The Great, Greater, and Greatest Recessions of US States

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Abstract

This paper examines state-level differences in the effects of the Great Recession. It finds that several states were in recession prior to the official start of the recession, while more than a dozen states didn't enter recession until six months or more after the official start. States' exits from recession were similarly staggered. As a result, 11 states' recessions lasted one year or shorter, while the recessions for five states lasted two years or longer. Further, there were geographic patterns to the spread of the recession across states. I use these state-level estimates to introduce a new approach for calculating the total effects of recessions on employment, one that accounts for lost employment growth as well the decrease in employment. States formed distinct geographic groupings according to these total effects, with states in the West and Southeast tending to have seen the greatest harm. Finally, many of the state-level differences in the effects of the Great Recession were related to differences in industry mix and the prevalence of sub-prime mortgages. The states with the longest and deepest recessions also tended to have been those with the highest shares of subprime mortgages.

[JEL Codes: R12, E24, E32]

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1 Introduction

This paper examines the differences in the effects of the Great Recession on aggregate employment across US states. Specifically, following Owyang, Piger, and Wall (2005, 2013), I obtain state-specific peaks, troughs, and depths for payroll employment during and surrounding the official NBER recession of 2008-2009. This approach is based on Burns and Mitchell (1946), in which the business cycle is a series of distinct expansion and recession phases, as with the official recession dates from the NBER Business Cycle Dating Committee. OPW's purpose in applying Burns and Mitchell to the states and metro areas was to demonstrate and examine how the US business cycle has a spatial dimension in addition to its time dimension.

When this approach is applied to US states and metro areas, significant differences in subnational business cycles are revealed. In particular, during periods of national recession: (1) some states and metro areas will not experience a recession at all, (2) state and metro recessions follow a geographic pattern, and (3) state and local recessions are deeper in manufacturing-heavy areas. In other applications, OPW (2008) found that states experienced the Great Moderation of the 1980s sometimes several years apart, Hamilton and Owyang (2012) found that states tend to experience the business cycle in clusters, Wall (2013) found that the cycle can differ between neighboring cities as the result of intra-metro specialization in function and human capital, and OPW (2015) showed that knowledge of early state-level recessions can improve forecasts of national recessions.[1]

When I apply the approach to the period of the Great Recession, I find that all states experienced the recession, although at different times and to vastly different degrees. Further, in addition to industry mix, the prevalence of subprime lending was a significant driver of differences in both the timing and the depths of state recessions. These state-level effects of the Great Recession are of interest on their own, but they also are useful for understanding the national business cycle. Although it is only recently gaining traction among macroeconomists, there is a long-standing literature in urban/regional economics mixing macroeconomic concepts and models to spatially disaggregated data. Pioneers in

[1] Most applications have been to the US, but it has also been applied to New Zealand (Hall and McDermott, 2007), Japan (Wall, 2007), Spain (Gadea, Gomez-Loscos, and Montanes, 2012), China (Garfaoui and Girardin, 2015), the United Kingdom (Martin, et al., 2016), Canada (Lange, 2017), Europe (Gomez-Loscos, Gadea, and Bandres, 2020), and Mexico (Kondo, 2021).

two alternative approaches to OPW include Carlino and DeFina (1998), which uses VARs to estimate differences in the impacts of monetary policy on states and regions; and Carlino and Sill (2001), Carlino and DeFina (2004), Partridge and Rickman (2005), which estimate and examine the co-movement of state and regional employment over the business cycle. Examples of the use of spatially disaggregated data in the macroeconomics literature include Fogli, Hill, and Perri (2013), Mian and Sufi (2014); Bereja, Hurst, and Ospina (2019); and Guren, McKay, Nakamura, and Steinnson (2021).

Obviously, the Great Recession has received a great deal of attention as an aggregate, national event. Much less attention has been paid to its effects across spatial units. The two exceptions address similar questions to mine using different measures of the business cycle. Han and Goetz (2015) construct a measure of economic resilience for US counties. They define county peaks and troughs according to local max and min of household employment, and resilience as a county's ability to recover its potential employment level. The patterns they find for the timing and depths of county recessions bear some resemblance to those I find in this paper. Cainelli, Lupi, and Tabasso (2021) are interested in calculating the business cycle similarity between pairs of US states during the period 2002-11. They use a band-pass filter to determine whether states are in an upswing or a downswing, and devise a measure of state-pair synchronicity. Their results are comparable to the business cycle concordance measures of Owyang, Piger, and Wall (2013) for metro areas.

Other papers of note examining the Great Recession include Rickman and Guettabi (2014) who look at the economic performance of non-metro areas, Beyers (2013) who constructs clusters of states according to their industry unemployment trends, and Deller and Watson (2016) who look at economic diversity and county employment stability. Stumpner (2019) finds evidence that intra-state trade contributed to the geographic spread of the Great Recession.

The remainder of the paper proceeds as follows. Section 2 describes the Markov-switching model and applies it to US payroll employment to obtain the peak and trough of the national employment cycle. The model is applied to states in Section 3, which describes the results and their geographic patterns. Possible explanations for the differences in state recession characteristics are examined in Section 4, while Section 5 calculates and examines two measures of the overall employment effects of state recessions. Section 6 concludes.

2 Recession Dating

As with OPW, I use the Hamilton (1989) version of the Markov-switching model to determine the state-level recession and expansion phases. The absence of useful, high-frequency state-level data for GDP means that we are limited to discussing state employment cycles rather than the general business cycle for states. As such, I use payroll employment growth to measure the condition of state economies. Finally, I restrict my sample to 2005-2019 to avoid having to assume that the Great Recession was structurally the same as the 2001 and 2020 recessions.

In the Hamilton model, there are two distinct phases to the business cycle: recession and expansion. Over time, shocks make an economy switch between the two phases, each of which has its own growth rate. Formally, let μ_0 be the growth rate of employment during expansion, and let μ_1, which is normalized to be negative, be the difference between the recession and expansion growth rates (the recession gap). The switching between recession and expansion is governed by a state variable, $S_t = \{0,1\}$, and deviations from the phase growth rates are a stochastic disturbance, $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$. When S_t switches from 0 to 1 (from expansion to recession), the growth rate switches from μ_0 to $\mu_0 + \mu_1$, and vice versa. In general, therefore, the growth rate of employment, y_t, is

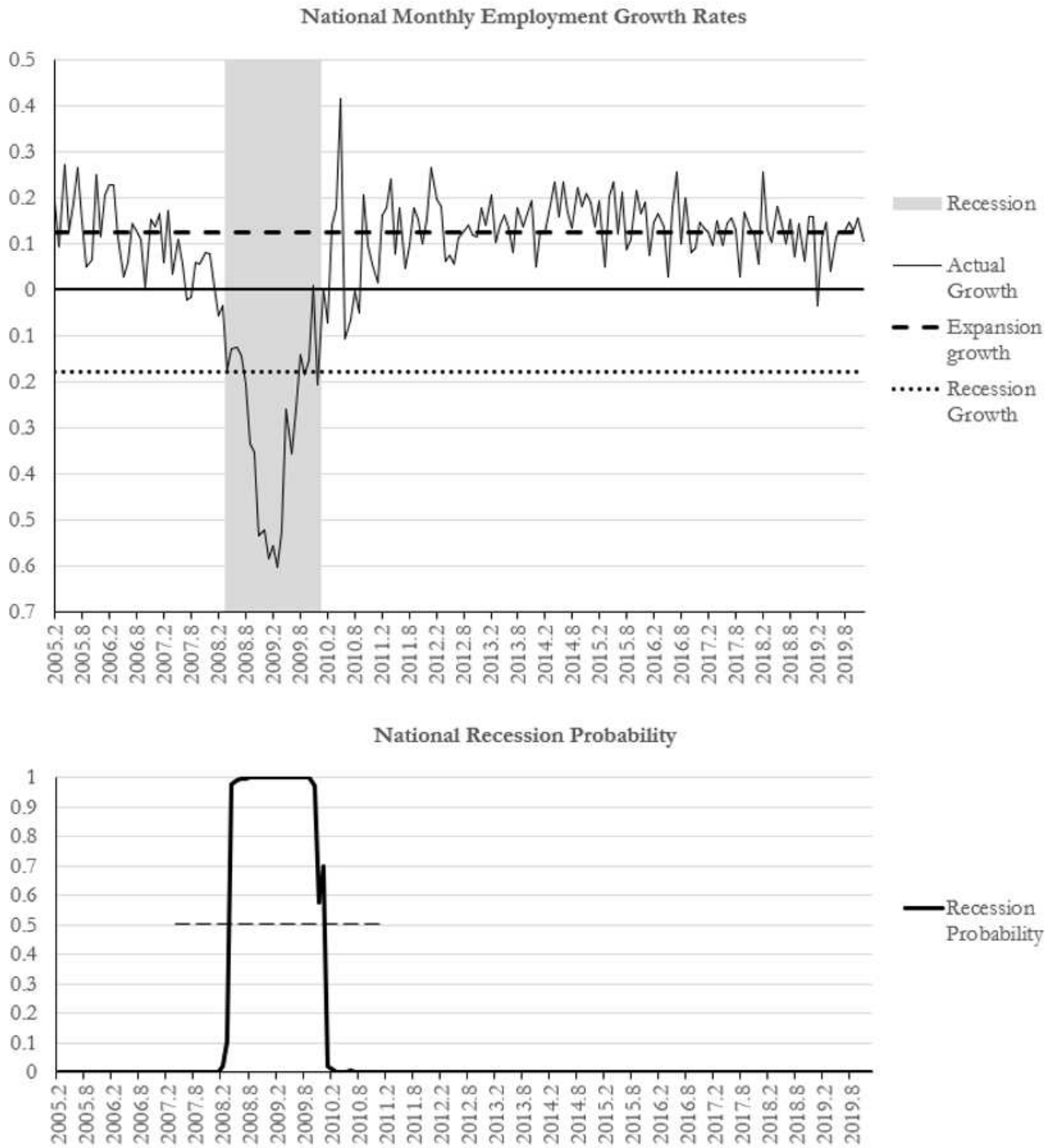
$$y_t = \mu_0 + \mu_1 S_t + \varepsilon_t. \quad (1)$$

Note that the value of S_t summarizes any persistence from the previous period in that, because the process for S_t is a first-order two-state Markov chain, the probability process driving S_t is captured by the transition probabilities. I apply the model to each state's monthly employment growth and estimate it using the multi-move Gibbs-sampling procedure for Bayesian estimation of Markov-switching models of Kim and Nelson (1999).[2]

Figure 1, which uses national payroll employment, is useful for illustrating how the model determines that national employment cycle. The Markov-switching model assumes that this series has two average growth rates that the economy switches between. In the figure, these growth rates are the two dotted lines: expansion growth is positive (μ_0 = 0.125 percent) while recession growth is negative ($\mu_0 + \mu_1$= -0.177 percent). The recession gap (μ_1= -0.302 percent) represents the monthly growth loss during recession. The model also assigns each observation a probability that it is in the recession phase.

[2] See Chauvet and Piger (2013) for a full description of the estimation procedure.

Figure 1. Markov-Switching and National Employment Recession



If the phases are distinct enough, as in the figure, the probability of recession (the bottom panel of Figure 1) will periodically switch from being 0 (or very close to it) to 1 (or very close to it), and vice versa.

The model works extremely well in separating national employment into its two phases in that almost every month is clearly an expansion or recession month. If the probability of recession is not close to 0 or 1, the convention is to use 0.5 to distinguish between the two phases. The gray area in the top panel indicates recession months. The peak and trough of the national employment recession were March 2008 and December 2010, respectively, so the employment recession was 21 months long. Note that the employment recession does not coincide with the official NBER recession, which usually is closely related to GDP growth. According to the NBER, the national business cycle peaked in December 2007 and reached its trough in June 2009. The national employment recession began 3 months after the start of the NBER recession. It has become common for the national employment recession to end after the end of the NBER recession (jobless recoveries). For the Great Recession the gap was six months.

3 State-Level Recessions

3.1 Growth Rates and Recession Gaps

I apply the model independently to 48 states and the District of Columbia. Alaska is excluded because its cycle is extremely idiosyncratic relative to the rest of the country, whereas Louisiana is excluded because the effects of Hurricane Katrina on its economy dwarf that of even the Great Recession. In effect, Louisiana was in permanent recession after August 2005. The estimates of 50 "state" expansion growth rates (μ_0) are provided by Figure 2, which indicates a geographic pattern similar to long-standing trends in growth. States in the West and South tended to grow faster during expansionary periods than did states in the Northeast and Midwest. North Dakota stands out because of its large oil and natural gas sector.

Keep in mind that when determining the effects of a recession on growth, it's not really the job losses during recession that matter, but the lost job growth. That is, the states' recession gaps—the $\mu_1's$ —are better measures of the monthly effects of the recession on state employment. If a state's

Fig 2. Monthly Expansion Growth Rates

US = 0.125

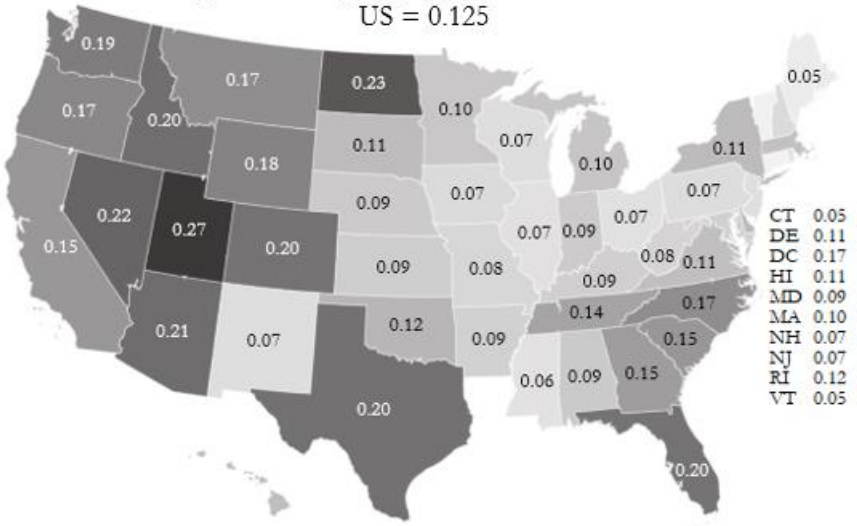


Fig 3. Monthly Recession Gaps

US = -0.302

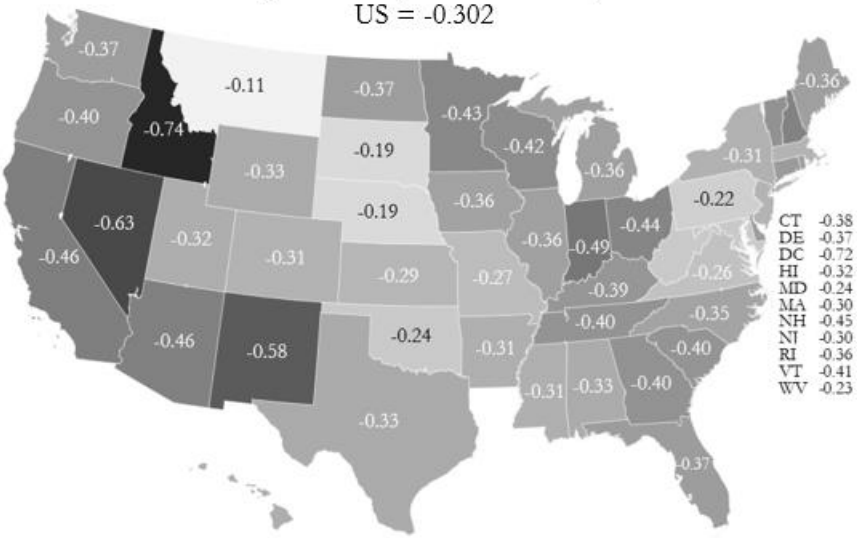


Fig 4. Monthly Recession Growth Rates

US = -0.177

growth even during good times isn't that strong, then a moderate recession growth rate is less severe for that state than it is for a state that grows rapidly during expansion. Figure 3 shows that the absolute recession gaps tended to be larger in the West and Mountain regions, across much of the South, and for Indiana, Ohio, Minnesota, New Hampshire, and Wisconsin. States in the Plains and east coast from New York to Virginia were among those with the smallest absolute recession gaps. Generally speaking, the recession gaps have a more-scattershot geographic pattern than do the expansion growth rates.

Because the recession gaps were large relative to expansion growth rates, the scattershot geography of the recession gaps largely is true for states' recession growth rates (Figure 4) also. States from the West, Northeast, and Great Lakes regions were some of those with the greatest monthly job losses, while the West, the Great Plains, and the Northeast contained some of those with the lowest rates. DC, Idaho, Nevada, Indiana, and New Mexico stand out as states with extremely large monthly employment losses during recession, whereas Montana, Utah, South Dakota, and Nebraska had relatively little monthly job loss during recession. In fact, Montana had a positive recession growth rate.

3.2 Recession Timing

State recession probabilities over the sample period are provided by Figure 5, which includes just 10 states to illustrate their variety. Each state's recession probability is shown relative to the national employment recession, which is shaded gray. The complete set of recession probabilities is provided in the appendix. Note first that all of the state employment growth series tend to split very neatly into the two business cycle phases. This "success" of the model is typical in other studies covering different periods and places, but is much easier given that the depth of the Great Recession creates a great deal of separation between the two phases. There are, however, significant differences across states in the movement in and out of employment recession.

Note first that California was largely in sync with the country as a whole, while Arizona and Florida both saw their recession probabilities shoot up prior to the national recession and shoot down at about the same time as the national recession. The recession probabilities for Rhode Island and Michigan, on the other hand, rose well before the national recession, and fell months prior to the end of it. Michigan suffered an idiosyncratic recession in 2006 that it was still recovering from when the Great Recession hit.

Figure 5. Select State Recession Probabilities, 2005-2019
Gray shading indicates national employment recession

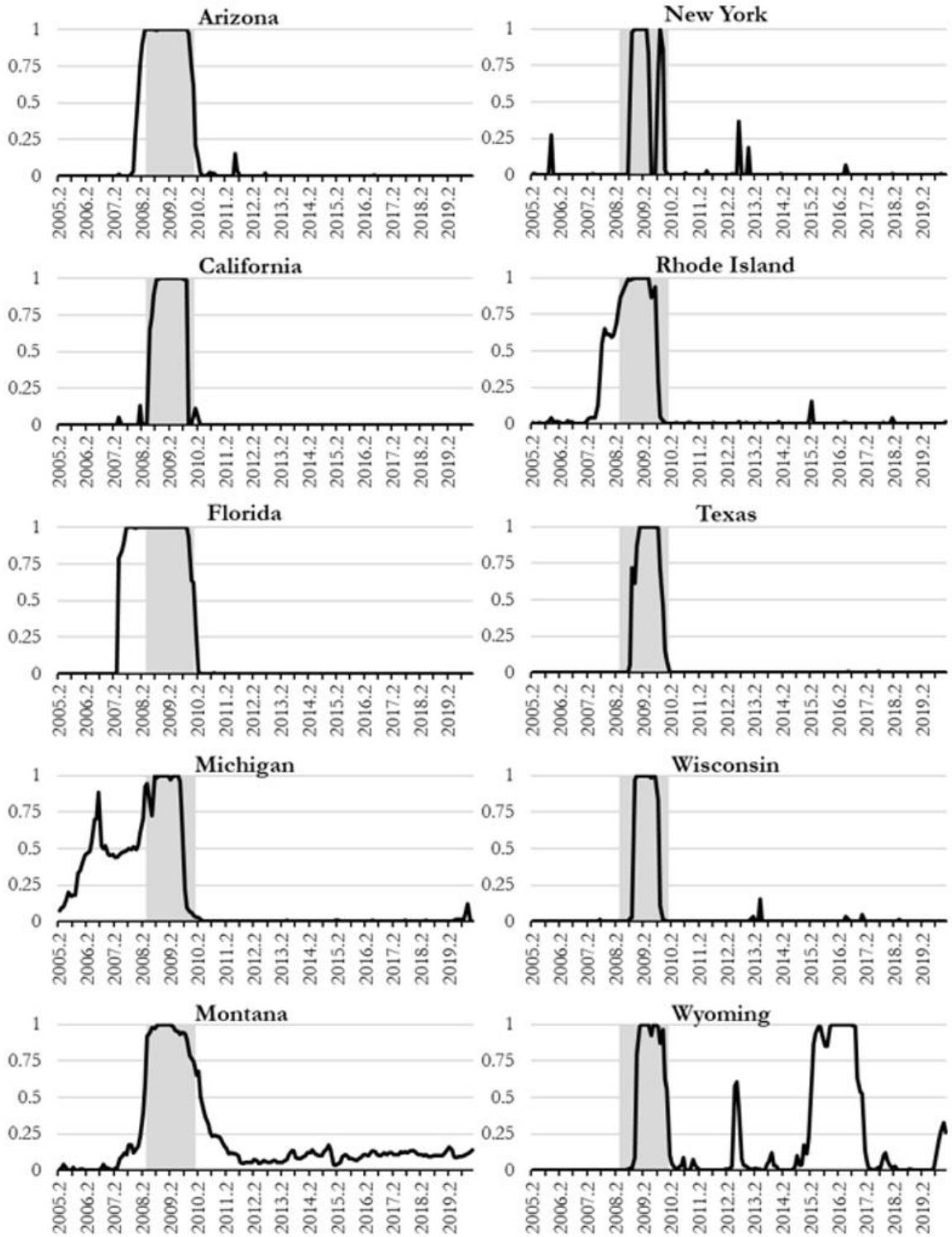
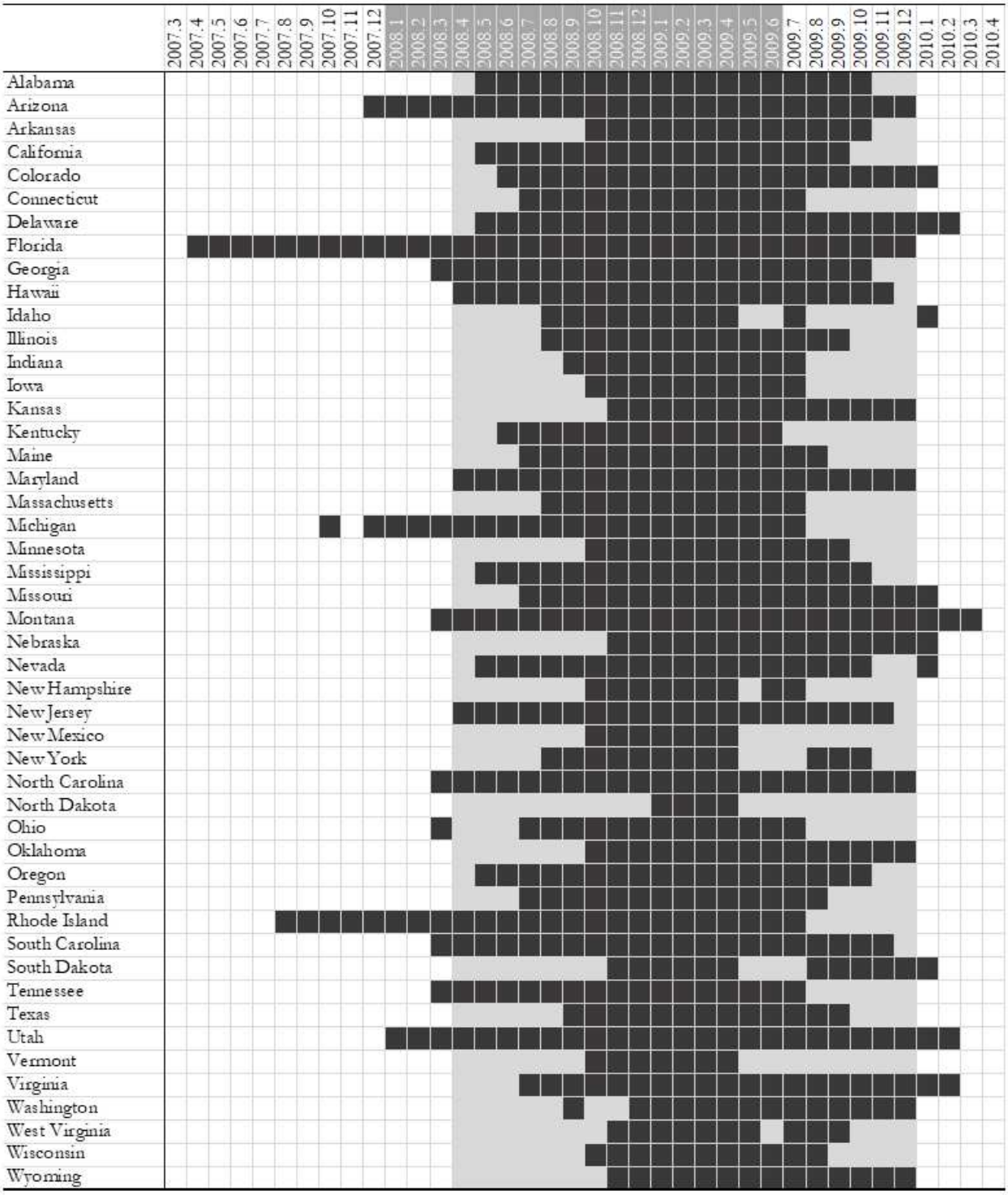


Figure 6. Peaks and Troughs Across the States

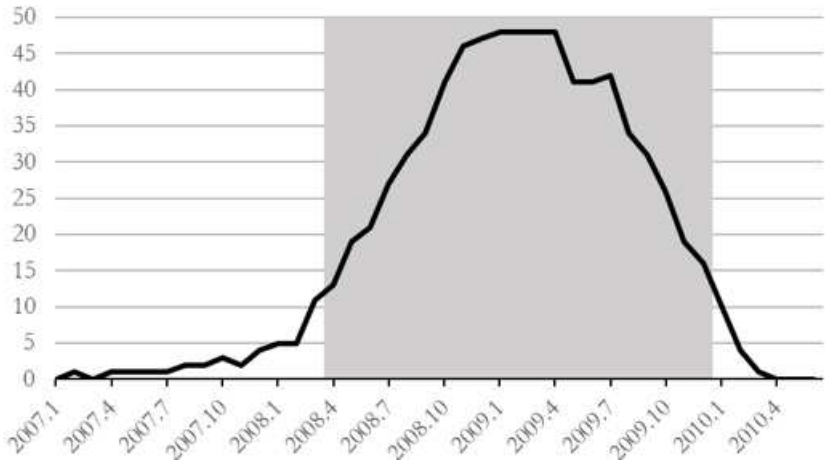
■ = Recession Month, Light Gray = National Employment Recession, Dark Gray = NBER Recession



At the other end of the range of experiences are Texas and Wisconsin, both of which saw their recession probabilities rises and fall well within the bounds of the national recession. Montana's recession probability, on the other hand, rose and fell outside of the national recession. New York and Wyoming had idiosyncratic experiences. New York saw a double-dip recession, with its recession probability rising and falling twice during the national recession. Like other small energy-producing states, Wyoming's recession probability was hit by two significant shocks during the sample period: The Great Recession and the collapse of oil prices during the second half 2014, when the price of a barrel of oil fell from about $120 to $40.

The states' employment cycle experiences during the period of the Great Recession are summarized by Figure 6, which translates the state recession probabilities into recession and expansion phases using the rule of thumb that a recession is when the recession probability exceeds 0.5. Note that the national employment recession is shaded light gray and the NBER recession months are indicated by dark gray shading of the dates at the top of the figure. The figure shows the great variety of state-level experience even for a massive downturn like the Great Recession: 11 states' peaks were prior to the national peak, 10 states' troughs were later than the national trough, and 16 states didn't enter recession until September 2008, 4 months after the national employment recession began, and nine months after the start of the official NBER recession. As Figure 7 shows, it wasn't until the financial crisis in the fall of 2008 that the great mass of states had switched into recession. And by May 2009, states began switching into expansion, even though the official recession didn't end until July and national employment remained in recession until the end of the year.

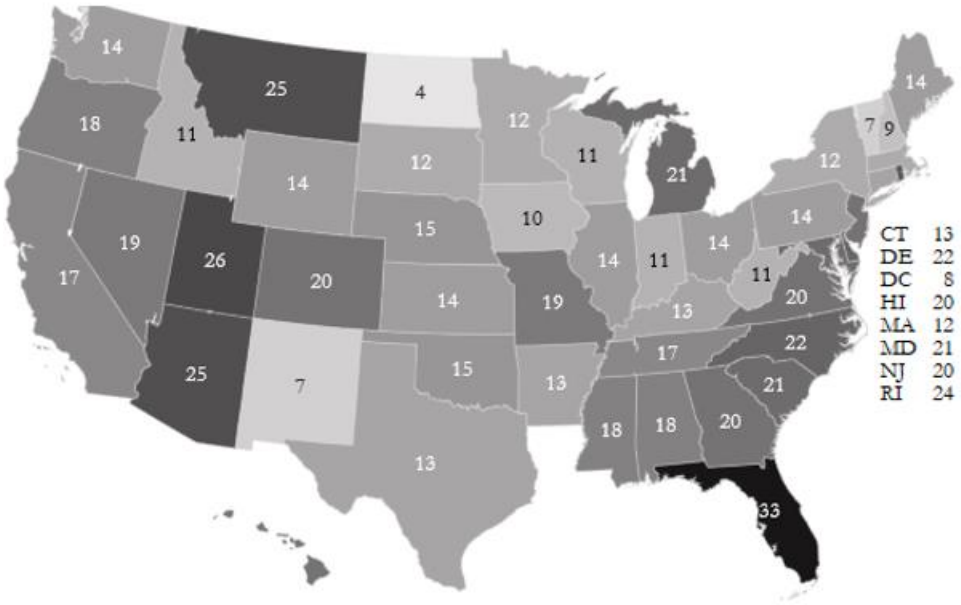
Figure 7. Number of States in Recession, 2007-2010



3.3 The Geography of the Great Recession

The search for patterns in the state-level employment recessions begins with Figure 8, which shows the geographic distribution of recession frequency surrounding the Great Recession. Generally speaking, states with the most recession months tended to be in the Mountain and Far West regions, or on the Atlantic coast from New Jersey to Florida. Wide swaths of the middle of the country from New Mexico to Maine, and from Texas to South Dakota had recession frequencies that were well below average. Only Missouri and Michigan stand out and, as already noted, the latter state began the period with problems of its own.

Figure 8. Months of Recession, 2007-2010
US = 21



The geographic pattern of states' entry into recession mirrors the frequency pattern, suggesting that it was a state's time of entry into recession, rather than exit from it, that drove whether the state saw a long or short recession. Figure 9 shows this pattern of switching into recession using three-month intervals and shading recessionary states in black. As early as October 2007, states as varied as Michigan, Florida, and Rhode Island were already in recession, and were joined by Utah and New Mexico by January 2008, the first month of the official NBER recession. By April, several states along the Atlantic coast, plus Montana, had entered recession. By July, much of the East and West were in recession, but most of the states in the middle of the country, as well as New York and parts of New

Figure 9. Entering the Great Recession
Gray = Expansion, Black = Recession, AK and LA excluded

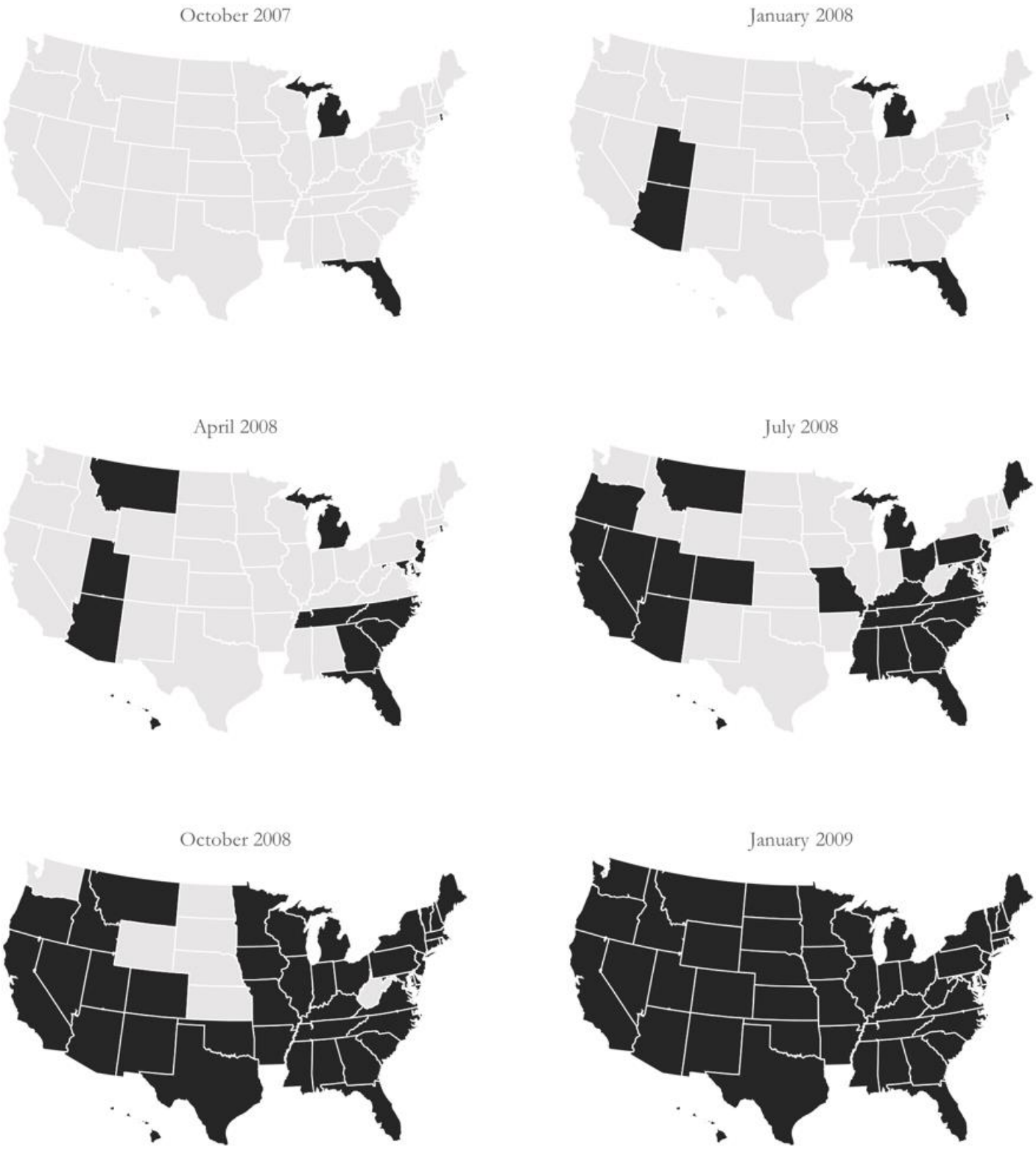
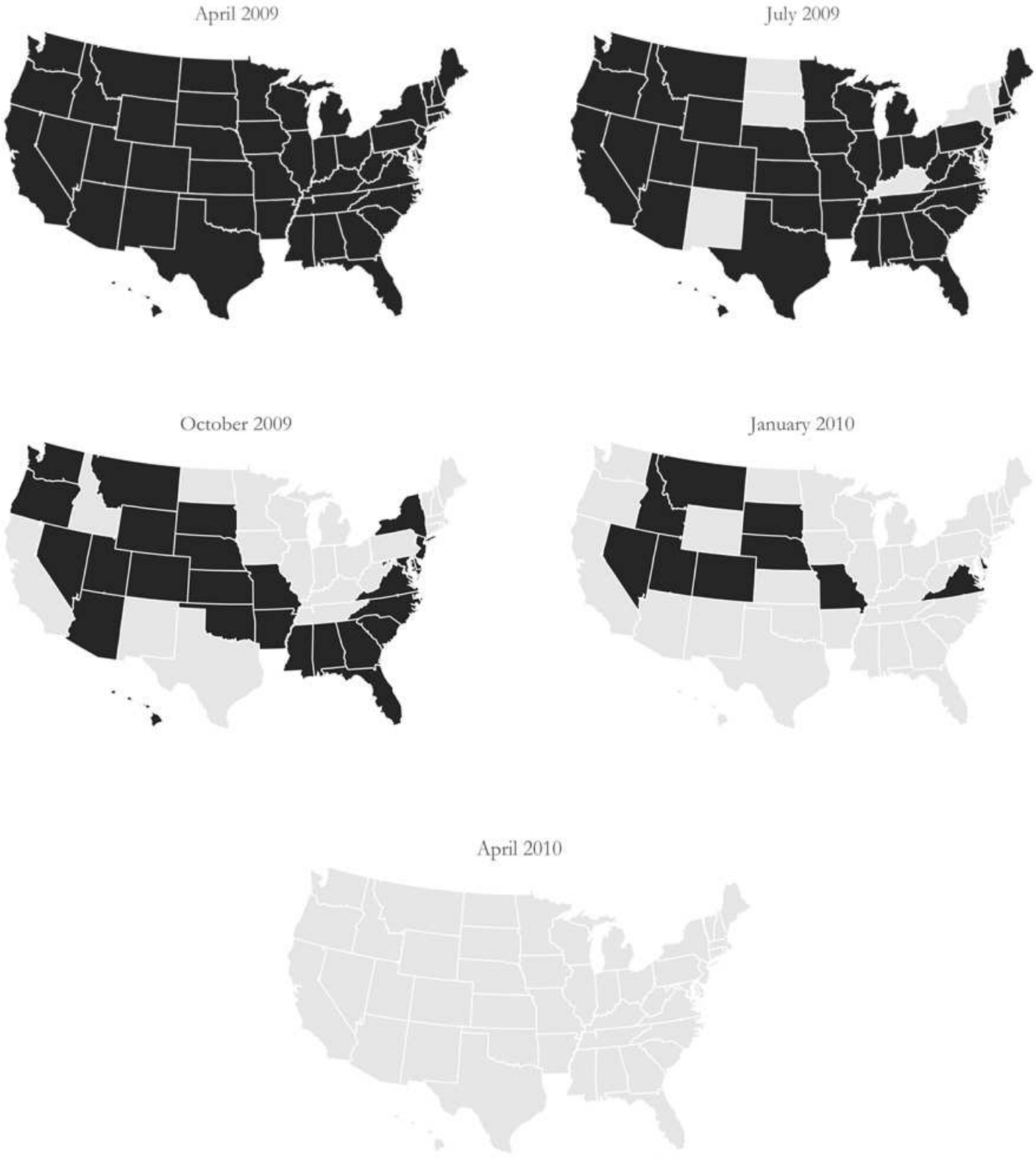


Figure 10. Exiting the Great Recession
Gray = Expansion, Black = Recession, AK and LA excluded



England and West were still in expansion. As the financial system spiraled into crisis in September and October, only West Virginia, Washington, and some states of the Great Plains were still in expansion. By January, the recession was truly national in that it was occurring in every state. It's worth noting that such geographic uniformity is rare. Only briefly in 1982 were there months in the post-war period in which every state was in recession at once (OPW, 2008).

Exit from employment recession was not as drawn out as was entry into it, although it too had a strong geographic component. As Figure 10 shows, all states were in still in recession in April 2009, but several had exited by July of the same year. By October 2009 almost the entire Midwest was in expansion, all of New England, plus Texas, California, New Mexico, and Idaho. By January 2010, the first month of national employment expansion, only 10 states—mostly in the Plains and Mountain regions—were still in recession. By April, two years after the national employment recession began, all states had switched into expansion.

4 Explaining Recession Characteristics

In the previous section I reported substantial differences across states in the depths and timing of state-level employment recessions associated with the Great Recession. Instead of a single recession to examine, we have 49 of them, so it is possible to see if there are variables that describe the recession tendencies across states. This is still not a large number of observations, but they are sufficient for obtaining some simple regression results to suggest the sources of the geographic variations. The Great Recession was unlike other post-war recessions in that it included or was preceded by a massive financial crisis preceded by a housing bubble and a sharp increase in the issuance of subprime mortgages. As such, I include a measure of the importance of subprime mortgages in the states constructed by Mayer and Pence (2009).[3] Specifically, I proxy for the prevalence of subprime mortgages at the start of the recession with Mayer and Pence's variable "subprime originations as a share of housing units" in 2005. See Appendix C for the prevalence of subprime lending across states.

[3] They use data from First American LoanPerformance on mortgages sold in subprime pools. These mortgages are usually subprime because of the low credit scores of the borrowers and high loan-to-value ratio. Mayer and Pence don't include Hawaii, however, so my data set is reduced to 48 observations.

Because sectors such as manufacturing and construction have tended to be harder hit by recessions than have service sectors, differences in industrial mix might also be expected to explain the state difference during the Great Recession. The variables I include are the shares of state employment in 2007 for three sectors: Manufacturing; Mining, logging, and construction; and Financial activities. See Appendix B for an illustration of the differences across states in the prevalence of jobs in these sectors. The first two of these sectors are typically affected relatively hard by recessions via a decrease in the demand for durables as the economy slows. On the other hand, they are usually targeted by loose monetary policy as a channel for the Fed to boost aggregate demand to end a recession. As outlined by Barker (2011), manufacturing employment fell at more than twice the rate of total employment from December 2007 until the end of 2009 and began to rise somewhat earlier than did total employment. Housing played a special role in fomenting the Great Recession, so the construction sub-sector's experience did not follow the pattern of previous recessions: National employment in construction declined sharply prior to the start of the general recession, and its employment kept declining throughout it (Hadi, 2011). Mining employment, which includes oil extraction, had a strong and early rebound in the middle of the national recession as oil prices recovered (Davidson, 2011), which is clearly reflected in the experience of North Dakota and West Virginia, although is less obvious for other energy-producing states where the industry's state-wide impact is smaller. Unfortunately, the conflicting experiences of construction and mining cannot be separated at the state level because disclosure rules prevent the BLS from reporting mining employment for every state.

The Financial activities sector is usually a source of aggregate employment stability during recessions, but the Great Recession was certainly different (Prassas, 2011): The housing crisis that preceded the recession meant that the sector's employment started falling nationally in 2007. For a state with a large Financial activities sector, the recession was likely to have begun earlier than average. Having a large Financial activities sector likely meant a deeper and longer recession because of the financial crisis and the general decline of the sector well into 2010.

As already noted, both the entry and exit of states into recession had strong geographic patterns and, to a lesser extent, so did the recession gaps and the recession frequency. In previous recessions these patterns reflected more than differences in industry mix and other factors (OPW, 2008). To capture these geographic patterns, I include dummy variable to indicate the states' Bureau of Economic

Analysis regions: New England, Mideast, Southeast, Southwest, Great Lakes, Plains, Rocky Mountain, and Far West.

Table 1. State Recession Characteristics and the Influence of Subprime Loans, Industry Shares, and Regional Effects

Dependent variable	Recession Gap		Recession Frequency		Peak Month		Trough Month	
Model	Unrestricted	Regional effects = 0	Unrestricted	Regional effects = 0	Unrestricted	Regional effects = 0	Unrestricted	Regional effects = 0
Constant	−0.569*	−0.522*	−5.504	−1.534	25.132*	23.383	25.098*	28.238*
	(0.241)	(0.206)	(6.666)	(6.298)	(4.040)	(3.800)	(4.125)	(4.761)
Subprime as % of housing	−3.085*	−3.403*	165.573*	134.521*	−147.517*	−122.427*	11.181	−1.678
	(1.419)	(0.846)	(52.213)	(56.522)	(36.541)	(43.075)	(30.308)	(24.368)
Mining, logging, and construction share	0.013	−0.009	0.089	0.640†	0.242	−0.052	−0.075	0.150
	(0.013)	(0.009)	(0.409)	(0.317)	(0.251)	(0.201)	(0.206)	(0.181)
Manufacturing share	−0.000	0.000	0.184	0.249	−0.099	−0.148	−0.198	−0.219
	(0.010)	(0.007)	(0.331)	(0.265)	(0.230)	(0.164)	(0.211)	(0.168)
Financial activities share	0.037†	−0.036*	1.674*	1.095*	−0.762†	−0.333	0.571†	0.476
	(0.022)	(0.018)	(0.549)	(0.500)	(0.393)	(0.330)	(0.294)	(0.363)
Region dummies	Yes	No	Yes	No	Yes	No	Yes	No
R^2	0.337	0.301	0.552	0.277	0.580	0.275	0.387	0.166
Adjusted R^2	0.135	0.236	0.415	0.210	0.452	0.208	0.199	0.088
p-value for restriction		0.867		0.005*		0.000*		0.001*

Robust standard errors are in parentheses. Statistical significance at the 5 percent and 10 percent levels are indicated by "*" and "†",

Table 1 presents the Ordinary Least Squares results using the recession gap, recession frequency, first peak month, and final trough month, respectively, as dependent variables. Given that regions can contain as few as five states, their estimated effects are suppressed in the Table. To test the joint statistical significance of the region effects the table includes versions of the model that assume that regional effects do not matter. In short, the results indicate that state recession gaps were larger (more negative) the more prevalent subprime mortgages were, and smaller (less negative) the larger the share of employment in Financial activities. They were not, however, related to the other two included industries or to a state's region. To put the importance of subprime mortgages into perspective, consider Arizona, which had one of the highest rates of subprime mortgages, and the seventh largest recession gap in absolute terms. If its share of subprime mortgages had been the average across states, it would have lost about 1/4 employment per month of recession than it did, and have had the 26th largest absolute gap, just above that of Texas.

Recession frequency was related to regional effects and was positively related to the prevalence of subprime mortgages and the share of employment in financial activities. These latter two effects are

consistent with the discussion above, although the absence of a link for manufacturing is not. Note that the link between subprime mortgages and recession frequency was due to a tendency for states to have earlier peaks if they had large shares of subprime mortgages. For context, if Arizona had had the average share of subprime mortgages instead of the second highest, its recession would have been 17 months long instead of 25 months long.

5 The Great, Greater, and Greatest State Recessions

Having found the characteristics of state-level recessions, it is now possible to calculate state-specific effects of the economic shock of the Great Recession. Traditionally, one would look at the percentage change in employment between the peak and trough of the NBER recession. As we have shown, however, national recession dates can be quite misleading at the state level because state recessions were often very different from them, however defined. To show the importance of the distinction, Table 2 provides the percentage changes in states' employment between the NBER peak and trough, as well as between states' own peaks and troughs from Figure 6. For the most part, states with large job losses during the NBER recession tended to see large job losses during their own employment recessions. There were, nevertheless, some anomalies—DC and North Dakota had positive job growth between the NBER peak and trough.

I'm not that interested in the first column of calculations except in how the second column differs from them. These differences are illustrated by Figure 11, which shows for each state the percentage change in calculated job losses between the two methods. For the eight states shaded black, state-specific peaks and troughs indicated 20 percent more jobs lost during recession when state peaks and troughs are used. South Dakota and DC are also shaded black because the went from gaining to losing jobs when their own peaks and troughs were used. At the other end are eight states for which the move to state peaks and troughs means lower calculated job losses. In all, there were 22 states for which the adjustment meant fewer calculated jobs lost, and 26 for which it meant more calculated jobs lost.

Looking at the more preferred of these two measures of the effect of recession, the average state saw employment changes of -5.2 percent, but three states—North Dakota, DC, and Vermont—saw changes below -2 percent, while three states—Nevada, Florida, and Arizona—saw employment

changes of -10.9 percent or worse. As illustrated by Figure 12, with the exception of Michigan, the states with the largest decreases in employment were in either the West or the Southeast. The Upper Midwest had a concentration of states with small employment decreases, with other of these states

Table 2. State Employment Effects of the Great Recession

Type of effect	% Change	% Change	Forgone
Peaks and troughs	NBER	State−specific	State−specific
United States	*−5.6*	*−6.1*	*−8.5*
Alabama	−6.6	−6.6	−8.0
Arizona	−9.7	−10.9	−15.1
Arkansas	−3.8	−3.5	−4.5
California	−7.5	−7.2	−9.3
Colorado	−5.1	−6.1	−9.4
Connecticut	−5.2	−4.4	−4.9
Delaware	−6.1	−7.0	−9.1
District of Columbia	0.8	−1.3	−4.0
Florida	−9.2	−11.3	−16.6
Georgia	−7.0	−7.4	−9.9
Hawaii	−6.0	−6.3	−8.9
Idaho	−7.8	−5.3	−6.6
Illinois	−6.0	−5.7	−6.5
Indiana	−7.6	−6.0	−6.8
Iowa	−3.6	−2.9	−3.5
Kansas	−3.5	−4.6	−5.6
Kentucky	−5.7	−5.1	−6.0
Maine	−4.4	−4.1	−4.7
Maryland	−3.7	−4.0	−5.5
Massachusetts	−3.8	−3.4	−4.4
Michigan	−9.9	−8.8	−10.4
Minnesota	−4.6	−4.2	−5.1
Mississippi	−5.6	−5.8	−6.8
Missouri	−4.4	−5.0	−6.2
Montana	−4.2	−4.4	−8.0
Nebraska	−1.9	−2.7	−3.8
Nevada	−12.0	−11.7	−14.7
New Hampshire	−4.1	−3.0	−3.6
New Jersey	−5.0	−5.3	−6.5
New Mexico	−4.7	−2.8	−3.1
New York	−2.4	−3.1	−4.5
North Carolina	−6.8	−7.7	−10.7
North Dakota	1.2	−0.4	−0.9
Ohio	−7.3	−5.7	−6.3
Oklahoma	−2.7	−4.6	−6.0
Oregon	−7.5	−7.7	−10.2
Pennsylvania	−3.8	−3.6	−4.4
Rhode Island	−6.5	−6.6	−7.9
South Carolina	−7.4	−8.1	−10.7
South Dakota	−1.1	−2.4	−3.8
Tennessee	−7.3	−6.7	−8.6
Texas	−2.6	−3.6	−5.8
Utah	−6.8	−7.2	−13.1
Vermont	−4.3	−1.9	−2.2
Virginia	−3.7	−4.2	−6.0
Washington	−5.1	−4.6	−6.5
West Virginia	−2.3	−2.5	−3.2
Wisconsin	−5.4	−4.8	−5.4
Wyoming	−3.4	−6.2	−8.2

The percent change in employment is calculated either between the NBER peak and trough or the states' first peak and final trough in Figure 6. Forgone employment is the percent difference between potential and actual employment at the state's final trough.

Figure 11. Employment Losses: State-Specific Recessions vs. NBER Recession

% Difference using state-specific recessions instead of NBER recession

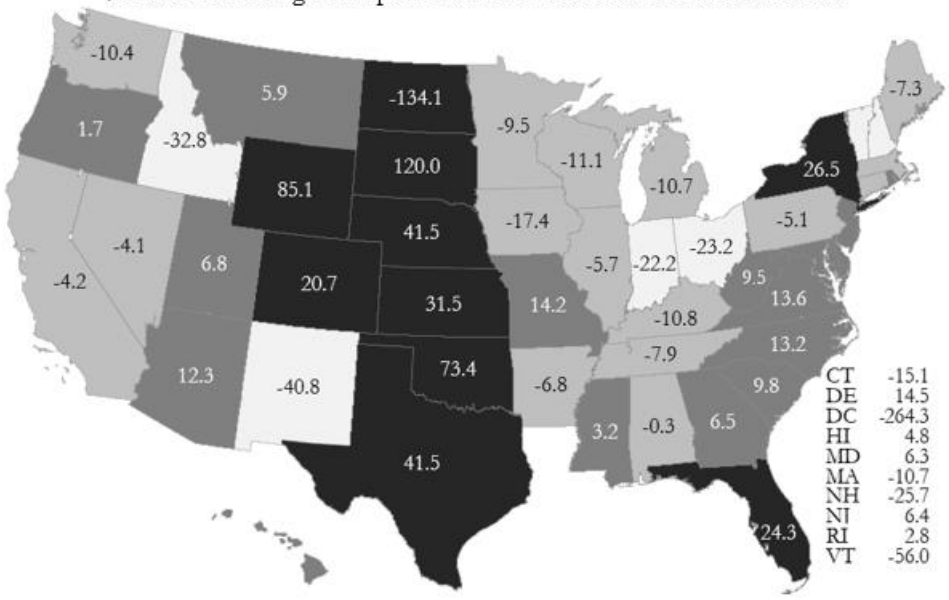
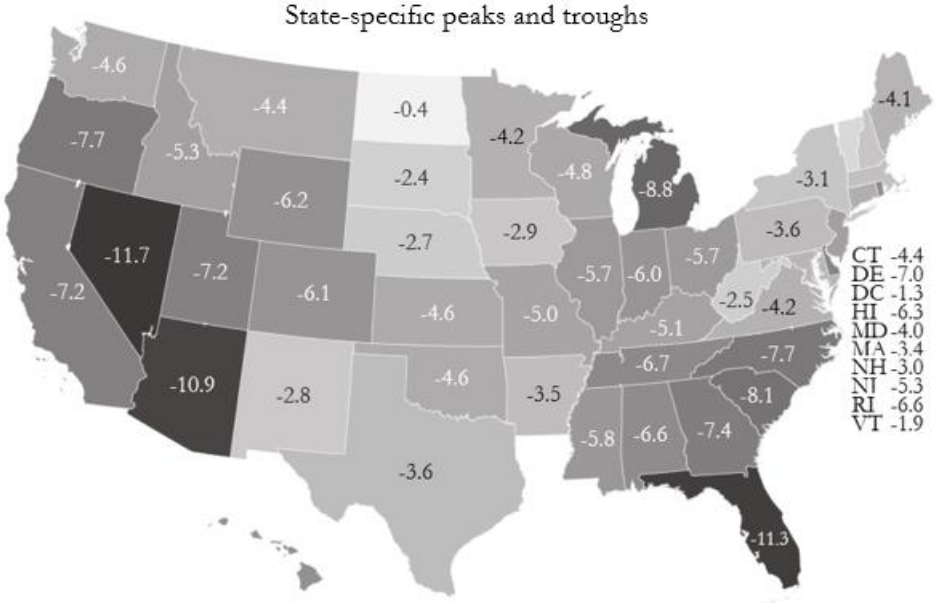


Figure 12. Percentage Changes in Employment

State-specific peaks and troughs



scattered from New Mexico to New England. The Northeast and states between Texas and North Dakota in the middle of the country tended to have seen relatively small decreases in employment over the course of their recessions.

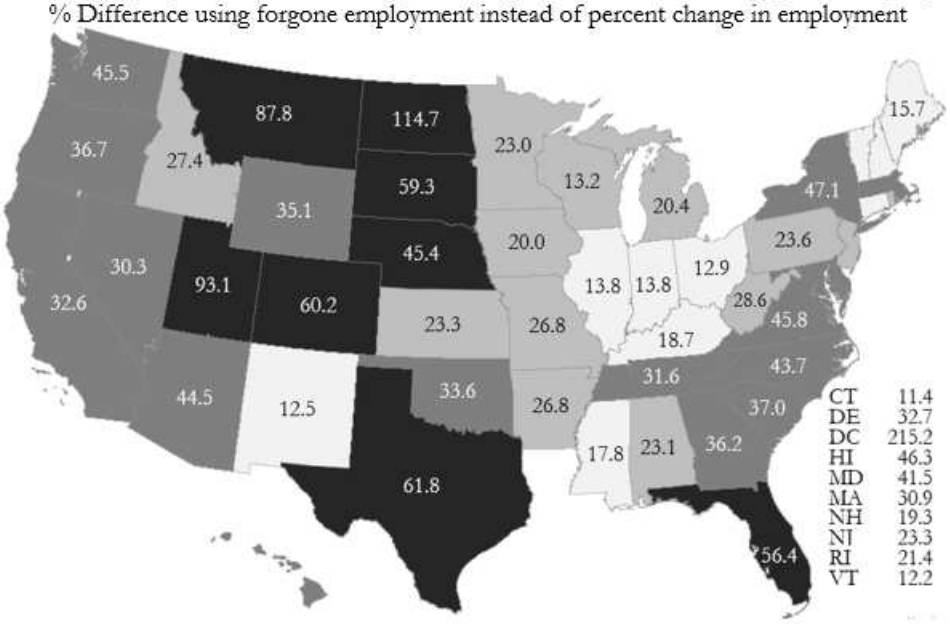
The percentage change calculations are an important twist on the usual calculations in that they use state-specific peaks and troughs rather than applying a national peak and trough to all states. They

still, however, overlook how the same percentage decrease in employment can mean different things for different states. For example, a normally fast-growing state that experienced a 2 percent decrease in employment over the course of its recession actually saw more harm than did a normally slow-growing state that also experienced a 2 percent decrease. A state sees not only the decrease from its initial employment level, but also loses the employment growth that would have happened if the recession had not occurred. To account for this, my second set of calculations of the effects of the recession—forgone employment—is the percentage difference at the trough between actual employment and employment that would have occurred if state employment had continued growing at its expansion rate.

The final column of Table 2 provides the calculations of forgone employment. Note that using foregone employment rather than the percentage change in employment will necessarily increase the calculated job losses from the recession, and the adjustment differs a great deal across states. As shown by Figure 13, a total of 26 states see greater than 30 percent increases in calculated job losses when lost job growth is considered. The largest percentage increases occur for the Dakotas and Montana (although from small bases) and for Texas, Utah, Colorado, Florida. The smallest increases occurred for most of the Great Lakes states and New England.

Figure 13. Employment Losses: Forgone Employment vs. % Change in Employment

% Difference using forgone employment instead of percent change in employment



Looking at the calculations of forgone employment, there are four categories of recession among the states during the period of the Great Recession (Figure 14). There were the 30 states with forgone employment between 2.2 percent and 6.8 percent who experienced a great recession, 14 states who with forgone employment between 7.9 and 10.7 percent who experienced greater recessions, and four states with forgone employment between 13.1 percent and 16.6 percent who suffered the greatest recessions. North Dakota stood alone in experiencing a meh recession with forgone employment of just 0.9 percent. Despite the fact that forgone employment combines the several different facets of recessions, each with their own geographic pattern, it has a fairly distinct pattern of its own. States of the Far West and Mountain Regions tended to have lost the most from the recession, along Michigan and states of the South East. The great swath of states from New Mexico to Maine and from Texas to Minnesota saw significant effects themselves, but the distribution of forgone employment was skewed toward other groups of states.

Figure 14. Great, Greater, and Greatest Recession by Forgone Employment
% Difference between potential and actual employment at the state trough

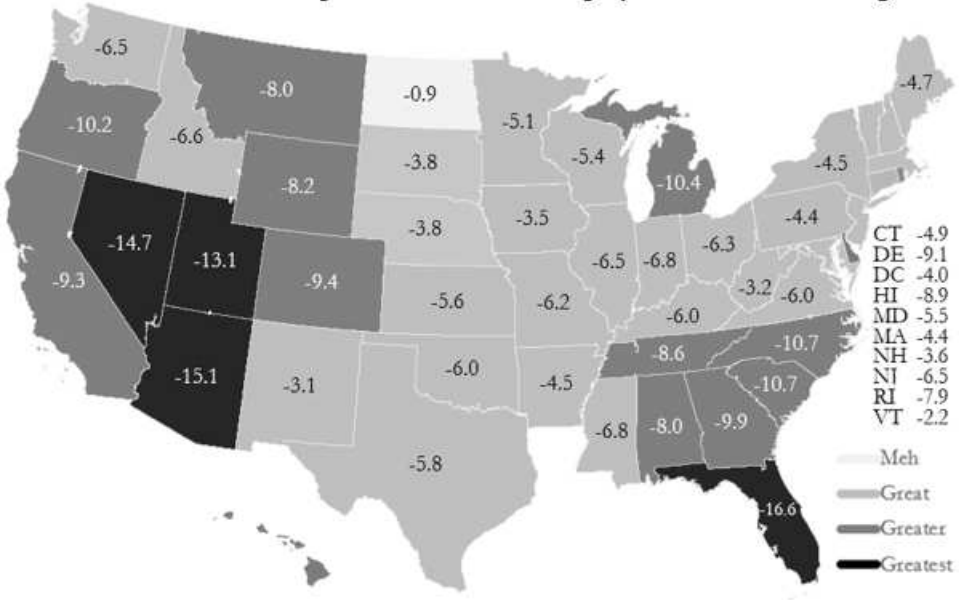


Table 3 summarizes the OLS estimates of the links between the latter two employment effect calculations and the subprime and industry mix variables from above. The percentage change in employment is related to all three industry shares: A state tended to see a larger decrease in employment from peak to trough the more subprime mortgages it had, and the larger its share of Mining, logging, and construction; Manufacturing; and Financial activities. These links are consistent with the

Table 3. Determinants of the Employment Effects of State Recessions

Effect	% Change in Employment		Forgone Employment	
Model	Unrestricted	Regional effects = 0	Unrestricted	Regional effects = 0
Constant	6.408*	5.569*	7.049*	5.860*
	(1.519)	(1.397)	(2.124)	(2.418)
Subprime as % of housing	−93.462*	−101.177*	−120.519*	−124.550*
	(14.588)	(21.468)	(20.900)	(21.468)
Mining, logging, and construction share	−0.293*	−0.449*	−0.200	−0.601*
	(0.086)	(0.144)	(0.123)	(0.144)
Manufacturing share	−0.243*	−0.343*	−0.188	−0.309*
	(0.086)	(0.060)	(0.131)	(0.098)
Financial activities share	−0.495*	−0.192	−0.721*	−0.291
	(0.246)	(0.183)	(0.246)	(0.233)
Region dummies	Yes	No	Yes	No
R^2	0.751	0.606	0.734	0.526
Adjusted R^2	0.675	0.570	0.652	0.482
p-value for restriction		0.008*		0.001*

Robust standard errors are in parentheses. Statistical significance at the 5 percent and 10 percent levels are indicated by "*" and "†", respectively.

performance of those industries through the period. Regional effects were also statistically significant. The results for forgone employment differ somewhat because, all else equal, forgone employment is higher for states that normally grow relatively fast. Because faster-growing states tended to make greater use of subprime mortgages, the mortgage and financial sector channels tended to be more important for forgone employment than for the percentage change in employment. Specifically, the coefficients for subprime housing and Financial activities are larger, and the effects for Mining, logging, and construction and Manufacturing are smaller and not statistically significant. In short, subprime mortgages and the Financial activities were so important during the Great Recession that they swamped the usual links between recession and other sectors.

6 Summary and Conclusions

This paper found state-specific recessions for the period of the Great Recession and found that, despite the severity of the recession, there were substantial differences across states. States entered and exited recession at very different times, resulting in significant differences in recession frequency. There were geographic patterns to states' peaks and troughs, and longer recessions were related to the

prevalence of subprime mortgages and states' shares of employment in Financial activities. Monthly employment losses during recession were also related to the pre-recession share of subprime mortgages. Total employment losses ranged from 0.4 percent for South Dakota to 11.7 percent for Nevada and were related to industry mix and the share of subprime mortgages. Forgone employment differed similarly across states and was related to states shares of Financial activities and their use of subprime mortgages.

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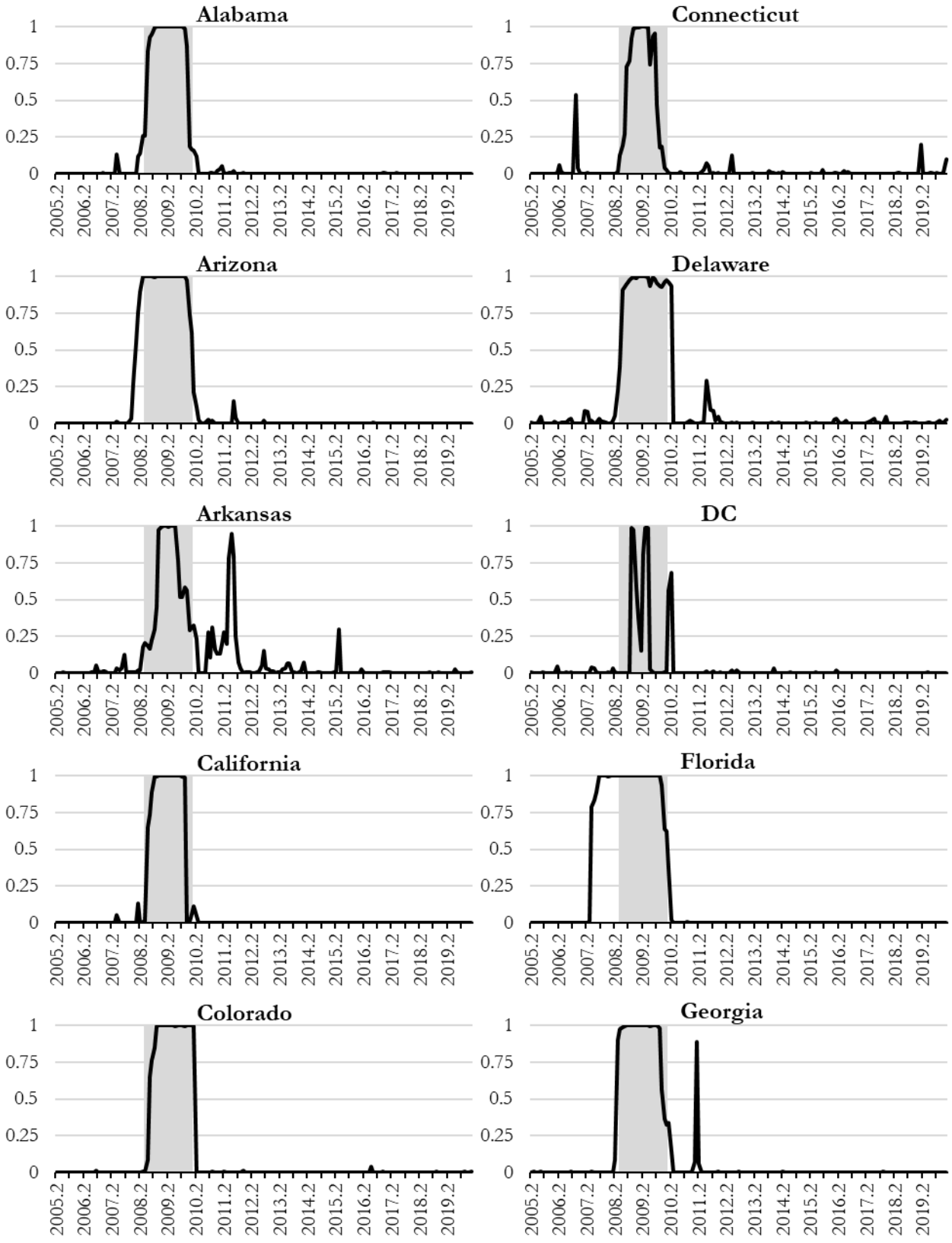
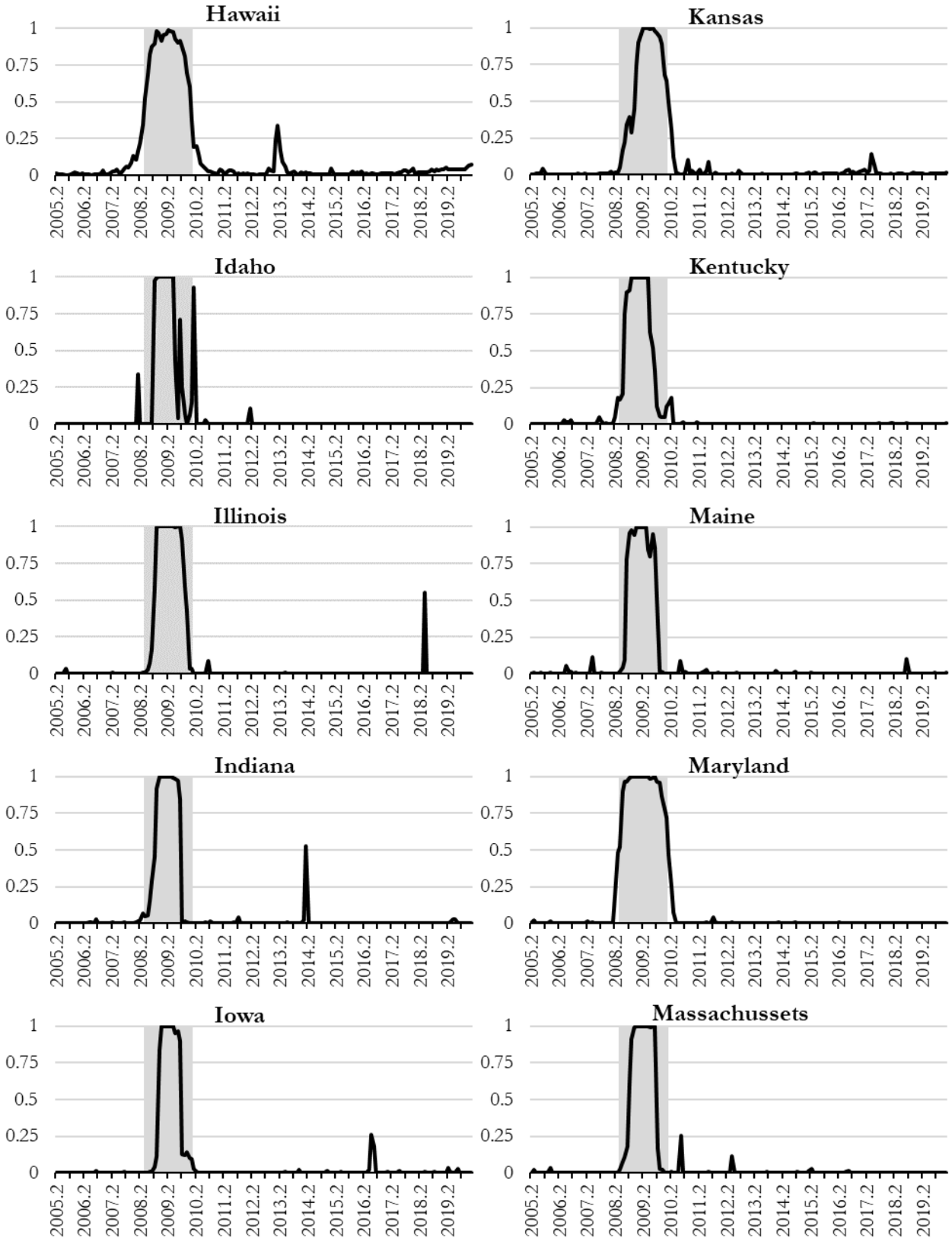
Appendix A. State Recession Probabilities, 2005-2019

Gray shading indicates national employment recession



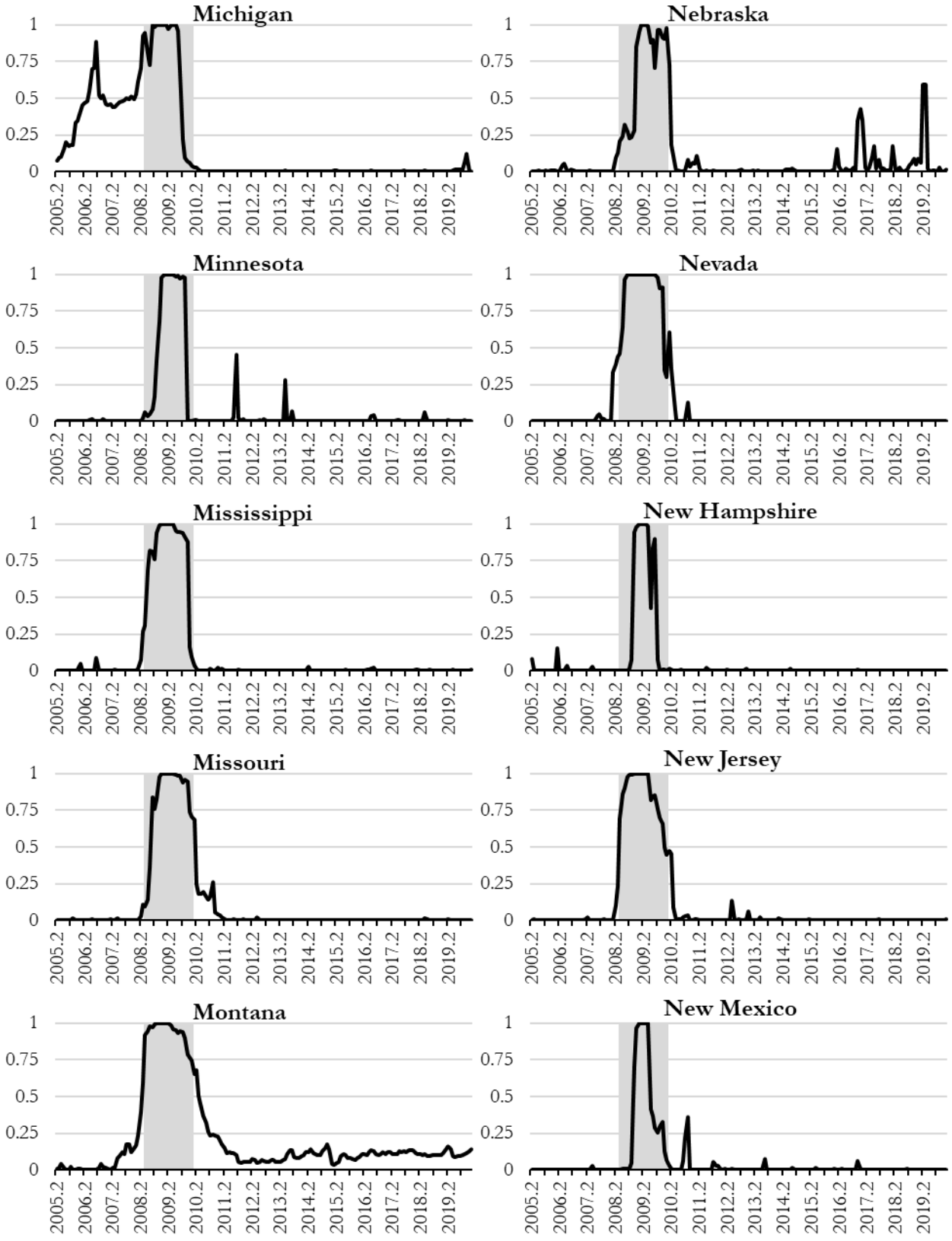
Appendix A. State Recession Probabilities, 2005-2019 (continued)

Gray shading indicates national employment recession



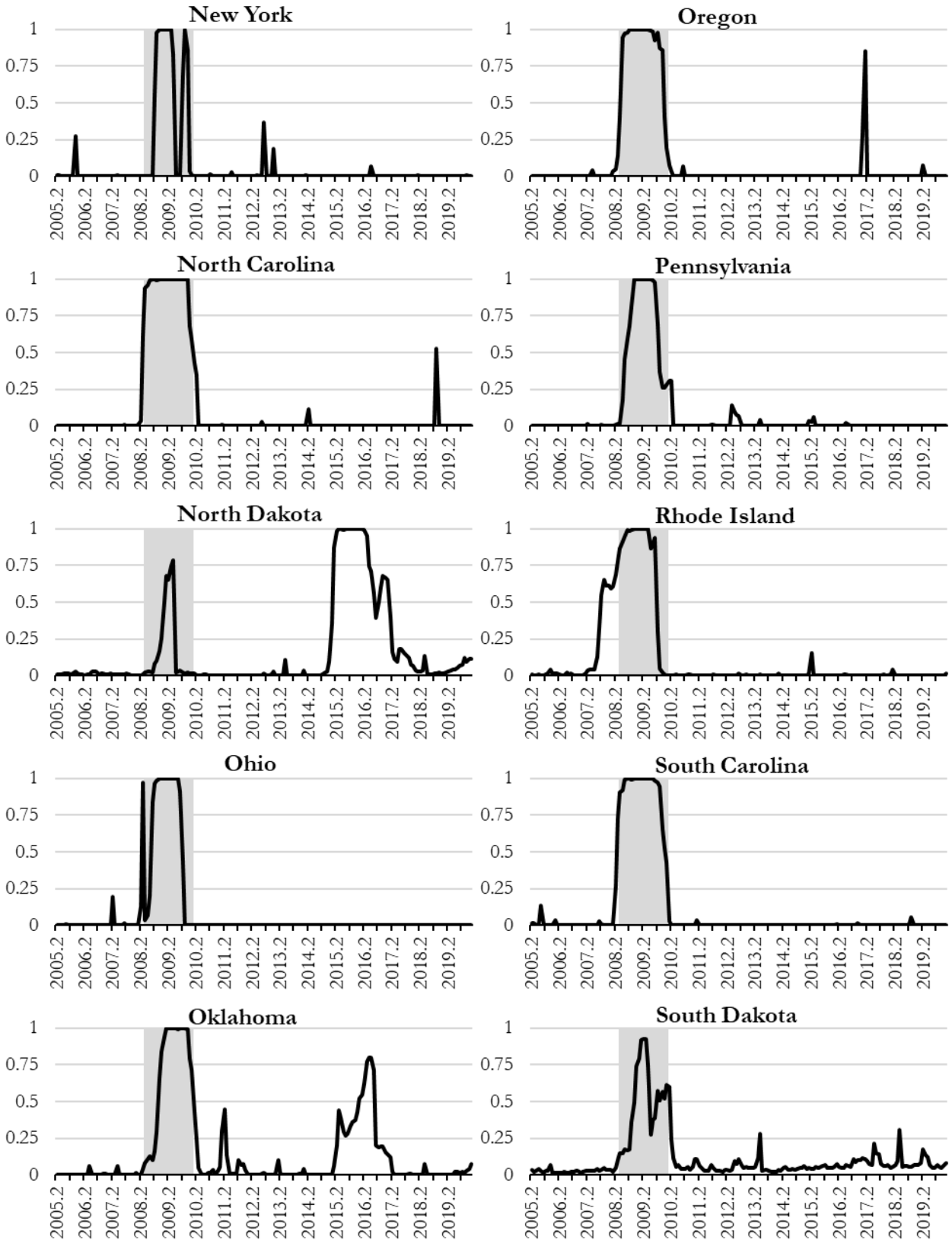
Appendix A. State Recession Probabilities, 2005-2019 (continued)

Gray shading indicates national employment recession



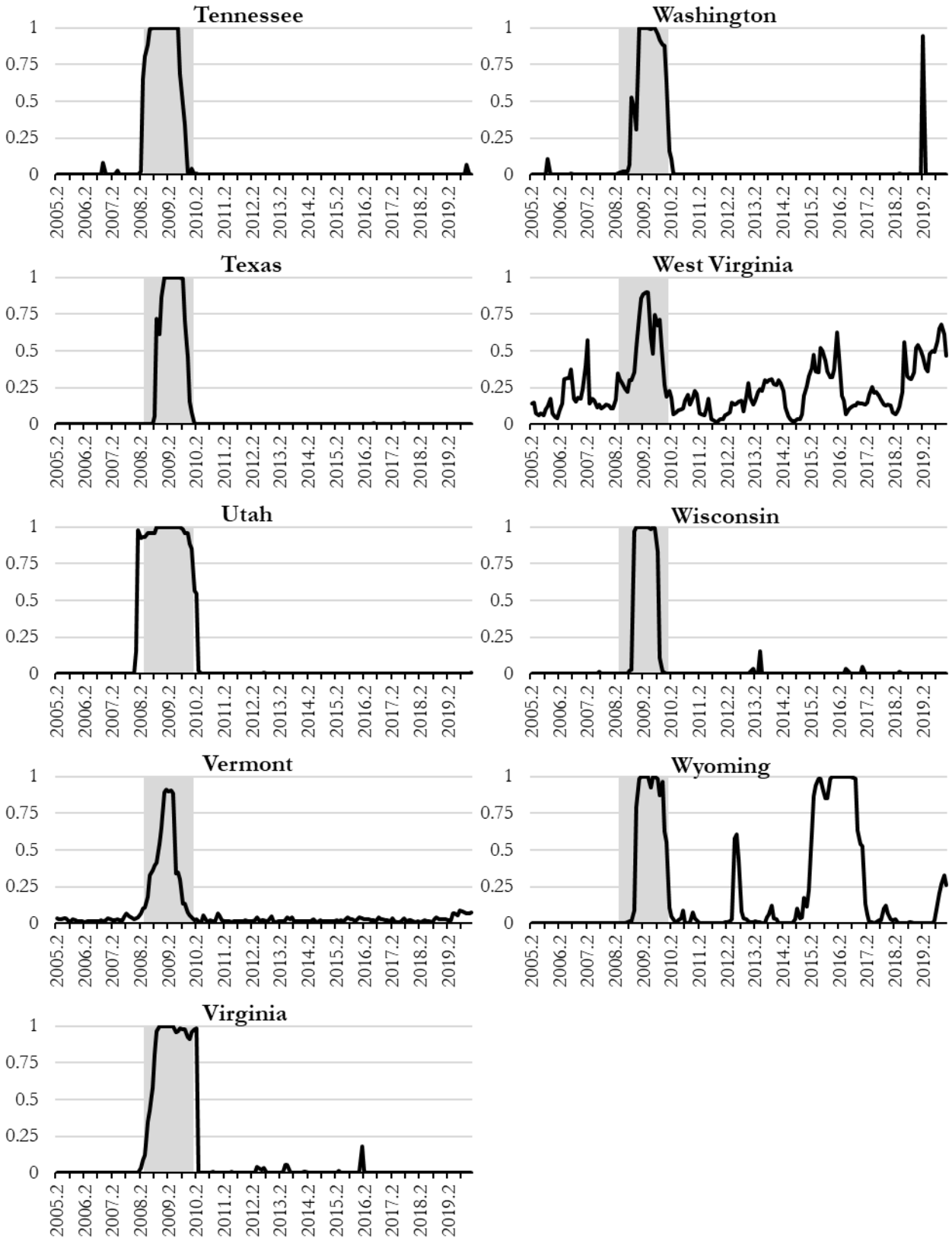
Appendix A. State Recession Probabilities, 2005-2019 (continued)

Gray shading indicates national employment recession

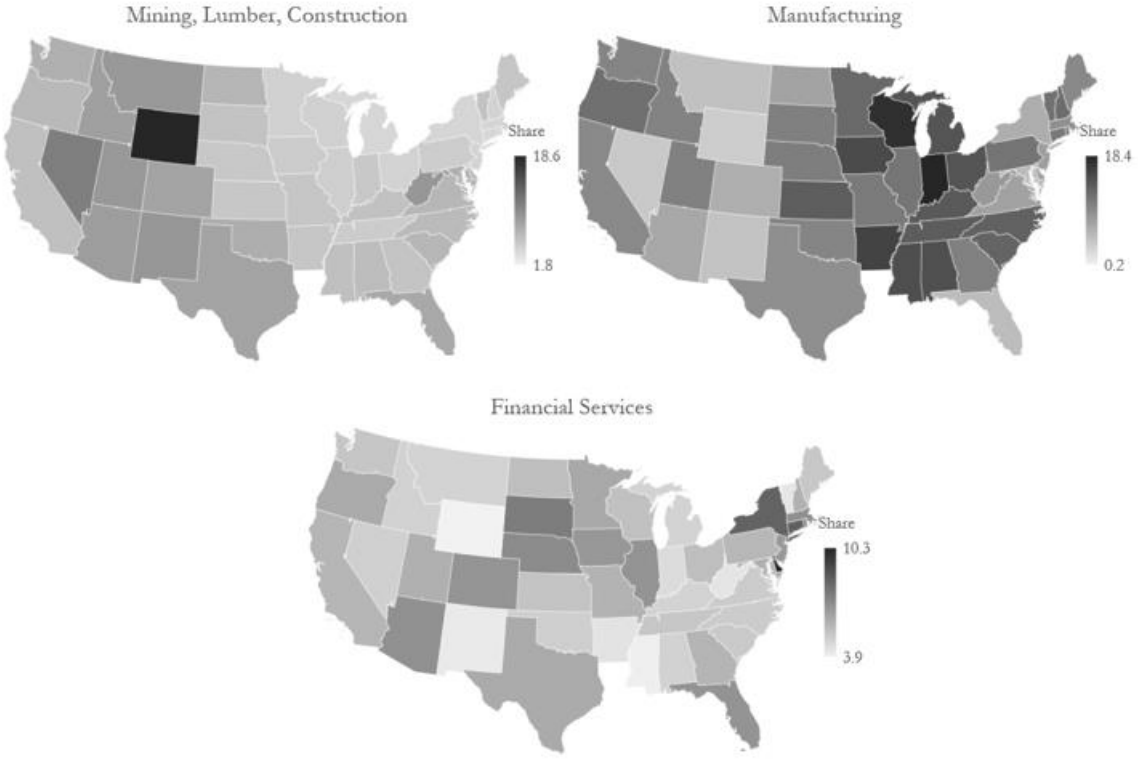


Appendix A. State Recession Probabilities, 2005-2019 (continued)

Gray shading indicates national employment recession



Appendix B. Employment Shares of Select Industries, 2007



Appendix C. Subprime Originations as a Share of Housing Units, 2005

Source: Mayer and Pence (2009)