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The Effect of State Policies on the Location of Industry: Evidence from State Borders*

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ABSTRACT

This paper provides new evidence that state policies play a role in the location of industry. The paper classifies a state as pro-business or anti-business depending upon whether or not the state has a right-to-work law. The paper finds that, on average, there is a large abrupt increase in manufacturing activity when crossing a state border from an anti-business state into a pro-business state.

*The views expressed herein are those of the author and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System.

1 Introduction

Do the pro-business policies pursued by some states attract industry? This is a controversial issue. In state capitals throughout the country, proponents of pro-business policies routinely claim that state policies are an important determinant of business location. But this claim is open to debate. While there has been no shortage of studies on the issue, there is a lack of consensus.[1] Some studies have found pro-business policies to be associated with growth in industry, but it is difficult to infer from these studies that the policies *caused* growth.

This paper uses a fresh approach to examine this issue. It considers what happens to manufacturing activity when one crosses state borders. Suppose that a state with a pro-business policy is adjacent to a state with an anti-business policy. If state policies are important for the location of industry, we should find a discontinuous drop in manufacturing activity when crossing the border from the pro-business state into the anti-business state.

I classify a state as *pro-business* if it has a right-to-work law and as *anti-business* if it does not. Section 2 explains in detail my reasons for focusing on right-to-work laws. I will briefly mention two of those reasons. The first is that a right-to-work law is, in itself, a pro-business law because such a law weakens unions. A right-to-work law makes it illegal for someone to be forced to join a union as a condition of employment at a firm. It is clear that the original intent of these laws was to weaken unions, and there is some evidence that the laws have had their intended effect. The second reason for focusing on right-to-work laws is that states with such laws tend to adopt a variety of other pro-business policies. Thus a right-to-work law serves as an indicator of a pro-business legislative climate.

Figure 1 is a map showing which states have right-to-work laws. The tendency for states within the same region to have the same policy is striking. No state in the traditional *manufacturing belt* (the New England, mid-Atlantic and Great Lakes states) has a right-to-work law. Every state that joined the Confederacy has a right-to-work law. In fact, the border between the Confederate and Union states coincides with a portion of the right-to-work border.

[1] See Bartik (1991) and Wasylenko (1991) for surveys.

There has been a dramatic shift of manufacturing activity to states with right-to-work laws. Manufacturing employment across states without right-to-work laws is virtually the same today as it was in 1947 and is 10 percent less than it was in 1963. What was once called the manufacturing belt is now sometimes called the "rust belt." In contrast, since 1947 manufacturing employment has increased 150 percent in the right-to-work states. North Carolina and Mississippi are now the leading manufacturing states in terms of manufacturing's share of total employment.

The fact that industry shifted in a dramatic way to right-to-work states does not necessarily imply that the pro-business policies pursued by these states caused this migration. Many factors that have nothing to do with state policy played a role in the migration of manufacturing to the South.[2]

For starters, there is little doubt that the low wages in the South played a major role in attracting industry. One explanation for these low wages that has nothing to do with policy is the productivity revolution in agriculture. Advances in agricultural productivity freed up labor resources from farms and depressed wages. This had a disproportionate effect in the South because of the high share of agriculture in the southern economy. Because of the productivity revolution in agriculture, we would expect to see an increase in manufacturing activity in states that initially had high agricultural shares. But, not coincidently, the states with high agricultural shares all passed right-to-work laws and the states with low agricultural shares did not. This makes it hard to separate the agriculture-based explanation from the policy-based explanation.

There is also the issue of unions. It is widely believed that industry left the North to escape unions. Unions have been weak in the South and continue to be weak for various reasons, most of which probably have little to do with policy. Southerners as a group are perceived to have hostile attitudes towards unions. Perhaps this is related to the fact that manufacturing was a small share of the Southern economy during the union movement earlier this century. Even if right-to-work laws were irrelevant in location decisions, we would still expect to see a positive correlation between manufacturing growth and these laws. This follows because hostile attitudes

[2]For a discussion of these various factors see Fuchs (1963) or Wheat (1973).

towards unions would be associated with both growth in manufacturing activity as well as passage of these laws.

Other factors for why industry shifted south include climate and changes in transportation. The advent of air conditioning made the climate in the South relatively more attractive than the climate in the North. This played a role in attracting people, and along with this migration of people, came a migration of manufacturing activity. Right-to-work states tend to be warmer than the other states, so the climate factor should induce a positive correlation between manufacturing growth and right-to-work status. Changes in transportation, such as the substitution of trucking for rail transport, may have diminished the forces that originally caused manufacturing to agglomerate in the manufacturing belt, and this might lead to a spreading out of industry. Manufacturing activity might have grown more in right-to-work states because manufacturing activity was initially low in these states.

To identify the effect of state policies on the location of industry, one might attempt to control in a regression analysis for the various geographical factors that determine the distribution of industrial activity. One would have to obtain information on the climate of a location, the fertility of the soil, access to an ocean, a river, or lake, the proximity to raw materials, and so forth. This list of variables one would have to control for is somewhat daunting. A particularly difficult issue is how one might handle the possibility of agglomeration economies. Two different locations might be identical in natural geographic factors. But because of agglomeration economies, industry might concentrate in one of the locations and not the other

This paper is able to draw inferences about the effects of state policies by examining what happens at state borders.[3] At state borders, the geographic determinants of the distribution of industry, e.g., climate, soil fertility, access to transportation, the level of agglomeration benefits, and so one, are approximately the same on both sides of the border. What differs at the border is policy. To the extent that the pro-business policies pursued by the southern states have been a factor in the southward

[3]Some previous research has examined border areas as a way of determining the effects of different policies on the part of adjacent states. Fox (1986) finds evidence that differences in sales tax rates between neighboring states affect retail sales in border counties. Card and Krueger (1994) consider the New Jersey/Pennsylvania border area to examine the effects of an increase in the minimum wage.

movement of industry, there should be an abrupt change in manufacturing activity at the border. In contrast, if the policies make no difference, there should be no abrupt change at the border. Consider the case of climate. While the average temperature in the South is certainly much higher than in the North, in the border area the temperature is approximately the same on both sides of the border. To the extent that the economic development of the South is due to its favorable climate, there should be no abrupt change at the border. Analogously, if state policies are irrelevant, then union power will not change abruptly at state borders and neither will industrial activity.

I find evidence that manufacturing activity increases abruptly when crossing the right-to-work border into a right-to-work state. To obtain my estimates, I use data on manufacturing employment levels for counties and classify each county by how far its population centroid is from the right-to-work border. I find that manufacturing employment in a county as a percent of total employment in the county increases on average by approximately one third when crossing the border into a right-to-work state. It is important to emphasize that a finding that employment increases one third at a state border does not imply that a pro-business state policy increases employment by one third throughout the state. The effects of policy differences far from the border can be very different from the effects close to the border. This issue is discussed in Section 3.

In addition to examining the *levels* of industrial activity, I also look at growth rates in manufacturing employment over the postwar period 1947-1992. As mentioned earlier, growth in right-to-work states is remarkably higher than in the remaining states. I find that there is a sharp difference in growth rates right at the boundary where the policy changes.

The rest of the paper is organized as follows. Section 2 motivates why I focus on right-to-work laws. Section 3 is a brief theoretical section that makes a few points about what can happen at state borders. Section 4 explains how I handled the geographic nature of the data. Section 5 is the main section of the paper. It examines what happens to manufacturing activity at the border. Section 6 concludes.

2 Why Focus on Right-to-Work Laws?

The purpose of this section is to motivate why I choose to focus on right-to-work laws. It is useful to begin with some background about right-to-work law history. Florida and Arkansas passed the first right-to-work laws in 1944. It was not initially clear whether these statutes were legal under federal labor law. This ambiguity was cleared up in 1947 when the US Congress passed the Taft-Hartley Act. Section 14(b) of this act gave states the legal power to pass right-to-work laws. After the Taft-Hartley Act, more states passed right-to-work laws, with most of the legislation enacted in the late 1940s and 1950s (see Gall (1988) for a discussion of the legislative battles). With three exceptions, the map of the right-to-work states as it exists today (see Figure 1) was in place by 1958. The three exceptions are as follows: Indiana, in 1965, repealed the right-to-work law it had passed in 1957; Louisiana passed its right-to-work law in 1976; and Idaho passed its law in 1986. Even though the map has changed little for some time, the controversy about these laws continues. The National Right to Work Committee, an anti-union lobbying group, remains busy trying to pass these laws in states that do not have them. And pro-union forces actively try to repeal these laws in states that do.[4] At the federal level, there is an effort by the anti-union forces to pass a national right-to-work law.[5] Pro-union forces have been seeking a repeal of Section 14(b) of the Taft-Hartley Act since the act was passed.

This paper focuses on right-to-work laws for two reasons. First, a right-to-work law is a clear-cut case of a pro-business policy. Second, right-to-work states tend to pursue other pro-business policies, so the presence of a right-to-work law is a proxy of a pro-business climate.

2.1 Right-to-work Laws are Pro-Business

Let's take as a given that a policy that weakens unions is a policy that is pro-business. There are reasons to believe that right-to-work laws weaken unions. Under a right-to-

[4]For example, labor unions have recently tried to pass Fair Share legislation in states with right-to-work laws. This would enable unions to negotiate clauses in their contracts that would force all workers to contribute their "fair share" of organizing costs. See Lewis (1993).

[5]See the article by the sponsor of this legislation, Senator Orrin Hatch (R., Utah): "...But the Strong-Arm Tactics Continue," *Wall Street Journal*, September 1, 1995.

work law, an employee covered under a union contract cannot be forced to pay union dues. Unions complain that this creates a free-rider problem. Covered employees can enjoy the benefits of collective bargaining without paying the cost. Freeman and Medoff (1984, p. 243) report that "in right-to-work states, upwards of 20 percent of workers covered by collective bargaining are not union members." This limits the financial resources of a union, and this, in turn, may weaken its bargaining power.

A right-to-work law reduces the value to a union of organizing a plant compared to what the value would be if the union could impose a union shop. Hence, we might expect that a right-to-work law would lower the frequency with which unions successfully organize plants. Ellwood and Fine (1987) provide some evidence that passage of a right-to-work law reduces the success of subsequent organizing drives. Their results suggest that a right-to-work law reduces the percent of employees working in organized plants by 5 to 10 percent. This is consistent with other recent studies, e.g., Ichniowski and Zax (1991), that right-to-work laws have a small negative effect on union membership.[6]

While the effect of right-to-work laws on union membership is a well studied subject, there are relatively few studies of the effect of the laws on plant location. Some statistical studies, including Newman (1983) and Plaut and Pluta (1983), report that right-to-work laws are associated with various measures of state growth, such as growth in manufacturing employment.[7] These studies do not establish that right-to-work laws *caused* the higher growth.

There are case studies that suggest right-to-work laws might make a difference in plant location. A good example is the case of Nissan's choice of a site for its North American automobile plant. Nissan was and remains openly anti-union. All the states on the final list (Tennessee, Georgia, and South Carolina) were right-to-work states. All of these states had the drawback of being far from the automotive supplier base centered in Michigan. Nissan eventually chose a site in Tennessee, the closest right-to-work state to Michigan. Rubenstein (1992) writes, "The choice of rural Tennessee fit Nissan's strong anti-union orientation. The nearby Nashville

[6]There is a debate in the literature about how big this effect is. See Moore and Newman (1985) for a survey.

[7]This contrasts with an earlier study by Soffer and Korenich (1961) that found little relationship.

metropolitan area had little automotive employment. More importantly, Tennessee was a so-called right-to-work state." Perrucci (1994, p.56) makes a similar point.

It is certainly clear that states that have right-to-work laws use them to promote their state. For example, Louisiana advertises that it has a right-to-work law in the trade magazine *Site Selection.* As discussed in Cobb's (1993) history of the South's effort to attract industry, development officials in southern states regarded their states' hostile public policies toward unions as important selling points for their states.

2.2 Right-to-work States are Pro-Business States

States that have right-to-work laws tend to adopt other pro-business policies compared with states that do not have these laws. Consider, for example, the border pair of Minnesota, a state without a right-to-work law, and North Dakota, a state with such a law. Minnesota, the home of Hubert Humphrey and Walter Mondale, has a strong tradition of pro-labor tendencies. The Democratic party is actually called the Democratic-Farm-Labor party in this state. Minnesota was the first state to require employers to offer parental leave and the first state to ban the hiring of permanent replacements of strikers.[8] North Dakota has different traditions. It can be counted on to vote Republican in presidential contests. It has a reputation for having low taxes. A 1983 study of border cities by the Minnesota Planning Division (1983) found that a typical business could cut its taxes in half by moving from the Minnesota side of the border to the North Dakota side. The same study also reported that workers compensation costs were significantly lower on the North Dakota side.[9]

One can find rankings of "state business climates" in a variety of places. One well-known ranking is the one constructed by the Fantus company in 1975.[10] Though somewhat dated, the Fantus index was constructed in a more comprehensive way than more recent alternatives. The ranking was based on 15 different aspects of state policy, including labor-market policies, unemployment compensation taxes, corporate

[8]The law bannning permanent replacements was subsequently overturned by the courts.

[9]Minnesota has recently changed its workers compensation policy to be more in line with its neighboring states.

[10]Weinstein and Firestine (1978) present the results of this ranking and discuss how it was constructed.

income taxes, and so forth. Table 1 presents the ranking of the states according to the overall score. The striking thing about Table 1 is the extremely high correlation between business climate ranking and presence of a right-to-work law. This occurs even though right-to-work law status counts for only one of the 15 different criteria in the index, and the 15 different categories were equally weighted.

Consider the states along the right-to-work border in Figure 1. In virtually every case, the right-to-work states have higher overall business climate rankings than their neighboring states without right-to-work laws. The only exceptions involve the western states of Colorado, Wyoming and Idaho (which will not be included in the analysis, for reasons discussed later) and Missouri and Kansas. But note that in the Missouri/Kansas exception, Kansas, the right-to-work state, is ranked only one spot below Missouri, its neighbor without a right-to-work law. Hence, my empirical results would be essentially the same, if I used the Fantus rankings to classify states as pro-business or anti-business instead of right-to-work status.

An interesting feature of Table 1 is that states with extremely low legislative business climate rankings are never found bordering states with extremely high rankings; i.e., we don't see states like New York (widely believed to be extremely anti-business) bordering states like South Carolina (widely believed to be extremely pro-business). There are two reasons for this. First, underlying characteristics of states may change gradually as we move across space, and this might tend to smooth out the way policies change over space. Second, competition between neighboring states may tend to cause adjacent states to offer similar policies. This suggests that even if differences in state policies do matter, we might not pick this up by looking at bordering states because bordering states might tend to have similar policies. But this isn't necessarily true; there may be "fault lines" where polices change in an important way at state borders. The right-to-work border may be such a fault line.

3 Theoretical Background

Before looking at the data, it is useful to start with a theoretical model that lays out what can happen at state borders when adjacent states pursue different policies. This section presents a simple model and makes several points that will play a role in

the later discussion. For example, this section discusses what can be learned about the effects of a policy far from the border from measuring the effects near the border.

The economy is a line segment. Locations are indexed by $y \in [-1, 1]$. There are two political jurisdictions or states, and $y = 0$ is the boundary. The locations with $y \leq 0$ are in a state called the South. The locations with $y > 0$ are in state called the North. The South pursues a pro-business policy, while the North pursues an anti-business policy.

At each location, there is a set of manufacturing entrepreneurs. Assume for now that the entrepreneurs are initially uniformly spread out through the economy. An entrepreneur initially located at a point y chooses whether to set up a factory at his or her initial location y or to set up no plant at all. As explained below, some entrepreneurs may have a third option of building a plant at an alternate location. Let q denote the productivity of a manufacturing entrepreneur. This equals the amount of the final good that is produced if a manufacturing agent of productivity q sets up a plant and employs a worker. Assume that q is uniformly distributed on the unit interval and that the distribution of q is independent of location.

Workers are perfectly mobile and homogeneous. There is a competitive wage w in the economy that is paid for each unit of labor that is constant across locations.

If a manufacturing entrepreneur sets up a factory in a location in the South, the entrepreneur's profit equals his or her productivity q less the competitive wage w paid to the single employee less any moving costs incurred. (Moving costs are described below). If a manufacturing entrepreneur sets up in the North, an additional cost c is incurred. This cost arises because the North pursues the anti-business policy. The cost c has a variety of interpretations. It could represent a wage premium that arises because of pro-union policies in the North. In this case, the wage $w + c$ at a Northern factory will be above the competitive wage w, and manufacturing jobs in the North will be rationed. An alternative interpretation of c is that it is a dead-weight loss from wasteful work practices that are imposed by unions in the North. Another possibility is that c is some kind of tax.

As mentioned above, some entrepreneurs have the option of moving to an alternate location. With probability p, an entrepreneur initially located at location $y > 0$ in the

North has some alternate location $y' < 0$ in the South. Given that an entrepreneur has an alternate location, assume that this location y' is drawn from a uniform distribution over the set of locations $[-1, 0]$ in the South. Finally, assume that the cost of moving from y to y' is $t \cdot (y - y')$, i.e., t dollars per unit distance moved.

This simple formulation captures a number of intuitive ideas. The first idea is that the further one moves from his or her initial location, the bigger the cost. The second idea is that an entrepreneur may not have the option of moving to the border point $y' = 0$ in the South to minimize moving costs. The initial location at y may have some specific geographic features that the entrepreneur needs, e.g., access to a river, a critical raw material, etc. The border might not have the critical geographic features, but an interior location y' in the South may have these critical geographic features.

Let $M(y)$ denote the measure of manufacturing employment at location y. Since each factory hires one worker, this equals the measure of entrepreneurs initially at y who set up plants plus any entrepreneurs who move to y to set up a plant. It is straightforward to calculate $M(y)$, and its shape is illustrated in Figure 2a. There exists a critical distance $\hat{y}$ defined by $t\hat{y} \equiv c$ such that the moving cost of moving this distance exactly equals the cost c of the anti-business policy. Entrepreneurs at locations $y > \hat{y}$ in the North are so far from the border that it would never be worth moving to the South. The measure of manufacturing employment here (denote this m°) equals the measure of entrepreneurs initially there with a productivity level q above $w + c$. Consider next the analogous case where $y < -\hat{y}$. This is so far in the interior of the North that nobody would move there. The measure of employment here m' is the measure of entrepreneurs with productivity above w. Note that m' is higher than m°, since the productivity threshold of w on the pro-business side is lower than the productivity threshold of $w + c$ on the anti-business side.

Now consider $y \in (0, \hat{y})$. Manufacturing entrepreneurs in this region may be lucky enough to obtain locations in the South that are worth moving to; i.e., ones where $t \cdot (y - y') < c$. The lower is y, the closer the initial location is to the border and the higher the probability that the entrepreneur draws a Southern location worth moving to. This accounts for why manufacturing employment $M(y)$ is lower the

lower is y. Right at the border where the policy changes, there is a discontinuous increases in manufacturing employment as we cross into the South. As we lower y further and move further South, manufacturing employment $M(y)$ decreases. This follows because as we move further away from the border in the South, the pool of entrepreneurs who are willing to pay the moving cost to get there shrinks.

Think of the status quo as a case where the policies are the same in both states. In particular, suppose that initially both states pursue the same anti-business policy (For example, think of this as a time period before the Taft-Hartley Act when right-to-work laws were illegal). In this case, employment equals m° at all locations. This is illustrated by the dotted line in Figure 2a. Now consider what happens if the South adopts the pro-business policy. In this particular figure, the effect of the policy is very small at locations away from the border since m' is not much bigger than m°. However, the policy change has a big effect at the border, driven by the entrepreneurs initially located just north of the border, who make a small move to the area just south of the border. This example shows that finding a big effect at the border by no means implies that a policy has a big effect far from the border. The effect of a policy may fizzle out to virtually nothing when we move away from the border.

But it is also possible for the effect of the policy *not* to fizzle out as we move away from the border, as can be seen in the following two examples. Suppose first that $t = \infty$ so that moving costs are infinite. This example is illustrated in Figure 2b. Without the policy, all locations have an employment of m°. If the pro-business policy is adopted in the South, employment in the South increases to m' because the productivity threshold decreases from $w + c$ to w. Employment in the North remains fixed because moving costs are too high for anyone to move.

The second example is where $t = 0$ so that moving costs are zero. This is illustrated in Figure 2c. Assume also that c is close to zero. In the status quo where the South does not adopt the policy, employment is m° everywhere. If the South adopts the policy, employment decreases in the North and increases in the South by virtually the same amount. The policy has virtually no effect on aggregate manufacturing employment since the cost of the policy is negligible. Even though the cost of the policy is negligible, anyone who has an opportunity to move to the South does so

because the moving cost is zero. The movers to the South spread themselves out, so there is no change in manufacturing activity as we move away from the border.

Figures 2b and 2c illustrate that it is not possible to draw welfare conclusions from this border analysis. The two examples look exactly alike. Manufacturing employment is flat in the South, falls discontinuously at the border, and is flat in the North. However, these two examples are very different in terms of the welfare effects of the policy. In the case of Figure 2b, the adoption of the pro-business policy by the South creates wealth in the South and has no effect in the North. In the case of Figure 2c, adoption of the policy has a negligible effect on aggregate employment and welfare. The policy just redistributes manufacturing employment to the South.

Suppose one were interested in determining the effect of the policy at locations far from the border. Based on the discussion so far, one might want to look at what happens to manufacturing employment as we move away from the border. If, as in Figure 2a, manufacturing employment in the South drops off quickly away from the border, one might think that the effects of the policy away from the border might not be large. The final example illustrates that one should be careful about drawing such a conclusion.

Drop the assumption that the initial manufacturing endowments are uniformly distributed across the economy. Assume instead that the initial endowments are such that if policies were the same in the North and the South, the North would have a higher share of manufacturing activity. This is illustrated in Figure 2d. The dotted line illustrates manufacturing employment in the status quo where the North and the South pursue the same anti-business policy. In this case, manufacturing employment continuously increases as one moves in the direction of the North.

Suppose the South adopts the pro-business policy. (One reason it might adopt a different policy from the North is that its manufacturing endowment is different.) Suppose $t = 0$ as in Figure 2c. The effect of the pro-business policy will look something like the solid line in Figure 2d. The policy has a large effect on manufacturing activity at locations far from the border. However, the pattern near the border looks the same as in Figure 2a where the effects far from the border are small. So, one has to be careful not to confuse 2a and 2d. In principle, it might be possible to

distinguish 2a and 2d by looking for the kinks $\hat{y}$ and $-\hat{y}$ in figure 2a. However, this would certainly be a tricky business, and I do not try to do it here.

In the empirical analysis, I will look at what happens to manufacturing employment as a share of total employment. To tie the empirical work to the model, consider an extension of the model to allow for the existence of *service* entrepreneurs that are similar to the manufacturing entrepreneurs already described, with one difference. The difference is that the service entrepreneurs do not pay the cost c of the anti-business policy in the North. This assumption is easy to motivate in the context of state policies towards unions. Unlike manufacturing, services have extremely low unionization rates. A policy in the North that strengthens unions will be irrelevant to a service entrepreneur to the extent the entrepreneur does not have any union to deal with. Under the assumption that service entrepreneurs do not pay c, the differences in state policies will not effect the distribution of service employment. Suppose we look at manufacturing's share of total employment (i.e., manufacturing plus services) and plot this as a function of distance from the border. Manufacturing's share as a function of distance from the border will be similar in shape to the plots in Figure 2.

On the basis of the discussion of this section, we can draw several conclusions. First, if the policy makes a difference for manufacturing activity (i.e., if $c > 0$) but not service activity, then there will be a discontinuous jump in manufacturing's share of total employment when we cross the border into the pro-business state. Second, it is difficult to determine the effect of the policy far away from the border based on what we see close to the border. What we can say is that an estimate of the effect at the border places an upper bound on the effect far from the border. Third, it is difficult to draw welfare conclusions. Even if there is a large change in manufacturing activity at the border, the welfare effects of the policy might be small.

4 The Treatment of the Geographic Data

This section describes the treatment of the geographic data. I start with a few definitions. States that currently have right-to-work laws (see Figure 1) are *pro-business* states and those that do not are *anti-business* states. The *policy-change border* is the set of state borders that separate pro-business states from anti-business

states.

The county is the geographic unit for this analysis. The county offers the finest level of detail for which comprehensive Census Bureau data are available. Figure 3 depicts the boundary lines of the approximately 3000 counties of the 48 contiguous states.

I obtained the longitude and latitude coordinates of the population centroid of each county. Using these geographic coordinates, I calculated the minimum distance from the population centroid of the county to the policy-change border and called this variable $mindist_i$. Figure 3 illustrates all the counties that are within 25 miles from the border, i.e., the counties for which $mindist_i \leq 25$. The counties within 25 miles of the border on the pro-business side are dark gray and the corresponding counties on the anti-business side are light gray.

In Figure 3, a dotted line separates the western states (Montana, Wyoming, Colorado, New Mexico, and the states further west) from the rest of the country. If we look east of this dotted line, the set of counties 25 miles from the border nicely trace out the policy-change border. These counties form a strip of land on both sides of the border of fairly uniform width. In contrast, the set of counties in the West that are 25 miles from the border makes up what looks to be an odd assortment of counties. The reason for this difference is that counties in the West are so much bigger than counties outside of the West. Many counties in the West are larger than the state of New Jersey.

I chose to eliminate the western states from the main analysis of this paper. My main reason for doing so is the large size of the counties in these states. A key step in my method is to accurately measure the distance of observed manufacturing activity from the policy-change border. The coarseness of the geographic information in the western states makes accurate measurements of distance relatively difficult to do. A second consideration is that Idaho—a border state in the West—only recently passed its right-to-work law. In contrast, outside of the West, all states along the policy-change border (this excludes Louisiana and Indiana) have had the same right-to-work policy since 1958. In this analysis, I am looking for long-run effects of policy, and my prior belief is that this is a process that can take decades. A third consideration

is that many of the counties in the western states are sparsely populated. There is likely to be a lot of noise in data from sparsely populated counties.

While the western states are excluded in the main analysis, I have redone the analysis with the western states included, and the estimates do not change much. This is discussed at the end of Section 5.

So, now exclude the states west of the dotted line. In the remaining states, the policy-change border has two segments. Segment 1 begins at point A, at the western end of the Oklahoma-Texas border, and ends at point B, where the Maryland-Virginia border meets the Atlantic Ocean. I obtained the geographic coordinates of the line segments that make up this border. I mapped out the border and determined mile markers along the border analogous to something one might find on a highway. For example, at point A the mile marker is zero. At the point where the Oklahoma-Texas border ends and the Oklahoma-Arkansas border begins is the 716 mile marker (the Oklahoma-Texas border is 716 miles long). Analogously, at the 914 mile marker, the Oklahoma-Arkansas border ends and the Missouri-Arkansas border begins. Segment 1 ends at the Atlantic Ocean with the 2386 mile marker.

Segment 2 of the policy-change border begins at point C, where the Minnesota-North Dakota border intersects the boundary with Canada. It ends at point D, at the western end of the Oklahoma-Kansas border. Segment 2 is 1891 miles long.

As discussed earlier, I determined the minimum distance $mindist_i$ of county i to the policy change border. I also kept track of the mile marker along the policy-change border at which the minimum distance was attained. The geography of the actual policy-change border is somewhat complicated because the border curves and bends. I found it useful to map the geographic information into a space where the border is a straight line. In essence, I tugged on the endpoints of the border and straightened the border out. I defined two variables, y_i and x_i, for each county i. I set the absolute value of y_i equal to the distance between the center of the county and the border. I let y_i be positive if the county is in an anti-business state, and negative otherwise. Formally, if county i is in an anti-business state, then $y_i = mindist_i$, and if county i is in a pro-business state, then $y_i = -mindist_i$. The variable x_i is defined to be the point along the policy-change border at which the minimum distance to the border is

obtained. The point x_i specifies both the segment number and the mile marker of the closest point along the border. This procedure maps the complicated geographic data of the counties into a Cartesian space where the policy-change border is defined by the straight line $y = 0$. The counties with positive y are in the anti-business region. The counties with negative y are in the pro-business region. The variable x provides a lateral dimension. A change in x at $y = 0$ is a movement along the policy-change border.

5 The Effect on Manufacturing Activity

I now address the main question of this paper. Is there an abrupt change in manufacturing activity at the border where policy changes?

Two measures of manufacturing activity will be considered. The first measure is manufacturing employment in a county as a percent of total private nonagricultural employment in the county. The use of this measure was discussed at the end of Section 3. I will focus on the data from 1992, the most recent available when I began this project, but I also consider other years. I use County Business Patterns (CBP) data as well as data from the Census of Manufactures (see the appendix for a discussion of the data). In the 1992 CBP, employment of all US manufacturing establishments was 18.2 million, and this represented 19.6 percent of total private employment that year.

The second measure is the growth rate in manufacturing employment over the period 1947 to 1992. The growth rate in county i is defined as

$$growth_i = 100 \times \frac{emp_{i,92} - emp_{i,47}}{.5emp_{i,47} + .5emp_{i,92}}, \tag{1}$$

where $emp_{i,47}$ and $emp_{i,92}$ are the levels of manufacturing employment. This measure of growth has a maximum value of 200 that is attained if a county had no employment in 1947 and positive employment in 1992. Analogously, the minimum value is -200. I choose this measure of growth because otherwise some counties would have infinite growth rates. Over the 1947 to 1992 time period, total US manufacturing employment grew at a rate of 24 percent as defined in (1). I picked 1947 as the starting year because this is the year of the Taft-Hartley Act which enabled states to pass right-to-work

laws.

Before beginning any sort of statistical analysis, it is useful to look at a picture. Figure 4 illustrates the geographic distribution of the county manufacturing-share deciles. The number to the right of the boxes in the legend is the top share in the decile. For example, the first decile of counties consists of the counties with manufacturing shares between 0 and 4.0. The counties in the first decile are indicated in white. The tenth decile consists of counties with shares between 48.0 and 88.8. These are indicated in black. The intermediate deciles are indicated by intermediate shades of gray. The two segments of the policy-change border are noted in black with the exception of the part of the border that involves Arkansas and Tennessee where I use white to denote state borders.

A striking thing about Figure 4 is the extent to which the top decile counties—those with manufacturing share above 48.0 percent marked in black—are concentrated in the South. Large sections of states like Tennessee and Mississippi are marked in black. Consider Segment 1 of the policy-change border—the border that coincides with the border of the Confederacy. Begin with the Arkansas-Oklahoma portion of this border and head east along the northern border of Arkansas, Tennessee, and Virginia. It is clear in the figure that the counties on the pro-business side of this portion of the border tend to have higher manufacturing shares than the counties on the anti-business side. But is the increase in manufacturing activity gradual as we move from one region to the other, or is there an abrupt change at the border? It is hard to say. On one hand, to a striking extent, the shares begin to get high approximately at the border. The dark shades of gray in Arkansas plainly trace out the borders of Arkansas with Oklahoma and Missouri (even the heel of the boot in the southeastern corner of Missouri is visible). On the other hand, at some places, the high manufacturing shares spill over into the anti-business side of the border, as it does in parts of the Kentucky-Tennessee border. Of course, some noise is to be expected. The advantage of the statistical analysis to follow is that some of this noise can be averaged out.

As just mentioned, the preponderance of dark gray and black counties on the Arkansas side make the Arkansas/Oklahoma border plainly visible. But just as clear

is the border between Arkansas and Louisiana. In this analysis the border between Arkansas and Louisiana is not being considered because both states have right-to-work laws so both are classified as pro-business. However, putting Louisiana in the pro-business category is actually counter to conventional wisdom. Louisiana has long held a reputation of being an anti-business state.[11] Compared to other southern states it did very poorly in the Fantus rankings in Table 1. Even though Louisiana has a right-to-work law, it was a reluctant to pass the law, waiting until 1976 to do so.[12] Compare this with Arkansas, a state with a strong reputation for being pro-business, a state so eager to pass a right-to-work law that it did so in 1944 before any other state and three years before the Taft-Hartley act made such a law legal. The abrupt change in manufacturing activity that is clearly evident at the Louisiana/Arkansas border may be due to differences in policies between these two states that have nothing to do with right-to-work laws.[13] This is a good reminder that any differences in manufacturing activity found at the right-to-work border may be due to other policies besides right-to-work laws.

Now consider Segment 2 of the policy-change border, the segment separating the Plains states from the industrial states of the Midwest. It's hard to pick up anything here at the border with the naked eye (with the exception perhaps of the relatively high frequency of first decile counties in the Minnesota border area with the Dakotas). However, the statistical analysis to follow will indicate that, on average, border counties on the pro-business side have higher manufacturing shares than border counties on the anti-business side.

One last comment about Figure 4 is in regards to the white (i.e., first decile) region in Kentucky and West Virginia near the border with Virginia. The story here

[11]Cobb (1993, p. 157) writes that as of the 1950s, "A reputation for high taxes, free spending, and a shady and ineffective government that was openly hostile to business had dogged the state since the tumultuous era of ... Huey Long." He then goes on to say that at the end of the 1970s, "Leaders in Louisiana were still struggling to overcome their state's anticorporate image."

[12]It also passed a right-to-work law in 1954 that was repealed two years later.

[13]Another intriguing border pair is Nevada and Utah. There is virtually no manufacturing activity in the western part of Nevada, making the outline of the state strikingly evident in the figure. Since Nevada is mostly a desert, the absence of manufacturing activity here may not come as much of a surprise. However, the eastern part of Utah is also a desert, yet manfacturing activity becomes relatively intense right at the Utah border. What makes this intriguing is that even though Nevada has a right-to-work law, it did very poorly in the Fantus ranking, with a rank of 32, well below all the other right-to-work states. In contrast, Utah did very well in the rankings, coming in at 10.

is coal mining. There is a discontinuity in nature, e.g., mountains and coal veins, that coincides with state boundaries. Even if state policies made no difference, we would expect manufacturing shares to decline when we cross the border into Kentucky and West Virginia since the mining share goes up. Therefore, in the statistical analysis to follow, I will for the most part exclude the Kentucky/Virginia border and the West Virginia/Virginia border.

The statistical analysis is divided into two parts. The first part looks at some simple cross-tabulations of the data. The second part estimates a simple statistical model.

5.1 Cross-tabulations of the Data

I begin by defining groups of counties based on how far the counties are from the border and the side of the border they are on. Let the *anti-business border layer* be the set of counties with $y_i \in (0, 25]$. In words, these are the counties in anti-business states (since $y > 0$) that are within 25 miles of the policy-change border (since $y_i \leq 25$). These are illustrated in Figure 3 in light gray. There are 151 counties in this set. Note this count does not include counties in the western states. As discussed earlier, the western states are excluded in the analysis. The *pro-business border layer* is the set of counties with $y_i \in [-25, 0)$. There are 174 counties in this layer. I also define interior layers three deep on each side of the border. For example, for the anti-business counties, the *first interior layer* consists of those counties whose center is 25 to 50 miles from the border, i.e., $y_i \in (25, 50]$; the *second interior layer* consists of those with $y_i \in (50, 75]$; and the *third interior layer* consists of those with $y_i \in (75, 100]$. Analogously, there are three interior layers on the pro-business side. The number of counties in each of the six interior layers ranges from a low of 116 counties for the third anti-business interior layer to a high of 149 counties for the first pro-business interior layer.

For each county, I determined the manufacturing share of total employment in the county and the 1947 to 1992 manufacturing employment growth rate. I then calculated simple unweighted means across counties. The first column of Table 2 reports the mean cross-county share for the various border layers. The second column

reports mean cross-county growth. Columns three and four report the means when the coal region discussed earlier is excluded (i.e., the Kentucky/Virginia border and the West Virginia/Virginia border).

I begin the discussion by focusing on the border layers. The dotted line in the table represents the border. Just above the dotted line are the means for the anti-business border layer, and just below it are the means for the pro-business border layer. The table shows that there are substantial differences in mean share between the two border layers. With the coal region included, mean share is 21.0 percent on the anti-business side and 28.6 percent on the pro-business side. With the coal region excluded, the shares are 22.1 on the anti-business side and 27.9 on the pro-business side. In the remaining tables of this section, I exclude the coal region. As one might expect, all the estimates of differences at the border are bigger if I leave the coal region in.

Table 2 indicates that there is also a difference in growth rates at the border. With the coal region included, mean growth in the anti-business border is 62.4. Just on the other side of the border the mean growth is 100.7. These differences remain, even when the coal region is excluded.

To help assess the meaning of the differences in manufacturing share and growth between the border layers, it is useful to consider how these variables change as we move across the interior of the pro-business side and the interior of the anti-business side. Suppose we were to start at the pro-business layer 75 to 100 miles from the border (call this Pro:75-100). Consider a move into the adjacent layer 50 to 75 miles from the border (Pro:50-75). The manufacturing share goes from 23.1 at Pro:75-100 to 24.5 at Pro50:75, a change in share of 1.4 (I am using the data that excludes the coal region here). The change in share of 1.4 from this movement is given in the bottom row of Table 3. Analogously, if we move from Pro:50-75 to Pro:25-50, the share increases from 24.5 to 25.5, an increase of 1.0. The next step to the border layer Pro:0-25 increases the share by 2.4. So far, we have moved within the pro-business side. In the next step, we cross the border into Anti:0-25 and the share drops by 5.8. Once on the anti-business side, the share starts going back up again as we cross adjacent layers with the changes equalling 2.6, .3, and 0.

There is an interesting pattern here: the share goes up gradually as we move in the direction of the anti-business layer except for the big drop at the border. This pattern looks like what happens in Figure 2a in the theoretical model and also like Figure 2d. While this is intriguing, I want to put off for the moment what to make of this particular pattern. At this point, I am interested in establishing that the difference at the border is big in absolute value compared to the differences found in the interior. That is, the change in the share at the border is *abrupt* compared to changes in the share that we find as we move across space in the interior. One way to make this point is to simply observe that the difference in share at the border of 5.9 is more than twice as large in absolute value than the differences of any of the other adjacent pairs (the next highest is 2.6). Another way to make the point is to use simple statistical methods. Consider a series of pairwise t-tests of null hypotheses that particular adjacent layers are drawn from the same distribution. The second column of numbers in Table 3 gives the p-values for tests of these null hypotheses. For example, for the Pro 75-100 and Pro:50-75 adjacent layers the p-value is .517; i.e., under the null hypothesis of equality, with probability .517 the difference in means would be bigger in absolute value than the observed difference. The null hypothesis of equality can not be rejected in this case. In contrast, the p-value for the adjacent border layers is .003 which is highly significant. What happens at the border sticks out as being very different from what happens between the other adjacent layers.

Similar results are obtained for the growth rate. The average growth rate is 104.2 percent for the pro-business border layer and 77.2 percent for the anti-business border layer. This difference is bigger in absolute value than the differences of the all the other adjacent layers. This difference is statistically significant (with a p-value of .008), and none of the other differences in growth rates between adjacent layers is statistically significant.

The results so far suggest that, on average, there is an abrupt increase in manufacturing shares and growth rates when we cross the border into pro-business states. A natural question to ask is whether this difference is occurring throughout the policy-change border, or is it just happening for a few particular states?

Table 4 is a first step at addressing this issue. It is the same as Table 2, except

it provides a breakdown by the two segments of the policy change border. That is, it distinguishes between counties that are closest to Segment 1 (the border segment that coincides with the border between the Confederacy and the Union) and counties that are closest to Segment 2 (the border segment separating the Plains states from the Midwest industrial states).

Consider first what happens to manufacturing share. Table 4 shows that the big change in manufacturing share that we found with the combined data occurs in each of the separate segments. For both segments, manufacturing shares increase by about 5.5 when we cross the border to the pro-business side.

Notice that for the manufacturing shares of Segment 2, with the exception of the big drop at the border, there is a strong upward trend as we move up the column. This upward trend is not surprising. As we move up the column, we are moving away from states like North and South Dakota to industrial states like Minnesota, Wisconsin, and Illinois. If state policies had no effect on business location, we would expect, a priori, to find manufacturing shares gradually increasing as we move away from the Great Plains towards the industrial heartland. If state policies did have an effect on location, we might expect the share to gradually trend upward, then fall at the border, then gradually trend upward again, as in Figure 2d from the theoretical model. So, the model in Figure 2d is one explanation for what is happening along Segment 2.

As discussed in the theoretical section, there is another reason the share might trend up after we cross the border into the anti-business side. This reason is that the effects of the policy may fizzle out as we move away from the border. This is what happens in the model illustrated in Figure 2a. So, corresponding to Figures 2a and 2d, we have two explanations for the trend found at Segment 2: first, that the effects of the policy fizzle out, and second, that the underlying geographic suitability for manufacturing gradually increases. The merits of these two alternative explanations are hard to sort out, and I am not going to do so in this paper except for making the following observation. The policy-fizzling-out model alone cannot account for the pattern in Segment 2. In the policy-fizzling-out model illustrated in Figure 2a, the manufacturing share far into the interior of the pro-business side is at least as high as

the share far into the interior of the anti-business side. But in the data for segment 2, the shares in the interior of the pro-business side of 19.7 and 17.1 are much lower than the shares of 24.4 and 26.7 in the interior of the anti-business side. This suggests that some underlying trend in non-policy geographic factors plays some role in accounting for why the manufacturing share trends upward in Segment 2 as we move towards the anti-business states.

Now consider what happens with the growth rates for the two segments. In Segment 1, the average growth rate of the border layer is 104.5, and this is the highest growth rate over all the different layers. However, this is only negligible higher than the average growth rate of the anti-business layer. Hence, there is little difference at the border for Segment 1. The story is very different for Segment 2. There is a marked difference in average growth between the border layers, 54.7 on the anti-business side and 104.0 on the pro-business side. But in addition, the average growth rates of all the layers on the anti-business side are all quite small, while the growth rates of all the layers on the pro-business side are quite big. Something fundamental seems to be changing at the border here.

Table 5 takes a further step at examining the extent to which the effects found on the border as a whole are true for individual portions of the border. In this table, the policy change border is broken down into pairings of individual pro-business states with individual anti-business states. For example, Texas and Oklahoma are the first pairing, Arkansas and Oklahoma are the second pairing, and so forth. There are 17 different pairings of individual states.[14] For each pair of bordering states, I calculated the mean share and growth for the counties in the border layers (the counties 25 miles from the border). Recall that over the entire border, the average share on the pro-business side is 28.6 and the average share on the anti-business side is 21.0. The first two columns of Table 5 indicate that the share on the pro-business side is bigger than on the anti-business side for virtually all the states along the border. There are only two exceptions out of the 17 different pairwise comparisons (these are highlighted with a box around the numbers). But in these two exceptions, the difference in shares between the two bordering states is essentially zero. This table indicates that to a

[14]For the purposes of this table, the District of Columbia is combined with Maryland.

striking degree, the increase in manufacturing share on the pro-business side can be found throughout the policy-change border.

The last two columns look at average growth rates for each of the border-state pairs. The results here are not quite as impressive as the case for shares. Still, the growth rate is lower on the pro-business side in only five out of the 17 cases. The table indicates that increase in growth on the pro-business side is widespread throughout the policy-change border.

5.2 A Simple Statistical Model

Table 5 shows that there are big changes in manufacturing shares as we move *along* the policy-change border, in addition to the changes that occur as we move *across* the policy-change border. For example, along the Texas/Oklahoma portion of the border, the shares are relatively low on both sides: 17.3 and 16.1. On the other hand, along the Tennessee/Kentucky portion of the border, employment on both sides is relatively high: 48.4 and 38.7. This is also clearly evident in Figure 3. This suggests that it might be useful to consider a statistical model that allows for the expected employment share in a county to vary *along* the border as well as *across* the border. This subsection considers such a model.

Suppose that the observed manufacturing share in county i in 1992 is represented by

$$share_i = \theta_i + \alpha(x_i) + \beta(x_i)y_i + \epsilon_i. \tag{2}$$

The variable θ_i is a shift term that varies with state policy, $\theta_i = 0$ if the county is in an anti-business state and $\theta_i = \theta$ if the county is in a pro-business state. The functions $\alpha(\cdot)$ and $\beta(\cdot)$ are general continuous functions of x that allow manufacturing shares to vary across space in a general way. The variable ϵ_i is classical measurement error.

To understand specification (2), consider the null hypothesis that state policies do not matter; i.e., $\theta = 0$. Under specification (2), the expected share at a location along the border (i.e., one with $y = 0$) with mile marker x is given by the general function $\alpha(x)$. The expected share at a location away from the border (i.e., one where $y \neq 0$) is obtained by adding in the trend term $\beta(x)y$ to $\alpha(x)$. Note the dichotomy

here. If at $y = 0$ we move in the x direction, the expected share varies in a general nonlinear way though $\alpha(x)$. If we move in the y direction, the share varies in a linear way with slope $\beta(x)$. My motivation for this dichotomy is that movements in the y direction will be relatively small in the analysis, at most 100 miles either way. Hence, a first-order (i.e., linear) approximation may be reasonable here. On the other hand, the movements in the x direction will cover a distance of 4000 miles, so a first-order approximation would not be reasonable.

According to specification (2), manufacturing share varies in a continuous and fairly general way across space with a discontinuous change of θ when crossing the border into the pro-business side. My goal here is to estimate θ. To do so, I approximate function $\alpha(\cdot)$ with a fourth-degree polynomial along border Segment 1 and a second, different, fourth-degree polynomial along border Segment 2. I do not report my estimates of the parameters of the $\alpha(\cdot)$ function because these parameters are of little interest in themselves. I consider four different specifications for the trend function $\beta(\cdot)$. The first specification is no trend; i.e., $\beta(x) = 0$, for all x. The second specification is a constant for the entire border; i.e., $\beta(x) = \beta_0$ all x. The third specification is a constant trend $\beta(x) = \beta_1$ for x along Segment 1 and a different constant trend $\beta(x) = \beta_2$ for x along Segment 2. The fourth specification is to allow $\beta(x)$ to be a different fourth-degree polynomial for each segment analogous to what I do for $\alpha(x)$.

Table 6a presents the OLS estimates of θ for each of these four specifications. I restrict attention to counties within 100 miles of the border ($y \in [-100, 100]$). In specification 1 with no trend, the estimate of θ is 3.4 with a standard error of .9. In specification 2 which allows for a constant trend, the estimate of θ rises to 6.4 with a standard error of 1.6, and the estimate for this constant trend β_0 is .03. Given the existence of a positive trend, it is easy to see why the estimate of θ is higher in specification 2 than in specification 1. If there is a positive trend but we don't allow for it, then our estimate of θ will be biased downward because locations on the pro-business side have low (negative) y's. Specification 3 allows a different constant trend for the two different segments of the border. There is a large positive trend for Segment 2 ($\beta_2 = .08$), the Plains-States border. This is consistent with the earlier

discussion of what happened in the cross-tabulation for this border in Table 4. Note that the estimated trend for Segment 1, the Confederate border, is essentially zero. Specification 4 allows for the trend to vary in a general way, but the estimate of θ of 6.6 is essentially the same as in cases 2 and 3 where a trend term is introduced. The conclusion of this statistical model then is that when crossing the border into the pro-business side, the average increase in manufacturing share is 6.6, an increase of one third, since the average share is approximately 20 percent. This is similar to the difference found in the cross-tabulation of Table 2. The difference at the border has a t-statistic of over 4 which has a high degree of statistical significance.

I considered a statistical model of county growth rates of the same form as (2), and the estimates of θ for the growth rates are in Table 6b. The estimates of θ are similar across the 4 specifications. The estimate of θ for specification 4, the most general case, is 23.1; i.e., the expected manufacturing employment growth rate increases by 23.1 when crossing into the pro-business side.

To place some perspective on these estimates of the shift-parameter θ, I conducted a simple experiment. I considered a set of counties all drawn from the same side of the policy-change border. Within this set of counties, I made up a simulated border and estimated the statistical model (2). In order to be able to look at a variety of different simulated borders, I estimated the model for counties 50 miles above and below the border. Table 7 reports the results of this exercise.

The middle row reports the case where the simulated border is $y = 0$. This is the case where the simulated border coincides with the actual border. The estimate of θ for manufacturing shares is 9.1, and for growth is 39.9 (I estimate the model under specification 4 where $\beta(x)$ is a general function). These estimates are different from the estimates of θ in Table 6 because here only counties within 50 miles of the border are included, while in Table 6, counties up to 100 miles from the border are included. Nevertheless, the qualitative story is the same. At the actual border, there is a big change in manufacturing shares and growth that is highly statistically significant.

Now consider the row labeled $y = 50$. For this row, counties with y between 0 and 100 were considered. All of these counties are actually on the anti-business side. But I estimated the statistical model using $y = 50$ as a simulated border, i.e., y between 0

and 50 were treated as though they were pro-business, and y between 50 and 100 were treated as anti-business. The estimate for θ is 1.1 for the case of shares and 6.1 for the case of growth. Both of these figures are small and not statistically significant. The same can be said for the estimates of θ for the other simulated borders—the estimates are much smaller than what is obtained at the true border, and the estimates are not statistically significant. Table 7 indicates that there is something special about the policy-change border.

I conclude this section by discussing what happens when data from other years are considered and when the western states that so far have been excluded are incorporated into the analysis. Table 8 presents estimates for the shift-parameter θ for these alternative cases. For all these cases, the $\beta(\cdot)$ function is allowed to take the general form corresponding to specification 4 above. As in Table 6, counties within 100 miles of the border are included. The first row of Table 8 is the baseline case from Table 6 for the effect on 1992 manufacturing share. The estimate indicates that average 1992 manufacturing share increases by 6.6 when one crosses the border to the pro-business side.

Data on manufacturing employment at the county level is available from the Census of Manufacturers for a variety of different years. However, I ran into problems collecting county-level data on total employment prior to 1964.[15] So, for this discussion, I look at manufacturing employment as a percent of county population rather than total employment. Table 8 reports that average 1992 manufacturing employment as a percent of population increases by 2.5 when crossing the border into the pro-business side. When we take into account that the 1992 US population was 2.7 times County-Business-Pattern total employment and that $2.5 \times 2.7 = 6.75$, this estimate of 2.5 percent of total population is consistent with the previous estimate of 6.6 percent of total employment.

Table 8 reports the estimate of θ for various other Census years before 1992. The estimate for 1947 is .4. Given the standard error of .4, this is not significantly different from zero in a statistical sense. Therefore, as of the date of the Taft-Hartley

[15]The County Business Patterns Program dates from 1947. However, before 1964, many counties were aggregated into larger reporting units. Data on the labor force by county is available from the Census of Population. However, this reports employment by place of residence rather than place of employment.

Act there was not much of a difference at the border. The estimate for 1963 is 1.3, and this is significantly different from zero in a statistical sense. The estimate for 1987 is 2.0. It is interesting that the difference has grown from 2.0 to 2.5 over the 1987 to 1992 time period. This suggests there might be more at work here than the effects of right-to-work laws passed in the 1950s.

The bottom section of Table 8 shows the results when all of the Western states are included in the analysis. Recall that I earlier excluded these states because the counties are so large and because Idaho changed its policy status in 1985. Table 8 shows that including these states makes little difference. The estimate of 5.7 on the effect on manufacturing share is just a little below the estimate of 6.6 obtained when the Western states are excluded.

6 Conclusion

This paper starts out with a simple classification scheme: a state is defined at pro-business if it has a right-to-work law. It then examines the border areas between pro-business and anti-business states. The differences at the border are surprisingly big. On average, the manufacturing share of total employment in a county increases by about a third when one crosses the border to the pro-business side. Along part of the border, the differences appear to be visible on a map (Figure 3). There is a lot of uncertainty and debate about whether or not state policies make much difference in the geographic distribution of industrial activity. This results of this paper suggest that state policies do matter.

There are, of course, limitations in the procedure used here. Differences at state borders are not necessarily due to differences in state policies. Nature can have discontinuities. A good example are the coal veins and mountains that begin at the Kentucky/Virginia border. I excluded this coal region from the analysis, but there may be others I don't know about. And even if differences at the border are due to state policies, it may be policies from long ago that have nothing to do with a state's current policies towards business. For example, because Oklahoma was originally set up as an Indian territory more than 100 years ago, there remains today a sharp increase in the Native American population at the border between

Arkansas and Oklahoma. Shifts in demographics at state borders can potentially be associated with shifts in the distribution of economic activities at state borders. These examples suggest the need for caution in ascribing the differences found at the border to differences in state policies towards business. We can take some comfort in the fact that the border considered consists of 17 different pairs of adjacent states and is 4000 miles long. Over a long border, there is some hope that extraneous factors will average out.

If the differences found at the border are due to differences in state policies, there still is the question of which policies matter. Does a right-to-work law in itself matter? Or is a right-to-work a proxy for a whole configuration of pro-business state polices that matter? This paper does not tackle this important question. However, there are results along the way that suggest that right-to-work laws per se are not the whole story. For example, the border between Arkansas and Louisiana is not part of the policy-change border because both states currently have right-to-work laws. Yet in Figure 4, the difference in manufacturing activity at this border is as clear as the differences at any border. What makes this case interesting is that Louisiana is the only southern state with a reputation for being hostile to business. If differences in policies unrelated to right-to-work laws account for the differences in manufacturing activity at the Arkansas/Louisiana border, the same may be true for differences in manufacturing activity along the right-to-work border.

Data Appendix

Counties

Virginia is different from other states in that it has 41 independent cities organized as separate counties. Most of these independent cities are completely surrounded by other counties. In the County Business Patterns data, employment figures are given for each of these cities.

To be consistent with other states, I combine independent cities in Virginia with their surrounding counties. I do this in the same way that the Bureau of Economic Analysis combines Virginia counties in the Regional Economic Information System (REIS) program. I refer to counties grouped this way as *REIS counties.* These are distinct from *census counties,* which are not combined.

The main analysis (which excludes the western states) considers data on 1156 census counties. These are the counties within 100 miles of the policy-change border. After consolidating the independent cities of Virginia into their surrounding counties, there are 1126 REIS counties in the analysis. After excluding counties in the coal-region, there are 951 counties.

1992 Data

Employment data for 1992 is from the 1992 County Business Patterns (CBP). For 88 of the 1156 census counties, manufacturing employment was withheld for disclosure reasons. Data on total employment was withheld for none of the 1156 counties.

Fortunately, there is a simple way to come up with a fairly good estimate of employment for the counties with withheld data (I use a similar procedure in Holmes (1995)). In the CBP, there are cell counts for each county for the number of manufacturing establishments in each of the following employment size classes: 1–4, 5–9, 10–19, 20–49, 50–99, 100–249, 500–999, 1000–1499, 1500–2499, 2500–4999, and 5000 and above. To obtain my estimate of the number of manufacturing employees in each county, for each size class I multiply the number of establishments in the size class times the average employment in the size class. I sum this product over all the size classes and call this estimate $\widehat{emp}_i$ for county i.

In addition to the above information, CBP also provides for each county the range of total manufacturing employment in the county, e.g., 0–19, 20–99, and so forth. I

verify that my estimate $\widehat{emp}_i$ falls within these bounds. In the five cases where it does not, I adjust the estimate so that it falls within the bounds. All of the 88 counties with estimated manufacturing employment data have less than 5000 employees. More than half have less than 100 employees.

Population data is from the Census Bureau.

1947 Data

While the County Business Patterns data were collected in 1947, data are missing for many counties, so the data are not usable for this project. Limits in computation technology at the time led the Census Bureau to restrict the number of geographical units for each state to 99. For states such as Texas, with over 300 counties, counties were combined into 99 groups.

The 1947 Census of Manufactures did publish county-level data on manufacturing employment, and data is missing for only a few counties. Employment data for a county was withheld only if there were 1 or 2 establishments in the county. Data are missing for 67 counties. Data on cell counts of establishment sizes are not available at the fine level of detail of the 1992 CBP (there are only 3 categories, 1–19, 20–99, and 100 and over). Hence, I do not try to estimate 1947 employment for the missing observations.

Data for Other Years

As discussed above, in the 1947 census, employment data were withheld only if there were one or two establishments in the county (a relatively rare occurrence). This disclosure policy was maintained through the 1963 census. Hence, the data for the 1954, 1958, and 1963 censuses reported in Table 4 are analogous to the data for 1947.

Beginning in 1967, the Census Bureau greatly tightened its disclosure rules. There are a relatively large number of counties with missing employment observations. However, for these later years there exist data on cell counts of establishment sizes at a relatively fine level of detail. For the 1982 and 1987 Census of Manufactures, I estimated manufacturing employment at locations with withheld data, using a procedure similar to the one used for the 1992 CBP data. I was unable to do this for the 1972, so there are many missing observations for this year as is apparent in Figure 8.

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Table 1
1975 Fantus Legislative Business Climate Rankings

1975 Fantus Ranking	State	Does state have a right-to-work law now?
1	Texas	yes
2	Alabama	yes
3	Virginia	yes
4	South Dakota	yes
5	South Carolina	yes
6	North Carolina	yes
7	Florida	yes
8	Arkansas	yes
9	Indiana	no (Had a law, but repealed in 1965.)
10	Utah	yes
11	North Dakota	yes
12	Mississippi	yes
13	Georgia	yes
14	Iowa	yes
15	Tennessee	yes
16	Arizona	yes
17	Nebraska	yes
18	Colorado	no
19	Missouri	no
20	Kansas	yes
21	Oklahoma	no
22	Kentucky	no
23	New Mexico	no
23	Wyoming	yes
25	Idaho	yes (Passed law in 1985.)
26	Louisiana	yes (Passed law in 1976.)
27	Ohio	no
28	New Hampshire	no
29	West Virginia	no
30	Maine	no
31	Montana	no
32	Nevada	yes
33	Rhode Island	no
34	Wisconsin	no
35	Illinois	no
36	Maryland	no
37	New Jersey	no
38	Vermont	no
39	Washington	no
40	Oregon	no
41	Minnesota	no
42	Pennsylvania	no
43	Connecticut	no
44	Delaware	no
45	Michigan	no
46	Massachusetts	no
47	California	no
48	New York	no

Source for Fantus rankings: Weinstein and Firestine (1978)

Table 2
Manufacturing Employment Shares and Growth Rates
Cross-County Averages
By Distance From Border and Side of Border

Side of Border	Miles from Border	Coal Region Included		Coal Region Excluded	
		Share of 1992 Total	Growth Rate 1947-92	Share of 1992 Total	Growth Rate 1947-92
	75-100	25.9	67.5	25.0	68.2
Anti-	50-75	23.1	62.7	25.0	80.9
Business	25-50	23.2	82.0	24.7	88.8
	0-25	21.0	62.4	22.1	77.2
	0-25	28.6	100.7	27.9	104.2
Pro-	25-50	26.7	89.1	25.5	88.3
Business	50-75	26.7	92.9	24.5	90.1
	75-100	25.4	91.8	23.1	93.5

Table 3
T-tests of Equality of Means of Adjacent Layers
Coal Region Excluded

Adjacent County Layers			Share		Growth Rate	
			change in mean	p value for test of equality	change in mean	p value for test of equality
Anti:50-75	→	Anti:75-100	.0	.975	12.7	.259
Anti:25-50	→	Anti:50-75	.3	.880	-7.9	.463
Anti:0-25	→	Anti:25-50	2.6	.185	11.6	.283
Pro:0-25	→	Anti:0-25	-5.8	.003	-27.0	.008
Pro:25-50	→	Pro:0-25	2.4	.217	15.9	.104
Pro:50-75	→	Pro:25-50	1.0	.620	-1.8	.863
Pro:75-100	→	Pro:50-75	1.4	.517	-3.4	.742

Table 4
Manufacturing Employment Shares and Growth Rates
By Segment and Distance from Border

Side of Border	Miles from Border	1992 Share		1947-1992 Growth	
		Segment 1 Confederate Border (excludes coal region)	Segment 2 Plains States Border	Segment 1 Confederate Border (excludes coal region)	Segment 2 Plains States Border
	75-100	25.4	24.4	75.9	58.3
Anti-	50-75	23.0	26.7	97.7	67.5
Business	25-50	28.5	21.1	101.8	76.5
	0-25	26.6	17.7	99.1	54.7
	0-25	32.3	23.2	104.5	104.0
Pro-	25-50	30.4	20.3	85.8	91.0
Business	50-75	28.3	19.7	88.8	91.7
	75-100	28.5	17.1	97.7	89.1

Table 5
Manufacturing Employment Shares and Growth Rates
By Individual Borders

Border States		1992 Share		Growth Rate 1947-1992	
Pro-business side	Anti-business side	Pro	Anti	Pro	Anti
Texas	Oklahoma	17.3	16.1	29	54
Arkansas	Oklahoma	43.5	27.6	132	144
Arkansas	Missouri	40.7	30.1	158	125
Tennessee	Missouri	47.8	39.3	100	78
Tennessee	Kentucky	48.4	38.7	142	122
Virginia	Kentucky	17.7	3.4	143	-55
Virginia	West Virginia	31.7	20.1	59	5
Virginia	Maryland	16.3	8.5	89	84
North Dakota	Minnesota	16.2	6.3	137	20
South Dakota	Minnesota	16.2	11.1	138	27
Iowa	Minnesota	28.5	25.1	130	85
Iowa	Wisconsin	29.9	30.2	109	103
Iowa	Illinois	33.6	23.1	73	13
Iowa	Missouri	25.2	16.7	121	122
Nebraska	Missouri	13.8	10.0	69	167
Kansas	Missouri	21.1	22.6	78	96
Kansas	Oklahoma	19.5	11.2	80	-12

Table 6a
Statistical Model
County Manufacturing Shares
(Excludes Coal Region)

Parameter	Specification 1 No trend, $\beta(x) = 0$	Specification 2 Constant trend, $\beta(x) = \beta_0$	Specification 3 Different constant for each segment, $\beta(x) \in \{\beta_1, \beta_2\}$	Specification 4 Trend $\beta(x)$ a general function of x.
θ	3.4	6.4	6.5	6.6
	(.9)	(1.6)	(1.6)	(1.6)
β_0	-	.03	-	-
		(.01)		
β_1	-	-	-.01	-
			(.02)	
β_2	-	-	.08	-
			(.02)	
R^2	.306	.310	.330	.350
N	951	951	951	951

Table 6b
County Growth Rates
(Excludes Coal Region)

Parameter	Specification 1 No trend, $\beta(x) = 0$	Specification 2 Constant trend, $\beta(x) = \beta_0$	Specification 3 Different constant for each segment, $\beta(x) \in \{\beta_1, \beta_2\}$	Specification 4 Trend $\beta(x)$ a general function of x.
θ	19.1	21.2	21.2	23.1
	(5.0)	(9.4)	(9.4)	(9.2)
β_0	-	.02	-	-
		(.09)		
β_1	-	-	.08	-
			(.10)	
β_2	-	-	-.04	-
			(.10)	
R^2	.118	.118	.120	.161
N	892	892	892	892

Table 7
Statistical Model
Estimates Shift-parameter θ for Simulated Borders
Counties 50 miles above and below Simulated Border

Location of simulated border	1992 Shares	1947-92 Growth Rates
y = 100	-.0	-20.9
	(2.7)	(15.8)
y = 75	1.8	-4.6
	(2.7)	(15.3)
y = 50	1.1	6.1
	(2.5)	(14.4)
y = 0 (true border)	9.1	39.9
	(2.1)	(13.0)
y = -50	-.9	4.4
	(2.2)	(12.9)
y = -75	-1.4	2.3
	(2.4)	(14.6)
y = -100	-3.3	-15.1
	(2.4)	(14.8)

Table 8
Estimates of Shift-parameter θ for Alternative Specifications and Years
Coal Region Excluded

	Estimate of θ	N
Share of 1992 Employment (baseline case)	6.6 (1.6)	951
Share of Population		
1992	2.5 (.6)	951
1987	2.0 (.5)	951
1982	1.8 (.6)	951
1972	1.2 (.6)	723
1963	1.3 (.5)	917
1954	.9 (.5)	901
1947	.4 (.4)	895
Manufacturing Employment Growth		
1947-92 (baseline)	23.1 (9.2)	892
1963-92	13.9 (8.6)	915
1982-92	11.1 (6.0)	948
Western States Included		
1992 Share	5.7 (1.3)	1256
1947-1992 Growth	19.6 (9.2)	1135

Figure 1

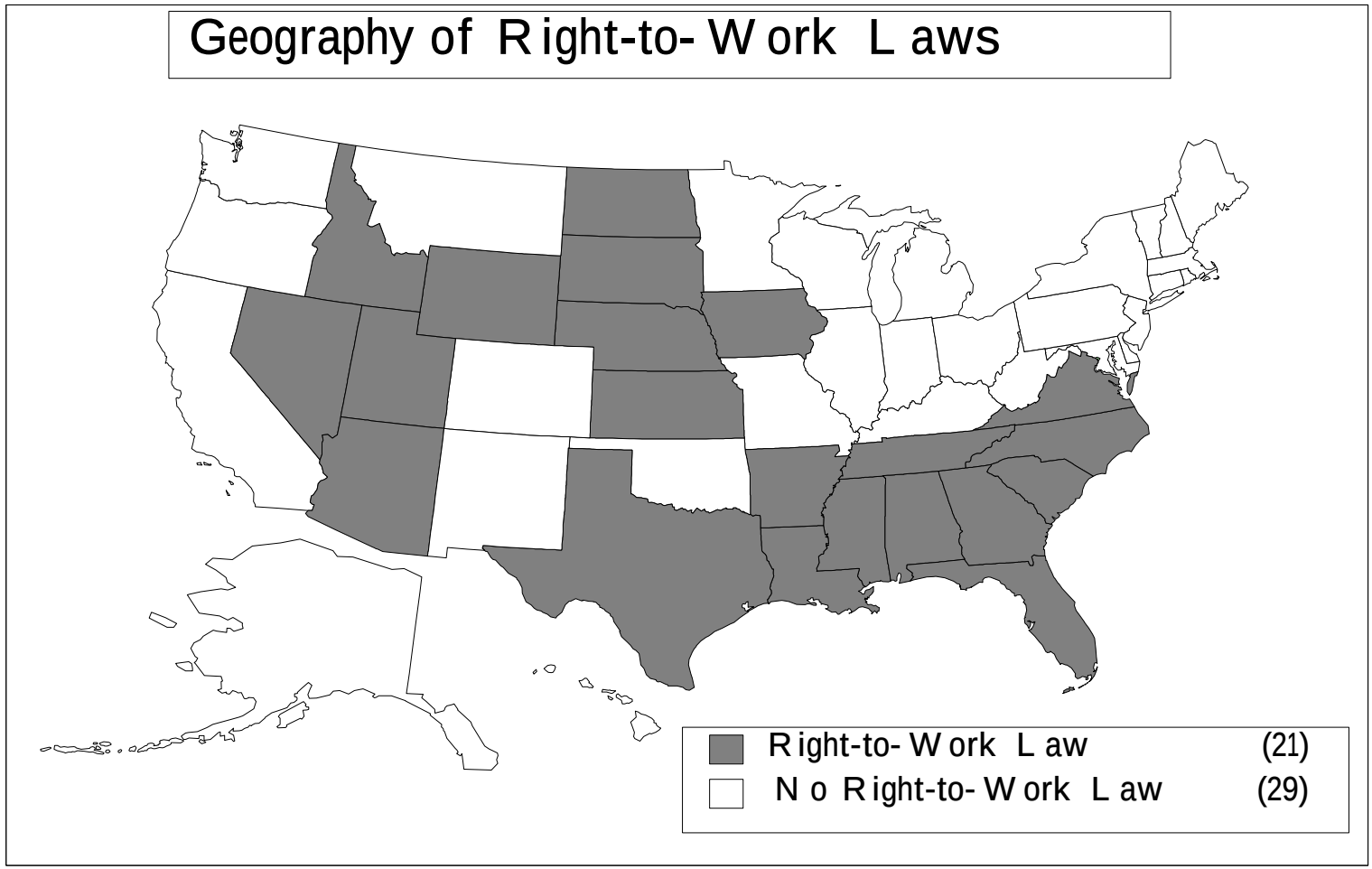
Geography of Right-to-Work Laws
Right-to-Work Law (21)
No Right-to-Work Law (29)

Figure 2a
Case Where Effect at Border Fizzles Out

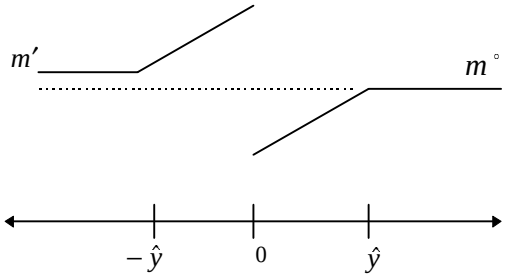

Figure 2b
Case of $t = \infty$

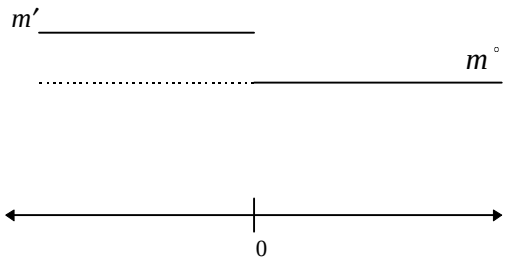

Figure 2c
Case of $t = 0$

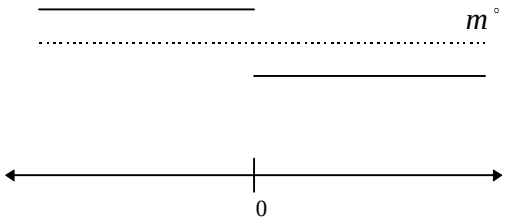

Figure 2d
Trend in Manufacturing Endowment and $t = 0$

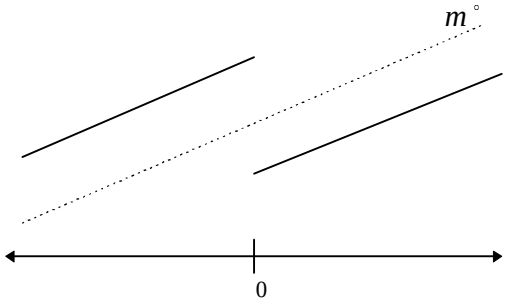

Figure 3

Counties within 25 Miles of the Policy-Change Border

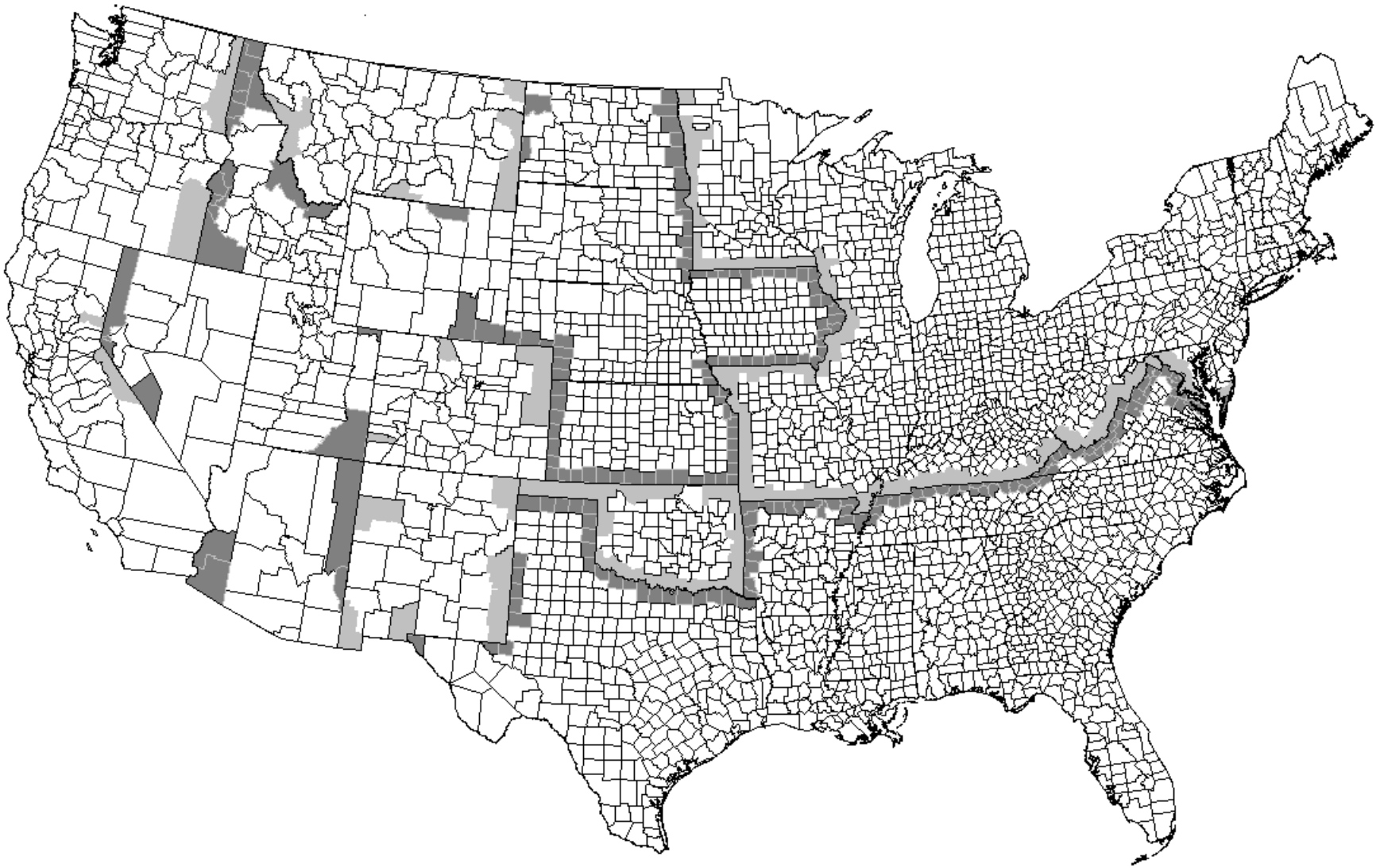

Figure 4: Distribution of 1992 Manufacturing Shares

County Deciles