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Abstract

This study investigates the impacts of the minimum wage on U.S. regional labor markets. The empirical analysis uses panel data covering ten years and (most) U.S. counties to examine the relationship between the minimum wage and several key components of the labor market. Following past research, we use data on the number of people in the labor force to represent labor supply, but—as an extension to the literature—we use job postings data as a measure of labor demand. Consistent with previous studies, our findings show a positive relationship between the number of people in the labor force and a county's minimum wage. The results, however, show that the relationship between job postings and the minimum wage is not statistically significant in the full-sample analysis of U.S. counties. Additional analyses also suggest that metropolitan and urban labor markets react differently to changes in the minimum wage when compared to their non-metropolitan and rural counterparts.

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1. Introduction

In the United States, the relationship between the minimum wage and various aspects of regional labor markets has been a topic of discussion since the wage floor was introduced in 1938 (Stigler, 1946). During the last 85 years, advancements in empirical methodologies and data collection have dramatically improved the way researchers estimate the impacts of the minimum wage. Instead of providing clarity, however, researchers continually produce contradictory findings, turning this topic of discussion into one of the most fiercely debated subjects in economics. This debate is also prevalent in the political sphere where policymakers at all levels of government often disagree about the impacts of the minimum wage on workers and businesses (Peters, 2009).

The last federal increase took effect in July 2009 and increased the minimum wage from $6.55 to $7.25. At that time, 11 states and the District of Columbia already had wage requirements exceeding the new minimum. By the end of 2010, three more states had increased their wage requirements above the federal floor (Figure 1). In the following years, many state and local governments continued to raise their minimum wage requirements and by 2019, 29 states, five counties and 41 cities had wage requirements above the federal minimum ("Inventory of U.S. City and County Minimum Wage Ordinances," 2022). Even with these wage increases, during 2019 approximately 1.6 million hourly U.S. workers earned wages at or below the federal minimum (Characteristics of Minimum Wage Workers, 2019, 2020).

Insert Figure 1(Map)

This paper contributes to the literature by using panel data of U.S. counties to evaluate the impact of the minimum wage on several key components of the labor market. While the minimum wage literature is substantial, most large-scale studies focus on the impacts of the minimum wage on indicators related to labor supply (e.g., number of people in the labor force) with little mention of labor demand. One reason for this emphasis on aspects of labor supply is the lack of data measuring labor

demand. Our study uses job postings data, collected by Lightcast analytics, as a proxy for labor demand.[2] While the number of job postings is not equivalent to actual labor demand, it represents the hiring desires and plans of businesses within U.S. counties. In addition to extending the literature with an analysis of job postings, this paper provides an update to existing studies using data from 2010 to 2019. This period is characterized by relatively stable economic activity, and, because of numerous actions taken by state and local legislation, it features large variation in the minimum wage across U.S. counties.

2. Literature Review

2.1 Historical Perspectives on Labor Theory

Neoclassical labor theory argues that because time is finite—i.e., there are only so many hours in a day—all individuals face a tradeoff between hours spent on work and hours spent on leisure (Cahuc & Zylberberg, 2004). Theory further argues that wage dictates how workers navigate this tradeoff. A low wage is thought to decrease the amount of time an individual spends working while a high wage should result in the individual working more hours. If wages fall too low, an individual may choose to spend zero hours on work (Greenlaw & Shapiro, 2017). This tipping-point wage, or the lowest wage an individual is willing to accept, is referred to as the reservation wage (Falk et al., 2006). In general, an individual's reservation wage is determined by their search costs, the rate of job offers they receive, and the distribution of their wage offers (Addison et al., 2013).

As suggested by neoclassical labor theory, the employed population is comprised of individuals who have a reservation wage below the market wage. Conversely, the unemployed population is made-up of individuals who have a reservation wage above the market wage. Together, the employed and unemployed populations make up the total labor supply (Vachris & Bohanon, 2012). Under this theory,

[2] Lightcast was formerly Emsi and Burning Glass Technologies. Information about Lightcast and how it collects job postings data can be found here: https://kb.emsidata.com/glossary/total-job-postings/

an individual's characteristics and preferences determine if they choose employment or unemployment. Likewise, neoclassical labor demand theory is conceptually straightforward. As long as the expected profits from a vacant job are positive, existing firms will continue to hire workers and new firms will enter the market creating additional vacancies. This pattern will continue until the cost of the vacancy is equal to the expected profit from the job being filled. Once a firm reaches this equilibrium, it will not hire additional workers unless its output profits increase or its wage requirements decrease (Cahuc et al., 2014).

Neoclassical labor theory, however, is heavily debated. In a 1936 publication, John Maynard Keynes introduced the idea of involuntary unemployment. Under Keynes' theory, individuals may be denied employment even if their reservation wage is below the market wage. In this situation, labor demand falls below labor supply, and the mismatch adds to the unemployed population (Keynes, 1936; Spencer, 2006). The Keynesian labor hypothesis suggests that the demand for a firm's products determines the number of people that the business employs. If a firm experiences a decrease in product demand, it will respond by laying off workers rather than lowering output prices (Keynes, 1936; Bils et al., 2013).

Neoclassical and Keynesian theories provide a logical base to explain specific labor market dynamics. Neither theory, however, fully explains observable events in modern labor markets. By assuming labor markets are perfectly competitive, theory does not account for the effects of resource allocation, imperfect information, mobility costs, job search costs, recruitment costs and more (Cahuc et al., 2014). Utilizing a theoretical base while acknowledging these limitations is essential when examining the relationship between wages and employment at regional and macro levels.

2.2 Evolution of Modern Minimum Wage Theory

Prior to 1990, most applied economic studies found an inverse relationship between the minimum wage and employment (Brown et al., 1982). In the early 1990s, however, a series of studies by David Card, Alan Krueger and Lawrence Katz reignited the debate regarding the minimum wage's effect on employment. Focusing on the 1991 federal minimum wage increase, Katz and Krueger were unable to identify a negative effect on employment in Texas' fast-food industry (Katz & Krueger, 1992). Likewise, Card and Krueger failed to find a negative impact on employment when looking at New Jersey's fast-food industry before and after a state-mandated wage increase (Card & Krueger, 1994).

The findings of Card (1992), Katz and Krueger (1992), and Card and Krueger (1994) generated renewed interest in the impacts of the minimum wage. For example, David Neumark and William Wascher produced results from a national analysis which concluded a "10% increase in the minimum wage causes a decline of 1-2% in employment among teenagers and a decline of 1.5-2% in employment for young adults" (Neumark & Wascher, 1992, p. 55). Card, Krueger, and Katz revisited the 1992 study by Neumark and Wascher and, after altering the methodology, produced results consistent with their findings (from the Texas and New Jersey studies) of no negative impact on employment (Card et al., 1994). Likewise, Neumark and Wascher reevaluated the Card and Krueger 1994 study and, after changing the data from survey data (used by Card and Krueger) to payroll data, identified results consistent with their 1992 research (Neumark & Wascher, 1995). By the second half of the 1990s, contradictory findings related to the impacts of the minimum wage appeared in other industrialized countries including the United Kingdom, Netherlands, New Zealand, and Portugal (Neumark & Wascher, 2004).[3]

[3] United Kingdom (Minford and Ashton [1996] vs. Machin and Manning [1994, 1996])
Netherlands (Van Soest [1994] vs. Dolado et al. [1996])
New Zealand (Maloney [1995] vs. Mare [1995] and Chapple [1997])
Portugal (Pereira [2003] vs. Portugal and Cardoso [2002])

The debate over the effect of the minimum wage on employment persists in the United States and abroad. A 2014 analysis reviewed 74 minimum wage studies published after 2000 and found the results of these studies varied widely in magnitude, sign, and significance (Belman & Wolfson, 2014). More recent work by Alan Manning (2021) acknowledges the inconsistent relationship between wages and employment. With that in mind, Manning suggests that labor economists should focus on identifying the level at which the minimum wage produces negative employment effects. A study of Greece's labor market attempts to determine this level. Using data collected between 2004 and 2019, Eirini Andriopoulou and Alexandros Karakitsios (2021) failed to find evidence of a causal relationship between raises in the minimum wage and transitions into unemployment. Their analysis suggests Greece's minimum wage may still be below the "adequate" level.

Variation in wage rates between countries is often dramatic but can be explained in part by institutional and regulatory differences. Wage variation within a country, however, is harder to explain because labor and capital are unconstrained and differences in institutions and regulations are relatively small. To understand regional wage disparities within a single country, researchers need to examine local labor markets (Enrico, 2011).

2.3 Regional Approaches to the Minimum Wage and Employment

In his seminal 1992 publication, Card exploited regional differences in employment and wages to examine how the 1990 federal minimum wage increase impacted teen employment. This research, along with several other studies conducted in the early 1990s, laid the foundation for modern minimum wage analysis (Neumark & Wascher, 1992; Katz & Krueger, 1992; Williams, 1993). Recent contributions to the literature continue to expand the scope of the 1990s studies. A 2019 U.S. county-level analysis of the agricultural industry looked at long-run elasticity and found evidence that a "10% increase in the minimum wage is associated with a 4% decline in aggregate farm employment after 10-20 years"

(Kandilov & Kandilov, 2020, p. 613). Results from an economic study in Poland indicate that national wage increases between 2006 and 2012 did not impact overall employment. As the mandatory increases continued, however, the estimated impact on employment became (and remained) negative from 2013 to 2018. Likewise, research shows that regions with higher average wages are less likely to be negatively impacted by a mandatory wage increase compared to regions with lower average wages (Majchrowska & Strawiński, 2021).

2.4 Job Vacancies and the Labor Market

Within the literature, there are a limited but growing number of studies utilizing the number of job postings as a measure of labor demand. In a 2007 publication, researchers manually collected "help-wanted ads" from Sunday editions of the *Portland Oregonian* and the *Seattle Times*.[4] Using this data, the study produced evidence suggesting that raises in the minimum wage "reduced the amount of job vacancies (and related hiring efforts), particularly for those jobs where the minimum wage is relatively binding" (Singell Jr & Terborg, 2007, p. 41). Since the 2007 study, web scraping tools, online databases, and other technological advances have vastly improved the accuracy and availability of job postings data. When studying the pandemic, Shuai and colleagues collected weekly job postings data and found "COVID-19 caused a significant decline in labor demand, by as much as 30%, measured by the number of job advertisements" (Shuai et al., 2021, p. 29). This research also determined that the correlation coefficient between their job postings data and the official U.S. non-agricultural employment data was 0.75 (significant at a 99% confidence level). Other pandemic-related studies use job vacancy data as an indicator of future employment and argue that it is a main determinant of how many unemployed people will be able to find work (Fukui et al., 2020). Our study builds on these contributions by using ten years of job postings data as a measure of labor demand in U.S. counties.

[4] Help wanted ads were collected for specific eating/drinking and hotel/lodging jobs between 1994 and 2001

3. Data

To estimate the effects of changes in the minimum wage on aspects of regional labor markets, we use panel data collected annually from 2010 to 2019. This timeframe, characterized by relatively stable economic conditions, minimizes the influence of 2007's recession and 2020's COVID-19 pandemic. Concerning the level of analysis, we focus on labor markets at the county level. By analyzing these smaller regions, we follow the examples of Thompson (2009) and Kandilov and Kandilov (2020), who argue that counties are a more accurate representation of labor markets than larger, more heterogeneous states.

Minimum wage numbers are from the U.S. Department of Labor and the University of California, Berkeley's Labor Center. Using this data, we determined that, in 2010, 14 states and the District of Columbia had a minimum wage higher than the federal requirement of $7.25 per hour (Changes in Basic Minimum Wages, 2022). These 14 states contain 542 counties, which account for approximately 17% of the total number of U.S. counties. By 2019, however, 29 states, five counties and 41 cities had increased their wage requirements above the federal minimum ("Inventory of U.S. City and County Minimum Wage Ordinances," 2022). Collectively, these 29 states have 1,343 counties, or approximately 43% of all U.S. counties. While it was relatively straightforward to assign state and county-level minimum wage changes to the appropriate counties and years, addressing minimum wage increases at the city level was more challenging.[5] As a result, we determined that if a wage ordinance was enacted in a city that contained more than 30% of its county's population, the higher wage would be used for the entire county. For example, the city of Flagstaff, Arizona, increased its minimum wage in 2017. At that time, 51% of Coconino County's population resided in Flagstaff; therefore, the higher wage was applied to the

[5] Minneapolis and multiple cities in California imposed wage rates based on the size of the firm. In these situations, we used the wage for firms who employed between 25 and 500 employees.

entire county. If multiple cities within a county raised their wages, we used the wage from the most populous city. It is important to note that during the sample period, multiple city wage ordinances were exceeded by state-mandated increases. Finally, because our data are measured annually, all wage changes were applied to the entire year, regardless of what month they took effect.

Information regarding local job vacancies (also referred to as "job postings"), used as a measure of labor demand, was collected via Lightcast, previously EMSI and Burning Glass Technologies. Lightcast's job vacancy data are compiled from more than 45,000 websites and it is cleaned to remove duplicate postings. This labor market database has been used in several academic studies including research by Azar et al. (2019), Hershbein and Kahn (2018) and Deming and Kahn (2018).[6] After extracting vacancy data for our sample period, we discovered that 13 counties returned zero job postings for one or more years. These counties were eliminated from the sample in order to maintain a balanced panel.[7] Population estimates are from the US Census Bureau.[8] Employment, unemployment and labor force numbers came from the Bureau of Labor Statistics. Finally, The Bureau of Economic Analysis provided approximations for gross domestic product (GDP) and average wages. Table 1 shows a complete list of variables and descriptive statistics.

Insert Table 1(Descriptive Statistics)

Additional data cleaning was required to ensure consistent, county-level data collection across the various agencies. We began by addressing the United States' 41 independent cities. While these cities are treated as county equivalents by the Census Bureau, other government and private agencies combine a variety of independent cities with nearby counties when reporting data.[9] These differences led us to exclude the state of Virginia from the analysis, which removed 95 counties and 38 independent

[6]See Azar et al. (2019) for a more complete overview of Lightcast (EMSI & Burning Glass) and its use in academic research.
[7] Eliminated counties include Blaine County, Nebraska; Echols County, Georgia; Kent County, Texas; Keya Paha County, Nebraska; Loup County, Nebraska; Loving County, Texas; McPherson County, Nebraska; San Juan County, Colorado; Slope County, North Dakota; Terry County, Texas; Throckmorton County, Texas; Webster County, Georgia; King County, Texas.
[8]A U.S. census was collected in 2010.
[9] Louisiana's parishes were treated as counties.

cities. We then merged the three remaining independent cities with their surrounding counties and adjusted the data accordingly.[10] Alaska was also excluded from the analysis due to inconsistencies pertaining to its boroughs and census areas. After data cleaning, our final sample contained 10 annual observations of 2,963 counties.

4. Empirical Strategy and Methods

The empirical analysis examines the effects of a county's minimum wage on the number of job postings (*Posts*), the number of people in the labor market (*Labor*), the number of people who are unemployed (*Unemp*) and a county's level of output (*GDP*). As noted above, the number of people in the labor market is a measure of labor supply, whereas the number of job postings by businesses is used to represent labor demand in a county. The number of people who are unemployed is an outcome of a binding wage floor and the forces of labor demand and supply in a region, and county-level GDP is a measure of the amount of economic activity in the region. Equations 1 to 4 summarize the empirical models estimated in the analysis:

(1) $\ln(Posts_{c,t}) = \beta_1 \ln(Min\_Wage_{c,t}) + \beta_2(X_{c,t}) + \sigma_c + \tau_t + \varepsilon_{c,t}$
(2) $\ln(Labor_{c,t}) = \beta_1 \ln(Min\_Wage_{c,t}) + \beta_2(X_{c,t}) + \sigma_c + \tau_t + \varepsilon_{c,t}$
(3) $\ln(Unemp_{c,t}) = \beta_1 \ln(Min\_Wage_{c,t}) + \beta_2(X_{c,t}) + \sigma_c + \tau_t + \varepsilon_{c,t}$
(4) $\ln(GDP_{c,t}) = \beta_1 \ln(Min\_Wage_{c,t}) + \beta_2(X_{c,t}) + \sigma_c + \tau_t + \varepsilon_{c,t}$

where, ln(*Posts*) is the natural logarithm of the number of job postings, ln(*Labor*) is the natural logarithm of the number of people who are employed or actively seeking employment, ln(*Unemp*) is the natural logarithm of the number of people looking for work, ln(GDP) is the natural logarithm of the value of goods and services produced in the county, and ln(*Min_Wage*) is the natural logarithm of the minimum wage. The error term is denoted by $\varepsilon_{c,t}$.

[10] St. Louis City joined St. Louis County, Baltimore City joined Baltimore County, Carson City joined Douglas County.

Equations 1 to 4 include fixed effects for the year (τ_t) and county (σ_c). This specification differences away county-specific, time-invariant factors that influence the dependent variables. Following common practice in the literature, we include a matrix of demographic control variables ($X_{c,t}$), to account for population growth and average wages in the county. Population growth is included in the regressions given its close connection to the supply of (and demand for) labor in a county. We include average wages in a county as a proxy for worker productivity. In Equations 1 to 3, we also include county-level GDP, lagged by one year, as an explanatory variable to control for the size of a county's economy. Using these specifications, we can benchmark our results within the literature and create a baseline for reference when conducting additional analysis.

Previous studies suggest that changes in the minimum wage do not have a uniform effect across labor markets. To explore the heterogeneity in the effects of the minimum wage, we analyze subgroups of U.S. counties. Following the work of Enrico (2011) and Gilbert et al. (2001), we compare urban and metropolitan counties to rural and non-metropolitan counties.[11] We also examine the effects of the minimum wage in counties with the lowest average wages. In theory, these low-wage counties should be more impacted by minimum wage changes than higher-wage counties.

5. Empirical Results

5.1 Main Findings

Table 2 presents regression results on the effects of the minimum wage on job postings, the number of people in the labor market, the number of people who are unemployed, and county-level GDP. The second specification uses the variables shown in Equations 1 to 4, while Specifications 1 and 3 display results for alternative models.

[11] Urban and rural counties were determined using the US Census Bureau's *List of Population, Land Area, and Percent Urban and Rural in 2010*. Metro and non-metro areas were classified using the USDA's 2013 Urban-Rural Continuum Codes where metropolitan counties are assigned a number between 1-3 and non-metropolitan counties have a number between 4 and 9.

Insert Table 2 (regression results for equations 1-4)

In Specification 2, the effects of raising the minimum wage on the numbers of people in the labor force and those who are unemployed are positive and statistically significant. Using the parameter estimates, a 100% increase (i.e., doubling) in the minimum wage is associated with a 4.5% increase in the labor force and a 17.4% increase in unemployment. The result pertaining to the labor force variable suggests that a higher minimum wage brings more people into the labor force and the effect related to unemployment suggests that a higher minimum wage increases the gap between the number of people in the labor force and the number of jobs provided by businesses in the region. These findings are consistent with the results of Biçerli and Merve, (2019), Brunt and Barilla (2018), and Partridge and Partridge (1999). Estimates for the effects of the minimum wage on job postings and GDP are negative, but not statistically significant.

These regression results are highly robust to the inclusion of different combinations of explanatory variables in the model. For example, the minimum wage has a positive and statistically significant effect on the labor force and unemployment variables in a regression that—along with the dummy variables indicating the year and county—has a single explanatory variable representing the minimum wage (Specification 1). Likewise, the results are similar in a regression model that controls for a county's (lagged) GDP, which represents the size of regions. Although the models' goodness-of-fit increase substantially with the inclusion of county GDP (e.g., from less than 0.1 to about 0.5 or higher), the estimated coefficients corresponding to the minimum wage variable are practically identical between Specifications 2 and 3.

Along with the analysis of the full sample of 2,963 U.S. counties, we examine the effects of the minimum wage on the labor markets of several different types of regions. For these regressions, we use model Specification 1 that includes the minimum wage variable along with dummy variables for the county and year. In the tables (3 to 5) that present these results, we highlight the estimated coefficients

that measure the effect of the minimum wage on the four different dependent variables (i.e., job postings, labor market, unemployment, GDP).

5.2 Urban and Rural Analysis

Our first analysis of subsamples of the main dataset examines the effects of the minimum wage in urban and rural counties (Table 3). A county is considered urban if more than one-half of its population resides in an urban area, as defined by the U.S. Census Bureau (see footnote 12). All other counties were classified as rural. Using the 11,930 observations for urban counties, we once again find a positive and statistically significant effect of the minimum wage on the number of people in the labor force (0.048), but a negative and statistically significant effect on unemployment (-0.139). The decrease in unemployment associated with the minimum wage is in accord with the results of Card and Krueger (1994), who suggest that a reasonable increase in the minimum wage will have a small, if any, negative consequence on the labor market.

Focusing on the 17,700 observations in rural counties, the regressions show positive and statistically significant parameter estimates for the impacts of the minimum wage on the number of people in the labor force and unemployment. Applying these estimates, which are similar to those found in our analysis of all U.S. counties, we find that doubling the minimum wage is associated with a 3% increase in the rural labor force and an 34.3% increase in rural unemployment. The magnitude of the minimum wage's impact on rural unemployment aligns with the work of Thompson (2009), who found that smaller counties (i.e., those employing less than 10,000 people) experienced relatively larger employment effects after a wage increase. Likewise, a study of Great Britain's labor market found the effects of a minimum wage increase to be "the greatest in remote rural areas where labor markets are less integrated with urban ones" (Gilbert et al., 2001, p. 769).

Insert Table 3 (regression results for urban and rural subsamples)

5.3 Metropolitan and Non-Metropolitan Analysis

A second analysis of subsamples of the dataset of all U.S. counties investigates the impacts of the minimum wage on metropolitan and non-metropolitan regions (Table 4). The metropolitan versus nonmetropolitan area classification is based on the USDA Rural-Urban Continuum Codes (see footnote 12). The regression results focusing on metropolitan counties show a negative and statistically significant effect of the minimum wage on the number of job postings by businesses in a county. Specifically, we find that a 100% increase in the minimum wage is associated with a 33.3% decrease in the number of job postings. This negative impact of the minimum wage on job postings aligns with the recent empirical study by Romich et al. (2020), which found that approximately one in four employers of low-wage workers reported reducing their workforces in response to Seattle's minimum wage increase.[12]

Results from the analysis of non-metropolitan counties mirrored those found in the regressions focusing on the rural subsample of counties. In response to an increase in the minimum wage, non-metropolitan counties experience a positive and statistically significant increase in the labor force (0.067) but a larger change—in terms of elasticity—in the number of people who are unemployed (0.213). Overall, the results pertaining to the impacts of the minimum wage on unemployment in metropolitan and non-metropolitan counties provide additional support for the argument that minimum wage increases have more adverse employment effects in less dense labor markets.

Insert Table 4 (regression results for metro and non-metro subsamples)

[12] Workforce reductions include reductions in hours and/or employees

5.4 Average Wage Analysis

Our final analysis of subsamples of U.S. counties separates regions by the average wages of workers in the county. We are particularly interested in the effects of the minimum wage on the labor markets of low-wage counties, given that the minimum wage is likely to be "more binding" in these areas (Ford et al., 2012). Specifically, we identified and grouped the 296 counties with the lowest average wages in 2015, which accounts for roughly ten percent of all counties in our main sample.[13] The rest of the counties, with higher wages as of 2015, were used as a comparison group.

Regression results (Table 5) from an analysis of the low-wage counties show that the minimum wage has a negative effect on job postings and a positive effect on the number of people who are unemployed. When looking at the higher-wage counties, the results show a positive and statistically significant impact of the minimum wage on the number of people in the labor force and those who are unemployed. While the analysis of both subsamples of counties indicates a positive relationship between unemployment and the minimum wage, results from the low-wage subsample suggest that a doubling of the minimum wage is associated with a 48% increase in unemployment. Doubling the minimum wage in higher-wage counties, however, is associated with only an 8% increase in unemployment. These findings align with the research of Clemens and Wither (2019), Singell Jr. and Terborg (2007), and Majchrowska and Strawiński (2021), who argue that mandatory wage increases have larger employment effects in markets where the wage is binding.

Insert Table 5 (regression results for average wage subsamples)

[13] To maintain a balanced panel, we determined our groups based on 2015's values and then include the ten observations of those counties.

6. Conclusions

This study examined the effects of the minimum wage on several indicators of U.S. regional labor markets. We use the number of people in the labor market as an indicator of labor supply and, as an extension to the minimum wage literature, the job postings of businesses to represent labor demand. Regression results from an analysis of (almost) all U.S. counties suggest that a higher minimum wage brings more people into the labor market and, subsequently, is associated with a larger number of people who are unemployed. The analysis of all U.S. counties, however, does not reveal a statistically significant relationship between the number of job postings in a county and the minimum wage.

Extensions to the main analysis investigate the effects of the minimum wage on different subsamples of counties. Here, we find that—generally speaking—an increase in the minimum wage has more pronounced impacts on unemployment in rural and non-metropolitan areas, and in counties with lower average wages. Although the analysis of all U.S. counties does not uncover a negative effect of the minimum wage on the job postings of businesses, our analysis of subsamples of U.S. counties shows a negative relationship between the number of postings and the minimum wage in metropolitan counties and low-wage areas.

Our findings suggest that the effects of the minimum wage on regional labor markets differ depending on the type of county (e.g., rural versus urban, low wage versus higher wage) and the labor market indicator considered. Although these differences limit our ability to come up with a definitive conclusion for how the minimum wage affects businesses and workers, our findings shed light on recent minimum wage studies that show very different and, often, contradictory results. In the literature review summarized at the beginning of this paper, we noted the wide differences in results regarding the minimum wage in studies that used different methodologies and data, and focused on different areas. In this study, we find substantial heterogeneity in our results across different types of regions despite using the same empirical methods and data.

Overall, these results suggest to state and local policymakers that there's no one-size-fits-all answer to the question of how the minimum wage affects workers, businesses and regions. Whereas an increase in the minimum wage might disrupt the labor market of a low-wage, rural area, a minimum wage hike might go largely unnoticed—in terms of the impact on unemployment—in a high-wage, urban county. Our findings also provide a challenge to federal policymakers when considering the impacts of an increase to the U.S. minimum wage. That is, the overall impacts of an increased U.S. minimum wage on total U.S. employment will likely conceal large impacts in some regions that are balanced by smaller (or offsetting) impacts elsewhere.

Future research can use our insights into the effects of the minimum wage on different types of U.S. counties to show the uneven impacts of potential increases in the U.S. minimum wage across regions. Other promising avenues for additional research include an analysis—using microdata or surveys—of the impacts of the minimum wage on different types of businesses and workers. Insights gained from the "micro" effects of the minimum wage might help further inform results of how the minimum wage impacts regional and macro labor markets.

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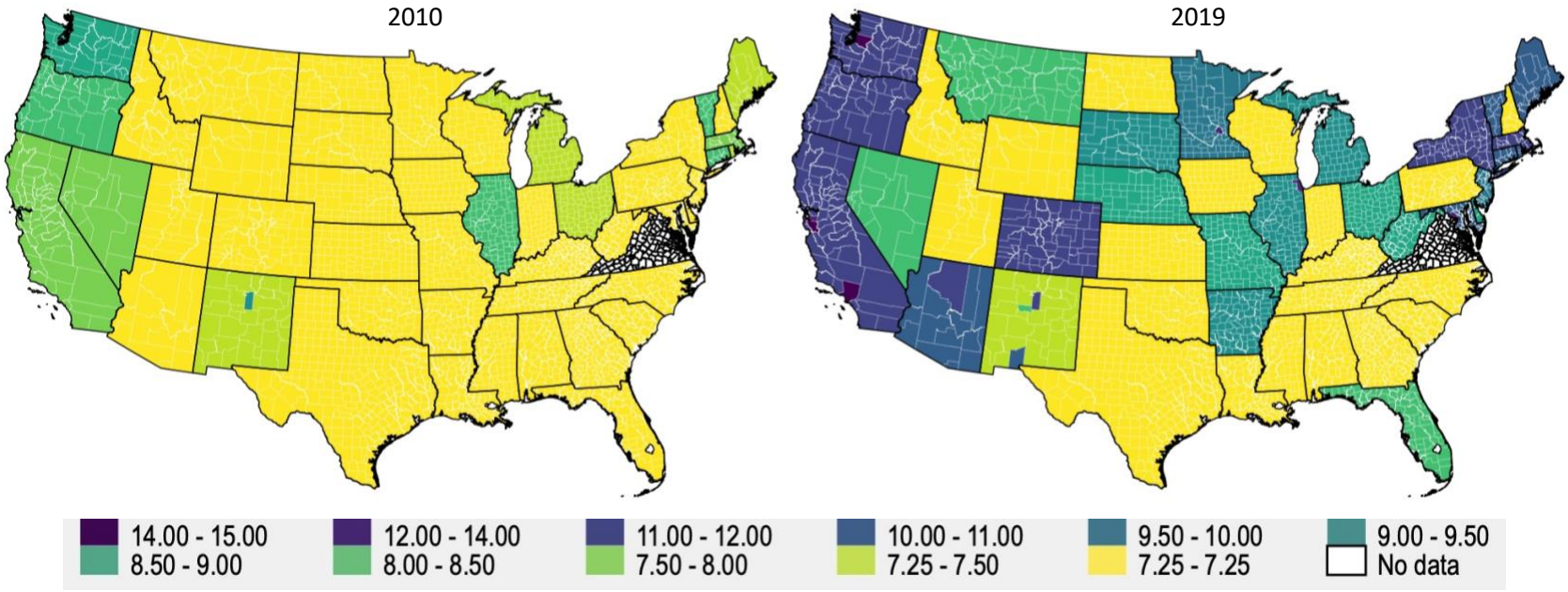
Figure 1 Minimum Wage Level by State and County



*Not shown Hawaii's and Alaska's minimum wage increased from $7.25 to $10.10 and $10.19 respectively

Table 1 Descriptive statistics of variables used in the analysis

Variable		Mean	Std. dev.	Min	Max
Minimum Wage *(dollars)*	Overall	7.70	0.85	7.25	15.00
	Between		0.63	7.25	11.38
	Within		0.57	4.87	12.65
Labor Force *(persons)*	Overall	51,661.39	167,823.50	217.00	5,153,091.00
	Between		167,758.00	225.90	5,010,230.00
	Within		5,524.96	-83,632.61	257,713.30
Unemployment *(persons)*	Overall	3,216.61	12,233.76	8.00	621,950.00
	Between		11,510.95	11.00	396,917.50
	Within		4,147.67	-166,665.90	228,249.10
Job Postings	Overall	8,434.87	37,913.09	1.00	1,392,074.00
	Between		35,119.20	9.20	764,357.70
	Within		14,298.19	-410,585.80	636,151.20
Gross Domestic Product *(thousands of chained 2012 dollars)*	Overall	5,588,256.00	23,900,000.00	6,311.00	704,000,000.00
	Between		23,800,000.00	18,201.50	622,000,000.00
	Within		2,179,634.00	-63,900,000.00	90,600,000.00
Average Wage *(dollars)*	Overall	39,945.95	11,534.13	14,929.00	225,987.00
	Between		10,701.65	17,472.60	194,093.90
	Within		4,306.47	-9,870.95	89,246.65
Population Change (*percent*)	Overall	0.08	1.29	-34.61	23.65
	Between		0.90	-3.89	10.23
	Within		0.93	-30.92	19.40

Note: Excluding population change, the total number of observations is 29,630, or ten observations of 2,963 counties. The number of observations for population change is 26,667, or nine observations of 2,963 counties.

Table 2 Regression results from primary models

	Specification 1				Specification 2				Specification 3		
Variable	**ln(Posts)**	**ln(Labor)**	**ln(Unemp)**	**ln(GDP)**	**ln(Posts)**	**ln(Labor)**	**ln(Unemp)**	**ln(GDP)**	**ln(Posts)**	**ln(Labor)**	**ln(Unemp)**
ln(Min_Wage)	-0.060 (0.062)	0.057*** (0.011)	0.119*** (0.031)	0.015 (0.025)	-0.077 (0.059)	0.045*** (0.010)	0.174*** (0.027)	-0.030 (0.025)	-0.072 (0.058)	0.047*** (0.009)	0.177*** (0.027)
ln(Ave_Wage)	-	-	-	-	0.057 (0.074)	0.200*** (0.012)	-0.630*** (0.029)	0.943*** (0.036)	-0.059 (0.071)	0.153*** (0.011)	-0.706*** (0.029)
Population Change	-	-	-	-	0.024*** (0.003)	0.005*** (0.000)	-0.019*** (0.002)	-0.001 (0.001)	0.025*** (0.003)	0.005*** (0.000)	-0.019*** (0.002)
l.ln(GDP)	-	-	-	-	-	-	-	-	0.244*** (0.047)	0.098*** (0.008)	0.158*** (0.013)
Time/County Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs	29,630	29,630	29,630	29,630	26,667	26,667	26,667	26,667	26,667	26,667	26,667
R^2 Overall	0.062	0.009	0.037	0.001	0.061	0.080	0.007	0.139	0.605	0.824	0.470

Note: Robust standard errors are reported in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 3 Regression results for urban and rural subsamples

Panel A. Counties where more than 50% of the population is urban (URBAN)						**Panel B. Counties where less than 50% of the population is urban (RURAL)**					
Dependent Variables	**Explanatory Variable**	**Model Fit**				**Dependent Variables**	**Explanatory Variable**	**Model Fit**			
	ln(Min_Wage)	R^2 Within	R^2 Between	R^2 Overall	rho		ln(Min_Wage)	R^2 Within	R^2 Between	R^2 Overall	rho
ln(Posts)	-0.087 (0.069)	0.712	0.055	0.056	0.973	ln(Posts)	0.099 (0.096)	0.670	0.010	0.156	0.900
ln(Labor)	0.048*** (0.015)	0.034	0.053	0.012	0.999	ln(Labor)	0.030** (0.015)	0.126	0.000	0.000	0.998
ln(Unemp)	-0.139*** (0.042)	0.857	0.070	0.034	0.993	ln(Unemp)	0.343*** (0.044)	0.855	0.000	0.064	0.987
ln(GDP)	0.021 (0.033)	0.150	0.049	0.002	0.994	ln(GDP)	-0.027 (0.037)	0.040	0.001	0.001	0.983
No. Obs.	11,930					No. Obs.	17,700				

Note: Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 4 Regression results for metro and non-metro subsamples

Panel A. Metro Counties						**Panel B. Non-Metro Counties**					
Dependent Variables	**Explanatory Variable**	**Model Fit**				**Dependent Variables**	**Explanatory Variable**	**Model Fit**			
	ln(Min_Wage)	R^2 Within	R^2 Between	R^2 Overall	rho		ln(Min_Wage)	R^2 Within	R^2 Between	R^2 Overall	rho
ln(Posts)	-0.333*** (0.081)	0.696	0.098	0.041	0.975	ln(Posts)	0.139 (0.089)	0.669	0.020	0.131	0.919
ln(Labor)	0.006 (0.014)	0.132	0.097	0.000	0.999	ln(Labor)	0.067*** (0.014)	0.133	0.005	0.001	0.998
ln(Unemp)	0.007 (0.041)	0.889	0.114	0.042	0.994	ln(Unemp)	0.213*** (0.044)	0.835	0.007	0.061	0.986
ln(GDP)	0.016 (0.030)	0.206	0.099	0.001	0.997	ln(GDP)	-0.008 (0.036)	0.041	0.005	0.001	0.983
No. Obs.	10,790					No. Obs.	18,840				

Note: Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 5 Regression results for average wage subsamples

Panel A. 90% of Counties with the Highest Average Wage in 2015						**Panel B. 10% of Counties with the Lowest Average Wage in 2015**					
Dependent Variables	**Explanatory Variable**	**Model Fit**				**Dependent Variables**	**Explanatory Variable**	**Model Fit**			
	ln(Min_Wage)	R^2 Within	R^2 Between	R^2 Overall	rho		ln(Min_Wage)	R^2 Within	R^2 Between	R^2 Overall	rho
ln(Posts)	-0.016 (0.063)	0.667	0.050	0.061	0.964	ln(Posts)	-0.513* (0.309)	0.669	0.009	0.174	0.884
ln(Labor)	0.046*** (0.011)	0.026	0.038	0.009	0.999	ln(Labor)	0.038 (0.056)	0.310	0.001	0.001	0.997
ln(Unemp)	0.080** (0.032)	0.852	0.045	0.034	0.994	ln(Unemp)	0.482*** (0.117)	0.885	0.009	0.106	0.982
ln(GDP)	-0.005 (0.025)	0.087	0.038	0.000	0.994	ln(GDP)	0.067 (0.150)	0.004	0.000	0.000	0.983
No. Obs.	26,670					No. Obs.	2,960				

Note: Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01