

State Minimum Wage Increases and Self-Employment: Analysis of Heterogeneous Treatment Effects Across Occupations

Abstract:

Previous empirical work on the minimum wage has examined its potential impacts on unemployment, however there may be other potential consequences for workers that cannot be observed in unemployment insurance rolls; for example, what is the impact of a minimum wage increase on the share of self-employment? While self-employment can confer higher wages and greater control for some workers, it is also associated with greater wage volatility and a lack of benefits and labor protections. We use American Community Survey (ACS) data from 2000-2017 and a Quadruple Difference (DDDD) model to examine the compositional effects of state minimum wage increases, specifically on the rates of unincorporated and incorporated self-employment within occupations. Our results indicate that a state minimum wage increase is associated with a decrease in self-employment, particularly unincorporated self-employment within low-wage occupations with flexible work hours. We theorize that workers consider both the earnings from self-employment and hired employment as well as the relative risk of each type of work. Workers previously classified as self-employed are induced into hired employment when the wage they can expect to earn from hired employment matches or exceeds expected earnings in self-employment.

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Previous empirical work on the minimum wage has examined its potential impacts on unemployment, however there may be other potential consequences for workers that cannot be observed in unemployment insurance rolls. There is evidence of the minimum wage inducing labor substitution across demographic groups and skill level, where groups are differentially affected by minimum wage increases (Fairris & Bujanda, 2008; Giuliano, 2013; Cengiz et al., 2019). For example, using personnel data from a nationwide retail firm, Giuliano (2013) found that the 1996 federal minimum wage resulted in a relative increase in the rate of teenage employment and a relative decrease in the rate of employment of workers aged 20-22. But what about substituting independent contractors for employees?

Building upon the literature around job quality the determinants of self-employment, and the effects of the minimum wage, we use American Community Survey (ACS) data from 2000-2017 matched with state minimum wage data (Neumark, 2019) and a Quadruple Difference (DDDD) model to examine the compositional effects of state minimum wage increases, specifically on the rates of unincorporated and incorporated self-employment within occupations. We consider both the wage quartile of an occupation and scheduling flexibility of an occupation as degrees to which a worker can be ‘treated’ or affected by a minimum wage increase.

We theorize that individuals consider the relative earnings of self-employment and hired employment against the greater risks presented by self-employment, and that a minimum wage increase, by increasing the earnings a worker can expect to receive in hired employment, induces workers away from self-employment and into hired employment. We find that increases in the minimum wage are associated with a decrease in the probability a worker in a highly flexible, low-wage occupation is self-employed. Effects vary by incorporation status, and there appear to be heterogeneous treatment effects with respect to age, gender, and education.

This paper contributes to the growing literature around the effects of the minimum wage on the composition of the labor force by explicitly examining the relationship between the minimum wage and self-employment. The effects of the minimum wage on employment, both in general and among various subgroups of the labor force, has been widely studied, however the notion that the minimum wage can shift workers' decision making with regards to the form of their employment has not been studied. Our paper would suggest that the minimum wage may have a greater role in mitigating labor market risks for workers than previously considered.

This paper proceeds as follows: we summarize the literature around non-standard forms of work, the determinants of self-employment, and the effects of the minimum wage in order to develop a framework through which to view the interaction between the minimum wage and self-employment decisions. The Methods and Data sections introduce our Difference in Difference designs, specifying how we identify our quasi-treated groups (workers in low-wage occupations and workers in occupations with higher scheduling flexibility). We estimate the effects of state minimum wage increases on an individual's probability of self-employment using a Quadruple Differences (DDDD) design, with state fixed effects and an interaction between logged minimum wage, occupational wage quartile, and occupational flexibility of work hours. The results indicate that a state minimum wage increase is associated with a decrease in self-employment, particularly unincorporated self-employment within low-wage occupations with highly flexible work hours. After reviewing results, we discuss limitations and possible directions for future work.

Literature Review

Literature around job quality and contingent work, self-employment, and the minimum wage are broad and diverse. As our research touches on these topics, we start this section with a

brief review of the self-employment literature before discussing some of the individual- and societal-level drivers of self-employment. Finally, we discuss the existing scholarship on the minimum wage and employment. Following the literature review, we provide hypotheses based on prior work.

What does self-employment mean?

Many have speculated that the number of permanent jobs with traditional employer-employee relationships has declined in the United States, driven in part by digital platforms and online gig work as well as domestic outsourcing and the use of independent contractors (Government Accountability Office, 2015). It is important to keep in mind that there are different definitions of work arrangements that are outside of the traditional employer-employee relationship, and there is some overlap in definitions, which include contingent work, alternative work, and self-employment, among others. Non-standard employment, sometimes called contingent work, can be defined as temporary, contract, or other forms of non-standard employment arrangements in which workers do not expect their work to last on a long-term basis (U.S Bureau of Labor Statistics, 2017) or who do not receive employer-provided retirement and health benefits or other employment protections. This definition captures temporary employment as well as agency temps, day laborers, part-time workers, and independent contractors. Using data from the Contingent Worker Survey (CWS) supplements to the Current Population Survey (CPS) for 1995-2017, the 2015 RAND-Princeton Contingent Work Survey, and administrative tax data from the Internal Revenue Service for 2000-2016, Katz and Krueger (2019) conclude that there has been a modest upward trend in non-standard employment during the 2000s, however it is important to note that not all forms of employment within the broad category of non-standard work may be exhibiting the same trends.

Self-employment can be distinct from other types of alternative or non-standard employment and usually indicates ownership of a business whether as a sole proprietor or as a partner. One analysis using the U.S. Census Bureau's 2012 Survey of Business Owners found that the self-employed under this definition numbered 14.6 million, or about 10 percent of the workforce (Pew Research Center, 2015) while a study by the U.S Treasury using tax filings estimated that 17 million taxpayers were self-employed (Jackson, Looney, Ramnath, 2014). It has been noted by Katz and Kruger (2019) as well as Collins and his coauthors (WP) that self-employment rates are rising in administrative tax data, but, puzzlingly, there is a declining trend in worker self-reports of self-employment, at least in primary jobs. The rise in self-employment reported in 1099 tax forms is driven by individuals with relatively small amounts of self-employment income, likely from secondary or supplemental work (Collins et al., WP).

Nonstandard employment is often associated with lower wages, fewer benefits, greater job instability, and, in some cases, increased risk of injury (Kalleberg, Reskin, & Hudson, 2000; Government Accountability Office, 2015); however, some characteristics of nonstandard employment such as self-employment—like flexible scheduling and choice over timing and location of work— may be attractive (Golden, 2001; Lombard. 2001).

It remains to be seen whether self-employment is 'good' or 'bad.' While self-employment can confer higher wages and greater control for some workers, it is also associated with a lack of health and retirement benefits (Kalleberg, 2011).

The ambiguity in job quality of self-employment may be due to contradictory drivers of an individual's entrance into self-employment. Levine and Rubinstein (2013) disaggregate self-employment into incorporated and unincorporated self-employment to proxy for entrepreneurial and non-entrepreneurial forces, respectively, and find higher earnings among the incorporated.

Abraham et al. (2017) note that unincorporated self-employment in public-use data sources likely captures gig work, though gig work is not measured well in such sources. Moulton and Scott (2016) posit that self-employment can be characterized as ‘good’ or ‘bad’ depending upon the type of work, skills, and resources required, among other factors. However, it is not always feasible to distinguish these features in existing datasets.

Indeed, measuring both non-standard work and self-employment presents challenges. Katz and Krueger (2019) note that estimates of non-standard work can differ significantly due to different sampling frames and points in the business cycle, and that workers appear to have a difficult time accurately reporting their work status in standard surveys. They further conclude that surveys like the monthly CPS and CWS instrument may not capture the incidence of casual or intermittent work, because errors in respondent reporting are likely to be exacerbated in periods of changing working relationships. As with the broader definition of non-standard work, self-employment is similarly prone to mismeasurement: on average, two-thirds of those with self-employment income in administrative tax data over the period of 1996-2015 did not report self-employment to the CPS Annual Social and Economic Supplement (ASEC), with this gap growing over time (Abraham et al., 2020).

Drivers of self-employment

Scholars in self-employment and entrepreneurship often separate the determinants of self-employment, which occur at either the individual or social level, into two groups: “push” factors and “pull” factors (Thurik et al., 2008). Much of the literature around the determinants of self-employment and entrepreneurship was produced in the late 1990s and early 2000s, with some more recent scholarship focusing on particular subgroups, like older workers (Zissimopoulos &

Karoly, 2007 and 2009; Moulton & Scott, 2016), minorities (Blanchflower, 2008) and women (Özcan, 2011; Patrick et al., 2016).

Push factors—like recessions, unemployment, loss of benefits, discrimination and short-run labor market conditions— are those that push workers away from hired employment and into self-employment (Fairlie & Meyer, 1996; Blanchflower & Oswald, 1998; Parker, 2004). Post-Great Recession, underemployment may also be a push factor: higher rates of unincorporated self-employment on primary and secondary jobs, as well as higher rates of multiple job holders, are significantly associated with increases in involuntary part-time work in a state, (Valetta et al., 2020). In their analysis, Valetta et al. (2020) found that state unemployment rates have no meaningful impact on unincorporated self-employment, which may indicate that involuntary part-time work is more effective in capturing slack labor market conditions.

Pull factors pull a person into self-employment when the self-employment wage is greater than that from hired employment (Benedict & Hakobyan, 2008; Moulton & Scott, 2016). Pull factors are often individual, like human, financial, and social capital (Dunn & Holtz-Eakin, 2000; Anderson & Miller, 2003; Fairlie & Krashinsky, 2012), openness to risk (Brown et al., 2011), and good health or household circumstances (Lombard, 2001; Wellington, 2006; Budig, 2006), though there are social factors like tax incentives or health insurance (Bruce, 2000; Heim & Lurie, 2010; Gumus & Regan, 2015). Importantly, the interplay between social and individual factors likely vary depending on the policy context; for example, health insurance coverage is a significant consideration for American entrepreneurs given the lack of universal health care in the United States (Gumus & Regan, 2015; Moulton, Diebold, & Scott, 2017).

Self-Employment and the Minimum Wage

Though there is a great deal of evidence around the employment effects of the minimum wage, there is very little existing research on the effect of the minimum wage on self-employment specifically. Much of the literature on the minimum wage concludes there is a small negative impact on employment (Neumark & Wascher, 2007 and 2017). Other authors suggest there is no effect on employment or that the minimum wage results in a small increase in employment (Doucouliagos & Stanley, 2009; Dube et al., 2010; Allegretto et al., 2011).

With regards to other outcomes, it appears that the minimum wage is associated with a reduction in job turnover: authors have found that minimum wage increases reduce quits and/or layoffs as well as hiring rates (Reich et al., 2005, Bronchu & Green, 2013; Dube et al., 2016). There is less evidence regarding the effect of minimum wages on labor force participation, though existing literature suggests those with less human capital may stop searching for jobs, while workers with more human capital enter into the labor force (Wessels, 2005; Luna Alpizar, WP; Treacy, WP).

The search for one definitive estimate of the relationship between the minimum wage and employment can obscure heterogeneous treatment effects: Doucouliagos & Stanley (2009) conclude that even when the minimum wage is found to result in no job loss on average, some employers eliminate certain positions when the cost of labor increases as a result of a minimum wage increase. In general, the negative employment effects of the minimum wage have decreased over time and are largely localized to teenagers (Wolfson & Belman, 2019; Treacy, WP).

Related to the concept of heterogeneous treatment effects is the effect of the minimum wage on the composition of the work force. There is evidence of the minimum wage inducing

labor substitution across demographic groups and skill level (Fairris & Bujanda, 2008; Fang & Gunderson, 2009; Alegretto et al., 2011; Giuliano, 2013; Cengiz et al., 2019). For example, Fairris and Bujanda (2008) observe that a wage increase is offset by substitution toward Latino, male, and African American workers and workers with more formal training. But what about substituting independent contractors for employees? Given the diversity of types of work that fall under the broader umbrella of ‘non-standard employment,’ it is likely that the minimum wage differentially impacts these types.

Blau (1987) first studied the relationship between self-employment and the minimum wage, where the minimum wage was a proxy for wage rigidity. Observing that the long-term trend in declining self-employment was reversing beginning in late 1960s, he hypothesized increased wage rigidity increased the proportion of the labor force that resorts to self-employment as a response to being rationed out of wage jobs. Expecting a positive relationship between the minimum wage and self-employment (which would suggest the minimum wage as a push factor), Blau found the real minimum wage had mixed effects on self-employment: two out of the three coefficient estimates were negative. He concluded that the minimum wage variable is no doubt a relatively crude proxy for wage rigidity. There has been little follow-up research from Blau, though there is some literature in developing countries that minimum wage legislation is associated with an increase in formal employment. Using Canadian data, Kahmi and Leung (2005) found increases in the minimum wage are associated with an increase in the own-account self-employment rate and argue that individuals at the low end of the labor market in terms of skills who are unemployed enter self-employment as an alternative to unemployment.

Hypotheses

Existing literature around the relationship between self-employment and the minimum wage is scant, however its mixed results are perhaps unsurprising. Self-employment can be viewed as a substitute for hired employment for both employees and employers, and because of this, an a priori prediction of the effect of a minimum wage increase on self-employment is ambiguous. Insofar as the minimum wage represents regulation in the labor market and an increase in operating costs, employers may cut back on wage workers and rely on self-employed contractors, thereby increasing demand for self-employed workers. However, self-employed workers, observing higher wages in traditional employment, may apply for hired work, reducing the supply of self-employed workers.

We theorize that individuals weigh the relative gains to self-employment and hired employment against the relative risk of self-employment and their own risk aversion (Blau, 1987; Parker, 1996). Self-employment inherently carries different risks than hired employment due to volatility of earnings and lack of benefits, however self-employment can also confer higher earnings relative to hired employment, in addition to greater flexibility and control over work. A minimum wage increase represents a shift in the relative earnings of self-employment versus hired employment, where, upon a minimum wage increase, workers may be able to expect a hired wage equal to or greater than the wage they would expect from self-employment. This shift in relative earnings is more likely for workers in occupations that pay lower wages than those paying higher wages.

Thus, we expect to see that workers previously classified as self-employed under a lower minimum wage (where the expected wage from hired employment is lower than that of self-employment) may be induced into hired employment following a minimum wage increase. If this

relationship exists, we should observe it in occupations in which workers have greater control over their work hours (scheduling flexibility, discussed further in Data section). Workers in occupation with greater scheduling flexibility are more likely to have a preference for greater control over their work schedules and therefore are more likely to view self-employment as a substitute for hired employment. We therefore expect to see:

Hypothesis 1: Increases in the state minimum wage are associated with a decline in self-employment within occupations with a high rate of scheduling flexibility.

Hypothesis 2: Increases in the state minimum wage are associated with a decline in self-employment within flexible occupations particularly for workers in occupations paying lower wages.

Unincorporated self-employment is easier and less expensive to enter, relative to incorporated self-employment, and lower skilled workers are more likely to be unincorporated than incorporated (Hipple, 2010). Approximately 60% of the 15 million self-employed workers in the United States in 2015 were unincorporated. Workers typically incorporate their businesses in order to receive more traditional benefits of a corporate structure, like tax considerations, limited liability, and more opportunities to raise capital. Incorporated self-employed workers are more likely than unincorporated self-employed workers to have paid employees, and the rates of incorporated self-employment tends to rise more with educational attainment than unincorporated self-employment (Hipple & Hammond, 2016). Given relative ease to move between hired and self-employment and the greater likelihood that an unincorporated self-employed worker possesses less skills (making them more susceptible to a minimum wage increase), we predict that:

Hypothesis 3: The relationship between minimum wage and self-employment predicted in Hypotheses 1 and 2 is stronger for unincorporated self-employment, versus incorporated self-employment.

We test the above hypotheses using the methodology and data specified in the following sections.

Methods

In order to understand the effect of state minimum wage increases on self-employment, we employ a series of Difference in Differences designs, starting first with a Difference in Difference (DD) stratified along the occupation's degree of scheduling flexibility and the occupation's median wage. We then estimate two sets of Triple Differences (DDD) stratified by flexibility and wage. We finally estimate a Quadruple Difference (DDDD) that incorporates all of these stratifications within one estimating equation, allowing us to test if the effect sizes observed for the different stratifications in the other methods are statistically different. This section describes each estimation and treatment variables used.

Our outcome variable is an individual's probability of being self-employed, where we examine self-employment in general as well as unincorporated and incorporated self-employment separately. All estimations include: η_{iost} , a vector of individual-level indicators, specifically indicators for educational attainment, age, and gender; state fixed effects (θ_s); year fixed effects (ϑ_t); and state-by-year linear trends (ν_{st}). Subscripts are as follows: i for individual, o for occupation, s for state, and t for year.

Difference in Difference

We first conduct a simple Difference in Difference estimation using the following equation:

$$\Pr(\text{SelfEmployed})_{iost} = \alpha_1 + \gamma_1(\ln MW_{st}) + \eta_{1iost} + \theta_{1s} + \vartheta_{1t} + \nu_{1st} + \varepsilon_{1iost}$$

Where $\ln MW$ is the logged state minimum wage in a given state and year.¹ The coefficient for logged state minimum wage, γ_1 estimates the effect of a percent increase in the state minimum wage on the probability a worker is self-employed. We then stratify this regression by both wage quartile (discussed further in the Data section) and by how flexible the work schedule of an occupation is (discussed further in the Data section). *Flexible* is a binary indicator equaling 1 if an occupation has a higher degree of flexibility in work hours (high flexibility) and zero otherwise (low flexibility).

Triple Difference (DDD)

We employ two Triple Difference (DDD) designs. In order to assess whether the effect of a minimum wage increase varies by scheduling flexibility of occupation in a statistically significant way, we employ our first DDD design, which includes an interaction between logged state minimum wage and flexibility of occupation. The state minimum wage increase is theorized to affect the self-employment rates of a quasi-treated group, flexible occupations, more than that of our quasi-control group, non-flexible occupations. Our estimation equation is shown below:

$$\begin{aligned} \Pr(\text{SelfEmployed})_{iost} &= \alpha_2 + \beta_1(\text{Flexible}_{ost}) + \gamma_2(\ln MW_{st}) + \delta_1(\text{Flexible}_o * \ln MW_{st}) + \eta_{2iost} \\ &+ \theta_{2s} + \vartheta_{2t} + \nu_{2st} + \varepsilon_{2iost} \end{aligned}$$

The coefficient on the interaction between *Flexible* and $\ln MW$, δ , captures the effect of a minimum wage increase on the probability a worker within a quasi-treated occupation is self-employed. Recognizing that workers across the wage distribution, whether in flexible or non-

¹ We run all of our models with logged minimum wage lagged one year (results in **Appendix 2**). We also run our models using logged real minimum wage, with 2007 as a base year (results in **Appendix 3**). Our results are qualitatively similar, and we observe coefficients of higher magnitude when using logged real minimum wages, in particular.

flexible occupations, are likely to be differentially affected by a minimum wage increase, we stratify these regressions by the occupation's wage quartiles.

We conduct our second DDD design in order to assess whether a state minimum wage increase differentially affects self-employment of workers in different occupational wage quartiles, and whether that differential effect is statistically significant. The estimation includes an indicator for the occupation's wage quartile as well as an interaction term between that indicator and the logged minimum wage:

$$\begin{aligned} \Pr(\text{SelfEmployed})_{iost} &= \alpha_3 + \gamma_3(\ln MW_{st}) + \lambda_1(\text{WageQuartile}_o) + \rho_1(\text{WageQuartile}_o * \ln MW_{st}) \\ &+ \eta_{3iost} + \theta_{3s} + \vartheta_{3t} + \nu_{3st} + \varepsilon_{3iost} \end{aligned}$$

It should be noted that the fourth wage quartile is omitted, and therefore the coefficients on the first, second, and third wage quartile are the effect of working in an occupation in that respective wage quartile on self-employment, relative to occupations in the fourth wage quartile. The most common occupations in the fourth wage quartile are professional occupations like accountant and auditors, lawyers and judges, registered nurses, and police officers and detectives (see Appendix 1). The coefficient on that interaction between logged minimum wage and wage quartile, ρ_1 , estimates the effect of a percent increase in a state minimum wage on the probability a worker in an occupation in a given wage quartile (1st, 2nd, or 3rd) is self-employed, relative to a worker in an occupation in the fourth wage percentile.

By stratifying the above estimation equation by scheduling flexibility of the occupation (high vs. low), we can observe whether the effect of the minimum wage on self-employment varies not just by the wage quartile of the occupation but also by how flexible that occupation is.

Quadruple Difference (DDDD)

Where the triple difference regressions above allow us to see the relative effect of the minimum wage on self-employment across wage quartile and occupational scheduling flexibility, we can observe whether these differences are statistically significant in a Quadruple Difference (DDDD) design. The estimation, as specified below, includes logged minimum wage, occupational flexibility indicator for wage quartile, and interactions of these terms:

$$\begin{aligned} \Pr(\text{SelfEmployed})_{iost} &= \alpha_4 + \beta_2(\text{Flexible}_{ost}) + \gamma_4(\ln MW_{st}) + \lambda_2(\text{WageQuartile}_o) + \delta_2(\text{Flexible}_o \\ &\quad * \ln MW_{st}) + \rho_2(\text{WageQuartile}_o * \ln MW_{st}) \\ &\quad + \vartheta(\text{WageQuartile}_o * \text{Flexible}_o) + \phi(\text{WageQuartile}_o * \text{Flexible}_o \\ &\quad * \ln MW_{st}) + \eta_{4iost} + \theta_{4s} + \vartheta_{4t} + \nu_{4st} + \varepsilon_{4iost} \end{aligned}$$

The DDDD estimator, ϕ , is the predicted effect of a percent increase in the state minimum wage on the probability a worker in a highly flexible occupation in a given wage quartile (1st, 2nd, or 3rd) is self-employed, relative to a worker in a non-flexible occupation in the fourth wage percentile.

Data

We use American Community Survey (ACS) data from 2000-2017,² conditioned on employment and working age (aged 16-65). The self-employment indicator variable is derived from the values for the ACS variable CLASSWKR, which specifies whether a worker is a wage or salary earner, self-employed (incorporated or not incorporated), or an unpaid family worker.³

² From IPUMS USA (Ruggles et al., 2020).

³ For workers with multiple sources of employment, CLASSWKR relates to the work relationship in which they spent the most time during the reference day or week. This necessarily limits our inferences, as workers who are self-employed outside of their main job are uncaptured by our analysis.

We supplement our data with two additional data sources: (1) David Neumark's (2019) state minimum wage data for 2000-2017, matched by state-year; and (2) data from the CPS Work Schedules Supplement, collapsed to the occupation-state-year and matched to our data. The Work Schedules Supplement⁴ collects additional information on working hours for all respondents in a household that were working at the time of the supplement (May of 1991, 1997, 2001, and 2004). We use the values for WSFLEXHRS, which reports whether respondents have the ability to vary when they begin and end the workday, a measure of schedule flexibility, as an additional treatment variable. Workers in highly flexible occupations likely have preferences towards schedule flexibility, a characteristic of self-employment. These workers may be more likely, therefore, to view self-employment as a substitute for hired employment. Collapsing the data by occupation across supplement years (1991, 1997, 2001, and 2004) for occupations with at least 10 observations per year, we examine the proportion of workers with flexible hours within each occupation. Those occupations with higher rates of scheduling flexibility than the median rate (roughly 30%) are considered 'Flexible' occupations. Our results (the coefficients for 'Flexible') suggest a positive correlation between self-employment and scheduling flexibility across type of self-employment and wage quartile, giving us some confidence about scheduling flexibility as a treatment variable.

The wage quartiles mentioned in the Methods section were created using ACS data from 2001 to 2007.⁵ Wages were constructed using business and wage income, divided by the product of usual hours worked, UHRSWORK, and weeks worked, WKSWORK1. Wages were converted to real wages, with 2007 as the base year, using the Consumer Price Index (CPI). The median

⁴ From IPUMS CPS (Ruggles et al., 2020).

⁵ We use the years 2001-2007 only, because the ACS variable for weeks worked, WKSWORK1, is reported in intervals from 2008 onwards.

wage was then calculated for each occupation and merged with our dataset. Finally, we determined the wage quartiles within our dataset, with the wage quartiles as follows: \$6.37 to \$10.98 for Quartile 1; greater than \$10.98 to \$15.82 for Quartile 2; greater than \$15.82 to \$22.45 for Quartile 3; and greater than \$22.45 to the maximum of \$71.01 for Quartile 4.⁶

Summary statistics are shown in **Table 1**. The underlying sample contains approximately 19.5 million observations. Approximately 10% of the sample is self-employed, with 6% unincorporated and 4% incorporated. The average state minimum wage for the time period is \$7.15 an hour, with the minimum \$5.15 and maximum \$12.50 an hour. Approximately 40% of the sample possessed a high school degree or less, while about 20% has four years of college.

Results

We run a Difference in Difference (DD) model, regressing self-employment on logged minimum wage across the entire sample, then stratified by wage quartile and by flexibility of occupation (high versus low) in **Table 2**. Though there are very few significant results in this table, a one percent increase in state minimum wage is associated with a 0.006 percentage point decline in the probability a worker in the second wage quartile will be self-employed, significant at the 95% confidence level (Regression 2).

Table 3 displays our first Triple Difference (DDD) estimation for the whole sample, then stratified by wage quartile. Unsurprisingly, there is an association between the flexibility of an occupation (how flexible that occupation is in its work hours) and the likelihood that a worker within that occupation is self-employed, as evidenced by positive, statistically significant coefficients across all regressions. The minimum wage is associated with higher probability of

⁶ See **Appendix 1** for a full list of occupations by scheduling flexibility and wage quartile. Common flexible occupations in the first wage quartile are retail salespersons, grounds maintenance workers, personal care aids, and agricultural workers, compared to non-flexible occupations in the first wage quartile like chefs and cooks, childcare workers, waiters and waitresses, and cashiers.

self-employment both at the lowest and highest wage quartiles among non-flexible occupations. However, the coefficient on the interaction between minimum wage and flexibility is negative and statistically significant across all wage quartiles (Regressions 1 and 4-7), providing further evidence to support Hypothesis 1. As predicted in Hypothesis 2, the coefficient for the first wage quartile is substantially larger in magnitude than the other quartiles and suggests that a one percent increase in a state's minimum wage is associated with a .095 percentage point decrease in the likelihood a worker in a flexible occupation is self-employed, significant at the 99% confidence level. We can interpret this reduction in individual probability that a worker is self-employed as the reduction in the occupation's overall share of self-employment: within flexible, lower-wage occupations, a minimum wage increase is associated with a decrease in the share of self-employed workers.

The coefficients for the interaction term appear to largely be driven by unincorporated self-employed (Regressions 2 and 8-11) versus the incorporated self-employed (Regressions 3 and 12-15), for which statistically significant results are only present at higher wage quartiles (and at much smaller magnitudes). As discussed in Hypothesis 3, the more consistent effects for unincorporated self-employment may be driven by the fact that it is likely easier to move between hired employment and unincorporated self-employment than it is to move between hired employment and incorporated self-employment. Also, insofar as unincorporated self-employment is more likely to capture casual, non-standard work (Abraham et al., 2017), it is plausible that increases in the minimum wage disproportionately allow for workers who bear greater labor market risk to move into less risky, hired employment.

We perform another Triple Difference (DDD) estimation in **Table 4**, wherein the interaction term is now between wage quartile and logged minimum wage, and regressions are

presented for all occupations as well as stratified by scheduling flexibility of occupation. The coefficient on the interaction between the first wage quartile and logged minimum wage among workers in highly flexible occupations is negative for unincorporated self-employment (Regression 4) and positive for incorporated self-employment (Regression 8), suggesting different forces driving workers into these two subtypes. It is worth noting that the omitted category for these indicators is the fourth wage quartile, thus an interpretation of these coefficients is relative to that omitted category; for example, a one percent increase in the minimum wage is associated with a .0711 percentage point decrease in the probability that a worker in a flexible occupation in the first wage quartile is unincorporated self-employed, significant at the 99% confidence level (Regression 5). The fourth wage quartile being the omitted category may be why the interaction between wage quartile and logged minimum wage is otherwise positive (for example, in Regression 8 for the second and third quartile).

Table 5 shows results from a Quadruple Difference (DDDD) estimation, where the interaction between wage quartile, logged minimum wage, and scheduling flexibility of occupation is the coefficient of interest. While the interaction⁷ is negative and statistically significant for self-employment in general, this estimate is driven by unincorporated self-employment: a one percent increase in the minimum wage is associated with a .071 percentage point decrease in the probability that a worker, earning a wage within the first wage quartile and working in a highly flexible occupation, is unincorporated self-employed, significant at the 99% confidence level (Regression 2). As a comparison, the same interaction is slightly positive but statistically insignificant for incorporated self-employed. Conversely, the coefficient interaction between the third wage quartile, high flexibility, and logged minimum wage is positive (though

⁷ Between first wage quartile, logged minimum wage, and scheduling flexibility.

substantially smaller in magnitude) and statistically significant for both types of self-employment. Again, we can interpret these individual probabilities as compositional changes within occupation: a state minimum wage increase is associated with declines in unincorporated self-employment in highly flexible, lower wage occupations, compared to that of higher wage occupations. Minimum wage increases are conversely associated with an increase in the share of workers who are self-employed in highly flexible occupations that are in the third wage quartile, though this compositional change is smaller in size.

Finally, we explore heterogeneous treatment effects by stratifying the regression used in Table 5 by gender, age, and education, and focusing on the probability someone is self-employed. **Table 6** displays stratifications by gender. While both men and women working in flexible occupations in the first wage quartile are less likely to be self-employed as a result of a state minimum wage increase, relative to workers in occupations in the fourth wage quartile, the magnitude of the coefficient for women is just over half the magnitude for men. However, women are less likely to be self-employed in general, with 7.5% of women in our sample being unincorporated self-employed, versus 12.4% of men. Results for workers in occupations in other wage quartiles (quartiles two and three) are less consistently significant, with only the interaction for wage quartile 2 for women and the interaction for wage quartile 3 for men being positive and statistically significant.

Table 7 displays stratifications by age. The relationship between minimum wage and self-employment among flexible, first wage quartile occupations (relative to the fourth wage quartile) remains statistically significantly negative across all but one age group (16-25 years), and the magnitude the magnitude of the coefficient on this interaction (between minimum wage, flexibility, and first wage quartile) generally increases with older ages, peaking for workers aged

46-55. The relationship between minimum wage and self-employment among flexible, third wage quartile occupations (relative to the fourth wage quartile) is statistically significant and positive across age groups until the age of 45, though the magnitude for this effect is notably smaller than that for wage quartile 1.

Table 8 shows stratifications by education. The relationship between minimum wage and self-employment among flexible, first wage quartile occupations (relative to the fourth wage quartile) is statistically significant for workers with a high school diploma or more education, and the magnitude of the coefficient on this interaction (between minimum wage, flexibility, and first wage quartile) generally increases with educational attainment, peaking for those with a college degree. The sign of the relationship between minimum wage and self-employment among flexible, third wage quartile occupations (relative to the fourth wage quartile) varies with educational attainment: the relationship is statistically significantly negative for workers with some college education or with a college degree but positive for those without a high school diploma and those with some post-graduate education.

Discussion

In this paper, we show that a state minimum wage increase is associated with a decrease in self-employment, particularly unincorporated self-employment within occupations that are likely to be more affected by a minimum wage increase: occupations in the first wage quartile (\$6.37 to \$10.98). This negative association between minimum wage and self-employment for lower wage work is present for occupations with greater scheduling flexibility. The effect of the minimum wage on within-occupation self-employment varies by wage quartile of the occupation, where a minimum wage increase is associated with *increases* in the share of self-employed for higher-paying occupations. Are higher wage workers involuntarily pushed into

self-employment due to increased labor costs resulting from a minimum wage increase? Is there a substitution of lower-wage workers for higher-wage workers as a result of a minimum wage increase? Questions around this result merit further study. Effects also vary depending on whether our outcome variable is unincorporated or incorporated self-employment, corroborating existing literature that would suggest these two subtypes of self-employment are likely fundamentally different from one another.

We have argued that a negative relationship between the minimum wage and self-employment in flexible, low-wage occupations is observed because individuals weigh the relative gains of self-employment and hired employment against the risks self-employment carries in more volatile earnings, lack of benefits, and other considerations. A minimum wage represents a shift in relative earnings of self-employment versus hired employment, particularly for those working in lower-wage occupations. Workers in highly flexible occupations have a greater ability to move between hired and self-employment, therefore these workers may move into less risky hired employment when the hired wage is equal to or exceeds what they can expect from a self-employed wage. The negative relationship between minimum wage and self-employment among low-wage occupations is greater in magnitude for unincorporated versus incorporated self-employment.

We observed in Tables 6-8 that there are differential effects of the minimum wage on self-employment (within occupations with low wages and high flexibility) across gender and education. Further research is needed to understand why these differential effects persist. Similarly, it is reasonable to expect that, given the diversity of work arrangements within the broader group of non-standard employment, the effect of the minimum wage should vary across

these groups. While we focus specifically on self-employment, further research should explore the extent to which the minimum wage affects other subtypes of non-standard employment.

There are some notable limitations to our analysis. First, surveys are known to have substantial measurement error when it comes to self-employment and other forms of non-standard employment, such that instances of self-employment are likely not captured in our ACS data. Second, we theorize that workers in occupations with greater scheduling flexibility have a greater propensity to enter self-employment, because these workers have a preference for greater control over their work schedules. Though we can observe occupational scheduling flexibility is associated with higher rates of self-employment, it may be possible that another occupational dimension would be better suited for this analysis. Finally, we have presented a theory around risk of self-employment and the extent to which the minimum wage can alter workers' trade-offs between earnings and risk, and we have shown some analysis using public survey data to support it. However, further research into how individuals make these choices should be conducted, and should include other constraints like health insurance access, household composition, and the tightness of the labor market.

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Table 1: Summary Statistics				
	Average	SD	Min	Max
Self-Employed	0.10	0.30	0	1
Unincorporated Self-Employed	0.06	0.24	0	1
Incorporated Self-Employed	0.04	0.19	0	1
Year	2010	4.5	2000	2017
Minimum Wage	7.14	1.19	5.15	12.5
Female	0.48	0.50	0	1
Age	41.54	12.94	16	65
Education (NA omitted)				
Nursery to 4	0.00	0.06	0	1
Grade 5 to 8	0.02	0.13	0	1
Grade 9	0.01	0.10	0	1
Grade 10	0.02	0.13	0	1
Grade 11	0.02	0.15	0	1
Grade 12	0.34	0.47	0	1
1 Years of College	0.16	0.37	0	1
2 Years of College	0.09	0.29	0	1
4 Years of College	0.21	0.41	0	1
5+ Years of College	0.12	0.33	0	1
N	19,516,316			
Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).				

Table 2: P(Self-Employed) Difference in Difference (DD) Stratified by Wage Quartile and Flexible Occupations							
	Full	Wage Quartile				Flexible	
		1st	2nd	3rd	4th	High	Low
	(1)	(4)	(5)	(6)	(7)	(16)	(17)
<i>Self-Employed</i> log(min wage)	-0.0027 (0.0025)	-0.0016 (0.0057)	-0.0060** (0.0027)	-0.0016 (0.0054)	-0.0039 (0.0029)	-0.0039 (0.0041)	-0.0022 (0.0019)
	(2)	(8)	(9)	(10)	(11)	(18)	(19)
<i>Unincorporated Self-Employed</i> log(min wage)	-0.0031 (0.0025)	-0.0037 (0.0051)	-0.0051 (0.0035)	-0.0022 (0.0045)	-0.003 (0.0025)	-0.004 (0.0044)	-0.0026 (0.0016)
	(3)	(12)	(13)	(14)	(15)	(20)	(21)
<i>Incorporated Self-Employed</i> log(min wage)	0.0004 (0.0020)	0.0021 (0.0017)	-0.001 (0.0026)	0.0005 (0.0029)	-0.0009 (0.0030)	0.0001 (0.0029)	0.0004 (0.0010)
N	19,516,316	4,880,963	4,879,313	4,869,222	4,886,818	9,800,881	9,715,435
<p>*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified separately by the median wage for each occupation (by quartile) and occupation's flexibility of work hours. Standard errors clustered by state are in parentheses.</p> <p>Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).</p>							

Table 3: P(Self-Employed) Triple Difference (DDD) Stratified by Wage					
	Full	Wage Quartile:			
	(1)	1st	2nd	3rd	4th
		(4)	(5)	(6)	(7)
<i>Self-Employed</i>					
Flexible×Log(min wage)	-0.0454*** (0.0053)	-0.0950*** (0.0197)	-0.0227*** (0.0078)	-0.0274** (0.0127)	-0.0382*** (0.0106)
Log(min wage)	0.0204*** (0.0035)	0.0272*** (0.0095)	0.0012 (0.0032)	0.0146 (0.0102)	0.0282*** (0.0093)
Flexible	0.1855*** (0.0111)	0.3280*** (0.0398)	0.1474*** (0.0150)	0.1657*** (0.0219)	0.1622*** (0.0188)
	(2)	(8)	(9)	(10)	(11)
<i>Unincorporated Self-Employed</i>					
Flexible×Log(min wage)	-0.0341*** (0.0054)	-0.0898*** (0.0139)	-0.0222*** (0.0058)	(0.0164) (0.0118)	-0.0212** (0.0095)
Log(min wage)	0.0142*** (0.0034)	0.0236*** (0.0071)	0.0021 (0.0039)	0.0075 (0.0093)	0.0147* (0.0076)
Flexible	0.1241*** (0.0105)	0.2848*** (0.0298)	0.1188*** (0.0105)	0.0969*** (0.0201)	0.0805*** (0.0165)
	(3)	(12)	(13)	(14)	(15)
<i>Incorporated Self-Employed</i>					
Flexible×Log(min wage)	-0.0113*** (0.0031)	(0.0052) (0.0081)	(0.0005) (0.0049)	-0.0111*** (0.0032)	-0.0170*** (0.0036)
Log(min wage)	0.0062*** (0.0022)	0.0036 (0.0030)	-0.0009 (0.0031)	0.0071** (0.0030)	0.0135*** (0.0040)
Flexible	0.0614*** (0.0064)	0.0432*** (0.0148)	0.0286*** (0.0091)	0.0687*** (0.0069)	0.0817*** (0.0079)
N	19,516,316	4,880,963	4,879,313	4,869,222	4,886,818
*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified by the median wage for each occupation (by quartile). Standard errors clustered by state are in parentheses.					
Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).					

Table 4: P(Self-Employed) Triple Difference (DDD) Stratified by Flexible Occupations

Flexible:	<u>Self-Employed</u>			<u>Unincorporated Self-Employed</u>			<u>Incorporated Self-Employed</u>		
	Full (1)	High (2)	Low (3)	Full (4)	High (5)	Low (6)	Full (7)	High (8)	Low (9)
Wage Q1×Log(min wage)	0.0036 (0.0085)	-0.0549** (0.0219)	0.0032 (0.0069)	-0.0113* (0.0066)	-0.0711*** (0.0158)	(0.0010) (0.0067)	0.0148*** (0.0038)	0.0162* (0.0084)	0.0042*** (0.0008)
Wage Q2×Log(min wage)	0.0280*** (0.0051)	0.0196** (0.0093)	0.0071 (0.0053)	0.0101*** (0.0023)	(0.0010) (0.0050)	0.0005 (0.0061)	0.0179*** (0.0038)	0.0206*** (0.0058)	0.0066*** (0.0019)
Wage Q3×Log(min wage)	0.0260*** (0.0047)	0.0181** (0.0069)	0.0037 (0.0038)	0.0144*** (0.0045)	0.0095 (0.0068)	0.0016 (0.0044)	0.0116*** (0.0017)	0.0086*** (0.0019)	0.0021 (0.0013)
Log(min wage)	-0.0170*** (0.0037)	-0.0043 (0.0055)	-0.0062 (0.0058)	-0.0064** (0.0030)	0.0038 (0.0047)	-0.0025 (0.0061)	-0.0106*** (0.0026)	-0.0081** (0.0033)	-0.0036*** (0.0011)
Wage Q1	0.0365* (0.0192)	0.2360*** (0.0450)	0.0458*** (0.0126)	0.0829*** (0.0155)	0.2705*** (0.0344)	0.0463*** (0.0122)	-0.0464*** (0.0073)	-0.0345** (0.0154)	(0.0005) (0.0019)
Wage Q2	-0.0387*** (0.0096)	0.0273 (0.0170)	0.0366*** (0.0096)	0.0116** (0.0048)	0.0732*** (0.0094)	0.0329*** (0.0112)	-0.0503*** (0.0069)	-0.0459*** (0.0102)	0.0037 (0.0034)
Wage Q3	-0.0465*** (0.0087)	0.0045 (0.0124)	0.0128* (0.0067)	(0.0116) (0.0079)	0.0213* (0.0117)	0.0096 (0.0077)	-0.0350*** (0.0035)	-0.0168*** (0.0040)	0.0032 (0.0026)
N	19,516,316	9,800,881	9,715,435	19,516,316	9,800,881	9,715,435	19,516,316	9,800,881	9,715,435

*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified by the occupation's flexibility of work hours. Standard errors clustered by state are in parentheses.

Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).

	Self-Employed	Unincorporated Self-Employed	Incorporated Self-Employed
	(1)	(2)	(3)
Wage Q1×Flexible×Log(min wage)	-0.0595** (0.0274)	-0.0713*** (0.0197)	0.0118 (0.0091)
Wage Q2×Flexible×Log(min wage)	0.0135 (0.0155)	(0.0024) (0.0099)	0.0159** (0.0062)
Wage Q3×Flexible×Log(min wage)	0.0126*** (0.0035)	0.0062** (0.0029)	0.0064*** (0.0021)
Wage Q1×Log(min wage)	0.0019 (0.0081)	(0.0017) (0.0073)	0.0036*** (0.0011)
Wage Q2×Log(min wage)	0.0055 (0.0070)	0.0000 (0.0070)	0.0055*** (0.0016)
Wage Q3×Log(min wage)	0.0035 (0.0050)	0.0017 (0.0050)	0.0018 (0.0011)
Flexible×Log(min wage)	-0.0373*** (0.0110)	-0.0209** (0.0097)	-0.0164*** (0.0038)
Wage Q1×Flexible	0.1665*** (0.0514)	0.2108*** (0.0380)	-0.0443** (0.0167)
Wage Q2×Flexible	(0.0161) (0.0271)	0.0390** (0.0177)	-0.0552*** (0.0110)
Wage Q3×Flexible	(0.0009) (0.0075)	0.0171*** (0.0057)	-0.0180*** (0.0043)
Log(min wage)	0.0154* (0.0079)	0.0125 (0.0080)	0.003 (0.0024)
Wage Q1	0.0601*** (0.0144)	0.0548*** (0.0129)	0.0053** (0.0022)
Wage Q2	0.0359*** (0.0121)	0.0320** (0.0122)	0.0039 (0.0030)
Wage Q3	0.0048 (0.0085)	0.0050 (0.0085)	(0.0002) (0.0023)
Flexible	0.1633*** (0.0195)	0.0784*** (0.0166)	0.0849*** (0.0084)
N	19,516,316	19,516,316	19,516,316

*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified by the occupation's flexibility of work hours. Standard errors clustered by state are in parentheses.

Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).

Table 6: P(Self-Employed) Quadruple Difference (DDD) Stratified by Gender		
Gender:	Male	Female
	(1)	(2)
Wage Q1×Flexible×Log(min wage)	-0.0933** (0.0358)	-0.0477** (0.0204)
Wage Q2×Flexible×Log(min wage)	(0.0090) (0.0272)	0.0202*** (0.0050)
Wage Q3×Flexible×Log(min wage)	0.0122** (0.0061)	(0.0038) (0.0026)
Prob(Self-Employed)	0.1236	0.0749
N	10,104,847	9,411,469
<p>*** p<0.01, ** p<0.05, * p<0.1 Models include indicators for gender, education, age, state, and year and state by year linear time trends. The above models also include occupational flexibility, wage quartile, logged minimum wage, and interaction terms between wage quartile and minimum wage, flexibility and minimum wage, and wage quartile and flexibility. Standard errors clustered by state are in parentheses.</p> <p>Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).</p>		

Age:	16 to 25	26 to 35	36 to 45	46 to 55	56 to 65
	(1)	(2)	(3)	(4)	(5)
Wage Q1×Flexible×Log(min wage)	(0.0094)	-0.0318*	-0.0818**	-0.1167**	-0.1050**
	(0.0075)	(0.0171)	(0.0360)	(0.0444)	(0.0522)
Wage Q2×Flexible×Log(min wage)	(0.0033)	(0.0042)	0.0016	0.0217	0.0650***
	(0.0073)	(0.0114)	(0.0160)	(0.0165)	(0.0223)
Wage Q3×Flexible×Log(min wage)	0.0129***	0.0198***	0.0224***	0.0019	(0.0026)
	(0.0042)	(0.0038)	(0.0052)	(0.0076)	(0.0086)
Prob(Self-Employed)	0.0267	0.0662	0.1071	0.1267	0.1539
N	2,814,466	3,955,927	4,495,814	4,958,321	3,291,788

*** p<0.01, ** p<0.05, * p<0.1 Models include indicators for gender, education, age, state, and year and state by year linear time trends. The above models also include occupational flexibility, wage quartile, logged minimum wage, and interaction terms between wage quartile and minimum wage, flexibility and minimum wage, and wage quartile and flexibility. Standard errors clustered by state are in parentheses.

Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).

Table 8: P(Self-Employed) Quadruple Difference (DDD) Stratified by Education					
Education:	< High School	High School	Some College	College	College +
	(1)	(2)	(3)	(4)	(5)
Wage Q1×Flexible×Log(min wage)	0.0059 (0.0349)	-0.0532** (0.0233)	-0.0742*** (0.0243)	-0.0792*** (0.0272)	-0.0688** (0.0274)
Wage Q2×Flexible×Log(min wage)	0.0016 (0.0291)	0.0180 (0.0187)	(0.0032) (0.0187)	0.0097 (0.0091)	0.1334*** (0.0146)
Wage Q3×Flexible×Log(min wage)	0.0449* (0.0253)	0.0059 (0.0053)	-0.0151** (0.0060)	-0.0188** (0.0092)	0.0374*** (0.0076)
Prob(Self-Employed)	0.1026	0.1000	0.0912	0.1004	0.1164
N	1,536,084	6,646,864	4,885,600	4,065,266	2,382,502
<p>*** p<0.01, ** p<0.05, * p<0.1 Models include indicators for gender, education, age, state, and year and state by year linear time trends. The above models also include occupational flexibility, wage quartile, logged minimum wage, and interaction terms between wage quartile and minimum wage, flexibility and minimum wage, and wage quartile and flexibility. Standard errors clustered by state are in parentheses.</p> <p>Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).</p>					

Appendix 1: Occupations, Scheduling Flexibility and Wage Quartile (Count in Parentheses)

Wage Quartile 1

High Flexible	Low Flexible
Retail Salespersons (431,337)	Cashiers (406,598)
Grounds Maintenance Workers (145,377)	Janitors and Building Cleaners (305,904)
Personal Care Aides (123,028)	Chefs and Cooks (301,012)
Farmers, Ranchers, and Other Agricultural Managers (115,030)	Laborers and Freight, Stock, and Material Movers, Hand (271,556)
Agricultural workers, nec (108,445)	Nursing, Psychiatric, and Home Health Aides (262,476)
Hairdressers, Hairstylists, and Cosmetologists (102,458)	Waiters and Waitresses (252,693)
First-Line Supervisors of Food Preparation and Serving Workers (71,633)	Stock Clerks and Order Fillers (195,618)
Recreation and Fitness Workers (51,551)	Childcare Workers (173,108)
Combined Food Preparation and Serving Workers, Including Fast Food (42,183)	Maids and Housekeeping Cleaners (170,985)
Taxi Drivers and Chauffeurs (38,173)	Receptionists and Information Clerks (148,789)
Host and Hostesses, Restaurant, Lounge, and Coffee Shop (34,907)	Teacher Assistants (143,999)
Personal Appearance Workers, nec (31,578)	Food Preparation Workers (100,582)
Law enforcement workers, nec (27,654)	Preschool and Kindergarten Teachers (75,789)
Nonfarm Animal Caretakers (25,885)	Bank Tellers (56,200)
Bakers (24,288)	Packers and Packagers, Hand (52,151)
Door-to-Door Sales Workers, News and Street Vendors, and Related Workers (22,322)	Bartenders (47,303)
Library Assistants, Clerical (16,917)	Food preparation and serving related workers, nec (41,456)
Telemarketers (14,718)	Cleaners of Vehicles and Equipment (41,253)
Personal Care and Service Workers, All Other (12,280)	Dishwashers (34,769)
Residential Advisors (11,974)	Packaging and Filling Machine Operators and Tenders (32,746)
Food Batchmakers (10,925)	Sewing Machine Operators (29,072)
Barbers (10,475)	Counter Attendant, Cafeteria, Food Concession, and Coffee Shop (27,999)
Tailors, Dressmakers, and Sewers (10,157)	Laundry and Dry-Cleaning Workers (23,556)
Library Technicians (7,873)	Entertainment Attendants and Related Workers, nec (23,240)
Tour and Travel Guides (6,975)	Food Servers, Nonrestaurant (22,915)
Photographic Process Workers and Processing Machine Operators (6,773)	Hotel, Motel, and Resort Desk Clerks (17,124)
Models, Demonstrators, and Product Promoters (6,419)	Automotive and Watercraft Service Attendants (14,158)
Animal Trainers (5,560)	Counter and Rental Clerks (13,918)
Shoe and Leather Workers and Repairers (1,496)	Vehicle and Mobile Equipment Mechanics, Installers, and Repairers, nec (10,436)
	Parking Lot Attendants (8,520)
	Helpers, Construction Trades (7,835)
	Pressers, Textile, Garment, and Related Materials (6,314)
	Graders and Sorters, Agricultural Products (6,170)
	Helpers--Production Workers (5,919)
	Crossing Guards (5,727)

	Ushers, Lobby Attendants, and Ticket Takers (5,113) Motor Vehicle Operators, All Other (4,615) Machine Feeders and Offbearers (4,501) Woodworking Machine Setters, Operators, and Tenders, Except Sawing (3,651) Helpers--Installation, Maintenance, and Repair Workers (2,794) Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders (2,109) Food Cooking Machine Operators and Tenders (1,443) Shoe Machine Operators and Tenders (456)
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Wage Quartile 2

High Flexible	Low Flexible
Customer Service Representatives (306,123)	Secretaries and Administrative Assistants (533,218)
Bookkeeping, Accounting, and Auditing Clerks (200,271)	Driver/Sales Workers and Truck Drivers (432,603)
Carpenters (167,227)	Construction Laborers (192,521)
Food Service and Lodging Managers (129,563)	Office Clerks, General (166,077)
Other Teachers and Instructors (112,971)	Other production workers including semiconductor processors and cooling and freezing equipment operators (164,034)
Painters, Construction and Maintenance (66,246)	Assemblers and Fabricators, nec (134,689)
Billing and Posting Clerks (64,940)	Automotive Service Technicians and Mechanics (113,248)
Clergy (62,320)	Security Guards and Gaming Surveillance Officers (111,524)
Data Entry Keyers (57,939)	Inspectors, Testers, Sorters, Samplers, and Weighers (106,254)
Word Processors and Typists (50,132)	Medical Assistants and Other Healthcare Support Occupations, nec (105,557)
File Clerks (46,202)	Welding, Soldering, and Brazing Workers (82,827)
Athletes, Coaches, Umpires, and Related Workers (34,541)	Shipping, Receiving, and Traffic Clerks (76,655)
Other Installation, Maintenance, and Repair Workers Including Wind Turbine Service Technicians, and Commercial Divers, and Signal and Track Switch Repairers (32,598)	Bus and Ambulance Drivers and Attendants (73,930)
Payroll and Timekeeping Clerks (24,654)	Health Diagnosing and Treating Practitioner Support Technicians (70,419)
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers (23,055)	Industrial Truck and Tractor Operators (67,930)
Carpet, Floor, and Tile Installers and Finishers (21,464)	Metal workers and plastic workers, nec (58,578)
Automotive Body and Related Repairers (20,568)	Insurance Claims and Policy Processing Clerks (45,219)
Photographers (20,291)	Dispatchers (38,031)
Massage Therapists (20,129)	Dental Assistants (36,913)
First-Line Supervisors of Personal Service Workers (18,544)	Bookbinders, Printing Machine Operators, and Job Printers (32,518)
Drywall Installers, Ceiling Tile Installers, and Tapers (18,441)	Couriers and Messengers (32,445)
Interviewers, Except Eligibility and Loan (17,926)	
Information and Record Clerks, All Other (13,876)	
Logging Workers (11,675)	

<p>Medical, Dental, and Ophthalmic Laboratory Technicians (11,362) Religious Workers, nec (11,019) Travel Agents (10,507) Physical Therapist Assistants and Aides (10,483) Pest Control Workers (9,146) First-Line Supervisors of Farming, Fishing, and Forestry Workers (8,948) Directors, Religious Activities and Education (8,467) Credit Authorizers, Checkers, and Clerks (6,780) Electronic Home Entertainment Equipment Installers and Repairers (6,251) Office Machine Operators, Except Computer (6,208) Coin, Vending, and Amusement Machine Servicers and Repairers (5,796) Fishing and hunting workers (5,748) Home Appliance Repairers (5,393) Upholsterers (5,255) Entertainers and Performers, Sports and Related Workers, All Other (5,099) Molders, Shapers, and Casters, Except Metal and Plastic (4,530) Fence Erectors (3,692) Locksmiths and Safe Repairers (3,574) Dancers and Choreographers (2,298) Forest and Conservation Workers (2,180) Paperhangers (747)</p>	<p>First-Line Supervisors of Housekeeping and Janitorial Workers (31,610) Butchers and Other Meat, Poultry, and Fish Processing Workers (31,592) Emergency Medical Technicians and Paramedics (25,761) Bill and Account Collectors (25,110) Roofers (23,265) Electrical, Electronics, and Electromechanical Assemblers (21,168) Brickmasons, Blockmasons, and Stonemasons (20,424) Painting Workers and Dyers (20,242) Correspondent clerks and order clerks (20,094) Reservation and Transportation Ticket Agents and Travel Clerks (18,357) Medical Records and Health Information Technicians (17,511) Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic (17,233) Highway Maintenance Workers (15,972) Parts Salespersons (15,663) Mail Clerks and Mail Machine Operators, Except Postal Service (13,494) Crushing, Grinding, Polishing, Mixing, and Blending Workers (12,595) Court, Municipal, and License Clerks (11,996) Refuse and Recyclable Material Collectors (11,605) Weighers, Measurers, Checkers, and Samplers, Recordkeeping (10,855) Cutting Workers (10,243) Extraction workers, nec (8,947) Baggage Porters, Bellhops, and Concierges (8,914) Cabinetmakers and Bench Carpenters (8,754) Cement Masons, Concrete Finishers, and Terrazzo Workers (8,622) Human Resources Assistants, Except Payroll and Timekeeping (8,150) Material moving workers, nec (7,636) Opticians, Dispensing (7,400) Molders and Molding Machine Setters, Operators, and Tenders, Metal and Plastic (7,094) Small Engine Mechanics (6,758) Construction workers, nec (6,747) Telephone Operators (6,141) Sawing Machine Setters, Operators, and Tenders, Wood (5,842) Prepress Technicians and Workers (5,669)</p>
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	<p>Insulation Workers (5,305) Jewelers and Precious Stone and Metal Workers (5,224) Switchboard Operators, Including Answering Service (5,115) Meter Readers, Utilities (4,907) Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders (4,650) Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic (4,495) Woodworkers including model makers and patternmakers, nec (4,419) Plasterers and Stucco Masons (4,026) Textile, Apparel, and Furnishings workers, nec (3,189) Furniture Finishers (2,286) Paving, Surfacing, and Tamping Equipment Operators (2,079) Proofreaders and Copy Markers (1,927) Recreational Therapists (1,885) Adhesive Bonding Machine Operators and Tenders (1,684) Textile Knitting and Weaving Machine Setters, Operators, and Tenders (1,679) Etchers, Engravers, and Lithographers (1,472) Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic (1,423) Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic (1,188) Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic (527)</p>
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Wage Quartile 3

High Flexible	Low Flexible
First-Line Supervisors of Sales Workers (577,917)	Elementary and Middle School Teachers (534,214)
First-Line Supervisors of Office and Administrative Support Workers (216,830)	First-Line Supervisors of Production and Operating Workers (141,200)
First-Line Supervisors of Construction Trades and Extraction Workers (130,493)	Electricians (104,063)
Social Workers (128,771)	Licensed Practical and Licensed Vocational Nurses (99,008)
Human Resources, Training, and Labor Relations Specialists (122,856)	Office and administrative support workers, nec (79,881)
Designers (108,822)	Pipelayers, Plumbers, Pipefitters, and Steamfitters (71,670)
Real Estate Brokers and Sales Agents (103,681)	Maintenance and Repair Workers, General (70,196)
Counselors (96,173)	Sheriffs, Bailiffs, Correctional Officers, and Jailers (59,732)
Insurance Sales Agents (73,604)	
Computer Support Specialists (71,979)	
Property, Real Estate, and Community Association Managers (68,967)	

<p>Engineering Technicians, Except Drafters (59,545)</p> <p>Other Business Operations and Management Specialists (56,619)</p> <p>Paralegals and Legal Assistants (50,319)</p> <p>Social and Community Service Managers (48,176)</p> <p>Credit Counselors and Loan Officers (47,981)</p> <p>Production, Planning, and Expediting Clerks (43,217)</p> <p>Claims Adjusters, Appraisers, Examiners, and Investigators (40,519)</p> <p>Purchasing Agents, Except Wholesale, Retail, and Farm Products (38,243)</p> <p>Editors, News Analysts, Reporters, and Correspondents (36,316)</p> <p>Computer, Automated Teller, and Office Machine Repairers (33,556)</p> <p>Legal Support Workers, nec (29,738)</p> <p>Wholesale and Retail Buyers, Except Farm Products (29,659)</p> <p>Writers and Authors (27,716)</p> <p>Artists and Related Workers (27,552)</p> <p>Advertising Sales Agents (27,511)</p> <p>Community and Social Service Specialists, nec (26,723)</p> <p>Drafters (26,373)</p> <p>Life, Physical, and Social Science Technicians, nec (26,111)</p> <p>Musicians, Singers, and Related Workers (22,635)</p> <p>Public Relations Specialists (19,178)</p> <p>Therapists, nec (19,143)</p> <p>Meeting and Convention Planners (18,904)</p> <p>Flight Attendants and Transportation Workers and Attendants (17,065)</p> <p>Appraisers and Assessors of Real Estate (14,440)</p> <p>Broadcast and Sound Engineering Technicians and Radio Operators, and media and communication equipment workers, all other (13,555)</p> <p>Logisticians (13,452)</p> <p>Healthcare Practitioners and Technical Occupations, nec (12,957)</p> <p>Dieticians and Nutritionists (12,779)</p> <p>Tax Preparers (11,857)</p> <p>Private Detectives and Investigators (11,027)</p> <p>Precision Instrument and Equipment Repairers (8,786)</p> <p>Tax Examiners and Collectors, and Revenue Agents (8,467)</p>	<p>Industrial and Refractory Machinery Mechanics (59,013)</p> <p>Machinists (53,963)</p> <p>Construction equipment operators except paving, surfacing, and tamping equipment operators (53,684)</p> <p>Postal Service Mail Carriers (50,664)</p> <p>Heating, Air Conditioning, and Refrigeration Mechanics and Installers (47,690)</p> <p>Clinical Laboratory Technologists and Technicians (45,827)</p> <p>First-Line Supervisors of Mechanics, Installers, and Repairers (45,764)</p> <p>Bus and Truck Mechanics and Diesel Engine Specialists (43,500)</p> <p>Firefighters (39,771)</p> <p>Sales and Related Workers, All Other (35,801)</p> <p>Special Education Teachers (33,908)</p> <p>Supervisors of Transportation and Material Moving Workers (32,623)</p> <p>Heavy Vehicle and Mobile Equipment Service Technicians and Mechanics (31,869)</p> <p>Transportation, Storage, and Distribution Managers (30,598)</p> <p>Librarians (27,974)</p> <p>Aircraft Mechanics and Service Technicians (25,312)</p> <p>Telecommunications Line Installers and Repairers (20,522)</p> <p>Postal Service Clerks (19,433)</p> <p>Computer Operators (19,119)</p> <p>Loan Interviewers and Clerks (18,261)</p> <p>Sheet Metal Workers, metal-working (17,219)</p> <p>Health Technologists and Technicians, nec (16,134)</p> <p>Construction and Building Inspectors (13,324)</p> <p>Gaming Services Workers (13,152)</p> <p>Stationary Engineers and Boiler Operators (13,110)</p> <p>Water Wastewater Treatment Plant and System Operators (12,968)</p> <p>Postal Service Mail Sorters, Processors, and Processing Machine Operators (12,127)</p> <p>Supervisors, Protective Service Workers, All Other (11,845)</p> <p>Media and Communication Workers, nec (11,825)</p> <p>Computer Control Programmers and Operators (11,136)</p> <p>Tool and Die Makers (10,547)</p> <p>Surveying and Mapping Technicians (10,541)</p> <p>Chemical Technicians (10,489)</p>
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<p>First-Line Supervisors of Gaming Workers (8,374)</p> <p>Financial Specialists, nec (8,285)</p> <p>Security and Fire Alarm Systems Installers (6,809)</p> <p>Archivists, Curators, and Museum Technicians (6,635)</p> <p>Television, Video, and Motion Picture Camera Operators and Editors (6,515)</p> <p>Social Scientists, nec (6,386)</p> <p>Surveyors, Cartographers, and Photogrammetrists (5,573)</p> <p>Agents and Business Managers of Artists, Performers, and Athletes (5,169)</p> <p>Agricultural and Food Scientists (4,469)</p> <p>Biological Technicians (3,233)</p> <p>Funeral Directors (2,916)</p>	<p>Eligibility Interviewers, Government Programs (10,202)</p> <p>Mining Machine Operators (9,391)</p> <p>First-Line Supervisors of Correctional Officers (8,927)</p> <p>Crane and Tower Operators (8,780)</p> <p>Structural Iron and Steel Workers (8,276)</p> <p>Chemical Processing Machine Setters, Operators, and Tenders (8,031)</p> <p>Dredge, Excavating, and Loading Machine Operators (6,466)</p> <p>Transportation Inspectors (6,454)</p> <p>Announcers (6,389)</p> <p>Ship and Boat Captains and Operators (5,830)</p> <p>Glaziers (5,479)</p> <p>Derrick, rotary drill, and service unit operators, and roustabouts, oil, gas, and mining (5,236)</p> <p>Maintenance Workers, Machinery (4,954)</p> <p>Agricultural and Food Science Technicians (4,829)</p> <p>Paper Goods Machine Setters, Operators, and Tenders (4,357)</p> <p>Sailors and marine oilers, and ship engineers (4,318)</p> <p>Electric Motor, Power Tool, and Related Repairers (4,145)</p> <p>Credit Analysts (4,038)</p> <p>Pumping Station Operators (4,018)</p> <p>Earth Drillers, Except Oil and Gas (3,928)</p> <p>Structural Metal Fabricators and Fitters (3,808)</p> <p>Hazardous Materials Removal Workers (3,733)</p> <p>Statistical Assistants (3,690)</p> <p>Metal Furnace Operators, Tenders, Pourers, and Casters (3,555)</p> <p>Control and Valve Installers and Repairers (2,886)</p> <p>Fire Inspectors (2,778)</p> <p>Gaming Managers (2,747)</p> <p>Engine and Other Machine Assemblers (2,407)</p> <p>Explosives Workers, Ordnance Handling Experts, and Blasters (2,404)</p> <p>Boilermakers (2,329)</p> <p>Electronic Equipment Installers and Repairers, Motor Vehicles (2,227)</p> <p>Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders (1,932)</p> <p>Conveyor operators and tenders, and hoist and winch operators (1,872)</p> <p>Rail-Track Laying and Maintenance Equipment Operators (1,617)</p> <p>Buyers and Purchasing Agents, Farm Products (1,521)</p>
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	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic (717) Railroad Brake, Signal, and Switch Operators (698)
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Wage Quartile 4

High Flexible	Low Flexible
Managers, nec (including Postmasters) (482,322)	Registered Nurses (423,110)
Accountants and Auditors (284,334)	Secondary School Teachers (115,282)
Sales Representatives, Wholesale and Manufacturing (200,847)	Police Officers and Detectives (112,936)
Postsecondary Teachers (194,161)	Diagnostic Related Technologists and Technicians (45,565)
Computer Scientists and Systems Analysts/Network systems Analysts/Web Developers (172,387)	Pharmacists (38,342)
Chief executives and legislators/public administration (159,164)	Radio and Telecommunications Equipment Installers and Repairers (25,281)
Financial Managers (155,048)	Dental Hygienists (23,497)
Lawyers, and judges, magistrates, and other judicial workers (152,202)	Speech Language Pathologists (19,712)
Managers in Marketing, Advertising, and Public Relations (137,566)	First-Line Supervisors of Police and Detectives (17,491)
Software Developers, Applications and Systems Software (134,466)	Electrical Power-Line Installers and Repairers (17,048)
General and Operations Managers (133,192)	Respiratory Therapists (15,029)
Education Administrators (127,354)	Physician Assistants (14,264)
Physicians and Surgeons (120,601)	First-Line Supervisors of Fire Fighting and Prevention Workers (7,966)
Constructions Managers (102,762)	Millwrights (7,790)
Management Analysts (97,897)	Power Plant Operators, Distributors, and Dispatchers (7,630)
Sales Representatives, Services, All Other (83,864)	Locomotive Engineers and Operators (7,223)
Medical and Health Services Managers (82,918)	Railroad Conductors and Yardmasters (7,143)
Computer and Information Systems Managers (73,207)	Plant and System Operators, nec (6,432)
Engineers, nec (71,882)	Air Traffic Controllers and Airfield Operations Specialists (5,645)
Computer Programmers (70,445)	Elevator Installers and Repairers (3,552)
Human Resources Managers (64,108)	Electrical and electronics repairers, transportation equipment, and industrial and utility (3,145)
Personal Financial Advisors (46,680)	Electronic Repairs, nec (1)
Civil Engineers (44,749)	
Securities, Commodities, and Financial Services Sales Agents (41,630)	
Industrial Production Managers (35,205)	
Mechanical Engineers (34,012)	
Electrical and Electronics Engineers (32,613)	
Network and Computer Systems Administrators (32,355)	
Physical Therapists (30,008)	
Physical Scientists, nec (28,188)	
Purchasing Managers (27,839)	
Compliance Officers, Except Agriculture (27,820)	

<p>Industrial Engineers, including Health and Safety (26,726)</p> <p>Architects, Except Naval (26,527)</p> <p>Psychologists (26,242)</p> <p>Aircraft Pilots and Flight Engineers (23,796)</p> <p>Actors, Producers, and Directors (23,744)</p> <p>Dentists (23,287)</p> <p>Architectural and Engineering Managers (22,408)</p> <p>Aerospace Engineers (19,302)</p> <p>Operations Research Analysts (18,473)</p> <p>Cost Estimators (17,810)</p> <p>Medical Scientists, and Life Scientists, All Other (17,741)</p> <p>Administrative Services Managers (17,372)</p> <p>Financial Analysts (15,788)</p> <p>Database Administrators (15,628)</p> <p>Education, Training, and Library Workers, nec (14,966)</p> <p>Insurance Underwriters (14,446)</p> <p>Occupational Therapists (13,942)</p> <p>Economists and market researchers (13,244)</p> <p>Chemists and Materials Scientists (12,626)</p> <p>Biological Scientists (12,297)</p> <p>Veterinarians (11,643)</p> <p>Environmental Scientists and Geoscientists (11,478)</p> <p>Technical Writers (8,889)</p> <p>Computer Hardware Engineers (8,612)</p> <p>Chemical Engineers (8,543)</p> <p>Chiropractors (7,978)</p> <p>Budget Analysts (7,242)</p> <p>Optometrists (5,402)</p> <p>Materials Engineers (5,016)</p> <p>Environmental Engineers (4,706)</p> <p>Sales Engineers (4,641)</p> <p>Petroleum, mining and geological engineers, including mining safety engineers (4,553)</p> <p>Conservation Scientists and Foresters (4,345)</p> <p>Actuaries (3,608)</p> <p>Urban and Regional Planners (3,446)</p> <p>Audiologists (2,257)</p> <p>Astronomers and Physicists (1,754)</p> <p>Statisticians (431)</p>	
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Appendix 2: Difference In Difference Models with Logged Minimum Wage Lagged One Year

Table A-2: P(Self-Employed) Difference in Difference (DD) Stratified by Wage Quartile and Flexible Occupations Using Logged Minimum Wage Lagged One Year							
	<u>Full</u>	<u>Wage Quartile</u>				<u>Flexible</u>	
		1st	2nd	3rd	4th	High	Low
	(1)	(4)	(5)	(6)	(7)	(16)	(17)
<i>Self-Employed</i> LagLog(min wage)	-0.0014 (0.0025)	0 (0.0059)	-0.0042* (0.0025)	-0.0045 (0.0042)	0.001 (0.0041)	0.0005 (0.0040)	-0.0037** (0.0018)
	(2)	(8)	(9)	(10)	(11)	(18)	(19)
<i>Unincorporated Self-Employed</i> LagLog(min wage)	0 (0.0026)	0.0015 (0.0045)	-0.0039 (0.0038)	-0.0026 (0.0037)	0.0035 (0.0026)	0.0027 (0.0042)	-0.0029* (0.0017)
	(3)	(12)	(13)	(14)	(15)	(20)	(21)
<i>Incorporated Self-Employed</i> LagLog(min wage)	-0.0014 (0.0022)	-0.0015 (0.0024)	-0.0004 (0.0030)	-0.0019 (0.0020)	-0.0025 (0.0038)	-0.0022 (0.0035)	-0.0008 (0.0010)
N	19,344,532	4,840,849	4,833,640	4,824,674	4,845,369	9,714,936	9,629,596
<p>*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified separately by the median wage for each occupation (by quartile) and occupation's flexibility of work hours. Standard errors clustered by state are in parentheses.</p> <p>Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).</p>							

Table A-3: P(Self-Employed) Triple Difference (DDD) Stratified by Wage Using Logged Minimum Wage Lagged One Year					
		Wage Quartile:			
	Full	1st	2nd	3rd	4th
	(1)	(4)	(5)	(6)	(7)
<i>Self-Employed</i>					
Flexible×LagLog(min wage)	-0.0474*** (0.0051)	-0.0939*** (0.0206)	-0.0247*** (0.0077)	-0.0315** (0.0126)	-0.0414*** (0.0106)
LagLog(min wage)	0.0228*** (0.0033)	0.0282*** (0.0092)	0.0039 (0.0037)	0.0143 (0.0095)	0.0355*** (0.0075)
Flexible	0.1880*** (0.0108)	0.3233*** (0.0407)	0.1506*** (0.0145)	0.1727*** (0.0214)	0.1673*** (0.0183)
	(2)	(8)	(9)	(10)	(11)
<i>Unincorporated Self-Employed</i>					
Flexible×LagLog(min wage)	-0.0342*** (0.0051)	-0.0888*** (0.0145)	-0.0227*** (0.0056)	(0.0181) (0.0119)	-0.0216** (0.0094)
LagLog(min wage)	0.0174*** (0.0035)	0.0282*** (0.0061)	0.0037 (0.0043)	0.0082 (0.0088)	0.0214*** (0.0069)
Flexible	0.1233*** (0.0100)	0.2804*** (0.0305)	0.1191*** (0.0102)	0.0998*** (0.0199)	0.0806*** (0.0159)
	(3)	(12)	(13)	(14)	(15)
<i>Incorporated Self-Employed</i>					
Flexible×LagLog(min wage)	-0.0132*** (0.0031)	(0.0052) (0.0079)	(0.0020) (0.0046)	-0.0134*** (0.0031)	-0.0198*** (0.0036)
LagLog(min wage)	0.0055** (0.0026)	0 (0.0039)	0.0003 (0.0036)	0.0061** (0.0025)	0.0140*** (0.0037)
Flexible	0.0648*** (0.0064)	0.0429*** (0.0142)	0.0315*** (0.0086)	0.0729*** (0.0067)	0.0867*** (0.0079)
N	19,344,532	4,840,849	4,833,640	4,824,674	4,845,369
*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified by the median wage for each occupation (by quartile). Standard errors clustered by state are in parentheses.					
Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).					

Table A-4: P(Self-Employed) Triple Difference (DDD) Stratified by Flexible Occupations Using Logged Minimum Wage Lagged One Year

Flexible:	<u>Self-Employed</u>			<u>Unincorporated Self-Employed</u>			<u>Incorporated Self-Employed</u>		
	Full (1)	High (2)	Low (3)	Full (4)	High (5)	Low (6)	Full (7)	High (8)	Low (9)
Wage Q1×LagLog(min wage)	0.0051 (0.0087)	-0.0520** (0.0228)	0.0020 (0.0068)	-0.0117* (0.0068)	-0.0708*** (0.0167)	(0.0020) (0.0067)	0.0168*** (0.0038)	0.0188** (0.0082)	0.0040*** (0.0008)
Wage Q2×LagLog(min wage)	0.0282*** (0.0049)	0.0193** (0.0090)	0.0060 (0.0052)	0.0092*** (0.0024)	(0.0021) (0.0050)	(0.0001) (0.0061)	0.0191*** (0.0037)	0.0214*** (0.0055)	0.0061*** (0.0017)
Wage Q3×LagLog(min wage)	0.0247*** (0.0050)	0.0159** (0.0072)	0.0027 (0.0038)	0.0129*** (0.0047)	0.0074 (0.0070)	0.0011 (0.0043)	0.0118*** (0.0018)	0.0084*** (0.0020)	0.0016 (0.0012)
LagLog(min wage)	-0.0160*** (0.0040)	0.0002 (0.0056)	-0.0069 (0.0051)	-0.0028 (0.0030)	0.0111** (0.0042)	-0.0023 (0.0058)	-0.0132*** (0.0033)	-0.0109** (0.0044)	-0.0045*** (0.0012)
Wage Q1	0.0336* (0.0193)	0.2289*** (0.0462)	0.0483*** (0.0123)	0.0834*** (0.0156)	0.2681*** (0.0357)	0.0481*** (0.0119)	-0.0498*** (0.0072)	-0.0392** (0.0148)	0.0002 (0.0018)
Wage Q2	-0.0383*** (0.0093)	0.0285* (0.0162)	0.0389*** (0.0095)	0.0138*** (0.0050)	0.0753*** (0.0094)	0.0341*** (0.0109)	-0.0521*** (0.0066)	-0.0468*** (0.0094)	0.0048 (0.0032)
Wage Q3	-0.0431*** (0.0091)	0.0094 (0.0127)	0.0149** (0.0066)	(0.0081) (0.0081)	0.0255** (0.0118)	0.0106 (0.0074)	-0.0350*** (0.0036)	-0.0161*** (0.0041)	0.0043* (0.0024)
N	19,344,532	9,714,936	9,629,596	19,344,532	9,714,936	9,629,596	19,344,532	9,714,936	9,629,596

*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified by the occupation's flexibility of work hours. Standard errors clustered by state are in parentheses.

Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).

	Self-Employed	Unincorporated Self-Employed	Incorporated Self-Employed
	(1)	(2)	(3)
Wage Q1×Flexible×LagLog(min wage)	-0.0551* (0.0285)	-0.0699*** (0.0208)	0.0148 (0.0090)
Wage Q2×Flexible×LagLog(min wage)	0.0146 (0.0149)	(0.0026) (0.0097)	0.0172*** (0.0059)
Wage Q3×Flexible×LagLog(min wage)	0.0117*** (0.0036)	0.0049 (0.0031)	0.0068*** (0.0021)
Wage Q1×LagLog(min wage)	0.0003 (0.0080)	(0.0029) (0.0072)	0.0032*** (0.0011)
Wage Q2×LagLog(min wage)	0.0042 (0.0069)	(0.0008) (0.0069)	0.0050*** (0.0014)
Wage Q3×LagLog(min wage)	0.0021 (0.0049)	0.0010 (0.0049)	0.0011 (0.0010)
Flexible×LagLog(min wage)	-0.0406*** (0.0109)	-0.0213** (0.0095)	-0.0193*** (0.0038)
Wage Q1×Flexible	0.1565*** (0.0528)	0.2062*** (0.0395)	-0.0497*** (0.0163)
Wage Q2×Flexible	(0.0178) (0.0257)	0.0394** (0.0170)	-0.0572*** (0.0102)
Wage Q3×Flexible	0.0012 (0.0075)	0.0199*** (0.0059)	-0.0186*** (0.0043)
LagLog(min wage)	0.0190** (0.0072)	0.0163** (0.0079)	0.0027 (0.0026)
Wage Q1	0.0631*** (0.0139)	0.0569*** (0.0125)	0.0062*** (0.0022)
Wage Q2	0.0386*** (0.0118)	0.0334*** (0.0119)	0.0052* (0.0029)
Wage Q3	0.0075 (0.0083)	0.0064 (0.0082)	0.0011 (0.0022)
Flexible	0.1684*** (0.0190)	0.0785*** (0.0160)	0.0899*** (0.0084)
N	19,344,532	19,344,532	19,344,532
*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified by the occupation's flexibility of work hours. Standard errors clustered by state are in parentheses.			
Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).			

Table A-6: P(Self-Employed) Quadruple Difference (DDD) Stratified by Gender Using Logged Minimum Wage Lagged One Year		
Gender:	Male	Female
	(1)	(2)
Wage Q1×Flexible×LagLog(min wage)	-0.0896** (0.0369)	-0.0446** (0.0212)
Wage Q2×Flexible×LagLog(min wage)	(0.0080) (0.0264)	0.0203*** (0.0049)
Wage Q3×Flexible×LagLog(min wage)	0.0105* (0.0061)	-0.0050* (0.0028)
Prob(Self-Employed)	0.1236	0.0749
N	10,014,779	9,329,753
<p>*** p<0.01, ** p<0.05, * p<0.1 Models include indicators for gender, education, age, state, and year and state by year linear time trends. The above models also include occupational flexibility, wage quartile, logged minimum wage, and interaction terms between wage quartile and minimum wage, flexibility and minimum wage, and wage quartile and flexibility. Standard errors clustered by state are in parentheses.</p> <p>Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).</p>		

Table A-7: P(Self-Employed) Quadruple Difference (DDD) Stratified by Age Using Logged Minimum Wage Lagged One Year

Age:	16 to 25	26 to 35	36 to 45	46 to 55	56 to 65
	(1)	(2)	(3)	(4)	(5)
Wage Q1×Flexible×LagLog(min wage)	(0.0083)	(0.0277)	-0.0789**	-0.1118**	-0.0966*
	(0.0081)	(0.0189)	(0.0376)	(0.0459)	(0.0522)
Wage Q2×Flexible×LagLog(min wage)	(0.0038)	(0.0049)	0.0011	0.0216	0.0689***
	(0.0074)	(0.0112)	(0.0154)	(0.0160)	(0.0209)
Wage Q3×Flexible×LagLog(min wage)	0.0126***	0.0188***	0.0202***	0.0007	(0.0033)
	(0.0042)	(0.0043)	(0.0056)	(0.0074)	(0.0086)
Prob(Self-Employed)	0.0267	0.0662	0.1070	0.1267	0.1538
N	2,787,839	3,916,816	4,448,078	4,918,543	3,273,256

*** p<0.01, ** p<0.05, * p<0.1 Models include indicators for gender, education, age, state, and year and state by year linear time trends. The above models also include occupational flexibility, wage quartile, logged minimum wage, and interaction terms between wage quartile and minimum wage, flexibility and minimum wage, and wage quartile and flexibility. Standard errors clustered by state are in parentheses.

Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).

Table A-8: P(Self-Employed) Quadruple Difference (DDD) Stratified by Education Using Logged Minimum Wage Lagged One Year					
Education:	< High School	High School	Some College	College	College +
	(1)	(2)	(3)	(4)	(5)
Wage Q1×Flexible×LagLog(min wage)	0.0279 (0.0377)	-0.0447* (0.0240)	-0.0704*** (0.0251)	-0.0776*** (0.0281)	-0.0738*** (0.0274)
Wage Q2×Flexible×LagLog(min wage)	0.0220 (0.0305)	0.0213 (0.0183)	(0.0002) (0.0182)	0.0116 (0.0093)	0.1313*** (0.0152)
Wage Q3×Flexible×LagLog(min wage)	0.0556* (0.0283)	0.0086 (0.0052)	-0.0141** (0.0057)	-0.0194** (0.0092)	0.0351*** (0.0074)
Prob(Self-Employed)	0.1026	0.1000	0.0912	0.1004	0.1163
N	1,519,710	6,583,263	4,844,928	4,032,228	2,364,403
<p>*** p<0.01, ** p<0.05, * p<0.1 Models include indicators for gender, education, age, state, and year and state by year linear time trends. The above models also include occupational flexibility, wage quartile, logged minimum wage, and interaction terms between wage quartile and minimum wage, flexibility and minimum wage, and wage quartile and flexibility. Standard errors clustered by state are in parentheses.</p> <p>Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).</p>					

Appendix 3: Difference In Difference Models with Logged Real Minimum Wage (2007 Base Year)

Table A-9: P(Self-Employed) Triple Difference (DDD) Stratified by Wage, Using Logged Real Minimum Wage					
	Full	Wage Quartile:			
	(1)	1st	2nd	3rd	4th
		(4)	(5)	(6)	(7)
<i>Self-Employed</i>					
Flexible×log(real min wage)	-0.0427*** (0.0114)	-0.1708*** (0.0343)	(0.0018) (0.0180)	(0.0026) (0.0267)	(0.0088) (0.0214)
log(real min wage)	0.0191*** (0.0061)	0.0510*** (0.0137)	-0.0059 (0.0058)	0.0011 (0.0175)	0.0043 (0.0179)
Flexible	0.1782*** (0.0224)	0.4672*** (0.0674)	0.1069*** (0.0335)	0.1174** (0.0482)	0.1046*** (0.0390)
	(2)	(8)	(9)	(10)	(11)
<i>Unincorporated Self-Employed</i>					
Flexible×log(real min wage)	-0.0295** (0.0120)	-0.1519*** (0.0236)	(0.0054) (0.0119)	0.0107 (0.0264)	0.0031 (0.0205)
log(min wage)	0.0120* (0.0063)	0.0431*** (0.0094)	-0.0036 (0.0053)	-0.0072 (0.0171)	-0.0051 (0.0164)
Flexible	0.1138*** (0.0227)	0.3984*** (0.0478)	0.0861*** (0.0219)	0.0450 (0.0476)	0.0333 (0.0371)
	(3)	(12)	(13)	(14)	(15)
<i>Incorporated Self-Employed</i>					
Flexible×log(real min wage)	-0.0131* (0.0075)	(0.0189) (0.0157)	0.0036 (0.0123)	-0.0133** (0.0063)	(0.0119) (0.0080)
log(real min wage)	0.0071* (0.0039)	0.0078 (0.0052)	-0.0023 (0.0048)	0.0083** (0.0040)	0.0094 (0.0064)
Flexible	0.0644*** (0.0146)	0.0689** (0.0292)	0.0208 (0.0226)	0.0724*** (0.0127)	0.0713*** (0.0157)
N	19,516,316	4,880,963	4,879,313	4,869,222	4,886,818
<p>*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified by the median wage for each occupation (by quartile). Standard errors clustered by state are in parentheses.</p> <p>Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).</p>					

Table A-10: P(Self-Employed) Triple Difference (DDD) Stratified by Flexible Occupations Using Logged Real Minimum Wage

Flexible:	Self-Employed			Unincorporated Self-Employed			Incorporated Self-Employed		
	Full (1)	High (2)	Low (3)	Full (4)	High (5)	Low (6)	Full (7)	High (8)	Low (9)
Wage Q1×log(real min wage)	(0.0224)	-0.1360***	0.0226*	-0.0337***	-0.1410***	0.0146	0.0112	0.0050	0.0080***
	(0.0149)	(0.0365)	(0.0128)	(0.0115)	(0.0265)	(0.0130)	(0.0069)	(0.0144)	(0.0015)
Wage Q2×log(real min wage)	0.0184	0.0200	0.0062	0.0002	(0.0039)	(0.0007)	0.0182**	0.0239*	0.0069*
	(0.0125)	(0.0221)	(0.0107)	(0.0058)	(0.0114)	(0.0132)	(0.0079)	(0.0128)	(0.0041)
Wage Q3×log(real min wage)	0.0347***	0.0291**	0.0136*	0.0205**	0.0205	0.0075	0.0142***	0.0086**	0.0061*
	(0.0090)	(0.0144)	(0.0068)	(0.0086)	(0.0145)	(0.0087)	(0.0039)	(0.0042)	(0.0031)
log(real min wage)	-0.0105*	0.0047	-0.0148	0	0.0117*	-0.0088	-0.0105**	-0.007	-0.0059***
	(0.0063)	(0.0082)	(0.0099)	(0.0039)	(0.0059)	(0.0113)	(0.0045)	(0.0053)	(0.0022)
Wage Q1	0.0860***	0.3873***	0.0092	0.1248***	0.3998***	0.0166	-0.0389***	(0.0125)	-0.0073**
	(0.0304)	(0.0719)	(0.0236)	(0.0241)	(0.0540)	(0.0238)	(0.0131)	(0.0265)	(0.0030)
Wage Q2	(0.0192)	0.0275	0.0386*	0.0309***	0.0786***	0.0352	-0.0502***	-0.0511**	0.0034
	(0.0230)	(0.0405)	(0.0197)	(0.0109)	(0.0212)	(0.0242)	(0.0145)	(0.0232)	(0.0074)
Wage Q3	-0.0618***	(0.0156)	(0.0057)	(0.0224)	0.0007	(0.0015)	-0.0394***	-0.0163**	(0.0042)
	(0.0168)	(0.0264)	(0.0123)	(0.0155)	(0.0261)	(0.0156)	(0.0075)	(0.0080)	(0.0060)
N	19,516,316	9,800,881	9,715,435	19,516,316	9,800,881	9,715,435	19,516,316	9,800,881	9,715,435

*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified by the occupation's flexibility of work hours. Standard errors clustered by state are in parentheses.

Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).

Table A-11: P(Self-Employed) Quadruple Difference (DDD) Stratified by Gender Using Logged Real Minimum Wage			
	Self-Employed	Unincorporated Self-Employed	Incorporated Self-Employed
	(1)	(2)	(3)
Wage Q1×Flexible×log(real min wage)	-0.1655*** (0.0482)	-0.1604*** (0.0352)	(0.0051) (0.0157)
Wage Q2×Flexible×log(real min wage)	0.0061 (0.0354)	(0.0098) (0.0228)	0.0159 (0.0134)
Wage Q3×Flexible×log(real min wage)	0.0094 (0.0080)	0.0085 (0.0064)	0.0009 (0.0044)
Wage Q1×log(real min wage)	0.0247 (0.0157)	0.0155 (0.0144)	0.0092*** (0.0019)
Wage Q2×log(real min wage)	0.0120 (0.0144)	0.0029 (0.0151)	0.0091*** (0.0031)
Wage Q3×log(real min wage)	0.0166* (0.0092)	0.0094 (0.0100)	0.0072*** (0.0022)
Flexible×log(real min wage)	(0.0082) (0.0224)	0.0047 (0.0211)	(0.0128) (0.0083)
Wage Q1×Flexible	0.3649*** (0.0904)	0.3764*** (0.0670)	(0.0115) (0.0289)
Wage Q2×Flexible	(0.0011) (0.0642)	0.0532 (0.0416)	-0.0543** (0.0243)
Wage Q3×Flexible	0.0060 (0.0157)	0.0132 (0.0122)	(0.0072) (0.0084)
log(real min wage)	-0.0006 (0.0152)	-0.0003 (0.0170)	-0.0004 (0.0045)
Wage Q1	0.0169 (0.0284)	0.0220 (0.0260)	(0.0051) (0.0036)
Wage Q2	0.0237 (0.0259)	0.0263 (0.0272)	(0.0026) (0.0058)
Wage Q3	(0.0201) (0.0164)	(0.0097) (0.0179)	-0.0104** (0.0043)
Flexible	0.1061** (0.0408)	0.0288 (0.0381)	0.0773*** (0.0165)
N	19,516,316	19,516,316	19,516,316

*** p<0.01, ** p<0.05, * p<0.1. Models include indicators for gender, education, age, state, and year and state by year linear time trends. Models are stratified by the occupation's flexibility of work hours. Standard errors clustered by state are in parentheses.

Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).

Table A-12: P(Self-Employed) Quadruple Difference (DDD) Stratified by Gender Using Logged Real Minimum Wage		
Gender:	Male	Female
	(1)	(2)
Wage Q1×Flexible×log(real min wage)	-0.2232*** (0.0645)	-0.1261*** (0.0331)
Wage Q2×Flexible×log(real min wage)	(0.0278) (0.0624)	0.0242** (0.0108)
Wage Q3×Flexible×log(real min wage)	0.0123 (0.0132)	(0.0094) (0.0060)
Prob(Self-Employed)	0.1236	0.0749
N	10,104,847	9,411,469
<p>*** p<0.01, ** p<0.05, * p<0.1 Models include indicators for gender, education, age, state, and year and state by year linear time trends. The above models also include occupational flexibility, wage quartile, logged minimum wage, and interaction terms between wage quartile and minimum wage, flexibility and minimum wage, and wage quartile and flexibility. Standard errors clustered by state are in parentheses.</p> <p>Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).</p>		

Age:	16 to 25	26 to 35	36 to 45	46 to 55	56 to 65
	(1)	(2)	(1)	(2)	(2)
Wage Q1×Flexible×log(real min wage)	-0.0385*** (0.0114)	-0.1125*** (0.0279)	-0.1974*** (0.0621)	-0.2639*** (0.0788)	-0.2611*** (0.0897)
Wage Q2×Flexible×log(real min wage)	(0.0048) (0.0145)	0.0018 (0.0279)	0.0087 (0.0364)	0.0201 (0.0350)	0.0533 (0.0441)
Wage Q3×Flexible×log(real min wage)	0.0119* (0.0070)	0.0229*** (0.0078)	0.0260** (0.0116)	0.0042 (0.0134)	(0.0030) (0.0156)
Prob(Self-Employed)	0.0267	0.0662	0.1071	0.1267	0.1539
N	2,814,466	3,955,927	4,495,814	4,958,321	3,291,788

*** p<0.01, ** p<0.05, * p<0.1 Models include indicators for gender, education, age, state, and year and state by year linear time trends. The above models also include occupational flexibility, wage quartile, logged minimum wage, and interaction terms between wage quartile and minimum wage, flexibility and minimum wage, and wage quartile and flexibility. Standard errors clustered by state are in parentheses.

Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).

Table A-14: P(Self-Employed) Quadruple Difference (DDD) Stratified by Education Using Logged Real Minimum Wage					
Education:	< High School	High School	Some College	College	College +
	(1)	(2)	(1)	(2)	(2)
Wage Q1×Flexible×log(real min wage)	(0.0472)	-0.1577***	-0.1624***	-0.1715***	-0.1682***
	(0.0518)	(0.0391)	(0.0422)	(0.0485)	(0.0448)
Wage Q2×Flexible×log(real min wage)	(0.0029)	(0.0067)	(0.0010)	0.0314	0.1831***
	(0.0558)	(0.0402)	(0.0405)	(0.0197)	(0.0276)
Wage Q3×Flexible×log(real min wage)	0.0839*	(0.0141)	-0.0257**	(0.0185)	0.0410**
	(0.0439)	(0.0093)	(0.0114)	(0.0220)	(0.0187)
Prob(Self-Employed)	0.1026	0.1000	0.0912	0.1004	0.1164
N	1,536,084	6,646,864	4,885,600	4,065,266	2,382,502

*** p<0.01, ** p<0.05, * p<0.1 Models include indicators for gender, education, age, state, and year and state by year linear time trends. The above models also include occupational flexibility, wage quartile, logged minimum wage, and interaction terms between wage quartile and minimum wage, flexibility and minimum wage, and wage quartile and flexibility. Standard errors clustered by state are in parentheses.

Source: U.S. Census American Community Survey 2001 - 2017, Neumark (2019).