How do minimum wages affect nonemployer business establishments in the United States?

Ke Lyu
Frank M. Fossen

Abstract

This paper investigates the impact of regional minimum wage increases on nonemployer business establishments in the United States. We develop a theoretical model of occupational choice motivating our empirical analysis. The effects of minimum wages are estimated using panel data analysis and an identification strategy that compares nonemployer establishments in contiguous counties across neighboring states. Our analysis employs data from the Nonemployer Statistics provided by the U.S. Census Bureau, spanning from 2001 to 2020. The findings indicate that a $1 increase in the minimum wage leads to a 0.5%-0.9% decrease in the number of nonemployer businesses, likely due to relatively more attractive wage employment. This shift is smaller in counties characterized by higher percentages of Hispanics, Blacks, Asians, and lower percentages of high school graduates. Conversely, higher minimum wages increase the number of nonemployers in the transportation sector as individuals are pushed into the gig economy, which is not covered by minimum wages. Further analysis based on various data sources from official statistics reveals that higher minimum wages discourage transitions from nonemployer to employer status and instead increase transitions from self-employment to wage employment and unemployment. Our findings add perspective to the debate on minimum wages by showing how this regulation affects nonemployers as an important part of their regional institutional environment.

Keywords: Minimum wages, nonemployer businesses, entrepreneurship

JEL Codes: J24; L26

Acknowledgement: We thank the Ewing Marion Kauffman Foundation for funding the research project RG-202204-12283. The contents of this paper are solely the responsibility of the authors.

Frank M. Fossen: University of Nevada, Reno, Department of Economics; University of California, Berkeley. E-Mail: ffossen@unr.edu

Ke Lyu (corresponding author): University of Nevada, Reno, Department of Economics, 1664 N. Virginia Street, Reno, NV 89557. E-Mail: klyu@unr.edu.

1 Introduction

Self-employment with employees is declining in most countries, while solo self-employment is rising in nearly half of them. This trend, where solo self-employment is increasing relative to self-employment with employees almost everywhere (Boeri et al., 2020), highlights the changing nature of the labor market and raises questions about the factors driving these shifts. In particular, do regulations controlled by national, regional or local governments play a role? One potentially important regulation is the minimum wage. Higher minimum wages can increase labor costs, making it more difficult for small businesses to hire employees. Additionally, higher minimum wages raise the opportunity cost of self-employment, potentially leading more individuals to pursue wage employment instead. The federal minimum wage in the United States has remained constant at $7.25 since 2009, while many states and some cities within the U.S. have increased their minimum wages in different years. Governments raise minimum wages with the intention to enhance the well-being of low-skilled employees. However, employment outcomes of minimum wages should also be considered. Research and the policy discussion have mostly been concerned with effects of the minimum wage on the segment of the labor market covered by the minimum wage (regular paid employment), but potential impacts on the uncovered market (self-employment) should not be overlooked.

In this study, we address three research questions. How do minimum wage increases affect the number of nonemployer business establishments? How do higher minimum wages influence transitions, particularly flows from nonemployer to small-employer firms, wage employment, and unemployment? How do these effects vary across local labor markets and industries, including the gig-oriented transportation sector?

To answer these questions, we combine multiple data sources and empirical strategies. Our primary analysis uses the county-level Nonemployer Business Statistics from the U.S. Census Bureau (2001–2020) to measure nonemployer firm counts. We exploit variation in county minimum wages over time using two-way fixed effects regressions with county and year fixed effects. To address potential endogeneity from time-varying local shocks, we also implement a boundary-pair fixed-effects design, comparing contiguous counties across state borders with different minimum wage laws. In addition, we draw on complementary data – including Business Formation Statistics, Business Dynamics Statistics, the Current Population Survey, and the Quarterly Census of Employment and Wages – to examine firm creation and worker flow outcomes related to solo entrepreneurship.

Our analysis reveals four key findings. First, increases in the minimum wage reduce nonemployer business activity. Specifically, a $1 increase in the minimum wage leads to a 0.5–0.9% decline in the number of county-level nonemployer establishments. This negative effect is consistent across both two-way fixed effects and border-pair fixed effects specifications. Second, minimum wage hikes hinder upward entrepreneurial

mobility. They significantly lower the probability that nonemployer firms transition into employer status, consistent with increased labor costs. Higher minimum wages also increase the likelihood that individuals exit solo self-employment in favor of wage employment or, in some cases, unemployment. Third, the effects vary by local workforce composition and industry. The decline in nonemployer activity is attenuated in counties with more diverse populations—characterized by higher shares of women, racial and ethnic minorities, or lower levels of educational attainment. In contrast, the transportation sector, a core component of the gig economy, exhibits a positive response: minimum wage increases lead to growth in nonemployer firms, likely reflecting increased reliance on app-based platform work (Glasner, 2023). The findings have broader implications for labor market policy. Minimum wage increases affect not only employment levels in the covered sector but also the dynamics of self-employment and occupational transitions, underscoring the importance of considering uncovered markets in the evaluation of wage policy.

This study contributes to the existing literature in several ways. First, it investigates the effect of the minimum wage on uncovered markets, focusing on self-employment, an area less studied compared to the extensive research on covered markets and employment performance. Second, it explores the effect of the minimum wage on self-employment dynamics. We examine transitions from self-employment to employer status, wage employment, and unemployment. Third, we examine the varying effects of the minimum wage by county-level demographics and industry. Fourth, in addition to the two-way fixed effects model, we adopt the boundary pair fixed effects model and the difference-in-differences model to avoid potential bias and confirm the robustness of the estimation results.

The subsequent sections of this study unfold as follows: Section 2 lays out the theory, policy, and literature background. Section 3 describes the data and variables used in the analysis. Section 4 outlines the empirical strategy. Section 5 presents the main findings, along with mechanism explorations, heterogeneity analysis, and robustness checks. Finally, Section 6 concludes with discussions and policy implications.

2 Background

2.1 Minimum wages and nonemployers

The federal minimum wage policy in the U.S. started in 1997 and remained constant at $5.15 until 2007. In 2008, the minimum wage was adjusted to $6.55, and then to $7.25 in 2009, where it has remained fixed as of 2023. Many states and some cities implemented their own minimum wages and changed them at different points in time; at each location, the highest minimum wage is the binding one. Figure B1 shows the geographic distribution of the interplay between the minimum wages and the numbers of nonemployer

business establishments in 2001, 2010, and 2020. In 2001, on the west coast, in states like California, Oregon, and Washington, we see higher minimum wages than the federal level and a greater number of nonemployer businesses, indicated in darker colors. Moving to the central states, the lighter shades on the map, as seen in states such as Nebraska and Kansas, indicate that these states do not set a minimum wage higher than the federal level, and they have fewer nonemployer businesses. On the east coast, we notice pockets of darker color in Vermont, Massachusetts, and Connecticut, where higher minimum wages are associated with more nonemployer businesses, mirroring the west coast situation. The minimum wage in 2001 was relatively flat, with no substantial variation between different states, however, this changed over the following two decades. In 2020, the west coast still maintains higher minimum wages and a robust presence of nonemployer businesses, similar to two decades ago. This consistency suggests a stable environment for nonemployers. Central areas, such as Kansas, Oklahoma, and Texas continue to exhibit lighter shades, indicating the persistence of lower minimum wages and fewer nonemployer businesses. This could reflect a longstanding economic structure that differs from that of the coastal regions. However, some central states, such as Arizona, Colorado, New Mexico, and South Dakota, have now set higher minimum wages above the average level. On the east coast, states like New York are marked with deeper shades, indicating an increase in both minimum wages and nonemployer businesses. Overall, some states have undergone notable changes, leading to a high variation in minimum wages between different states and across time.

To understand the theoretical effect of the minimum wage on nonemployer businesses, we first turn to the dualistic labor market model developed by Mincer (1976) and Welch (1974). In this framework, the labor market is segmented into a covered sector (e.g., wage employment) and an uncovered sector (e.g., self-employment or informal jobs), separated by nominal wage rigidities such as the minimum wage. Employees in the covered sector are subject to the minimum wage, whereas nonemployer businesses are not. Figures 1 and 2 illustrate the dual-market mechanism. In the absence of a minimum wage, the equilibrium wage is P_c^* in the covered sector and P_u^* in the uncovered sector. A binding minimum wage $\bar{P}_c$ in the covered market leads to excess labor supply $(Q_s - Q_d)$, pushing some workers to the uncovered sector or into unemployment. This creates reallocation effects: the uncovered sector's labor supply curve may shift outward (from S_u to S_u^2), increasing employment but lowering wages (from P_u^* to P_u^2). The magnitude depends on labor demand elasticity and how binding the minimum wage is (Mazumdar, 1989).

However, this effect may be counteracted. Higher covered wages may attract workers away from self-employment, reducing uncovered sector labor supply. Competitive nonemployers may shift to wage jobs or temporarily become unemployed while waiting for covered jobs. Additionally, capital reallocation or fairness norms may raise pay benchmarks in the uncovered sector (Harrison and Leamer, 1997; Maloney and Mendez, 2004), shifting the supply curve inward (from S_u to S_u^1), reducing employment but increasing wages (to P_u^1).

If the inflow into the uncovered sector dominates, equilibrium shifts to (Q_u^2, P_u^2)—more labor, lower wages. If the outflow dominates, the new equilibrium is (Q_u^1, P_u^1)—less labor, higher wages. These opposing channels imply ambiguity in the minimum wage's impact on uncovered sector activity. Additionally, temporary unemployment may arise as some workers wait for covered jobs or exit uncovered self-employment.

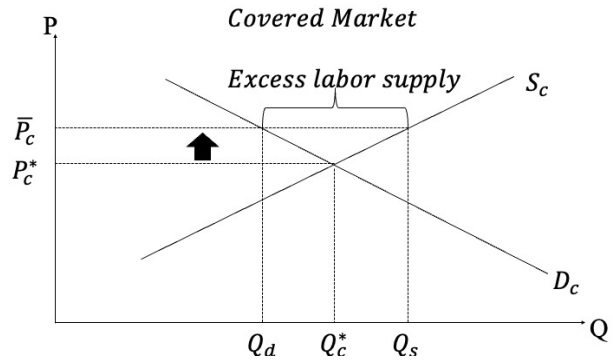


Figure 1: Covered Market

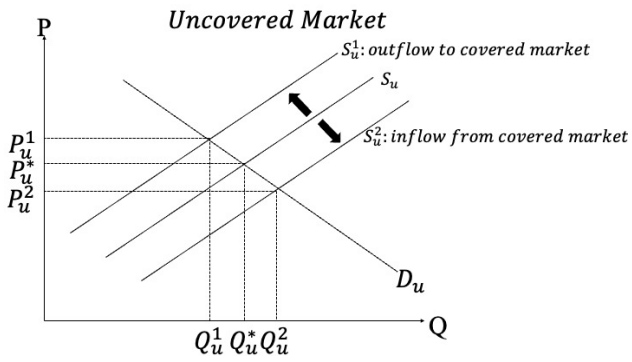


Figure 2: Uncovered Market

Importantly, the dual-market framework does not differentiate between employer and nonemployer businesses. To address this limitation, we develop a structural occupational choice model that builds on Medrano-Adán et al. (2015). Individuals differ in entrepreneurial ability and choose among five occupational states: unemployment, wage employment, involuntary nonemployment, voluntary nonemployment, and employer status. These choices are determined by ability thresholds that reflect heterogeneity in returns, fixed costs, and policy parameters such as the minimum wage and unemployment benefits. A rise in the minimum wage shifts the occupational thresholds, reducing the share of individuals choosing self-employment and employer status, and increasing unemployment. Full model details, including utility functions, threshold derivations, and comparative statics, are provided in Appendix A.

Figure A1 presents the model's implied occupational partition, defined by four ability thresholds e_0, e_1, e_2, and e_3. A higher minimum wage increases all thresholds, reducing the shares of employers and nonemployers and increasing unemployment. While the model predicts unambiguous declines in employer activity and employment, the effect on nonemployers-particularly those between e_0 and e_3—is theoretically ambiguous and sensitive to key parameters.

While the model captures the relevant mechanisms linking minimum wages to occupational choices, it does not provide definitive predictions about the net effect. We therefore turn to the empirical literature for guidance. For the wage employment sector, most empirical studies show that the minimum wage has a null or negative effect on employment (Holtemöller and Pohle, 2020; Jardim et al., 2022; Neumark and Shirley, 2022; Zavodny, 2000; Harasztosi and Lindner, 2019; Azar et al., 2023) and increases unemployment among contracted workers (Neumark and Wascher, 2008). A common explanation for the null findings is

the presence of substantial labor market monopsony or oligopsony. Under perfect competition, a binding increase in the minimum wage is expected to clearly reduce employment (Naidu et al., 2018). When the minimum wage goes up, it can lead to job cuts, especially in places that hire a lot of low-wage workers. While firms' ability to adjust in other ways, for example, by increasing prices for consumers, may buffer the employment decline, under perfect competition, employment has no possibility of increasing. However, some studies point to positive outcomes such as better productivity and less turnover (Azar et al., 2023). The effects are often minor or insignificant, especially when the wage increases are small and spread out over time (Card and Krueger, 2000; Dube et al., 2010).

For the self-employment, the literature reports mixed effects of minimum wages on self-employment, positive or negative (Glasner, 2023). Some studies, such as those by Ganserer et al. (2022), suggest that higher minimum wages can encourage self-employment, particularly in unregulated sectors like the gig economy. Conversely, other research, including studies by Kim et al. (2021) and Égert and Mourougane (2024), indicates that increased labor costs from higher minimum wages can lead to business closures and discourage entrepreneurial activities, especially among small business owners. The overall impact appears context-dependent, varying across industries and economic conditions. Further research is needed to fully understand these nuanced dynamics.

2.2 Minimum wages and nonemployer transitions

We turn to the labor market dynamics of workers to consider the transition patterns between solo self-employment and other forms of employment status, such as wage employment, unemployment, and self-employment with employees. As shown in Figure 3, there are three choices for nonemployers if they want to transition to another status after a minimum wage increase.

First, nonemployers could transition to becoming employers. Previous research indicates that solo self-employment is persistent, with a higher probability of transitioning to employership than from paid employment or unemployment (Lechmann and Wunder, 2017; Boeri et al., 2020). Solo entrepreneurs often aim to expand their businesses and hire employees, driven by the motivation to grow their ventures and achieve greater economic stability. However, a higher minimum wage makes this transition more difficult due to increased wage costs. Studies have shown that an increased minimum wage can deter business expansion and reduce the likelihood of solo self-employed individuals hiring employees (Kim et al., 2021; Égert and Mourougane, 2024). The higher wage costs can reduce profit margins, making it less attractive for nonemployer businesses to take on the additional financial burden of hiring employees (Chava et al., 2023). This can be particularly challenging for small businesses operating on thin margins, where the

incremental costs of complying with minimum wage laws may outweigh the potential benefits of business growth. Consequently, higher minimum wages may push nonemployer businesses to remain solo or even exit the market entirely, thereby affecting overall business dynamics and labor market structures. For some solo entrepreneurs, the increased costs of potentially employing workers in the future may render their business models unsustainable, leading to closures. This reduction in the number of nonemployer businesses can have broader economic implications, including reduced innovation and fewer opportunities for employment in local markets.

Second, wage employment may become more attractive because of the higher wages, but it may be difficult for many self-employed individuals to achieve the transition into the covered market. Research by Ganserer et al. (2022) indicates that while higher minimum wages can make wage employment more appealing, the skills mismatch and the lack of available positions in higher-paying sectors often make it challenging for self-employed individuals to switch to wage employment. Many self-employed individuals, particularly those in solo self-employment, possess specialized skills that do not easily transfer to wage employment opportunities, especially in sectors experiencing wage growth due to minimum wage increases. However, some self-employed individuals do manage to transition to wage employment, especially those with transferable skills or those in industries where wage employment opportunities are expanding. Research by Kaiser and Malchow-Møller (2011) shows that self-employed individuals transitioning to wage employment often do so at lower wages. Consequently, despite the potential allure of higher wages, the practical barriers to transitioning from self-employment to wage employment may remain significant, leaving many self-employed individuals unable to capitalize on the benefits of increased minimum wages.

Third, some nonemployers may discontinue their business activities due to a lower propensity to hire employees and expand operations. Consequently, these individuals may encounter temporary unemployment as they await opportunities to transition to wage employment. Several studies corroborate this potential rise in unemployment among former nonemployers. Wursten and Reich (2023) suggest that increases in the minimum wage can impose significant cost burdens on small businesses, potentially leading to closures and layoffs, particularly within industries characterized by narrow profit margins. Additionally, Luca and Luca (2019) find that even modest increases in the minimum wage can elevate the probability of business exits, especially for smaller firms that lack the capacity to transfer higher labor costs to consumers. These findings collectively support the hypothesis that elevated minimum wage policies can induce temporary unemployment among small business owners who find it untenable to sustain operations amid rising wage pressures. Another contributing factor to increased unemployment is that, in the covered market, some wage employment may be crowded out and shift to the uncovered market. This displacement can lead to increased competition for nonemployer positions, leaving some of the original disadvantaged nonemployers unable to

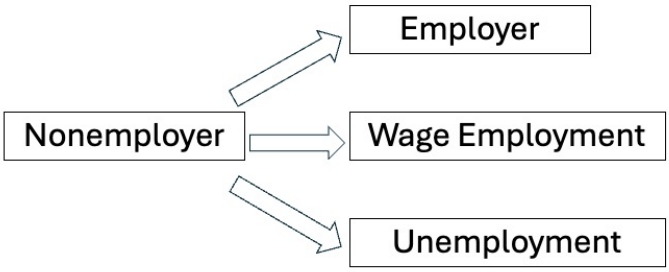


Figure 3: Transition between Nonemployer and other employment status

find employment and thus experiencing unemployment.

Overall, these transitions highlight the complex dynamics and varied responses of solo self-employed individuals to minimum wage increases, emphasizing the need for supportive policies that can mitigate the negative impacts and enhance opportunities for these workers.

3 Data and variables

The primary research question in this paper is: What is the effect of the minimum wage on the number of nonemployer establishments? The second research question is: What is the effect on the transition probabilities between nonemployers and other employment statuses, such as unemployment, wage employment, and employer?

To address the first question, we construct county-level minimum wage data by combining state-level minimum wage data from 2001 to 2020, provided by the U.S. Department of Labor, with city-level minimum wage data from the research by Dube and Lindner (2021), who provide detailed city-level minimum wage information. The minimum wage is coded as the county-level nominal minimum wage on January 1 of each year.[1]

We employ Nonemployer Statistics (NES) data from 2001 to 2020, provided by the Census Bureau, to estimate the size of the uncovered labor market. The NES data are derived from business income tax records supplied by the Internal Revenue Service (IRS) to the Census Bureau, which effectively capture administrative nonemployer business establishments, particularly those in the gig economy (Abraham et al., 2021; Garin et al., 2022). The NES includes the number of businesses without paid employees and their

[1]San Francisco serves as both a city and a county, making its minimum wages representative for the entire county, unlike other cities within larger counties. For counties with a small city that sets its own minimum wages, we use the state-level minimum wages as the county-level minimum wages.

total receipts at the county level. Most nonemployers are self-employed individuals operating unincorporated businesses, defined as businesses without paid employees and having receipts of $1,000 or more (or $1 or more for the Construction sector).

To analyze transitions from nonemployers to wage employment and unemployment, we use several data sources. The Current Population Survey (CPS), spanning from 2001 to 2020, employs a rotating panel design that enables tracking of individual employment status transitions over time. Each household in the CPS sample is interviewed for four consecutive months, followed by an eight-month gap, after which they are interviewed again for another four months. This 4-8-4 structure allows us to observe changes in employment status within a year. We focus on transitions from (unincorporated) self-employment to either wage employment or unemployment. The non-employers are mostly self-employed individuals with small unincorporated businesses (Patel and Devaraj, 2022).[2] In addition to the monthly CPS data, we use the Annual Social and Economic Supplement (ASEC), an extension of the CPS, covering the same period (2001–2020). The ASEC data follows individuals across two consecutive March surveys, enabling us to observe year-to-year transitions between self-employment and other employment statuses. Furthermore, the ASEC provides data on business firm sizes, allowing us to identify businesses with fewer than 10 employees, which includes nonemployer businesses.[3] By using both CPS and ASEC data, we are able to capture a comprehensive view of employment transitions, particularly those involving nonemployer businesses. [4] Besides, the Quarterly Census of Employment and Wages (QCEW), provided by the U.S. Bureau of Labor Statistics, offers county-level payroll and wage information from 2001 to 2020, which aids in examining the effect of minimum wages on employment and wages in the covered market.

To analyze transitions from nonemployers to employers, we utilize the Business Formation Statistics (BFS) data from 2004 to 2020, provided by the U.S. Census Bureau. The BFS is based on administrative data from Employer Identification Number (EIN) applications, which are required for filing payroll taxes. Since obtaining an EIN indicates a high likelihood of hiring employees, it serves as a strong indicator of a transition from nonemployer to employer status. Another supplementary data source is the Business Dynamics Statistics (BDS) from 2001 to 2020, also provided by the Census Bureau, which offers annual measures of business dynamics, such as aggregated job creation and destruction, and establishment births and deaths at the county level. BFS and BDS are used to observe the transition from nonemployer to employer and overall job creation dynamics.

[2]The CPS distinguishes between incorporated and unincorporated self-employment; for this study, we concentrate on unincorporated self-employment due to its strong correlation with nonemployer businesses.

[3]The ASEC classifies business sizes into eight categories: fewer than 10 employees, 10–24, 25–49, 50–99, 100–499, 500–999, and 1000+. In this study, we focus on businesses with fewer than 10 employees, as they show a strong correlation with nonemployer business patterns.

[4]Neither the CPS monthly data nor the ASEC provides a direct indicator for nonemployer businesses. Therefore, we use unincorporated businesses as a proxy in the CPS data, and businesses with fewer than 10 employees in the ASEC data.

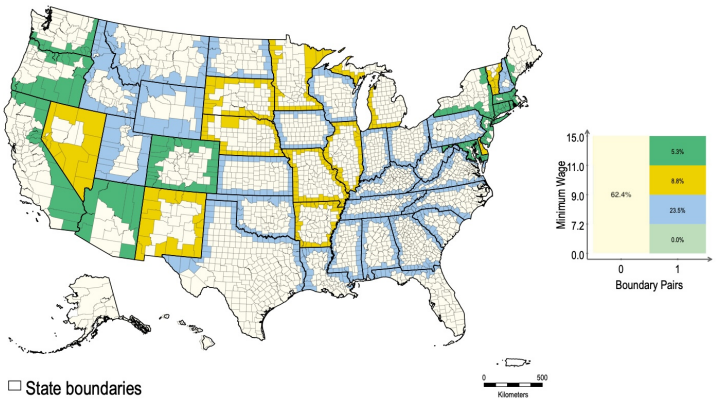


Figure 4: Contiguous Boundary Pair Counties with Minimum Wage in 2020

To analyze the causality of minimum wages on nonemployer businesses, we use control variables from various sources. Demographic and socioeconomic characteristics at the county level, such as GDP per person, population, per capita income, unemployment rate, female percentage, white percentage, Hispanic percentage, percentage of individuals aged 25 to 64, high school graduation percentage, and college graduation percentage, are obtained from the U.S. Census Bureau's intercensal datasets, American Community Survey (ACS), Bureau of Economic Analysis (BEA), and the Economic Research Service (ERS). Additionally, data on contiguous counties sourced from the Census Bureau's County Adjacency File are used to generate contiguous county pairs that may control for geographic factors. The map in Figure 4 shows the spatial distribution of counties that share a border with a state border, along with the minimum wage levels in 2020. We use the contiguous cross-state boundary pairs formed by these counties to exploit differences in minimum wages within pairs of adjacent counties.

4 Methodology

Our analysis begins with a conventional two-way fixed effect (TWFE) specification, incorporating both county and year fixed effects. The baseline model is formulated as follows:

$$Log(Y_{c,t}) = \beta_0 + \beta_1 \text{Minimum wage}_{c,t-1} + \beta_2 X_{c,t} + \theta_c + \tau_t + \varepsilon_{c,t} \tag{1}$$

where $Log(Y_{c,t})$ is the log of number of nonemployer business establishments or log of their total gross receipts of county c during year t. Minimum wage$_{c,t-1}$ represents the minimum wage in county c during year $t-1$; $X_{c,t}$ is a control vector including GDP per person, population, per capita income, unemployment

rate, female percentage, white percentage, Hispanic percentage, percentage of individuals aged 25 to 64, high school graduation percentage, and college graduation percentage. θ_c is a county fixed effect that removes time-invariant unobserved county-level factors, τ_t is the year fixed effect to capture unobserved time variation in outcomes, and $\varepsilon_{i,c,t}$ is a random error term. The coefficient, β_1, quantifies the estimated impact of county-level minimum wages on nonemployer business establishments. We report standard errors clustered at the state level throughout the paper because the minimum wage varies mostly by state.

The identification in Equation 1 is based on the assumption that nonemployer business establishments would have followed similar trajectories in all states in the absence of minimum wage implementation. However, factors such as economic growth, culture, and other unobserved variables may influence solo self-employment decisions differently across states prior to the increase in the minimum wage. Although we can introduce controls for a set of state-specific linear trends to account for unobserved heterogeneity under certain parametric assumptions, as pointed out by Dube et al. (2010), there is a possibility that some useful variation for identification might be removed. This is because the estimated trends themselves could also be affected by the treatment.

A technique known as the Boundary Pair Fixed Effects (BPFE) approach, introduced by Dube et al. (2010), addresses unobserved spatial heterogeneity by limiting the sample to adjacent counties in neighboring states that have implemented different policies. Peng et al. (2020) and Patel and Devaraj (2022) utilized a boundary pairs fixed effects approach to estimate the impact of state-level labor policies on employment performance. Following Dube et al. (2010), our identification strategy exploits variation between contiguous counties straddling a common state boundary.[5] Each county located at a state border is adjacent to at least one other county in a different state. For example, Washoe County in Nevada has 14 adjacent counties: five in California, seven in Nevada, and two in Oregon. Therefore, Washoe County has seven cross-state neighbors (five in California and two in Oregon), resulting in seven cross-state county pairs. Counties that are matched with n contiguous cross-state counties appear in the county-pairs sample n times with their county ID, but with different county-pair IDs, which they share only with one neighbor. For example, Washoe County has seven replicates in the sample, all with the same county ID, but with seven different county-pair IDs. The estimation then controls for county fixed effects as well as county-pair specific time fixed effects.

After introducing the contiguous county pairs, equation 1 can be reformulated for estimation on the

[5]Contiguous county pairs are defined by fulfilling one of the following conditions: First, the counties share a border; second, if the counties do not physically touch, they are connected by a bridge or ferry; third, the counties share a corner.

boundary pairs sample and use the following identification strategy[6]:

$$Log(Y_{c,p,t}) = \beta_0 + \beta_1 \text{Minimum wage}_{c,p,t-1} + \beta_2 X_{c,p,t} + \theta_c + \tau_{p,t} + \varepsilon_{c,p,t} \tag{2}$$

where p indexes the county-pair, and $\tau_{p,t}$ is the county-pair specific time fixed effect. Thus, $\tau_{p,t}$ account for any unobserved shocks that impact two neighboring counties in the same year, such as changes in local economic conditions. The effect of the minimum wage is identified, as neighboring counties (sharing the same county-pair ID) are subject to different minimum wage changes due to their locations in different states. Equation 2 does not rely on any untestable parametric assumption on the evolution of the outcomes.

To complement our analysis of the effects of minimum wage policies on nonemployer business establishments, we employ a staggered difference-in-differences (DID) approach following Angrist and Pischke (2009) and Callaway et al. (2024). To explore heterogeneity in treatment effects, we use a linear interaction model that estimates the conditional marginal effects of the minimum wage across different values of key moderating variables. In particular, we examine how the effects vary by county-level demographic characteristics, including the shares of females, Hispanics, Blacks, Asians, individuals aged 25 to 64, and high school graduates (Xu et al., 2017). Finally, we extend the analysis to the individual level by applying a two-way fixed effects (TWFE) model to study occupational transitions.

5 Empirical results

5.1 Main results

Table 1 shows descriptive statistics for the sample containing all counties and the boundary county-pair sample. The all-county sample includes data from 62,405 observations across 51 states, including Hawaii and Alaska, whereas the boundary county-pair sample includes data from 52,090 observations across 49 states (excluding Hawaii and Alaska), with a total of 1,180 unique counties forming 1,304 county pairs over 20 years. The average number of nonemployer business establishments per county is 7,169 for all counties and 7,398 in the boundary county-pair sample; this difference is not statistically significant. Overall, the counties in the two samples are similar on average. The average total receipts of the nonemployers are $330,409 for all counties, with boundary pairs showing a (statistically significantly) higher mean of $346,446. The average

[6]For example, when California increased its minimum wage by a dollar in 2019 while Nevada left its minimum wage unchanged, this changed the minimum wage for Placer County in California, but not for its neighbor Washoe County in Nevada, contributing to identifying the coefficient of the minimum wage. Any other unobserved shocks in 2019 that hit the two neighboring counties the same way are absorbed by the county-pair fixed effect, as both counties share the same county-pair ID; and any time-invariant differences between Placer county and Washoe county, such as differences in geography and urbanization, are accounted for by the county fixed effects.

nominal minimum wage is approximately $6.82 for all counties, with boundary pairs showing a marginally higher mean of $6.85. This slight increase in minimum wages in boundary pairs might be attributed to the fact that these counties are often located in states with higher minimum wage policies. The boundary county-pair sample exhibits a larger average county population, a higher GDP per person, and slightly higher per capita income.

Table 1: Descriptive Statistics

	(1) All-County Sample		(2) Boundary County-Pair Sample		Difference
	Mean	Standard Deviation	Mean	Standard Deviation	
Nonemployer Business	7,169.475	27,518.845	7,398.398	22,863.167	228.923
Total Receipts	330,409.346	1,392,075.455	346,446.324	1,143,627.872	16036.978**
Minimum Wage	6.822	1.392	6.852	1.421	0.030***
GDP per Person ($1,000)	57.864	1147.170	61.600	1,208.659	3.736
Population	99,995.507	318,145.271	105,524.813	285,309.978	5,529.306***
Per Capita Income ($1,000)	35.499	11.888	36.203	13.421	0.704***
Unemployment Rate (%)	6.119	2.688	6.091	2.683	-0.028*
Female (%)	50.057	2.260	50.174	1.912	0.117***
White (%)	86.935	16.392	86.230	16.306	-0.705***
Hispanic (%)	8.124	13.141	8.230	16.306	0.106
Age (25 to 64) (%)	51.083	3.643	51.314	3.187	0.231***
High School Graduate (%)	83.075	7.855	83.395	7.545	0.320***
College Graduate (%)	19.280	8.817	19.343	8.762	0.063
Number of Observations		62,405		52,090	
Number of County-pairs				1,304	
Number of Unique Counties				1,180	
Number of States		51		49	

Sample means and standard deviations are reported for all counties in the United States and for all boundary county pairs. The all-county sample includes Hawaii and Alaska, while the boundary county-pair sample does not.
The p-values are from t-tests comparing means between the two samples. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2 shows the main estimation results using the log of nonemployer business establishments and the log of total nonemployer receipts as dependent variables. Columns (1) and (2) present the results from the TWFE model, while columns (3) and (4) present the results from the BPFE model. In the TWFE model, a $1 increase in the lagged minimum wage decreases the number of nonemployer business establishments by 0.5% and decreases total nonemployer receipts by 0.5%. The BPFE model, which accounts for unobserved spatial heterogeneity by using county pairs straddling state borders, reveals similar coefficients: a $1 increase in the minimum wage decreases the number of establishments by 0.9% and decreases total receipts by 0.5%, although the latter coefficient is not statistically significant in this smaller sample.

5.2 Mechanisms

As shown in Table 2, we find that an increase in the minimum wage leads to a decrease in the number of nonemployer business establishments. Given these findings, an important question arises: where do these nonemployer business owners go? Is there a transition from nonemployer status to other employment

Table 2: Effects of Minimum Wage on Nonemployer Business Establishments

	TWFE		BPFE	
	(1)	(2)	(3)	(4)
	Log(Establishments)	Log(Total Receipts)	Log(Establishments)	Log(Total Receipts)
L.Minimum Wage	-0.005**	-0.005*	-0.009**	-0.005
	(0.003)	(0.003)	(0.004)	(0.004)
Controls	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes		
County Pair × Year Fixed Effects			Yes	Yes
Number of observations	62,405	62,405	52,090	52,090

The dependent variable is shown at the top of each column.

The control variables include GDP per person, population, per capita income, unemployment rate, female percentage, white percentage, Hispanic percentage, percentage of individuals aged 25 to 64, high school graduation percentage, and college graduation percentage.

Standard errors in parentheses, clustered at the county level.

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

statuses such as unemployment, wage employment, or becoming employers? These potential transitions warrant further investigation to understand the broader impacts of minimum wage policies on employment dynamics and economic outcomes.

5.2.1 Transition to employer

To examine the impact of minimum wage increases on the transition from nonemployer to employer status, we merge state-level business application data on EIN filings from the BFS with county-level minimum wage data and covariates. Because the application for an EIN could also be for non-employment purposes, we only use state-level outcomes related to applicant firms planning to hire employees in the near future. We use only the count of applications that are likely to lead to hiring, i.e., applications either reporting planned wages (WBA) or those classified as applications with a high propensity to employ (HBA). The results in Table 3 show that an increase in the minimum wage significantly reduces HBA and WBA applications. Specifically, a $1 increase in the minimum wage decreases HBA by 1.7% and WBA by 1.0% using the TWFE model. The BPFE model shows a similar negative effect, with a 0.3% decrease in HBA, which is insignificant, and a 1.6% decrease in WBA. These findings show that higher minimum wages discourage non-employer firms from intending to hire employees, thereby hindering business expansion and job creation, consistent with the state-level findings of Patel (2019). Supplementary evidence for the negative effect of minimum wages on the transition from nonemployer to employer can be observed in Table C1 in Appendix C, based on BDS data. This table shows that the minimum wage has a negative effect on the net job creation rate at the county level.[7] Although job creation is not solely attributed to nonemployer businesses hiring new employees, it provides indirect evidence that higher minimum wages can hinder job creation and create barriers for nonemployers seeking to expand their businesses.

[7]Net Job Creation Rate = Job Creation Rate - Job Destruction Rate

In summary, while transitioning from solo self-employment to employer status is a natural progression for many entrepreneurs, higher minimum wages present a significant obstacle to this expansion. As we have found that minimum wages reduce the number of nonemployer business establishments, but the self-employed do not advance to employer status, the question remains whether nonemployers become employees or join the ranks of the unemployed. We explore these two possibilities in the following sections.

Table 3: Effects of Minimum Wage on the Transition from Nonemployer to Employer, BFS

	TWFE		BPFE	
	(1)	(2)	(3)	(4)
	lnHBA	lnWBA	lnHBA	lnWBA
L.Minimum Wage	-0.017***	-0.010***	0.003	-0.016***
	(0.003)	(0.002)	(0.004)	(0.006)
Controls	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes		
County Pair × Year Fixed Effects			Yes	Yes
Number of observations	53,023	53,023	44,102	44,102

HBA refers to business applications with a high propensity of turning into businesses with payroll, and WBA refers to business applications with planned wages.

Business application data is sourced from the Business Formation Statistics (BFS).

The control variables, as in the main regression, include GDP per capita, population, per capita income, unemployment rate, percentage of females, percentage of whites, percentage of Hispanics, percentage of individuals aged 25 to 64, high school graduation rate, and college graduation rate.

Standard errors in parentheses, clustered at the county level.

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

5.2.2 Transition to wage employment

The labor market continuously exchanges between self-employment and wage employment. Individuals shift from self-employment to wage employment for stability and benefits, or due to business failure, while some move to self-employment for autonomy and potentially higher income. The minimum wage affects this exchange by influencing both outflows and inflows. Higher minimum wages can make wage employment more attractive due to increased earnings, prompting some self-employed individuals to seek employment. Conversely, if higher minimum wages make it more difficult for low-skilled workers to secure employment, some may be pushed into self-employment.

Figure B2 shows standardized differences in mean characteristics between self-employed individuals and wage employees as well as between the self-employed with unincorporated businesses and wage employees, using the CPS data.[8] The self-employed group generally has advantages, such as higher education levels and more industry experience. In contrast, the unincorporated self-employed group, linked to nonemployer

[8]The CPS data include questions on whether a business is a nonemployer or employer only in the fourth and eighth waves starting from 2014. Since our study period spans 2001 to 2020, relying on this information would exclude a large number of observations. Therefore, we do not distinguish nonemployer businesses in the CPS data.

businesses, shows disadvantages like lower education levels but has some advantages over wage employment, such as being less likely to be Hispanic or female. Therefore, unincorporated self-employment has both advantages and disadvantages compared to wage employment, facilitating the transition between these two statuses.

Before examining the transition between wage employment and self-employment, we first focus on the underlying motivation. An increase in the minimum wage can immediately raise wages and pay in the covered market. This can lead to an increase in inflows from the uncovered market attracted by higher wages. As shown in Table 4, the minimum wage increase significantly raises total wages and average pay in the covered market. Specifically, the TWFE model estimates show that a $1 increase in the minimum wage leads to a 0.9% increase in total wages and a 0.4% increase in average pay. Similarly, the BPFE model estimates indicate a 1.0% increase in total wages and a 0.5% increase in average pay.

Table 4: Effects of Minimum Wage on Wage and Pay, QCEW

	TWFE		BPFE	
	(1)	(2)	(3)	(4)
	Log(Total Wages)	Log(Average Pay)	Log(Total Wages)	Log(Average Pay)
L.Minimum Wage	0.009***	0.004***	0.010**	0.005***
	(0.003)	(0.001)	(0.004)	(0.002)
Controls	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes		
County Pair × Year Fixed Effects			Yes	Yes
Number of observations	62,393	62,393	52,060	52,060

Annual total wages and average pay are sourced from the Quarterly Census of Employment and Wages (QCEW).

The control variables, as in the main regression, include GDP per capita, population, per capita income, unemployment rate, percentage of females, percentage of whites, percentage of Hispanics, percentage of individuals aged 25 to 64, high school graduation rate, and college graduation rate.

Standard errors in parentheses, clustered at the county level.

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

The increasing wages and pay caused by the rising minimum wage lead to transitions between self-employment and wage employment. This increase makes more wage employees maintain their status and not outflow from the covered market, while attracting more self-employed individuals to wage employment. Table 5 shows the effect of minimum wage increases on the transitions between self-employment and wage employment using individual-level CPS data. Columns (1) and (3) depict the transitions between wage employment and self-employment, while columns (2) and (4) show the transitions between wage employment and unincorporated self-employment. The results show that wage employees are less likely to become self-employed after a minimum wage increase. A $1 increase in the minimum wage decreases the probability by 0.03%. For unincorporated self-employment, wage employees are still less likely to transition to this category, and there are no significant effects that minimum wage increases will affect the transition from unincorporated self-employment to wage employment. This suggests that while minimum wage hikes affect wage levels, there is an inflow from self-employment to wage employment, but this net flow is smaller

for unincorporated self-employment.[9] Table C3 shows the marginal effects of minimum wage increases on transitions using a Logit model, as the transition is a dummy variable. The estimates are quite similar to those in Table 5. Furthermore, we examine the transitions between self-employment and wage employment using ASEC data, as shown in Table C4. The results indicate a positive effect of minimum wage increases on the year-to-year transition from self-employment to wage employment, raising the probability by 1.01%. For businesses with fewer than 10 employees, the positive effect is even more pronounced: a $1 increase in the minimum wage raises the probability by 1.33%. The transition between wage employment and self-employment is statistically insignificant for low-income individuals whose household income falls below the federal poverty level, as shown in Table C5.

In summary, higher minimum wages encourage individuals to move from self-employment to wage employment. This effect is smaller for the unincorporated self-employed, who are less competitively advantaged compared to wage employees. The negative impact of minimum wages on nonemployer businesses can be partially explained by this outflow to wage employment. For those in solo self-employment, the last option often seems to be unemployment. We explore this possibility in the following section.

Table 5: Effects of Minimum Wage on the Transition between Nonemployer and Wage Employment, CPS

	(1) Emp. to Self-emp.	(2) Emp. to Uninc.	(3) Self-emp. to Emp.	(4) Uninc. to Emp.
L.Minimum Wage	-0.0003***	-0.0002**	0.0012	-0.0001
	(0.0001)	(0.0001)	(0.0008)	(0.0011)
Controls	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Number of observations	11,609,841	11,549,361	1,578,124	972,286

The dependent variable is shown at the top of each column.
Individual employment status is sourced from the Current Population Survey.
The control variables include age, sex, marital status, ethnicity, and education level.
Standard errors in parentheses, clustered at the individual level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2.3 Transition to unemployment

Solo self-employment occupies an intermediate status between employment and unemployment, potentially representing a new frontier of underemployment (Boeri et al., 2020; Lyu, 2023). As illustrated in Figure B3, the self-employed exhibit some advantaged socioeconomic characteristics (college degree, male) in comparison to the unemployed; however, these advantages are less pronounced for unincorporated self-employment. Solo self-employed individuals often face unemployment due to factors such as business failure

[9] As shown in Figure B4, the average annual outflow from wage employment to self-employment is 197,436, while the outflow from self-employment to wage employment is 205,909. These figures are based on the CPS sample, not the full U.S. population, and indicate that transitions from self-employment to wage employment slightly exceed those in the opposite direction.

or insufficient resources. The increase in the minimum wage can exacerbate these challenges by making it more expensive to hire workers, making it harder for self-employed individuals currently working solo to sustain their businesses in the longer term.

Table 6 presents the effects of minimum wage increases on transitions from nonemployer status to unemployment using CPS data. Columns (1) and (2) show transitions from unemployment to self-employment and unincorporated self-employment, respectively. Columns (3) and (4) display transitions from self-employment and unincorporated self-employment to unemployment. The results reveal that a $1 increase in the minimum wages significantly leads to a 0.1% increase in transitions from both self-employment and unincorporated self-employment to unemployment. Conversely, there are no significant effects on transitions from unemployment to self-employment or unincorporated self-employment. The insignificant effect may be due to the unemployed group being more disadvantaged in the labor force, as shown in Figure B3, making it difficult for them to work as solo self-employed individuals. Table C6 shows the marginal effects of minimum wage increases on transitions using a Logit model; the estimates are similar to those in Table 6. Additionally, the results from the ASEC data are consistent with the CPS monthly data, as shown in Table C7. An increase in the minimum wage has a positive effect on the transition from self-employment to unemployment. This effect is more pronounced for small self-employed businesses, particularly those with fewer than 10 employees. For households whose income is below the federal poverty level, there is an increased probability of transitioning from self-employment or small self-employed businesses to unemployment, as demonstrated in Table C8.

Table 6: Effects of Minimum Wage on the Transition between Nonemployer and Unemployment, CPS

	(1) Unemp. to Self-emp.	(2) Unemp. to Uninc.	(3) Self-emp. to Unemp.	(4) Uninc. to Unemp.
L.Minimum Wage	0.0012	0.0005	0.0008***	0.0010**
	(0.0010)	(0.0009)	(0.0003)	(0.0004)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Number of observations	398,400	395,470	1,390,097	852,315

The dependent variable is shown at the top of each column.
Individual employment status is sourced from the Current Population Survey.
The control variables include age, sex, marital status, ethnicity, and education level.
Standard errors in parentheses, clustered at the individual level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In summary, for some individuals, particularly low-skilled solo self-employed, the challenges posed by higher minimum wages can be significant. If these individuals find it difficult to expand their businesses by hiring workers and also struggle to secure jobs in the covered market, they may experience periods of unemployment before entering the covered market. Thus, minimum wage increases can inadvertently push solo self-employed individuals towards unemployment by making it harder for them to grow their ventures or find alternative employment opportunities. This dynamic underscores the fragility of solo self-employment

in the labor market.

5.3 Heterogeneity analysis

The heterogeneity analysis reveals that the impact of minimum wage increases on nonemployer business activity varies across different county demographics. Figure B5 shows that counties with a higher percentage of disadvantaged labor force experience a less negative, or even positive, impact of minimum wages on nonemployer business establishments. Specifically, counties with a higher percentage of females (panels a and b) experience a less negative or even positive impact of minimum wages on nonemployer business activity in both the TWFE and BPFE models. Similarly, counties with a higher percentage of Hispanics (panels c and d), Blacks and African Americans (panels e and f), and Asians (panels g and h) show less negative effects. Conversely, counties with lower percentages of these groups experience more negative impacts. Finally, counties with fewer high school graduates (panels k and l) experience more negative effects on nonemployer business activity.

A potential explanation for these results is that solo self-employment may act as a fallback option for certain demographic groups when wage employment becomes less attainable. When minimum wages rise and increase competition for wage jobs, marginalized groups—such as women and Hispanics—may be pushed into nonemployer self-employment due to structural disadvantages in the wage labor market. This aligns with the literature on necessity entrepreneurship, where individuals enter self-employment out of constraint rather than choice.

Figures B6 and B7 provide additional evidence using CPS data. Figure B6 shows that women and Hispanics are less likely than others to transition from wage employment to self-employment when minimum wages rise, and less likely to transition back from self-employment to wage jobs. This may reflect labor market barriers that limit their mobility. In addition, Figure B7 shows that women are more likely to enter self-employment from unemployment following a minimum wage increase, reinforcing the idea that nonemployer businesses provide a buffer for groups that are otherwise disadvantaged in accessing covered employment.

These findings are consistent with a labor market sorting process where disadvantaged groups face limited options. If formal wage employment becomes scarcer with higher minimum wages, and employer businesses are increasingly costly to operate, solo self-employment may emerge as the most feasible alternative. This interpretation challenges the view that solo self-employment reflects entrepreneurial opportunity and instead points to the persistence of structural inequality in labor market access.

We also find that the impact of minimum wage increases varies across industries. Notably, in the

transportation sector—a crucial component of the gig economy—the effect has been positive, particularly since 2010. This finding is consistent with Glasner (2023). Table 7 indicates that while other nonemployer businesses experience a decrease in establishment numbers with rising minimum wages (columns (1) and (3)), the transportation industry sees an increase (columns (2) and (4), significant only in the TWFE model). Considering that the gig economy in the transportation industry emerged in the 2010s, particularly in the form of ride share, the impact of minimum wage increases on nonemployer businesses has been more positive after 2010 compared to before, as detailed in Table C9. This suggests that gig economy workers in transportation are bucking the trend compared to other industries. From the labor demand perspective, higher minimum wages can increase labor costs for traditional employers, leading them to reduce hiring or cut hours to manage expenses. This can make it more difficult for workers, especially low-skilled ones, to find traditional employment or maintain full-time positions, pushing them towards gig work such as ride share as an alternative. Moreover, businesses might also turn to gig workers as a cost-saving measure, preferring to hire freelancers or contract workers rather than regular employees who are subject to minimum wage regulations and other benefits. This shift in hiring practices can create more gig opportunities and attract more workers to the gig economy. From the labor supply perspective, gig work has lower barriers to entry and flexible working conditions, making it a feasible option for workers as minimum wages rise.

Table 7: Effects of Minimum Wage on Nonemployer Business by Industry

	TWFE		BPFE	
	(1)	(2)	(3)	(4)
	Log(Est.)-Other	Log(Est.)-Trans	Log(Est.)-Other	Log(Est.)-Trans
L.Minimum Wage	-0.011***	0.035***	-0.008***	0.001
	(0.003)	(0.008)	(0.003)	(0.012)
Controls	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes		
County Pair × Year Fixed Effects			Yes	Yes
Number of observations	62,405	62,405	52,090	52,090

The dependent variable is shown at the top of each column.

The control variables, as the main regression, include GDP per person, population, per capita income, unemployment rate, female percentage, white percentage, Hispanic percentage, percentage of individuals aged 25 to 64, high school graduation percentage, and college graduation percentage.

Standard errors in parentheses, clustered at the county level.

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

5.4 Robustness checks

To ensure the robustness of our main results, we conduct a series of checks, including alternative model specifications, different definitions of key variables, variations in sample selection, alternative datasets or levels of analysis, and the inclusion of additional control variables to account for potential confounding

events.

First, while the inclusion of control variables may partially alleviate endogeneity concerns arising from omitted variables, the issues of simultaneity and selection bias persist when using the current period's minimum wage (Minimum wage$_{c,t}$). To address these concerns, we employ instrumental variables (IV) to enhance the robustness of our analysis. Specifically, we use the one-year lagged minimum wage (Minimum wage$_{c,t-1}$) as an instrument for the current period's minimum wage. This lagged variable is less likely to be influenced by contemporaneous economic conditions that may affect the growth of nonemployer businesses. The estimates in columns (1) and (2) of Table 8, using the full sample and the boundary pair sample, respectively, remain robust. Additionally, we utilize the average lagged minimum wage across surrounding states as an alternative instrument. Minimum wages are likely to be spatially correlated due to yardstick competition, but minimum wages in neighboring states should not directly influence local nonemployer businesses. The estimates in column (3) continue to be negative and significant, supporting the robustness of our findings. In the first stage, both the Cragg-Donald Wald F statistic and the Kleibergen-Paap rk Wald F statistic confirm that the lagged minimum wage for the current minimum wage, and the surrounding states' minimum wage for the minimum wage, are strong instruments. These IV regressions thus increase confidence in our results.

Second, the TWFE model in our main estimations uses the minimum wage as a continuous treatment variable, which may lead to bias in case of heterogeneous effects. To address this, the staggered DID model with a binary treatment has been employed for further robustness checks (Angrist and Pischke, 2009). The binary treatment is defined as 1 when a state first sets its minimum wages higher than the federal level, and it remains 1 in the following years. States that have always followed the federal minimum wage are regarded as the control group, with the treatment variable set to 0. Column (4) in Table 8 shows a negative and significant effect of minimum wages on nonemployer establishments. The event study graph in Figure B8 indicates that the overall pre-trend effect is not significant, while the post-trend effect is negative.

This staggered DID model may still lead to bias introduced by heterogeneous and dynamic effects due to the differential timing of treatment (Callaway et al., 2024; Goodman-Bacon, 2021). To assess this potential issue, we adopt the Goodman-Bacon decomposition. As shown in Table C14, a Goodman-Bacon decomposition of TWFE estimates of the effect of a minimum wage increase on nonemployer businesses shows that only 3.89 percent of the weight in the estimated treatment effect comes from within groups, specifically from the potentially problematic comparison of timing groups, which are "later-adopting" versus "earlier-adopting" states. Figure B9 also illustrates that estimates obtained from the timing groups are more likely to be above the average treatment effects: most estimates, represented by circles in the figure, are above the horizontal line. This indicates that the negative overall treatment effect we estimate is not driven by the potentially problematic timing groups.

To further confirm the accuracy of the staggered DID results, we reestimate the above staggered DID using the DID model (CSDID) proposed by Sant'Anna and Zhao (2020) and Callaway et al. (2024). This estimator removes potential bias from negative weighting that can occur in TWFE specifications and does not rely on already-treated units to serve as controls. It estimates a weighted average of group-time average treatment effects, which can be compared to results from other models. Column (5) in Table 8 shows the results for CSDID and confirms the robustness of the findings. The corresponding event study in Figure B10 shows that there was no significant pre-trend, and the negative effect of minimum wage increases sets in significantly in the first year after the policy change and then grows stronger over time.

Table 8: Robustness Checks: Alternative Specifications

	IV	IV	IV	DID	CSDID
	(1)	(2)	(3)	(4)	(5)
	Log(Est.)	Log(Est.)	Log(Est.)	Log(Est.)	Log(Est.)
Minimum Wage	-0.005**	-0.009**			
	(0.003)	(0.004)			
L.Minimum Wage			-0.038**		
			(0.011)		
Treat_{ct}				-0.022**	-0.053***
				(0.009)	(0.015)
Controls	Yes	Yes	Yes	Yes	Yes
County Fixed Effects	Yes		Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
County Pair × Year Fixed Effects		Yes			
Number of observations	62,405	52,090	61,841	62,405	57,950

Columns (1) and (2) show the use of lagged minimum wage as an instrument for the current minimum wage for the full sample and the boundary pair sample, respectively. Column (3) shows the results using the lagged surrounding state minimum wage as an instrument. Column (4) shows the traditional staggered DID model results by Angrist and Pischke (2009). Column (5) shows the results using staggered DID model by Callaway et al. (2024).

The control variables, consistent with the main analysis, include GDP per person, population, per capita income, unemployment rate, female percentage, white percentage, Hispanic percentage, percentage of individuals aged 25 to 64, high school graduation percentage, and college graduation percentage.

Standard errors in parentheses, clustered at the county level.

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

Third, we change the dependent variable from the log of nonemployer business establishments to the number of nonemployer business establishments per 1,000 labor force. This adjustment allows for a direct comparison of business density and its relationship with minimum wage increases. In Table C10, columns (1) and (2) indicate that a $1 increase in the minimum wage decreases the number of establishments per 1,000 labor force by 0.432 and 0.529 using the TWFE and BPFE models, respectively, consistent with our main results.

Fourth, we substitute the independent variable with the minimum wage in the current period ($\text{Minimum wage}_{c,t}$) instead of the lagged period ($\text{Minimum wage}_{c,t-1}$), as shown in columns (3) and (4) of Table C10. The negative effect of the minimum wage on nonemployer business establishments remains significant. We also replace

the lagged nominal minimum wage with the lagged real minimum wage (L. Real Minimum wage$_{c,t-1}$), as shown in Table C11.[10] Real minimum wages continue to have a significant negative effect on nonemployer business establishments and on the number of establishments per 1,000 in the labor force.

Fifth, since Alaska and Hawaii are not included in the BPFE sample, we exclude these two states from the TWFE model as well, as shown in column (5) of Table C10. The negative effect remains robust.

Sixth, to account for potential confounding from concurrent policy shocks, we additionally control for state-level corporate and personal income taxes, sourced from the Tax Foundation. Columns (1) and (2) of Table C12 show that the negative effects remain robust after including these tax variables in both TWFE and BPFE models. Columns (3) and (4) further demonstrate that our results are not sensitive to redefining population as population density, confirming the robustness of the main findings to alternative control variable specifications.

The final robustness check uses an alternative dataset. We use individual-level data from the CPS and find that minimum wages have a negative and significant effect on the probability of being self-employed or unincorporated self-employed, consistent with the county-level analysis. This result is consistent with our county-level analysis and aligns with the findings of Sullivan (2023). As shown in Table C13, a $1 increase in the minimum wage decreases the probability of being self-employed by 0.07 percentage points, translating to a relative effect of approximately -0.54%, given the mean probability of 11.2% as shown in Table C2. Similarly, the probability of being in unincorporated self-employment decreases by 0.08 percentage points, corresponding to a relative effect of about -1.05%, given the mean probability of 7.6%. To make the analysis comparable to our main county-level analysis, we also substitute county fixed effects for state fixed effects. However, CPS only reports the state, not the county of residence for respondents living in small counties. Therefore, we combine all suppressed counties within a state into a super county per state (Fossen et al., 2024; Evans et al., 2022). Columns (3) and (4) in Table C13 show the results using county fixed effects. For unincorporated self-employment, the results still show a negative and significant effect. For the transportation industry, representative of the gig economy, the estimates are positive and significant for the probability of being in unincorporated self-employment, with negative signs for other industries, as shown in columns (5)-(8) in Table C13.

6 Conclusion

This study investigates the extent to which changes in the minimum wage impact the number of nonemployer business establishments and transitions in the United States. The main estimations use two-

[10] To calculate the real minimum wage, we use the Consumer Price Index (CPI) Inflation Calculator from the U.S. Bureau of Labor Statistics.

way fixed effects and boundary pair fixed effects models and data from the Census Bureau spanning 2001 to 2020. The key findings are as follows.

First, an increase in the minimum wage generally leads to a decrease in the number of nonemployer business establishments. Specifically, a $1 increase in the minimum wage results in a 0.5%-0.9% decrease in nonemployers.

Second, a higher minimum wage creates barriers to the transition from solo self-employment to employer status, likely due to higher labor costs. Instead, it increases the transition rates from self-employment to wage employment, which becomes more attractive due to higher wages, and from self-employment to unemployment in case wage employment is not immediately attainable.

Third, the negative effects of increasing the minimum wage on the number of nonemployer businesses are weaker in counties with higher percentages of females, Hispanics, Blacks, Asians, and fewer high school graduates. These demographic groups may find it more difficult to transition to wage employment when it becomes more difficult to hire and expand the business.

Third, the transportation industry, a major component of the gig economy including ride share, exhibits increasing numbers of nonemployers as a response to minimum wage increases, consistent with findings reported by Glasner (2023). This suggests that higher minimum wages push workers into independent gig work, which is typically not regulated by minimum wage laws.

Overall, while minimum wage increases aim to improve worker earnings and reduce poverty, they also pose challenges for nonemployer business establishments. When further increasing the minimum wage, policymakers should carefully balance expected welfare and employment outcomes in both covered and uncovered markets. Minimum wages could increase with firm size to reduce the barriers for nonemployers to hire their first workers, as they do in California, New York, and Washington, among other states. As we found differential effects in different industries, separate minimum wages could be considered for different industries. With the rise of the gig economy, increasing the minimum wage could further boost self-employment in the transportation industry. This shift could reduce wage employment in the covered market. Policymakers should take into account these multifaceted effects when designing and implementing minimum wage policies to support the sustainability and growth of small businesses while ensuring fair wages for workers.

References

Abraham, K. G., Haltiwanger, J. C., Hou, C., Sandusky, K., and Spletzer, J. R. (2021). Reconciling survey and administrative measures of self-employment. *Journal of Labor Economics*, 39(4):825–860.

Angrist, J. D. and Pischke, J.-S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.

Azar, J., Huet-Vaughn, E., Marinescu, I., Taska, B., and Von Wachter, T. (2023). Minimum wage employment effects and labour market concentration. *Review of Economic Studies*, page rdad091.

Boeri, T., Giupponi, G., Krueger, A. B., and Machin, S. (2020). Solo self-employment and alternative work arrangements: A cross-country perspective on the changing composition of jobs. *Journal of Economic Perspectives*, 34(1):170–195.

Callaway, B., Goodman-Bacon, A., and Sant'Anna, P. H. (2024). Difference-in-differences with a continuous treatment. Technical report, National Bureau of Economic Research.

Card, D. and Krueger, A. B. (2000). Minimum wages and employment: A case study of the fast-food industry in New Jersey and Pennsylvania: reply. *American Economic Review*, 90(5):1397–1420.

Chava, S., Oettl, A., and Singh, M. (2023). Does a one-size-fits-all minimum wage cause financial stress for small businesses? *Management Science*, 69(11):7095–7117.

Dube, A., Lester, T. W., and Reich, M. (2010). Minimum wage effects across state borders: Estimates using contiguous counties. *The Review of Economics and Statistics*, 92(4):945–964.

Dube, A. and Lindner, A. (2021). City limits: What do local-area minimum wages do? *Journal of Economic Perspectives*, 35(1):27–50.

Égert, B. and Mourougane, A. (2024). The labour market and tax policy drivers of self-employment: new evidence from Europe. *International Labour Review*.

Evans, M. F., Harris, M. C., and Kessler, L. M. (2022). The hazards of unwinding the prescription opioid epidemic: Implications for child maltreatment. *American Economic Journal: Economic Policy*, 14(4):192–231.

Fossen, F. M., Hossain, M., Mukhopadhyay, S., and Toth, P. (2024). The cost of health insurance and entry into entrepreneurship. *Small Business Economics*, https://doi.org/10.1007/s11187-024-00927-x.

Ganserer, A., Gregory, T., and Zierahn, U. (2022). Minimum wages and the rise in solo self-Employment. IZA Discussion Papers 15283, Institute of Labor Economics (IZA).

Garin, A., Jackson, E., Koustas, D., et al. (2022). New gig work or changes in reporting?: understanding self-employment trends in tax data. Technical report, OECD Publishing.

Glasner, B. (2023). The minimum wage, self-employment, and the online gig economy. *Journal of Labor Economics*, 41(1):103–127.

Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, 225(2):254–277.

Harasztosi, P. and Lindner, A. (2019). Who pays for the minimum wage? *American Economic Review*, 109(8):2693–2727.

Harrison, A. and Leamer, E. (1997). Labor markets in developing countries: An agenda for research. *Journal of Labor Economics*, 15(S3):S1–S9.

Holtemöller, O. and Pohle, F. (2020). Employment effects of introducing a minimum wage: The case of Germany. *Economic Modelling*, 89:108–121.

Jardim, E., Long, M. C., Plotnick, R., Van Inwegen, E., Vigdor, J., and Wething, H. (2022). Minimum-wage increases and low-wage employment: Evidence from Seattle. *American Economic Journal: Economic Policy*, 14(2):263–314.

Kaiser, U. and Malchow-Møller, N. (2011). Is self-employment really a bad experience?: The effects of previous self-employment on subsequent wage-employment wages. *Journal of Business Venturing*, 26(5):572–588.

Kim, D., Kim, W.-Y., and Han Bai, J. (2021). The effect of minimum wage on self-employment. *Journal of Economic Literature*, 27.

Lechmann, D. S. and Wunder, C. (2017). The dynamics of solo self-employment: Persistence and transition to employership. *Labour Economics*, 49:95–105.

Luca, D. L. and Luca, M. (2019). Survival of the fittest: The impact of the minimum wage on firm exit. Technical report, National Bureau of Economic Research.

Lyu, K. (2023). Social capital and self-employment dynamics in china. *The Chinese Economy*, 56(6):459–485.

Maloney, W. and Mendez, J. (2004). Measuring the impact of minimum wages. evidence from Latin America. In *Law and Employment: Lessons from Latin America and the Caribbean*, pages 109–130. University of Chicago Press.

Mazumdar, D. (1989). *Microeconomic issues of labor markets in developing countries: analysis and policy implications*, volume 40. World Bank Publications.

Medrano-Adán, L., Salas-Fumás, V., and Sanchez-Asin, J. J. (2015). Heterogeneous entrepreneurs from occupational choices in economies with minimum wages. *Small Business Economics*, 44:597–619.

Mincer, J. (1976). Unemployment effects of minimum wages. *Journal of Political Economy*, 84(4, Part 2):S87–S104.

Naidu, S., Posner, E. A., and Weyl, G. (2018). Antitrust remedies for labor market power. *Harvard law review*, 132(2):536–601.

Neumark, D. and Shirley, P. (2022). Myth or measurement: What does the new minimum wage research say about minimum wages and job loss in the United States? *Industrial Relations: A Journal of Economy and Society*, 61(4):384–417.

Neumark, D. and Wascher, W. L. (2008). *Minimum Wages*. The MIT Press.

Patel, P. C. (2019). Minimum wage and transition of non-employer firms intending to hire employees into employer firms: State-level evidence from the US. *Journal of Business Venturing Insights*, 12:e00136.

Patel, P. C. and Devaraj, S. (2022). Non-employer establishments and economic development in counties: Evidence from cross-border neighbor county-pairs in the US. *Small Business Economics*, 58(1):77–92.

Peng, L., Guo, X., and Meyerhoefer, C. D. (2020). The effects of Medicaid expansion on labor market outcomes: evidence from border counties. *Health Economics*, 29(3):245–260.

Sant'Anna, P. H. and Zhao, J. (2020). Doubly robust difference-in-differences estimators. *Journal of econometrics*, 219(1):101–122.

Sullivan, A. (2023). The effects of minimum wage policy on self-employment: Evidence from the Current Population Survey.

Welch, F. (1974). Minimum wage legislation in the United States. *Economic Inquiry*, 12(3):285–318.

Wursten, J. and Reich, M. (2023). Small businesses and the minimum wage. Technical report, Working Paper.

Xu, Y., Hainmueller, J., Mummolo, J., and Liu, L. (2017). INTERFLEX: Stata module to estimate multiplicative interaction models with diagnostics and visualization. Statistical Software Components, Boston College Department of Economics.

Zavodny, M. (2000). The effect of the minimum wage on employment and hours. *Labour Economics*, 7(6):729–750.

Appendices

A Model setting

Theoretical Framework

We consider a static model of occupational choice in which individuals differ in entrepreneurial ability $\theta \in [0, 1]$, distributed according to a continuous CDF $F(\theta)$. Individuals choose among five mutually exclusive occupations to maximize utility or profit.

Occupational Options and Utility Functions

1. **Unemployment (U)**: Individuals receive a utility that increases in the minimum wage but is scaled by $\alpha \in (0, 1)$, which captures the generosity of the unemployment safety net, and a stigma parameter $\beta > 0$:

$$U_U(\theta) = \alpha(w_{\min} + \beta\theta) \tag{3}$$

2. **Involuntary Nonemployer (S_1)**: The return to effort is normalized to 1. The cost of running the business is inversely related to ability:

$$U_{S_1}(\theta) = \theta - \frac{c_1}{\theta} \tag{4}$$

with $c_1 > 0$.

3. **Wage Employment (W)**: Individuals earn the statutory minimum wage $w_{\min}$. The nonpecuniary component of job matching is captured by $\beta\theta$:

$$U_W(\theta) = w_{\min} + \beta\theta \tag{5}$$

4. **Voluntary Nonemployer (S_2)**: The return to effort is $R_{S_2} > 1$, and fixed costs are higher than for S_1:

$$U_{S_2}(\theta) = \theta R_{S_2} - \frac{c_2}{\theta}, \quad \text{with } c_2 > c_1 \tag{6}$$

5. **Employer (E)**: Individuals hire labor L at the minimum wage and face diminishing returns $R_E(L)$ and fixed cost C_E:

$$U_E(\theta) = \max_L [\theta R_E(L) - w_{\min} L] - C_E \tag{7}$$

where $R_E''(L) < 0$.

Thresholds and Occupational Sorting

Let e_0, e_1, e_2, e_3 define thresholds that partition the population into five occupational categories:

$$\theta \in [0, e_0] \Rightarrow \text{Unemployed}$$
$$\theta \in (e_0, e_1] \Rightarrow \text{Involuntary Nonemployer}$$
$$\theta \in (e_1, e_2] \Rightarrow \text{Wage Employment}$$
$$\theta \in (e_2, e_3] \Rightarrow \text{Voluntary Nonemployer}$$
$$\theta \in (e_3, 1] \Rightarrow \text{Employer}$$

These thresholds are determined by pairwise indifference conditions:

$$U_U(e_0) = U_{S_1}(e_0) \tag{8}$$
$$U_{S_1}(e_1) = U_W(e_1) \tag{9}$$
$$U_W(e_2) = U_{S_2}(e_2) \tag{10}$$
$$U_{S_2}(e_3) = U_E(e_3) \tag{11}$$

Comparative Statics

Differentiating the threshold conditions with respect to $w_{\min}$, we obtain:

$$\frac{\partial e_0}{\partial w_{\min}} = \frac{\alpha}{1 - \alpha\beta + \frac{c_1}{e_0^2}} > 0 \quad \text{if } 1 > \alpha\beta \tag{12}$$
$$\frac{\partial e_1}{\partial w_{\min}} = \frac{1}{1 - \beta + \frac{c_1}{e_1^2}} > 0 \quad \text{if } 1 > \beta \tag{13}$$
$$\frac{\partial e_2}{\partial w_{\min}} = \frac{1}{R_{S_2} - \beta + \frac{c_2}{e_2^2}} > 0 \quad \text{if } R_{S_2} > \beta \tag{14}$$
$$\frac{\partial e_3}{\partial w_{\min}} = \frac{L^*}{R_{S_2} + \frac{c_2}{e_3^2} - \frac{\partial}{\partial e_3}\left(\theta R_E(L^*) - w_{\min} L^*\right)} > 0 \quad \text{if } R_E''(L) < 0 \tag{15}$$

Interpretation

Figure A1 illustrates how an increase in the minimum wage shifts all occupational thresholds to the right. As $w_{\min}$ rises, more individuals fall below each threshold cutoff. This expands unemployment, reduces employer formation, and compresses both involuntary and voluntary nonemployer segments. The overall effect on nonemployer activity is theoretically ambiguous, depending on parameter values.

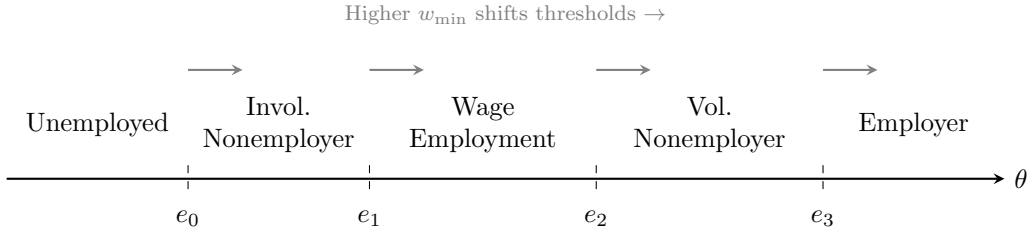
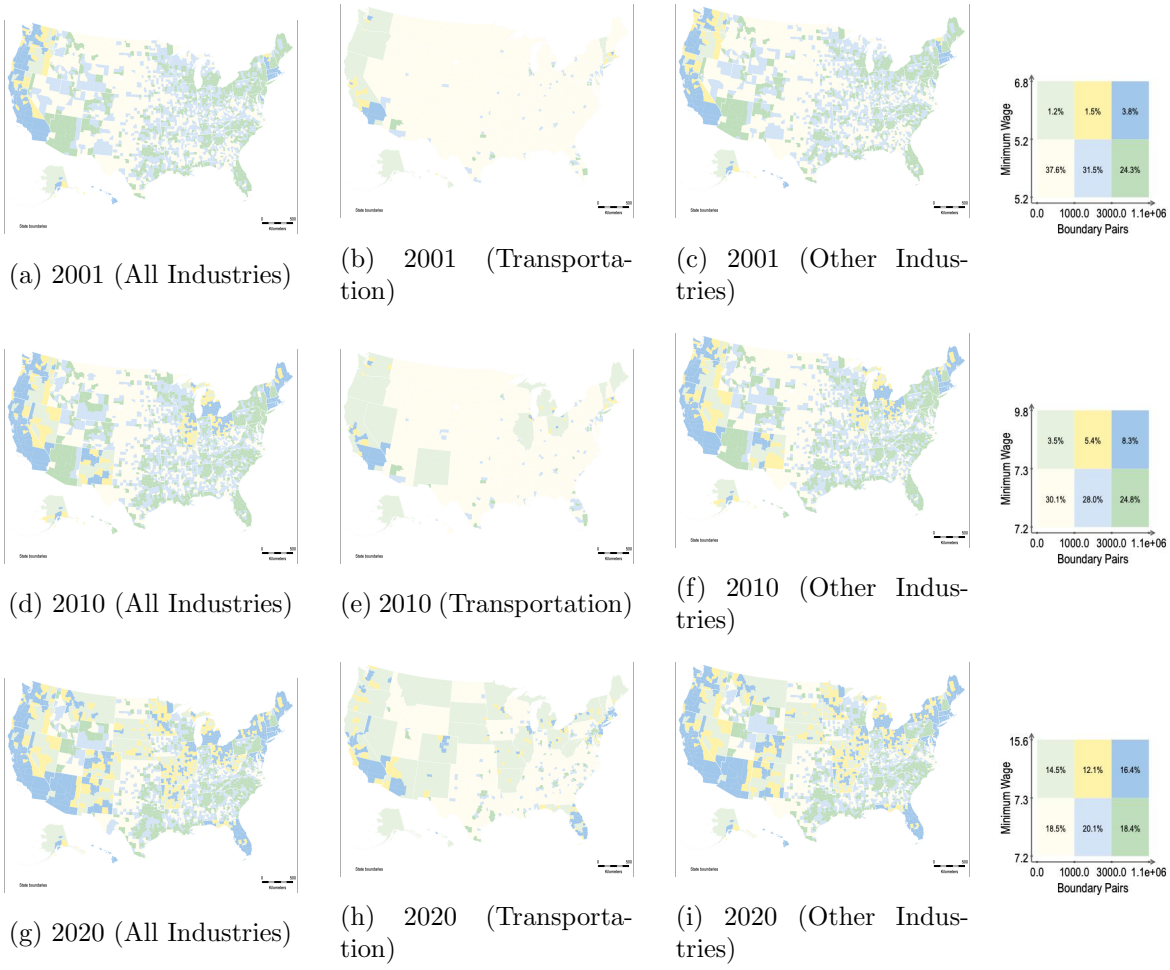


Figure A1: Effect of Minimum Wage Increase on Occupational Thresholds

B Supplemental figures



(a) 2001 (All Industries)

(b) 2001 (Transportation)

(c) 2001 (Other Industries)

(d) 2010 (All Industries)

(e) 2010 (Transportation)

(f) 2010 (Other Industries)

(g) 2020 (All Industries)

(h) 2020 (Transportation)

(i) 2020 (Other Industries)

Figure B1: Geographical Distribution of Minimum Wage and Nonemployer Business in 2001, 2010, and 2020

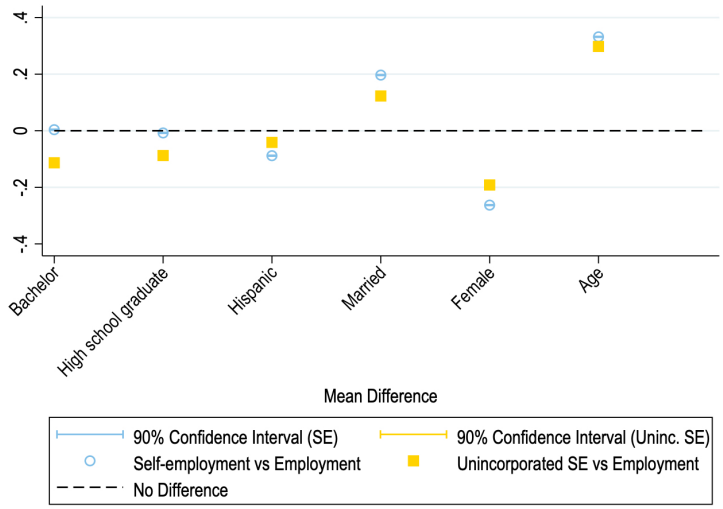


Figure B2: Standardized Differences between Mean Characteristics, CPS

Notes: This figure illustrates the standardized mean differences in characteristics among self-employed individuals, unincorporated self-employment, and wage employment. The circle indicates the mean difference between self-employed individuals and wage employment, while the square mark represents the mean difference between unincorporated self-employment and wage employment. The confidence intervals are too small to be visible in the figure.

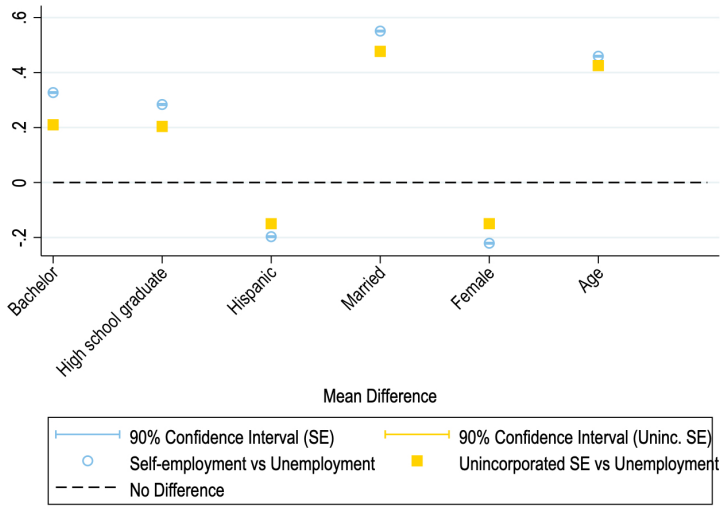


Figure B3: Standardized Differences between Mean Characteristics, CPS

Notes: This figure illustrates the standardized mean differences in characteristics among self-employed individuals, unincorporated self-employment, and unemployment. The circle indicates the mean difference between self-employed individuals and unemployment, while the square mark represents the mean difference between unincorporated self-employment and unemployment. The confidence intervals are too small to be visible in the figure.

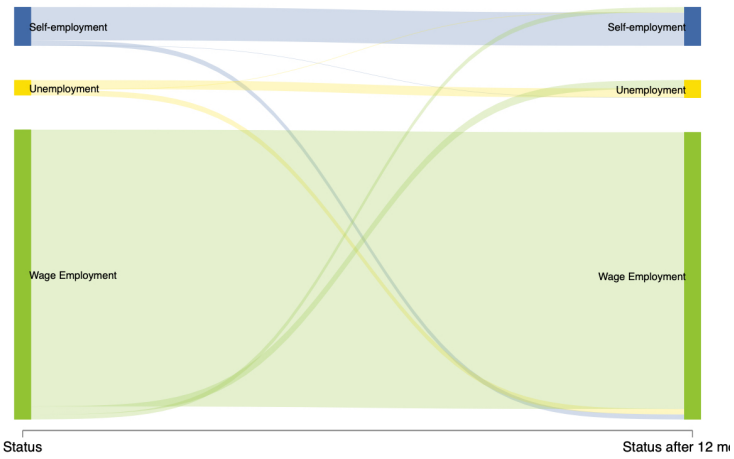
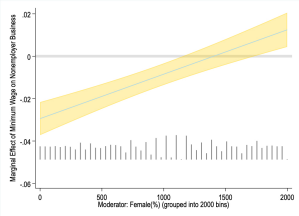
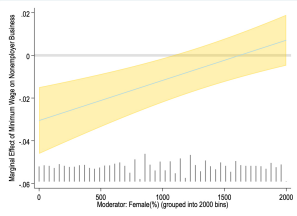


Figure B4: Job Transition between Employment Status, CPS

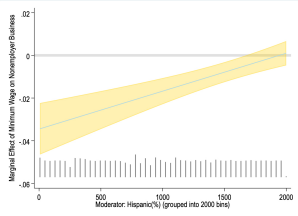
Notes: This figure illustrates the employment transitions between self-employment, unemployment, and wage employment at time t and 12 months later.



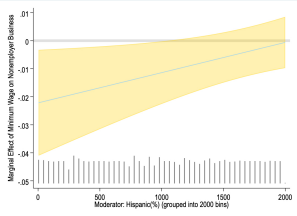
(a) Female (%) — TWFE



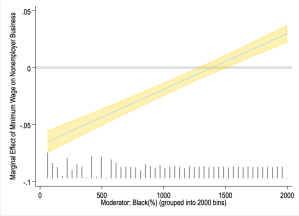
(b) Female (%) — BPFE



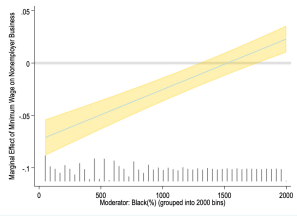
(c) Hispanic (%) — TWFE



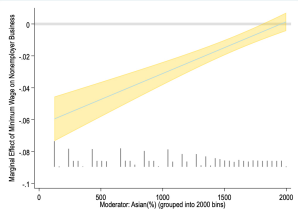
(d) Hispanic (%) — BPFE



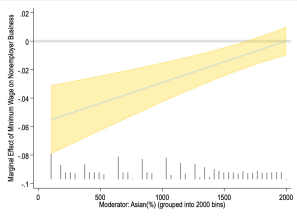
(e) African American (%) — TWFE



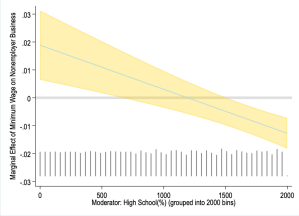
(f) African American (%) — BPFE



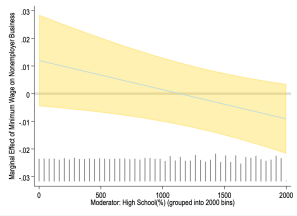
(g) Asian (%) — TWFE



(h) Asian (%) — BPFE



(i) High School Graduates (%) — TWFE



(j) High School Graduates (%) — BPFE

Figure B5: Marginal Effects of Minimum Wage on Nonemployer Business Entry, by County-Level Socioeconomic Characteristics. Estimates are based on TWFE and BPFE models.

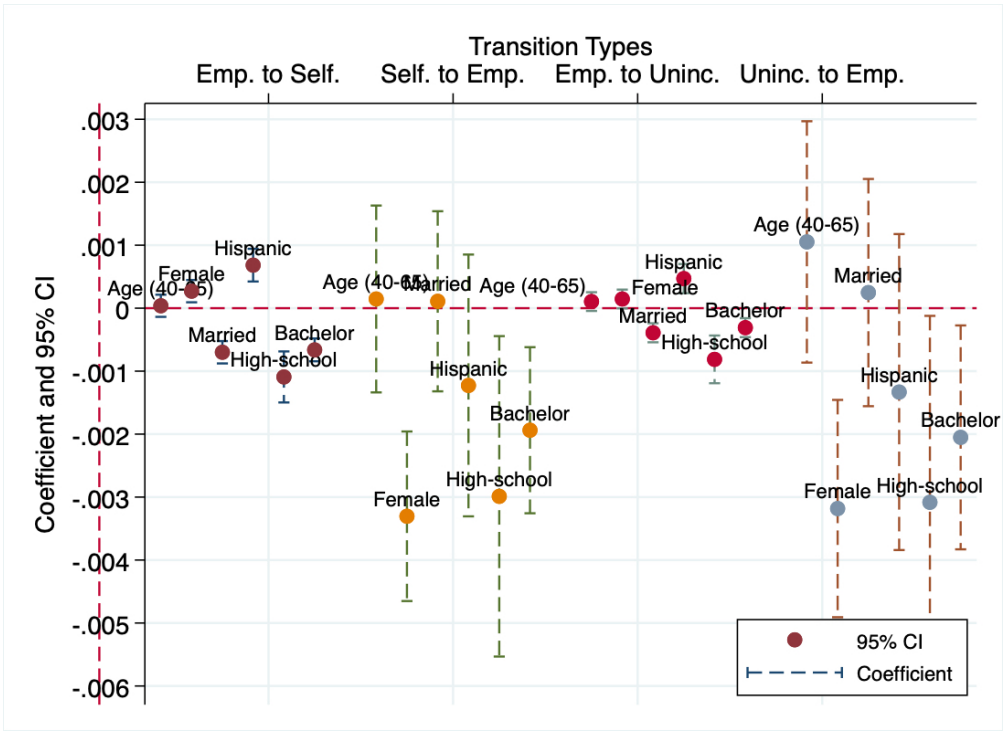


Figure B6: Differences in the Effects of Minimum Wage on Transitions between Wage Employment and Self-Employment

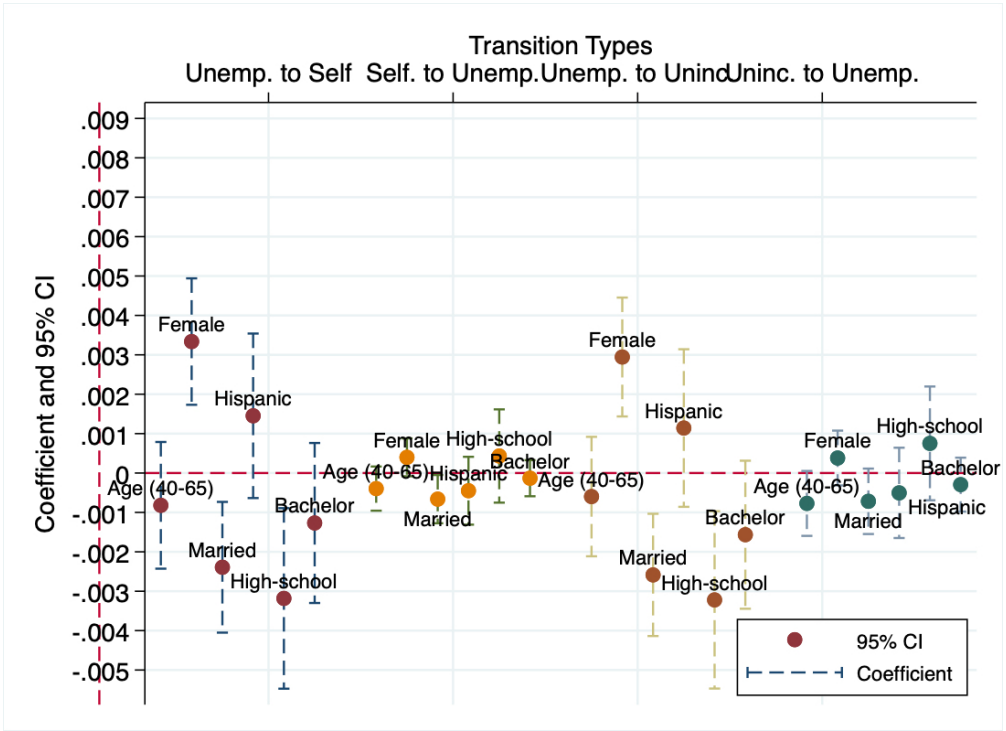


Figure B7: Differences in the Effects of Minimum Wage on Transitions between Unemployment and Self-Employment

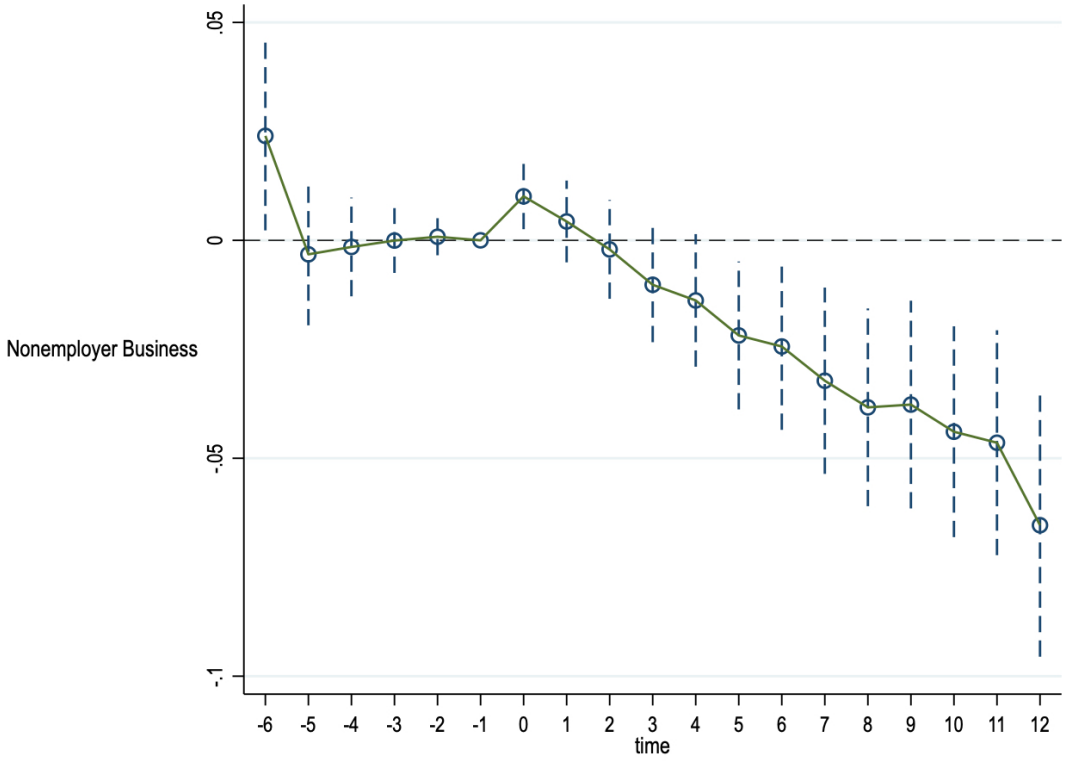


Figure B8: Event Study Using Simple DID

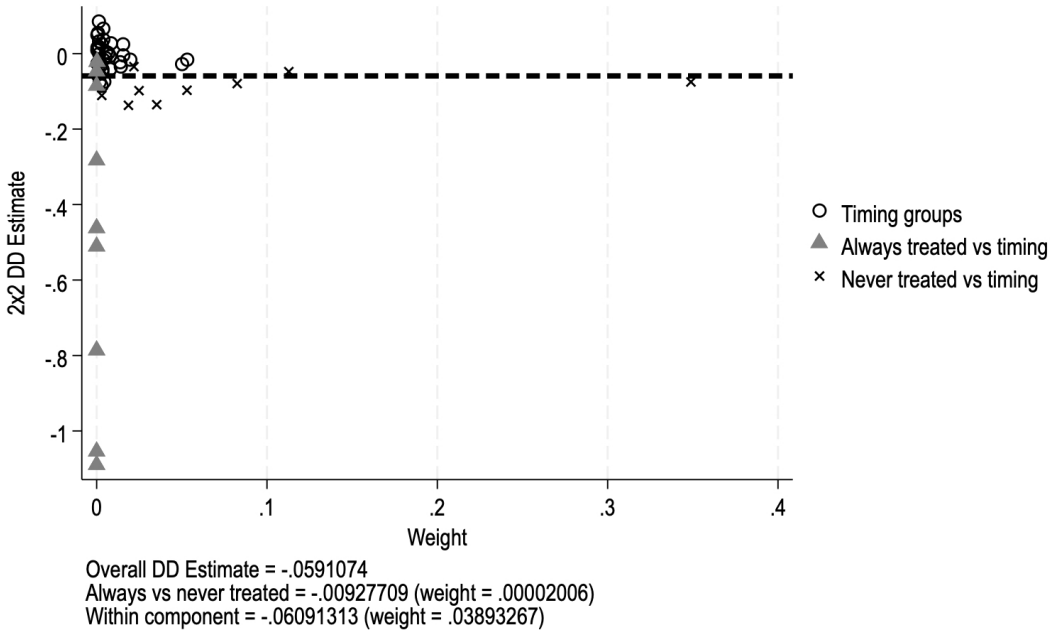


Figure B9: Bacon Decomposition Results

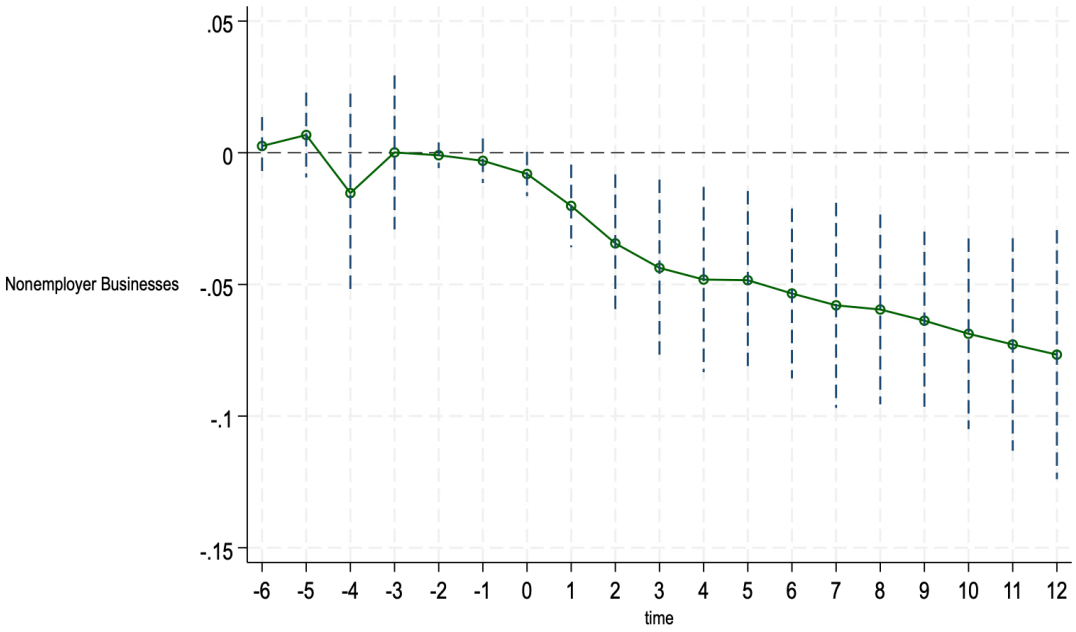


Figure B10: Event Study Using CSDID

C Supplemental tables

Table C1: Effect of Minimum Wage on Job Creation, BDS

	TWFE	BPFE
	(1)	(2)
	Net Job Creation Rate	Net Job Creation Rate
L.Minimum Wage	-0.077*	-0.125*
	(0.046)	(0.073)
Controls	Yes	Yes
County Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	
County Pair × Year Fixed Effects		Yes
Number of observations	62,375	52,026

Net job creation rate data is sourced from the Business Dynamics Statistics (BDS).

The control variables, as in the main regression, include GDP per capita, population, per capita income, unemployment rate, percentage of females, percentage of whites, percentage of Hispanics, percentage of individuals aged 25 to 64, high school graduation rate, and college graduation rate.

Standard errors in parentheses, clustered at the county level

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

Table C2: Summary Statistics, CPS

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Self-employment	0.112	0.316	0	1	14,144,612
Unincorporated Self-employment	0.076	0.264	0	1	13,582,322
Wage Employment	0.844	0.363	0	1	14,144,612
Unemployment	0.044	0.205	0	1	14,144,612
Age	43.533	10.816	25	64	14,144,612
Female	0.479	0.500	0	1	14,144,612
Married	0.633	0.482	0	1	14,144,612
Hispanic	0.119	0.324	0	1	14,144,612
High-school Graduate	0.924	0.265	0	1	14,144,612
Bachelor	0.362	0.481	0	1	14,144,612

Sample means and standard deviations are reported for individual level data from the CPS.

Table C3: Marginal Effects of Minimum Wage on the Transition between Nonemployer and Wage Employment, CPS

Logit Model	(1) Emp. to Self-emp.	(2) Emp. to Uninc.	(3) Self-emp. to Emp.	(4) Uninc. to Emp.
L.Minimum Wage	-0.0002*	-0.0001	0.0017*	0.0002
	(0.0001)	(0.0001)	(0.0010)	(0.0012)
Controls	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Number of observations	11,609,841	11,549,361	1,578,124	972,286

This table uses a Logit model to show the average marginal effect of the minimum wage on the transition.

Individual employment status is sourced from the Current Population Survey.

The dependent variable is shown at the top of each column. The control variables include age, sex, marital status, ethnicity, and education level.

Standard errors in parentheses, clustered at the individual level.

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

Table C4: Effects of Minimum Wage on the Transition between Nonemployer and Wage Employment, ASEC

	(1) Emp. to Self-emp.	(2) Emp. to Small Self-emp.	(3) Self-emp. to Emp.	(4) Small Self-emp. to Emp.
L.Minimum Wage	-0.0006**	-0.0004***	0.0101***	0.0133***
	(0.0003)	(0.0002)	(0.0019)	(0.0023)
Controls	Yes	Yes	Yes	Yes
Number of observations	302,660	300,045	42,788	31,889

The dependent variable is shown at the top of each column.

Individual employment status is sourced from the Annual Social and Economic Supplement.

The control variables include age, sex, marital status, ethnicity, and education level.

Standard errors in parentheses, clustered at the individual level.

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

Table C5: Effects of Minimum Wage on the Transition between Self-employment and Wage Employment for Low-income, ASEC

	(1) Emp. to Self-emp.	(2) Emp. to Small Self-emp.	(3) Self-emp. to Emp.	(4) Small Self-emp. to Emp.
L.Minimum Wage	0.0051	-0.0011	0.0161	0.0236
	(0.0077)	(0.0071)	(0.0154)	(0.0198)
Controls	Yes	Yes	Yes	Yes
Number of observations	1,078	1,055	724	497

The dependent variable is shown at the top of each column.

Individual employment status and household income are sourced from the Annual Social and Economic Supplement.

The control variables include age, sex, marital status, ethnicity, and education level.

Standard errors in parentheses, clustered at the individual level.

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

Table C6: Marginal Effects of Minimum Wages on the Transition between Nonemployer and Unemployment, CPS

Logit Model	(1) Unemp. to Self-emp.	(2) Unemp. to Uninc.	(3) Self-emp. to Unemp.	(4) Uninc. to Unemp.
L.Minimum Wage	0.0011	0.0005	0.0009***	0.0012**
	(0.0010)	(0.0010)	(0.0003)	(0.0005)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Number of observations	398,400	395,470	1,390,097	852,315

This table uses a Logit model to show the average marginal effect of the minimum wage on the transition.

Individual employment status is sourced from the Current Population Survey.

The dependent variable is shown at the top of each column. The control variables include age, sex, marital status, ethnicity, and education level.

Standard errors in parentheses, clustered at the individual level.

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

Table C7: Effects of Minimum Wage on the Transition between Nonemployer and Unemployment, ASEC

	(1) Unemp. to Self-emp.	(2) Unemp. to Small Self-emp.	(3) Self-emp. to Unemp.	(4) Small Self-emp. to Unemp.
L.Minimum Wage	0.0041	0.0042	0.0013**	0.0014**
	(0.0055)	(0.0048)	(0.0006)	(0.0006)
Controls	Yes	Yes	Yes	Yes
Number of observations	5,199	4,965	32,776	24,569

The dependent variable is shown at the top of each column.

Individual employment status is sourced from the Annual Social and Economic Supplement.

The control variables include age, sex, marital status, ethnicity, and education level.

Standard errors in parentheses, clustered at the individual level.

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

Table C8: Effects of Minimum Wage on the Transition between Nonemployer and Unemployment for Low-income, ASEC

	(1) Unemp. to Self-emp.	(2) Unemp. to Small Self-emp.	(3) Self-emp. to Unemp.	(4) Small Self-emp. to Unemp.
L.Minimum Wage	0.0171	0.0142	0.0256**	0.0184**
	(0.0308)	(0.0246)	(0.0116)	(0.0086)
Controls	Yes	Yes	Yes	Yes
Number of observations	300	285	570	399

The dependent variable is shown at the top of each column.

Individual employment status and household income are sourced from the Annual Social and Economic Supplement.

The control variables include age, sex, marital status, ethnicity, and education level.

Standard errors in parentheses, clustered at the individual level.

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

Table C9: Effects of Minimum Wage on Nonemployer Business in Transportation Industry

	TWFE	
	(1)	(2)
	Log(Est.)-After 2010	Log(Est.)-Before 2010
L.Minimum Wage	0.035***	0.009
	(0.009)	(0.008)
Controls	Yes	Yes
County Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Number of observations	34,359	28,046

The dependent variable is the nonemployer business in transportation industry after and before 2010, as shown at the top of each column.

The control variables, as the main regression, include GDP per person, population, per capita income, unemployment rate, female percentage, white percentage, Hispanic percentage, percentage of individuals aged 25 to 64, high school graduation percentage, and college graduation percentage.

Standard errors in parentheses, clustered at the county level.

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

Table C10: Robustness Checks: Alternative Variables and Sample

	TWFE	BPFE	TWFE	BPFE	TWFE
	(1)	(2)	(3)	(4)	(5)
	Est./Labor (1,000)	Est./Labor (1,000)	Log(Est.)	Log(Est.)	Log(Est.)
Minimum Wage			-0.005**	-0.009**	
			(0.003)	(0.004)	
L.Minimum Wage	-0.431**	-0.529**			-0.005**
	(0.216)	(0.259)			(0.003)
Controls	Yes	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes		Yes
Year Fixed Effects	Yes		Yes	Yes	Yes
County Pair × Year Fixed Effects		Yes		Yes	
Number of observations	62,405	52,090	62,405	52,090	61,841

Columns (1) and (2) show alternate dependent variables using nonemployer establishments per 1,000 labor force, employing TWFE and BPFE respectively. Columns (3) and (4) use the current minimum wage instead of the lagged minimum wage as the independent variable for the full and boundary pair samples, respectively. Column (5) shows the results after dropping Alaska and Hawaii.

The control variables, consistent with the main analysis, include GDP per person, population, per capita income, unemployment rate, female percentage, white percentage, Hispanic percentage, percentage of individuals aged 25 to 64, high school graduation percentage, and college graduation percentage.

Standard errors in parentheses, clustered at the county level.

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

Table C11: Robustness Checks: Alternative Variable for Real Minimum Wages

	TWFE		BPFE	
	(1)	(2)	(3)	(4)
	Log(Est.)	Est./Labor (1,000)	Log(Est.)	Est./Labor (1,000)
L. Real Minimum Wage	-0.010***	-0.388*	-0.008**	-0.550**
	(0.003)	(0.225)	(0.003)	(0.269)
Controls	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes		
County Pair × Year Fixed Effects			Yes	Yes
Number of observations	62,405	62,405	52,090	52,090

Columns (1) and (2) show alternative independent variables: real minimum wages, with outcomes Log(Establishments) and nonemployer establishments per 1,000 labor force, respectively, using a TWFE model. Columns (3) and (4) employ the same independent variables but use the BPFE model.

The control variables, consistent with the main analysis, include GDP per person, population, per capita income, unemployment rate, female percentage, white percentage, Hispanic percentage, percentage of individuals aged 25 to 64, high school graduation percentage, and college graduation percentage.

Standard errors in parentheses, clustered at the county level.

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

Table C12: Robustness Checks: Alternative Controls

	TWFE	BPFE	TWFE	BPFE
	(1)	(2)	(3)	(4)
	Log(Est.)	Log(Est.)	Log(Est.)	Log(Est.)
L. Minimum Wage	-0.005***	-0.009**	-0.005**	-0.006**
	(0.003)	(0.004)	(0.003)	(0.003)
Controls	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes		Yes	
County Pair × Year FE		Yes		Yes
Number of observations	62,405	52,090	62,405	52,090

Columns (1) and (2) add state-level corporate income tax and personal income tax as control variables, using TWFE and BPFE models, respectively. Columns (3) and (4) show the results when changing the population variable in the control set to population density (population/land area), again using TWFE and BPFE models.

The control variables, consistent with the main analysis, include GDP per person, population (or population density), per capita income, unemployment rate, female percentage, white percentage, Hispanic percentage, percentage of individuals aged 25 to 64, high school graduation percentage, and college graduation percentage.

Standard errors in parentheses, clustered at the county level.

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

Table C13: Effects of Minimum Wage on Self-employment, CPS

	All		All-Super County		Other Industries		Transportation Industry	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Self-emp.	Not Inc.	Self-emp.	Not Inc.	Self-emp.	Not Inc.	Self-emp.	Not Inc.
L.Minimum Wage	-0.0007**	-0.0008***	-0.0005	-0.0007***	-0.0008**	-0.0010***	0.0018	0.0022*
	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0014)	(0.0012)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes			Yes	Yes	Yes	Yes
County Fixed Effects			Yes	Yes				
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	14,144,612	13,582,322	14,144,612	13,582,322	13,567,380	13,025,274	577,232	557,048

Self-employment data is sourced from the Current Population Survey (CPS).

The control variables include age, sex, marital status, ethnicity, and education level.

Standard errors are in parentheses, clustered at the individual level.

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

Table C14: Bacon Decomposition Results

	Bacon Decomposition	
	Coefficient	Total Weight
Timing groups	-0.01317	0.26158
Always vs. Timing	-0.03649	0.00026
Never vs. Timing	-0.07619	0.69921
Always vs. Never	-0.00928	0.00002
Within	-0.06091	0.03893

The decomposition includes comparisons across 10 timing groups, an always-treated group, and a never-treated group. The standard error for the DID coefficient is 0.0014319.