Sectoral Change and Unemployment During the Great Recession, In Historical Perspective

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Abstract

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Abstract

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1. Introduction

An important question in regional economics is how locales respond to recessionary shocks. For example, Fingleton et. al. (2012) found that United Kingdom regions responded differentially to recessions, but left open the question of what explained those differences (130). An answer to this question could shed light on the question of resilience in general (Martin 2012, 3). For example, according to the plucking model, generally ascribed to Milton Friedman, recessionary shocks, even those that affect the region's economic structure, could be transitory and have no permanent effects on the economy's long-term growth ceiling or trend (5-6). By contrast, some recessionary shocks could be sufficiently severe so as to change the sectoral composition of the economy (8), and lead to hysteresis in the form of higher unemployment or lower employment and economic growth well into the future.

This paper examines the effect of sectoral change on United States (U.S.) unemployment during the Great Recession. During that time, unemployment reached 10.1% and has declined only slowly since the Recession ended officially in November 2009. Although most attention has focused on the role of aggregate demand, a number of researchers have suggested that structural imbalances associated with changes in the structure of labor demand might be partly to blame for both the level and persistence of unemployment. The role of structural factors is implicated by the findings of a number of researchers that the Beveridge Curve, the equilibrium relationship between vacancies and unemployment, shifted outward during the Great Recession (Davis, Feberman, and Haltiwanger 2012; Elsby, Hobijn, and Şahin 2010).

One difficulty in assessing the role of structural change is that many such measures are based on Lilien (1982), who measured it as the dispersion of employment growth rates across industries. As pointed out by Abraham and Katz (1986) and Murphy and Topel (1987), the dispersion of growth rates will tend to rise during a recession solely due to the fact that not all industries are equally sensitive to the business cycle. Construction, in particular – Leamer (2007) went so far as to suggest that housing construction *is* the business cycle -- and durable goods manufacturing are more sensitive than are nondurable goods, services and government. Finding a positive relationship between unemployment and dispersion-based measures of sectoral change could, in principle, reflect merely transitory effects of aggregate demand.

To address this shortcoming, I revive an empirical measure of sectoral change proposed by Neumann and Topel (1991), which is designed to capture only longer-run changes in the sectoral composition of employment. In the case of the current paper, the long run is defined as a period of either 4 or 8 years. The resulting measure should be much less influenced by transitory business cycle effects than are point-in-time, dispersion-based measures.

It is important to note that I am not contesting the notion that the ultimate source of sectoral change during the Great Recession was the collapse of the housing market and the resulting financial crisis that ensued. Rather, I view sectoral change as a potential transmission mechanism. As noted by Fingleton et. al. (2012) and Martin (2012), regions may respond differently to the initial shock both going into and coming out of the recession. Furthermore, a shock that is sufficiently severe in impact could have effects that last long after the shock itself has dissipated.

I estimate regression models of unemployment as function of sectoral change using monthly data across U.S. states, controlling for a host of factors that other research has found to be important. To help place my analysis of the Great Recession period in context, I estimate models for periods both prior to and after the Great Recession as well. As will be seen, structural change during the Great Recession rose to levels unprecedented in my data, which go back to the early 1990s. In addition, the estimated effects of sectoral change are larger during the two recessions in my data, and particularly the Great Recession, than during normal times.

I use the regression results to calculate how much of the 1.3 percentage point rise in mean unemployment between the mid-2000s and the Great Recession can be explained by sectoral change. I decompose the effect of sectoral change into (1) a component due to the higher rate of sectoral change holding constant its estimated effect, about 0.23 percentage points and (2) a component due to the higher estimated effect holding constant the level of sectoral change, also about 0.43 percentage points. Combined, the two effects are estimated to account for about a 0.68 percentage points of the 1.3 percentage point rise in mean unemployment.

Because housing played such a central role in the onset of the Great Recession, I try to control for aggregate demand effects that emanated from that sector with two housing-related variables. However, I find that they explain little, at least conditional on the other variables in the model. I also test the robustness of the results by considering whether the large effect of sectoral change estimated for the Great Recession period is due principally to the construction sector by recalculating the sectoral change measure ignoring it. It turns out that no single sector, construction included, is crucial in this sense.

The remainder of the paper is organized as follows. Section 2 briefly reviews the literature on sectoral change and unemployment. Section 3 introduces the Neumann-Topel (1991) measure. Section 4 presents the data and Section 5 presents an overview of sectoral change over time and across US states. Section 6 presents the main regression analysis and Section 7 presents the just-mentioned test of robustness. Section 8 examines whether the effects of sectoral change during the Great Recession persisted into the 2010s. Section 9 concludes the paper with a brief summary and discussion.

2 Great Recession Unemployment: A Brief Review of the Literature

Most research on the Great Recession has focused on the role of aggregate demand. For example, Mian and Sufi (2012) examined the role of aggregate demand in explaining job losses across US counties between 2007 and 2009. In order to focus on aggregate demand channel, they took steps to net out frictions associated with structural changes by excluding from their measure of job losses those associated with construction and other related industries. By contrast, such structural factors are the focus of this paper.

A number of authors have calibrated Mortensen-Pissarides (1999) search models to estimate the effect of structural change on unemployment during the Great Recession. For example, Şahin et. al. (2012) solved a multi-sectoral, dynamic program in which a central planner allocates unemployed workers optimally across sectors so as to maximize the number of job matches. Their measure of mismatch, equal to the fraction of hires lost due to misallocation across industries, accounts for 11% of the rise in unemployment during the Great Recession, with misallocation across occupations or geographic locations explaining little.

Pilossoph (2012) calibrated a multi-sectoral search model to investigate whether the contraction of the construction sector during the Great Recession played a disproportionate role in raising unemployment. Holding the aggregate demand for labor constant, she found that increased dispersion of productivity shocks between the construction and non-construction sectors could account for little of the rise in unemployment.

Furlanetto and Grosheny (2013) explore the potential for fluctuations in job matching efficiency to understand unemployment by calibrating a New Keynesian model of employment fluctuations. They find that fluctuations in matching efficiency are nearly irrelevant during "normal times," but raised unemployment by 1.25 percentage points during the Great Recession.

Closest in spirit to my paper is the study by Estevão and Ridiviki (2011), which examines the relationship between unemployment rates across US states and a skill-mismatch index defined as the summed squared deviations of the percentage of the population and the percentage of the employed workforce with each of 3 levels of skill across one-digit industries – roughly speaking, the squared deviations of supply from demand. My paper differs from theirs in that I measure sectoral change in terms of industry composition rather than skill composition, and use Neumann and Topel's (1991) measure to focus on longer-term structural changes and net out shorter-term movements as might occur within a business cycle. I also present estimates for a variety of time periods, permitting the estimated effects of structural change (and other factors) to vary over time.

3 Measuring Sectoral Change

3.1 Lilien's Measure

Lilien (1982) was the first to attempt to quantify the effects of labor market search frictions on unemployment, measuring those frictions as the dispersion of industry employment growth rates. Estimating a strong, positive relationship between the US national unemployment rate and the dispersion index, Lilien (198s) concluded that much of the rise in unemployment that occurred in the late 1970s was structural. His view that contrasted sharply with that prevailing that the high unemployment of the time was due to a lack of aggregate demand.

Abraham and Katz (1986) pointed out that Lilien's (1982) dispersion-based measure of structural change could reflect merely non-neutral changes in aggregate demand, a concern echoed by Murphy and Topel (1987), Schuh and Triest (1998), Lazear and Spletzer (2012) and Mulligan (2012). For example, employment in construction contracts dramatically more during a typical recession than in most other industries, thus increasing the standard deviation of employment growth rates during business cycle troughs.

3.2 Neumann-Topel Measure of Sectoral Change

Neumann and Topel (1991) devised a measure of structural change to be robust to Abraham and Katz's (1986) critique. Their measure is designed to measure only long-term changes in industry employment shares, and is constructed as follows. Define the *direction of persistent change* in industry composition as the vector

$$\Delta\tilde{s}_{s,t} = \sum_{j=1}^{J} \delta_j s_{s,t+j} - \sum_{j=1}^{J} \delta_j s_{s,t-j}, \qquad \sum_{j=1}^{J} \delta_j = 1 \qquad (1)$$

Thus, $\Delta\tilde{s}_{s,t}$ is equal to the difference between moving averages of future and past vectors of employment shares at each point in time, *t*. By contrast, the *actual* difference between the current and past employment shares is defined as being equal to

$$\Delta s_{s,t} = s_{s,t} - \sum_{j=1}^{J} \delta_j s_{s,t-j} \qquad (2)$$

Neumann and Topel (1991) assumed that (2) has persistent and transitory components. The persistent component is defined as the time period *t*-specific least squares projection of the current change (2) onto the direction of permanent change (1):

$$\Delta s_{s,t}^{P} = \frac{\Delta\tilde{s}_{s,t}' \Delta s_{s,t}}{\Delta\tilde{s}_{s,t}' \Delta\tilde{s}_{s,t}} \cdot \Delta\tilde{s}_{s,t} \qquad (3)$$

The persistent component of structural change is given by

$$PERS_{s,t} = \left\| \Delta s_{s,t}^{P} \right\|, \qquad (4)$$

which is the Euclidean length of the projection of a vector of changes in current employment shares on the vector of changes in *future* as well as past employment shares. For ease of exposition, I refer to (4) as "sectoral change." The transitory component of sectoral change is defined residually as the difference between (3) and (4):

$$TRAN_{s,t} = \left\| \Delta s_{s,t} - \Delta s_{s,t}^{P} \right\|. \qquad (5)$$

Neumann and Topel (1991) used *J*=16 quarters (4 years) to construct their measures of sectoral change, so that $\delta_j = (0.9)^j/7.33$. Setting J=48 months would allow me to construct equations (9) and (10) only through November 2009. Making due with *J*=24 months permits me to examine data through November 2011. I set $\delta_j = (0.965)^j/15.846$, which places similar weights on data at a given horizon compared with those in Neumann and Topel (1991). However, in order to examine whether my findings are sensitive to the shorter time horizon, I also construct an index with *J*=48 months, with $\delta_j = (0.965)^j/22.585$, which allows me to examine data through just November 2009.

3.3 Two Interpretations of Sectoral Change

Some researchers interpret unemployment as arising from sectoral change only if aggregate demand is unchanged, that is, if (say) a decline in demand in construction or manufacturing is offset by a rise in demand in (say) services. This is the view taken by Abraham and Katz (1986) and Murphy and Topel (1987, especially 55). By contrast, Lilien (1987, 67) interprets unemployment as structural whenever the originating shocks are concentrated in a sector (industry, occupation, or geographic region), even if the result of those shocks is to decrease the aggregate demand for labor in the short run. As Murphy and Topel (1987) put it, shocks that have a relatively narrow origination might give rise to spillover effects and thereby affect the aggregate demand for labor. Perhaps it was the detection of such spillovers by Murphy and Topel (1987) that led Neumann and Topel (1991) to account for sectoral change and find that it indeed help explain differences in state unemployment rates (1354).[1]

It is this second, broader interpretation of sectoral shocks that I adopt for this paper. As pointed out in the introduction, my interest in sectoral change stems not from a belief that something other than aggregate shocks led to the Great Recession, but that the transmission mechanism of those shocks could matter for understanding the depth and duration of the high

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[1] Disagreements centered around the meaning of "aggregate demand," interpreted by Lilien (1982) as "unanticipated money," and by Abraham and Katz (1986) as balanced vacancies and unemployment. By 1991, Topel appears to have modified his view; Neumann and Topel (1991) measure aggregate demand using Bartik's (1991) well-known index.

rates of unemployment that followed in the wake of the housing and financial crisis. In particular, workers who became unemployed as a result of the initial aggregate shock could face higher barriers to reentering employment in markets in which the structure of demand changed more. As Katz (2010) put it, "substantial mismatches between the skills and aspirations of job losers (especially the long-term unemployed) and the skill requirements and compensation packages of new job openings are likely to emerge as the economy recovers from the Great Recession" (52).

4 Data

4.1 Unemployment Data

I collected monthly data on state unemployment and sectoral employment, seasonally unadjusted, from Bureau of Labor Statistics.[2] The data, which begin for the most part in 1990, allow me to construct the Neumann-Topel (1991) measure of sectoral change across 14 industrial "super-sectors" for 40 states. I am able to construct the measure for a subset of the study period for 2 other states as well. The sectors are: extraction (mining and logging); construction; durables manufacturing; nondurables manufacturing; transportation and utilities; wholesale trade; retail trade; information; financial activities; professional and business services; education and health services; leisure and hospitality; other services; and government.

Figure 1 shows employment by sector for the US between 1991 and 2012, normalized to the start of the Great Recession (December 2007). Visible on the Figure are the business cycle peak and trough dates as determined by the National Bureau of Economic Research (NBER) for the recession of 2001 (March to November) and the Great Recession (December 2007 through June 2009). For easier viewing in this and the remaining Figures, I have smoothed the data in using a 12-month trailing, moving average; the empirical analysis uses the unsmoothed data.

Focusing first on **Figure 1a**, which depicts employment in goods-producing industries, the recession of 2001 is barely visible, mostly due to the longer downward trend in employment in durable and nondurable manufacturing and transportation and utilities. By contrast, employment contracted sharply in all but extraction industries in the Great Recession. During that period, employment declined in construction by 1.48 million, or 19.8%, accounting (coincidentally) for 19.8% of the 7.5 million decline in total employment over the recession, and

[2] The unemployment data were collected from text files at the BLS's Local Area Unemployment Statistics page (www.bls.gov/lau).The data set is la.data.2.AllStatesU. The employment data were accessed from the text file link on the BLS's State and Metro Area Employment, Hours, and Earnings (www.bls.gov/sae/data.htm). The name of the data set is sm.data.1.AllData.

continued to decline another 5.8% between June 2009 and 2011.[3] Employment in durables manufacturing declined by 1.5 million (17.5%) and accounted for 20.2% of the decline in total employment.

Figure 1b depicts employment in selected service industries. Information services declined sharply in the recession of 2001, by nearly 20% by the mid-2000s. A more modest decline in 2001 is also visible in professional and business services. Employment in these industries contracted during the Great Recession, but by less than in goods-producing industries. For example, employment in the financial sector declined by "just" 475 thousand from 8.2 to 7.75 million, or 6.4%.[4] Employment trends in the remaining service sectors, shown, for completeness, in **Figure 1c**, are similar.

The same story is visible in **Figures 2a, 2b,** and **2c**, which show smoothed, year-on-year changes in employment in the same sectors.

5. Overview of Sectoral Change

Figure 3 graphs sectoral change using the 2-year measure in the US from 1992 to 2011, smoothed, averaged across the 42 states in the sample, and normalized by the mean so that the sample average is equal to unity. Sectoral change at the start of the data declined gradually until 2000. It nearly doubled in the wake of the 2001 recession, and nearly tripled during the Great Recession, each time reverting to normal levels. Also graphed in **Figure 3** is the smoothed, year-on-year change in unemployment. The temporal coincidence of movements in unemployment and sectoral change is remarkable, all the more so because they are constructed from independent data series. State-by-state plots of the two variables, seen in **Figures 4a-e**, reveal the same patterns.

The patterns in these Figures suggest that it is useful to divide the sample period into five sub-periods: (1) the pre-2000 recession period (called "1990s"), (2) the 2001 recession, expanded to include 2002 because much of the rise in sectoral change occurred after the official recession end date, (3) the mid-2000s, (4) the 2009 recession, and (5) the 2010s. **Figure 5** shows mean levels of sectoral change in each period, by state, grouped by US Census region.[5] In most states,

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[3] Construction did not decline uniformly. For example, in Texas, construction, along with mining, continued to expand until January 2009 (Anari 2011).

[4] The relatively high level of aggregation masks substantial changes within more narrowly defined finance industries. For example, employment in in real estate credit industries declined by 44.0% and in mortgage and nonmortgage broker industries by 54.5% (Byun 2010, 10). Those industries form a relatively small portion of the finance super-sector.

[5] The regions are: New England (NEN), Mid-Atlantic (MAT), South Atlantic (SAT), East North Central (ENC), West North Central (WNC), East South Central (ESC), West South Central (WSC), Mountain; (MTN), and Pacific (PAC).

sectoral change rose during or just after the two recessions. There are exceptions: North Dakota (WNC) and Louisiana (WSC) perhaps due to the rise of their energy sectors, and Maine (NEN) and Nevada (MTN). Sectoral change in the 2009 recession was particularly high in the Mountain states, in the industrial states of Indiana and Michigan (ENC), and in New Hampshire and Vermont (NEN).

Table 1 summarizes sectoral change using the 2-year measure, by sub-period, averaged across states (40 or 42). Sectoral change over the period as a whole was slightly skewed with a median of 0.96. The interquartile range is 27 points (0.85 to 1.12), and the range nearly 70 points (0.78 to 1.5). Between the 1990s and the 2001 recession, sectoral change increased by 40 points, 0.89 to 1.29, but averaged just 0.81 during the mid-2000s. Mean sectoral change spiked sharply during the Great Recession by 70 points, to 1.51 before falling to 1.2 during the 2010s. The pattern of sectoral change using the 4-year measure is similar.

6. Regression Analysis

I estimate the following regression:

$$UR_{st} = \beta_1 + \beta_2 PERS_{st} + \beta_3 TRAN_{st} + \beta_4 BARTIK_{st} + \beta_5 \Delta HPI_s + \beta_6 ELAST_s + \beta_7 \Delta HPI_s \times ELAST_s + \beta_8 EDUCATION + \beta_9 UR_{s,t-12} + DEMOGRAPHICS + TIME + REGION + \varepsilon_{st} \quad (6)$$

UR_{st} is the rate of unemployment in state *s* in month *t.* In addition to $PERS_{s,t}$ and $TRAN_{s,t}$, the permanent and transitory components of Neumann-Topel (1991) sectoral change, equation (6) contains a set of control variables that other researchers have found to be important in explaining geographic differences in unemployment rates.

$BARTIK_{s,t}$ is a widely used measure of labor demand, associated with Bartik's (1991) work. The index is equal to the local employment share-weighted sum of national industry growth rates:

$$BARTIK_{s,t} = \sum_{i=1}^{I} w_{i,s,t}\, g_{i,t} \qquad (7)$$

where $w_{i,s,t}$ is the employment share of industry *i* in state *s* at time *t*, $\sum w_{i,s,t} = 1$, and $g_{i,t}$ is the log employment change in industry *i* nationwide. Like Kerwin et. al. (2012), I exclude state *s* from the computation of $g_{i,t}$, and like Neumann and Topel (1991), I calculate $g_{i,t}$ as the deviation from a quadratic trend. Researchers typically find a negative relationship between unemployment and the Bartik index.

An exhaustive set of time dummy variables, one for each month in the sample, is included to control for the state of the aggregate labor market, as well as policies that were (largely) national in scope (e.g., emergency unemployment compensation during the Great Recession). I also include 8 regional dummy variables to capture effects common to each of the 9 U.S. census regions. Equation (10) also contains the one-year lag of unemployment in the state as a control variable.[6]

Typically, higher levels of education are associated with lower rates of unemployment (e.g., Partridge and Rickman 1997), and Glaeser (2010, 2012) found evidence to this effect for the Great Recession. I include the percentages of the population with (1) a high school or better, but no college degree and (2) a college degree or better as controls, taken from various years of Statistical Abstract of the United States. I also control for race and age composition of the labor market in the form of the percentages of the population that are black, Hispanic, and between the ages of 19 and 24.

For models estimated using data from the Great Recession period, I included variables that attempt to control for the aggregate demand channel identified by Mian and Sufi (2012), who studied the relationship between U.S. county unemployment and household leverage over the period of the Great Recession. According to their model, high debt-to-income ratios, fueled by an expansion in credit supply and large increases in house prices, led households to take on additional debt that they were unable to maintain in the face of the house price decline that followed (6).[7] Because Mian and Sufi's (2012) measure of household leverage is proprietary, I include instead two variables that Mian, Rao, and Sufi (2013) identify as being highly correlated with it: ΔHPI_s, equal to the log change in house prices between 2000 and 2005, and $ELAST_s$, equal to Saiz's (2010) measure of the elasticity of housing supply in the state.[8] I also include the

[6] I experimented with excluding the lag, but its estimated coefficient inevitably large, positive, and statistically highly significant.

[7] Mian and Sufi (2012) attempt to net out the effects of structural adjustment associated with the decline in the construction sector, an effect (among others) that is the focus in my paper. Sterk (2010) found that the deterioration of housing values may have increased structural change, flattening the Beveridge curve (modeledbehavior.com/tag/unemployment).

[8] The house price data, based on all transactions, quarterly and at the state level, are taken from the Federal Housing Finance Agency (http://www.fhfa.gov/Default.aspx?Page=87), data set 4q11hpi_sts.csv. Data on $ELAST_s$ are averages by state, available for 41 of the 42 states analyzed here. Mian, Rao, and Sufi (forthcoming) found that house price growth and leverage in the early 2000s were highly correlated, and leverage rose by more in regions with less elastic supplies of housing. Kerwin et. al. (2012) show that MSAs that experienced the fastest house price increases between 2000 and 2007 experienced the largest declines between 2007 and 2010 (10). They also showed that the 2000-2007 house price increase was inversely related, and the 2007-2010 housing price bust positively related to Saiz's (2010) elasticity.

interaction between the two. In practice, the housing variables had little impact on the other estimated coefficients, particularly in models that controlled for demographic composition.

Summary statistics for all variables are contained in **Table 2**.

6.1 Results

Results are contained in **Table 3**. All standard errors have been clustered on state in order to allow for possible serial correlation within, as well as for possible heteroscedasticity across states. Before turning to the main coefficients of interest, I briefly describe the estimated effects of the control variables.

6.2 Control Variables

The estimated coefficient on the Bartik index is negative as expected for the 2001 and 2009 recession periods, and the 2010s. The positive (but statistically insignificant) estimated coefficient found for the 1990s and mid-2000s reflects at least in part the fact that an exhaustive set of time dummy variables is included in all regressions; replacing these time dummies with a set of year and month dummies, the estimated coefficients on the Bartik index are uniformly negative and statistically significant (results not shown to reduce clutter).

The estimated coefficient on percent high school and percent college educated are usually negative, but statistically imprecise for all but the 2010s period. States with higher percentages black tend to experience higher rates of unemployment, but the estimated coefficient is significant only for the 2010s. Higher percentages Hispanic are associated with higher unemployment rates in 3 of the 5 periods. Higher percentages youth in the population are associated with higher unemployment rates prior to the mid-2000s and lower unemployment rates since then.

There is some modest evidence that states that experienced higher house price increases between 2000 and 2005 experienced higher rates of unemployment since the Great Recession, but the estimated effects are statistically imprecise. Neither the house price elasticity variable nor its interaction with the house price change variable is statistically significant. It seems likely that aggregation to the state level masks the strong aggregate demand effects estimated by Mian and Sufi (2012) at the county level.

Finally, the estimated coefficient on the 12-month lag of unemployment is positive and statistically significant in all time periods. This is to be expected, for a number of reasons. First, it takes time for workers who are unemployed to transition to employment (or out of the labor force). In addition, there are important differences across states unmeasured factors that determine unemployment above and beyond those that I am able to measure. Such factors could include differences in the provisions of unemployment and other social insurance programs. The import of the estimates is that higher rates of unemployment in one period imply higher rates of unemployment one year hence.

6.3 Sectoral Change

The estimated coefficients on sectoral change are positive in 4 of the 5 sub-periods. Recalling the normalization, each unit increase in sectoral change corresponds to a doubling relative to the overall sample mean. An increase of this magnitude is associated with a 0.037 percentage point increase in unemployment during the 1990s. Although the estimated effect is statistically significant at the 5% level (s.e.=0.018), the economic magnitude is tiny. By contrast, the estimated effect is 0.2587 (s.e. = 0.062) in the 2001 recession period, statistically significant at the 1% level, and 0.4553 (s.e.= 0.142) during the Great Recession, also significant at the 1% level.

The estimated coefficients on the transitory component of sectoral change are of mixed sign: negative and statistically significant in the 2001 recession, positive and significant in the 2000s, and negative and insignificant in the other periods, including the 2009 recession. The lack of importance of the transitory component of sectoral change suggests that the Neumann-Topel (1991) measure does a reasonably good job of netting out the non-neutral effects of aggregate demand, at least in the regression specification used here.

I also estimated equation (6) using the 4-year measure of sectoral change. I suppress full results to reduce clutter and describe the estimated coefficients on the variable of interest, which are remarkably similar to those on the 2-year measure except at the start and end of the data. For example, the estimated coefficient for the 1990s period is -0.0079 (s.e.=0.0260), compared to a positive 0.037 (s.e.=0.018) using the 2-year variable. For the 2010s – an inaccurate characterization, as the 5 months of data available for this period end in November 2009 – the estimated coefficient is equal to 0.3498 (s.e.=0.209), which borders on statistical significance at the 10% level. Like the 2-year measure, the estimated coefficient on the 4-year measure for the 2000s is small, negative, and insignificant. For the 2001 recession, the estimated coefficient on the 4-year structural change variable is 0.289 (s.e.=0.102), and for the Great Recession it is 0.5218 (s.e.=0.158), both of which statistically significant at the 1% level.

6.4 Estimating the Impact of Sectoral Change on the Rise in Unemployment

To gauge the empirical impact of sectoral change on state unemployment rates during the Great Recession, I estimated for each state the predicted change in unemployment relative to the mid-2000s. The total change is given by:

$$\hat{\beta}_{PERS}^{2009}\overline{P}ERS_{s,2009} - \hat{\beta}_{PERS}^{2000s}\overline{P}ERS_{s,2000s} \ , \qquad (8)$$

that is, the difference in mean sectoral change weighted by their respective estimated regression coefficients. I divide (8) into two components. The first component is the effect of increased sectoral change evaluated using the 2009 regression coefficients:

$$\hat{\beta}_{PERS}^{2009}\left(\bar{P}ERS_{s,2009}-\bar{P}ERS_{s,2000s}\right) \tag{9}$$

The second component, equal to (8) minus (9), is the impact of the increased importance of sectoral change.

The predicted values of (8) using the 2-year measure can be seen as the darker bars, and (9) as the lighter bars in **Figure 6**. The predicted values of (9) range from a high of 0.83 percentage points in Arizona to a low of just 0.04 percentage point in Texas and *negative* 0.25 in North Dakota (it is the single state in which sectoral change actually declined), with a median of 0.30. To put this in perspective, the mean rate of unemployment rose from 4.9% in the mid-2000s to 6.2% during the Great Recession, or 1.3 percentage points. The median estimated effect in (9) of 0.3 percentage points is therefore around 23% of the total.

Taking into account the increased magnitude of the estimated effect of sectoral change roughly doubles these figures. The largest predicted increase is in Arizona, at 1.3 percentage points, followed by Idaho (1.2 points), Nevada (1.1 points), and Florida (1.05 points). The smallest predicted increases are in West Virginia, New York, Louisiana, Texas, and North Dakota (0.48, 0.46, 0.41, 0.39, and 0.35 points). The median estimated effect is 0.68 points, equal to 52% of the 1.3-point change in mean unemployment.

How large are these estimated effects compared to those estimated by others? Furlanetto and Grosheny (2013) estimate that reduced matching efficiency increased unemployment by 1.25 percentage points on average since 2009. My estimates are of the same order of magnitude. Interestingly, despite our different approaches, both our studies find that the effects of structural change are larger in recession periods, and empirically insignificant in more normal times.

Estevaõ and Tsounta (2011) estimated that the structural unemployment rate in 2010 was 1.75 percentage points higher than before the onset of the housing crisis at the end of 2006. Their measure of structural change is given by

$$\sum_{j=1,2,3}\left(P_{s,j,t}-E_{s,j,t}\right)^{2} \tag{10}$$

where $E_{s,j,t}$ is the percent of *employed* individuals, and $P_{s,j,t}$ the percent of the *population* with skill level j in state s at time t.[9] They assumed that the equilibrium unemployment rate is given by an

[9] In practice, $E_{i,j,t}$ is based on the skill composition of industry (less than high school graduate; high school graduate but no college; college graduate) at the national level, combined with each state's industry

HP-filtered estimate for each state using data from 1990-2006 (34) and calculated the cumulative effect of structural change, year by year. Their estimated effects are not directly comparable with mine because I do not take a stand on the equilibrium level of unemployment, and because I calculate predicted effects on *average* rates of unemployment, and not cumulative effects.

Finally, Şahin et. al. (2012) combine industry-level data from Job Openings and Labor Turnover Survey and occupation-level data from Help Wanted OnLine to construct indexes of and quantify the importance of mismatch unemployment. Their mismatch index is derived as the fraction of hires lost in a period due to a "misallocation" of vacancies relative to unemployment across sectors. They estimated that 0.75 percentage points of the rise of unemployment from 2006 to the Fall of 2009 could be explained by their index of mismatch. This estimate is very close to my upper bound estimate of about 0.68 percentage points from equation (8).

7 Do Construction Shocks Drive the Results?

The fact that the housing sector played such a central role in the Great Recession raises the question of whether all of the estimated effects of sectoral change are operating via shocks to the construction sector. To answer this question, consider the index of sectoral change that excludes sector *j* as

$$PERS_{s,t}^{\sim j}. \qquad (11)$$

This difference between (11) and the measure defined over all 14 sectors in (4) is:

$$\Delta PERS_{s,t}^{j} = PERS_{s,t} - PERS_{s,t}^{\sim j}. \qquad (12)$$

I re-estimated the unemployment regressions, replacing $PERS_{s,t}$ with $PERS_{s,t}^{\sim j}$ and $\Delta PERS_{s,t}^{j}$. If any one sector, such as construction, is driving the results, then the estimated coefficient on $PERS_{s,t}^{\sim j}$ should be small and statistically less significant, and that on $\Delta PERS_{s,t}^{j}$ should be positive and statistically significant. By contrast, a positive and significant estimated coefficient on $PERS_{s,t}^{\sim j}$ and a small, insignificant coefficient on $\Delta PERS_{s,t}^{j}$ would suggest that it is the overall level of sectoral change that matters, and not merely sectoral change in sector j.[10]

Results for all 14 sectors for both the 2- and 4-year measures of sectoral change are reported in **Table 4**. The estimated coefficients on $PERS_{s,t}^{\sim j}$ are all positive and statistically significant, most at the 1 percent level. The important takeaway is that neither construction nor

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composition of employment. All employees who work in industries in the lower third of the industry skill distribution comprise the demand for the least skilled, in the middle third the demand for semi-skilled, and in the top third the demand for high skill employees.

[10] I do not include both $PERS_{s,t}^{\sim j}$ and $PERS_{s,t}$ because I am testing not whether the former is a superior measure, but only whether sector *j* contributes disproportionately to the results.

any other single sector can account for all of the estimated effects of $PERS_{s,t}$ on unemployment. The estimated coefficients on $\Delta PERS_{s,t}^{j}$ are generally not statistically significant, although that on construction comes closer to significance than any other sector, at least among those with positive estimated coefficients.

8 Conclusion

This paper has studied the relationship between unemployment and sectoral change across U.S. states during the Great Recession using Neumann and Topel's (1991) measure of sectoral change. By construction, this measure is based on long-term shifts in industry employment shares. The index may still be correlated with shifts in local aggregate demand, but it should not merely reflect the non-neutrality of aggregate demand shocks across sectors highlighted by Abraham and Katz (1986).

I find that sectoral change can account for an increase in average state unemployment rates of about 0.68 of a percentage point, or 52% of the actual increase of 1.3 percentage points that occurred between the mid-2000s and the Great Recession. The estimated effects are larger than those for the 2001 recession period, partly due to the sheer magnitude of the shocks involved but also because the estimated effect of a given shock was larger in the later recession.

Some researchers have traced the slow rate of decline in unemployment after the Great Recession to a mismatch between the skills and wage aspirations of unemployed workers and the skills demanded and compensation packages offered by employers (Katz 2010). Such mismatch could provide a basis for policy recommendations that center on retraining and retooling. However, evidence of persistent mismatch has been scarce. For example, Lazear and Spletzer (2012) examined the degree of mismatch across industries as measured by the difference between sectoral vacancy and unemployment rates. They found that mismatch rose during the recession 2007-2009, but by late 2011 had returned to its level prior to the recession. Mulligan (2012) also downplays sectoral change, focusing instead on the role of reduced incentives to work due to expansion of food stamps, extension of UI, and so on. The two stories are not mutually exclusive. Workers laid off from jobs in construction or durables manufacturing face the decision whether to remain unemployed or accept work at jobs that pay less – possibly much less -- in other industries. Federal government policies may have shifted the supply curve of labor to the left, but the sectoral change could move workers downward along their supply curves as well.

My results are broadly consistent with the conclusions of these authors. I find that the estimated effects of structural change rose dramatically during the Great Recession, and fell just as dramatically once the recession had ended. That being said, labor markets take time to adjust; unemployment today is a function of unemployment in the past. Higher rates of sectoral change during the Great Recession can therefore persist, a fact that could provide some basis for policies focused on retraining and retooling.

More research is necessary to understand how greater sectoral change during the Great Recession might translate into slower transitions into employment among the unemployed. Nor is unemployment the only economic outcome of interest. It is not currently known whether higher rates of structural change during the Great Recession are associated with greater loss of industry-specific or occupation-specific human capital among job-losers. Sectoral change could also potentially affect labor force participation rate as well as unemployment. If so, the fact that the pace of sectoral change varied dramatically across U.S. states suggests that policies will likely need to be carefully targeted to the specific circumstances of each region.

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Figure 1a

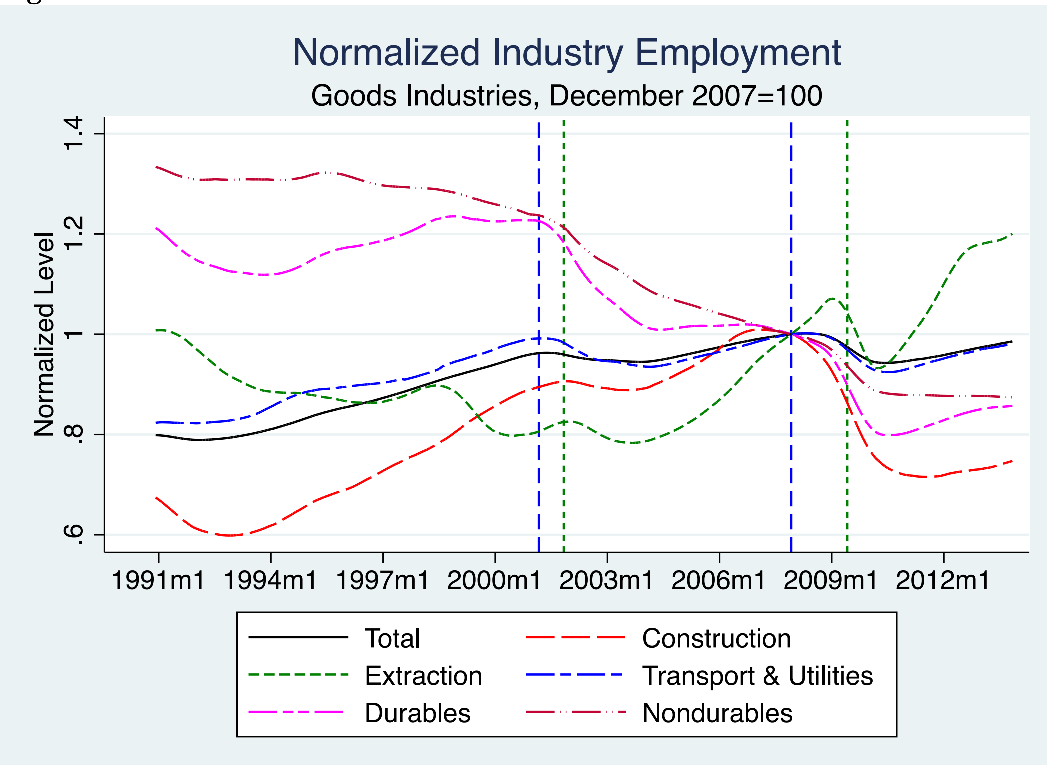

Normalized Industry Employment
Goods Industries, December 2007=100
Normalized Level
.6
.8
1
1.2
1.4
1991m1
1994m1
1997m1
2000m1
2003m1
2006m1
2009m1
2012m1
Total
Construction
Extraction
Transport & Utilities
Durables
Nondurables

Figure 1b

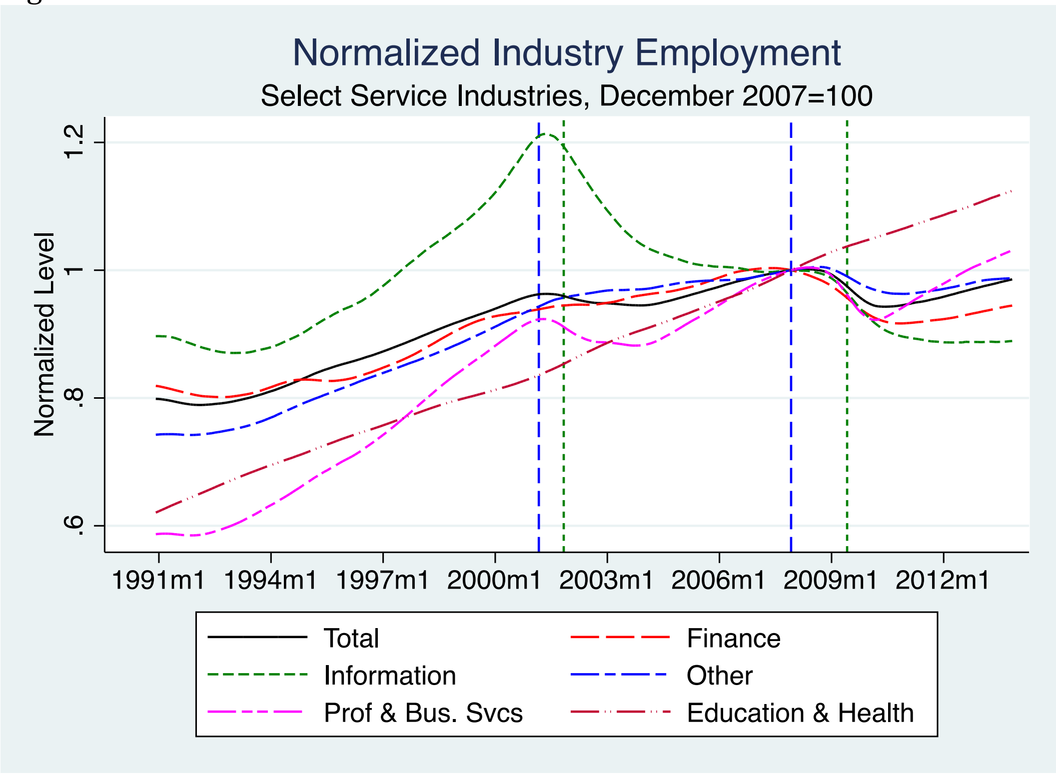
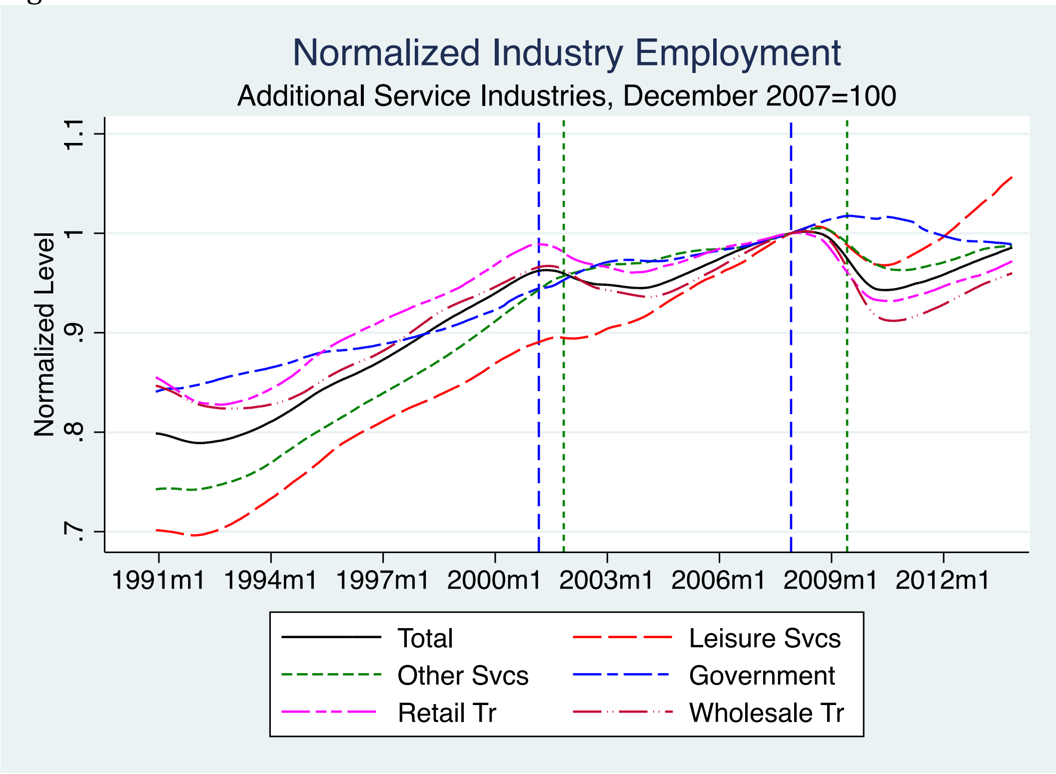

Normalized Industry Employment
Select Service Industries, December 2007=100
Normalized Level
.6
.8
1
1.2
1991m1
1994m1
1997m1
2000m1
2003m1
2006m1
2009m1
2012m1
Total
Finance
Information
Other
Prof & Bus. Svcs
Education & Health

Figure 1c


Normalized Industry Employment
Additional Service Industries, December 2007=100
Normalized Level
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.8
.9
1
1.1
1991m1
1994m1
1997m1
2000m1
2003m1
2006m1
2009m1
2012m1
Total
Leisure Svcs
Other Svcs
Government
Retail Tr
Wholesale Tr

Figure 2a

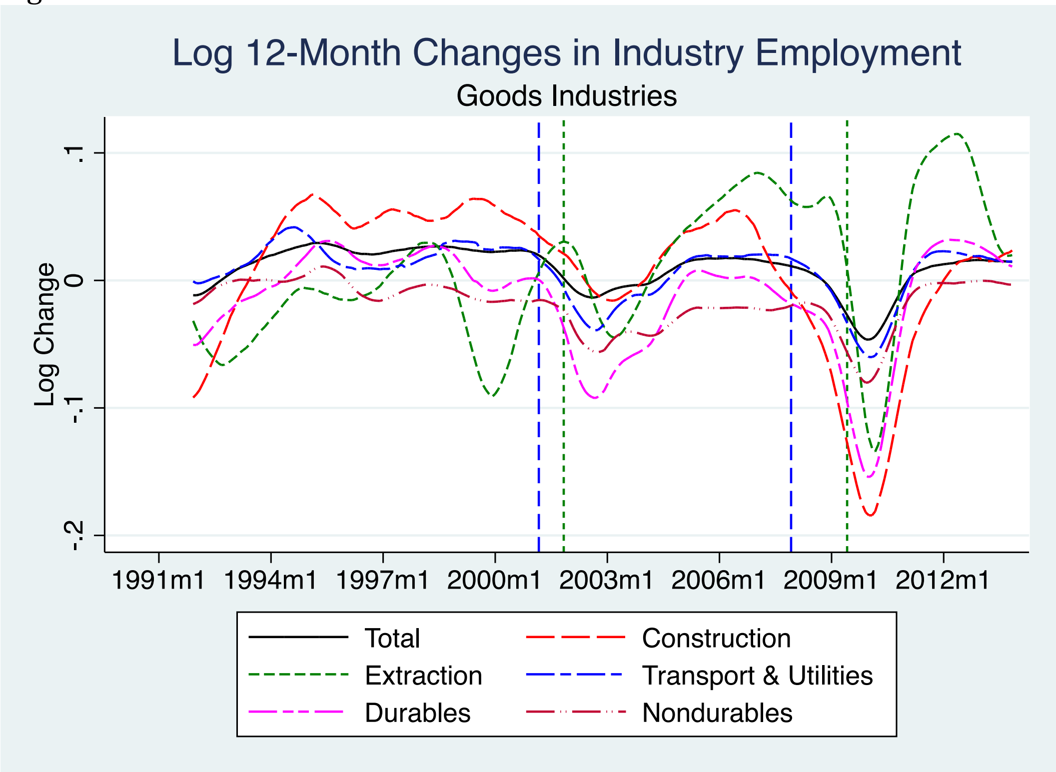
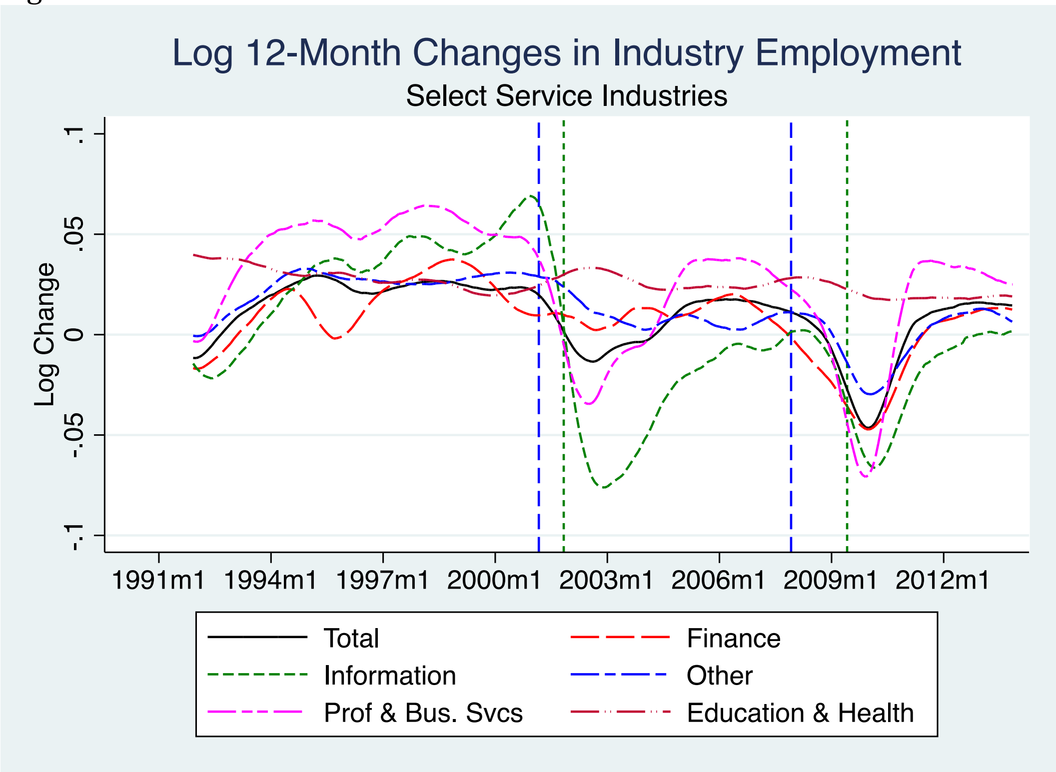

Log 12-Month Changes in Industry Employment
Goods Industries
Log Change
.1
0
-.1
-.2
1991m1
1994m1
1997m1
2000m1
2003m1
2006m1
2009m1
2012m1
Total
Construction
Extraction
Transport & Utilities
Durables
Nondurables

Figure 2b


Log 12-Month Changes in Industry Employment
Select Service Industries
Log Change
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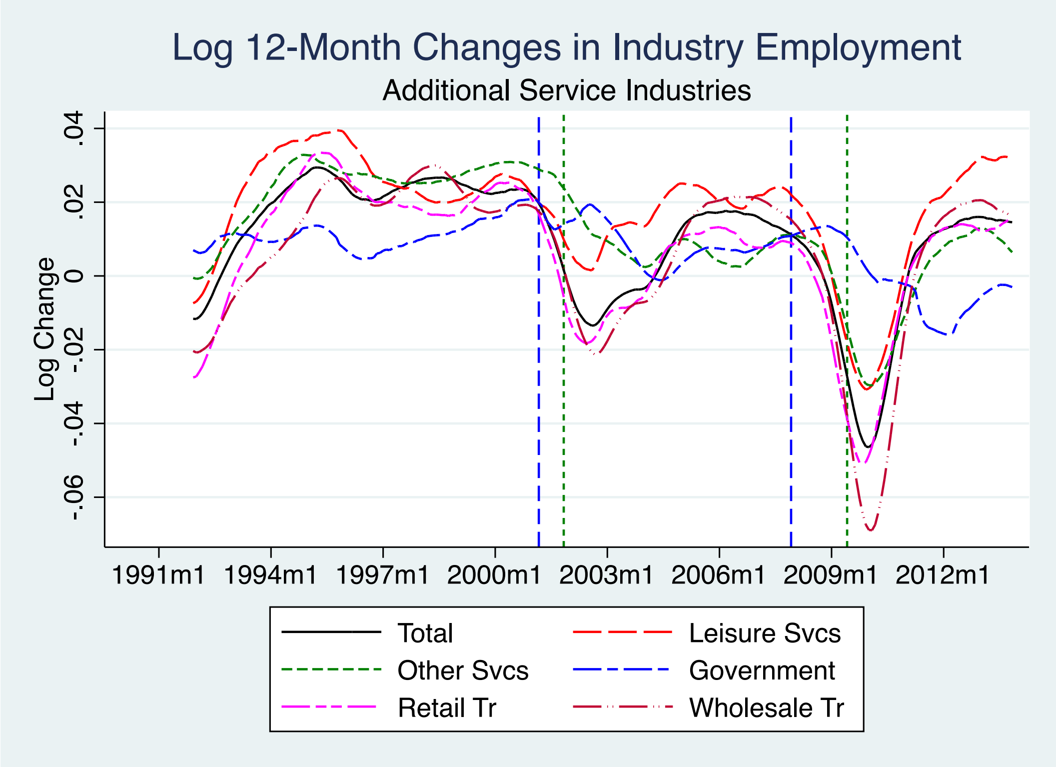
.05
0
-.05
-.1
1991m1
1994m1
1997m1
2000m1
2003m1
2006m1
2009m1
2012m1
Total
Finance
Information
Other
Prof & Bus. Svcs
Education & Health

Figure 2c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Additional Service Industries
Log Change
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-.04
-.06
1991m1
1994m1
1997m1
2000m1
2003m1
2006m1
2009m1
2012m1
Total
Leisure Svcs
Other Svcs
Government
Retail Tr
Wholesale Tr

Figure 3

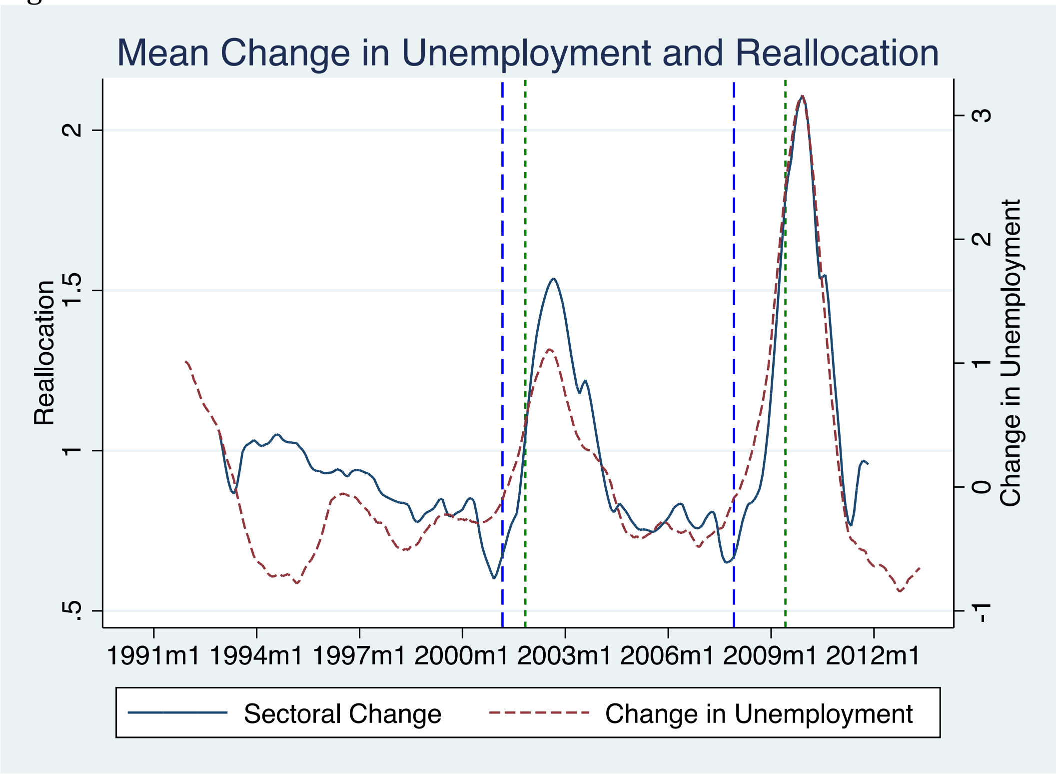

Mean Change in Unemployment and Reallocation
Reallocation
.5
1
1.5
2
Change in Unemployment
-1
0
1
2
3
1991m1
1994m1
1997m1
2000m1
2003m1
2006m1
2009m1
2012m1
Sectoral Change
Change in Unemployment

Figure 4a. Mean Sectoral Change and Change in Unemployment, by State

Figure 4b. Mean Sectoral Change and Change in Unemployment, by State, continued

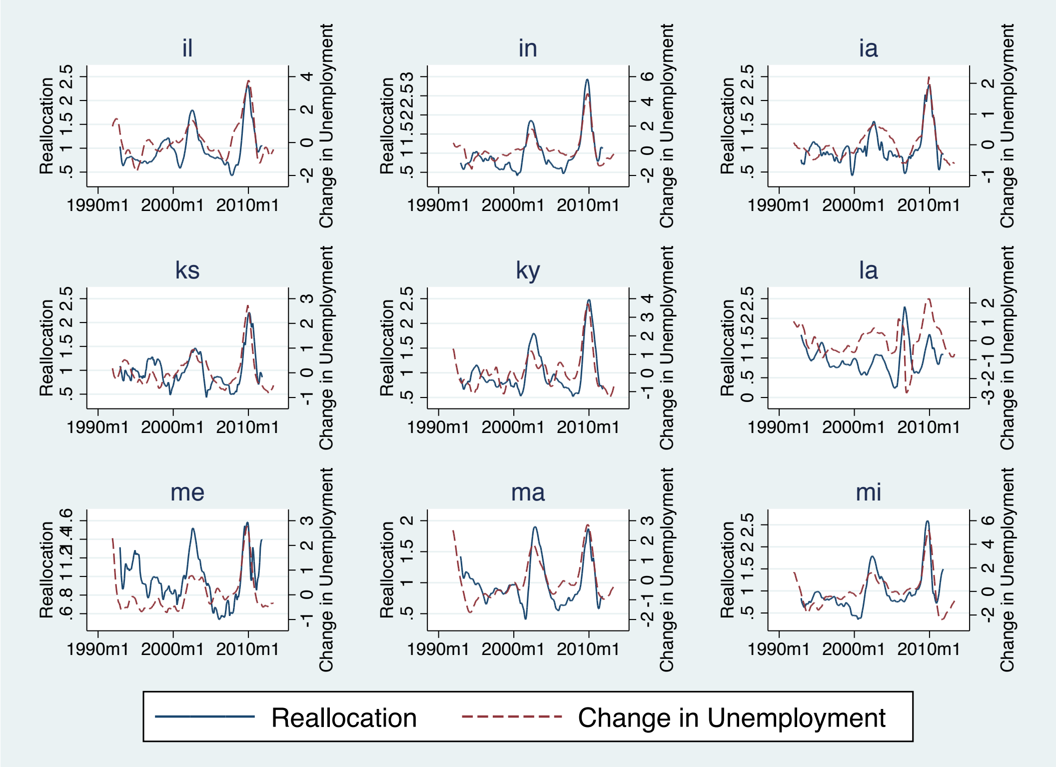


Figure 4c. Mean Sectoral Change and Change in Unemployment, by State, continued

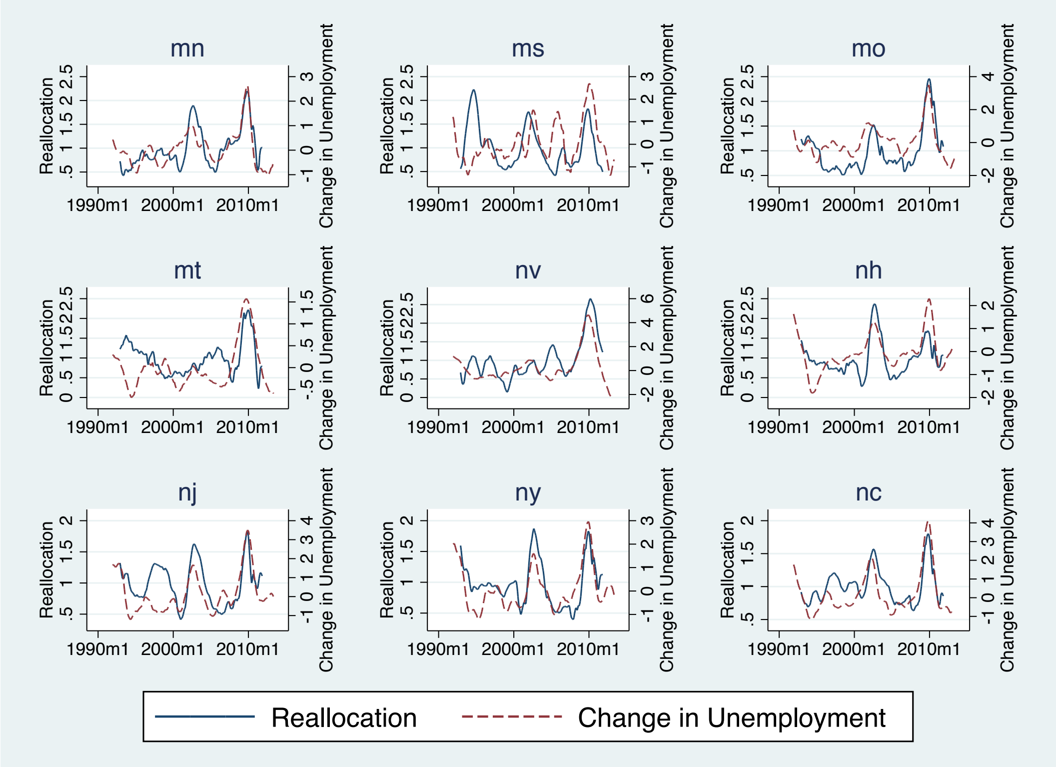
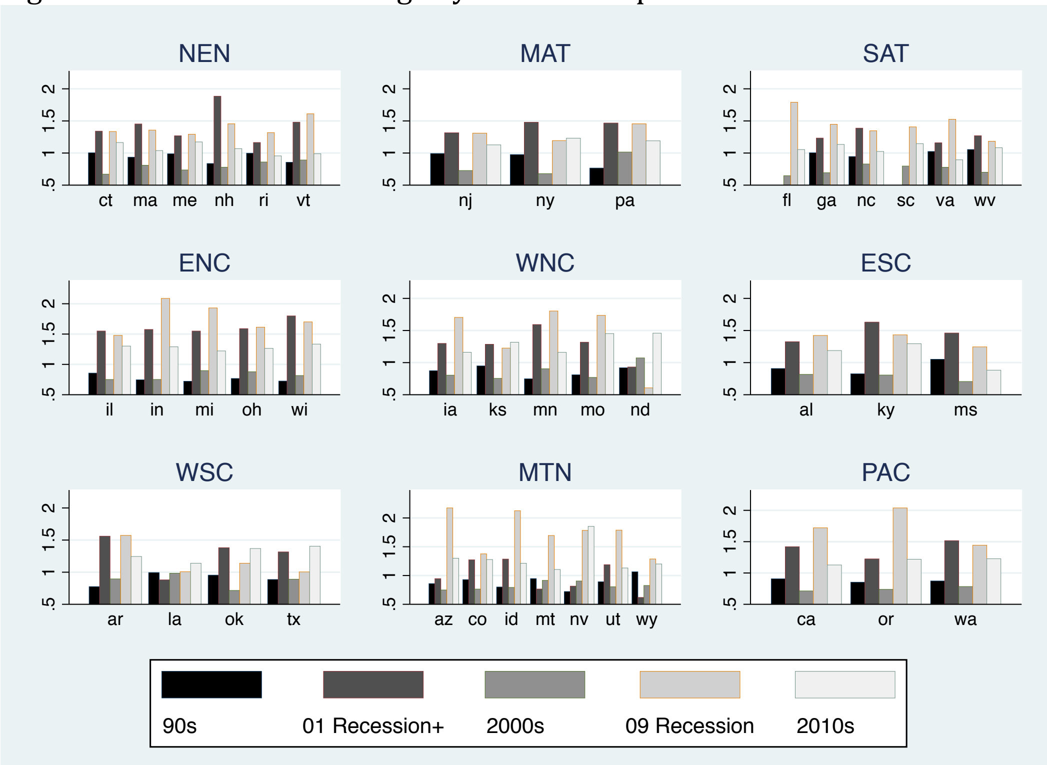


Figure 4d. Mean Sectoral Change and Change in Unemployment, by State, continued

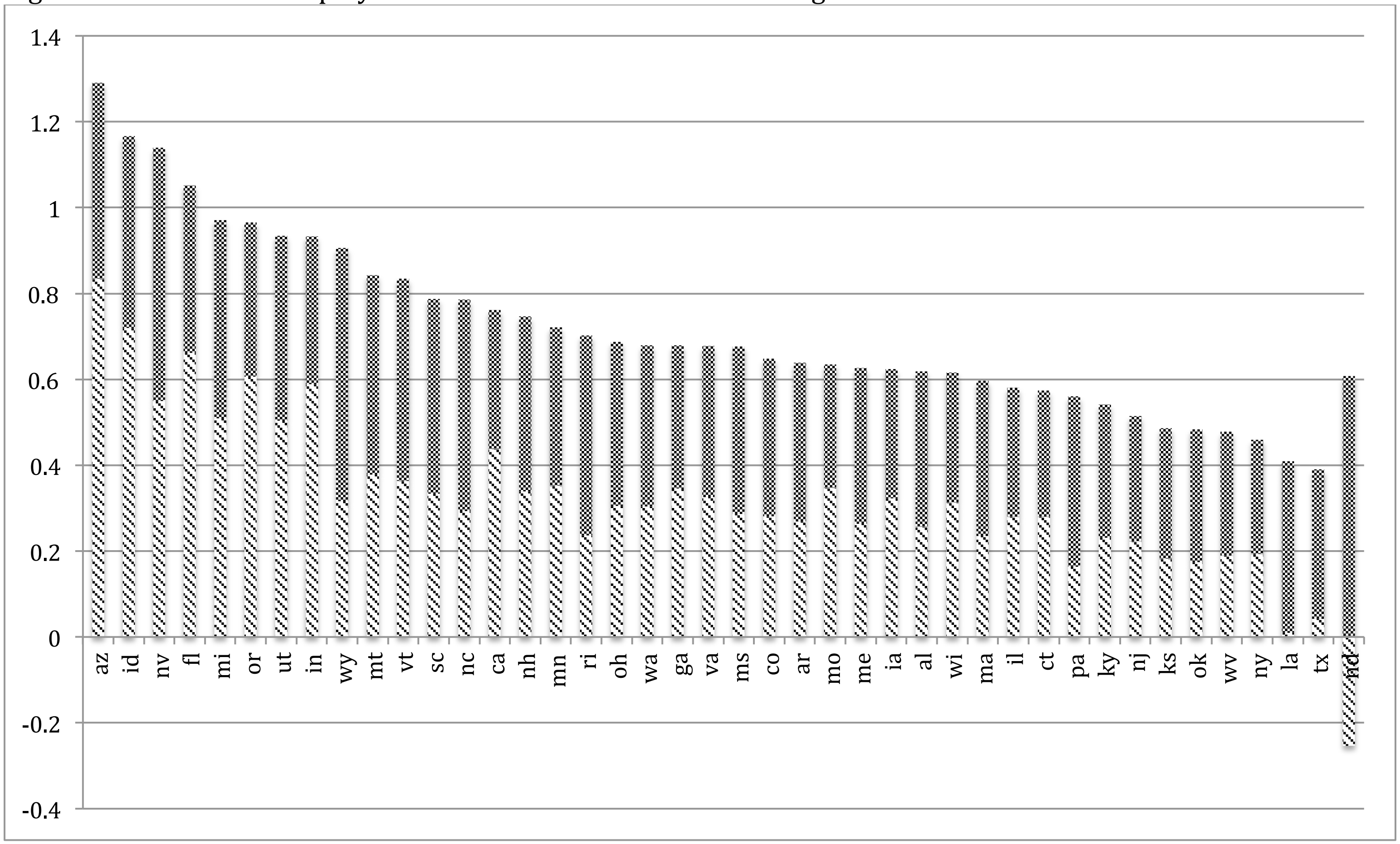
Figure 4e. Mean Sectoral Change and Change in Unemployment, by State, continued

Figure 5. Mean Sectoral Change by State: 5 Subperiods



Note: NEN=New England; MAT=Mid-Atlantic; SAT=South Atlantic; ENC=East North Central; WNC=West North Central; ESC= East South Central; WSC=West South Central; MTN=Mountain; PAC=Pacific.

Figure 6. Predicted Unemployment Increase Due to Sectoral Change Between the Mid 2000s and 2009 Recession



This table graphs values of equations (8), equal to the height of the darker bars, and (9), the seen as the lighter cross-hatched bars, for each state in the sample.

Table 1. Sectoral Change, by Period

	All	1990s	2001-2 recession	Mid-2000s	2009 recession	2010s
Mean	1.000	0.886	1.286	0.806	1.513	1.199
Median	0.955	0.872	1.262	0.770	1.445	1.138
Standard deviation	0.175	0.197	0.254	0.176	0.465	0.293
25th percentile	0.851	0.721	1.103	0.650	1.227	1.034
75th percentile	1.119	0.991	1.378	0.935	1.778	1.265
Minimum	0.775	0.562	0.750	0.557	0.719	0.849
Maximum	1.495	1.593	2.063	1.271	2.777	2.528
Number of states	42	40	40	42	42	42

The figures in this table are summary statistics of the 2-year sectoral change measure in equation (4), normalized by the mean. Means are calculated across all observations, and the other summary statistics are calculated from averages taken over the sub-period indicated. The earlier recession ended in 2001, but the sub-period was expanded to include 2002; see text for details.

Table 2. Means and Standard Deviations

	1990s	2001-2 Recession	Mid-2000s	Great Recession	2010s
Unemployment rate	5.261	4.964	4.898	6.199	8.049
	(1.6540)	(1.1450)	(1.2310)	(2.1200)	(2.0520)
Sectoral Change	0.892	1.294	0.811	1.522	1.207
	(0.6810)	(0.5450)	(0.5430)	(0.9580)	(0.8390)
Transitory Sectoral Shock	1.024	1.012	0.963	0.896	1.047
	(0.6270)	(0.6500)	(0.6260)	(0.5150)	(0.6010)
Bartik	0.465	-1.627	0.238	-2.016	0.158
	(1.2190)	(0.7840)	(0.8850)	(1.9500)	(2.2660)
Percent high school	59.026	59.342	59.095	59.226	59.171
	(5.0300)	(5.2930)	(5.2090)	(5.2220)	(5.4200)
Percent college	22.664	26.067	27.019	27.42	28.163
	(4.8430)	(5.0010)	(5.4760)	(5.5130)	(5.7770)
12-month unemployment lag	5.395	4.196	5.11	4.506	7.916
	(1.6440)	(1.0610)	(1.2070)	(1.1230)	(2.1470)
Percent black	0.11	0.112	0.113	0.114	0.115
	(0.1190)	(0.1170)	(0.1140)	(0.1120)	(0.1100)
Percent Hispanic	0.063	0.083	0.093	0.102	0.108
	(0.0800)	(0.0900)	(0.0930)	(0.0970)	(0.0980)
Percent youth	0.07	0.071	0.072	0.071	0.071
	(0.0070)	(0.0080)	(0.0070)	(0.0070)	(0.0060)
Hsg Price Chg 2000-5	0.358	0.358	0.358	0.358	0.358
	(0.1640)	(0.1640)	(0.1640)	(0.1640)	(0.1640)
Saiz Hsg Supply Elast	2.245	2.245	2.245	2.245	2.245
	(1.0910)	(1.0910)	(1.0910)	(1.0910)	(1.0910)
x Hsg Price Chg 2000-5	0.692	0.692	0.692	0.692	0.692
	(0.2780)	(0.2780)	(0.2780)	(0.2780)	(0.2780)

See text for details. The earlier recession ended in 2001, but the sub-period was expanded to include 2002; see text for details. Standard deviations are shown in parentheses.

Table 3. Unemployment Regression Results

	1990s	2001-2 Recession	Mid-2000s	Great Recession	2010s
Sectoral Change	0.0368	0.2587	-0.04	0.4553	0.1644
	(0.0180)	(0.0880)	(0.0450)	(0.1420)	(0.0800)
Transitory Sectoral Shock	-0.0114	-0.1512	0.1162	0.0178	-0.0746
	(0.0320)	(0.0500)	(0.0660)	(0.1090)	(0.1010)
Bartik	0.028	-0.7641	0.149	-1.5785	-0.8827
	(0.2380)	(0.1940)	(0.3170)	(0.4530)	(0.3140)
Percent high school	0.0068	-0.0043	-0.0197	-0.0683	-0.0993
	(0.0080)	(0.0160)	(0.0160)	(0.0530)	(0.0320)
Percent college	-0.0085	0.0113	-0.0176	-0.0724	-0.1293
	(0.0080)	(0.0150)	(0.0130)	(0.0400)	(0.0270)
Percent black	0.3083	0.1708	0.463	0.5624	2.6676
	(0.3090)	(0.5350)	(0.4580)	(1.4350)	(0.7830)
Percent Hispanic	1.0871	0.9483	-0.664	-0.2075	1.4702
	(0.3020)	(0.4860)	(0.4310)	(1.2970)	(0.8540)
Percent youth	3.9472	0.746	-6.8913	-3.997	-35.4066
	(2.3470)	(3.8500)	(3.0970)	(10.8270)	(12.1010)
12-month unemployment lag	0.8535	0.8455	0.8329	0.9977	0.7453
	(0.0240)	(0.0680)	(0.0610)	(0.0850)	(0.0430)
Hsg Price Chg 2000-5	-	-	-	1.0932	0.8523
				(1.2600)	(0.9570)
Saiz Hsg Supply Elast	-	-	-	0.0229	0.0493
				(0.1910)	(0.1580)
x Hsg Price Chg 2000-5	-	-	-	-0.204	-0.4964
				(0.8230)	(0.6620)
Time Dummies?	Yes	Yes	Yes	Yes	Yes
Region Dummies?	Yes	Yes	Yes	Yes	Yes
N	4400	840	2466	779	1189
R-Square	0.921	0.865	0.818	0.927	0.929
Root Mean Square Error	0.456	0.418	0.503	0.589	0.555

This table contains estimates of equation (6) in the text. The earlier recession ended in 2001, but the sub-period was expanded to include 2002; see text for details. Standard errors clustered on state appear in parentheses.

Table 4. Estimated Coefficients on Sectoral Change Omitting One Sector at a Time: Great Recession

	Two-year measure		Four-year measure	
Sector excluded (*j*)	$PERS^{-j}_{s,t}$	$\Delta PERS^{j}_{s,t}$	$PERS^{-j}_{s,t}$	$\Delta PERS^{j}_{s,t}$
Extraction	0.5264	-0.0027	0.6349	0.0000
	(0.149)	(0.000)	(0.165)	(0.000)
Construction	0.5098	0.0247	0.6673	0.0071
	(0.157)	(0.013)	(0.176)	(0.005)
Durables manufacturing	0.4887	0.0302	0.5551	0.0753
	(0.138)	(0.007)	(0.145)	(0.017)
Nondurables manufacturing	0.5611	-0.0032	0.6372	0.0403
	(0.153)	(0.001)	(0.163)	(0.014)
Transport & utilities	0.5820	-0.0343	0.6699	-0.0306
	(0.152)	(0.008)	(0.169)	(0.011)
Retail trade	0.6609	-0.1095	0.8174	-0.1584
	(0.172)	(0.037)	(0.190)	(0.039)
Wholesale trade	0.5778	-0.0356	0.6602	-0.0275
	(0.155)	(0.009)	(0.173)	(0.015)
Prof. & bus. Services	0.5736	-0.0294	0.6326	-0.0122
	(0.161)	(0.012)	(0.181)	(0.007)
Educ & health services	0.5718	-0.0621	0.6393	-0.0427
	(0.153)	(0.015)	(0.163)	(0.010)
Financial activities	0.5913	-0.0497	0.6814	-0.0464
	(0.163)	(0.014)	(0.184)	(0.019)
Information services	0.5571	-0.0105	0.6411	-0.0072
	(0.152)	(0.003)	(0.168)	(0.003)
Leisure services	0.5942	-0.0500	0.7027	-0.0635
	(0.164)	(0.025)	(0.182)	(0.030)
Other services	0.5784	-0.0332	0.6600	-0.0278
	(0.152)	(0.007)	(0.172)	(0.011)
Government	0.5575	-0.0206	0.6448	-0.0618
	(0.153)	(0.011)	(0.178)	(0.029)

This table contains estimates of equation (6) in the text, but in which the sectoral change measure in equation (4) has been replaced by a measure that is computed excluding the sector indicated in the left hand column and their difference. Each row shows the results of a separate regression, 14 regressions in total. Standard errors clustered on state appear in parentheses.

Table A1. Fisher-Type Unit Root Test Statistics

	Inverse chi-squared	Prob value	Inverse normal	Prob value	Inverse logit	Prob value	Modified inverse chi-squared	Prob value
Sectoral change (2-year)	773.1	5.2E-112	-23.7	5.2E-124	-33.0	0	53.2	0
Sectoral change (4-year)	418.6	6.5E-46	-15.3	6.4E-53	-17.7	0	25.8	0
Transitory shock (2-year)	1404.4	1.7E-238	-33.2	3.4E-242	-59.9	0	101.9	0
Transitory shock (4-year)	1088.9	1.7E-174	-28.5	1.9E-179	-46.4	0	77.5	0
Bartix	670.4	3.1E-92	-21.7	2.7E-104	-28.6	0	45.2	0
Unemployment rate	299.6	2.5E-21	-11.0	2.8E-28	-11.2	0	13.8	0
Percent high school	585.4	6.4E-69	-18.7	4.6E-78	-22.6	0	33.8	0
Percent college	628.7	8.9E-77	-19.9	2.6E-88	-24.3	0	36.9	0
Percent black	269.8	4.2E-17	-6.2	2.5E-10	-7.4	9.42E-13	11.8	0
Percent Hispanic	224.3	3.6E-11	-5.4	3.6E-08	-5.9	7.14E-09	8.6	0
Percent youth	395.8	3.3E-36	-13.1	1.1E-39	-14.8	0	20.6	0

This table reports Fisher-type tests, recommended by Maddala and Wu (1999), for a unit root in each of the indicated variables as specified in Choi (2001). These tests combine the probability values from independent Dickey-Fuller tests for a unit root to obtain an overall test statistic. Because the tests are independent, they permit the autocorrelation parameter to vary across panels. The null hypothesis is that all panels contain a unit root, and the alternative hypothesis is that at least one panel is stationary. All tests assume an infinite number of time periods; the inverse chi-square test is appropriate only for a finite number of panels, while the remaining tests can be used with either a finite or an infinite number of panels.

References

Choi, In. 2001. "Unit Root Tests for Panel Data," *Journal of International Money and Finance*, 20, 249-72.

Maddala, G.S. and Shaowen Wu. 1999. "A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test," *Oxford Bulletin of Economics and Statistics*, 61: 631-52.

Table A2. Sectoral change, by period: 4-year measure

	All	1990s	2001-2 recession	Mid-2000s	2009 recession	2010s*
Mean	1.000	0.896	1.230	0.858	1.307	1.745
Median	0.980	0.855	1.199	0.818	1.284	1.636
Standard deviation	0.170	0.220	0.304	0.190	0.430	0.514
25th percentile	0.885	0.718	1.025	0.754	1.069	1.452
75th percentile	1.097	1.056	1.400	0.999	1.470	1.920
Minimum	0.690	0.554	0.645	0.393	0.547	0.923
Maximum	1.450	1.413	1.923	1.296	2.455	3.405
Number of states	42	40	40	42	42	42

*Reflects only 5 months of data.

Table A3. Regression results, 4-year measure of sectoral change

	1990s	2001-2 Recession	Mid-2000s	Great Recession	2010s
Sectoral Change	-0.0079	0.289	-0.0222	0.5218	0.3498
	(0.026)	(0.102)	(0.063)	(0.158)	(0.209)
Transitory Sectoral Shock	0.0001	-0.1683	0.0291	0.1356	-0.0066
	(0.024)	(0.051)	(0.050)	(0.134)	(0.141)
Bartik	-0.2323	-0.7052	0.069	-1.4911	-1.4121
	(0.207)	(0.204)	(0.303)	(0.450)	(0.506)
Percent high school	0.0114	-0.0031	-0.0161	-0.0672	0.0104
	(0.006)	(0.016)	(0.016)	(0.055)	(0.077)
Percent college	-0.0047	0.0135	-0.0155	-0.0723	-0.0184
	(0.006)	(0.015)	(0.014)	(0.041)	(0.061)
Percent black	0.4738	0.1146	0.3064	0.7012	-0.4108
	(0.239)	(0.553)	(0.483)	(1.452)	(1.820)
Percent Hispanic	0.5319	1.1953	-0.6616	0.0495	1.5991
	(0.188)	(0.531)	(0.385)	(1.357)	(1.980)
Percent youth	7.3792	2.355	-9.1024	-4.5424	-1.184
	(2.269)	(3.310)	(3.335)	(11.382)	(28.929)
12-month unemployment lag	0.8531	0.8292	0.8217	0.9508	1.0673
	(0.019)	(0.072)	(0.063)	(0.087)	(0.121)
Hsg Price Chg 2000-5	-	-	-	0.654	-0.3799
				(1.315)	(2.058)
Saiz Hsg Supply Elast	-	-	-	-0.0095	-0.1975
				(0.196)	(0.329)
x Hsg Price Chg 2000-5	-	-	-	-0.1619	-0.2714
				(0.843)	(1.215)
Time Dummies?	Yes	Yes	Yes	Yes	Yes
Region Dummies?	Yes	Yes	Yes	Yes	Yes
N	3440	840	2418	779	205
R-Square	0.909	0.865	0.815	0.928	0.92
Root Mean Square Error	0.39661	0.41686	0.50461	0.58498	0.61859