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State minimum wages and business location: Evidence from a refined border approach

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ABSTRACT

This study examines the effect of state minimum wage changes on new and existing business establishments. It employs a refined border approach in conjunction with other differencing methods to control for unobserved heterogeneous area characteristics. The findings suggest that state minimum wage increases deter new establishments from locating in an area, particularly in industries that rely on low-education workforces, such as the retail and manufacturing industries. However, existing establishments, regardless of industry type, are not found to be adversely affected by minimum wage policy.

1. Introduction

Between 1997 and 2007 the federal minimum wage remained unchanged, despite a rising price level. As a result, states took a more prominent role in setting minimum wage policy, with 23 states increasing their minimum wage above the federal minimum wage of $5.15. This paper explores whether state minimum wage increases unintentionally deter new business location decisions and harms existing business activity.

There are three primary challenges when analyzing the effect of minimum wage policy. First, it is important to account for local characteristics at a fine geographic scale. The agglomeration economies literature (for a review see Rosenthal and Strange, 2001) has documented that immediate area characteristics play a critical role in the business location decisions. However, researchers have difficulty controlling for unobserved heterogeneous area characteristics due to lack of data at a sufficient geographic scope, which potentially biases estimates.

Second, state governments may enact other state polices that affect business location decisions concurrently with minimum wage increases, making it difficult to isolate the effect of the minimum wage increase. Third, previous research has had difficulty identifying the causal effect of the policy due to the timing of the minimum wage change because many studies do not adequately distinguish between anticipated and unanticipated minimum wage increases. For instance, many studies include minimum wage increases from states that index their minimum wage to the Consumer Price Index, which are clearly anticipated changes in the minimum wage. If businesses anticipate the minimum wage increase then results will be biased toward zero.

Due to these challenges, standard methods leave researchers with limited ability to identify the effects of the minimum wage on local businesses. To tackle these changes, a border approach with a unique Geographic Information Systems (GIS) process is used to create similar comparison areas that are adjacent and are within a short distance of the geographic areas that experienced a minimum wage increase. This border approach restricts the comparison areas to those which likely have similar unobserved area characteristics that may affect business location decisions. Within these border-areas, the effect of minimum wage changes on business activity is compared between industries that do not rely on minimum wage workers and industries that predominately hire minimum wage earning workers. To determine an industry's reliance on minimum wage earning workers the Integrated Public Use Microdata Series (IPUMS) dataset is used. Because all industries are affected by the other state policies, while the minimum wage affects these industries in varying degrees, it is possible to separate the effect of other state policies from the effect of the minimum wage. The identifying assumption being that other state

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policies affect workers of all education levels, while minimum wage policies disproportionately affect workers of low education. Finally, I focus only on unanticipated minimum wage increases by excluding those states whose minimum wage is indexed to inflation. Additionally, information on the legislative history of the minimum wage bills is used to identify the appropriate pre-period in order to remove any anticipatory effects.

Using these methods along with data on firm location and employment from Dun and Bradstreet (D&B), I estimate the effect of minimum wage increases on business location and employment decisions while controlling for unobserved heterogeneous area characteristics and other state policies that affect business location decisions. Previous literature tends to measure local business activity as the total number of firms or employment to capture the total effect of the policy change. However, if new and existing businesses are differentially affected by the minimum wage then the total number of firms or employment has the potential to mask these differential effects due to existing business comprising the majority of overall business. Therefore, this paper separates business activity into new and existing business activity to determine if there are these differential effects. Also, understanding the effect minimum wage policy has on new establishments is important because there has been recent interest by state and local policy makers to encourage and attract new establishments. This idea, known as "economic gardening," is highlighted by Neumark et al. (2006) who find that "new firms contribute substantially to job creation."[1] Therefore, it is important to determine whether minimum wage policy has an unintended consequence of deterring new business. The minimum wage could also cause existing establishments and their employment opportunities to move out of the area or shut down completely. As existing establishments make up a large proportion of local employment and tax receipts, losing these businesses could have substantial negative effects for the local area. In either case, it is important to understand how minimum wage policy affects both new and existing business.

Using the border approach, I find that minimum wage increases negatively affects the share of new establishment and employment in an area, particularly in industries most reliant on workers with low-education, such as retail, services and manufacturing. However, minimum wage policy does not affect an area's share of new establishment and establishment employment in industries that employ highly educated workforces, such as the finance, insurance and real estate industries. Also, this paper does not find evidence that minimum wage policy affects existing establishments, including those industries with a high reliance on low-education workers. The D&B data suggest that 96% of businesses in the border-areas considered are existing businesses, thus, in the aggregate; the large effects for new businesses are masked by the large proportion of existing businesses. This reinforces the importance of separating new and existing businesses when investigating the impact of minimum wage changes.

The remainder of the paper begins with a discussion of the related literature and how this paper extends the literature. Section 3 describes the data used to estimate the effect of state minimum wages on the establishment location decisions across industry types. This section also describes the GIS process that creates the comparison areas. Section 4 discusses methodology, providing description of the identification strategy and econometric specification. Estimation results are presented in Section 5 as well as results from placebo tests that are designed to determine if there were trends before the implementation of the state minimum wages. The final section concludes the paper.

[1] Littleton, Colorado pioneered the economic gardening approach to growth in the late 1980's. A complete description of the approach is available on the city's webpage at: www.littletongov.org/bia/economicgardening/.

2. Related literature

There are three strands in the existing literature that are particularly relevant to studying minimum wage policy and business location decisions. The first consists of studies that explore the employment effect of the minimum wage. Prior to 1990, there was a consensus in the literature that the minimum wage negatively affected employment (see Brown et al., 1982, for a summary). However, more recently there is a divide in the literature about the actual effect of the minimum wage on employment. While some authors find little or no effect on employment (Card and Krueger, 1994, 1995; Dube et al., 2008), others (Neumark and Wascher, 1995, 2000, 2007) find that the minimum wage causes unemployment, as traditional economic theory predicts. While this debate continues in the literature, the methodology has become more refined in terms of geographic scope. For example, recent papers (Kim and Taylor, 1995; Orazem and Mattila, 2002; Dube et al., 2008) are narrowing the geographic scope of analysis from the state to the county by using county-level data, such as the County Business Patterns data despite the fact that counties vary substantially in geographic size. This paper improves upon this literature by comparing business activity in areas within 10 miles or less of the state border.

A second strand consists of studies that have examined the effect of the minimum wage on the number and size of firms. While Carlton (1983) gives an econometric model for new firm location and employment, Orazem and Mattila (2002) focus more directly on the minimum wage and firm location by using county-level data and find that an increase in the state minimum wage of 10% leads to a two and a half percent decrease in the total number of firms over a year. In the entrepreneurship literature, Kreft and Sobel (2005) find the minimum wage is not one of the important determinants of entrepreneurship. However, most of the focus in this literature has been on total employment, which can mask the effect on employment at new business. This paper helps fill this gap by estimating effects separately for new and existing establishments.

The third strand develops the border methodology to control for area characteristics. This approach was pioneered by Holmes (1998) and contributed to more recently by Huang (2008). Holmes (1998) examines how manufacturing's share of total employment and the growth of manufacturing employment changed when moving from an "antibusiness" state to a "probusiness" state. He examined the areas on each side of the border, which allowed him to control for natural advantages and access to labor pools.

Also, the border approach has been extended to a panel framework by Duranton et al. (2006), which allowed them to control for unobserved site characteristics, heterogeneous establishments, and the endogeneity of taxation. Recently these border approaches have been extended to studying the effects of minimum wages by Dube et al. (2008). Using restaurant earnings and employment at the county-level, Dube et al. (2008) create county pairs across state borders, which allow them to better control for spatial trends in employment that are correlated with minimum wages. They find that the negative minimum wage elasticities at the national level are driven by unobserved heterogeneities and then find no employment effects at the local level.

While Dube et al. (2008) and this paper both use the border approach to study the minimum wage at a relatively narrow geographic scope, this analysis differs in three ways. First, they analyze how the minimum wage impacts labor demand issues, such as the amount of total employment and wages in a county. In contrast, this paper focuses on the minimum wage effect on new and existing establishment location decisions and the employment at those establishments. Second, while using counties to control for heterogeneous area characteristics may be sufficient when studying labor demand issues, studying business location

Table 1
Descriptive statistics of minimum wage changes: 2003–2006.

State name	Initial minimum wage	Initial minimum wage increase[a]	Final minimum wage increase[b]	Pre-period data used	Earliest indication	Date law implement	Post-period data used	Time difference
Arkansas	$5.15	$6.25	$6.25	2005-Q4	2006-Q2	2006-Q3	2007-Q1	6 Quarters
Connecticut	$7.10	$7.40	$7.65	2004-Q2	2005-Q2	2005-Q4	2007-Q1	7 Quarters
Illinois	$5.15	$5.50	$6.50	2003-Q1	2003-Q2	2004-Q1	2005-Q3	10 Quarters
Maryland	$5.15	$6.15	$6.15	2004-Q2	2006-Q1	2006-Q1	2007-Q1	10 Quarters
Michigan[c]	$5.15	$6.95	$7.40	2004-Q2	2006-Q2	2006-Q1	2007-Q1	9 Quarters
Minnesota	$5.15	$6.15	$6.15	2003-Q1	2004-Q2	2005-Q3	2007-Q1	12 Quarters
New Jersey	$5.15	$6.15	$7.15	2004-Q2	2005-Q2	2005-Q3	2007-Q1	11 Quarters
New York	$5.15	$6.00	$7.15	2003-Q1	2004-Q2	2005-Q1	2006-Q1	12 Quarters
Rhode Island	$6.15	$7.10	$7.40	2002-Q4	2003-Q1	2004-Q1	2005-Q3	11 Quarters
Wisconsin	$5.15	$5.70	$6.50	2003-Q1	2004-Q2	2005-Q2	2007-Q1	9 Quarters

[a] Source of minimum wage changes comes from US Department of Labor, Wage and Hour Division.
[b] Some state laws had multiple stages of minimum wage increase, the final minimum wage was the end change from that law.
[c] News articles indicate business anticipatory effects as early as third quarter 2005 so I use a pre-period of second quarter 2004.

decisions requires sharper geographic precision because heterogeneous area characteristics are important determinants of business location decisions that vary at a much smaller geographic scope. For example, there is a large agglomeration literature that shows that one of the most important determinants of business location decisions is localization (locating near businesses in your own industry) and that the impact of localization attenuates quickly over a few miles (Rosenthal and Strange, 2003), or even a mile or less (Arzaghi and Henderson, 2008). Using counties as the unit of observations may not be sufficiently localized because of their large size, with a county average size in the United States being roughly 1176 square miles, and their erratic shape, causing them to vary in size and distance to the state border.[2] To mitigate these problems, I use a GIS process to create narrow pairs of adjacent uniform areas on either side of a state border that are within 1, 5 and 10 miles of the border. Finally, this paper differs from Dube et al. (2008) by using a unique approach of comparing businesses in industries that vary on their reliance on low-education workers, a group that is more likely to be impacted by minimum wage laws, to control for time-varying area characteristics, such as other state policies.

3. Data description

3.1. Minimum wage data

The state minimum wages (in dollars) from 2003 to 2006 comes from the US Department of Labor, Wage and Hour Division. This time-period was chosen because of the large number of state minimum wage increases (fourteen in total). In order to isolate state minimum wage changes from the Federal legislation enacted in 2007, only state minimum wage changes implemented as late as 2006 were considered. In addition, the focus on minimum wage changes after 2003 allows falsification tests, described further below, preceding the time-period of study.

Table 1 reports descriptive statics on the ten states that increased their minimum wage during this time-period and are used in this study. Florida, Oregon, Vermont, and Washington are excluded because their minimum wage is indexed to the Consumer Price Index and the purpose of this paper is to measure the effect of unanticipated minimum wage increases. Many states signed minimum wage laws that increase their minimum wage law in multiple stages. It is possible the main effect of a minimum wage increase on business outcomes occurs when the minimum wage law was signed, not years later when the last stage of the minimum wage increase went into effect. For example, New York State signed their minimum wage bill in 2004, which produced the 2007 minimum wage increases. Therefore, Table 1 also includes the size of the initial minimum wage increase as well as the final minimum wage, because some states increased their minimum wage in multiple stages in response to the same minimum wage law.[3] Fig. 1 illustrates all 38 state border-pairs that are included in the paper, out of a possible 128 state border-pairs in the continental United States.

3.2. Establishment data

The data used to determine the amount of new and existing business activity in an area come from the Dun and Bradstreet Marketplace data files.[4] The data contain a wealth of information on establishments including its employment, sales, years of service, the location at the ZIP code level, and the two-digit Standard Industrial Classification (SIC) code of the establishments.[5]

The D&B market files are aggregated to the ZIP code level. The ZIP code level data is mapped to border-areas, which are further explained in Section 3.3, and a ZIP code to border-area correspondence is used to match the border-areas geography. This correspondence determines the percent of each ZIP code that lies in a given border-area and assigns that percentage of ZIP code employment or establishments to the border-area.[6] Specifically, the raw number of establishment counts and employment are allocated from a given ZIP code to its overlapping border-area based on the amount of land area that overlaps between the two. For example, if a ZIP code has 10 establishments and 20% of its land area is contained in a border-area, then the correspondence allocates two establishments to that border-area.

Table 1 also shows the dates of the Dun and Bradstreet establishment data files used to measure the change in new and existing business activity. The "earliest indication" column shows the quar-

[2] The square miles per county metric is from http://www.usgs.gov and http://www.cia.gov.

[3] All regressions reported follow the previous literature's approach of focusing on the initial minimum wage increase. As a robustness check the final minimum wage was also used as the minimum wage change, but this distinction did not impact the findings. These results are available upon request from the author.

[4] Although the D&B data do not contain all business activity in the U. S., the omissions from the data are sufficiently random that the data is considered representative of the spatial distribution of the business activity in the U. S. Examples of other studies that use their data are Rosenthal and Strange (2001) and Rosenthal and Strange (2003).

[5] SIC is a four digit industry classification system created by the United States government and used by such government agencies as the Security and Exchange Commission.

[6] To use this correspondence, it is assumes that the spatial distribution of business activity in a ZIP code is sufficiently random so that the border-area receives roughly the correct proportion of activity from the ZIP code. This is a standard assumption in the literature. (See, for example, Holmes (1998) and Rosenthal and Strange (2003)).

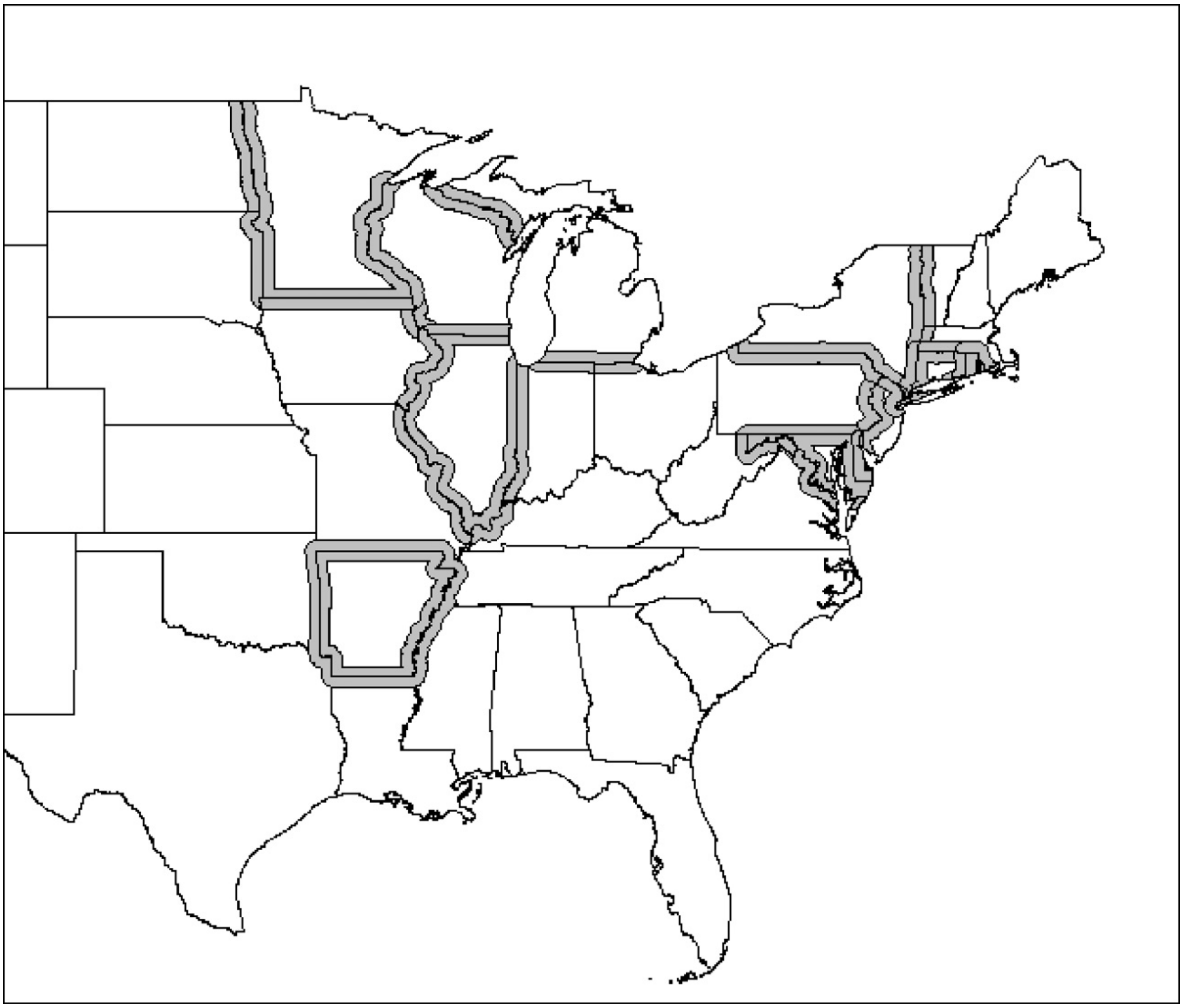

Fig. 1. Map of state borders used in this study.

ter that a given state's House or Senate first passed the minimum wage bill.[7] To prevent anticipatory bias, this date is used to select the establishment data for the pre-period in order to ensure it is sufficiently before the minimum wage increase. The ''earliest indication'' date is a strong proxy for when potential and existing business owners knew the minimum wage increase was going to occur due to the fact that many of the minimum wage bills' outcomes were uncertain. For instance, some of these bills were vetoed by the governor after the state House and Senate passed the bill. In these instances it took a second passing of the bill by the state Senate to pass the minimum wage law. The time-periods for the pre-period establishment data are chosen with the criteria of data availability and that the data are at least one quarter before the ''earliest indication'' date.

Using the D&B data, two measures of business activity were created. The first uses the count of new and existing establishments in each area. A second measure of business activity, the amount of employment at these establishments, is used because policymakers care about the size of the business starting in their jurisdiction. The years of service of the establishment is used to differentiate between new and existing establishments. An establishment is classified a new establishment when it has been in service for 1 year or less. Establishments with four or more years of service are considered existing establishments.

3.3. GIS process to create comparable border-area pairs

The border methodology requires comparison of pairs of geographic areas across jurisdictional boundaries. Ideally, pairs are created by matching identical existing geographic areas across state borders. In reality these existing geographic areas (i.e., counties or ZIP codes) are quite heterogeneous causing them to be neither ideally positioned across a state border from one another nor similar in size and shape.[8] Consequently, existing geographic areas vary in distances from each other across jurisdictional borders, making them less than ideal comparison areas. A further difficulty with comparing business activity in ZIP codes across state borders is that ZIP codes are defined by the US Postal Service for their own purposes, resulting in drastic shape variation. Another problem with ZIP codes is that ZIP codes can be single points (e.g. a university), which makes it difficult to calculate the amount of business activity per square mile.

[7] The ''Earliest Indication'' information was collected online by the author.

[8] For a general discussion of the effect of ZIP codes and counties being irregular see Briant et al. (2010). They find that the shape of the units of observations make no difference when estimating agglomeration effects and localization of industries.

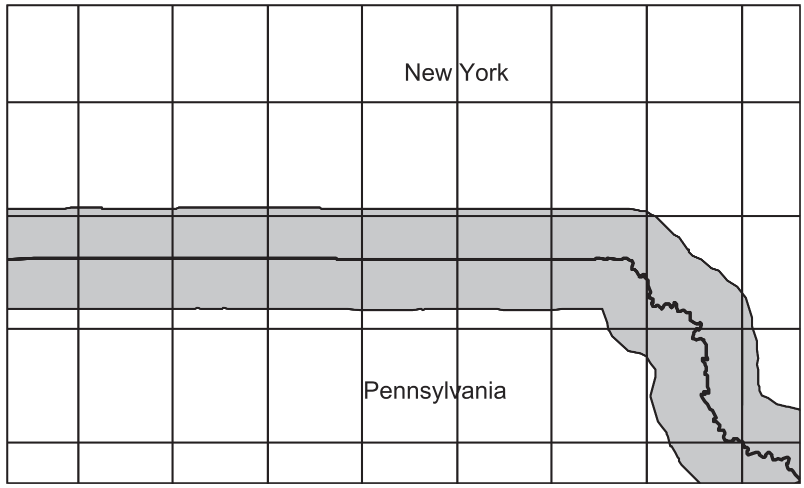

Fig. 2. Example of the GIS software border process to create uniform contiguous geographic border-pairs using 20 mile by 20 mile grid squares and a 10 mile border on either side of the state border.

A contribution of this paper is its use of GIS software to create approximately uniform geographic areas directly adjacent to each other on either side of a state border. This advancement makes the border approach more applicable because it creates more comparable areas across state borders.

The first step in this process is to create 1, 5 and 10 mile borders around each state that increased their minimum wage between 2003 and 2006. Ideally, the next step would be to cut the borders up every few miles to create the geographic area units that are adjacent and as similar as possible. However, state borders are erratically drawn at points making it difficult for the GIS software to make these geographic border-area units. A unique solution to this problem is to lay a twenty by twenty mile grid over the entire United States to create pairs of areas on either side of the border by using the cells that fall on top of the state border to cut the 1, 5 and 10 mile border widths around the state border.[9] This process creates two geographic areas on opposite sides of a state border that are similar in distance from the state border, as well as in length. These geographic areas are defined as border-areas and a pair of contiguous border-areas that reside on opposite sides of a state border is referred to as a border-area pair.

Fig. 2 provides a visual example of this process, which depicts the border-areas that are created for the New York and Pennsylvania border. This state border is a good representation of border-area pairs because it shows how this process deals with both straight borders, illustrated in the middle of the state border, and more jagged state border segments, such as the portion of the border to the east. Also, Fig. 2 highlights the importance of creating twenty mile wide border-area pairs along the border, because the effect of the minimum wage may be less in border-area pairs located closer to New York City due to the high cost of living relative to rural border-area pairs in the middle of the state border. A difficulty with this process is that some cells will be randomly placed in such a way that causes the areas of the two sides to be different in square miles. To correct for this, the establishment variables are modified to be establishment counts per square mile and establishment employment per square mile. Next, it is determined what proportion of ZIP codes are located in each newly created border-area which allows me to calculate the amount of new and existing establishments that reside in each border-area. The end product of the GIS process is a dataset with the amount of new and existing business activity in each border-area.

3.4. IPUMS data

The final data set used in this paper comes from the Integrated Public Use Microdata Series (IPUMS). The IPUMS dataset is a population data set that consists of a broad range of information about individuals and households, such as an individual's work and education characteristics. The 1% year 2000 sample is used to determine the average educational attainment of workers for each two-digit SIC industry. This information allows me to determine which two-digit SICs are most likely to be affected by minimum wage changes. To control for any border-area specific time-varying attributes that may be correlated with the minimum wage increases, such as other state policies affecting business location decisions, a comparison of business activity in industries that are more likely to employ minimum wage earning workers with industries that offer greater wages is undertaken. This allows the effect of the minimum wage on business location to be isolated from the effect of other state policies. Again, this strategy assumes that other state policies affect workers across all education levels, while minimum wage policies affect workers with lower levels of education. This identification strategy could produce biased estimates if states are enacting other policies that disproportionally affect low-education workers while instituting their minimum wage increases.

The IPUMS data set is used to calculate the proportion of an industry's workforce that has attained less than a high school education. This serves as a proxy for the likelihood that an industry's workforce faces a binding minimum wage requirement. The variables used from the IPUMS data set include the educational attainment of the individual, hours worked, and the industry in which the individual is currently (or last) working. Because IPUMS uses the North American Industrial Classification System (NAICS), while the establishment data uses the SIC classification system, a correspondence between NAICS and SIC is used.[10] The proportion of individuals who attained less than a high school education in each two-digit industry is calculated. Table 2 identifies the reliance on workers with less than a high school degree for different one-digit industries. The finance, insurance and real estate (FIRE) one-digit industry does not use many workers with low education with 1.5% of its workforce

9 Note that due to this process, business activity said to be 5–10, 1–5 and 0–1 miles from the border are in fact business activity 5 up to 10 miles, 1 up to 5 miles and 0 up to 1 miles away from the border.

10 I use the NAICS-SIC correspondence provided by the U.S. Census Bureau's website found at http://www.census.gov/epcd/www/naicstab.htm.

Table 2
Average percent of the industry's workforce with less than a high school education.

Industry group	SIC codes	Average percent less than HS Edu (%)
By 1-Digit SIC		
Agriculture[a]	1–9	22.99
Construction	15–17	14.04
Manufacturing	20–39	11.89
Retail	52–59	7.71
FIRE	60–67	1.51
Services	70–89	5.73
By reliance on low educated workers		
Less than 5%	10, 27, 28, 38, 48, 59–64, 67, 78, 80–82, 84, 86, 87, 89	1.99
5–15%	12–17, 21, 26, 32–37, 39, 41, 44, 47, 49–57, 65, 73, 75, 76, 79, 83	8.34
Greater than 15%	20, 22–25, 29–31, 42, 58, 70, 72	16.84

[a] Note that the agriculture industries are not included in this study due to lack business coverage in the Dun and Bradstreet data.

with less than a high school education. However, both the construction and manufacturing sectors have a relatively high reliance on low-education workers with 14% and 11.9% of their workforces with less than a high school education. Industries with a relatively high reliance of low-education workers, such as construction and manufacturing, are likely to be affected more by a minimum wage increase, while industries with a low reliance of low-education workers are expected to have a smaller effect.

4. Regression framework and identification

In order to identify and isolate the effect of the minimum wage, I use a border approach that uses these contiguous areas that did not receive a minimum wage increase as a comparison area for the areas on the opposite side of the border that did receive a minimum wage increase. The determinants of location decisions of new businesses, such as area characteristics, that need to be controlled for to isolate the causal effect of a minimum wage increase can be categorized into three groups: time-varying determinants that affect both areas similarly, area specific time-invariant determinants, and area specific determinants that vary over time. These determinants can be expressed in regression form as:

$$Y_{jt} = \alpha + \beta MW_{jt} + \gamma_j + \mu_t + \theta_{jt} + u_{jt} \qquad (1)$$

where j and t index area and time respectively, Y represents measures of new or existing business activity in a given j area and time-period t, MW is the minimum wage variable and is measured in dollar terms, γ is a full set of area fixed-effects that control for time-invariant area characteristic effects, μ are time fixed-effects that account for time-varying effects that impact all areas, θ represents time-varying area specific determinants of business location decisions, and u is a disturbance term.

Since the perfect dataset, one that accounts for all possible unobserved factors, does not exist, a differences-in-differences methodology is used to control for both unobserved time-invariant and time-varying factors affecting both areas. This methodology, in conjunction with a border approach, minimizes the possibility of unobserved area-specific attributes biasing the estimated effect of a minimum wage change.

This strategy compares new and existing business outcomes in border-areas that receive an increase in the minimum wage with adjacent border-areas that did not receive a minimum wage increase. The differences in business activity between the two adjacent border-areas before and after one area received the increase in the minimum wage are then compared. To reflect this methodology, the dependent and independent variables are of the form:

$$X_i = (X_{\text{MWside,post}} - X_{\text{nMWside,post}}) - (X_{\text{MWside,pre}} - X_{\text{nMWside,pre}}) \qquad (2)$$

where MWside indicates the border-area that received the state minimum wage increase and nMWside represents the adjacent border-area that did not receive a state minimum wage increase.

This differencing design is an approach to eliminate bias from heterogeneous unobserved area characteristics that could be driving correlation between the minimum wage and economic outcomes. Differencing across border-areas eliminates any area characteristics common to the border-area pair that could affect new and existing business, for example an area's access to production inputs, such as the local labor market, energy inputs and raw materials. Differencing also controls for time-varying determinants that affect both areas in the pair similarly (μ). For example, an economic shock of a major local employer relocating away from the area can be controlled for when differencing across border-areas, as long as the shock did not affect the border-area disparately.

Differencing across time eliminates any border-area specific time-invariant effects that could affect the business location decisions (γ), such as an area having a water front or disparities in public services between two areas that do not change over time. The time differencing plays an important part in determining the length of time chosen between the pre- and post-period. A longer time frame is preferred to analyze the longer term effects of the minimum wage. However, a shorter time frame is ideal to minimize changes in relative differences in state expenditures that could influence the location decisions of establishments. The distance between the pre- and post-periods is displayed in Table 1 and is previously discussed in Section 3.3. Note that the post-period is chosen based on data availability and keeping separate the state minimum wage changes from the federal minimum wage change in 2007.

To mitigate potential bias due to heterogeneous unobserved time-varying area characteristics, represented by θ, this paper utilizing a refined border approach. By comparing two adjacent border-areas that extend from the border over relatively short distances (1-mile, 5-mile and 10-mile) into the state, the spatial correlation of area characteristics is utilized to minimize area specific changes that only affect one area in the pair. The identifying assumption is that time-varying area characteristics, such as the change in the vitality of the local economy, vary similarly across short distances. This assumption becomes more realistic the narrower the spatial scope of analysis. For instance, two adjacent areas within a small geographic distance are likely to have local economies that are similar. This is important when studying establishment location decisions because the agglomeration economies literature (see Rosenthal and Strange, 2003) show that not only does localization (locating near other businesses in the same industry) and urbanization (locating in areas with considerable business activity regardless of industry type) influence business location decisions, but they have an effect at surprisingly small geographic distances and dissipate quickly. The border approach is able to control for these determinants of the business location decision as well as other area specific idiosyncratic factors, such as an entrepreneur's personal interest in a particular region.

Another concern is whether states that increase their minimum wage are also enacting other state policies that may affect new establishment location decisions. Not controlling for this could possibly bias the estimates either positively or negatively depending on the other policies enacted. For instance, using terminology from Holmes (1998), states could concurrently enact "probusiness" policies with minimum wage increases to counteract any negative effects of the minimum wage policy, as the federal government did when implementing the Fair Minimum Wage Act of 2007. This would introduce a positive bias in the estimated effect of a mini-

Table 3
Difference-in-differences regression results by 1-digit industry categories for new establishments (dependent variable: share of new business births or employment on the minimum wage increased side).

	All Industries		Construction		Manufacturing		Retail		FIRE		Service	
	New Births[a] (1)	New Emp.[b] (2)	New Births[a] (3)	New Emp.[b] (4)	New Births[a] (5)	New Emp.[b] (6)	New Births[a] (7)	New Emp.[b] (8)	New Births[a] (9)	New Emp.[b] (10)	New Births[a] (11)	New Emp.[b] (12)
Distance: 0–1 mile												
MWΔ	−0.064	−0.069***	−0.042	−0.007	−0.096***	−0.122***	−0.067*	−0.075*	0.045	0.0419	−0.074*	−0.071**
	(0.023)	(0.022)	(0.048)	(0.051)	(0.033)	(0.031)	(0.034)	(0.039)	(0.043)	(0.042)	(0.037)	(0.033)
Constant	0.386***	0.388***	−0.025	−0.044	−0.011	0.001	0.0262	0.0327	0.126*	0.127*	0.07	0.067
	(0.116)	(0.116)	(0.044)	(0.046)	(0.120)	(0.119)	(0.049)	(0.056)	(0.074)	(0.074)	(0.055)	(0.053)
2-Digit Industry FE	68	68	3	3	20	20	8	8	7	7	15	15
N	14535	14535	909	909	2955	2955	2429	2429	1649	1649	4391	4391
R^2	0.013	0.013	0.007	0.006	0.020	0.023	0.007	0.007	0.011	0.010	0.010	0.010
Distance: 0–5 miles												
MWΔ	−0.063**	−0.067***	−0.023	0.011	−0.100***	−0.122***	−0.064*	−0.074*	0.043	0.038	−0.062	−0.067*
	(0.023)	(0.022)	(0.052)	(0.053)	(0.033)	(0.030)	(0.032)	(0.037)	(0.038)	(0.037)	(0.037)	(0.033)
Constant	0.402***	0.404***	−0.033	−0.054	−0.113	−0.093	0.003	0.011	0.0263	0.008	0.019	0.013
	(0.110)	(0.109)	(0.048)	(0.049)	(0.115)	(0.113)	(0.046)	(0.053)	(0.063)	(0.069)	(0.068)	(0.069)
2-Digit Industry FE	68	68	3	3	20	20	8	8	7	7	15	15
N	14983	14983	921	921	3157	3157	2461	2461	1703	1703	4464	4464
R^2	0.011	0.012	0.004	0.004	0.020	0.023	0.007	0.007	0.008	0.008	0.009	0.009
Distance: 0–10 miles												
MWΔ	−0.062**	−0.067***	−0.020	0.014	−0.099***	−0.121***	−0.065**	−0.073*	0.048	0.042	−0.061	−0.068**
	(0.023)	(0.021)	(0.052)	(0.054)	(0.032)	(0.029)	(0.031)	(0.037)	(0.035)	(0.035)	(0.037)	(0.033)
Constant	0.418***	0.422***	−0.030	−0.053	−0.115	−0.094	0.052	0.079	0.019	0.002	0.036	0.034
	(0.14)	(0.14)	(0.05)	(0.05)	(0.12)	(0.12)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)
2-Digit Industry FE	68	68	3	3	20	20	8	8	7	7	15	15
N	15114	15114	922	922	3210	3210	2471	2471	1720	1720	4484	4484
R^2	0.011	0.012	0.003	0.004	0.018	0.021	0.008	0.009	0.008	0.008	0.008	0.008

MWΔ represents the change in the difference in minimum wage between border-areas over time.
[a] For all new birth specifications, the dependent variable is framed as $\text{Births}_{MWj}/(\text{Births}_{MWj} + \text{Births}_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[b] For all new employment specifications, the dependent variable is framed as $\text{Emp}_{MWj}/(\text{Emp}_{MWj} + \text{Emp}_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
* Significance levels for 10%.
** Significance levels for 5%.
*** Significance levels for 1%.

mum wage increase. As classical theory suggests that a minimum wage should have negative effects on businesses, this bias would produce an underestimate of the effect of a minimum wage increase. Alternatively, a negative bias would be introduced if states increasing their minimum wage are enacting other "antibusiness" policies along with the minimum wage increase. This would produce an overestimate of any negative effects of a minimum wage increase.

To address this concern two groups of businesses are compared that are similarly affected by other state policies but should have different responses to a minimum wage increase. Therefore, the differencing methodology is extended by comparing businesses in industries that hire a relatively high proportion of low-education workers, which are sensitive to minimum wage policy, to businesses in industries that hire relatively few low-education workers making them less sensitive to minimum wage policy. By separating businesses based on their industry's reliance on low-education workers, groups of businesses are created that are affected similarly by the other state policies but are differentially affected by minimum wage policy. Assuming that any time-varying border-area-specific attributes, such as other new state policies, do not differentially affect industries with different reliance on low-education workers, this methodology isolates the minimum wage increase from other state policy changes.

To study the effect of minimum wage on establishment location and employment decisions, two dependent variables are analyzed: the count of establishments (C) and establishment employment (N). Using both measures of business activity, two sets of regressions are estimated to determine the effect of a minimum wage increase on new and existing establishments, respectively. The estimating equations used in the regressions to determine the effect of state minimum wage increases on both new and existing establishment location and employment are as follows:

$$C_{i,n} = \alpha + \beta \text{MW}_i + X'_n\delta + u. \tag{3}$$

$$N_{i,n} = \alpha + \beta \text{MW}_i + X'_n\delta + u \tag{4}$$

where i indexes a pair of border-areas, n indexes the industry at the two-digit SIC level, X is a vector of industry dummy variables, and MW is the minimum wage variable.[11] The unit of observation is the border-area pair in a given two-digit industry.

Although business activity could be measured in level terms, the share of establishment activity is used to determine whether

[11] When only one of the two states increased their minimum wage, the differenced variable simply becomes the size of the increase in the minimum wage. For state border pairs in which both states increase their minimum wage, the differenced minimum wage variable is, mathematically, the difference in the size of the minimum wage increases. For example, the differenced minimum wage variable for the New York-New Jersey variable is 0.15 because the difference in their minimum wage increase ($1.00–$0.85) is $0.15. Note that only state border pairs that received a non-indexed minimum wage increase on at least one side of the border are included in this study.

Table 4
Difference-in-differences regression results by 1-digit industry categories for existing establishments (dependent variable: share of existing business counts or employment on the minimum wage increased side).

	All industries		Construction		Manufacturing		Retail		FIRE		Service	
	Existing Counts[a] (1)	Existing Emp.[b] (2)	Existing Counts[a] (3)	Existing Emp.[b] (4)	Existing Counts[a] (5)	Existing Emp.[b] (6)	Existing Counts[a] (7)	Existing Emp.[b] (8)	Existing Counts[a] (9)	Existing Emp.[b] (10)	Existing Counts[a] (11)	Existing Emp.[b] (12)
Distance: 0–1 mile												
MWΔ	0.006	0.003	0.002	0.003	0.014	0.008	0.003	0.004	−0.002	−0.006	0.003	0.002
	(0.005)	(0.004)	(0.011)	(0.013)	(0.013)	(0.014)	(0.007)	(0.008)	(0.011)	(0.015)	(0.004)	(0.004)
Constant	−0.075	−0.073	−0.004	−0.004	−0.062	−0.032	−0.007	−0.009	−0.016	−0.007	−0.003	−0.007
	(0.165)	(0.164)	(0.009)	(0.012)	(0.075)	(0.068)	(0.009)	(0.011)	(0.022)	(0.021)	(0.008)	(0.009)
2-Digit Industry FE	68	68	3	3	20	20	8	8	7	7	15	15
N	14535	14535	909	909	2955	2955	2429	2429	1649	1649	4391	4391
Adj. R^2	0.012	0.011	0.002	0.001	0.019	0.019	0.001	0.003	0.001	0.001	0.010	0.004
Distance: 0–5 miles												
MWΔ	0.006	0.004	0.002	0.003	0.012	0.012	0.005	0.004	−0.003	−0.010	0.004	0.005
	(0.005)	(0.004)	(0.009)	(0.012)	(0.015)	(0.013)	(0.008)	(0.008)	(0.011)	(0.014)	(0.003)	(0.004)
Constant	−0.128	−0.127	−0.003	−0.004	−0.052	−0.002	−0.010	−0.012	−0.002	−0.001	0.009	−0.011
	(0.185)	(0.185)	(0.008)	(0.012)	(0.057)	(0.066)	(0.011)	(0.011)	(0.014)	(0.021)	(0.019)	(0.015)
2-Digit Industry FE	68	68	3	3	20	20	8	8	7	7	15	15
N	14983	14983	921	921	3157	3157	2461	2461	1703	1703	4464	4464
Adj. R^2	0.013	0.013	0.004	0.001	0.021	0.022	0.002	0.004	0.004	0.003	0.011	0.005
Distance: 0–10 miles												
MWΔ	0.009	0.004	0.002	0.004	0.011	0.013	0.003	0.001	−0.0004	−0.007	0.004	0.006
	(0.005)	(0.004)	(0.009)	(0.012)	(0.014)	(0.013)	(0.008)	(0.008)	(0.012)	(0.014)	(0.004)	(0.005)
Constant	−0.194	−0.158	−0.003	−0.004	−0.052	−0.001	−0.017	−0.032	−0.005	−0.003	0.013	−0.010
	(0.111)	(0.118)	(0.008)	(0.012)	(0.056)	(0.067)	(0.031)	(0.027)	(0.014)	(0.021)	(0.019)	(0.017)
2-Digit Industry FE	68	68	3	3	20	20	8	8	7	7	15	15
N	15114	15114	922	922	3210	3210	2471	2471	1720	1720	4484	4484
Adj. R^2	0.013	0.013	0.004	0.001	0.020	0.022	0.002	0.005	0.004	0.003	0.010	0.005

MWΔ represents the change in the difference in minimum wage between border-areas over time.
[a] For all count specifications, the dependent variable is framed as $Counts_{MWj}/(Counts_{MWj} + Counts_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[b] For all employment specifications, the dependent variable is framed as $Emp_{MWj}/(Emp_{MWj} + Emp_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
* Significance levels are indicated for 10%.
** Significance levels are indicated for 5%.
*** Significance levels are indicated for 1%.

minimum wage law affects the spatial pattern of business activity. Therefore, both measures of business activity, $C_{i,n}$ and $N_{i,n}$, for both the new and existing establishment regressions, are expressed as the change in the percentage of establishment activity in the area in which the minimum wage increased. The dependent variables are created by calculating the total amount of establishment activity in terms of establishment counts or establishment employment in the entire border-area pair for each time-period. The percentage of the total establishment activity for both the pre- and post-period in the border-area pair where the minimum wage increased are then calculated. Lastly, I difference the ratio to determine the change in the share of total business activity in the border-area pair that occurs in the area where the minimum wage increased. Thus, the differenced dependent variables for a given border-area pair, n, take the form:

$$C_n = \frac{C_{\text{MWside,post}}}{C_{\text{MWside,post}} + C_{n\text{MWside,post}}} - \frac{C_{\text{MWside,pre}}}{C_{\text{MWside,pre}} + C_{n\text{MWside,pre}}} \quad (5)$$

$$N_n = \frac{N_{\text{MWside,post}}}{N_{\text{MWside,post}} + N_{n\text{MWside,post}}} - \frac{N_{\text{MWside,pre}}}{N_{\text{MWside,pre}} + N_{n\text{MWside,pre}}} \quad (6)$$

where MWside represents the area that received the minimum wage increase and nMWside represents the adjacent comparison area. Using shares of business activity allows for an easy interpretation of the regression coefficients with the differencing approach because it produces something akin to an elasticity. For example, a coefficient on the minimum wage variable of −0.05 means that a $1 increase in the minimum wage, which is roughly a 20% increase (based on the $5.15 federal minimum wage), results in a 5% decrease in establishment activity for that area. Additionally, using the share of business reinforces the idea that these border-areas are competing to attract the region's new and existing establishments. Note that this specification requires that there be some business activity in the border-area pair to be included in the analysis.[12]

5. Results

5.1. One-digit industry category results

Table 3 presents estimation results for Eqs. (3) and (4) using the change in the share of new establishments and new establishment

[12] Robustness checks were performed by running regressions where border-areas that had zero business activity in both border-areas were not dropped and instead assigned both border-areas a share of zero and found that keeping or dropping areas with no business activity produced similar results. Obviously, including border-area pairs that did not have any business activity increases the sample size which creates smaller standard errors. These regression results are available upon request from the author.

Table 5
Difference-in-differences regression results by industries with different reliance of low-educated workers for new establishments (dependent variable: share of new business births or employment on the minimum wage increased side).

	Percent of industry workforce with less than HS education[c]					
	Less than 5%		5–15%		Greater than 15%	
	New Births[a] (1)	New Emp.[b] (2)	New Births[a] (3)	New Emp.[b] (4)	New Births[a] (5)	New Emp.[b] (6)
Distance: 0–1 mile						
MWΔ	−0.022	−0.021	−0.071***	−0.074***	−0.129***	−0.134***
	(0.027)	(0.027)	(0.022)	(0.021)	(0.045)	(0.041)
Constant	0.367***	0.369***	0.017	0.021	0.005	0.007
	(0.109)	(0.109)	(0.171)	(0.179)	(0.118)	(0.117)
2-Digit Industry FE	23	23	33	33	12	12
N	4709	4709	7505	7505	2321	2321
Adj. R^2	0.009	0.009	0.014	0.014	0.018	0.019
Distance: 0–5 miles						
MWΔ	−0.02	−0.025	−0.07***	−0.075***	−0.122***	−0.127***
	(0.027)	(0.028)	(0.023)	(0.020)	(0.041)	(0.038)
Constant	0.389***	0.3925***	−0.141	−0.137	0.088	0.087
	(0.132)	(0.133)	(0.124)	(0.124)	(0.096)	(0.095)
2-Digit Industry FE	23	23	33	33	12	12
N	4862	4862	7704	7704	2417	2417
Adj. R^2	0.009	0.010	0.012	0.012	0.015	0.016
Distance: 0–10 miles						
MWΔ	−0.014	−0.021	−0.071***	−0.076***	−0.129***	−0.132***
	(0.026)	(0.028)	(0.023)	(0.020)	(0.040)	(0.037)
Constant	0.385***	0.390***	−0.007	0.002	0.1	0.098
	(0.132)	(0.132)	(0.145)	(0.145)	(0.093)	(0.092)
2-Digit Industry FE	23	23	33	33	12	12
N	4902	4902	7764	7764	2448	2448
Adj. R^2	0.008	0.009	0.012	0.012	0.016	0.017

MWΔ represents the change in the difference in minimum wage between border-areas over time.
[a] For all new birth specifications, the dependent variable is framed as $Births_{MWj}/(Births_{MWj} + Births_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[b] For all new employment specifications, the dependent variable is framed as $Emp_{MWj}/(Emp_{MWj} + Emp_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[c] The percent of an industry's workforce with less than a high school education is created by the IPUMS data set.
* Significance levels are indicated for 10%.
** Significance levels are indicated for 5%.
*** Significance levels are indicated for 1%.

employment as the dependent variables respectively.[13] Regression results are presented across different border distances and across different one-digit SIC industry categories to investigate whether the minimum wage has a differential effect across one-digit industries. All regressions include two-digit SIC industry fixed-effects and the standard errors are clustered at the state border.[14] The regression results for all distances in columns 1 and 2 of Table 3 show that an increase in the minimum wage in an area has a negative effect on that area's share of new establishments and new establishment employment for all industries aggregated together. For example, the coefficient on the minimum wage variable for a border distance of 0 up to 1 mile in column 2 indicates a $1 increase in the minimum wage decreased the share of new establishment employment in an area relative to its comparison area by 6.9%. This effect is statistically significant at the 1% level.

The results in columns 3 through 12 in Table 3 show that the sign on the point estimates differ across industries. Table 3 shows statistically significant negative impacts from the minimum wage on new establishment activity in manufacturing, retail and services for all three border distances. However, columns 9 and 10 of Table 3 show positive point estimates for all three distances in the finance, insurance, and real estate (FIRE) one-digit category. The results are particularly large in manufacturing where the coefficients in columns 5 and 6 suggest that a $1 minimum wage increase reduces the share of new establishment activity by between 9.6% and 12.2%. While large, these effects may be plausible because manufacturing SICs have a relatively high reliance on low skilled labor and therefore may be more sensitive to minimum wage increases. This hypothesis is further explored in Section 5.2.

Another important research question is how minimum wage policy affects an area's share of existing establishments. A change in existing establishment in an area could occur from establishment "deaths" or from establishments moving out of the area. The D&B data does not allow me to determine whether a change in existing establishments was the result of establishment "deaths" or moving. However, from an area's viewpoint an establishment "death" and an establishment moving out of an area has the same effect on the vitality of that area's local economy. Table 4 presents the analysis of the impact of minimum wage policy on an area's existing establishments, which use the change in the share of existing establishments and employment in an area that received a minimum wage increase as the dependent variable. The results are similarly presented across different distance widths from the state border and across different one-digit SIC industry categories as in Table 3. Columns 1 and 2 of Table 4 show that minimum wage

[13] Papers using difference-in-differences methodologies often begin by presenting simple levels regressions as well as first differenced regressions. Both levels regressions, which estimate the minimum wage on the share of business activity in the area for each year, and first difference regressions, which estimate the difference in the minimum wage on the difference in business activity between the border-area pair, do not adequately control for unobserved area characteristics so they are dropped for parsimony but are available upon request from the author.

[14] To test the robustness of the standard errors, the state is also clustered and similar standard errors are found. There are 38 state border pairs in this study. Please note that the NY-VT state border pair is excluded due to the fact that Vermont's changes are indexed.

Table 6
Difference-in-differences regression results using weights by reliance on low-educated workers for new establishments (dependent variable: share of new business births or employment on the minimum wage increased side).

	Percent of industry workforce with less than HS education[c]					
	Less than 5%		5–15%		Greater than 15%	
	New Births[a] (1)	New Emp.[b] (2)	New Births[a] (3)	New Emp.[b] (4)	New Births[a] (5)	New Emp.[b] (6)
Distance: 0–1 mile						
MWΔ	−0.059***	−0.017	−0.040***	−0.033***	−0.159***	−0.189***
	(0.012)	(0.013)	(0.011)	(0.011)	(0.022)	(0.024)
Constant	0.55	0.515	−0.028	−0.031	0.189	0.131
	(3.681)	(3.809)	(0.802)	(0.855)	(0.154)	(0.174)
2-Digit Industry FE	23	23	33	33	12	12
N	4709	4709	7505	7505	2321	2321
Adj. R^2	0.055	0.040	0.054	0.040	0.085	0.130
Distance: 0–5 miles						
MWΔ	−0.009	0.012	−0.007	−0.018	−0.081***	−0.092***
	(0.012)	(0.013)	(0.011)	(0.012)	(0.021)	(0.024)
Constant	0.508	0.489	−0.089	−0.084	0.251	0.255
	(3.705)	(3.995)	(1.112)	(1.187)	(0.356)	(0.411)
2-Digit Industry FE	23	23	33	33	12	12
N	4862	4862	7704	7704	2417	2417
Adj. R^2	0.039	0.028	0.040	0.028	0.054	0.062
Distance: 0–10 miles						
MWΔ	−0.012	0.011	−0.007	−0.018	−0.088***	−0.096***
	(0.0122)	(0.013)	(0.011)	(0.011)	(0.021)	(0.025)
Constant	−0.498	−0.502	−0.010	0.005	0.159	0.113
	(1.175)	(1.269)	(0.691)	(0.735)	(0.164)	(0.191)
2-Digit Industry FE	23	23	33	33	12	12
N	4902	4902	7764	7764	2448	2448
Adj. R^2	0.040	0.029	0.040	0.028	0.056	0.062

MWΔ represents the change in the difference in minimum wage between border-areas over time.
[a] For all new birth specifications, the dependent variable is framed as $Births_{MWj}/(Births_{MWj} + Births_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[b] For all new employment specifications, the dependent variable is framed as $Emp_{MWj}/(Emp_{MWj} + Emp_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[c] The percent of an industry's workforce with less than a high school education is created by the IPUMS data set.
* Significance levels are indicated for 10%.
** Significance levels are indicated for 5%.
*** Significance levels are indicated for 1%.

increases have little effect on existing establishments for all industries pooled. Additionally, for all one-digit SIC industries, except for the FIRE industries, the point estimates indicate that minimum wages had a slight positive effect on existing establishments, though the point estimates are imprecise. Again, as with the one-digit SIC category regressions for new establishments, the results are consistent across all three border distances.

There are two potential problems with measuring the effect of the minimum wage policy on business location decisions by the one-digit industry category. First, these results are aggregating groups of two-digit industries that may have different dependencies on minimum wage earning workers and therefore may have different responses to state minimum wage changes. For example, the manufacturing one-digit sector includes both businesses that employ low-skilled workers, such as in the apparel industry, as well as businesses that hire high-skilled workers, such as electronic and other electrical equipment manufacturers. Second, as previously discussed, these regressions may be biased due to time-varying border-area attributes that are correlated with minimum wage increases. To address both issues, two-digit industries are grouped by a measure which proxies for their reliance on minimum wage workers and then comparative results across these different industry groups are investigated.

5.2. Results by industry reliance of low-education workers

Ideally, when a state raises its minimum wage it does not also change other policies that could alter the state's attractiveness to new and existing establishments. Then one could completely isolate the minimum wage's effect on business location decisions. However, since states enact other policies concurrently, one needs to be concerned that the minimum wage effect is confounded by other time-varying area attributes. This paper attempts to isolate the minimum wage effect from other state policies by comparing industries with a low reliance on minimum wage earning workers, which should not be affected by minimum wage changes, with industries with a greater reliance on minimum wage earning workers, which may be more affected by minimum wage changes. Since time-varying unobserved area characteristics affect both types of groups, comparing between these two groups isolates the minimum wage effect from other state policies. The identifying assumption in this specification is that time-varying area characteristics do not differentially affect industries with high reliance on low-skilled workers.

To determine how reliant each two-digit industry is on minimum wage earning workers, the IPUMS dataset, described previously, is employed. This dataset allows calculation of the percent of each two-digit industry's workforce that has completed less than a high school education. This percent is used to classify industries into three categories. An industry is considered to have a low reliance on minimum wage workers if the industry's workforce consists of less than 5% of workers with less than a high school education. Likewise, an industry is considered to have some reliance on minimum wage workers if the workforce consists of between 5% and 15% of workers with less than a high school education. Lastly, a workforce with greater than 15% is defined as

Table 7
Difference-in-differences regression results by reliance on low-educated workers for existing establishments (dependent variable: share of existing business counts or employment on the minimum wage increased side).

	Percent of industry workforce with less than HS education[c]					
	Less than 5%		5–15%		Greater than 15%	
	Existing Counts[a] (1)	Existing Emp.[b] (2)	Existing Counts[a] (3)	Existing Emp.[b] (4)	Existing Counts[a] (5)	Existing Emp.[b] (6)
Distance: 0–1 mile						
MWΔ	−0.0008	−0.001	0.013**	0.009	0.001	−0.009
	(0.007)	(0.007)	(0.006)	(0.006)	(0.010)	(0.012)
Constant	−0.071	−0.071	−0.035	−0.071	−0.055	−0.024
	(0.165)	(0.165)	(0.089)	(0.083)	(0.076)	(0.069)
2-Digit Industry FE	23	23	33	33	12	12
N	4709	4709	7505	7505	2321	2321
Adj. R^2	0.009	0.007	0.012	0.008	0.019	0.027
Distance: 0–5 miles						
MWΔ	−0.0007	0.002	0.012**	0.008	−0.002	−0.004
	(0.007)	(0.006)	(0.006)	(0.005)	(0.009)	(0.010)
Constant	−0.145	−0.156	−0.052	0.001	−0.116	−0.151**
	(0.111)	(0.118)	(0.054)	(0.066)	(0.069)	(0.068)
2-Digit Industry FE	23	23	33	33	12	12
N	4862	4862	7704	7704	2417	2417
Adj. R^2	0.011	0.011	0.011	0.008	0.024	0.033
Distance: 0–10 miles						
MWΔ	−0.0009	0.00490	0.011*	0.008	0.0001	−0.002
	(0.007)	(0.006)	(0.006)	(0.006)	(0.009)	(0.009)
Constant	−0.289	−0.312	−0.128	−0.185*	−0.223*	−0.285*
	(0.111)	(0.118)	(0.074)	(0.054)	(0.061)	(0.06)
2-Digit Industry FE	23	23	33	33	12	12
N	4902	4902	7764	7764	2448	2448
Adj. R^2	0.011	0.008	0.011	0.009	0.022	0.032

MWΔ represents the change in the difference in minimum wage between border-areas over time.
[a] For all count specifications, the dependent variable is framed as $Counts_{MWj}/(Counts_{MWj} + Counts_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[b] For all employment specifications, the dependent variable is framed as $Emp_{MWj}/(Emp_{MWj} + Emp_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[c] The percent of an industry's workforce with less than a high school education is created by the IPUMS data set.
* Significance levels are indicated for 10%.
** Significance levels are indicated for 5%.
*** Significance levels are indicated for 1%.

having a high reliance on minimum wage workers. Table 2 maps the two-digit industries into each category as well as each category's average percentage of the workforce that has less than a high school education.

The results of the minimum wage's effect on new establishment location decisions and employment across these categories are presented in Table 5. Importantly, the results in Table 5 show that the effect of the minimum wage change increases with the reliance on low-education workers. Columns 1 and 2 of Table 5 show a 2% decrease in new establishment activity from a $1 increase in the minimum wage in industries that are classified to have a low reliance on low-education workers, though the effect is not statistically significant. Additionally, the estimates show that an area that receives a $1 minimum wage increase loses roughly 7% of new business activity in industries where 5–15% of their workforces are without a high school education relative to their adjacent comparison area. Columns 5 and 6 show that industries with the highest reliance on low-education workers are the industries most affected. Areas lose roughly 13% of their share of new establishment activity relative to the comparison area when they receive a $1 minimum wage increase. While these results are substantial, the negative effects of the minimum wage in industries that do not rely on minimum wage workers suggest that states are enacting other policies that deter new business and that these results are an upper bound of the effect. Using the results from columns 1 through 4 as a baseline for the effects of other concurrent state policies suggests that the effect of the minimum wage for those industries most reliant on lower-educated workers is between 6 and 11%. These results are robust to different border widths with the results for 0 up to 5 miles and 0 up to 10 miles being similar. In summary, after controlling for both unobserved heterogeneous characteristics and other state policies, increases in the minimum wage appear to negatively affect new business location decisions.

An important concern for the specification used in this paper is dealing with border-areas that have no business activity in a given time-period. It is difficult to determine whether to exclude these border-areas because they are very rural areas that rarely have any business activity regardless of changes in the minimum wage or to include these border-areas because they are important areas that simply happen to have no new business activity in that year. The previous estimates excluded these areas so as a robustness check, the same regressions were estimated by reliance on low-education workers weighting each border-area pair based on the total amount of existing establishment activity in the pair in the pre-period. These regressions include all available border-areas and give additional weight to areas with greater existing business activity.[15]

[15] This was calculated by giving areas with zero new establishment activity on either side in a given year a zero percent for both sides instead of a missing observation.

Table 8
Difference-in-differences regression results for selected 2-digit industry categories for new establishments (dependent variable: share of new business births or employment on the minimum wage increased side).

	Eating and drinking places		Hotel industry		Apparel manufacturing		Legal services		Engineering and management services		Holding and investment services	
	New Births[a] (1)	New Emp.[b] (2)	New Births[a] (3)	New Emp.[b] (4)	New Births[a] (5)	New Emp.[b] (6)	New Births[a] (7)	New Emp.[b] (8)	New Births[a] (9)	New Emp.[b] (10)	New Births[a] (11)	New Emp.[b] (12)
Workforce with a HS education (%)	15.5		15.2		29.7		0.6		1.2		1.0	
Distance: 0–1 mile												
MWΔ	−0.073	−0.058	−0.262**	−0.272**	−0.315***	−0.336***	−0.011	−0.032	0.049	0.066	0.106	0.102
	(0.089)	(0.09)	(0.125)	(0.105)	(0.114)	(0.115)	(0.11)	(0.11)	(0.112)	(0.105)	(0.09)	(0.088)
Constant	0.019	0.047	0.208*	0.232**	0.145	0.167	0.025	0.037	−0.016	−0.022	−0.104	−0.096
	(0.082)	(0.079)	(0.116)	(0.099)	(0.124)	(0.126)	(0.098)	(0.099)	(0.088)	(0.084)	(0.079)	(0.077)
N	339	339	290	290	171	171	208	208	341	341	275	275
Adj. R^2	0.004	0.002	0.043	0.044	0.073	0.085	0.000	0.001	0.002	0.003	0.009	0.008
Distance: 0–5 miles												
MWΔ	−0.055	−0.038	−0.259**	−0.274**	−0.266**	−0.283**	−0.001	−0.019	0.055	0.072	0.117	0.11
	(0.087)	(0.092)	(0.119)	(0.104)	(0.098)	(0.135)	(0.114)	(0.114)	(0.109)	(0.105)	(0.088)	(0.086)
Constant	−0.007	0.004	0.209*	0.249*	0.132	0.158	0.01	0.025	−0.025	−0.032	−0.109	−0.100
	(0.081)	(0.078)	(0.109)	(0.099)	(0.112)	(0.117)	(0.104)	(0.104)	(0.093)	(0.092)	(0.079)	(0.078)
N	339	339	301	301	181	181	223	223	342	342	283	283
Adj. R^2	0.002	0.001	0.043	0.044	0.051	0.058	0.000	0.000	0.002	0.004	0.010	0.009
Distance: 0–10 miles												
MWΔ	−0.057	−0.037	−0.281**	−0.289***	−0.256**	−0.271**	0.025	0.007	0.059	0.065	0.129	0.122
	(0.085)	(0.089)	(0.118)	(0.101)	(0.098)	(0.103)	(0.109)	(0.109)	(0.110)	(0.106)	(0.088)	(0.085)
Constant	−0.010	−0.001	0.225**	0.26**	0.136	0.16	−0.001	0.014	−0.031	−0.028	−0.12	−0.109
	(0.08)	(0.077)	(0.108)	(0.098)	(0.11)	(0.115)	(0.102)	(0.102)	(0.093)	(0.092)	(0.079)	(0.078)
N	340	340	304	304	183	183	226	226	342	342	287	287
Adj. R^2	0.002	0.001	0.051	0.050	0.046	0.051	0.000	0.000	0.003	0.003	0.013	0.011

MWΔ represents the change in the difference in minimum wage between border-areas over time.
[a] For all new birth specifications, the dependent variable is framed as $Births_{MWj}/(Births_{MWj} + Births_{nonMWj})$ for all j = 1,. . .,J border-area pairs.
[b] For all new employment specifications, the dependent variable is framed as $Emp_{MWj}/(Emp_{MWj} + Emp_{nonMWj})$ for all j = 1,. . .,J border-area pairs.
* Significance levels are indicated for 10%.
** Significance levels are indicated for 5%.
*** Significance levels are indicated for 1%.

Table 6 shows that the weighted regressions support the earlier findings that industries that rely most heavily on low-education workers are affected the most by changes in the minimum wage. For the 0 up to 1 mile distance, industries classified as low or with some reliance on the minimum wage (less than 15%) lose roughly 2–6% of their share while industries with over 15% of their workforce without a high school education lose 16–19% of their share of new establishment activity following a $1 increase in the minimum wage. This finding is consistent across all border distances. Tables 5 and 6 present evidence that new establishments, which are more mobile compared to existing establishments, are negatively affected by minimum wage increases.

Finally, the effect of a state minimum wage increase on existing establishments across an industry's reliance on low-education workers is investigated. Similar to the earlier results in Table 4, there is little evidence that the minimum wage has any impact on existing establishments either changing their location or changing their number of employees. Additionally, the estimated effects are small regardless of the reliance on low-education workers. These findings, coupled with the findings of Table 4, suggest that existing establishments are not affected by the minimum wage.[16] The differential effect between new and existing businesses may explain the recent literature's findings that aggregate employment is not impacted by the minimum wage. With 96% of businesses in the D&B dataset in the border-areas classified as existing businesses and the results in Tables 4 and 7 that indicate that existing businesses are not affected by the minimum wage, the previous literature may be missing the effect on new business.

5.3. Results for selected two-digit industries

A review of the recent literature on the employment effects of minimum wages finds a plethora of studies that focus on specific industries known to hire large numbers of minimum wage earning workers, such as the restaurant and hotel industries.[17] In this section I compare how minimum wage policy affects specific industries with high dependences on low-education workers (eating and drinking places, hotel and apparel manufacturing) with industries that have the least reliance on low-education workers (legal services, engineering and management services, and holding and investment services).

Table 8 investigates the effect on new establishments and shows a modest 7% decrease in new establishments in the eating and drinking places industry (although statistically imprecise). However, columns 3 and 5 for the 0–1 mile distance show the hotel

[16] Note that there is little need to run weighted regressions for existing establishments as there are few border-areas with no existing establishments. Nonetheless, the weighted regressions on existing establishments were estimated and the results support the main finding that existing establishments are not affected by the minimum wage.

[17] See Card and Krueger (1995), Neumark and Wascher (2007) for a review of this literature. An example of recent research on the restaurant industry is Singell and Terborg (2007).

Table 9
Difference-in-differences regression results for selected 2-digit industry categories for existing establishments (dependent variable: share of existing business counts or employment on the minimum wage increased side).

	Eating and drinking places		Hotel industry		Apparel manufacturing		Legal services		Engineering and management services		Holding and investment services	
	Existing Counts[a] (1)	Existing Emp.[b] (2)	Existing Counts[a] (3)	Existing Emp.[b] (4)	Existing Counts[a] (5)	Existing Emp.[b] (6)	Existing Counts[a] (7)	Existing Emp.[b] (8)	Existing Counts[a] (9)	Existing Emp.[b] (10)	Existing Counts[a] (11)	Existing Emp.[b] (12)
% of Workforce with a HS Education	15.5%		15.2%		29.7%		0.6%		1.2%		1.0%	
Distance: 0–1 mile												
MWΔ	0.006	0.014	0.009	0.033	0.042	−0.003	0.012	0.009	−0.0004	−0.006	−0.044	−0.0006
	(0.008)	(0.009)	(0.015)	(0.023)	(0.055)	(0.045)	(0.015)	(0.019)	(0.018)	(0.033)	(0.039)	(0.059)
Constant	−0.006	−0.017*	0.0006	−0.039	−0.058	−0.022	−0.009	−0.012	0.01	0.021	0.02	−0.010
	−0.009	(0.009)	(0.015)	(0.025)	(0.044)	(0.039)	(0.011)	(0.014)	(0.009)	(0.025)	(0.030)	(0.059)
N	339	339	290	290	171	171	208	208	341	341	275	275
Adj. R^2	0.002	0.005	0.002	0.007	0.005	0.000	0.003	0.001	0.000	0.000	0.005	0.000
Distance: 0–5 miles												
MWΔ	0.008	0.016*	0.004	0.028	0.045	0.036	0.018	0.012	0.0005	0.001	−0.048	−0.006
	(0.008)	(0.009)	(0.014)	(0.023)	(0.055)	(0.047)	(0.014)	(0.019)	(0.017)	(0.029)	(0.036)	(0.054)
Constant	−0.008	−0.022**	0.003	−0.039	−0.049	−0.056	−0.014	−0.014	0.009	0.014	0.029	−0.003
	(0.009)	(0.010)	(0.014)	(0.024)	(0.037)	(0.039)	(0.010)	(0.013)	(0.009)	(0.021)	(0.026)	(0.053)
N	339	339	301	301	181	181	223	223	342	342	283	283
Adj. R^2	0.003	0.005	0.000	0.006	0.007	0.004	0.008	0.002	0.000	0.000	0.006	0.000
Distance: 0–10 miles												
MWΔ	0.008	0.015	0.003	0.029	0.048	0.039	0.014	0.009	0.0003	0.001	−0.040	0.005
	(0.008)	(0.009)	(0.013)	(0.023)	(0.053)	(0.047)	(0.014)	(0.018)	(0.017)	(0.029)	(0.037)	(0.053)
Constant	−0.009	−0.021**	0.002	−0.041*	−0.047	−0.054	−0.012	−0.013	0.009	0.015	0.023	−0.015
	(0.009)	(0.010)	(0.013)	(0.024)	(0.037)	(0.039)	(0.010)	(0.013)	(0.009)	(0.021)	(0.027)	(0.052)
N	340	340	304	304	183	183	226	226	342	342	287	287
Adj. R^2	0.003	0.005	0.000	0.006	0.008	0.005	0.005	0.001	0.000	0.000	0.004	0.000

MWΔ represents the change in the difference in minimum wage between border-areas over time.
[a] For all count specifications, the dependent variable is framed as $Counts_{MWj}/(Counts_{MWj} + Counts_{nonMWj})$ for all $j = 1, \ldots, J$ border-area pairs.
[b] For all employment specifications, the dependent variable is framed as $Emp_{MWj}/(Emp_{MWj} + Emp_{nonMWj})$ for all $j = 1, \ldots, J$ border-area pairs.
* Significance levels are indicated for 10%.
** Significance levels are indicated for 5%.
*** Significance levels are indicated for 1%.

and apparel manufacturing industries were significantly affected with decreases of 26% and 31% in new establishments, respectively, compared to the adjacent comparison area. Likewise, only legal services shows a small statistically insignificant decrease in new establishment activity, while the engineering and holding and investment services industries have positive point estimates that are imprecise.

Turning the analysis to how existing establishments were affected in these industries, Table 9 shows no discernable difference between industries with different dependencies on low-education workers. However, columns 1 through 4 illustrate, for all distance widths, small positive point estimates for eating and drinking places (restaurants) and the hotel industry, though the effects are generally imprecisely estimated. A potential explanation for the small positive results on existing establishment activity is decreased competition from new businesses as the estimates in Table 8 suggest that new business activity decreases following the minimum wage increase.

5.4. Placebo test results

As a robustness check, the same analysis was conducted using the same state borders for both new and existing establishments but prior to the actual minimum wage increase. This tests whether there were any trends in establishment activity leading up to the time-periods used in this paper, as well as if there were any anticipatory effects that were overlooked. In particular, the post-periods I use in the placebo test are the pre-periods used for the earlier regression analyses. I then choose pre-periods for the placebo test 2 years earlier, subject to data availability. Table 10 shows the time-periods that were used for the placebo test and the time difference between the pre- and post-time-periods.

Table 10
Descriptve statistics for data used in 2 years Earlier Placebo Test.

State name	Pre-period data used	Post-period data used[a]	Time difference
Arkansas	2004-Q2	2005-Q4	7 Quarters
Connecticut	2002-Q4	2004-Q2	6 Quarters
Illinois	2000-Q4	2003-Q1	9 Quarters
Maryland	2002-Q4	2004-Q2	6 Quarters
Michigan	2002-Q4	2004-Q2	6 Quarters
Minnesota	2000-Q4	2003-Q1	9 Quarters
New Jersey	2002-Q3	2004-Q2	7 Quarters
New York	2000-Q4	2003-Q1	9 Quarters
Rhode Island	2000-Q4	2002-Q4	8 Quarters
Wisconsin	2000-Q4	2003-Q1	9 Quarters

[a] Note that the post-period data is the pre-period data used in the main results.

Table 11 presents the results of the 2-year placebo tests for both new and existing establishments separating the industries by their reliance on low-education workers. The top panel of Table 11 shows the effect of the pseudo minimum wage increases on new establishment activity. Although none of the point estimates are statistically significant, the point estimates in columns 1 and 2 of Table 11 suggest that new businesses that do not rely

Table 11
Difference-in-differences regression results by reliance on low-educated workers (dependent variable: share of business counts or employment on the minimum wage increased side).

	Percent of industry workforce with less than HS Education[a]					
	Less than 5%		5–15%		Greater than 15%	
	New Births[b] (1)	New Emp.[c] (2)	New Births[b] (3)	New Emp.[c] (4)	New Births[b] (5)	New Emp.[c] (6)
Distance: 0–1 mile						
MWΔ[d]	−0.032	−0.035	0.009	0.004	0.049	0.048
	(0.027)	(0.028)	(0.022)	(0.023)	(0.048)	(0.049)
Constant	0.052	0.054	0.49***	0.496***	−0.026	−0.005
	(0.208)	(0.208)	(0.025)	(0.026)	(0.121)	(0.119)
2-Digit Industry FE	23	23	33	33	12	12
N	4238	4238	7052	7052	2204	2204
Adj. R^2	0.012	0.012	0.008	0.008	0.015	0.011
	Existing Counts[e] (1)	Existing Emp.[f] (2)	Existing Counts[e] (3)	Existing Emp.[f] (4)	Existing Counts[e] (5)	Existing Emp.[f] (6)
Distance: 0–1 miles						
MWΔ	−0.007	−0.004	−0.008	−0.004	0.006	0.011
	(0.008)	(0.009)	(0.008)	(0.004)	(0.009)	(0.009)
Constant	0.004	0.0001	−0.116	−0.119	−0.037	−0.036**
	(0.004)	(0.005)	(0.086)	(0.085)	(0.025)	(0.017)
2-Digit Industry FE	23	23	33	33	12	12
N	4238	4238	7052	7052	2204	2204
Adj. R^2	0.008	0.008	0.016	0.010	0.006	0.007

[a] The percent of an industry's workforce with less than a high school education is created by the IPUMS data set.
[b] For all new birth specifications, the dependent variable is framed as $Births_{MWj}/(Births_{MWj} + Births_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[c] For all new employment specifications, the dependent variable is framed as $Emp_{MWj}/(Emp_{MWj} + Emp_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[d] MWΔ represents the change in the difference in minimum wage between border-areas over time.
[e] For all count specifications, the dependent variable is framed as $Counts_{MWj}/(Counts_{MWj} + Counts_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
[f] For all employment specifications, the dependent variable is framed as $Emp_{MWj}/(Emp_{MWj} + Emp_{nonMWj})$ for all $j = 1,\ldots,J$ border-area pairs.
* Significance levels are indicated for 10%.
** Significance levels are indicated for 5%.
*** Significance levels are indicated for 1%.

on low-education workers were not as prevalent in states that increased their minimum wage relative to their comparison areas. Likewise, the point estimates in columns 5 and 6 give slight evidence that establishments that rely on low-education workers were gaining a greater share of the new establishment activity before minimum wage increases were implemented. This result reinforces the earlier findings that minimum wage policy deterred new establishment activity. The lower panel of Table 11 shows that there were no distinct trends in existing establishments 2 years prior to these areas receiving increases in their minimum wage.

6. Conclusion

To understand the full impact of minimum wage policy it is important not only to measure the benefits of the policy but also any potential unintended costs of the policy. In particular, it is valuable to identify whether state minimum wage policy is detracting from the goal of attracting new and existing establishments to increase the vitality of the local economy.

This paper is one of the first to find that new and existing businesses are differentially affected. The estimates suggest that minimum wage policy does in fact decrease new establishment activity in industries that depend on minimum wage earning workers. This can affect future agglomeration economies as well as tax revenues for an area. Other estimates suggest that minimum wage increases are not detrimental enough to cause existing establishments to decrease employment, or leave the area by shutting down or moving to an adjacent area with a lower minimum wage. This may be due to the high cost of moving for an establishment either in terms of actual moving costs or loss of customers. With existing establishments representing roughly 96% of total establishments in this study, the findings support the general conclusion, that the minimum wage has little effect on total business. However, finding that minimum wage policy negatively impacts new establishments is still important due to the significance of new business to the rate of growth and the economic vitality of a region. Previous papers that do not separate new business activity from total business activity may be missing an important unintended consequence of the minimum wage.

In a literature that has not conclusively found significant effects of the minimum wage on firm location, studying the geographic area that would have the most potential effect due to spillovers or firms "hopping" across to the other state has an important quality. While this potential for a negative bias may be a critique of labor demand studies, this effect is an advantage when studying firm location. Although, the benefit of businesses locating on the other side of a border is not large for society as a whole, additional establishments can have a significant impact on local governments in the form of tax receipts, particularly in times of large local and state budget deficits.

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References

Arzaghi, Mohammad, Henderson, J. Vernon, 2008. Networking off madison avenue. Review of Economic Studies 75 (4), 1011–1038.
Briant, A., Combes, P., Lafourcade, M., 2010. Dots to boxes: do the size and shape of spatial units jeopardize economic geography estimates? Journal of Urban Economics 67, 287–302.
Brown, Charles, Gilroy, Curtis, Andrew, Kohen, 1982. The effect of the minimum wage on employment and unemployment. Journal of Economic Literature 20, 487–528.

Card, David, Krueger, Alan B., 1994. Minimum wages and employment: a case study of the fast-food industry in New Jersey and Pennsylvania. American Economic Review 84 (4), 772–793.

Card, David., Krueger, Alan.B., 1995. Myth and measurement: the new economics of the minimum wage. Princeton University Press, Princeton, NJ.

Carlton, Dennis W., 1983. The location and employment choices of new firms: an econometric model with discrete and continuous endogenous variables. The Review of Economics and Statistics 65 (3), 440–449.

Dube, Arindrajit, Lester, T. William, Reich, Michael, 2008. Minimum wage effects across state borders: estimates using contiguous counties. Institute for Research on Labor and Employment Working Paper Series No. iirwps-157-07.

Duranton, G., Gobillon, L., Overman, H., 2006. Assessing the effects of local taxation using microgeographic data, Discussion Papers 5856, CEPR.

Holmes, Thomas J., 1998. The effects of state policies on the location of manufacturing: evidence from state borders. Journal of Political Economy 106 (4), 667–705.

Huang, Rocco., 2008. Evaluating the real effect of branch banking deregulation: comparing contiguous counties across US state borders. Journal of Financial Economics 87 (3), 678–705.

Kreft, Steven F., Sobel, Russel S., 2005. Public policy, entrepreneurship, and economic growth. Cato Journal 25 (3), 595–616.

Kim, Taeil, Taylor, Lowell, 1995. The employment effect in retail trade of California's 1988 minimum wage increase. Journal of Business and Economic Statistics 13 (2).

Neumark, David, Junfu, Zhang, Brandon, Wall, 2006. Where the jobs are: business dynamics and employment growth. Academy of Management Perspectives 20 (4), 79–94.

Neumark, David, Wascher, William, 1995. The Effect of New Jersey's Minimum Wage Increase on Fast-food Employment: A Re-evaluation Using Payroll Records. Department of Economics, Michigan State University, Mimeograph.

Neumark, David, Wascher, William, 2000. Minimum wages and employment: a case study of the fast-food industry in New Jersey and Pennsylvania: Comment. American Economic Review 90 (5), 1362–1396.

Neumark, David, Wascher, William, 2007. Minimum wages and employment. Foundations and Trends in Micro economics 13 (1–2), 1–182.

Orazem, Peter, Mattila, Peter, 2002. Minimum wage effects on hours, employment, and the number of firms: the Iowa case. Journal of Labor Research 23 (1).

Rosenthal, S.S., Strange, W.C., 2001. The determinants of agglomeration. Journal of Urban Economics 50, 191–229.

Rosenthal, S.S., Strange, W.C., 2003. Geography, industrial organization and agglomeration. The Review of Economics and Statistics 85 (2), 377–393.

Singell, Larry D., Terborg, James R., 2007. Employment effects of two northwestern minimum wage initiatives. Economic Inquiry 45 (1), 40–55.