

# A Confluence of Events?

## Explaining Fluctuations in Local Employment

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ocal economies are subject to different types of shocks. Usually, the fortunes of local economies depend on a confluence of national, sectoral, and local shocks.

That raises a question: Does one type of shock systematically buffet local economies more than another? The answer has important implications for both academic researchers and policymakers. Jerry Carlino examines the evidence to see which type of shock most likely explains fluctuations in local employment.

In the late 1980s residents of Los Angeles saw an ominous cloud forming over the city. The local housing market, which for the previous several years had been red hot, began to falter. Soon, Angelinos would have to deal with the unthinkable — declining housing prices and a generally worsening regional economy.

The loss of the area's economic vigor had several sources. For one, Congress had been rolling back some of the increased defense spending it had legislated earlier in the decade, in response to the public outcry over large and growing federal budget deficits.



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Because the defense sector has a large presence in southern California, the cutbacks meant widespread job losses and decreased disposable income.<sup>1</sup>

Problems in the banking sector added insult to injury. Loan defaults by Mexico and other developing countries combined with significant problems from the savings and loan crisis led to a noticeable contraction of employment and output in the financial services industry. Finally, the national economy went into a recession in 1991 causing the Los Angeles economy to stumble further.

<sup>1</sup> A sector consists of a group of industries whose firms produce a similar good or service. Nonagricultural employment is grouped into one of eight broad employment categories: government; mining; construction; transportation and public utilities; manufacturing; wholesale and retail trade; finance, insurance, and real estate; and nonfinancial services.

Throw in an earthquake or two, and the southern California economy was in serious trouble.

While the particulars of the preceding example are unique, virtually all local economies face the general experience much of the time. That is, local economic fortunes depend on a confluence of national events (for example, changes in interest rates), sectoral events (for example, changes in the defense and financial services industries), and local events (for example, earthquakes).

Some events, of course, are more important than others, depending on the time and place. But a question does arise: Does one type of shock, or disturbance, systematically buffet local economies more than another type? For example, do national events affect local economies more than sectoral ones do?

The answer has important and interesting implications, both for academic researchers who attempt to better understand the nature and sources of business cycles and for policymakers who wish to diminish the resulting swings in employment and output. For example, if national shocks were mainly the culprit, perhaps a monetary or fiscal policy action would be most helpful. If, however, disturbances to specific sectors were the main driver of fluctuations in activity, perhaps a policy that helped workers move from an economically troubled sector to a healthier one would be the better choice.

### TYPES OF ECONOMIC SHOCKS

The phrase “economic shock” represents economists’ shorthand for a

factor or force that causes unexpected changes in economic variables. When studying changes in local employment, economists usually discuss three types of shocks. The first is a national, or aggregate, disturbance, such as a monetary or fiscal policy action, that typically affects all industries. Although the shock is national in origin, its impact will be felt locally and will cause fluctuations in local employment, albeit to different degrees in each locality.

In a 1998 study, Robert DeFina and I found that shocks to interest rates induced by changes in monetary policy affected different regions in quantitatively distinct ways, primarily because of differences in industry mix across regions. Personal income in the Great Lakes region, for example, showed the largest response to an unexpected increase of 1 percentage point in the federal funds rate: It dropped almost 50 percent more than did income at the national level. Personal income in the Rocky Mountain and Southwest regions, by contrast, responded only half as much as national income.

A second type of shock is one that affects a specific industry, such as a change in defense spending, the imposition of a tariff on particular imported goods, or a strike by workers in a particular sector, such as the automobile industry. Shocks that affect a specific sector of the economy will also have differing local effects because of variations in the concentration of industries. Mark Hooker and Michael Knetter found that changes in national military procurement spending have a modest impact on employment in most states but a sizable impact on those states that depend heavily on the military. Hooker and Knetter also found that changes in military spending have an asymmetric impact on income and employment: Large cutbacks in military spending have proportionately greater effects than do large awards.

As another example, the recently imposed tariffs on imported steel will have a larger effect in steel-producing states such as Pennsylvania, Ohio, and West Virginia, than in other locales. The 1996 strike at a General Motors brake plant in Dayton, Ohio, which crippled General Motors' North American operations, adversely affected

national versus sectoral shocks.<sup>3</sup> The majority of this work has used quarterly or annual data and data that cover the nation and broad regional areas, such as the regions defined by the Bureau of Economic Analysis (BEA).<sup>4</sup> These studies have generally found that national shocks account for slightly more than one-half of the variation in

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the economies in both southeastern Michigan and northeastern Ohio.

The third type of economic shock is one that directly affects the locality itself: the San Francisco earthquake and fire of 1906 or the flooding that has recently afflicted Prague. The imposition or elimination of taxes by a municipal government also directly affects the local economy, as can passage of “living wage” legislation, which mandates that firms pay wages higher than the national minimum wage.<sup>2</sup>

### **SORTING OUT SOURCES OF LOCAL EMPLOYMENT FLUCTUATIONS**

Economists have conducted a substantial amount of research trying to sort out how much of the fluctuations in employment growth at the national, regional, and local levels is due to

economic activity. However, the particular data that underpin the analyses turn out to have an important influence on the studies' conclusions. Some very recent studies that look at monthly data, instead of quarterly or annual, for smaller geographical areas (cities and metropolitan areas) have found a considerably smaller role for national shocks and a correspondingly higher one for sectoral shocks.

**Studies Using Quarterly and Annual Data for Regions.** In an influential article, David Lilien suggested that frictions associated with the reallocation of workers across industries in the economy accounted for a substantial portion of fluctuations in aggregate unemployment. Lilien's paper inspired a considerable amount of research examining the extent to which sectoral disturbances contribute to fluctuations in national economic

<sup>2</sup> In December 1994, Baltimore Mayor Kurt Schmoke signed into law one of the nation's first living wage ordinances. Nearly 40 cities have passed some form of living wage law since then. According to David Neumark, these ordinances entail much higher wage requirements than traditional minimum wage legislation.

<sup>3</sup> Much less research has focused on identifying how much of the fluctuations in employment growth in metropolitan areas is due to the effects of local shocks, such as natural disasters.

<sup>4</sup> The BEA regions are New England, Mideast, Great Lakes, Plains, Southeast, Southwest, Rocky Mountain, and Far West.

activity. A majority of the studies indicate that sector-specific shocks play an important role in variations in employment and output for the national economy. In a 1996 review of the literature, Michael Horvath and Randal Verbrugge concluded that, on average, 40 percent to 45 percent of the variation in total economic activity in the nation could be attributed to sectoral shocks.

The majority of studies done at the sub-national level have looked at broad regions. A number of these studies have looked at the extent to which sector-specific disturbances contribute to fluctuations in employment or output in each of the major regions of the United States.<sup>5</sup> These studies indicate that sector-specific disturbances account for between 35 percent and 67 percent of total variation in regional economic activity. Taking an average across these studies indicates that about 45 percent of regional fluctuations in output or employment can be attributed to sectoral shocks, roughly the same average that other studies have found for the nation. Several studies that looked at the issue for Canadian regions produced estimates that also yielded an average of 45 percent.<sup>6</sup>

**Some Shortcomings of Regional Studies.** The studies just reviewed indicate that sectoral shocks explain approximately one-half of fluctuations in regional economic activity. There are reasons, though, to suspect that studies based on quarterly or annual data for broad regions systematically understate the role of sectoral shocks. Michael Horvath and

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<sup>5</sup> See the articles by Stefan Norrbin and Don Schlagenhauf; Todd Clark; Clark and Kwanho Shin; and Tamin Bayoumi and Eswar Prasad.

<sup>6</sup> See the article by Joseph Altonji and John Ham and the one by Eswar Prasad and Alun Thomas. See Clark and Shin's article for an excellent review of the literature.

Randal Verbrugge pointed out that studies based on quarterly or annual data might erroneously characterize shocks that actually have origins in a specific sector as having a common, non-sector-specific source. Over time, shocks initially specific to an industry tend to be transmitted to other industries through trade. For example, a

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strike in the automobile industry will eventually affect employment in the steel, rubber, glass, and plastics industries and in all the other industries that supply inputs to auto producers. In turn, firms in industries that supply goods and services to the steel, rubber, glass, and plastics industries will be affected, and so on. If these disturbances propagate rapidly — say, within one quarter — disturbances initially specific to a sector (autos, in our example) will appear as a national shock (because it directly or indirectly affects other industries) in studies that use quarterly data.

In addition, by using data for broad regions, these studies run the risk of further tilting the findings to favor the influence of national shocks. That's because it's possible that positive disturbances to an industry in one area of a broad region (such as a BEA region) are likely to be offset by negative disturbances to that industry in other

areas of that region. Suppose a steel producer closes its Pittsburgh operation, resulting in a loss of 5000 jobs in the steel industry in the Pittsburgh metropolitan area. At the same time, an expansion of an existing steel plant in Philadelphia results in 5000 additional jobs in the Philadelphia metropolitan area. This change would leave steel employment in Pennsylvania unaffected. But steel employment (and total employment) in the Pittsburgh area would fall, while steel employment (and total employment) in the Philadelphia area would rise. Thus, the measured effects of shocks that have their origins in a specific industry are likely to be much smaller for broad regions than for local areas within the region.

**Studies Using Monthly City and MSA Data.** As an alternative to the approaches used in the previously discussed studies, we can examine monthly data on employment in cities or in metropolitan statistical areas (MSAs). Using monthly data limits the problem of shocks that are rapidly transmitted to other sectors; using city or MSA data limits the possibility that shocks within a broader region cancel each other out.

A 1999 study by Ed Coulson and a study that I did with Robert DeFina and Keith Sill overcame some of the data issues by looking at monthly data for sectors in cities (Coulson's study) and sectors in MSAs (our study). Both studies used a statistical technique known as a vector autoregression (VAR).<sup>7</sup> Coulson's study looked at employment growth in eight broad sectors in four cities (Baltimore, Denver, Houston, and New York).<sup>8</sup> The model

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<sup>7</sup> A VAR is a widely used modeling technique for gathering evidence on business-cycle dynamics. VARs typically rely on a small number of variables expressed as past values of the dependent variable and past values of the other variables in the model. See Theodore Crone's article for a discussion of VARs as applied to regional analysis.

for each city included 16 equations, one equation for local employment in each of the eight sectors to capture local disturbances plus one equation for national employment in each of the eight sectors to capture national disturbances to each sector.<sup>9</sup>

Coulson's findings showed that shocks to local sectors are much more important than shocks to national sectors in accounting for volatility in city employment growth. His study suggested that disturbances to local sectors explain between 67 percent (Baltimore) and 97 percent (Denver) of the variation in total employment growth.<sup>10</sup>

Our study looked at employment growth in seven of the eight broad sectors used in Coulson's study but in five MSAs (Chicago, Los Angeles, Oklahoma City, San Francisco, and Tucson). Our model included nine

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<sup>8</sup> In Coulson's study, the beginning date is January 1949 for Baltimore, January 1950 for New York City, and January 1970 for Denver and Houston. The ending date is April 1996 for all four cities.

<sup>9</sup> Coulson's model does not include variables to separately control for the effects of monetary and fiscal policies or for city-specific shocks, such as natural disasters. The effects on city employment of monetary and fiscal policies are indirectly "picked-up" in the model's variables for national employment by sector. Similarly, the effects on city employment of shocks to the city's economy are indirectly "picked-up" by the model's variables for city employment by sector.

<sup>10</sup> In another study, Kenneth Kuttner and Argia Sbordone provided some details on the factors that affect the performance of New York City, one of the cities also studied by Coulson. They found that while the economy of New York City usually tracks expansions and contractions of the national economy, the relationship is far from a lockstep one. For example, Kuttner and Sbordone found that much of the slow growth in New York City's employment during the late 1980s and early 1990s can be traced to weakness in the financial services industry, although the study did not determine how much of the weakness in the financial services industry was due to shocks to the industry in New York City and how much was due to national shocks to the industry.

equations, one for each of the seven local sectors plus two equations to capture common national economic disturbances (Table 1).<sup>11</sup> To account for common or national disturbances, the model included the level of the three-month Treasury bill rate and the

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monthly growth rate of national productivity. The assumption is that the Treasury bill rate and national productivity are influenced by national developments and not by developments in any given sector or any particular metropolitan area. The study used monthly data for 1951 to 1999. Our model did not separately identify shocks specific to a metropolitan area or national shocks to individual industries. These shocks are "picked up" through their effects on specific industries that make up the local economy.

Similar to Coulson's findings for cities, our findings demonstrated that sectoral disturbances are much more important than national disturbances that are common across industries in accounting for fluctuations in metropolitan employment growth. In fact, our study found that sectoral disturbances account for between 87 percent of volatility in employment growth in the

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<sup>11</sup> Our study omitted the mining sector, since this sector typically accounts for a tiny share of employment in most metropolitan areas. The five metropolitan areas used in our study were chosen because they are the only metropolitan areas for which monthly data are available over a long period, namely, 1951 to 1999, for each of the remaining seven sectors.

Los Angeles MSA to almost 94 percent in the Tucson MSA.

Among sectors, the bulk of the evidence in both studies indicated that shocks to government, manufacturing, and nonfinancial services accounted for a substantial portion of volatility in local

employment growth. Shocks in these three sectors accounted for one-half or more of the variation in total employment in three of the four cities studied by Coulson (Table 2) and in all five metropolitan areas in our study (Table 3); they accounted for 43 percent of the variation in employment in the city of Houston.

Our study found that among individual sectors, shocks in manufacturing explain more of the variation in total employment growth in the Chicago and Los Angeles MSAs than in the Oklahoma City, San Francisco, and Tucson MSAs. Similarly, Coulson reported that manufacturing explained more of the variance in total employment growth in Baltimore and New York than in Denver and Houston. Both studies found that disturbances to the nonfinancial services and government sectors are generally important in accounting for total variance in employment growth.<sup>12</sup>

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<sup>12</sup> Nonfinancial services consist of employment in personal services, health care, business support services, legal services, and social services. Employment in services such as finance, insurance, and real estate is excluded from the nonfinancial services category, as are jobs in wholesale and retail trade.

**TABLE 1**

**Share of Total Employment Accounted for by Major Industry  
(Average share for the period 1951-99)**

	Metropolitan Areas					United States
	CHICAGO	LOS ANGELES	OKLAHOMA CITY	SAN FRANCISCO	TUCSON	
Government	11.6	13.2	24.4	18.7	23.2	15.3
Mining	0.2	0.4	3.4	0.2	3.3	0.9
Construction	4.0	3.9	5.1	5.0	7.9	4.6
Manufacturing	27.2	26.7	12.3	15.1	11.2	22.3
Trans. and Public Utilities	6.9	5.9	6.2	9.3	6.1	5.7
Wholesale and Retail Trade	22.6	22.4	24.4	22.5	22.4	28.1
Finance, Insurance, and Real Estate	6.8	5.8	6.0	8.0	4.3	5.0
Nonfinancial Services	20.7	21.7	18.1	21.3	21.7	18.0

Source: Carlino, DeFina, and Sill (2001).

Changes in the Treasury bill rate and national productivity growth typically played a considerably smaller role than disturbances to industries within the metropolitan area in accounting for the volatility in a metropolitan area’s employment growth. Our results indicated that the largest *combined* effect of these common national disturbances is 13 percent in Los Angeles; the smallest is 6.3 percent in Tucson (Table 4). Thus, national disturbances are relatively unimportant for understanding fluctuations in individual MSAs’ employment growth. Still, our study showed that the five

metropolitan areas responded differently to changes in the national economic variables used in the study.

**The Importance of a Region’s Size.** Earlier, I pointed out that looking at the major regions of the country rather than at MSAs might increase the measured impact of national disturbances and decrease the impact of sectoral disturbances. Is that the case?

To look at this issue, DeFina, Sill, and I estimated two additional VARs. The first is called a five-metropolitan-area aggregate model. For this model, we constructed an aggregate

region by summing the data over the five metropolitan areas in our study for each industry. The second model, called the nation model, simply used national data for each industry.

An important finding from these additional estimates is that the measured impact of national disturbances does, in fact, increase as the level of the data increases, first from metropolitan area to region and again as we move from the region to the nation (Table 4). Changes in national economic variables account for about 16.7 percent of the fluctuations in the five-metropolitan-area model and 41.1

percent of fluctuations in the nation model. Similarly, changes in national economic variables explain a much smaller share of the variation in employment growth in each of the five metropolitan areas than was found for either the nation or the five metropolitan areas as a whole.

## CONCLUSION

An important issue facing economists and policymakers is the degree to which fluctuations in economic activity can be attributed to sector-specific disturbances and the degree to which the fluctuations are due to forces common across sectors. Research on this issue for the national economy suggests that sectoral disturbances account for approximately one-half of the fluctuations in total economic activity.

Studies at the local level find a more significant role for sectors in accounting for fluctuations in economic activity than national studies, suggesting

### TABLE 2

#### How Local Sectors Contribute to City Employment Growth\* (Average response, in percent)

	Baltimore	Denver	Houston	New York City
Source of Variance				
Government	14.0	28.7	14.8	41.9
Manufacturing	25.6	14.1	11.4	27.4
Nonfinancial Services	18.5	14.5	16.8	5.8
Construction	2.3	14.6	16.3	1.7
Trans., Comm., and Utilities	3.2	5.4	6.2	3.4
Trade	3.3	16.6	10.0	3.1
Finance, Insurance, and Real Estate	0.3	1.9	1.6	0.9
Mining	0.0	0.9	3.4	0.0

\*Percent of variation in total employment growth accounted for by disturbances to specific sectors. Columns do not sum to 100 because national sectoral contribution to city growth is not included in the table.

The beginning dates are 1949 for Baltimore, 1950 for New York City, and 1970 for Denver and Houston.

The ending date is 1996 for all four cities.

Source: Coulson.

### TABLE 3

#### How Sectors Contribute to Local Employment Growth\* (Average response for the period 1951-99, in percent)

	Chicago	Los Angeles	Oklahoma City	San Francisco	Tucson
Source of Variance					
Government	16.3	5.6	14.9	10.4	32.3
Manufacturing	32.6	34.5	21.0	18.4	17.3
Nonfinancial Services	13.0	18.9	24.3	20.9	7.9
Construction	7.3	7.9	6.5	14.6	16.8
Trans., Comm., and Utilities	7.5	5.9	7.6	11.6	6.3
Trade	7.9	8.3	14.0	10.3	10.8
Finance, Insurance, and Real Estate	6.4	5.9	4.8	2.6	2.4
Treasury Bill Rate	7.9	6.6	2.6	4.3	1.9
Productivity Growth	1.1	6.4	4.3	6.8	4.4

\* Percent of variation in metropolitan area total employment growth accounted for by disturbances to specific sectors, Treasury bill rate, and productivity growth.

Source: Carlino, DeFina, and Sill.

that at least two-thirds of the fluctuations are due to sectoral disturbances.

These findings raise an important issue facing national and local policymakers. Large differences in fluctuations in economic activity across metropolitan areas can make it difficult for national policymakers to maintain low unemployment and low inflation in all parts of the country. Attempts at stimulating the economy during a national downturn in business conditions, for example, may lead to tight labor markets and falling unemployment rates in some parts of the country while others lag behind. If most disturbances to local economies have their origins in

**TABLE 4**

**Percent of Variation in Total Employment Growth Accounted for by National Disturbances**

Chicago	Los Angeles	Oklahoma City	San Francisco	Tucson	Five-Metro-Area Aggregate	Nation
9.0	13.0	6.9	11.1	6.3	16.7	41.1

Source: Carlino, DeFina, and Sill.

specific sectors, as these studies suggest, national and local policies that promote

labor mobility across sectors might serve as a useful adjustment mechanism for local economies. 

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