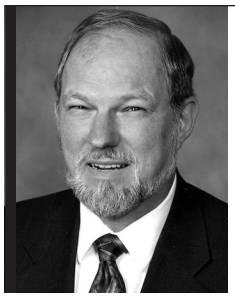
A Pattern of Regional Differences in the Effects of Monetary Policy

BY THEODORE M. CRONE

Although there is only one national monetary policy, that does not mean that monetary policy does not affect some regions of the country more than others. We know that business cycles differ across states and regions, and a number of studies have examined how monetary policy may affect regions differently and why. A review of these studies reveals that certain parts of the country are consistently more affected by monetary policy than others. Identifying the reasons for regional differences in the effects of monetary policy may help us better understand how changes in monetary policy ripple through the economy. In this article, Ted Crone reviews where the research has brought us so far.

Federal Reserve officials are sometimes asked how monetary policy can help solve regional economic problems. The standard answer is straightforward: There is only one national monetary policy, and it is not designed to address purely regional issues. This does not mean, however, that monetary policy does not affect some regions of the country more than others. Business people, civic leaders, and government officials may want to know how much their region will be affected by changes in monetary policy relative to the rest of the country. We know that business cycles differ across states and regions, and over the past decade, a number of studies have examined what role monetary policy may play — i.e., how monetary policy may affect regions differently and why. A review of these studies reveals that certain parts of the country are consistently more affected by monetary policy than others. So far, the only convincing explanation for these differences is the different mix of industries in the regions. But the search for other reasons is likely to continue.



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BUSINESS CYCLES DIFFER ACROSS STATES AND REGIONS

It is widely recognized that there are differences in business cycles across states. In some cases, it is the depths of the recessions, and in others, it is the timing of recessions. Differences in cycles across multi-state regions in the U.S. are less pronounced than differences across individual states, but they are still discernible.

Two recent studies have used a newly developed set of coincident indexes for the 50 states to define and compare state recessions. In an earlier *Business Review* article, I used these indexes to examine recessions at the state level based on the traditional definition of a recession — a significant decline in economic activity that lasts for several months. Using the same set of indexes, in a second study, economists at the St. Louis Fed applied a standard technique, known as a Markov switching model, to identify different phases in each state's economic cycle. Both articles find that the 50 states have experienced different business cycles in terms of their number, timing, and severity.

Other studies have examined the issue from a different perspective. How closely are the cyclical movements in income or employment correlated across the states? In a study published in 2001, Christophe Croux and his co-

authors proposed a new statistic, called a cohesion index, which measures the co-movement of regional economies over the business cycle. They apply the measure to personal income in the 50 states and find that while the correspondence among the states is higher than the correspondence among the European countries, it is not perfect. In a 2004 article, Gerald Carlino and Robert DeFina calculate the same statistic for employment in eight major industry groups across 38 states for which data are available. A value of one would indicate a perfect correlation of industry employment by state across business cycles. Thus, for an industry with a cohesion index of one, quarterly increases and decreases in employment due to the business cycle would be proportional across all the states.[1] The cohesion measures in the study range from 0.82 for manufacturing to 0.44 for mining. Thus, business cycles for the major industries differ across the states. The co-movement of income or employment among multistate regions is stronger than the co-movement among the states, but again, it is not perfect.[2] In effect, grouping states together smooths out some of the individual features of business cycles, but it does not eliminate them.

Since business cycles differ across states and across regions in the U.S., it is natural to ask whether differential effects of monetary policy are a factor. Answering this question requires a consistent framework to measure the effect of monetary policy on the economies of states or regions.

ESTIMATING THE REGIONAL EFFECTS OF MONETARY POLICY

In recent years economists have turned to econometric models known as vector autoregression (VAR) models to measure the effects of changes in monetary policy on states and regions. A VAR is a system of equations for estimating the historical relationship between a variable, such as personal income in a region, by past values of that variable and by current and past values of other variables, such as the short-term interest rate targeted by the Federal Reserve (the fed funds rate). Using this type of model, we can estimate the effect of an unanticipated change in the fed funds rate on income in a state or region. These effects are known as impulse responses. Of course, the estimates will differ depending on what variables are included in the model and what assumptions are made. For example, do changes in monetary policy affect income in the current period or only in later periods? And do shocks to one region's economy spill over directly to the economies of other regions?

The recent studies differ somewhat in their assumptions. But all of the studies include in their models three key variables: personal income in each region, the fed funds rate, and some measure of oil prices or commodity prices in general. Some of the models add other variables to this list, such as the rate on 10-year Treasury bills. In each study, the regional effects of monetary policy are measured by the response over time of the region's personal income to an unanticipated change in the fed funds rate. All of the models assume that unanticipated changes in the fed funds rate affect personal income with a lag of at least one quarter.

Ideally, we would like to estimate the effects of monetary policy on each of the 50 states in a single model. But VAR models are suitable only for a limited number of variables, not the 50 plus variables that would be required to include each of the states in the same model. Therefore, the differential effects of monetary policy have generally been estimated by region rather than by state.[3] And most of the studies use the eight regions defined by the Bureau of Economic Analysis (BEA).[4]

The Earliest Model. About 10 years ago in the *Business Review*, Gerald Carlino and Robert DeFina published the first of the recent articles that used a VAR model to estimate the regional effects of monetary policy.[5] They assume that monetary policymakers can react to a shock or unanticipated change in a region's personal income growth in the same quarter. Personal income, however, responds to changes in monetary policy only in subsequent quarters because monetary policy affects the economy only after some time lag. The authors also assume that any change to personal income in one region can spill over to

[1] A cohesion index of zero would indicate no systematic relationship in industry employment growth across the states. A negative index would indicate that industry employment in some states moves in the opposite direction as employment in other states.

[2] In a related study Carlino and Sill (2001) found that the change in the cyclical component of *per capita* income is highly correlated across regions except for the Far West. But the volatility of per capita income across the business cycle varies significantly from region to region.

[3] In their 1999 article, Carlino and DeFina use 48 separate models, one for each of the contiguous 48 states, to estimate the effects of monetary policy on each of the states. Since each of the estimates is derived from a slightly different model, the estimates would not necessarily be the same as those derived from a single model containing all 48 contiguous states.

[4] The eight BEA regions are New England, Mideast, Southeast, Great Lakes, Plains, Southwest, Rocky Mountain, and Far West. It is customary to remove Alaska and Hawaii from the Far West region because their economies differ significantly from the other states in that region.

[5] See Carlino and DeFina's 1996 *Business Review* article. A more technical version of this study was published in the *Review of Economics and Statistics* in 1998.

other regions in subsequent periods. Thus, there can be a ripple effect across regions.

On the basis of these assumptions, Carlino and DeFina estimate the cumulative response of real personal income growth in each of the eight BEA regions to an unanticipated increase in the federal funds rate.[6] The maximum effect in each region of an unanticipated change in the federal funds rate occurs after two to two-and-a-half years. In three of the eight BEA regions, the cumulative effect is significantly different from the national average after a few quarters and remains significantly different through 20 quarters. Figure 1 shows the cumulative responses for these three regions. In the Great Lakes region, the effect of changes in monetary policy on personal income is significantly *greater* than the national average. In the Southwest and Rocky Mountain regions, the effect is significantly *less* than the national average. This pattern reoccurs to some extent in most other studies of the regional effects of monetary policy.

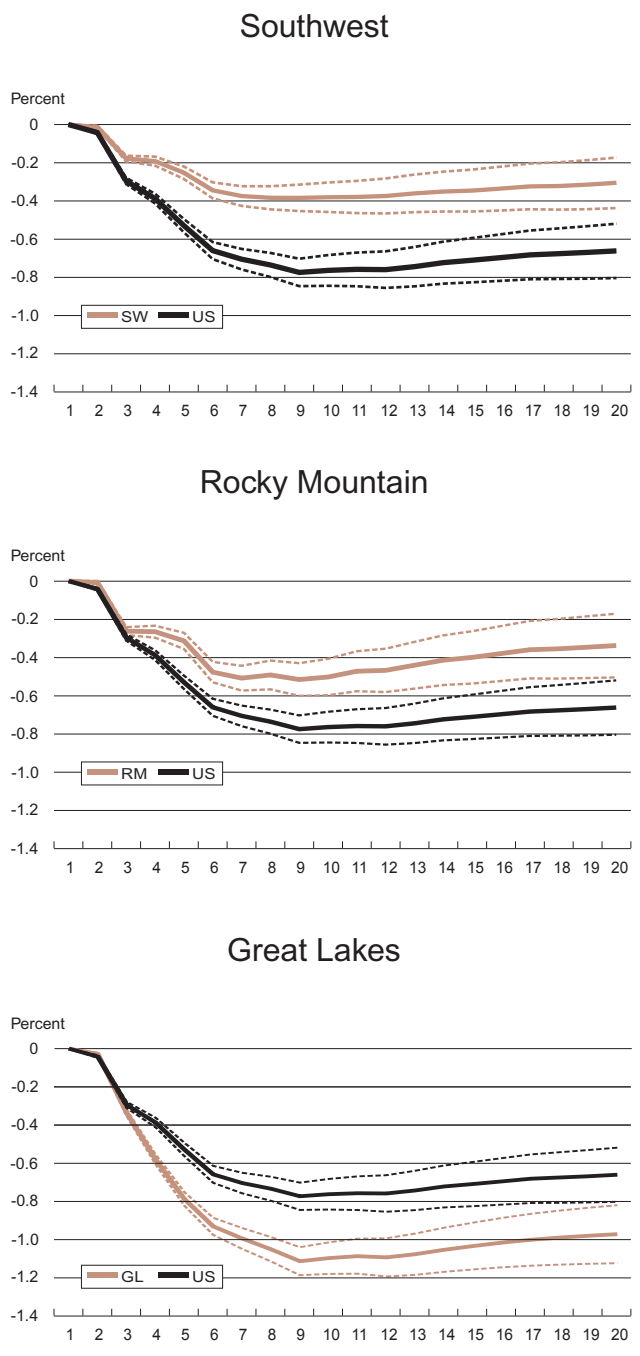
In a recent study on grouping states into regions, I found additional support for Carlino and DeFina's findings. In the 1950s the BEA grouped contiguous states into eight regions based on a number of economic and social characteristics at that time. But there was no attempt to ensure that states in the same region had similar business cycles, an important consideration for analyzing regional business cycles. I grouped contiguous states into regions based on how closely their economies moved together over the business cycle. (See *Alternative Definitions of Regions in the U.S.*) It turns out that over the past quarter century, the business cycles in some states were more closely aligned with those in states in neighboring BEA regions than those in their own region.[7] Although the realignment of states into different regions was based on a purely statistical measure of the similarity in business cycles, some of the realign-

[6] Specifically, they estimate the cumulative effect of a 0.83 percent increase in the fed funds rate, which is one standard deviation of the unanticipated change in the fed funds rate based on their model.

[7] This coordination of business cycles could be the result of a similar mix of industries or trading patterns or similar responses to national fiscal or monetary policy. The constraint that regions consist of contiguous states meant that some states whose cycles were similar were not included in the same region.

FIGURE 1

Responses of Personal Income for the BEA Regions



Note: The solid lines represent the cumulative effect on personal income in the designated quarter resulting from a change in the federal funds rate in quarter one. The dashed lines represent the 95 percent confidence intervals for the estimated impulse responses. Based on the model, the true impulse responses have only a one in 20 chance of being outside that range.

ment was obvious. For example, most observers would not question that the oil-rich economy of Louisiana, which is in the BEA's Southeast region, is much closer to that of Texas and Oklahoma, which are in the BEA's Southwest region, than to the economies of the other states in the Southeast region.

Using this alternative definition of regions, I replicated Carlino and DeFina's original study. The same basic patterns emerged as in the original study, but the results were stronger. The effects of monetary policy were significantly different from the national average in more regions than in the original study (Figure 2). The impulse responses were more precisely estimated for the alternative regions than for the BEA regions. The states around the Great Lakes formed the most significantly affected region just as in the original study. But the West was also affected more significantly than the U.S. average. The Energy Belt was the least affected region in the replication. This region contains six of the nine states in the BEA's Southwest and Rocky Mountain regions — the least affected regions in Carlino and DeFina's study. The Mideast was also less affected than the national average in my replication of Carlino and DeFina's study.[8]

Different Responses to Monetary Policy Over Time. The studies by Carlino and DeFina and my study estimated the differential regional effects of monetary policy from 1958 to 1992. In a recent study, Michael Owyang and Howard Wall revisited the issue and asked whether the regional effects of monetary policy may have changed over time. They estimate the effect on personal income of an unanticipated increase of one percentage point in the fed funds rate for one quarter. They looked at three different periods: the period of their full sample (1960 to 2002), the pre-Volcker period (1960 to 1978), and the Volcker-Greenspan period (1983 to 2002).[9]

The estimated effects on personal income of changes in monetary policy are much weaker in every region in the Volcker-Greenspan era.

Owyang and Wall found that the estimated effects of an unanticipated increase in the fed funds rate varied depending on which time period was used to estimate the model. For the full sample and the pre-Volcker period, personal income in each of the eight regions was negatively affected for one or more quarters and the effect was statistically significant. In both the full sample and the pre-Volcker period the region most affected was the Great Lakes. The Southwest and Rocky Mountains were the least affected regions in the pre-Volcker period. These were also *among* the least affected regions in the full sample.[10] These results are similar to the earlier results from the studies by Carlino and DeFina and my study.

Owyang and Wall's results for the Volcker-Greespan period differ somewhat from their results for the earlier period. The estimated effects on personal income of changes in monetary policy are much weaker in every region in the Volcker-Greenspan era.[11] Moreover, because the effects are not very precisely estimated, Owyang and Wall find a statistically significant decline in personal income in response to an unanticipated increase in the fed funds rate since the early 1980s only for the Great Lakes region and for only a few quarters. These results for the Volcker-Greeenspan period suggest that the differential regional effects of monetary policy may have lessened in recent years.

Identifying Specific Regional Responses to Monetary Policy. The studies by Carlino and DeFina; my study; and Owyang and Wall's were

[8] In Carlino and DeFina's original study, the Mideast was close to being significantly less affected than the national average, but the impulse responses were not estimated precisely enough to draw that conclusion. It is not the case that the effect of monetary policy is just stronger in those regions that are most volatile. For the alternative regions, the coefficient of variation of quarterly changes in personal income for the region most affected by monetary policy, the Great Lakes (0.57), is not very different from the coefficient of variation for the least affected region, the Energy Belt (0.55). But both are quite different from the coefficient of variation for the Plains (0.75), where the effect of monetary policy is close to the national average. Thus, having a more or less volatile economy by itself does not determine the relative impact of monetary policy on a region's economy.

[9] See the 2004 paper by Michael Owyang and Howard Wall. In their subperiods, Owyang and Wall omit the years 1979 to 1982, a period when the Fed was using the monetary aggregates as its intermediate target to control inflation. Their model differs from the model used by Carlino and DeFina, who estimate the cumulative effect of a permanent increase in the fed funds rate. Owyang and Wall estimate the future effect of an increase in the fed funds rate that lasts only one quarter. They also include 10-year Treasury rates, the consumer price index, and a commodity price index in their model. They account for periods of high oil prices by including a separate variable equal to one in six quarters during their sample period when oil prices rose rapidly (periods of oil-price shocks). Like Carlino and DeFina, Owyang and Wall allow for direct spillovers among regions.

[10] In the full sample, the Mideast was slightly less affected than the Southwest and Rocky Mountains, and New England was less affected than the Rocky Mountains.

[11] This corresponds to results in several other studies that economic volatility as measured by a number of variables declined significantly in the early 1980s for the nation as a whole and for individual states and regions. See Carlino's 2007 *Business Review* article.

Alternative Definitions of Regions in the U.S.

ORIGIN OF THE EIGHT REGIONS DEFINED BY THE BUREAU OF ECONOMIC ANALYSIS

The regions defined by the Bureau of Economic Analysis (BEA) had their origin in the designation of census regions and divisions. Since 1850, the Census Bureau has divided the U.S. states into regions, and since 1910, the Bureau has also defined nine smaller groups of states, called divisions, within the regions. In the 1950s, an interagency working group in the Department of Commerce undertook a major review of the census regions and divisions. The working group's mandate was to divide the states into six to 12 regions, each consisting of two or more contiguous states. Regions were to be homogeneous with respect to certain economic and noneconomic (social) factors. The economic factors included the industrial composition of income (e.g., manufacturing, agriculture, trade, and service), the level of per capita income in 1951, and the change in per capita income from 1929 to 1951. The noneconomic factors included, among other things, population density, racial composition, education levels, telephones per 1000 people, and infant deaths per 1000 live births. Depending on which criteria were examined, several states fell into different regions, and some personal judgment had to be made about which region a state was assigned to. While the Census Bureau did not change its definition of regions or divisions based on this review, the Bureau of Economic Analysis accepted a modified version of the working group's final recommendation to define the eight BEA regions.* (See the Table on pages 14-15.)

AN ALTERNATIVE DEFINITION OF REGIONS BASED ON SIMILARITIES IN STATE BUSINESS CYCLES

In a 2005 article, I argued that for business cycle analysis states should be grouped into regions based on the similarity of their business cycles. I grouped states based on the cyclical components of a new set of coincident indexes for the 50 states that incorporate changes in payroll employment, unemployment rates, average hours worked in manufacturing, and real wages and salaries. To compare this set of regions to the BEA regions, I grouped the 48 contiguous states into eight regions. I used standard cluster analysis to group the states with similar business cycles. In general, the states in the eight alternative regions were more cohesive than the states in the original BEA regions. This alternative grouping of states has many similarities with the BEA regions but also some significant differences. (See the Table on pages 14-15.)

* One of the working group's suggestions was a division of the states into nine regions, which were different from the nine census divisions. The BEA modified this suggestion by combining the working group's Upper South region and Lower South region into one region — the Southeast.

based on similar models and arrived at similar conclusions about the regional effects of monetary policy. Michael Kouparitsas developed a somewhat different model. In his VAR, he estimates the effect of a change in monetary policy on a common unobserved component of personal income across the eight BEA regions and specific effects on personal income in each region.[12]

Since the common component is not observed directly, Kouparitsas must estimate changes to the common component within his model. To do this, he chooses the Southeast region as the benchmark. He assumes that changes in the common component are reflected one for one in changes in personal income in the Southeast. Moreover, changes in monetary policy do not affect the Southeast directly but only through the common component. For the other seven regions a change in monetary policy can affect the region's personal income through its effect on the common component of personal income and through a specific effect on the region's income that is not due to the common component. The total effect of a change in monetary policy on a region's personal

[12] See the 2001 paper by Michael Kouparitsas. Kouparitsas makes other important assumptions that differ from Carlino and DeFina's and Owyang and Wall's. Monetary policy does not respond to regional shocks to personal income but only to shocks in the unobserved common component, and there are no direct spillovers between regions. In an earlier article (1999) Kouparitsas used eight separate models to estimate the regional effects of a change in the fed funds rate on each of the eight regional economies. The use of a different model for each region also precludes any direct spillovers between regions.

TABLE

BEA Regions		Alternative Regions Based on Similarities in State Business Cycles	
Region	**State**	**State**	**Region**
New England	Maine	Maine	New England
	New Hampshire	New Hampshire	
	Vermont	Vermont	
	Massachusetts	Massachusetts	
	Rhode Island	Rhode Island	
	Connecticut	Connecticut	
Mideast*	New Jersey	New Jersey	Mideast*
	Pennsylvania	Pennsylvania	
	Delaware	Delaware	
	Maryland	Maryland	
Southeast	Virginia	Virginia	Southeast
	North Carolina	North Carolina	
	South Carolina	South Carolina	
	Georgia	Georgia	
	Florida	Florida	
	Kentucky	Kentucky	
	Tennessee	Tennessee	
	Alabama	Alabama	
	Mississippi	Mississippi	
	Arkansas	Arkansas	
	Louisiana		
	West Virginia		
		West Virginia	Great Lakes
Great Lakes	Michigan	Michigan	
	Ohio	Ohio	
	Indiana	Indiana	
	Illinois	Illinois	
	Wisconsin	Wisconsin	
		Minnesota	
Plains	Minnesota		
	Missouri	Missouri	Plains
	Kansas	Kansas	
	Nebraska	Nebraska	
	Iowa	Iowa	
	South Dakota		
	North Dakota		

TABLE (continued)

BEA Regions		Alternative Regions Based on Similarities in State Business Cycles	
Region	**State**	**State**	**Region**
		South Dakota	Mountains/ Northern Plains
		North Dakota	
Rocky Mountain	Montana	Montana	
	Idaho	Idaho	
	Wyoming		
	Utah		
	Colorado		
		Louisiana	Energy Belt
		Wyoming	
		Utah	
		Colorado	
Southwest	Texas	Texas	
	Oklahoma	Oklahoma	
	New Mexico	New Mexico	
	Arizona		
		Arizona	West
Far West	California	California	
	Nevada	Nevada	
	Washington	Washington	
	Oregon	Oregon	

*New York was inadvertently omitted from both the BEA region and the alternative region.

income is a combination of these two effects. Most of the regional effects of monetary policy in Kouparitsas' study come through the estimated common component of personal income. The specific regional effects are very small, and none are statistically significant, although the specific regional effect in the Southwest is close to significant. It is also important to note that changes in the common component can affect regions differently. So even *without* the specific regional impacts, changes in monetary policy can have differential regional effects on personal income.

Kouparitsas' estimates of the cumulative responses to a 1 percent increase in the fed funds rate range from less than 0.4 percent to almost 0.6 percent.[13] Income in the Rocky Mountains, the Plains, and the Great Lakes is more strongly affected by a change in monetary policy than income in the benchmark region (Southeast).[14] The total effect of changes in monetary policy was smallest in the Southwest. Thus, in Kouparitsas' study, as in the previous ones, the Southwest stands out because of the relatively low impact of monetary policy on income in the region.

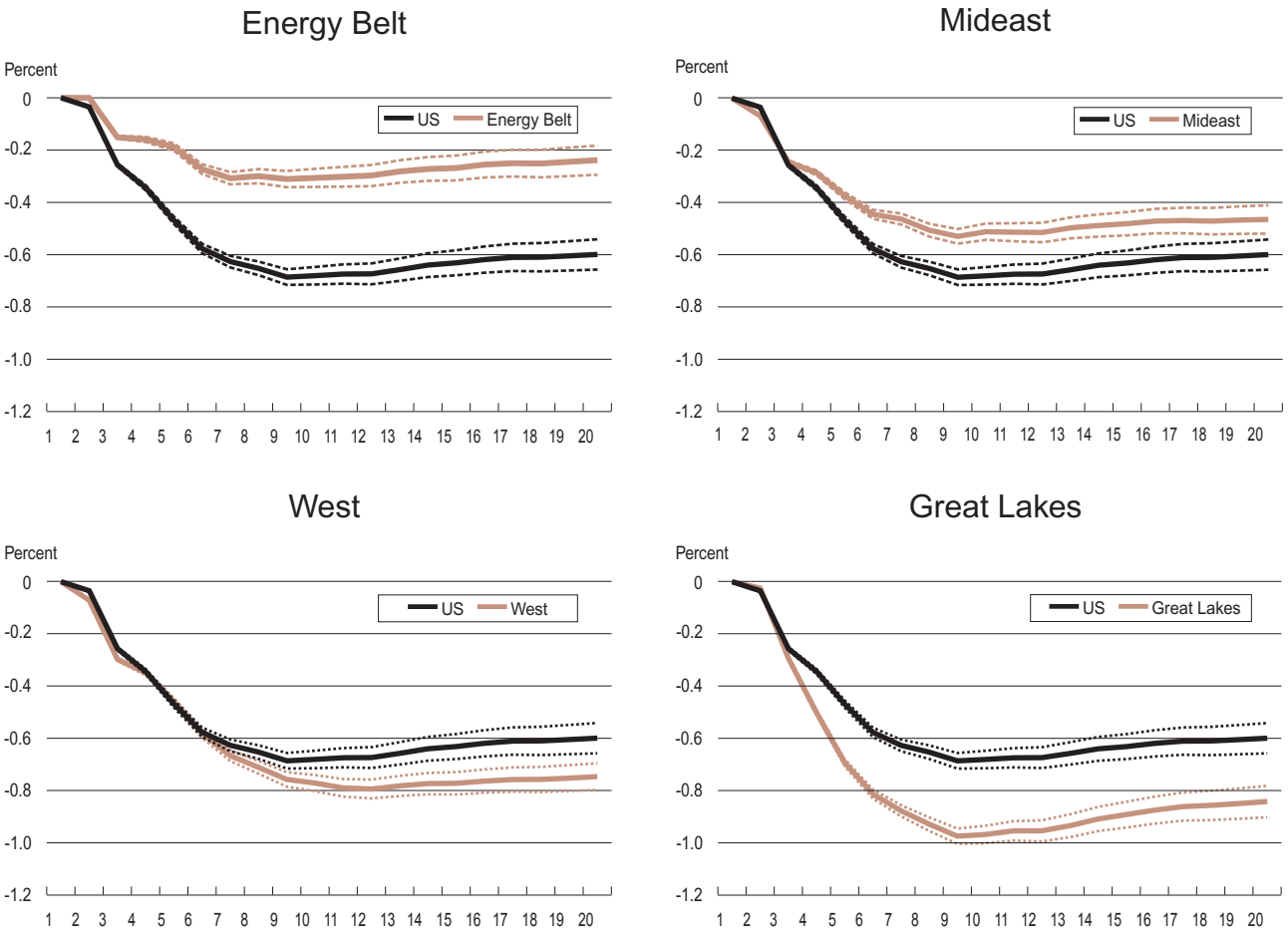
Some Common Patterns. Despite the differences among the four studies we have summarized, some common patterns run through them all. In all four studies the area around the Great Lakes is one of the regions most affected by shocks to monetary

[13] These responses include both the specific regional effects and the effects transmitted through the common component. The regional responses to a change in monetary policy are not very precisely estimated, so no region's response is statistically different from any other region's. This lack of precision may be due in part to the fact that Kouparitsas must estimate the effect of a monetary policy change on the common component and the effect of a change in the common component on each region's income.

[14] This result for the Rocky Mountains differs substantially from that of the other studies.

FIGURE 2

Responses of Personal Income for the Alternative Regions



Note: The solid lines represent the cumulative effect on personal income in the designated quarter resulting from a change in the federal funds rate in quarter one. The dashed lines represent the 95 percent confidence intervals for the estimated impulse responses. Based on the model, the true impulse responses have only a one in 20 chance of being outside that range.

policy. Regions with a large proportion of their economic activity derived from energy are among the least affected, whether this is the Southwest as in the traditional BEA definition of regions or the Energy Belt as I have defined it.

EXPLAINING DIFFERENCES IN THE REGIONAL EFFECTS OF MONETARY POLICY

VAR models with eight regions produce only eight observations of the regional effects of monetary policy, too small a sample to adequately test which characteristics of a region determine the size of the regional response to monetary policy. The issue of the small number of observations has been addressed in two different ways. In two follow-up articles to their original paper, Carlino and DeFina estimated the effects of monetary policy at the state level from 48 *different* VARs.[15] The 48 different models produce a different measure of the maximum effect of monetary policy for each state. The drawback of this approach is that each measure comes from a somewhat different system of equations. Owyang and Wall tackle the problem in a different way. They subdivide the 48 contiguous states into 19 sub-regions consisting of two to four states in a given BEA region.[16] They reestimate their system of equations

[15] See the 1999 *Journal of Regional Science* article and the 1999 *Business Review* article by Carlino and DeFina.

[16] The states in each sub-region must be in the same BEA region.

with these 19 sub-regions in place of the eight BEA regions. Carlino and DeFina use their state measures and Owyang and Wall use the measures from their 19 sub-regions to examine some common explanations of the transmission of monetary policy. The evidence is mixed on the importance of the various channels for regional differences in the effects of monetary policy.

Interest-Rate-Sensitive Industries. Some industries, such as manufacturing and construction, are highly sensitive to interest rates. Thus, we would expect regions with high concentrations of these industries to be more seriously affected by changes in monetary policy than other regions. The evidence suggests that they are. Carlino and DeFina found that the larger the share of a state's output in the manufacturing sector, the larger the declines in personal income from an unanticipated increase in the fed funds rate. Owyang and Wall got similar (but somewhat weaker) results using the share of nonfarm employment in the manufacturing sector to explain the total loss of personal income from a one-quarter increase in the fed funds rate. In their *Business Review* article on the subject, Carlino and Defina found that the effect on manufacturing was concentrated in the durable goods industries.[17] They also found some effects working through the construction industry. This is not surprising, given that the construction industry, like manufacturing, is sensitive to interest rates. Furthermore, Carlino and DeFina found that states with a higher concentration of output in the extractive industries (mining and drilling) were less affected than other states by unanticipated changes in monetary policy. They had no easy explanation for this finding.

The notion that monetary policy is transmitted to the overall economy through sectors that are sensitive to interest rates has a long tradition in economics. Since the late 1980s, however, several economists have argued that monetary policy is also transmitted through a credit channel.[18] The credit channel should not be viewed as an alternative to the interest-rate view of how monetary policy is transmitted but rather as a reinforcement of the interest-rate effect. There are two explanations of how this credit channel works; they are often referred to as the broad credit channel and the narrow credit channel.[19]

Some industries, such as manufacturing and construction, are highly sensitive to interest rates.

The Broad Credit Channel. An increase in short-term interest rates can have a negative effect on the balance sheets of firms whose cash flows may decline because of higher interest payments on existing debt and whose assets may decline in value. Those firms that have better access to capital markets, e.g., by issuing their own debt, are better able to cope with these balance-sheet changes and maintain the inventory and production levels they would like. Mark Gertler and Simon Gilchrist argue that, in general, large firms have better access to capital markets than small firms because small firms tend to be younger and have less collateral and a greater degree of idiosyncratic risk.

Based on the broad credit channel, one would expect that regions with a high percentage of small firms should be more affected by changes in monetary policy than other regions. Carlino and DeFina, however, find no evidence that the effect of monetary policy on a state's personal income is related to the percentage of small firms or the average firm size in the state. Owyang and Wall even find some weak evidence that the opposite is true: In their full sample (1960-2002), total loss of personal income after an unanticipated increase in the fed funds rate is found to be less in sub-regions that have a higher proportion of small firms.[20]

The Narrow Credit Channel. The second explanation of a credit channel for the transmission of monetary policy focuses on the effect of monetary policy on banks' balance sheets and how they fund their loans. When the Federal Reserve raises the fed funds rate, it reduces the amount of reserves in the banking system. Since reserves must be held against bank deposits, a reduction in available reserves results in a reduction in those deposits. Therefore, banks must find other sources of funds to finance their loan portfolios, or they must reduce their supply of loans. In two articles, Anil Kashyap and Jeremy Stein argue that large banks have easier access than small banks to these other sources of funds, such as large certificates of deposits. Therefore, borrowers who depend on banks, especially small banks, for their finances will face more

[17] Owen Irvine and Scott Shuh document that the durable goods industries are the most interest sensitive.

[18] See, for example, the article by Ben Bernanke and Alan Blinder.

[19] They are also referred to as "the balance sheet channel" and "the bank lending channel." See the article by Ben Bernanke and Mark Gertler.

[20] This counterintuitive result, however, is only significant at the 10 percent level.

difficulty in obtaining loans.

One would expect regions with a larger share of loans or deposits at small banks to be more seriously affected by an unanticipated rise in the fed funds rate than other regions. This does not seem to be the case, however. Neither Carlino and DeFina nor Owyang and Wall find any evidence for this explanation of the regional differences in the cumulative effects of monetary policy. In fact, both studies find some weak evidence to the contrary.[21] Apparently, regions and states with a large share of loans or deposits at small banks have other characteristics that offset the negative effects of reduced lending by smaller banks.

Whatever the effects of the broad and narrow credit channels in enhancing the direct effects at the national level of an increase in interest rates, they do not seem to explain any of the regional differences in the effects of monetary policy. However, the direct interest-rate effects and the broad and narrow credit channels do not exhaust the possible ways in which monetary policy might be transmitted to the overall economy. Others have suggested that the direct effects of monetary policy can be enhanced through a change in asset prices or a change in exchange rates.[22] If these transmission mechanisms are important, regional differences in wealth and international trade flows might help explain regional differences in the effects of monetary policy. To date, however, no one has tested the regional effects of these channels of monetary policy. So far, differences in industry mix are the only explanation that has found consistent support in economic studies of regional differences in the effects of monetary policy.

[21] Owyang and Wall do find that in the Volcker-Greenspan period, the loss of personal income due to an increase in the fed funds rate is not as great at the trough of the downturn in regions with a larger share of deposits at the five largest banks. But the total loss of income over the cycle is not affected by the share of deposits at those banks.

[22] See the article by Kenneth Kuttner and Patricia Mosser and the one by Peter Ireland.

SUMMARY

Despite their differences, studies of the regional effects of unanticipated changes in monetary policy have revealed some consistent patterns. A greater than average effect and in most studies the greatest effect of monetary policy are felt in the states around the Great Lakes. The weakest effect is found in the energy-producing regions, especially in the Southwest. This knowledge alone is valuable to businesses and governments in those regions.

The hope that regional differences might help explain how monetary policy is transmitted has had only limited success. Industry mix is the only explanation for regional differences that finds support in these studies. States or regions with a high concentration of industries that are traditionally sensitive to interest rates are most affected. Any additional effect through a credit channel that may be operating at the national level is not reflected in the regional differences.

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