



Economic Letter

Global and National Shocks Explain A Large Share of State Job Growth

by Alexander Chudik, Janet Koech and Mark A. Wynne

ABSTRACT: Global and U.S. national shocks on average appear to equally explain more than half of the fluctuations in state employment growth, an important measure of assessing real economic activity. The overall assessment, however, conceals a wide variation among states.

Employment growth is a widely used and closely watched indicator of real economic activity at the state level. Booms are associated with rapid employment growth, while recessions are associated with job losses.

Employment growth in Texas, for example, has run at almost twice the average rate of growth in the United States as a whole since 1990. During the 2007–09 recession, job losses in Texas were less than the national average.

There is considerable variation in the rate of job gains and losses across the 50 states during the business cycle (*Chart 1*). The gap between states with the most job increases and the least, as measured by year-over-year employment growth, averaged 8.3 percentage points from 1980 through 2016. These variations can contribute to large differences in state unemployment rates.¹

What accounts for these differences? A state's rate of employment growth ultimately reflects its economic structure and the economic shocks impacting it. Both of these, in turn, are influenced by increased integration of the global economy over roughly the past quarter century, a process commonly referred to as globalization.

Globalization affects not just national economies, but also those of individual

states. Texas exported more than \$230 billion worth of goods to the rest of the world in 2016. So it is expected that employment growth in Texas would at least somewhat reflect global economic developments.

At the same time, Texas trades extensively with the rest of the U.S.—commerce that is greatly facilitated by the absence of trade barriers between states and by the sharing of a single currency. Thus, the national business cycle also affects Texas employment growth.

This leads to the question: What is the relative importance of global economic shocks, national economic shocks and residual shocks in accounting for employment growth fluctuations across the 50 states?

New econometric techniques provide some guidance. They reveal that global output shocks account for a quarter of the fluctuations in employment growth across states, with national shocks contributing a slightly higher share at 30.7 percent. The remaining unexplained portion—44.5 percent—results from any other shocks affecting the states (*Chart 2*).²

Measuring Shocks

Identifying shocks is a challenging fundamental problem in empirical research and a major source of dispute among economists. In this context, global output shocks are identified as

the shocks to real (inflation adjusted) gross domestic product (GDP) in an aggregate of 21 foreign countries. This grouping includes a mix of developed and emerging-market economies that collectively accounted for half of global GDP in 2016.³

National shocks are identified as shocks to U.S. national employment and output that cannot be accounted for by

the global shocks. And finally, residual shocks are constructed as the remainder term accounting for state employment growth fluctuations that cannot be explained by global and national output and employment growth fluctuations.

An econometric model known as a global vector autoregression (GVAR) is used to estimate contributions of these shocks to employment growth fluctua-

tions and to quantify the impact of these shocks. An advantage of the GVAR model is that it allows for rich interactions between countries and states.⁴ We estimate the model using quarterly growth rates from third quarter 1980 to fourth quarter 2016.

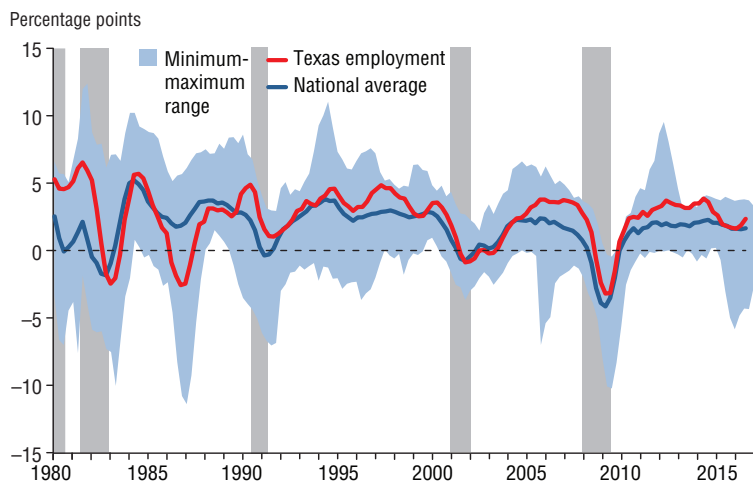
Which Shocks Matter?

While global output shocks account for 25 percent of the average share of variation in employment growth, large differences exist among states—from a low of 0.3 percent in Alaska to a high of 42.6 percent in Illinois.

Global output shocks play essentially no role in explaining employment growth fluctuations in the District of Columbia, North Dakota, Louisiana and West Virginia as well as Alaska. Given the importance of federal government employment in the District of Columbia, it is perhaps not surprising that global output shocks play a small role in employment growth fluctuations there.

What Alaska, North Dakota and Louisiana have in common is that they are big energy states. Employment in these states may be more dependent on technological innovations in crude oil extraction and the price of oil than on global and national business cycles. In Texas, over a third of employment growth

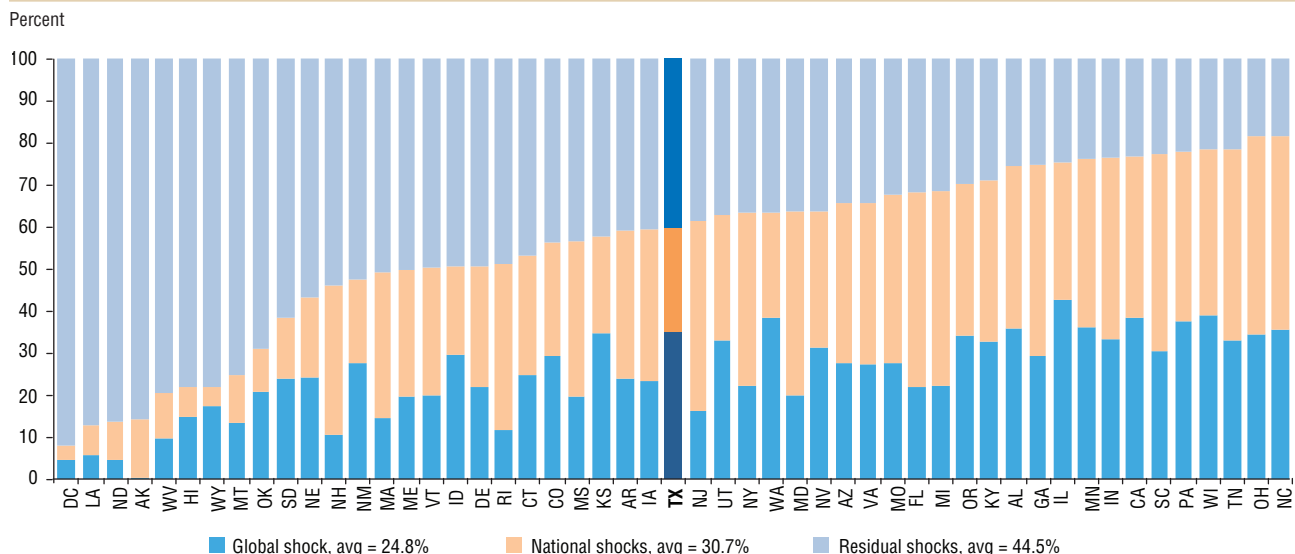
Chart 1 U.S. Employment Growth Gap Varies Across States



NOTES: Employment fluctuations are computed as year-over-year growth in quarterly nonfarm payroll employment. Shaded bars indicate U.S. recessions.

SOURCES: Bureau of Labor Statistics; Haver Analytics; authors' calculations.

Chart 2 Global, National and Residual Shocks Explain States' Employment Variation



SOURCE: Authors' calculations.

fluctuations are explained by global output shocks.

National shocks contribute an average of 30.7 percent to overall fluctuations in state employment growth. Interestingly, some of the same areas—the District of Columbia, North Dakota, Louisiana and West Virginia—that seem to be relatively immune to global output shocks are also immune to U.S. national shocks. National shocks also seem to play a relatively small role in explaining employment growth fluctuations in Wyoming, Hawaii, Oklahoma and Montana.

States most impacted by national shocks include Ohio, South Carolina, Michigan, Florida and North Carolina. National shocks explain about a quarter (24.7 percent) of employment growth fluctuations in Texas, well below the average share across states.

The share of employment growth fluctuations not explained by either global or national shocks is attributed to residual shocks. Residual shocks are most important in the District of Columbia (accounting for about 92 percent of employment growth fluctuations) and in the energy states of Louisiana, North Dakota and Alaska (where these shocks explain upwards of 80 percent of the fluctuations).

Conversely, North Carolina, Ohio, Tennessee, Wisconsin and Pennsylvania

have the lowest shares of employment growth fluctuations explained by residual shocks. These shares are less than half the average size of shares across all states. Residual shocks explain 40 percent of Texas' employment growth fluctuations, slightly below the national average.

Impact over Time

A natural follow-up question is how all of these shocks play out over time. What is the cumulative effect over four quarters of a global output shock on employment growth?

Based on the model, Chart 3 shows the effect of a 0.5 percent *negative* global output growth surprise on state employment levels four quarters after the shock. These types of simulations, known as impulse-response functions, show the deviations of employment growth from baseline projections as a sole consequence of the considered global output shock.

The findings indicate that the total effect after a year is negative for employment growth across all states except Alaska, where the estimated effect is not statistically significantly different from zero. The expected effect of a surprise slowdown in global output growth is most pronounced over a year in Nevada (down 1.4 percent), Wyoming (down 1.3

percent) and Idaho (down 1.2 percent). This is equivalent to a loss of between 3,500 and 18,100 jobs.

States less affected by a slowdown in foreign economies are Alaska, the District of Columbia, North Dakota and New Jersey. Employment in Texas is expected to fall 0.93 percent following a 0.5 percent surprise decline in aggregate foreign output. Texas' employment drop over four quarters is larger than the national average of 0.79 percent and equivalent to a loss of 111,700 jobs.⁵

Decomposing Texas Job Growth

Global and national business cycles have contributed to Texas' employment growth in varying amounts (*Chart 4*). A slow global economic recovery has held back the state's employment growth since 2012, while national factors have positively contributed to it.

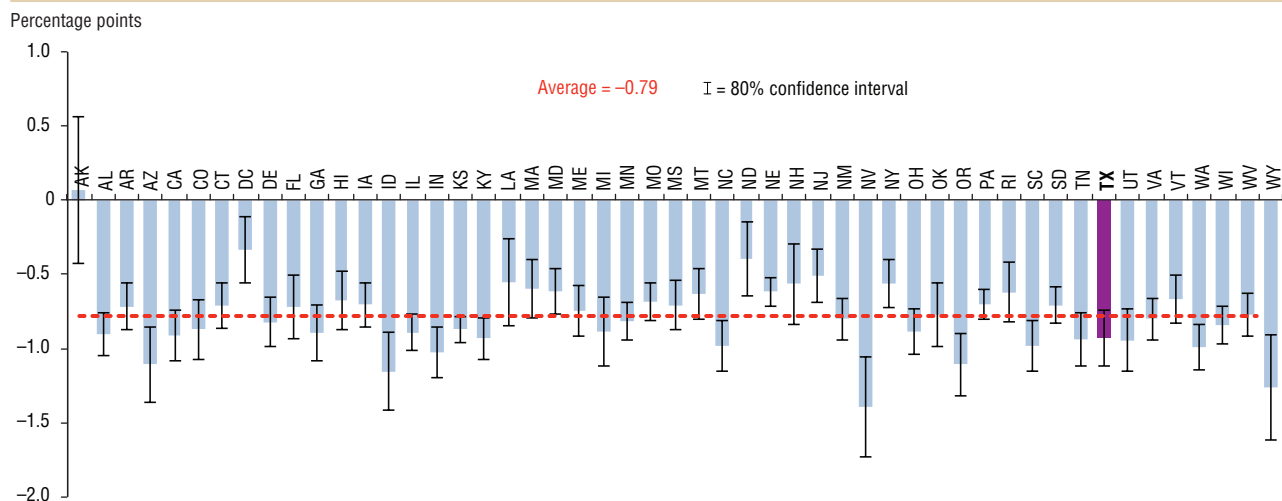
During the global financial crisis, Texas' employment growth fell sharply, dragged lower by both global and national factors, while residual factors seem to have contributed positively to employment growth during the period and since.

Geographic Differences

The impact of the global business cycle on job gains and losses in

Chart 3

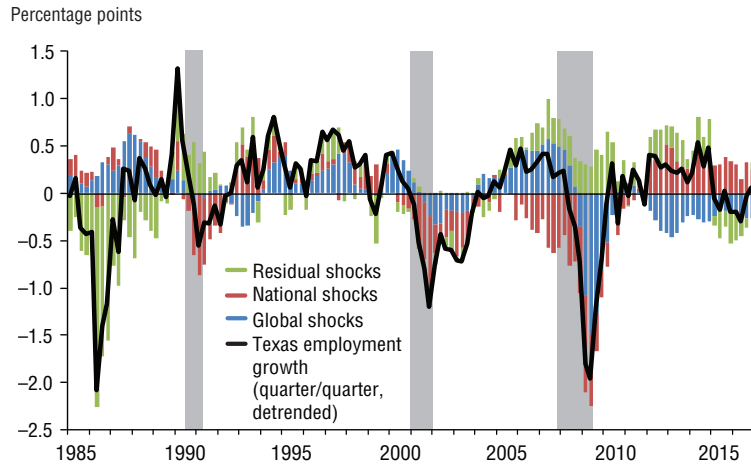
Effect of a 0.5% Negative Shock to Foreign Output on U.S. States' Employment Level One Year Later (Cumulative effect one year after shock—deviations from baseline)



NOTES: A one-year cumulative impact on national employment growth is -0.81 percent, and a one-year cumulative impact on foreign output growth is -1.16 percent. The 0.5 percentage-point magnitude of the shock is relatively large given that the sample standard deviation (a statistical measure of a standard size of a shock) is 0.35 percentage points.

SOURCE: Authors' calculations.

Chart 4 Texas Employment Growth Reflects Contributions of Various Shocks



NOTES: Texas employment growth is detrended by subtracting the historical average. Shaded bars indicate U.S. recessions.

SOURCE: Authors' calculations.

individual U.S. states is not negligible, accounting for about a quarter of individual state-level fluctuations, on average, and slightly less than the contribution of the national business cycle.

The effects of global and national business cycles are, at the same time, highly heterogeneous across the U.S. states. Among Federal Reserve policymakers, understanding such asymmetries is important to achieving a better understanding of geographic propagation of U.S. monetary policy. Industry structure, trade and financial linkages,

and demographic factors might provide additional insight into such state-by-state differences. Such relationships may be the subject of future research.

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Notes

¹ During the global financial crisis, for example, Michigan recorded the highest unemployment rate of 14.9 percent and North Dakota the lowest at 4.2 percent in June 2009. That gap between the highest and lowest unemployment rates across U.S. states had fallen substantially to just 4 percentage points by the end of 2016.

² Fluctuations in state employment growth not explained by global business-cycle movements or movements in the national business cycle are attributed to residual shocks. For instance, oil price movements impacting state employment that are not captured by global or national shocks are attributed to the residual shock.

³ Real GDP for the following countries were included in the estimation of the global output shock: Argentina, Australia, Austria, Belgium, Canada, China, Colombia, France, Germany, Italy, Japan, Korea, Mexico, Netherlands, Peru, Portugal, South Africa, Spain, Sweden, Switzerland and the United Kingdom.

⁴ An overview of the GVAR approach is provided by "Theory and Practice of GVAR Modelling," by Alexander Chudik and M. Hashem Pesaran, *Journal of Economic Surveys*, vol. 30, no. 1, 2016, pp. 165–97.

⁵ The model used is symmetric, and the effects of positive output growth surprises will be positive, with magnitudes equal to those from the effects of negative output growth surprises.

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