The Rise of Services, Deindustrialization, and the Length of Economic Recovery

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Abstract: *Economic recovery is longer in service-providing economies than in goods-producing economies. Services cannot be produced and inventoried ahead of demand; goods can. We are the first to document this macroeconomic repercussion of the sectoral shift away from the secondary sector toward the tertiary sector, that is, of deindustrialization and the rise of services. We distinguish between non-tradable services and all other sectors, using U.S. state-level employment data for post-1960 recessions. Concerns over the endogeneity of services are addressed in two ways: by using 3-year pre-recession averages of sector shares, and separately by invoking instrumental variables. Our results are robust to alternative specifications. The increase in service production and deindustrialization in the United States over the last half-century lengthens the trough-to-peak employment recovery from recessions by about 40 percent.*

Keywords: service sector, deindustrialization, economic recovery, manufacturing, employment, secondary sector, tertiary sector, inventory, exports

JEL classification codes: E24, E32, L80, N12

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Recovery from recessions in the United States takes longer today than in the past. This change has not happened because recessions are longer. Nor has it occurred because recessions are deeper than in the past. Instead we find that the lengthening of economic recoveries is associated with what some have termed deindustrialization—the shift of production out of goods and into services. We establish the empirical fact that service-based economies take longer to recover from recessions and suggest two possible mechanisms—inventories and exports—that might explain our findings.

A deindustrializing economy produces proportionately more services and fewer goods over time. That is, the movement of economic activity in the last sixty years in the United States has largely been between these two sectors, not between goods and other sectors (construction, farming, mining, etc.). Therefore the rise of the service sector is concomitant with deindustrialization—the decline in the percentage share of the goods sector. Our findings can be seen through either lens, the rise of services or the decline of goods. One has not occurred without the other.

We use a panel of state-level employment data for the United States covering the 5 recessions between 1969 and 2001. Our results document a strong empirical tendency: the lower is the share of goods and the higher is the share of services, the slower is the employment recovery. Our results are robust to alternative definitions of recovery length, to the use of an instrumental variables strategy, and to inclusion of data from the 2007-09 recession. The effect of the shift from goods to services in the U.S. economy over the last half-century lengthens recovery by about 40 percent.[1] In other words, a recovery that would have lasted 6 months in the

[1] We are not arguing that the most recent recession was deep and long and the recovery slow only because of rising service production. The recovery from the 2007-09 recession has been long because the combination of the popping

1950s will last over 8 months today. Recovery from the 2007-09 recession, which would have unfolded in just under 3 years in the 1950s, because of the decline of goods and rise of services, lasted over 4 years.

What might explain our findings? It is beyond the scope of this paper to confirm the channel by which a movement from goods to services could lengthen recoveries. We suggest two possible channels but leave further investigation to future research. First, at the trough of a business cycle, goods-producing businesses can increase production in *anticipation* of future demand, increasing their inventory holdings, spurring increased incomes and, through a multiplier effect, further increasing output and spending. This inventory cycle is a long-known characteristic of recessions and recoveries. Services, however, have no inventory cycle. Services can only be produced in response to actual, not expected, demand. The greater the share of services in the economy, the greater the share of businesses that must wait for demand to actually pick up before they can increase production.

Second, an exports channel may reinforce this inventory channel. Consider the division between tradables and non-tradables. External demand can spur a recovery when an economy produces tradables, but recovery in an economy that produces mostly non-tradables depends primarily on increased internal demand. Most services, with the exceptions of tourism and finance, are not tradable. Therefore the decline of the goods sector and the rise of the service sector depresses the size of the tradable sector, reducing the role for external demand in spurring a recovery in output and employment, thus slowing recovery.

These two possible explanations support each other. Because goods, but not services, can

of the housing bubble and the ensuing financial crisis in 2008 created a deep recession. Our argument is that the rise of services since the 1950s made today's recovery about 40 percent longer than it would have been had the same downturn transpired in the 1950s.

be produced ahead of demand, there is no role in a service-based economy for inventory accumulation. And because goods, but not most services, can be exported, there is little role in a service-based economy for external demand. The fewer goods and more services an economy produces, the longer it takes for a recovery to take hold.

Our argument is about behavior at the business cycle trough, not the peak. For our argument to also apply to the business cycle peak, we would need to argue that goods and service producers respond differently to an anticipated drop in demand. If their reactions are the same, then a shift away from goods and toward services would have no effect in the aggregate. But the key characteristic of services that undergirds our argument—their inability to be produced ahead of demand and inventoried—is not relevant when demand is falling and producers are reducing production. Indeed, we find that an economy's share of goods or services before it enters a recession does not affect the probability of experiencing a downturn nor the length nor depth of the downturn. That is, neither our hypothesis nor our findings are symmetrical with respect to decreases in aggregate demand.

Section I discusses literature on the pace of economic recoveries and the rise of the service sector. Section II details the data methodology and empirical analysis and section III presents the empirical results. Section IV suggests two possible causes of our findings. Section V concludes.

I. Economic Recovery and the Rise of the Service Sector

A. The Pace of Economic Recovery

The four longest recoveries since 1948 also have been the four most recent recoveries—those that followed the recessions of 1981, 1990, 2001, and 2007. The pace of recovery has been the focus of a great deal of research, particularly since the end of the Great Recession in 2009.

We are apparently the first to link the pace of recovery to the rise of services.

An employment cycle is the sum of two parts: the employment downturn—the number of months from the previous employment peak to trough—and the employment recovery—the number of months from the trough until employment reaches its previous peak. Recoveries are longer both absolutely and relative to the length of the downturn. In Table 1 we compare the number of months it takes nonfarm employment to recover to its previous business cycle peak with the downturn length. Whether compared with the employment downturn or the NBER-dated recession length, employment cycles and recoveries have lengthened relative to downturns since 1980.

< Table 1 here>

What might cause the lengthening of recoveries? One argument is that the past three recessions—1990, 2001, and 2007—have not been caused by contractionary monetary policy trying to reduce inflation, so recoveries can no longer start abruptly once the Fed begins to reduce interest rates (Hall 2007). Gali, Smets, and Wouters (2012) and Smets and Wouters (2007) argued that adverse demand shocks during recoveries since 1990—lower investment spending, and less expansionary fiscal and monetary policy—have slowed recoveries. Credit booms in an expansion can lead to more severe recessions and slower recoveries (Jorda, Schularick and Taylor 2013). Depressed credit conditions (Kannan 2012) can also lead to lead to permanent output losses (Cerra and Saxena 2008).

Other work focuses directly on the slow post-2009 recovery. Lazear and Spletzer (2012) argued that the issue is not *jobless* recoveries, but *slow* recoveries: the problem after 2009 "is not that the labor market is underperforming; it is that the [output] recovery has been very slow" (p. 33). The large decrease in aggregate demand has caused firms to reduce their recruiting intensity,

slowing employment growth (Davis, Faberman and Haltiwanger 2012). The rapid rise in household debt during the 2001-07 expansion is unwinding, leading to massive deleveraging, which depresses aggregate demand and increases unemployment (Mian and Sufi 2012). Geographic and industry mismatch is argued to have increased unemployment, or slowed its fall, by decreasing the job-finding rate (Sahin et al. 2012). The unprecedented rise in unemployment duration following 2007 can send negative signals to employers about the employability of long-term unemployed job seekers, leading to "duration dependence," or a positive feedback loop among the unemployed (Notowidigdo, Kroft, and Lange 2013). Policy changes, such as the extension of unemployment insurance benefit duration (Rothstein 2011), the rise of government transfers (Mulligan 2012), and uncertainty of policy direction (Baker, Bloom, and Davis 2012) are also argued to have negatively affected employment patterns during the current recovery.

But these explanations do not address more secular trends. Stock and Watson (2012) offered evidence that the recoveries in the 21st century will become increasingly slow because of slowing trend GDP growth, the slowdown in employment growth due to the plateauing of female labor force participation and the decline in male labor force participation, and real wage stagnation stemming from rising income inequality (Saez, Slemrod, and Giertz 2012) and skill mismatch (Goldin and Katz 2008). Basu and Foley (2013) found that employment has responded weakly to changes in output since the early 1980s, which has slowed recoveries, but argued that this change has been caused by measurement issues, such as overstating value-added in the service sector—especially the finance, insurance, and real estate sectors (FIRE)—because NIPA estimates of services output are imputed from income.

The above analyses use national data, which can obscure important variation between states. Blanchard and Katz (1992) for the 1947-1990 sample and Notowidigdo (2011) for the

1980-2000 sample found that firm relocation followed by labor relocation—outward migration of workers from contracting states and inward migration of workers to expanding states—is how states adjusted to shocks. For example, rapid employment growth in mining states since the late 1990s has led to firm creation and expansion, causing outflows of labor from depressed industrial states like Ohio and Michigan, and inflows of labor to states like North Dakota and Wyoming.

Using MSA-level data, Charles, Hurst, and Notowidigdo (2013) found that the decline of the manufacturing sector increased non-employment—unemployment plus workers dropping out of the labor force—between 2000 and 2011. About 40 percent of the rise in non-employment since 2000 was caused directly by the decline in manufacturing employment, but was offset by housing-bubble related increases in employment. The structural shift from goods production to service production has adversely affected employment patterns, but these authors do not specifically analyze the behavior of employment during recoveries, as we do.

Another strain of research emphasizes the role of jobless recoveries—when output recovers faster than employment—and the relationship between business cycles and the composition of employment. Jaimovich and Siu (2012) argued that the polarization of the skill distribution in employment—middle-skill jobs shrinking as a percent of total employment, with growing low- and high-skill shares—is responsible for jobless recoveries, especially since the early 1980s. Furthermore, they argued that the loss of middle-skill employment is largely a business-cycle phenomenon, where most of these jobs are lost during downturns and do not recover during the subsequent expansion. This loss in middle-skill jobs is the prime cause of jobless recoveries in the aggregate, making the skill-composition of employment endogenous to recessions.

Their analysis, however, does not distinguish between sectoral shifts, which are the focus of our hypothesis, rather only skill, nor do they find evidence of inter-industry switching. Mirroring the findings of Autor et al. (2003) and Acemoglu and Autor (2011), though at odds with Autor and Dorn (2013), Jaimovich and Siu (2012) argued that "job polarization is due largely to shifts in occupational composition…*within industries*, as opposed to shifts in industrial composition…" (p. 18, emphasis added). In other words, these studies do not suggest that job polarization alone will increase the share of service employment and production.

The primary takeaway is that changing employment patterns and slow recoveries are the new norm, and multiple forces are acting to lengthen recovery time from downturns. We argue, however, that the existing literature overlooks an important secular trend that affects the pace of recovery: the rise of the service sector.

B. The Rise of the Service Sector

An ever-increasing share of employment and output over the past 60 years is services and a decreasing share is goods. Figure 1A shows absolute levels of employment by sector since 1950. Goods-producing and manufacturing employment both reached absolute peaks in 1979. Since then, goods sector employment has fallen 22 percent and manufacturing employment (not shown) has fallen 37 percent. Service-producing employment, however, secularly rose 361 percent since 1950. Figure 1B shows the shares of expenditures by sector. In 1950, just under 40 percent of expenditures for U.S. GDP were for services and 50 percent of expenditures were for goods. By 2015, services constituted just over 60 percent of expenditures for GDP and goods were at 30 percent. Over the same period, service-producing jobs rose from 48 to nearly 70 percent while goods-producing jobs fell from 40 to about 15 percent of nonfarm employment.

<Figure 1 here>

The service sector is quite heterogeneous, encompassing a wide range of activities. Figure 2 shows employment shares in several sub-categories of services, expressed as a share of total employment.[2] Strong growth over the last half century is seen in health care, retail trade and restaurants, and "all other services."[3] In contrast to received wisdom, there is only moderate growth in the share of employment in the finance, insurance, and real estate (FIRE) sector. Little change was evident in several categories not shown in the figure–legal services, accommodations, wholesale trade, and transportation.[4]

<Figure 2 here>

There are "bad" service jobs with low pay, minimal benefits, and little job security, and there are "good" service jobs with high pay, good benefits, and reliable job security. To group service sub-sectors, we used wage and salary accruals per full-time equivalent (FTE) worker for both 1950 and 2010. "Median-pay jobs" are those that fell within 5 percent of the overall median wage per FTE worker in 1950 and in 2010. "High-pay service jobs" had wages more than 5 percent above the overall median and "low-pay service jobs" had wages more than 5 percent below the overall median. No sub-sector switched pay category between 1950 and 2010. Goods-

[2] The breaks in 1998-2000 are necessitated by the change in classification strategies. The NAICS (North American Industry Classification System) replaced the SIC (Standard Industrial Classification) in the late 1990s. A great number of activities were shifted from one category to another, some even moving between services and manufacturing. Three years, 1998-2000, overlap the two systems. In some sub-sectors, it is relatively easy to closely match the SIC and NAICS categories. Figure 2 is restricted to the categories for which there was a reasonably close match between 2-digit SIC and NAICS.

[3] "All other services" excludes legal services, accommodations, wholesale trade, and transportation, as well as the categories shown in Figure 2: FIRE, health, education, retail trade and restaurants.

[4] Moretti (2012) focuses on "high tech" as illustrative of the rise of services. There is not just one category "high tech" in either the SIC or the NAICS systems. The BLS list of high tech industries comprised 27 manufacturing and 4 service industries under SIC codes, and 29 manufacturing and 10 service industries using NAICS codes (National Science Foundation 2004, p. 8-54).

producing jobs, largely construction and manufacturing, are nearly all high-pay jobs.

Again in contrast to received wisdom, the rise of the service sector is not simply an increase in "bad" jobs. But as seen in Figure 3, nor is it a wash. Goods-producing jobs dropped precipitously as a share of total employment over the last 60 years. Employment in high-pay service jobs—FIRE and legal— did not offset the drop in manufacturing and construction jobs; their sharerose only slightly. Employment share in low-pay service jobs—retail trade and restaurants, accommodations, educators—increased moderately. Employment in service jobs that pay within 5 percent of the overall median—transportation, health services, and all other services—nearly doubled as a share of total employment.

<Figure 3 here>

There are a number of hypotheses, most of which reinforce each other, explaining the secular increase in service production and employment. Jorgensen and Timmer (2011) documented the rise of service production and decline in goods production in the European Union, United States, and Japan for 1980-2005 and attribute the trends to the increased availability and use of skilled labor, and the "knowledge intensification of production" (p. 18). Older literature, especially Stigler (1956), Kuznets (1957), Baumol (1967), Fuchs (1968), and Maddison (1987) explain the rise of services similarly as a result of biased productivity growth rates and non-homothetic preferences, or higher income elasticities of demand for services. Rowthorn and Ramaswamy (1999) used an international panel data set for 1963-1994 to argue that deindustrialization and the rise of services are due more to internal factors—faster productivity growth in manufacturing and rising incomes coupled with higher income elasticity of demand for services than for goods—than to external factors, such as import substitution from low-wage manufacturing countries. Buera and Kaboski (2012) explained the rise of services,

particularly after 1980, as a result of rising productivity and the subsequent rise in the wage premium to skilled workers, raising the opportunity cost of household production, leading to increased demand for services which substitute for home production.

The key point to be drawn about the rise of services is that it is a secular trend and is not itself determined by the business cycle. We argue, however, that the reverse is true: that the business cycle is affected by the proportional decline of goods and rise of services.

II. Empirical Analysis

We analyze a panel of state-level employment data for the 5 recessions from 1969 to 2001. We treat the 1980 and 1981-82 recessions as one single business cycle because at the state level there were not fifty double-dip recessions but fifty variously-timed single recessions (Basu and Foley 2013). Our analysis starts with the 1969 recession because complete state-level GDP data by sector begin in 1963. We omit the 2007-09 downturn from our primary results because we construct out-of-sample predictions and a counterfactual for the 2007-09 downturn, and to allay concerns that its unusually long recovery is skewing our results. As a robustness check, we extend the sample to include 2007-09. In both our primary results and in the robustness checks, we find that an increase in a state's service sector or decrease in its goods sector leads to longer employment recoveries.

We do not use the contemporaneous shares of goods or services due to concerns about their endogeneity. As argued by Jaimovich and Siu (2012), the goods and service shares might be endogenous to the business cycle because goods-producing jobs are disproportionately lost during downturns and, in the past 50 years, have rarely returned to their previous business cycle peak, mechanically increasing the share of services. We take two approaches to addressing

endogeneity.

First, we use an average of the goods or service share measured over the 3 years *before* the recession start year. In contrast to the share of goods or services in the first year of the recession or even a 3-year average that includes the first year of the recession, this lagged 3-year average is not correlated with the length or depth of the recession. We estimate the following equation by OLS:

$$Y_{st} = \beta_0 + \beta_1 \frac{\sum_{i=1}^{3}\left(\frac{sector}{GDP}\right)_{s,t-i}}{3} + \beta_2 depth_{st} + \beta_3 length_{st} + \alpha_s + \gamma_t + e_{st} \quad (1)$$

where Y_{st} is the recovery length (trough-to-previous peak) measured in months for state *s* in recession *t*; $\left(\frac{sector}{GDP}\right)_{s,t-i}$ is a state-specific variable measuring either goods or services and averaged over the 3 years ending in the year before the recession began; depth measures the percentage change in employment from peak to trough; length is the number of months from peak to trough, and α_s and γ_t capture state and recession fixed effects. Robust errors are clustered by state.

Second, as discussed further in Section IIB below, we also use an instrumental variables approach. Here we instrument the contemporaneous goods or services share with lagged goods or services shares from 4, 5, and 6 years previous to the start of the recession. We are prohibited from going back further than a 6 year lag because our state-level sector data begin in 1963. The IV approach confirms that our initial approach with the lagged 3-year average does not produce biased results.

In alternative specifications we include the shares of GDP for all sectors, not just the goods or services share. In those cases, we estimate the following equation by OLS:

$$Y_{st} = \beta_0 + \sum_{j=1}^{n-1}\beta_j \frac{\sum_{i=1}^{3}\left(\frac{sector_j}{GDP}\right)_{s,t-i}}{3} + \delta_2 depth_{st} + \delta_3 length_{st} + \alpha_s + \gamma_t + e_{st} \quad (2)$$

where *j* indexes *n-1* of the *n* sectors in the economy.

State-level analysis allows us to exploit the large heterogeneities in recovery length and service production between states. Our approach follows the growing literature that uses regional variation within the United States to examine macroeconomic issues (e.g. Autor, Dorn, and Hanson 2013; Chodorow-Reich et al. 2012; Clemens and Miran 2012; Mendez and Reber 2014; Nakamura and Steinsson 2014; Wilson 2012). State fixed effects capture time-invariant state-level characteristics and policies plus other unobserved heterogeneity across states. Recession fixed effects capture recession-specific characteristics, including federal fiscal and monetary policies that affect all states more or less equally, as well as the 1980s adoption of just-in-time inventory techniques (McCarthy and Zakrajsek 2007).

A. Dependent Variable: Recovery Length

Our measures of recovery length are drawn from the Bureau of Labor Statistics' "State and Metro Area Employment, Hours, & Earnings" establishment survey for seasonally adjusted nonfarm employment.[5] Downturn length—peak to trough—is the number of months it takes nonfarm employment to reach the trough from the peak. Recovery length—trough to previous peak—is the number of months it takes nonfarm employment to recover its previous cycle peak once employment has reached a trough.[6]

[5] The raw data for nonfarm employment by sector were provided to the authors by the Bureau of Labor Statistics. Seasonally-adjusted and non-seasonally-adjusted data by state for 1990-2012 were provided to us. The data for 1960-1989 were not seasonally adjusted. The seasonal adjustment process in EViews—the Census X12 method—replicated the difference between the not-seasonally-adjusted and seasonally-adjusted data for 1990-2012 and was therefore used to seasonally adjust the 1960-1989 data.

[6] Our measure of the lengthening of recoveries in employment is one of many possibilities. Mendez and Reber (2014) use a measure of "jobless recovery depth," which accounts for the length and depth of sustained job losses and changes in output. Our specification accounts for the number of months it takes employment to recover its pre-recession peak and the depth of the employment downturn, but we do not measure the variation in state output

State downturns do not necessarily follow exactly the NBER dates for the national economy—some start earlier, some start later—and therefore we allow state downturn dates to vary from the NBER-defined start of the recession. Peaks are defined as the months where employment is at a global maximum within 12 months, plus or minus, of the NBER start date.[7] For states that never enter a recession, we set their downturn and recovery lengths at 0.[8] In 10 cases, a state never recovers its previous-peak level of employment before the next downturn begins. For these states, we set the recovery length to the number of months until the next recession began, using the NBER-defined recession start date.[9] Because our dependent variable is recovery length—the number of months it takes a state's economy to recover its previous business cycle peak level of employment *following the employment trough*—we are forced to omit Michigan from our data set in 2001 because it never reaches a trough. Employment in Michigan peaked in April 2000 and fell continuously until July 2009. Without a trough, there can be no recovery. If Michigan had reached a trough in the early 2000s, we could top-code its recovery length, but this is not possible because there was no trough.

There are four data samples: all states for all recessions, whether or not the state goes into a recession and whether or not it fully recovers before the next recession begins (n=249); states

because we are only concerned with the length of employment recovery. They find, much as we do, although for different reasons, that employment losses are extremely diverse across states and time.

[7] We experimented with several approaches to identifying peaks and troughs. Details are in the discussion of our robustness checks in section IIIC. The reported results use the global peak and global trough for each state recession. Our results are robust to the definitions of peak and trough.

[8] The states that never enter a recession are: for the 1969-70 recession, AK, AZ, CO, FL, HI, ID, NE, NV, NC, ND, SC, and TN; for 1973-75, AK, ID, LA, NM, ND, OK, TX, UT, WA, and WY; for 1980-82, CO and FL; for 1990-91, ID, LA, MN, TX, UT, and WA; and for 2001, WY.

[9] Because states begin their downturns in varying months, the maximum value could be different for each state even within one recession. The states that never fully recover are: for the 1969-70 recession, NY; for 1980-82, LA, OK, WV, and WY; and for 2001, IL, IN, MA, MS, and OH.

that never go into recession or that enter a recession and fully recover (that is, excluding states that never fully recover, n=239); only states that entered a recession, whether or not they fully recover (n=218); and states that enter a recession and fully recover (n=208). The samples n=249 and n=218 each include the ten states that do not fully recover their previous-peak employment level before the start of the next recession. We present results for all four samples but are primarily interested in the most restrictive sample because our hypothesis deals with recovery length, which implies that a state experiences a downturn and recovers.

Owyang, Piger, and Wall (2005) find, much as we do, that state business cycle dates vary substantially from NBER national dates. Unfortunately their data only cover three of the five recessions we include, and truncate the length of the 2001 recovery for the states with the longest recoveries. We compared our data with their measure for the one complete recession we have in common, 1991, and found no systematic differences between their series, which uses state-level coincident indexes, and ours, which uses only employment data.[10] In order to test whether our findings are sensitive to our particular measures of recovery length, we ran additional regressions in which we allowed each recovery length to vary by a random amount within a 6, 12, 18, and 24 month range. The results are discussed in the robustness section below.[11]

[10]Our use of discrete business cycles might exclude useful information about state economic fluctuations outside of NBER-defined downturn and recovery periods (Beaudry and Koop 1993). But including those additional episodes would require a different empirical approach. For instance, Owyang, Piger, and Wall (2005, pp. 609-610) find that Alaska, Colorado, Louisiana, Montana, North Dakota, and Utah experience state-level recessions at various times during the national expansion from 1984-1990. Because we include recession fixed effects to take account of national events and policies, we do not include localized recessions that don't have a common timing. Including a localized recession with its own recession fixed effect would essentially dummy out the recession, adding no additional information.

[11] The smooth parabolas of business cycles that we often draw in the classroom are typically not reflected in state-level data. We experimented with alternative measures of the employment cycle that measures the length of time it takes employment to recover to its trend using a Hodrick-Prescott filter and multiple smoothing parameters. These measures failed to provide usable results because many states—more than that using our preferred trough-to-peak measure of recovery—never return to trend. To control for the employment effects of labor migration out of

There is substantial variation in recovery lengths by state and over time, with much cross-state variation within any one year and a dramatic re-ordering of states by recovery length from one recession to the next. In 2001 for states that entered a recession, the recovery length ranged from 2 to 87 months. Over time, recovery lengths in some states such as Kentucky and Alabama have worsened relative to other states, while in other states such as Rhode Island and Washington, recovery lengths have improved relative to other states.

B. Independent Variables: Goods, Services, Recession Depth and Length

Our key variables of interest are the goods and services shares of the economy. We start from annual state GDP data disaggregated by value added by industry.[12] We take two approaches to addressing the concern that the goods and service shares themselves could be determined endogenously by the depth and length of the recession and recovery. First, we compute the 3-year average of the sector's share of GDP, ending in the year prior to the start of the recession. For example, the services shares used for the 1969 recession are each state's average for 1966-68. Averaging over 3 years smoothes out annual fluctuations so that we are more likely to capture long-term trends. Using the 3 years prior to the start of the recession addresses

contracting states into expanding ones, we repeated this analysis using employment-population ratios. These results produced even more states that fail to recover to trend levels. We include trend employment growth as an independent variable in some of our alternative specifications.

[12] The transition from SIC to NAICS coding after 1997 does not affect our analysis. The recessions proximate to the 1997 switch from SIC to NAICS are the 1990-1991 and 2001 recessions, neither of which overlaps 1997. Moreover our state analysis relies on the cross-section differences between states and not the changes over time within a state. For the SIC sample (1963-1997), the service sector includes: transportation and public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and [all other] services. NAICS disaggregates "all other services." For the NAICS sample (1997-2010), the service sector includes: utilities; wholesale trade; retail trade; transportation and warehousing; information; finance and insurance; real estate and rental and leasing; professional, scientific, and technical services; management of companies and enterprises; administrative and waste management services; educational services; health care and social assistance; arts, entertainment, and recreation; accommodation and food services; and other services, except government.

endogeneity concerns; in our data, service shares *after* a recession are correlated with the length and depth of the recession but services shares *before* a recession are not.

Second, we invoke an instrumental variables strategy using 4-, 5-, and 6-year lagged values of the goods or service shares to instrument for the sector's share in the year a recession begins. For example, we instrument the 1969 services shares using services shares from 1963, 1964, and 1965. This approach follows Dehejia and Panagariya (2014). Although the sector shares at the start of a recession and during the subsequent recovery could be determined by dynamics from the recession itself (Jaimovich and Siu 2012), there is no *a priori* reason why the sector shares during the prior expansion and 4 to 6 years preceding the recession should create simultaneity issues with recovery length. In other words, the long-dated service shares are "plausibly exogenous" to recovery length (Dehejia and Panagariya 2014, p. 5). The reason we chose 6 years as our maximum long-date is because of data restrictions on the start date of GDP by state and sector, which begin in 1963. The instruments do very well in standard instrument tests for under- and over-identification and show strong first-stage F statistics. Summary statistics for the recovery length, goods share, and services share are presented in Table 2.[13]

<Table 2 here>

As with recovery length, there is substantial variation across time, between states, and in the ordering of most-to-least service-dependent and manufacturing-dependent states. Nevada in 1966-68 had the highest share of services at 73 percent and 4th lowest share of goods at 4.9 percent; its shares changed little over the next 40 years, changing to 75 percent for services and

[13]An alternative approach might be to use shares of employment but state employment data by sector are incomplete for many states and years. Private correspondences with Bureau of Labor Statistics' economists confirmed the BLS does not have these data. Output-based and employment-based measures of the service share follow similar, secularly-increasing trends over time.

4.3 percent for goods by 2004-06. For nearly all other states, there is a striking re-ordering of highest-to-lowest goods or services shares. Delaware, for example, saw its service share nearly double from 42 percent to 78 percent due to the relocation of financial firms, while its goods share fell over the 40-year period from 41 percent to 8 percent.[14] By 2007, Alaska, Kentucky, and South Carolina no longer had the lowest shares of services; oil-rich states Wyoming, Alaska, and Louisiana did. Similarly, by 2007, the most manufacturing-dependent states were no longer Michigan, Delaware, Indiana, and Connecticut, but instead Indiana, Louisiana, Wisconsin, and Oregon. And although Nevada still had a very high share of services, it was no longer the most service-dependent state; by 2007, New York and Delaware were.

Our unit of analysis is the state. "Exports" thus cross not just international borders but state borders as well. State GDP data do not distinguish domestic from "foreign," or in this case interstate, sales of goods and services. But some services, especially tourism and finance, are tradable, allowing external demand to spark a recovery. Las Vegas may lose all its construction jobs, but if high-rolling Midwesterners still travel to its Strip, recovery might not be slowed. Hawaii may see its military bases shuttered, but if West Coast residents still rent a beachfront condo, recovery might proceed apace. Similarly, states such as New York and Delaware, which have a high share of financial services in their output, are not necessarily dependent on internally generated demand because clients in, say, California might utilize their services for pension management, and thus recovery in finance-heavy states might not be slowed.

In alternative specifications we therefore create proxies for tradable and non-tradable services. We cannot directly measure interstate and international tourism, so we use NAICS

[14] The specific values for Nevada are likely influenced by the switch from the SIC to NAICS classification schemes. The shift for Delaware, however, is clearly a trend, independent of the classification scheme.

subsector 721 "accommodation" —hotels and motels, RV parks, rooming and boarding houses— as a proxy for tradable tourism services.[15] Hawaii and Nevada are heavily dependent upon tourism. We use NAICS subsector 52 "finance and insurance" as our proxy for tradable financial services.[16] Some states have particularly large finance and insurance sectors that provide interstate or international services: New York and, for post-1990 recessions, also Connecticut, Delaware, and South Dakota. Our proxy for non-tradable services is then the remainder: total services less accommodations and finance.[17]

In our most parsimonious specifications, we omit all other sectors and examine the effect on cycle length of changes in the shares of GDP attributable to total services, our proxy for non-tradable services, or goods. The question is then: How does the rise of the (non-tradable) service sector or decline of the goods sector affect the employment recovery?

In alternative specifications, we break GDP into eight sectors: non-tradable services, tradable services (accommodations and, separately, finance), goods, farming, mining, construction, and government. In each case, we calculate 3-year averages of the shares of GDP, with the average ending in the year prior to the beginning of the recession. We offer two specifications that use all eight sectors: one omitting the goods sector, and one omitting non-tradable services. These "all sector" regressions allow us to see which margins truly matter to recovery length. Is it the shift from goods to services, or from goods to other sectors, that increases recovery length? Similarly, is it the shift to services from goods, or to services from other sectors, that increases recovery length?

[15] Under the SIC codes, this is major group 70, "hotels, rooming houses, camps, and other lodging places."

[16] Under the SIC codes, we used division H, "finance, insurance, and real estate" less major group 65, "real estate."

[17] Jensen and Kletzer (2005) offer an empirical strategy for identifying which service sectors are potentially tradable.

Clearly economic recoveries may be longer if recessions are deeper or longer, so we include control variables for downturn depth and length. We measure the downturn's depth as the total percentage change in employment for the employment downturn, from cycle peak to trough. We expect states with very large drops in employment will experience longer recoveries simply because the state is climbing out of a deeper downturn.[18] Finally, we expect the length of the downturn—the number of months from peak to trough—should also affect the recovery, with longer recessions yielding longer recoveries.

III. Empirical Results

A. Employment Recovery Length

Our most parsimonious results are in Table 3, where our hypothesis is confirmed: the larger the share of a state's output that is services, or the smaller the share that is goods, the longer the employment recovery. To conserve space, we report in Table 3 only the coefficient on services or goods for each of several specifications. Full results are available in an Appendix. We estimate the effect of an increase in total services (panel A), the effect of an increase in non-tradable services (panel B), and the effect of an increase in goods (panel C). The shares of GDP run from 0 to 100 so the estimated coefficient shows the effect of a 1 percentage point increase in that sector's share of GDP. All variables enter with the expected sign. Our results are insensitive to sample restrictions: excluding states that never fully recover, states that never enter recession,

[18] We tried incorporating lagged recovery length, either raw length or standard deviations from the recession-specific mean, as an additional independent variable to check for persistence of recovery length in a state. Doing so eliminated 20 percent of our sample and did not alter our results. The estimated coefficients on lagged recovery length were statistically significant but negative. Relatively short recoveries were followed by relatively long ones, and vice versa. Importantly, including the lagged recovery coefficient did not change the magnitude nor statistical significance of the services coefficient.

or both.

<Table 3 here>

We do not use the contemporaneous measure of a sector's share in any of the regressions. The "OLS" results in Table 3 utilize the lagged 3-year average of the service or goods share as our measure of that sector. To further address concerns about the endogeneity of the goods and service shares, we also employed an instrumental variables strategy, reported in the "IV" columns, using the 4-, 5-, and 6-year lagged values of the goods or service share as instruments for that sector's share in the year the recession began. In each case the instruments do very well on the first-stage F test (consistently above 10), the under-identification test (p-values consistently about 0.02), and the over-identification test (p-values on the Hansen J-statistic consistently about 0.9 or above). Our results using the 3-year lagged average of the goods or service share are broadly consistent with those from the IV strategy.

We also offer in Table 3 two additional specifications that include the 5- and 10-year trend employment growth rates, estimated both with OLS and IV strategies described above. For each state-recession observation, the trend employment growth rates were computed as simple arithmetic averages of the annual growth rates of employment ending in the year the recession began. Using a geometric average would not change the results. The coefficients are consistent with those we obtain from our most parsimonious specification.

Regardless of which sector we focus on—goods, services, or nontradables services—we find that declines in goods production and increased service production lengthens economic recovery. A 1 percentage point increase in total services as a share of GDP (panel A) or a 1 percentage point decrease in goods as a share of GDP (panel C) increases the recovery length by about 0.7 months, an increase of about 4.0 percent from the mean. But some services are tradable

and we would not expect a rise in their shares in an economy to necessarily lengthen recoveries. Focusing just on the effect of non-tradable services (panel B) thus does a better job of capturing our thesis that more services lengthens economic recovery due to inventory and export channels. Indeed the effect of non-tradable services is larger, more consistent across sample restrictions, and robustly significant. A 1 percentage point increase in non-tradable services as a share of GDP increases recovery length by about 0.9 months, an increase of about 5.5 percent from the mean.

In specifications that include only the goods or services share, we are unconcerned with the source of the change in the share; the omitted category is "all other sectors." The sector shares sum to 100 percent so an increase in the services share or a decrease in the goods share must be reflected by a change in other sector shares. Do all sectoral shifts have the same effect? When the service sector share increases (or, the goods sector share decreases), does the effect on recovery length depend upon which sectors are declining (or, increasing)? The results are shown in Table 4.

<Table 4 here>

Here we include 7 of the economy's 8 sectors. When we omit the non-tradable services sector (even-numbered columns), the coefficients on each of the other sectors tell us which margins account for the effect of non-tradable services seen in Table 3. Interpretation requires multiplying by -1: the coefficient in the table shows the effect of *decreasing* non-tradable services and increasing the sector shown, even though the temporal pattern is just the opposite: *increasing* non-tradable services. When we omit the goods sector (odd-numbered columns), we are asking which movements between goods and other sectors account for the effect reported in Table 3, that the relative decline in goods production increased recovery length.

Most of the actual movement between sectors involves just goods and services. The inter-

quartile range of the construction sector as a share of state GDP barely changed over time: it was [4.7, 5.6] in 1969 and [4.5, 5.1] in 2001. Similarly, the government share showed little movement, changing from an interquartile range of [10.2, 16.4] in 1969 to [10.4, 15.0] in 2001. A large statistically significant coefficient on a sector that barely changed over time gives us relatively little in what McCloskey terms "oomph" or economic significance (Ziliak and McCloskey 2008). By contrast, the inter-quartile range for non-tradable services as a share of state GDP rose from [41.7, 47.1] in 1969 to [51.8, 59.0] in 2001. And for goods, the interquartile range dropped from [15.5, 31.8] in 1969 to [12.0, 18.1] in 2001.

The first thing to note is that distinguishing between tradable and non-tradable services is the right thing to do; tradable services are similar to goods in their effect on recoveries. Swaps between goods production and accommodations or between goods production and finance have no consistent statistically significant effect on the recovery length.

Second, note that the tradeoff between non-tradable services and goods drives the increase in recovery length. This is measured by the coefficient on goods or non-tradable services, and is seen consistently in all columns. A 1 percentage point swap toward non-tradable services away from goods production lengthens recoveries by about 1.1 months, an increase of about 6 percent from the mean. Changes in the finance, accommodations, farming, mining, and government sectors have no consistent effect on the length of recovery.

Finally, the results in Table 4 highlight the volatility of the construction sector. Although residential investment makes up a relatively small percentage of national GDP and has shown no temporal pattern over the last four decades, it can have disproportionately large effects at business cycle turning points and at more local levels. It is well known that economies with more construction have longer cycles (Davis et al 2005; Browne 2000; Gabe and Florida 2013).

We find this as well. Economies with more construction have longer cycles—whether the margin is with goods (odd-numbered columns) or non-tradable services (even-numbered columns)—because construction has a protracted time dimension. The time factor arises because of the need to acquire permits before building, houses take a long time to build from start to finish, and during recoveries, developers will sell excess inventory before beginning new construction.

Is our main finding symmetrical with respect to decreases in demand? That is, does a change in the size of a state's service or goods sector affect the length and depth of the downturn or the probability of entering a recession? We find no consistent supporting empirical evidence for this claim. Table 5 presents these results.[19] The lack of symmetry does not surprise us. Our argument is that goods-producing firms can hire workers when actual demand is weak if they anticipate increased demand in the future. But firms are unlikely to lay off workers when demand is strong, even if they think it will decline in the future, because that would force firms to forgo existing revenue in the present. Normally, firms don't adjust their labor input until after a downturn begins, reducing hours during the early stages, and only in latter stages laying off workers (Rones 1981; Elsby, Hobijn, Sahin 2010).

<Table 5 here>

B. Counterfactual Analysis

Our results allow us to estimate the impact of the last half-century's relative decline of goods and rise of services on the length of the most recent recovery. For the United States as a whole, the

[19] With state fixed effects, we are not comparing manufacturing-heavy states with service-heavy states, but looking instead at the effect of a change in a state's economic composition.

2004-06 average shares of GDP were 68 percent for total services, 57 percent for non-tradable services, and 12 percent for goods. Fifty years earlier, the 3-year averages before the nation's economy entered the 1957 downturn were 49 percent for total services, 43 percent for non-tradable services, and 27 percent for goods.

We use the estimated equations from regressions that end with 2001 to predict out-of-sample actual and counterfactual values for the United States as a whole for the 2007-09 downturn. The actual values are predicted from the Table 3 and 4 regressions using the length, depth, and sector shares for the U.S. economy as a whole for the 2007-09 downturn. The counterfactual values are estimated from the same equations but using the 1954-56 U.S. sector shares and again the 2007-09 values of the other control variables. The difference between the forecasted actual and counterfactual cycle lengths shows the aggregate effect of the last half century's rise of services and decline of goods on the length of recovery. We show the effect in months and also as a percent of the predicted counterfactual length.

The results are shown in Table 6. The sectoral shift from goods to services is far from inconsequential. The recovery is 28 to 51 percent longer than it would have been a half-century ago due just to the rise of the service sector.[20] Averaging the effect over all specifications in Table 6 provides our headline estimate: the effect of deindustrialization and the rise of services in the U.S. economy over the last half century increased recovery length by about 40 percent.

<Table 6 here>

For the U.S. economy as a whole, nonfarm employment peaked at 138,365 million in January 2008, fell to a trough of 129,649 million in February 2010, and recovered its previous

[20] These results are our most conservative estimates, based on the 208- and 218-observation samples which exclude the states that never enter recession. Including the states that don't experience recession would make the effect of the rise of non-tradable services on recovery length even larger.

peak value in April 2014. From the trough in February 2010, it therefore took 50 months to recover all nonfarm jobs lost during the downturn. The recovery would have taken just 33 to 39 months if the 2007 economy still had 1957's share of non-tradable services. The lengthening of the recovery by about 40 percent would hold even if the 2007 recession had been relatively short and shallow.

C. Robustness Checks

We conducted several checks to be sure our specific measure of recovery length wasn't biasing our results and consistently found that, even with alternative measures of recovery length, an increase in a state's share of services led to longer economic recoveries.

In the results reported above, we defined the beginning of recession—the peak month—as the month in which the global maximum level of employment occurred within 12 months (minus or plus) of the NBER-start date for the recession. The end of recession and beginning of recovery—the trough month—is the month in which the global minimum level of employment occurred following the peak. The end of the recovery is the month in which the previous peak is obtained.

But business cycles are rarely perfect parabolas with obvious peaks and troughs. Sometimes there are several local peaks before or after a global peak, and sometimes there are multiple local troughs before or after a global trough. If employment in sequential months is 102, 100, 103, 100, 98, 101, 100, 98, is the peak value 103 (the global maximum) or 102 (the first local maximum) or 101 (the last local maximum)?

We experimented with several variants of peak and trough definitions by introducing a rounding parameter that could itself vary in size. The rounding parameter was expressed as a percentage of that state's level of employment. If the economy bounced along the top before

turning down and all the bouncing fell within the rounding parameter (for example, within 0.1percent of employment), the month chosen as the peak was either the first or the last local maximum, giving us two different specifications. We introduced a similar rounding parameter for the trough. If the economy bounced along the bottom before hitting a global minimum and all of the bouncing fell within the rounding parameter, the month chosen as the trough was the first local minimum. Our results are robust to these alternative specifications. Regardless of how we chose the peak and the trough, service-heavy states had longer recoveries.

In a second set of checks, we conducted a simple Monte Carlo simulation. We allowed the recovery length to vary by a random amount, ran each regression 500 times with 500 different randomized adjustments, and then determined the range of estimated coefficients on the services share. First, we let the recovery length vary randomly within a range of minus or plus 3 months, a 6-month range. Subsequently we expanded the range incrementally to minus or plus 6 months, 9 months, and 12 months. We ran these regressions using both OLS with the 3-year lagged average of the service share, and the IV approach. We report the OLS results in Table 7. For each set of 500 simulations, we show the minimum and maximum values of the estimated services coefficient as well as the 10th and 90th percentile cutoffs. For comparison we also include the estimated coefficients from Table 3, column 1.

<Table 7 here>

Our primary results in Table 3 are not sensitive to reasonable changes in our measure of recovery length. The actual recovery lengths range from 0 to 88 months (Table 2, column 2). The mean values of recovery length by recession range from 8 months (1969-70 recession) to 24 months (2001 recession). When the recovery length varies randomly within a 6-month range (Table 7, column 1), the estimated services coefficient never falls below 0.6. As we widen the

range within which recovery length can vary, the range of service coefficients obtained in the 500 simulations widens as well. But never does the estimated coefficient fall below 0, and the P10-P90 range of estimated coefficients never falls below 0.5. Even if our measures of recovery are off by up to 12 months in either direction, it remains the case that in states with larger service shares, recoveries are longer.

Another check, shown in Table 8, broke out the goods sector into durable and nondurable goods sectors. If monetary policy or consumption anticipations are the cause of the connection between services and recovery length, we might expect states with large durable goods industries to recover more quickly than those with relatively large nondurable goods industries. Monetary policy affects interest rates, which are more relevant to durable than to nondurable goods purchases (Erceg and Levin 2006, Barsky et al 2016). Anticipations of recovery-driven price increases might lead consumers to accelerate purchases of goods and services – particularly storable durable goods – during the early phase of recovery (Petev, Pistaferri, Eksten 2011). However we do not find support for either hypothesis. The estimated coefficients for the durable and nondurable goods sector shares are statistically equal.

<Table 8 here>

Finally, in regressions reported in Table 9, we included what we know of the recoveries from the 2007-09 recession. Seven states have not fully recovered and so our data are incomplete. But does including the 2007-09 data change the story? Is the recovery from a recession triggered by the bursting of financial and housing asset bubbles fundamentally different from the more "traditional" post-World War II recessions? We do not find supporting evidence, as shown in Table 9. Full results are available in an Appendix. Indeed our results are larger and stronger when the sample is expanded to include the 2007-09 downturn. We bias our

case against ourselves by focusing on the pre-2007 sample.

<Table 9 here>

IV. Possible Explanations for the Link Between Services and Recovery Length

We find a strong and robust empirical relationship between the size of the goods or service sector and the length of recoveries. As an economy's production shifts from goods to services, recoveries are longer. Here we offer two complementary possible explanations for our findings: services cannot be produced ahead of demand, and most services cannot be exported. Both possibilities share a common theme: services, unlike goods, can only be produced when actual domestic demand exists. It is beyond the scope of this paper to explicitly test whether these mechanisms are the causal factors driving our results, and remains an important area for future research.[21]

A. Expected Demand and Inventory

Our first suggested explanation is essentially a closed-economy story, allowing no role for external demand. Businesses producing goods or structures are not dependent on just actual demand to increase production as the economy comes out of a recession; they can also produce in anticipation of future demand. In other words, domestic demand need not increase before goods production increases.

[21] Referees and seminar participants have suggested additional possible channels that also deserve investigation in future research. We suggest that growth in goods-producing jobs should drive recoveries but perhaps due to their larger share of output and employment, it is actually service-providing jobs that are the driving force of recoveries, Another possible channel focuses on unionization. To the extent goods-producing jobs are more likely to be unionized than service-providing jobs perhaps our result is a reflection of a movement toward non-union jobs with fewer employment protections. We recognize that our work does not settle the causal question of the link between services and longer recoveries. The topic is an important area for future research,

When output is produced in anticipation of future demand, firms accumulate inventory. Goods producers not only can, but indeed want to produce ahead of demand. Firms face a tradeoff between "stockouts"—when consumers confront empty shelves—and surplus inventory. Whereas surplus inventory can be carried over and sold once demand increases, stockouts reduce not only current sales but also future sales due to lower customer goodwill and loyalty (Kahn 1987, Wen 2005). Optimizing firms will accumulate inventory to avoid stockouts because the cost of a stockout is typically greater than the cost of holding excess inventory.

Service producers, on the other hand, cannot produce ahead of demand. A restaurant cannot produce a meal weeks in advance; you have to be in the booth. A dentist cannot produce and inventory a teeth cleaning; you have to be in the dentist's chair. A service producer must wait until the customer is present—that is, until demand actually appears—in order to produce.

If production of services required goods inputs, then recovery might not be slowed by the rise in services: a service producer expecting increased demand would inventory goods inputs, spurring recovery. But production of services requires relatively few goods inputs as seen in Table 10, which uses input-output tables from the Bureau of Economic Analysis to provide estimates of the contributions to total output from primary inputs (agriculture and mining), manufactured inputs (goods), services, and value added. Over 90 percent of the value of services represents either service inputs or value added by producers.[22] Preparing to produce services tomorrow is unlikely to spur a recovery today because less than 8 percent of inputs to services production are goods.

<Table 10 here>

[22] As a side note, the rise of services inputs went hand-in-hand with the decline of value added in goods production in the 1980s and 1990s, a pattern consistent with the practice of contracting out. When goods producers hire an accounting firm rather than employ their own in-house accountants, services inputs rise and value added declines.

B. Exports & Tradability

A second possible explanation of our finding is an open-economy story, with an explicit role for external demand. When an economy produces tradables, external demand can spur a recovery. But an economy that produces mostly non-tradables is primarily dependent on internal demand. Since most services are not tradable, the rise of the service sector reduces the size of the tradable sector, which has the effect of reducing the role for external demand in spurring a recovery in output and employment.

Goods, which are more tradable than services, can be exported, so businesses producing goods can respond to increases in external demand independent of the level of their home state's demand. Most services, on the other hand, cannot be exported.[23] States can have robust recoveries, despite having a large service sector, because of tourism and finance's exportability, creating a larger role for external demand. If a large share of a state's service production is tradable, they can have faster growth from the trough. States that do not have a large tradable service sector cannot rely on external demand to stimulate recovery and will experience slower recoveries.

V. Conclusion

The rise in the service share and decline in the goods share of the U.S. economy has made recoveries from downturns slower and longer—a negative macroeconomic externality. This finding is robust to the use of an instrumental variables strategy, to alternative measures of recovery length, and to inclusion of available data from the 2007-09 recession. The effect of the

[23] Goe (1994) studied Cleveland and Akron, OH and found that the vast majority of revenue of producer services is locally generated.

rise in services and decline in goods in the United States will cause recoveries to last about 40 percent longer than they would have a half century ago.

We suggest two possible explanations for why more services lead to longer recoveries. Goods-producing businesses can produce ahead of increasing demand because retailers want to build up inventory to avoid stockouts once consumer demand reappears. But because services cannot be inventoried, service producers must wait until actual demand appears. And because most services are non-tradable, the rise of services makes economic recoveries increasingly dependent on internal demand. Modeling and testing for causal channels of our findings is an area where more research is needed.

Moretti (2012) argues the rise of services, and especially the high-tech sector, is not harmful to long-run growth, but his analysis ignores business cycle dynamics. Our findings focus on the cyclical effect of the rise of the service sector, impacts not previously considered in the literature. States that have experienced deindustrialization and an increase in their service share, particularly non-tradable services, experience slower recoveries from recession, lengthening the business cycle.

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Figure 1. Goods, Services, and Structures, 1950-2016

Figure 1a. Goods and Services Employment, 1950-2016 (thousands of employees)

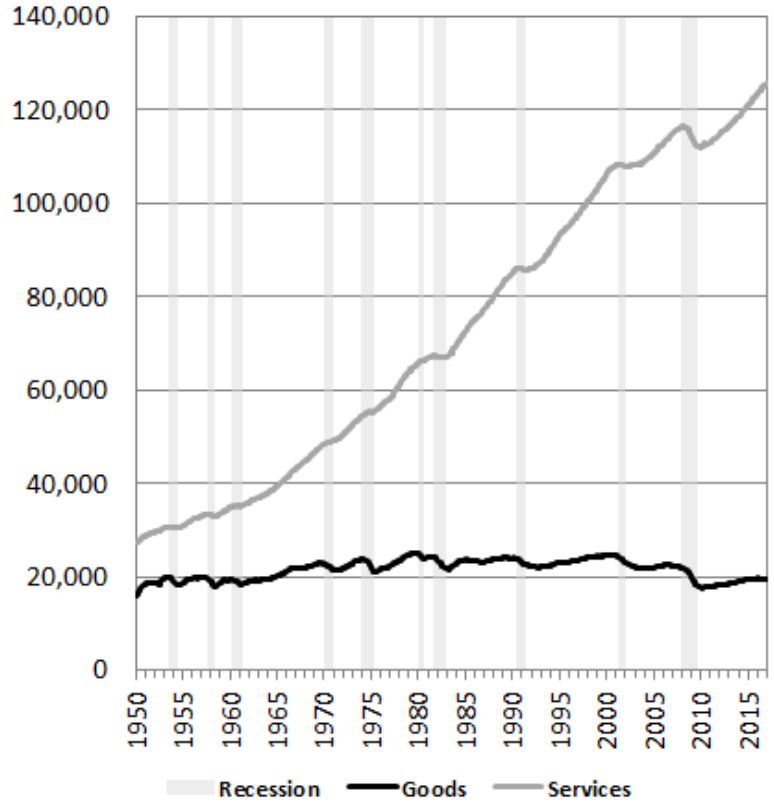
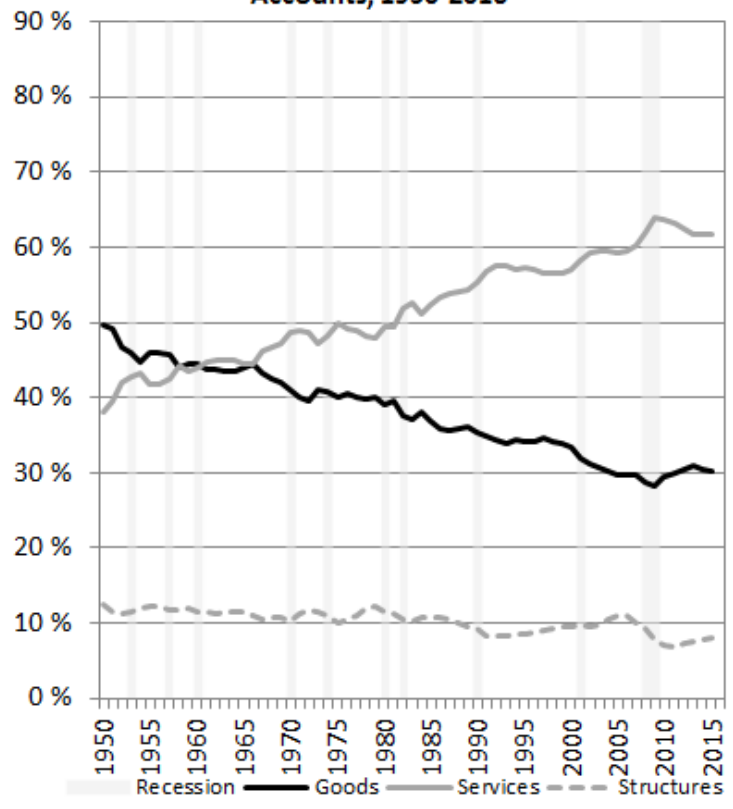
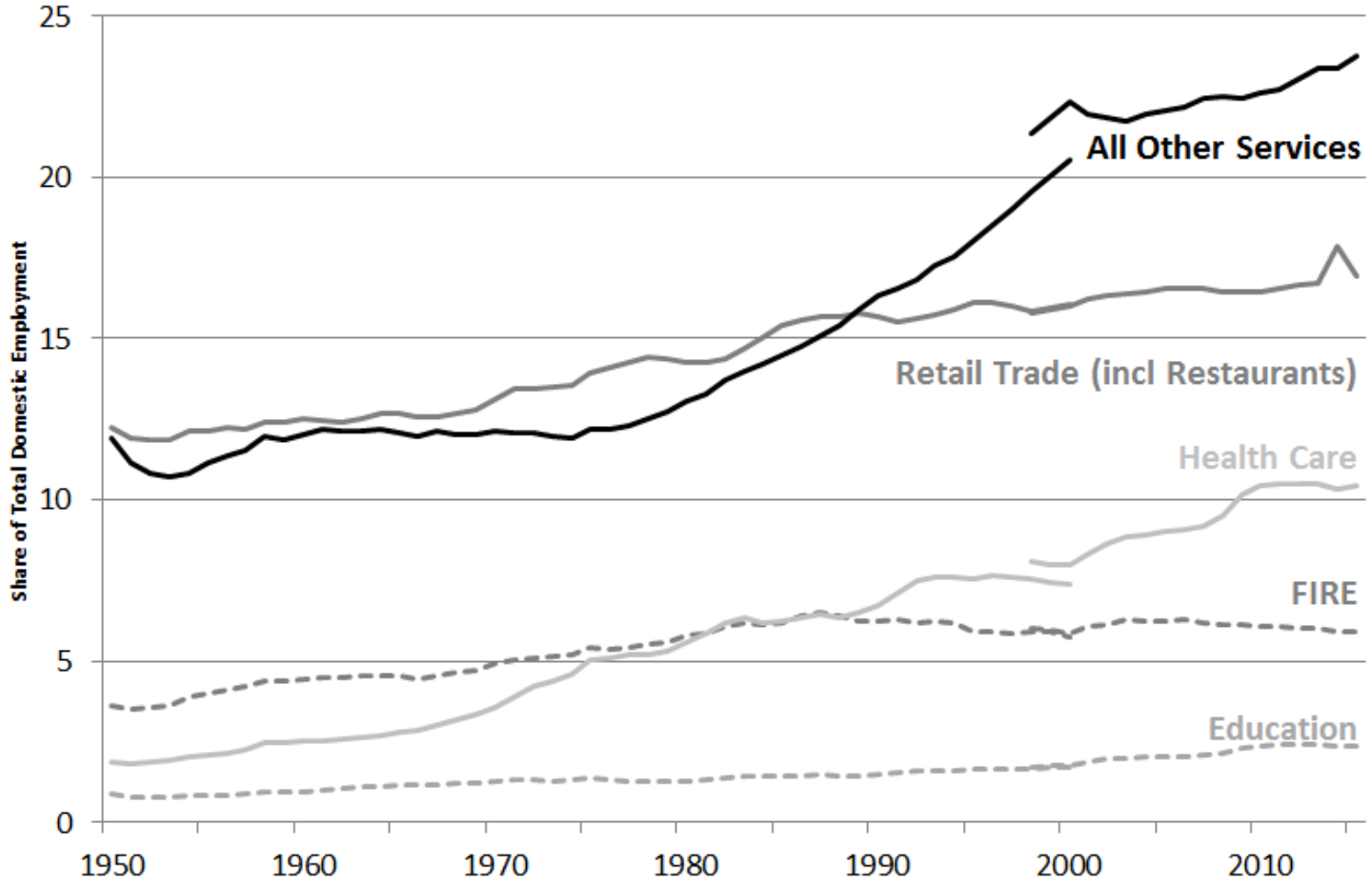


Figure 1b. Shares of GDP, from Expenditure Accounts, 1950-2016



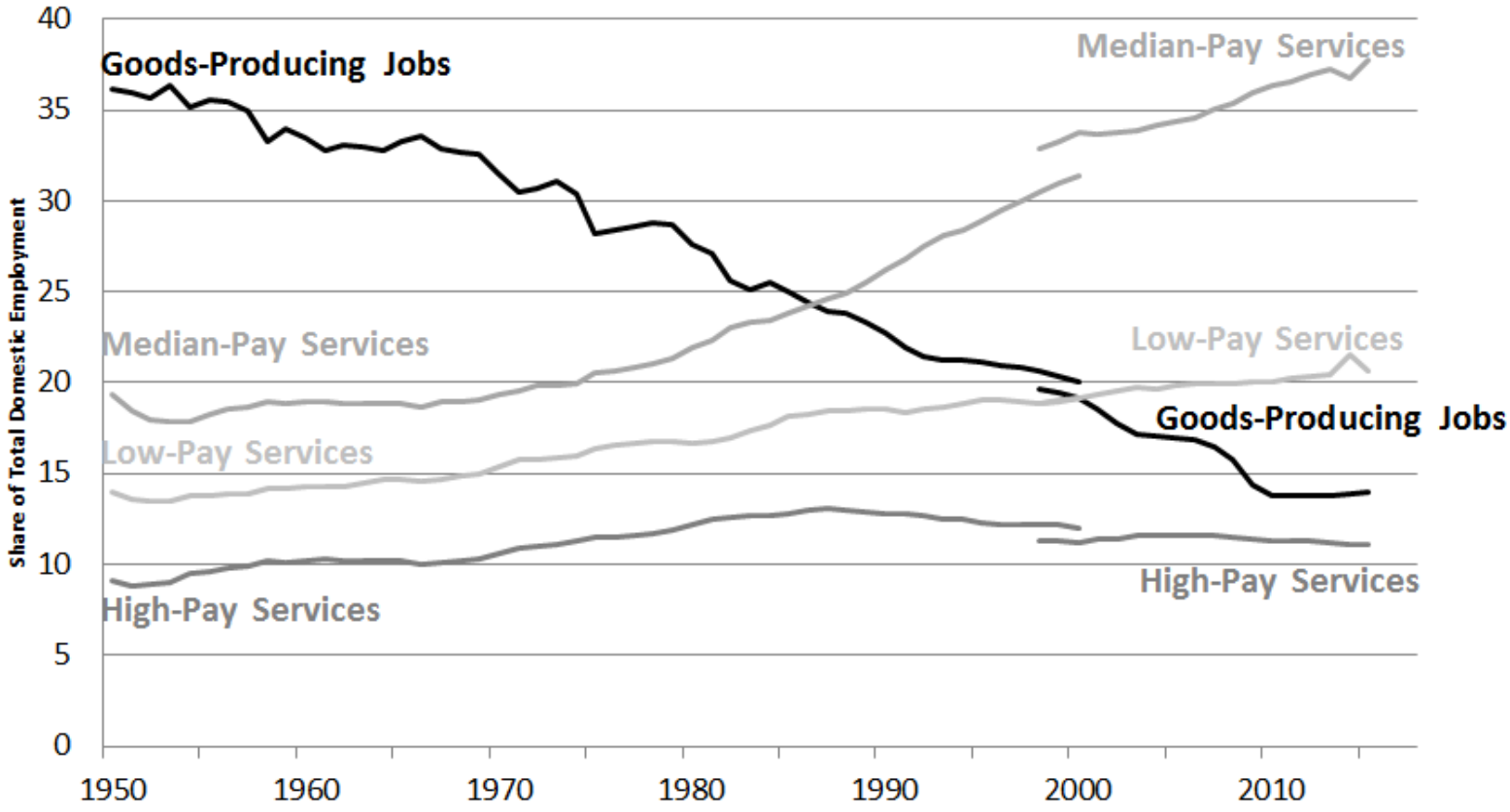
Source: Authors' calculations from FRED, Series USGOOD and SRVPRD; and Bureau of Economic Analysis, NIPA Table 1.2.5 Gross Domestic Product by Major Type of Product. Data accessed 1-10-17..

Figure 2. Employment Share by Service Industry, 1950-2015



Source: BEA.gov, Table 6.5 (Full-Time Equivalent Employees by Industry). SIC codes for 1950-2000; NAICS codes for 1998-2015. Some NAICS categories were combined for closer equivalency with SIC categories. Categories that showed little change over the time frame are omitted: legal services, education, accommodations, wholesale trade, transportation . "All other services" excludes omitted categories as well. Data accessed 2-22-17.

Figure 3. Employment Share in Goods; and High-, Median-, Low-Pay Service Industries, Shares, 1950-2015



Source: BEA.gov, Table 6.5 (Full-Time Equivalent Employees by Industry) and Table 6.6 (Wage & Salary Accruals per Full-Time Equivalent Employees by Industry). SIC codes for 1950-2000; NAICS codes for 1998-2015. Categories that can be matched across SIC-NAICS transition were sorted based on wages per FTE in 1950 & 2010. Median-pay jobs fell within 5% of the domestic industry average. Goods jobs (construction & manufacturing) are a mix of high- and median-pay jobs. Data accessed 2-22-17.

Table 1. National Data: Employment Downturn, Recovery, and Full Cycle Lengths

	Months				Ratio of Employment Recovery to:	
NBER Recession Dates	NBER Recession Length	Employment Downturn (Peak-to-Trough)	Employment Recovery (Trough-to-Peak)	Full Employment Cycle (Peak-to-Peak)	Employment Downturn	NBER Recession Length
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Nov. 1948-Oct. 1949	11	13	9	22	0.7	0.8
Jul. 1953-May 1954	10	13	10	23	0.8	1.0
Aug. 1957-Apr. 1958	8	14	10	24	0.7	1.3
Apr. 1960-Feb. 1961	10	10	10	20	1.0	1.0
Dec. 1969-Nov. 1970	11	8	10	18	1.3	0.9
Nov. 1973-Mar. 1975	16	9	10	19	1.1	0.6
Jan. 1980-Jul. 1980	6	4	6	10	1.5	1.0
Jul. 1981-Nov. 1982	16	17	11	28	0.6	0.7
Jul. 1990-Mar. 1991	8	11	21	32	1.9	2.6
Mar. 2001-Nov. 2001	8	30	18	48	0.6	2.3
Dec. 2007-Jun. 2009	18	25	50	75	2.0	2.8

Source: Authors' calculation for the United States as a whole from Bureau of Labor Statistics data, "Employment, Hours, and Earnings from the Current Employment Statistics," Series ID CES0000000001 (total nonfarm employment, U.S.), accessed April 3, 2015. "Employment downturn" is the number of months from previous employment peak to trough. "Employment recovery" is the number of months from trough until employment reaches its previous peak. "Full Employment Cycle" is the sum, the number of months from peak until employment reaches its previous peak. NBER Recession dates from http://www.nber.org/cycles.html.

Table 2. State Data: Recovery Length, Services, and Goods as a Share of GDP

		Annual values for first year of recession (1969, 1973, 1980, 1990, 2001, 2007)							
		Recovery Length (months)		Total Services / GDP (percent)		Non-Tradable Services / GDP (percent)		Goods / GDP (percent)	
Recession	# of States	Mean (s.d.)	Range	Mean (s.d.)	Range	Mean (s.d.)	Range	Mean (s.d.)	Range
		(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Including all states (n=292)									
Dec. 1969-Nov. 1970	50	7.8 (7.5)	0- 26	49.6 (6.0)	37.5 - 71.5	44.8 (4.8)	34.3 - 58.9	22.8 (10.5)	4.2 - 42.9
Nov. 1973-Mar. 1975	50	10.8 (8.9)	0 - 35	49.8 (6.1)	38.7 - 70	45.1 (5.1)	35.3 - 57.9	20.7 (9.5)	4.0 - 39.2
Jan. 1980-Nov. 1982	50	23.1 (21.4)	0 - 85	52.0 (6.9)	32.4 - 69.9	46.4 (5.6)	29.2 - 57.0	20.1 (8.6)	3.7 - 33.6
Jul. 1990-Mar. 1991	50	18.6 (22.7)	0 - 88	57.3 (7.3)	37.6 - 70.5	50.4 (6.0)	34.1 - 61.0	17.7 (7.1)	3.6 - 30.1
Mar. 2001-Nov. 2001	49	24.3 (13.8)	0 - 54	65.6 (6.5)	50.1 - 79.4	56.5 (5.0)	43.1 - 67.0	13.0 (5.4)	2.1 - 26.7
Dec. 2007-Jun. 2009	43	61.8 (17.3)	16 - 90	66.2 (7.5)	46.6 - 80.1	56.5 (6.6)	39.3 - 68.0	12.2 (5.4)	1.8 - 28.1
Including only states that enter recession & fully recover (n=251)									
Dec. 1969-Nov. 1970	37	9.8 (6.6)	1 - 26	48.7 (4.0)	39.9 - 56.4	44.3 (3.6)	36.2 - 51.7	24.9 (9.6)	4.2 - 42.9
Nov. 1973-Mar. 1975	40	13.5 (7.8)	2 - 35	50.7 (6.1)	41.9 - 70.0	45.9 (5.0)	38.3 - 57.9	22.9 (8.8)	4.0 - 39.2
Jan. 1980-Nov. 1982	44	21.7 (19.7)	1 - 82	52.6 (6.0)	35.7 - 69.9	46.9 (4.6)	33.2 - 55.2	21.1 (8.5)	3.7 - 33.6
Jul. 1990-Mar. 1991	44	21.1 (23.1)	1 - 88	57.7 (7.6)	37.6 - 70.5	50.6 (6.3)	34.1 - 61.0	17.7 (7.5)	3.6 - 30.1
Mar. 2001-Nov. 2001	43	21.8 (10.8)	1 - 49	66.0 (6.1)	57.1 - 79.4	56.7 (4.8)	43.1 - 67.0	12.5 (5.0)	2.1 - 22.9
Dec. 2007-Jun. 2009	43	61.8 (17.3)	16 - 90	66.2 (7.5)	46.6 - 80.1	56.5 (6.6)	39.3 - 68.0	12.2 (5.4)	1.8 - 28.1

Sources: (1) to (2): Authors' calculation from Bureau of Labor Statistics data, "State and Metro Area Employment, Hours, & Earnings" establishment survey for nonfarm employment, Series ID CES0000000001, (http://bls.gov/data/#employment, accessed January 2017). Means are unweighted averages of state data. (3) to (8): Authors' calculation from Bureau of Economic Analysis data, "Gross Domestic Product by State," (http://www.bea.gov/regional/index.htm), accessed July 2016. Raw data are current-dollar GDP by industry by state. Data prior to 1997 use the SIC industrial classification system; subsequent data based on NAICS. Value is for the year the recession begins. Table reports unweighted means across states.

Table 3. Regression Results: Coefficient on Services or Goods under Different Specifications

	Without employment growth trend		*With 5-year employment growth trend*		*With 10-year employment growth trend*	
Data Sample	*OLS*	*IV*	*OLS*	*IV*	*OLS*	*IV*
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Coefficient on Total Services / GDP						
All states (n=249)	0.730*	0.624	0.721*	0.633	0.739*	0.654
	(0.386)	(0.453)	(0.378)	(0.454)	(0.386)	(0.469)
Excluding states that never fully recover (n=239)	0.696*	0.732	0.703*	0.713	0.704*	0.839*
	(0.351)	(0.460)	(0.357)	(0.463)	(0.367)	(0.495)
Excluding states that never enter recession (n=218)	0.659	0.505	0.658	0.547	0.661	0.516
	(0.414)	(0.474)	(0.402)	(0.477)	(0.410)	(0.482)
Including only states that enter recession & fully recover (n=208)	0.649*	0.608	0.641	0.582	0.654	0.694
	(0.385)	(0.481)	(0.392)	(0.489)	(0.402)	(0.519)
Panel B. Coefficient on Non-tradable Services / GDP						
All states (n=249)	0.921**	0.837**	0.896**	0.818*	0.968***	0.939**
	(0.375)	(0.411)	(0.350)	(0.417)	(0.359)	(0.432)
Excluding states that never fully recover (n=239)	0.836**	0.961**	0.922***	0.995**	0.934**	1.225**
	(0.337)	(0.446)	(0.327)	(0.431)	(0.355)	(0.511)
Excluding states that never enter recession (n=218)	0.948**	0.743*	0.874**	0.718	0.982***	0.818*
	(0.394)	(0.440)	(0.363)	(0.450)	(0.362)	(0.461)
Including only states that enter recession & fully recover (n=208)	0.895**	0.867*	0.937**	0.874*	1.053***	1.191**
	(0.369)	(0.478)	(0.361)	(0.475)	(0.362)	(0.489)
Panel C. Coefficient on Goods / GDP						
All states (n=249)	-0.771***	-0.759***	-0.779***	-0.776***	-0.769***	-0.763***
	(0.259)	(0.274)	(0.260)	(0.277)	(0.259)	(0.274)
Excluding states that never fully recover (n=239)	-0.733***	-0.713**	-0.728***	-0.699**	-0.737***	-0.747***
	(0.262)	(0.272)	(0.265)	(0.275)	(0.263)	0.273
Excluding states that never enter recession (n=218)	-0.752**	-0.736**	-0.776**	-0.783**	-0.752**	-0.735**
	(0.284)	(0.299)	(0.291)	(0.311)	(0.287)	(0.300)
Including only states that enter recession & fully recover (n=208)	-0.677**	-0.663**	-0.667**	-0.646**	-0.663**	-0.669**
	(0.280)	(0.295)	(0.284)	(0.300)	(0.279)	(0.295)

Notes: * p < 0.10, ** p< 0.05, *** p < 0.01. Robust standard errors clustered by state in parentheses. "OLS" results measure services or goods share of GDP as average over 3 years before recession begins. "IV" results instrument services or goods share of GDP in the year the recession begins with the 4-, 5-, and 6-year lagged values of services or goods. Non-tradable services excludes accommodations and finance and insurance from Total Services. All regressions include state and recession fixed effects. Additional covariates are depth and length of downturn and, in columns (3)-(6), trend employment growth rate. Full results reported in the Appendix. For states that never enter recession, recovery length equals 0. Sample n=249 excludes MI in 2001. Sample n=239 also excludes NY in 1969, LA, OK, WV, and WY in 1980, and IL, IN, MA, MS and OH in 2001. Sample n=218 excludes AK, AZ, CO, FL, HI, ID, NE, NV, NC, ND, SC, and TN in 1969, AK, ID, LA, NM, ND, OK, TX, UT, WA and WY in 1973, CO and FL in 1980, ID, LA, MN, TX, UT and WA in 1990, and MI and WY in 2001 recession. Sample n=208 also excludes NY in 1969, LA, OK, WV, and WY in 1980, and IL, IN, MA, MS and OH in 2001 recession.

Table 4. Regression Results: All-Sector Analysis of Recovery Length

Dependent Variable: Recovery Length (months)	*All States*		*Excluding States that Never Fully Recover*		*Excluding States that Never Enter Recession*		*Including Only States that Enter Recession and Fully Recover*	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Goods / GDP	<omitted>	-1.179***	<omitted>	-1.060***	<omitted>	-1.099**	<omitted>	-1.017**
		(0.368)		(0.351)		(0.415)		(0.396)
Non-tradable Services /	1.182***	<omitted>	1.062***	<omitted>	1.100**	<omitted>	1.019**	<omitted>
	(0.368)		(0.351)		(0.415)		(0.395)	
Finance / GDP	0.375	-0.805*	0.417	-0.643	0.334	-0.765	0.330	-0.687
	(0.394)	(0.473)	(0.396)	(0.456)	(0.393)	(0.502)	(0.383)	(0.465)
Accommodations / GDP	1.712	0.528	0.392	-0.671	2.557	1.456	1.113	0.093
	(1.634)	(1.528)	(0.931)	(0.807)	(2.312)	(2.268)	(1.393)	(1.336)
Farm / GDP	0.619	-0.558	0.408	-0.650	0.622	-0.476	0.318	-0.697
	(0.495)	(0.611)	(0.431)	(0.541)	(0.573)	(0.706)	(0.462)	(0.614)
Mining / GDP	0.490	-0.690	0.619	-0.441	0.550	-0.549	0.540	-0.477
	(0.480)	(0.633)	(0.390)	(0.475)	(0.523)	(0.656)	(0.426)	(0.527)
Construction / GDP	2.730***	1.551	3.086***	2.026**	2.676**	1.577	3.016***	2.000*
	(0.983)	(1.071)	(0.865)	(0.897)	(1.114)	(1.267)	(0.995)	(1.081)
Government / GDP	0.977**	-0.202	0.633	-0.427	1.109*	0.011	0.460	-0.556
	(0.441)	(0.512)	(0.403)	(0.445)	(0.609)	(0.728)	(0.632)	(0.719)
Depth of downturn	3.425***	3.424***	3.901***	3.900***	3.581***	3.581***	3.994***	3.993***
	(0.691)	(0.691)	(0.617)	(0.617)	(0.735)	(0.735)	(0.703)	(0.702)
Length of downturn	0.180	0.181	0.169	0.169	0.173	0.173	0.157	0.157
	(0.114)	(0.114)	(0.127)	(0.127)	(0.119)	(0.119)	(0.139)	(0.139)
Mean of Dependent Variable (months)	16.9	16.9	15.6	15.6	19.3	19.3	17.9	17.9
n	249	249	239	239	218	218	208	208
Recession FE	yes	yes	yes	yes	yes	yes	yes	yes
State FE	yes	yes	yes	yes	yes	yes	yes	yes
F-statistic	21.3	21.3	34.7	34.6	16.4	16.4	26.8	26.8
Within R^2	0.71	0.71	0.74	0.74	0.69	0.69	0.73	0.73

Notes: * p < 0.10, ** p< 0.05, *** p < 0.01. OLS. Robust standard errors clustered by state in parentheses. Sector shares of GDP are average of 3 years before recession begins. Columns (1) and (2) exclude MI in 2001. Columns (3) and (4) exclude NY in 1969, LA, OK, WV, and WY in 1980, and IL, IN, MA, MS and OH in 2001. Columns (5) and (6) exclude AK, AZ, CO, FL, HI, ID, NE, NV, NC, ND, SC, and TN in 1969, AK, ID, LA, NM, ND, OK, TX, UT, WA and WY in 1973, CO and FL in 1980, ID, LA, MN, TX, UT and WA in 1990, and MI and WY in 2001 recession. Columns (7) and (8) exclude NY in 1969, LA, OK, WV, and WY in 1980, and IL, IN, MA, MS and OH in 2001 recession.

Table 5. Regression Results: Downturn Length, Downturn Depth, and Likelihood of Experiencing Downturn

	Coefficient and (s.d.) on:				
	Total Services / GDP	Non-tradable Services / GDP	Goods / GDP	First-stage F statistic	under ID over ID
Panel A. Downturn Length (months)					
Excluding States that Never Enter Recession (n = 218)	-0.342 (0.451)			33.9	0.012 0.937
		-0.524 (0.501)		49.2	0.005 0.945
			-0.085 (0.232)	182.1	0.000 0.695
Including Only States that Enter Recession and Fully Recover (n = 208)	-0.299 (0.442)			33.1	0.015 0.929
		-0.390 (0.486)		52.0	0.006 0.856
			-0.066 (0.230)	198.3	0.001 0.197
Panel B. Downturn Depth (percent decline)					
Excluding States that Never Enter Recession (n = 218)	-0.088 (0.080)			33.9	0.012 0.969
		-0.150* (0.087)		49.2	0.005 0.623
			0.026 (0.036)	81.8	0.001 0.374
Including Only States that Enter Recession and Fully Recover (n = 208)	-0.079 (0.076)			33.1	0.015 0.711
		-0.113 (0.081)		52.0	0.006 0.430
			0.032 (0.040)	80.6	0.002 0.322
Panel C. 0/1 Experiences Downturn					
All States, including state FE (n = 250)	-0.042 (0.062)			0.26	
		-0.063 (0.070)		0.27	
			-0.090 (0.139)	0.27	
Excluding states that never fully recover, including state FE (n = 239)	-0.025 (0.070)			0.25	
		-0.046 (0.078)		0.25	
			-0.097 (0.141)	0.25	

Notes: * p < 0.10, ** p< 0.05, *** p < 0.01. Panels A and B estimated with 2SLS using 5th and 6th lagged values of sector share to instrument for sector share in the year the recession began. Panel C estimated with clogit. All regressions includes state and recession fixed effects. Robust standard errors clustered by state in parentheses. Samples exclude 2007 recession. Sample size n=218 excludes AK, AZ, CO, FL, HI, ID, NE, NV, NC, ND, SC, and TN in 1969; AK, ID, LA, NM, ND, OK, TX, UT, WA and WY in 1973; CO and FL in 1980; ID, LA, MN, TX, UT and WA in 1990; and MI and WY in 2001 recession. Sample size n=208 also excludes NY in 1969; LA, OK, WV, and WY in 1980; and IL, IN, MA, MS and OH in 2001 recession. Sample size n=249 excludes MI in 2001. Sample size n=239 excludes NY in 1969; LA, OK, WV, and WY in 1980; and IL, IN, MA, MI, MS and OH in 2001.

Table 6. Counterfactual Analysis: Effect of the Changes in Services or Goods on Recovery Length

		Predicted 2007 Recovery (months)	Counterfactual 2007 Recovery (months)	Marginal Impact of Non-Tradable Services on Recovery (months)	Marginal Impact of Non-Tradable Services on Recovery (percent)
All States (n = 249)	Total Services	47.6	33.7	13.8	41%
	Non-Tradable Services	45.3	32.8	12.5	38%
	Goods	42.5	31.0	11.4	37%
	All-Sector Results	46.7	29.6	17.1	58%
Excluding States that Never Fully Recover (n = 239)	Total Services	50.4	37.2	13.2	35%
	Non-Tradable Services	47.6	36.3	11.3	31%
	Goods	45.8	34.9	10.9	31%
	All-Sector Results	46.6	31.1	15.5	50%
Excluding States that Never Enter Recession (n = 218)	Total Services	46.5	34.0	12.5	37%
	Non-Tradable Services	46.0	33.2	12.8	39%
	Goods	43.6	32.5	11.2	34%
	All-Sector Results	48.6	32.3	16.3	51%
Including Only States that Enter Recession and Fully Recover (n = 208)	Total Services	49.0	36.7	12.3	34%
	Non-Tradable Services	48.0	35.9	12.1	34%
	Goods	45.5	35.5	10.0	28%
	All-Sector Results	48.3	32.9	15.3	47%

Source: Authors' calculations from OLS regression results reported in Table 3, Panels A-B-C, column (1) and Table 4, odd-numbered columns. Predicted value for 2007 uses actual values of the independent variables for the U.S. as a whole for the 2007-2009 downturn. Counterfactual value uses services or goods share of GDP for U.S. as a whole for 1955-1957 and actual values for U.S. as a whole for 2007-2009 downturn for all other independent variables.

Table 7. Regression Results: Non-Tradable Services Coefficients when Recovery Length Allowed to Vary Randomly

Sample	Coefficient estimates reported from 500 simulations	Recovery length allowed to vary +/- 3 months (500 simulations)	Recovery length allowed to vary +/- 6 months (500 simulations)	Recovery length allowed to vary +/- 9 months (500 simulations)	Recovery length allowed to vary +/- 12 months (500 simulations)
		(1)	*(2)*	*(3)*	*(4)*
All states (n = 249)	Baseline (Table 3)	0.921** (0.375)	0.921** (0.375)	0.921** (0.375)	0.921** (0.375)
	Mean	0.920	0.919	0.922	0.928
	Min, Max	0.706, 1.090	0.507, 1.318	0.333, 1.553	0.086, 1.766
	P10, P90	0.831, 1.015	0.757, 1.086	0.680, 1.153	0.603, 1.273
Excluding states that never fully recover (n=239)	Baseline (Table 3)	0.836** (0.337)	0.836** (0.337)	0.836** (0.337)	0.836** (0.337)
	Mean	0.839	0.827	0.823	0.829
	Min, Max	0.616, 1.034	0.325, 1.167	0.250, 1.364	0.167, 1.595
	P10, P90	0.745, 0.930	0.659, 0.982	0.587, 1.040	0.520, 1.168
Excluding states that never enter recession (n=218)	Baseline (Table 3)	0.948** (0.394)	0.948** (0.394)	0.948** (0.394)	0.948** (0.394)
	Mean	0.947	0.943	0.954	0.961
	Min, Max	0.718, 1.140	0.462, 1.436	0.202, 1.658	0.114, 1.780
	P10, P90	0.849, 1.050	0.762, 1.141	0.698, 1.204	0.611, 1.327
Including only states that enter recession & fully recover (n=208)	Baseline (Table 3)	0.895** (0.369)	0.895** (0.369)	0.895** (0.369)	0.895** (0.369)
	Mean	0.901	0.886	0.886	0.894
	Min, Max	0.661, 1.112	0.385, 1.321	0.254, 1.518	0.222, 1.575
	P10, P90	0.795, 1.004	0.694, 1.067	0.615, 1.145	0.566, 1.249

Notes: * p < 0.10, ** p< 0.05, *** p < 0.01. Based on OLS regressions of recovery length on non-tradable services share, recession length, recession depth, with state and recession fixed effects. Shares of GDP are average of 3 years before recession begins. For each data restriction, "baseline" reports the coefficient and robust standard error from Table 3, column 1, which used original data. "Mean, min, max, P10, and P90" are estimated coefficients from running the same regression 500 times, each with a different random adjustment to the dependent variable (recovery length) within the range noted in the table heading.

Table 8. Regression Results: Breaking Out the Goods Sector

Dependent Variable: Recovery Length (months)	*All States*		*Excluding States that Never Fully Recover*		*Excluding States that Never Enter Recession*		*Including Only States that Enter Recession and Fully Recover*	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Goods / GDP	-1.179***		-1.060***		-1.099**		-1.017**	
	(0.368)		(0.351)		(0.415)		(0.396)	
Durable Goods / GDP		-1.130***		-1.065**		-1.013**		-1.011**
		(0.393)		(0.403)		(0.439)		(0.441)
Nondurable Goods / GDP		-1.269**		-1.052**		-1.277**		-1.031*
		(0.532)		(0.440)		(0.632)		(0.546)
Finance / GDP	-0.805*	-0.825*	-0.643	-0.642	-0.765	-0.804	-0.687	-0.691
	(0.473)	(0.488)	(0.456)	(0.464)	(0.502)	(0.527)	(0.465)	(0.484)
Accommodations / GDP	0.528	0.552	-0.671	-0.676	1.456	1.545	0.093	0.100
	(1.528)	(1.550)	(0.807)	(0.802)	(2.268)	(2.307)	(1.336)	(1.334)
Farm / GDP	-0.558	-0.554	-0.650	-0.651	-0.476	-0.477	-0.697	-0.698
	(0.611)	(0.609)	(0.541)	(0.543)	(0.706)	(0.705)	(0.614)	(0.615)
Mining / GDP	-0.690	-0.681	-0.441	-0.442	-0.549	-0.538	-0.477	-0.477
	(0.633)	(0.624)	(0.475)	(0.476)	(0.656)	(0.652)	(0.527)	(0.527)
Construction / GDP	1.551	1.550	2.026**	2.026**	1.577	1.580	2.000*	1.998*
	(1.071)	(1.074)	(0.897)	(0.898)	(1.267)	(1.265)	(1.081)	(1.082)
Government / GDP	-0.202	-0.180	-0.427	-0.429	0.011	0.082	-0.556	-0.552
	(0.512)	(0.498)	(0.445)	(0.449)	(0.728)	(0.715)	(0.719)	(0.734)
Depth of downturn	3.424***	3.412***	3.900***	3.901***	3.581***	3.564***	3.993***	3.992***
	(0.691)	(0.705)	(0.617)	(0.617)	(0.735)	(0.744)	(0.702)	(0.705)
Length of downturn	0.181	0.181	0.169	0.169	0.173	0.175	0.157	0.157
	(0.114)	(0.114)	(0.127)	(0.128)	(0.119)	(0.119)	(0.139)	(0.139)
Mean of Dependent Variable (months)	16.9	16.9	15.6	15.6	19.3	19.3	17.9	17.9
n	249	249	239	239	218	218	208	208
Recession FE	yes	yes	yes	yes	yes	yes	yes	yes
State FE	yes	yes	yes	yes	yes	yes	yes	yes
F-statistic	21.3	20.1	34.6	32.3	16.4	15.6	26.8	24.8
Within R^2	0.71	0.71	0.74	0.74	0.69	0.69	0.73	0.73

Notes: * p < 0.10, ** p< 0.05, *** p < 0.01. Omitted category is non-tradable services / GDP. Estimated with OLS. Robust standard errors clustered by state in parentheses. Sector shares of GDP are average of 3 years before recession begins. Columns (1) and (2) exclude MI in 2001. Columns (3) and (4) exclude NY in 1969, LA, OK, WV, and WY in 1980, and IL, IN, MA, MS and OH in 2001. Columns (5) and (6) exclude AK, AZ, CO, FL, HI, ID, NE, NV, NC, ND, SC, and TN in 1969, AK, ID, LA, NM, ND, OK, TX, UT, WA and WY in 1973, CO and FL in 1980, ID, LA, MN, TX, UT and WA in 1990, and MI and WY in 2001 recession. Columns (7) and (8) exclude NY in 1969, LA, OK, WV, and WY in 1980, and IL, IN, MA, MS and OH in 2001 recession.

Table 9. Regression Results: Coefficient on Services or Goods When Including 2007-09 Recession

	Without employment growth trend		*With 5-year employment growth trend*		*With 10-year employment growth trend*	
Data Sample	*OLS*	*IV*	*OLS*	*IV*	*OLS*	*IV*
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Coefficient on Total Services / GDP						
All states (n=292)	0.818**	0.664	0.800**	0.654	0.818**	0.672
	(0.346)	(0.418)	(0.338)	(0.415)	(0.347)	(0.424)
Excluding states that never fully recover (n=282)	0.825**	0.736*	0.831**	0.736*	0.820**	0.778*
	(0.336)	(0.429)	(0.340)	(0.431)	(0.342)	(0.446)
Excluding states that never enter recession (n=261)	0.757**	0.533	0.746**	0.541	0.758**	0.533
	(0.375)	(0.431)	(0.362)	(0.430)	(0.375)	(0.433)
Including only states that enter recession & fully recover (n=251)	0.794**	0.602	0.794**	0.600	0.782**	0.635
	(0.371)	(0.442)	(0.371)	(0.442)	(0.377)	(0.460)
Panel B. Coefficient on Non-tradable Services / GDP						
All states (n=292)	1.106***	0.948***	1.062***	0.898***	1.124***	0.995***
	(0.254)	(0.305)	(0.245)	(0.312)	(0.252)	(0.328)
Excluding states that never fully recover (n=282)	1.100***	1.059***	1.148***	1.082***	1.154***	1.198***
	(0.233)	(0.312)	(0.235)	(0.310)	(0.248)	(0.356)
Excluding states that never enter recession (n=261)	1.173***	0.878***	1.088***	0.812**	1.184***	0.919***
	(0.246)	(0.303)	(0.229)	(0.314)	(0.235)	(0.324)
Including only states that enter recession & fully recover (n=251)	1.203***	0.989***	1.219***	0.985***	1.286***	1.183***
	(0.229)	(0.301)	(0.226)	(0.302)	(0.221)	(0.306)
Panel C. Coefficient on Goods / GDP						
All states (n=292)	-0.822***	-0.832***	-0.822***	-0.840***	-0.823***	-0.834***
	(0.224)	(0.248)	(0.222)	(0.248)	(0.225)	(0.249)
Excluding states that never fully recover (n=282)	-0.837***	-0.834***	-0.839***	-0.834***	-0.831***	-0.840***
	(0.228)	(0.251)	(0.230)	(0.252)	(0.230)	(0.251)
Excluding states that never enter recession (n=261)	-0.801***	-0.791***	-0.811***	-0.815***	-0.807***	-0.796***
	(0.242)	(0.268)	(0.239)	(0.271)	(0.247)	(0.272)
Including only states that enter recession & fully recover (n=251)	-0.809***	-0.785***	-0.809***	-0.785***	-0.789***	-0.772***
	(0.244)	(0.271)	(0.244)	(0.272)	(0.244)	(0.271)

Notes: * p < 0.10, ** p< 0.05, *** p < 0.01. Robust standard errors clustered by state in parentheses. "OLS" results measure services or goods share of GDP as average over 3 years before recession begins. "IV" results instrument services or goods share of GDP in the year the recession begins with the 4-, 5-, and 6-year lagged values of services or goods. Non-tradable services excludes accommodations and finance and insurance from Total Services. All regressions include state and recession fixed effects. Additional covariates are depth and length of downturn and, in columns (3)-(6), trend employment growth rate. For states that never enter recession, recovery length equals 0. Sample n=292 excludes MI in 2001, and AL, ME, MI, MS, NM, RI, and WY in 2007. Sample n=282 also excludes NY in 1969, LA, OK, WV, and WY in 1980, and IL, IN, MA, MS and OH in 2001. Sample n=261 excludes AK, AZ, CO, FL, HI, ID, NE, NV, NC, ND, SC, and TN in 1969, AK, ID, LA, NM, ND, OK, TX, UT, WA and WY in 1973, CO and FL in 1980, ID, LA, MN, TX, UT and WA in 1990, MI and WY in 2001 recession, and AL, ME, MI, MS, NM, RI, and WY in 2007. Sample n=251 also excludes NY in 1969, LA, OK, WV, and WY in 1980, and IL, IN, MA, MS and OH in 2001 recession.

Table 10. Contributions to Output, Benchmark Years, 1947-2012

	Output of Goods				Output of Services			
	% of inputs that are				% of inputs that are			
	Agriculture & Mining	Goods	Services	Value Added	Agriculture & Mining	Goods	Services	Value Added
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
1947	13.6	36.2	11.0	36.3	2.1	12.2	20.1	65.1
1967	7.0	38.3	13.4	38.6	1.2	10.2	23.0	65.0
1987	6.5	33.7	17.3	42.0	0.9	8.5	24.6	65.5
1992	6.2	34.2	19.4	39.9	1.1	7.4	23.2	67.9
1997	6.0	35.5	24.0	34.1	0.7	6.1	25.8	67.0
2002	6.0	33.1	22.0	38.4	0.6	6.6	29.2	63.0
2007	9.5	33.5	20.7	35.9	0.8	7.2	30.4	61.1
2012	12.4	31.8	17.7	37.6	0.4	7.5	29.3	62.4

Source: Authors' calculation. 1947 and 1967 data from U.S. Bureau of the Census, *Historical Statistics of the United States: Colonial Times to 1970*, Series F668-696. 1987 to 2012 data from Bureau of Economic Analysis, "Input-Output Accounts Data" (http://www.bea.gov/industry/io_annual.htm, accessed April 2015). Inputs by industry aggregated into the three categories shown. Goods includes construction and manufacturing; services includes utilities, transportation, government, and other services.