita variable uses BEA data, and the house price index variable uses FHFA data. Data sources are more fully described in the note to Table 2. Column 1 reports the average value between 2011 and 2013 for each row, column 2 reports the average value between 2015 and 2016, and column 3 reports the difference between the two. Column 4 reports the change in the average value for each row relative to the relevant non-increaser value. Averages are weighted by state population.

## Table 6: Unadjusted Differences Across Policy Regimes Using CPS Data and $1 Cutoff

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | 2011–13 | 2015–16 | Change | Change Relative to Non-Increasers |
| Young Adult Employment | | | | |
| Non-Increasers | 0.377 | 0.404 | 0.027 | |
| Indexers | 0.373 | 0.403 | 0.030 | 0.003 |
| Increase < $1 | 0.400 | 0.431 | 0.031 | 0.004 |
| Increase >= $1 | 0.304 | 0.333 | 0.029 | 0.002 |
| Low-Skill Employment | | | | |
| Non-Increasers | 0.250 | 0.271 | 0.021 | |
| Indexers | 0.240 | 0.263 | 0.023 | 0.002 |
| Increase < $1 | 0.238 | 0.280 | 0.042 | 0.021 |
| Increase >= $1 | 0.198 | 0.200 | 0.002 | -0.019 |
| Prime-Age Employment | | | | |
| Non-Increasers | 0.761 | 0.778 | 0.017 | |
| Indexers | 0.757 | 0.781 | 0.024 | 0.007 |
| Increase < $1 | 0.774 | 0.795 | 0.021 | 0.004 |
| Increase >= $1 | 0.745 | 0.767 | 0.022 | 0.005 |
| Mid-Skill Employment | | | | |
| Non-Increasers | 0.591 | 0.614 | 0.023 | |
| Indexers | 0.589 | 0.632 | 0.043 | 0.020 |
| Increase < $1 | 0.583 | 0.609 | 0.026 | 0.003 |
| Increase >= $1 | 0.579 | 0.614 | 0.035 | 0.012 |
| House Price Index | | | | |
| Non-Increasers | 273.8 | 311.5 | 37.7 | |
| Indexers | 288.9 | 366 | 77.1 | 39.4 |
| Increase < $1 | 301.9 | 339.3 | 37.4 | -0.3 |
| Increase >= $1 | 456.1 | 562.2 | 106.1 | 68.4 |
| Income per Capita ($1,000s) | | | | |
| Non-Increasers | 40.68 | 45.03 | 4.35 | |
| Indexers | 40.54 | 45.36 | 4.82 | 0.47 |
| Increase < $1 | 44.41 | 49.15 | 4.74 | 0.39 |
| Increase >= $1 | 50.05 | 57.07 | 7.02 | 2.67 |

Notes: This table reports employment rates for each our of our four policy groups (non-increasers, indexers, increase < $1, and increase >= $1) broken out across four types of individuals: young adults, low-skill, prime-age, and mid-skill. Young adults are defined as individuals ages 16 to 21. Low-skill adults are those ages 16 to 25 without a completed high school education. Prime-age adults are defined as individuals between the ages of 26 and 54. Mid-skill individuals are those ages 22 to 30 years old with a high school degree, or high school dropouts between the ages of 30 and 65. This table also reports mean values of economic control variables (house price index and income per capita) for each of our four policy groups. The employment variables are constructed using CPS data, the income per capita variable uses BEA data, and the house price index variable uses FHFA data. Data sources are more fully described in the note to Table 2. Column 1 reports the average value between 2011 and 2013 for each row, column 2 reports the average value between 2015 and 2016, and column 3 reports the difference between the two. Column 4 reports the change in the average value for each row relative to the relevant non-increaser value. Averages are weighted by state population.

**Table 7: Relationship Between Minimum Wage Increases and Employment Using ACS Data and $1 Cutoff with 2015–16 as the Post Period (D-in-D Estimates)**

| Panel A: Low-Skilled Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Large Statutory Increaser x Post | -0.0113 | -0.0176** | -0.0086 | -0.0109 | -0.0113* | -0.0130 |
| | (0.007) | (0.008) | (0.010) | (0.007) | (0.006) | (0.008) |
| Small Statutory Increaser x Post | 0.0059 | 0.0070 | 0.0059 | 0.0051 | 0.0012 | 0.0016 |
| | (0.014) | (0.012) | (0.014) | (0.013) | (0.013) | (0.011) |
| Indexer x Post | 0.0183** | 0.0172* | 0.0198** | 0.0163* | 0.0136* | 0.0133* |
| | (0.008) | (0.009) | (0.009) | (0.009) | (0.007) | (0.008) |
| Ln(Income per Capita) | | 0.2533*** | | | | 0.2516*** |
| | | (0.093) | | | | (0.089) |
| Housing Price Index Divided by 1,000 | | | -0.0432 | | | -0.0681 |
| | | | (0.075) | | | (0.077) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.2918*** | | 0.2731*** |
| | | | | (0.099) | | (0.096) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 559,723 | 559,723 | 559,723 | 559,723 | 559,723 | 559,723 |
| R-squared | 0.015 | 0.015 | 0.015 | 0.015 | 0.102 | 0.103 |

| Panel B: Young Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Statutory Increaser Large x Post | -0.0084 | -0.0154** | -0.0172** | -0.0082 | -0.0110 | -0.0202** |
| | (0.008) | (0.007) | (0.008) | (0.008) | (0.008) | (0.008) |
| Statutory Increaser Small x Post | -0.0008 | 0.0003 | -0.0010 | -0.0012 | -0.0012 | -0.0009 |
| | (0.011) | (0.009) | (0.010) | (0.010) | (0.011) | (0.009) |
| Indexer x Post | 0.0100* | 0.0088 | 0.0049 | 0.0090 | 0.0115** | 0.0072 |
| | (0.006) | (0.006) | (0.008) | (0.006) | (0.006) | (0.007) |
| Ln(Income per Capita) | | 0.2754*** | | | | 0.1926*** |
| | | (0.058) | | | | (0.062) |
| Housing Price Index Divided by 1,000 | | | 0.1423** | | | 0.0733 |
| | | | (0.059) | | | (0.064) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.1592* | | 0.1404* |
| | | | | (0.089) | | (0.073) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 1,270,040 | 1,270,040 | 1,270,040 | 1,270,040 | 1,270,040 | 1,270,040 |
| R-squared | 0.015 | 0.015 | 0.015 | 0.015 | 0.150 | 0.150 |

Notes: This table reports difference-in-differences estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1 and states that increased their minimum wage by $1 or more between January 2013 and January 2015. The sample is from the ACS. Panel A includes individuals ages 25 and younger with less than a completed high school education and Panel B includes all individuals ages 16 to 21. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 5 and 6 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 8: Relationship Between Minimum Wage Increases and Employment Using ACS Data and $1 Cutoff with 2015–16 as the Post Period (D-in-D-in-D Estimates)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Ages 16 to 25 w/ Less than High School | | Ages 16 to 21 | |
| Treated x Large Statutory Increaser x Post | -0.0184*** | -0.0188*** | -0.0155** | -0.0186*** |
| | (0.006) | (0.005) | (0.006) | (0.006) |
| Treated x Small Statutory Increaser x Post | 0.0014 | -0.0038 | -0.0052 | -0.0059 |
| | (0.010) | (0.009) | (0.006) | (0.006) |
| Treated x Indexer x Post | 0.0108 | 0.0062 | 0.0027 | 0.0047 |
| | (0.008) | (0.008) | (0.005) | (0.005) |
| Age and Education Controls | No | Yes | No | Yes |
| Observations | 6,268,865 | 6,268,865 | 6,979,182 | 6,979,182 |
| R-squared | 0.115 | 0.165 | 0.102 | 0.165 |

Notes: This table reports triple-difference estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1 and states that increased their minimum wage by $1 or more between January 2013 and January 2015. Data come from the ACS. The treated group consists of individuals ages 25 and younger without a completed high school education in columns 1 and 2 and individuals 16 to 21 in columns 3 and 4. The control group consists of prime-age individuals ages 26 to 54. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 2 and 4 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 9: Relationship Between Minimum Wage Increases and Employment Using CPS Data and $1 Cutoff with 2015–16 as the Post Period (D-in-D Estimates)**

| Panel A: Low-Skilled Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Large Statutory Increaser x Post | -0.0189* | -0.0226** | -0.0120 | -0.0197* | -0.0139* | -0.0106 |
| | (0.011) | (0.010) | (0.009) | (0.010) | (0.008) | (0.007) |
| Small Statutory Increaser x Post | 0.0196 | 0.0202 | 0.0196 | 0.0198 | 0.0125 | 0.0134* |
| | (0.013) | (0.012) | (0.014) | (0.012) | (0.009) | (0.008) |
| Indexer x Post | 0.0053 | 0.0046 | 0.0093 | 0.0039 | 0.0019 | 0.0041 |
| | (0.008) | (0.008) | (0.009) | (0.008) | (0.007) | (0.007) |
| Ln(Income per Capita) | | 0.1457 | | | | 0.1374 |
| | | (0.170) | | | | (0.163) |
| Housing Price Index Divided by 1,000 | | | -0.1126 | | | -0.1243 |
| | | | (0.097) | | | (0.088) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.0949*** | | 0.1109*** |
| | | | | (0.028) | | (0.026) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 319,659 | 319,659 | 319,659 | 319,659 | 319,659 | 319,659 |
| R-squared | 0.020 | 0.020 | 0.020 | 0.020 | 0.112 | 0.112 |

| Panel B: Young Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Statutory Increaser Large x Post | 0.0022 | -0.0069 | -0.0126 | 0.0014 | -0.0003 | -0.0126* |
| | (0.011) | (0.009) | (0.008) | (0.011) | (0.009) | (0.007) |
| Statutory Increaser Small x Post | 0.0043 | 0.0057 | 0.0039 | 0.0046 | 0.0107 | 0.0113 |
| | (0.013) | (0.010) | (0.012) | (0.012) | (0.009) | (0.007) |
| Indexer x Post | 0.0052 | 0.0036 | -0.0035 | 0.0034 | 0.0143 | 0.0072 |
| | (0.009) | (0.008) | (0.010) | (0.008) | (0.009) | (0.010) |
| Ln(Income per Capita) | | 0.3630*** | | | | 0.1280 |
| | | (0.126) | | | | (0.125) |
| Housing Price Index Divided by 1,000 | | | 0.2409*** | | | 0.1340* |
| | | | (0.069) | | | (0.076) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.1176*** | | 0.1170*** |
| | | | | (0.027) | | (0.021) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 594,586 | 594,586 | 594,586 | 594,586 | 594,586 | 594,586 |
| R-squared | 0.020 | 0.020 | 0.020 | 0.020 | 0.151 | 0.151 |

Notes: This table reports difference-in-differences estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1 and states that increased their minimum wage by $1 or more between January 2013 and January 2015 The sample is from the CPS. Panel A includes individuals ages 25 and younger with less than a completed high school education and Panel B includes all individuals ages 16 to 21. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 5 and 6 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 10: Relationship Between Minimum Wage Increases and Employment Using CPS Data and $1 Cutoff with 2015–16 as the Post Period (D-in-D-in-D Estimates)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Ages 16 to 25 w/ Less than High School | | Ages 16 to 21 | |
| Treated x Large Statutory Increaser x Post | -0.0238** | -0.0182* | -0.0026 | -0.0045 |
| | (0.012) | (0.009) | (0.010) | (0.008) |
| Treated x Small Statutory Increaser x Post | 0.0156 | 0.0066 | 0.0003 | 0.0053 |
| | (0.012) | (0.009) | (0.010) | (0.007) |
| Treated x Indexer x Post | -0.0017 | -0.0070 | -0.0016 | 0.0066 |
| | (0.009) | (0.008) | (0.009) | (0.010) |
| Age and Education Controls | No | Yes | No | Yes |
| Observations | 3,330,252 | 3,330,252 | 3,605,179 | 3,605,179 |
| R-squared | 0.127 | 0.166 | 0.113 | 0.165 |

Notes: This table reports triple-difference estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1 and states that increased their minimum wage by $1 or more between January 2013 and January 2015. The sample is from the CPS. The treated group consists of individuals ages 25 and younger without a completed high school education in columns 1 and 2 and individuals 16 to 21 in columns 3 and 4. The control group consists of prime-age individuals ages 26 to 54. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 2 and 4 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 11: Relationship Between Minimum Wage Increases and Employment Using ACS Data and $1 Cutoff with 2016 as the Post Period (D-in-D Estimates)**

| Panel A: Low-Skilled Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Large Statutory Increaser x Post | -0.0119 | -0.0204** | -0.0069 | -0.0113 | -0.0133** | -0.0143* |
| | (0.007) | (0.008) | (0.011) | (0.007) | (0.006) | (0.008) |
| Small Statutory Increaser x Post | 0.0004 | 0.0010 | 0.0004 | -0.0004 | -0.0070 | -0.0072 |
| | (0.015) | (0.013) | (0.015) | (0.014) | (0.015) | (0.012) |
| Indexer x Post | 0.0162 | 0.0145 | 0.0193* | 0.0151 | 0.0110 | 0.0126 |
| | (0.010) | (0.010) | (0.011) | (0.010) | (0.008) | (0.009) |
| Ln(Income per Capita) | | 0.2908*** | | | | 0.2889*** |
| | | (0.093) | | | | (0.087) |
| Housing Price Index Divided by 1,000 | | | -0.0735 | | | -0.0991 |
| | | | (0.074) | | | (0.072) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.2682** | | 0.2587*** |
| | | | | (0.106) | | (0.095) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 451,902 | 451,902 | 451,902 | 451,902 | 451,902 | 451,902 |
| R-squared | 0.014 | 0.014 | 0.014 | 0.014 | 0.103 | 0.103 |

| Panel B: Young Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Statutory Increaser Large x Post | -0.0071 | -0.0154* | -0.0161 | -0.0066 | -0.0100 | -0.0189* |
| | (0.010) | (0.008) | (0.010) | (0.010) | (0.010) | (0.010) |
| Statutory Increaser Small x Post | -0.0045 | -0.0040 | -0.0046 | -0.0052 | -0.0062 | -0.0064 |
| | (0.011) | (0.009) | (0.011) | (0.011) | (0.011) | (0.009) |
| Indexer x Post | 0.0151** | 0.0135** | 0.0095 | 0.0143** | 0.0164** | 0.0125 |
| | (0.007) | (0.007) | (0.009) | (0.007) | (0.007) | (0.009) |
| Ln(Income per Capita) | | 0.2839*** | | | | 0.2070*** |
| | | (0.054) | | | | (0.067) |
| Housing Price Index Divided by 1,000 | | | 0.1299** | | | 0.0466 |
| | | | (0.062) | | | (0.067) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.2093** | | 0.1871** |
| | | | | (0.091) | | (0.075) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 1,021,078 | 1,021,078 | 1,021,078 | 1,021,078 | 1,021,078 | 1,021,078 |
| R-squared | 0.014 | 0.014 | 0.014 | 0.014 | 0.150 | 0.150 |

Notes: This table reports difference-in-differences estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1 and states that increased their minimum wage by $1 or more between January 2013 and January 2015. The sample is from the ACS. Panel A includes individuals ages 25 and younger with less than a completed high school education and Panel B includes individuals ages 16 to 21. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 5 and 6 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 12: Relationship Between Minimum Wage Increases and Employment Using ACS Data and $1 Cutoff with 2016 as the Post Period (D-in-D-in-D Estimates)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Ages 16 to 25 w/ Less than High School | | Ages 16 to 21 | |
| Treated x Large Statutory Increaser x Post | -0.0201*** | -0.0220*** | -0.0151** | -0.0186*** |
| | (0.007) | (0.005) | (0.007) | (0.007) |
| Treated x Small Statutory Increaser x Post | -0.0057 | -0.0140 | -0.0105 | -0.0125* |
| | (0.010) | (0.010) | (0.007) | (0.007) |
| Treated x Indexer x Post | 0.0086 | 0.0031 | 0.0076 | 0.0093 |
| | (0.010) | (0.008) | (0.006) | (0.006) |
| Age and Education Controls | No | Yes | No | Yes |
| Observations | 5,028,707 | 5,028,707 | 5,597,883 | 5,597,883 |
| R-squared | 0.116 | 0.166 | 0.102 | 0.166 |

Notes: This table reports triple-difference estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1 and states that increased their minimum wage by $1 or more between January 2013 and January 2015. Data come from the ACS. The treated group consists of individuals ages 25 and younger without a completed high school education in columns 1 and 2 and individuals 16 to 21 in columns 3 and 4. The control group consists of prime-age individuals ages 26 to 54. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 2 and 4 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 13: Relationship Between Minimum Wage Increases and Employment Using CPS Data and $1 Cutoff with 2016 as the Post Period (D-in-D Estimates)**

| Panel A: Low-Skilled Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Large Statutory Increaser x Post | -0.0175 | -0.0208 | -0.0100 | -0.0174 | -0.0136 | -0.0087 |
| | (0.014) | (0.014) | (0.012) | (0.014) | (0.010) | (0.009) |
| Small Statutory Increaser x Post | 0.0355** | 0.0358** | 0.0354** | 0.0351** | 0.0280** | 0.0277*** |
| | (0.016) | (0.016) | (0.017) | (0.015) | (0.011) | (0.010) |
| Indexer x Post | 0.0041 | 0.0035 | 0.0088 | 0.0030 | -0.0026 | -0.0000 |
| | (0.012) | (0.012) | (0.012) | (0.012) | (0.010) | (0.009) |
| Ln(Income per Capita) | | 0.1110 | | | | 0.0752 |
| | | (0.169) | | | | (0.173) |
| Housing Price Index Divided by 1,000 | | | -0.1089 | | | -0.0999 |
| | | | (0.101) | | | (0.096) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.0843** | | 0.1036*** |
| | | | | (0.037) | | (0.036) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 258,265 | 258,265 | 258,265 | 258,265 | 258,265 | 258,265 |
| R-squared | 0.020 | 0.020 | 0.020 | 0.020 | 0.112 | 0.112 |

| Panel B: Young Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Statutory Increaser Large x Post | 0.0072 | -0.0020 | -0.0070 | 0.0076 | 0.0039 | -0.0070 |
| | (0.013) | (0.011) | (0.011) | (0.012) | (0.011) | (0.010) |
| Statutory Increaser Small x Post | 0.0151 | 0.0159 | 0.0150 | 0.0146 | 0.0232* | 0.0229** |
| | (0.016) | (0.014) | (0.015) | (0.014) | (0.013) | (0.010) |
| Indexer x Post | 0.0139 | 0.0121 | 0.0050 | 0.0122 | 0.0190* | 0.0118 |
| | (0.011) | (0.010) | (0.013) | (0.011) | (0.010) | (0.011) |
| Ln(Income per Capita) | | 0.3160** | | | | 0.1056 |
| | | (0.126) | | | | (0.130) |
| Housing Price Index Divided by 1,000 | | | 0.2043** | | | 0.1175 |
| | | | (0.077) | | | (0.078) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.1292*** | | 0.1219*** |
| | | | | (0.032) | | (0.027) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 479,357 | 479,357 | 479,357 | 479,357 | 479,357 | 479,357 |
| R-squared | 0.020 | 0.020 | 0.020 | 0.020 | 0.151 | 0.152 |

Notes: This table reports difference-in-differences estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1 and states that increased their minimum wage by $1 or more between January 2013 and January 2015. The sample is from the CPS. Panel A includes individuals ages 25 and younger with less than a completed high school education and Panel B includes individuals ages 16 to 21. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 5 and 6 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 14: Relationship Between Minimum Wage Increases and Employment Using CPS Data and $1 Cutoff with 2016 as the Post Period (D-in-D-in-D Estimates)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Ages 16 to 25 w/ Less than High School | | Ages 16 to 21 | |
| Treated x Large Statutory Increaser x Post | -0.0211 | -0.0165 | 0.0037 | 0.0009 |
| | (0.015) | (0.012) | (0.011) | (0.009) |
| Treated x Small Statutory Increaser x Post | 0.0313** | 0.0205** | 0.0109 | 0.0163* |
| | (0.014) | (0.009) | (0.012) | (0.009) |
| Treated x Indexer x Post | -0.0027 | -0.0119 | 0.0073 | 0.0109 |
| | (0.012) | (0.010) | (0.010) | (0.010) |
| Age and Education Controls | No | Yes | No | Yes |
| Observations | 2,682,793 | 2,682,793 | 2,903,885 | 2,903,885 |
| R-squared | 0.128 | 0.167 | 0.114 | 0.166 |

Notes: This table reports triple-difference estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1 and states that increased their minimum wage by $1 or more between January 2013 and January 2015. The sample is from the CPS. The treated group consists of individuals ages 25 and younger without a completed high school education in columns 1 and 2 and individuals ages 16 to 21 in columns 3 and 4. The control group consists of prime-age individuals ages 26 to 54. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 2 and 4 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 15: Relationship Between Minimum Wage Increases and Employment Using ACS Data and $1.5 Cutoff with 2016 as the Post Period (D-in-D Estimates)**

| Panel A: Low-Skilled Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Large Statutory Increaser x Post | -0.0094 | -0.0163* | -0.0021 | -0.0082 | -0.0112* | -0.0082 |
| | (0.008) | (0.009) | (0.012) | (0.008) | (0.007) | (0.009) |
| Small Statutory Increaser x Post | -0.0055 | -0.0060 | -0.0057 | -0.0076 | -0.0118 | -0.0147 |
| | (0.015) | (0.014) | (0.016) | (0.015) | (0.015) | (0.013) |
| Indexer x Post | 0.0162 | 0.0148 | 0.0206* | 0.0150 | 0.0110 | 0.0141* |
| | (0.010) | (0.010) | (0.011) | (0.010) | (0.008) | (0.008) |
| Ln(Income per Capita) | | 0.2525** | | | | 0.2749*** |
| | | (0.097) | | | | (0.090) |
| Housing Price Index Divided by 1,000 | | | -0.1030 | | | -0.1335* |
| | | | (0.082) | | | (0.078) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.2760** | | 0.2850*** |
| | | | | (0.104) | | (0.091) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 451,902 | 451,902 | 451,902 | 451,902 | 451,902 | 451,902 |
| R-squared | 0.014 | 0.014 | 0.014 | 0.014 | 0.103 | 0.103 |

| Panel B: Young Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Statutory Increaser Large x Post | -0.0046 | -0.0114 | -0.0118 | -0.0037 | -0.0079 | -0.0137 |
| | (0.010) | (0.008) | (0.011) | (0.009) | (0.010) | (0.011) |
| Statutory Increaser Small x Post | -0.0103 | -0.0109 | -0.0102 | -0.0121 | -0.0110 | -0.0129 |
| | (0.013) | (0.011) | (0.012) | (0.012) | (0.012) | (0.011) |
| Indexer x Post | 0.0151** | 0.0137** | 0.0107 | 0.0143** | 0.0164** | 0.0137 |
| | (0.007) | (0.007) | (0.009) | (0.007) | (0.007) | (0.009) |
| Ln(Income per Capita) | | 0.2499*** | | | | 0.1897*** |
| | | (0.055) | | | | (0.067) |
| Housing Price Index Divided by 1,000 | | | 0.1027 | | | 0.0189 |
| | | | (0.066) | | | (0.071) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.2263** | | 0.2040*** |
| | | | | (0.088) | | (0.075) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 1,021,078 | 1,021,078 | 1,021,078 | 1,021,078 | 1,021,078 | 1,021,078 |
| R-squared | 0.014 | 0.014 | 0.014 | 0.014 | 0.150 | 0.150 |

Notes: This table reports difference-in-differences estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1.5 and states that increased their minimum wage by $1.5 or more between January 2013 and January 2016. The sample is from the ACS. Panel A includes individuals ages 25 and younger with less than a completed high school education and Panel B includes individuals ages 16 to 21. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 5 and 6 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 16: Relationship Between Minimum Wage Increases and Employment Using ACS Data and $1.5 Cutoff with 2016 as the Post Period (D-in-D-in-D Estimates)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Ages 16 to 25 w/ Less than High School | | Ages 16 to 21 | |
| Treated x Large Statutory Increaser x Post | -0.0161* | -0.0185*** | -0.0112* | -0.0151** |
| | (0.009) | (0.006) | (0.006) | (0.006) |
| Treated x Small Statutory Increaser x Post | -0.0147 | -0.0219** | -0.0195** | -0.0207** |
| | (0.011) | (0.010) | (0.009) | (0.009) |
| Treated x Indexer x Post | 0.0086 | 0.0031 | 0.0076 | 0.0093 |
| | (0.010) | (0.008) | (0.006) | (0.006) |
| Age and Education Controls | No | Yes | No | Yes |
| Observations | 5,028,707 | 5,028,707 | 5,597,883 | 5,597,883 |
| R-squared | 0.116 | 0.166 | 0.102 | 0.166 |

Notes: This table reports triple-difference estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1.5 and states that increased their minimum wage by $1.5 or more between January 2013 and January 2016. Data come from the ACS. The treated group consists of individuals ages 25 and younger without a completed high school education in columns 1 and 2 and individuals ages 16 to 21 in columns 3 and 4. The control group consists of prime-age individuals ages 26 to 54. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 2 and 4 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 17: Relationship Between Minimum Wage Increases and Employment Using CPS Data and $1.5 Cutoff with 2016 as the Post Period (D-in-D Estimates)**

| Panel A: Low-Skilled Workers. | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Large Statutory Increaser x Post | -0.0118 | -0.0127 | -0.0002 | -0.0118 | -0.0075 | 0.0020 |
| | (0.016) | (0.015) | (0.012) | (0.016) | (0.012) | (0.009) |
| Small Statutory Increaser x Post | 0.0227 | 0.0227 | 0.0224 | 0.0227 | 0.0145 | 0.0140 |
| | (0.021) | (0.021) | (0.022) | (0.020) | (0.016) | (0.015) |
| Indexer x Post | 0.0041 | 0.0039 | 0.0112 | 0.0029 | -0.0026 | 0.0023 |
| | (0.012) | (0.012) | (0.012) | (0.012) | (0.010) | (0.009) |
| Ln(Income per Capita) | | 0.0328 | | | | 0.0352 |
| | | (0.179) | | | | (0.173) |
| Housing Price Index Divided by 1,000 | | | -0.1660 | | | -0.1502 |
| | | | (0.105) | | | (0.099) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.0883** | | 0.1095*** |
| | | | | (0.037) | | (0.036) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 258,265 | 258,265 | 258,265 | 258,265 | 258,265 | 258,265 |
| R-squared | 0.020 | 0.020 | 0.020 | 0.020 | 0.112 | 0.112 |

| Panel B: Young Workers | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Statutory Increaser Large x Post | 0.0105 | 0.0029 | -0.0018 | 0.0106 | 0.0078 | -0.0003 |
| | (0.011) | (0.009) | (0.009) | (0.011) | (0.009) | (0.009) |
| Statutory Increaser Small x Post | 0.0074 | 0.0069 | 0.0077 | 0.0077 | 0.0136 | 0.0138 |
| | (0.021) | (0.020) | (0.020) | (0.019) | (0.020) | (0.017) |
| Indexer x Post | 0.0139 | 0.0123 | 0.0064 | 0.0122 | 0.0190* | 0.0132 |
| | (0.011) | (0.010) | (0.012) | (0.011) | (0.010) | (0.011) |
| Ln(Income per Capita) | | 0.2746** | | | | 0.0739 |
| | | (0.118) | | | | (0.128) |
| Housing Price Index Divided by 1,000 | | | 0.1732** | | | 0.0880 |
| | | | (0.066) | | | (0.076) |
| State Mid-Skill Emp-to-Pop Ratio | | | | 0.1298*** | | 0.1272*** |
| | | | | (0.033) | | (0.028) |
| Age and Education Controls | No | No | No | No | Yes | Yes |
| Observations | 479,357 | 479,357 | 479,357 | 479,357 | 479,357 | 479,357 |
| R-squared | 0.020 | 0.020 | 0.020 | 0.020 | 0.151 | 0.151 |

Notes: This table reports difference-in-differences estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1.5 and states that increased their minimum wage by $1.5 or more between January 2013 and January 2016. The sample is from the CPS. Panel A includes individuals ages 25 and younger with less than a completed high school education and Panel B includes individuals ages 16 to 21. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 5 and 6 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

**Table 18: Relationship Between Minimum Wage Increases and Employment Using CPS Data and $1.5 Cutoff with 2016 as the Post Period (D-in-D-in-D Estimates)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Ages 16 to 25 w/ Less than High School | | Ages 16 to 21 | |
| Treated x Large Statutory Increaser x Post | -0.0146 | -0.0099 | 0.0077 | 0.0054 |
| | (0.018) | (0.014) | (0.009) | (0.007) |
| Treated x Small Statutory Increaser x Post | 0.0166 | 0.0056 | 0.0014 | 0.0056 |
| | (0.018) | (0.012) | (0.018) | (0.016) |
| Treated x Indexer x Post | -0.0027 | -0.0119 | 0.0073 | 0.0109 |
| | (0.012) | (0.010) | (0.010) | (0.010) |
| Age and Education Controls | No | Yes | No | Yes |
| Observations | 2,682,793 | 2,682,793 | 2,903,885 | 2,903,885 |
| R-squared | 0.128 | 0.167 | 0.114 | 0.166 |

Notes: This table reports triple-difference estimates for which the policy indicator variables distinguish between states in which the minimum wage was increased by less than $1.5 and states that increased their minimum wage by $1.5 or more between January 2013 and January 2016. The sample is from the CPS. The treated group consists of individuals ages 25 and younger without a completed high school education in columns 1 and 2 and individuals ages 16 to 21 in columns 3 and 4. The control group consists of prime-age individuals ages 26 to 54. Variable definitions and sources are discussed in the note to Table 2 (and in the paper). All specifications include year and state fixed effects. Age and education controls consist of a dummy variable for each education group and age (included in columns 2 and 4 as indicated within the table). Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1