

Economic Review



FEDERAL RESERVE BANK OF KANSAS CITY

November 1989

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and the Central Bank
in a Market Economy

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of the U.S. Economy

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Industrial Structure, 1963-86:
Evidence from New State Data

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Commercial Banks and the Central Bank in a Market Economy

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By Alan Greenspan

As the Soviet Union moves toward a market economy, it may choose from an array of financial systems and central bank operating procedures to achieve long-run economic goals. But history has shown that certain fundamental principles underlie an effective banking system and a sound monetary policy.

The Changing Interest Sensitivity of the U.S. Economy

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Commercial Banks and the Central Bank in a Market Economy

By Alan Greenspan

Dynamic economies are always in a state of evolution, but I would guess that there are few examples in history to rival the scope of the restructuring now being undertaken in the Soviet economy. The challenges are enormous, but so are the potential rewards.

As you recognize, changes in financial structure are essential to successful economic restructuring. In that regard, I thought you might find it useful if I explored certain key elements in the financial systems of market economies. Specifically, I will discuss the principles guiding the operations of commercial banks and central banks in these economies. In addition, I will sketch how these principles have been applied in certain countries, including some lessons that have been learned from occasionally ignoring them.

Alan Greenspan is Chairman of the Board of Governors of the Federal Reserve System. He made these remarks in a speech at the Spaso House in Moscow, U.S.S.R., on October 10, 1989.

Principles of commercial and central banking

In market economies, commercial banks serve the key purposes of providing financial intermediation and transaction services. Intermediation is the process of selling financial claims, such as deposits, to savers, and of investing the proceeds in claims on businesses, households and government. This process can reduce the degree of risk and uncertainty in an economic system, thereby lowering the real rate of interest and the cost of capital, which in turn leads to higher investment and a better standard of living. Transaction services facilitate payments for goods, services and financial investments, and thereby support the medium of exchange.

The intermediation process is, perhaps, best understood by considering how a hypothetical market economy might function without commercial banks or other financial intermediaries. For purposes of simplicity, I will

assume that, for this economy, government receipts equal outlays and that the exports of goods and services equal imports. With minor additional violence to reality, I will also assume that all saving is by households and all investment is by businesses. Household claims on business may be in the form of debt or equity capital.

Abstracting as well from the influence of any monetary authorities, the level of interest rates and the associated valuation of equity in this simple market economy would be determined by the supply and demand for savings. In effect, the interest rate would adjust to that level which brings savings, and the demand for savings, that is, investment, into equality. For example, if there were a desire to invest over and above available savings, interest rates would rise until investment intentions fell and savings inclinations increased enough to restore equality between savings and investment.

In the absence of intermediaries, households would have to hold their savings in the form of equity or debt claims on specific businesses. Individual households would be limited in their ability to diversify their holdings among a wide variety of business firms by the high costs of obtaining information about many different companies and of dealing in a large volume of small-denomination securities. Accordingly, each household would have to assume the large risk that default by the particular business or businesses in which it invests could result in a loss of most or all of its savings. A high rate of interest and cost of capital would be required to induce a household to take on such large risks. Households would willingly accept a lower rate of interest if their risks could be reduced.

The key role of commercial banks and

other financial intermediaries is to reduce the risks faced by individual savers, mainly by pooling their savings and using them to assemble large, diversified portfolios of assets. The intermediary lends to business enterprises selected, ideally, so that the risks of bankruptcy of the different enterprises do not all depend on the same economic conditions specific to the firm, industry, geographic region, or even the entire economy. This requires specialized knowledge and expertise, as well as a portfolio of sufficient size. As statisticians would put it, there should be a low or, if possible, a negative covariance among the returns on the various investments in the portfolio. Because intermediaries can reduce risk through diversification, they can pay a lower rate of interest to households. With competition among banks, these lower costs of financing are passed through to business enterprises, and aggregate investment, productivity and incomes are increased.

A commercial bank in a market economy sells two types of claims on its own portfolio of assets, the claims of equity holders and the claims of creditors, mainly depositors. Equity capital is a claim available to investors willing to accept relatively more risk in hopes of obtaining a higher average return on investment. A decline in the value of a bank's assets (for instance, because of a borrower's default) is a direct loss to holders of equity claims on the bank.

A household's deposit is also a claim on a bank's assets, but, of course, with less risk than an equity claim. Thus the risk borne by a depositor is lower than the risk inherent in direct household claims on businesses, both because banks can better diversify their larger portfolios, and because bank equity capital absorbs any losses before depositors do.

The value of bank intermediation services is reflected in part in the difference, or spread, between the interest rate received by the bank and that paid out to depositors. This difference is the gross earnings of the commercial bank. From gross earnings is subtracted the costs of doing business: the bank's employee payroll, the costs of relevant equipment, materials, and facilities. What remains after taxes is the bank's profit, which is the return received by equity holders.

If household savers do not sufficiently value the reduction in risk, an intermediary's gross earnings and profits would be inadequate, or in other words, equity holders would not receive a competitive return on investment. The commercial bank would close and the equity capital would be reinvested in alternative enterprises. The closure of such a bank is an appropriate adjustment in a dynamic market economy. In such an economy, the price of goods and services reflects the value placed on them ultimately by the preferences of consumers. Competitive markets price labor, materials, and capital to reflect the desirability of what those inputs could produce in alternative employment. Inadequate profits therefore imply that the real resources the bank is using are valued more highly in producing different goods and services. The bank is not contributing enough value to the economy to justify its existence.

Up to this point, I have concentrated on the role of commercial banks as financial intermediaries. However, there are many special features of commercial banks that tend to distinguish them from other financial intermediaries, including: the provision of transaction services, the offering of deposits redeemable at the fixed price of par, and the financing of

smaller enterprises that are not well known—implying specialized skill in evaluating and monitoring individual credits. Because of these special features, and particularly because of their participation in the economy's payment mechanism, commercial banks are usually a subject of special attention and regulation.

In providing transaction and other short-term deposit accounts, commercial banks accept different types of risk, in addition to *default* or *credit risk*, which I have already discussed. If, for example, the average maturity of a bank's liabilities is less than the average maturity of its assets, a sharp increase in market interest rates would reduce the market value of its assets more than its liabilities, and the bank would suffer a loss due to *interest rate risk*. Moreover, a bank incurs *liquidity risk* to the extent that its demand liabilities can be withdrawn more rapidly than the bank can convert assets into cash for the purpose of meeting a drain of deposits.

Equity capital provides depositors with a cushion against possible losses that might arise from all of these potential risks. In many countries, various implicit or explicit forms of insurance also are provided to protect depositors from losses. To the extent that the cost of providing such insurance may be ultimately borne by the government, there is a distortion of the market signals between depositor and equity claim holders in banks. As a result, governments have considered it necessary to become involved in the regulation and supervision of commercial banks, including setting standards for the adequacy of their capital. The appropriate amount of bank equity capital relative to the various possible risks is an issue which is currently being debated in Western countries in considerable detail.

The importance of protecting depositors from losses is not based solely on the desirability of safeguarding the savings of households. A loss of confidence in the soundness of a bank by depositors can engender a contagious withdrawal of deposits, that is, a “run” on the general banking system. This could cause disruptions in the payments mechanism and in the flow of trade and commerce. Moreover, an abrupt, forced liquidation of commercial bank assets can cause bankruptcies among enterprises that lose access to credit, and among banks as well, if assets must be sold at depressed prices. The disruptive effects on the economy of a bank run are aggravated to the extent that commercial banks lend to enterprises that do not have direct access to other sources of credit. However, financial panics and systemic bank runs have not occurred in Western economies since the early 1930s, in part because of the safeguards put into place since that time.

Central banks play an essential role in providing these safeguards. They often participate in setting prudential and capital standards that limit risk-taking and its consequences. However, the intrinsic characteristic of a central bank is the ability to back up the commercial banking system in assuming liquidity risk by acting as the “lender-of-last-resort.” Through this lending facility, the central bank provides liquidity to individual banks and to the banking system in general, particularly in times of financial strain. A central bank provides liquidity to individual commercial banks by, in essence, exchanging demand claims on itself for the longer term assets of commercial banks. In actual practice, central banks normally lend cash using the commercial bank’s longer term assets as collateral. This facility enables commercial banks holding illiquid assets to meet

depositors’ claims for funds. The total liquidity provided through such central bank “discount facilities” depends on the level of requests for refinancing from individual commercial banks, subject to quantitative limitations or control of discount rates by central banks.

This total has consequences beyond those associated with liquifying the assets of banks under strain. Theory and practice have taught us that the aggregate liquidity provided by a central bank has important influences on interest rates, economic activity, and the rate of price inflation. Consequently, in order to be able to adjust aggregate liquidity for national policy purposes, central banks have resorted to a number of other methods to increase or decrease the aggregate level of demand claims in the economic system. These have included the direct financing of government expenditures or the purchase of securities in open market operations.

Because demand claims are associated with transaction services, and more generally, because of the liquidity of short term assets, the public is willing to hold them even though they do not pay the higher rate of interest of longer term assets. However, an increased supply of demand claims, for example, is willingly held by the public only if there is a decline in the interest foregone by holding them, represented by a fall in the rate of interest on longer maturities. The increase in demand claims, therefore, may result in a fall in the real rate of interest, that is, the nominal interest rate less the expected rate of inflation. A higher level of liquidity and a lower real interest rate generally tend to stimulate increased private spending on goods and services, which tends in turn to increase the level of economic activity

and put upward pressure on prices, depending on the current stage of the business cycle.

Over the long-run, with the economy generally close to full employment, the effects of monetary policy are felt mainly on the average level of prices. From the description of the effects of changing the volume of demand claims, one might expect the amount of cash in an economy (that is, the money supply), relative to the level of output of goods and services, to have some effect on the general price level and, indeed, such is the case. There is little evidence that short-term fluctuations in prices can be attributed to significant changes in money supply. However, over longer periods, say three to five years, a significant relationship seems to hold. We have found this to be the case in the United States, where the long-run level of prices is closely related statistically to a broad measure of the money supply (M2).

While stimulative monetary policies may reduce interest rates and expand production, these effects may be temporary, reversing over longer periods. Higher inflation and inflation expectations cause lenders to demand *higher* interest rates to protect the real value of their assets. Increased inflation and price variability imply more uncertainty in the economic system, with deleterious effects on investment activity, productivity, and economic growth.

The monetary role of a central bank that I have outlined is distinct from, though related to, the role of fiscal policy. Government expenditures may be financed by taxes, by borrowing from domestic or foreign sources, or by borrowing from the central bank. If large and persistent government deficits are automatically financed by borrowing from a central bank, or from commercial banks with central bank backing, high inflation tends to result. To help avoid

such outcomes, the decision-making by central banks should be independent of the fiscal policy process. While fiscal policy focuses on the composition and level of government spending and taxes, monetary policy needs to focus on the appropriate level of liquidity in the economy.

The fundamental aspects of commercial and central banking in market economies may be summarized as follows.

1. Financial intermediaries play a key role in reducing risks by holding a more diverse portfolio of assets than a household saver could obtain. As a result of competition among intermediaries, this reduced risk is passed along in the form of a lower interest rate for borrowers.

2. The risk faced by an individual depositor in a commercial bank is further reduced by the loss-absorbing role of bank equity capital.

3. As a consequence, commercial banks are also able to offer depositors improved liquidity, a fixed par value of deposits, and transactions services.

4. Central banks, as institutions distinct from commercial banks and from the fiscal role of government, have two main purposes in market economies: (a) to supply liquidity as required by depository institutions but, at the same time, (b) to make certain that the degree of aggregate liquidity is consonant with stable prices.

Practices of commercial and central banking

These fundamental principles of commercial and central banking hold for a great variety of institutional, cultural, and historical settings. They have been applied in a variety of ways, and have also been violated from time to time, in the experience of the major Western nations.

One important way in which commercial banking differs across Western countries and within countries over time, is in the degree of specialization of financial institutions by the types of savers or borrowers with whom they customarily deal. In some cases, specialization of financial intermediaries is the result of government laws or regulations, while in other instances it is the historical outcome of marketing decisions by private persons.

In West Germany, Switzerland, and a number of other countries, so-called "universal" banks combine commercial banking with the underwriting of corporate securities and other investment banking activities. In the 1930s, concern about potential conflicts of interest and the financing of stock market speculation led some countries, including the United States, to make a legal separation of commercial and investment banking.

These concerns of the 1930s may have been somewhat misguided in emphasis. In general terms, universal (that is, combined commercial and investment) banks enjoy the advantages of a wide diversification of activities, and they may promote competitive efficiency in financial markets other than commercial lending. However, they may lead to a greater concentration of market power in the financial sector in general and in the industrial sectors they finance, raising the cost of capital to the economy as a whole. They also raise questions about the scope of coverage of special government protections for banks, which could end up stretching well beyond retail deposits to a variety of sources of funds financing a wide range of activities. Nevertheless, with the increasing internationalization of financial markets in recent years, the continued separation of commercial and investment banking

activities has come under serious review.

Within the broad category of commercial banking itself, cost savings from a larger size or greater scope of activities are not an important consideration beyond a fairly modest size. Specialization may therefore occur at times because an enterprise finds a profitable niche in a differentiated market. However, much specialization has also resulted from governmental efforts to promote assistance to particular economic sectors or geographic regions. Creation of specialized institutions as a matter of policy has sometimes been motivated by the idea that the credit needs or savings opportunities of certain groups might not be adequately serviced by private markets. But constraining diversification through the creation of banks specializing in narrow economic sectors can make intermediaries much more vulnerable to credit risk.

Limitations on the geographic, functional, or sectoral scope of activity of financial institutions have existed in a wide range of countries at various times. In Japan, for instance, there is a distinction between city banks and regional banks, and a separation of long-term credit and trust banks from short-term commercial lending institutions. Even in West Germany, there are specialized banks co-existing with the dominant universal banks.

In the United States, geographic specialization is largely attributable to restrictions on interstate banking and on intrastate branching, in some cases. Mainly as a result of geographic restrictions, the United States has a large number of small, local depository institutions, in contrast to the banking systems of other industrial countries. In addition, the United States, like other countries, has laws to promote lending for specific purposes. For example, a

specialized “thrift” industry exists to promote housing finance and a separate farm credit system is designed to aid the agricultural sector. Because of the limited diversification of their asset portfolios, specialized financial institutions are subject to greater risks when there is a decline in the performance of the sectors or geographical areas they support. Such was the case for the U.S. agricultural sector in the early and mid-1980s. The losses of thrift institutions in this decade have illustrated the great risks involved when geographic and sectoral specializations are combined.

When considering special assistance for a particular economic sector or geographic region, it is important to question first whether the markets are not already allocating adequate resources for these purposes. In weighing the social benefits of providing such assistance, the risks to financial institutions imply social costs that are not always taken into account. If special government-supported promotion is justified, there are normally a variety of alternatives to the creation of specialized financial institutions that could be used to provide such assistance, without creating the problems inherent in such institutions.

Since the 1960s, major banking reforms have relaxed branching restrictions and legal distinctions among financial institutions in a number of Western countries. Some countries, like the United States, have followed a gradual approach, but in any case the general trend has been to enlarge the scope of activities of financial institutions and to relax their geographic restrictions.

The structure of banking systems also affects the way governments, including central banks, provide depositor protection and liquidity services. An important factor affecting the

operation of the banking system in the United States, given its large number of independent banks, has been the existence of federally provided deposit insurance. A credible system of insurance on bank deposits, together with the assurance provided by the central bank’s discount window, reduces the likelihood of a “run” on banks. This allows policymakers to focus on regulatory and managerial issues when an individual commercial bank confronts a liquidity or solvency problem. However, government-backed deposit insurance can allow unsound institutions to have continuing access to deposit funds. Therefore, careful regulation and supervision of banks is required in such a system. In countries with more concentrated financial sectors or with less certain guarantees of deposits, the need is greater to consider the macroeconomic implications of the provision of liquidity to individual commercial banks.

The structure of a financial sector more broadly can also influence the degree of independence of central banks from fiscal authorities. In the absence of markets for government securities, central banks are sometimes called upon to help finance government expenditures by providing demand claims directly to the government in exchange for government debt. Alternatively, central banks may be asked to help finance the purchase of government debt by commercial banks in attempts to avoid the crowding-out of private borrowers induced by large government deficits. In either case, if the creation of aggregate liquidity by a central bank is dictated by persistent, large fiscal deficits, rapid inflation results, as shown by the experience of some developing countries.

If an economy has broad secondary markets for government securities, a central bank can focus on appropriate adjustments to

aggregate liquidity through timely market purchases or sales. While the existence of securities markets expands the instruments available to a central bank, it does not guarantee the independence of a central bank from fiscal policy decisions or from political pressures that may ignore the long-run effects of monetary policy. Among Western industrial countries, West Germany's Bundesbank and the Swiss National Bank are often cited as examples of strong, independent central banks. Of course, the low inflation rates in those countries are well known. In other industrial countries, such as Japan and the United Kingdom, central banks have less independence, and the inflation performance has been mixed. In the United States over the post World War II period, the Federal Reserve System has had considerable independence within the governmental structure since 1951, when it reached an agreement with the Treasury Department that it no longer had to fix interest rates on government securities. Independence is most important in cases where large fiscal deficits are likely to occur and the private sector's savings are subnormal.

In the absence of security markets, central banks tend to rely more frequently on direct controls over interest rates and over the composition and level of commercial bank assets and liabilities, which theory and practice show to have undesirable consequences. Requirements for banks to hold minimum levels of reserves—that is, deposits at the central bank—or minimum levels of broader measures of liquidity, have often been employed. At times, central banks have attempted to control the aggregate supply of bank credit through the imposition of limits on lending by individual banks. Credit constraints are sometimes supplemented by a system of subsidies to promote

lending to particular economic sectors. At times, ceilings on interest rates have been imposed on loans to favored economic sectors. In the United States as in other countries, for many years there were differential ceilings on the interest rates payable on different types of deposit accounts and on accounts in different types of institutions.

A major shortcoming of quantitative and interest rate controls is that they distort market prices and the allocation of resources in undesirable ways. For instance, an interest rate ceiling for a "favored" sector may result in a reduction in the total credit provided to that sector when other interest rates rise past the ceiling. The consequences of artificial restraints on the general level of interest rates may include inadequate savings in the economy as a whole and excessive capital intensity in some investment projects. Government direction of lending may lead to the financing of unsound projects in favored sectors, while high-return investments in other sectors go unfunded. If subsidies for particular economic activities are warranted, it is generally more efficient to provide them directly, rather than through the financial sector. Furthermore, the imposition or adjustment of quantitative controls may have substantial short-run effects on aggregate economic activity which are difficult to predict. In the long-run, moreover, they may lose their effectiveness, as innovations in financial markets tend to circumvent the controls.

As a result of these considerations, as well as the competitive pressures arising from the global integration of financial markets and other factors, there has been a general movement toward financial deregulation in Western countries in recent years. Today, central banks in nearly all industrial countries attempt to influ-

ence macroeconomic outcomes only indirectly through instruments affecting the cost or quantity of currency and bank reserves.

Within this overall generalization, individual central banks still use a variety of methods. Some central banks have relied relatively heavily on adjustments in their official lending rates, as in Japan until recently. Canada, in contrast, has used variations in government deposits in the banking system as a primary monetary policy instrument. Most industrial countries now rely mainly on open market operations, where the central bank buys or sells some type of financial asset. Open market operations usually involve government debt, but they may also take place using private financial instruments or even, as in the case of Switzerland, foreign currency.

As regards the objectives for which these policy instruments are employed, central banks tend to share the ultimate goal of long-run price stability. It seems reasonable to define this objective as a state of affairs in which inflation and inflation expectations are no longer a significant influence on economic decision-making. Price stability implies reduced uncertainty in the forecasts of relative prices crucial for investment decisions, and elimination of the distortionary effects of inflation taxes on asset returns. For such reasons, price stability can have a substantial positive effect on the prospects for long-run economic growth.

Central banks tend to differ across countries and over time regarding the emphasis given to price stability relative to other short- to medium-run macroeconomic goals. In some cases, it may be important to avoid large deviations of actual output from an economy's potential. A low and steady rate of inflation may sometimes be thought preferable to the short-

run costs required to reach stable prices. However, too much attention to short-run output goals may lead to high inflation rates and reduced output growth over the long-run. In some cases, great importance may be given to the short-run stabilization of domestic financial markets or foreign exchange markets. Such considerations, however, may ultimately be counterproductive if they are allowed to obscure or cause long delays in the achievement of price stability.

Monetary policy actions usually affect the economy and prices over long periods. Thus, monetary policy decision-making is inherently forward-looking. In recognition of this, targets or indicators intermediate between policy decisions and ultimate outcomes are often employed to help achieve macroeconomic objectives. There is a wide choice of targets or indicators that have been used, or advocated, including: the growth rates of nominal and real income, nominal or real interest rates or exchange rates, or the growth rates of various monetary aggregates.

Many of these targets or indicators must be used cautiously or in conjunction with other indicators. Inordinate attention to some types of intermediate targets may not promote the attainment of long-run goals. For instance, attempts to hold interest rates at unsustainably low levels have been shown to result in accelerating inflation. Even gradual increases in nominal interest rates may not be sufficient to contain an accelerating inflation once it begins. Similarly, attempts to maintain unrealistic exchange rates may lead to destabilizing international capital flows, and ultimately have to be abandoned.

In the 1970s, the relationship between the growth rates of the money supply and the subse-

quent growth of nominal and real incomes appeared to be close. During that time, a number of the Western industrial countries began to pay closer attention to the growth of one or more measures of the money supply. It was hoped that a monetary quantity would provide a reliable nominal anchor that could be used to achieve a stable price level. In the 1980s, however, some of the traditional relationships between money and income appeared to shift and to become more unstable. As a result, less reliance has been placed on monetary growth targets in recent years. Nevertheless, as I mentioned before, we have found in

the United States that a reliable long-run relationship remains between the level of prices and a broad monetary aggregate (M2).

In closing then, we see that a wide variety of alternative financial systems and central bank operating procedures may be consistent with the achievement of a society's long-run objectives. However, historical experience has also shown the importance of the fundamental principles underlying an effective banking system and a sound monetary policy: diversified portfolios and adequate capital in commercial banks, and a timely and adequate, but not excessive, supply of liquidity by a central bank.

The Changing Interest Sensitivity of the U.S. Economy

By George A. Kahn

Following the breakdown of relationships between the monetary aggregates and the economy, the Federal Reserve in recent years has had to rely more heavily on short-term interest rates as an instrument of monetary policy. As a result, policymakers want reliable measures of how changes in short-term interest rates affect the U.S. economy. Recent events, however, may have changed the historical relationship between interest rates and economic performance. These events include changing methods of housing and consumer finance, the rising importance of international trade, and the changing financial structure of business firms.

Because of the structural changes implied by these events, policymakers need to reconsider how monetary policy affects the economy. For example, eliminating interest rate ceilings

on consumer deposits may have made the housing industry more immune to increases in interest rates. New forms of financing consumer durable purchases may have had a similar effect on consumption. On the other hand, the greater share of exports and imports in GNP and the rising indebtedness of business firms may have made these other sectors of the economy more sensitive to interest rates.

While economists generally agree that the channels of monetary policy have changed, economists have reached no such consensus on the overall effect of these changes. Any change in the overall sensitivity of the economy to interest rate changes, however, is at least as important as changes in the channels of influence. Overall changes in the economy's interest sensitivity affect the potency of monetary policy. A decrease in interest sensitivity, for example, might mean that a larger swing in short-term interest rates would be required to achieve the same results that a smaller change once generated. Moreover, periods of monetary

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restraint or ease might have to be sustained for longer periods than in the past to achieve the same results.

This article examines evidence on the changing interest rate sensitivity of the U.S. economy. The first section of the article shows how interest rates affect real output and how this effect may be changing in four key sectors—housing, consumption, business fixed investment, and foreign trade. The second section uses an empirical model to measure changes in the interest sensitivity of sectoral and aggregate output. The article concludes that declining interest sensitivity in many key sectors of the economy has led to an overall reduction in the interest sensitivity of real GNP in the 1980s. Evidence supports a decline in the interest sensitivity of housing and consumption but fails to detect a significant relationship between investment and interest rates, much less a change in this relationship. Net exports, which used to rise when interest rates rose, now fall.

I. WHY THE ECONOMY'S INTEREST SENSITIVITY MAY HAVE CHANGED

The economy of the 1980s is in many ways different from the economy of earlier decades. Financial markets have moved gradually toward deregulation; new financial instruments have emerged; international trade and financial flows have become more important to the United States; and business firms have become caught up in a mergers-and-acquisitions boom financed largely by borrowing. As a result of these structural changes, it would not be surprising to find that monetary policy now works through different interest rate channels than in earlier decades. Nor would it be surprising to find that

the size of monetary policy's effect on the economy has changed.

Monetary policy works principally through interest rates. By directly controlling very short-term interest rates, the Federal Reserve indirectly influences longer term interest rates. Longer term interest rates, in turn, affect spending on housing, business investment, consumer durables, and other interest sensitive sectors. Thus, any change in the economy's interest sensitivity potentially changes the impact that monetary policy has on overall economic activity as well as on individual sectors of the economy. This section examines how and why the interest rate sensitivity of housing, consumption, business investment, and foreign trade may have changed in the 1980s.¹ While the interest sensitivity of other sectors may also have changed, the sectors examined in this article are generally thought to have been affected the most by structural change.

Housing

The housing sector has customarily served as an important fulcrum of monetary policy. Because housing starts have traditionally been very sensitive to mortgage interest rates, policy actions that have led to increased mortgage rates have tended to contract the housing industry. Over the last few years, however, financial market deregulation and innovation have lessened the interest sensitivity of housing. In particular, the diminishing influence and eventual removal of interest rate ceilings on con-

¹ For more detailed discussions of these issues, see Bosworth 1989, Friedman 1989, and Dudley 1989.

sumer deposits, the growth of the secondary mortgage market, and the advent of adjustable-rate mortgages have reduced the interest sensitivity of the housing industry.²

When deposit rate ceilings were in effect, contractionary monetary policy hit the housing industry particularly hard. Before the 1980s, interest rates on deposits could only rise so far when the Federal Reserve tightened monetary policy and market interest rates rose. In 1972, for example, the interest rate ceiling at thrifts was 5.0 percent on passbook savings accounts and 5.25 percent on short-term time deposits under \$100,000. Such interest rate ceilings restricted the ability of banks and savings and loan institutions to attract deposits used to fund mortgages and other loans. As market rates rose above interest rate ceilings, consumers pulled their money out of banks and savings and loans and put it into assets earning a market rate of return. This process, called disintermediation, forced depository institutions to reduce mortgage originations and caused housing starts to plummet.³ From 1972 to 1974, for example, single-family housing starts fell roughly 33 percent as short-term market interest rates rose from about 4 to 8 percent.

The Depository Institutions Deregulation and Monetary Control Act of 1980 (DIDMCA) gradually reduced disintermediation by phasing out interest rate ceilings on consumer

deposits and authorizing the introduction of new deposit accounts. Under DIDMCA and subsequent legislation, banks were allowed in late 1982 to issue special deposit accounts, such as money market deposit accounts, that paid market rates of interest. Moreover, the Federal Reserve completely lifted interest rate ceilings on demand deposits in 1986. Because of these regulatory developments, interest rates on deposits now rise more closely in line with market interest rates. When the Federal Reserve tightens monetary policy and interest rates rise, banks can continue to attract funds for mortgages and other loans by raising deposit interest rates. Qualified home buyers who are willing to pay higher rates for mortgages are able to obtain them.

Another related development that has possibly changed the interest sensitivity of the housing sector is the development of the secondary mortgage market. Before the development of this market, depository institutions provided the majority of funds for mortgages. In 1964, for example, savings and loan associations, mutual savings banks, and commercial banks together accounted for nearly 80 percent of all mortgage lending (Friedman 1989, p. 6). When deposit growth slowed at these institutions because of disintermediation, no alternative source of funds was available for mortgage finance.

With the development of the secondary mortgage market, however, the housing industry no longer depends as critically on depository institutions. In fact, secondary mortgage pools now provide the majority of mortgage funds. Sponsors of mortgage pools, such as the Federal National Mortgage Association and the Federal Home Loan Mortgage Corporation, take mortgages from approved originators and issue debt

² For a more detailed examination of factors affecting the interest sensitivity of the housing industry, see Pozdena 1989.

³ For more information on the effects of financial market deregulation and disintermediation, see Keeton 1986 and Lombra 1984.

instruments against the resulting pool.⁴ These mortgage pools, which grew relatively slowly in the 1970s, experienced rapid growth in the 1980s. From 1980 to 1988, they accounted for over 50 percent of all net lending for mortgages (Friedman 1989, p. 7). These pools have opened housing finance to the enormous savings controlled by institutional investors such as pension funds, mutual funds, and life insurance companies. As a result, the secondary mortgage market has sharply reduced the dependence of the housing industry on depository institutions and reduced the adverse effects of disintermediation.⁵

A final source of reduced interest sensitivity in housing is the advent of adjustable rate mortgages (ARMs). ARMs tie mortgage interest rates to short-term market rates. ARMs are attractive to consumers because they offer a lower initial interest rate than fixed-rate mort-

⁴ For a description of the secondary mortgage market and the impact of securitization on housing finance, see Sellon and VanNahmen 1988.

⁵ Partly offsetting this effect, though, is the growing link between mortgage markets and other capital markets. Before the development of the secondary mortgage market, the market for mortgages was regional. The amount of credit issued in a regional market depended on the supply of deposits to banks and thrifts in that region and on the regional demand for mortgage credit. As a result, housing markets were relatively isolated from national credit markets. Changes in the level of long-term interest rates in national capital markets did not necessarily lead to changes in mortgage interest rates at the regional level. With the growth of the secondary mortgage market, however, mortgage rates more closely follow capital market rates. Changes in long-term market interest rates have a more immediate impact on mortgage markets. Therefore, the transmission lag from monetary policy to the mortgage market may have been shortened. See Roth 1988 for details on the importance of this effect.

gages. Issuers of ARMs can provide attractive rates because consumers assume part of the risk of future increases in market rates. Consumers assume only part of the risk, however, because the adjustment of interest rates in ARMs is capped. For example, a typical ARM might be tied to the one-year Treasury bill rate, but limited to an interest rate increase of 2 percent in any one year and 5 percent over the life of the mortgage.

Sharp increases in market interest rates made qualifying for a mortgage much more difficult before 1981, the year the Federal Home Loan Bank Board first allowed federally chartered savings and loans to issue ARMs. Before 1981, when interest rates rose, many consumers found they could not afford a mortgage or did not qualify for one. Rules of thumb for mortgage qualification require that mortgage payments—mostly interest in the first years of a mortgage—not exceed a certain percent of household income. Thus, a rise in mortgage interest rates reduced the number of qualified potential home buyers and slowed the growth of housing starts.

With the introduction of ARMs in 1981 and their increasing acceptance among consumers, higher rates on fixed-rate mortgages no longer necessarily cause households to drop out of the housing market. Instead, consumers can opt for an ARM that carries a lower initial interest rate, making qualification easier. The option of purchasing adjustable, rather than fixed-rate, mortgages has given the housing industry greater resilience in the face of interest rate increases.

Partly offsetting the effect of ARMs on the interest sensitivity of housing, however, is the increased sensitivity ARMs impart to the non-mortgage component of the household budget. When interest rates rise, holders of ARMs

generally face higher monthly mortgage payments. These higher payments potentially reduce the spending of households on other goods and services. Thus, the decreased sensitivity of housing to interest rate changes is partly offset by the increased sensitivity of other components of spending. Limiting the importance of this effect, though, is the caps most ARMs place on interest rate increases and the initial discount most ARMs offer over fixed-rate mortgages.⁶

Consumption

Structural changes affecting the interest sensitivity of consumption are smaller and more likely to be mutually offsetting than changes in the structure of the housing industry. Nevertheless, because consumption represents a much larger share of GNP than housing, even a small change in consumption's interest sensitivity has important ramifications for aggregate output and monetary policy. The analysis of the housing sector has already alluded to two opposing factors that may nevertheless have changed the interest sensitivity of consumption behavior. These factors are the decreased importance of disintermediation, which reduces interest sensitivity, and the growth of ARMs, which increases the interest sensitivity of the nonmortgage component of the household budget. Other factors that work in opposite directions are innovations in consumer finance, which decrease the interest sensitivity of consumption,

⁶ For a discussion of the view that ARMs are not significantly different from fixed-rate mortgages and, therefore, that they have not had a significant effect on the housing market's interest sensitivity, see Romer 1989, p. 116.

and a buildup of consumer debt, which increases interest sensitivity.

Just as the decline of disintermediation reduces the interest sensitivity of the housing sector, it also reduces the interest sensitivity of consumption. Because consumer durables, especially automobiles, are often financed by borrowing from banks, spending on consumer durables is influenced by the ability of banks to attract deposits and make loans. When interest rate ceilings were in effect, increases in market interest rates reduced the availability of credit for automobile purchases and potentially reduced auto sales. Today, with the deregulation of deposit interest rates, auto sales should be less affected than before by changes in market interest rates.

Reinforcing this reduced interest sensitivity of consumption are recent innovations in consumer finance. Cut-rate auto financing, for example, has reduced or eliminated the connection between market interest rates and rates paid on automobile loans.⁷ Automobile manufacturers frequently offer below-market interest rates on car loans as a buyer incentive that does not require marking down sticker prices. To the extent that such arrangements sever the link between market interest rates and rates paid on car loans, cut-rate financing reduces the interest sensitivity of consumption.

Two additional innovations in consumer finance that may have reduced consumption's interest sensitivity are longer terms and lower down payments for loans on durable goods such as automobiles. These innovations have likely reduced the interest sensitivity of consumer spending by making it easier for consumers to

⁷ Blinder (1989) makes this point.

qualify for loans. Before these innovations, markets for consumer durables excluded consumers who could not qualify for a loan when interest rates rose. Today, with more flexible financing, fewer consumers are excluded from markets just because of a rise in interest rates.

In contrast, the advent of ARMs and other forms of adjustable rate consumer debt has probably increased the interest sensitivity of consumption. As discussed in the last section, ARMs have made household budgets more sensitive to changes in market interest rates. In addition to ARMs, though, another source of consumer credit—home equity loans—has also contributed to increased interest sensitivity. Home equity loans have grown in popularity in recent years because of changes in the federal income tax code that have reduced, and will eventually eliminate, all other forms of consumer interest deductions. Home equity loans, unlike most other forms of short-term consumer credit, carry adjustable interest rates. Thus, like ARMs, home equity loans increase the exposure of the household budget to interest rate fluctuations. As a result, higher interest rates might cut consumer spending more sharply today than in the past.

Another factor increasing the interest sensitivity of consumption is the increasing indebtedness of consumers. Partly because of more liberal financing terms, consumer debt has risen to record levels in the 1980s. As a result, any restrictive monetary policy action that cuts production and increases unemployment might risk a sharper downturn than in the past. With relatively large debts outstanding and a reduction in income, some consumers might, out of necessity, sharply reduce spending. Other consumers, fearful of a future loss of income, might cut spending for precautionary reasons.

Either way, the resulting fall in consumption might be greater than it would be with less consumer debt.

Partly or completely offsetting this effect, however, is the increase in household assets that has matched the run-up in debt. Despite the increase in debt, household net worth relative to GNP has not changed significantly in the 1980s (Friedman 1989, p. 15). Moreover, consumers continue to be net creditors. Finally, the payment of market interest rates on deposits may also increase income and consumption as interest rates rise. The extent to which these factors affect consumption depends on, among other things, the distribution of accumulated assets relative to the distribution of the accompanying accumulation of debt. If wealthy consumers are the primary holders of credit, for example, higher interest rates might do little to boost consumer spending. Nevertheless, because of factors that increase consumer income when interest rates rise, consumers might maintain confidence in the economy and continue to spend even as monetary policy turned restrictive.⁸

Business fixed investment

Paralleling structural changes that affect consumption are structural changes affecting business fixed investment. While financial market innovations have made investment less sensitive to changes in interest rates, the unprecedented increase in business debt has increased investment's interest sensitivity.

⁸ For further information on the effect of interest rates on consumption, see Cantor 1989.

Because most corporate debt has traditionally carried adjustable interest rates, businesses have traditionally faced interest rate risk. As market interest rates rose, investment projects that were originally profitable sometimes became unprofitable, forcing firms to cut back on spending plans. Because of this interest rate risk, financial markets have developed new methods to insulate businesses from the risk of interest rate fluctuations. For example, three fairly recent innovations—interest rate swaps, cap markets, and the junk bond market—have reduced the interest sensitivity of business fixed investment.⁹

Interest rate swaps allow a business owning fixed-rate debt to exchange interest-payment obligations with a business owning variable-rate debt. These transactions allow both businesses to lower interest rate risk and obtain credit at a lower cost than by directly issuing their preferred variable-rate or fixed-rate debt instrument.¹⁰ They also allow businesses that have limited access to commercial paper markets because of their relatively low credit ratings to convert floating-rate bank credit to debt obligations with fixed payments. In this way, businesses with low credit ratings can reduce their exposure to interest rate fluctuations.

The market for caps allows businesses to reduce the interest rate risk associated with variable-rate debt in much the same way that ARMs limit interest rate risk to consumers. The cap market provides businesses the opportunity to buy debt with a limit on possible interest rate

increases. This innovation, therefore, reduces the sensitivity of business investment to sharp upturns in interest rates.

Finally, the junk bond market allows firms lacking high credit ratings to issue debt, thereby obtaining credit that might otherwise be unavailable or more expensive. Before the advent of the junk bond market, these firms were often unable to obtain long-term financing for investment opportunities when short-term interest rates were high. By issuing junk bonds, these businesses shield themselves from increases in short-term interest rates.

The advent of the junk bond market also has a down side, however. Junk bonds, along with a wave of mergers, acquisitions, leveraged buyouts, and stock repurchases, have contributed to a tremendous increase in business debt in the 1980s. This increase in debt—unique to the postwar U.S. economy—increases the economy's interest sensitivity in much the same way as increases in consumer debt. But because businesses have failed to acquire real assets at the same pace as their accumulation of debt, the buildup of business debt is potentially a more serious problem than the buildup of consumer debt.¹¹

The increase in business debt increases the sensitivity of investment to changes in interest rates and other adverse shocks. When a tightening of monetary policy leads to an economic downturn, business revenues decline. Lower revenues would make it difficult for some businesses to make interest payments on accumulated debt. Some businesses would cut back on investment spending, some might sell off assets, and others

⁹ These innovations are cited in Dudley 1989, p. 7.

¹⁰ For more information about interest rate swaps, see Whitaker 1987 and Beidleman 1985.

¹¹ This view is expressed in Friedman 1986, 1988, and 1989.

would be forced into bankruptcy. Moreover, creditors might face a loss of principal and interest income and find themselves similarly caught up in the downturn. In this way, a mild downturn might turn into something much more serious. Thus, the risk of monetary restraint may have increased in the 1980s. Monetary policies that once merely slowed economic growth might today cause a more severe economic downturn because of the fragility of heavily leveraged businesses.

Foreign trade

The growth of foreign trade and international capital flows may also have changed the economy's interest sensitivity. Since the advent of floating exchange rates in 1973, imports of goods and services have grown from roughly 10 percent to 15 percent of GNP, and exports of goods and services have grown from roughly 9 percent to 13 percent of GNP. Moreover, the difference between exports and imports—net exports—has fluctuated widely. Real net exports have fallen from a surplus of \$57 billion in 1980 to a record deficit of \$130 billion in 1986. Since then, they have only partly recovered, reaching a deficit of \$75 billion last year. Matching the increase in the trade deficit is a huge increase in international capital flows, as the United States has financed its trade deficit by borrowing from abroad. In the process, the United States has become the world's largest debtor nation, with a net international debt of \$533 billion at the end of 1988.¹²

The internationalization of the U.S. economy implied by these statistics reduces the

Federal Reserve's influence over interest rates but, nevertheless, potentially increases the economy's sensitivity to monetary policy. This apparent paradox is the result of monetary policy's effect on exchange rates due to financial market interdependence. Because deregulation and innovations in international capital markets have made foreign and domestic assets closer substitutes, the Federal Reserve's influence over domestic capital markets may have diminished. Nevertheless, because the Federal Reserve now influences the foreign exchange value of the dollar through its influence over interest rates, the Federal Reserve now has a greater impact on foreign trade.

Traditionally, when the Federal Reserve tightened monetary policy causing short-term interest rates to rise, long-term interest rates also tended to rise. The rise in long-term rates then reduced spending in interest sensitive sectors such as housing and investment. The contraction of housing and investment, in turn, reduced real output. The principal effect on the foreign sector came through income effects. With a decline in income, imports would fall, thereby increasing net exports. Today, because of the increasing integration of international financial markets, this channel of monetary policy may no longer be as important as it was in the past.

With increased capital mobility, attempts by the Federal Reserve to raise short-term interest rates generate inflows of capital to the United States as foreign investors seek higher rates of return. The increased demand for dollar-denominated assets, however, causes an appreciation of the dollar. If the higher dollar increases the attractiveness of all U.S. assets and if foreign investors are large players in U.S. financial markets, the prices of U.S. assets may

¹² Scholl 1989 as quoted in Friedman 1989.

remain strong. In particular, long-term bond prices may fall less than in the past, causing long-term interest rates to rise by less than in the past.¹³ Traditional monetary policy actions may thus have nontraditional effects. Specifically, if long-term interest rates do not rise as much as in the past when the Federal Reserve tightens policy, such traditionally interest sensitive sectors as housing and business fixed investment will not contract as much—at least not initially.

This nontraditional result does not imply that the economy as a whole is insensitive to monetary policy, however. Because monetary policy influences the foreign exchange value of the dollar, policy actions affect net exports. When the Federal Reserve tightens monetary policy, for example, the value of the dollar rises in foreign exchange markets, making imports less expensive and exports more expensive. As the demand for imports rises and the demand for exports falls, net exports contract. The decline in net exports, in turn, reduces real GNP. Although business fixed investment and other spending categories would eventually respond to the fall in GNP, the primary impact of the monetary tightening is felt in the foreign sector.

A complicating factor with this relatively new channel of monetary policy is the time it takes for net exports to respond to policy changes. Imports and exports adjust very slowly to changes in the value of the dollar—more slowly, for example, than housing and investment traditionally reacted to interest rate changes. In particular, even as the dollar reversed its climb and began to fall sharply in

early 1985, net exports continued to deteriorate until late 1986. Thus, to slow an economy that is expected to overheat, monetary policymakers must now act much further in advance than they once had to act given more traditional channels of influence.

Summary

Structural changes in the U.S. economy have likely changed the interest sensitivity of several key sectors of the economy in the 1980s. While the interest sensitivity of housing has likely declined, the interest sensitivity of net exports has likely increased. The interest sensitivity of consumption and business fixed investment, on the other hand, may have increased or decreased depending on the relative importance of various structural changes. Thus, determining the net effect of these changes on sectoral output is largely an empirical issue. Moreover, determining the net effect of structural changes on the interest sensitivity of aggregate output also requires empirical evidence.

II. EVIDENCE ON THE ECONOMY'S CHANGING INTEREST SENSITIVITY

It is relatively easy to identify structural changes affecting the economy's interest sensitivity; however, measuring the importance of these changes is much more difficult. Such measurements are inherently problematic because most of the structural changes that have been identified occurred fairly recently. Therefore, not enough data have yet accumulated to estimate very accurately changes in historical relationships. Nevertheless, because of the

¹³ Friedman (1989, p. 13), among others, makes this argument.

potential importance of structural change to monetary policy, gathering whatever empirical information is already available is worthwhile, even if the results are not conclusive. This section presents empirical evidence on the economy's changing interest sensitivity. After describing the basic approach, evidence is presented for each of the four sectors under consideration—housing, consumption, business fixed investment, and foreign trade—as well as for aggregate output. Finally, the results are compared with other studies and the monetary policy implications of the evidence are examined.

The empirical approach

In looking for empirical evidence of changes in the economy's interest sensitivity, one approach is to use a different analytical framework for each sector. In considering the housing industry, for example, one study (Bosworth 1989) compared the United States with Canada because Canadians have had much more experience with ARMs. In considering the foreign sector, however, the study used a multicountry econometric model. Another study (Friedman 1989) estimated a different model, based largely on economic theory, for each sector of the U.S. economy that may have experienced a change in interest sensitivity.

In contrast, this article uses a single analytical framework, called a Bayesian vector autoregression (BVAR), to study both aggregate and sectoral output. The BVAR, based more on statistical relationships than economic theory, explains current real output growth by its statistical relationship to past output growth and past changes in interest rates. Separate BVARs, described more fully in the

appendix, are estimated for residential investment, consumption, business fixed investment, net exports, and real GNP. The interest rate used in all cases is the federal funds rate—the interest rate banks charge each other for overnight loans of reserves.

The federal funds rate is the best interest rate for analyzing the monetary policy implications of the economy's changing interest sensitivity even though longer term interest rates more directly affect economic behavior. Because the Federal Reserve exerts considerable control over the federal funds rate, the funds rate is a better indicator of monetary policy than longer term rates.¹⁴ Furthermore, as discussed in the last section, increased capital mobility may have reduced the Federal Reserve's control over longer term interest rates. As a result, changes in the relationship of the federal funds rate to economic activity indicate potential changes in the efficacy of monetary policy.¹⁵

14 Another reason for using the federal funds rate instead of longer term rates is that the federal funds rate is more closely related to most indicators of real economic performance. In particular, Bernanke and Blinder (1989) find that the federal funds rate is a better predictor of economic activity than the Treasury bill or long-term bond yield (or, for that matter, M1 or M2). Furthermore, the authors find that the federal funds rate is a relatively good indicator of Federal Reserve policy, at least before 1979. Supporting the use of the nominal federal funds rate rather than a measure of the real federal funds rate is the lack of a statistically significant relationship between current real GNP growth and lags of changes in GNP and the ex post real federal funds rate. Moreover, accounting for changes in inflation expectations by including lags of both inflation and changes in the nominal federal funds rate in a real output growth equation does not fundamentally alter the relationship between the nominal federal funds rate and real output.

15 A decline in the Federal Reserve's ability to influence longer term interest rates through its control over the federal

The basic approach is the same for both aggregate and sectoral output. The interest sensitivity of output from the fourth quarter of 1955 to the third quarter of 1979 is compared with the interest sensitivity of output from the first quarter of 1983 to the second quarter of 1989. Because the Federal Reserve placed significantly less emphasis on the federal funds rate from the fourth quarter of 1979 to the fourth quarter of 1982 than in either the earlier or later period, this interim period is omitted in the two forecasts.¹⁶ For each period, output is forecast, first, under the assumption of no change in the federal funds rate, then, under the assumption of a permanent one-percentage-point increase in the federal funds rate. Again, for each period, the difference between the two forecasts is plotted. Results are normalized so that, with no interest rate change, output would remain constant at its second-quarter 1989 level.¹⁷

funds rate would reduce monetary policy's influence on interest-sensitive spending. Confirming this reduced efficacy of monetary policy would be a breakdown of statistical relationships between the federal funds rate and interest sensitive spending. However, such a decline in the efficacy of monetary policy might not show up in estimated relationships between longer term interest rates and interest-sensitive spending. Thus, the federal funds rate is better than longer term interest rates for determining how changes in the economy's interest sensitivity affect the efficacy of monetary policy.

¹⁶ Ignoring this interim period reduces the likelihood that structural causes for changes in the economy's interest sensitivity might be mistaken for the effect of a change in monetary policy regime. Nevertheless, except for net exports, results for the period from 1979:Q1 to 1989:Q2 are very similar to results for 1983:Q1 to 1989:Q2.

¹⁷ Friedman (1989) uses a similar technique to present conditional forecast of sectoral equations from the Federal Reserve Board MPS model. Friedman uses different sample periods for each sector but in all cases includes the period from 1979:Q4 to 1982:Q4 in one of the forecasts.

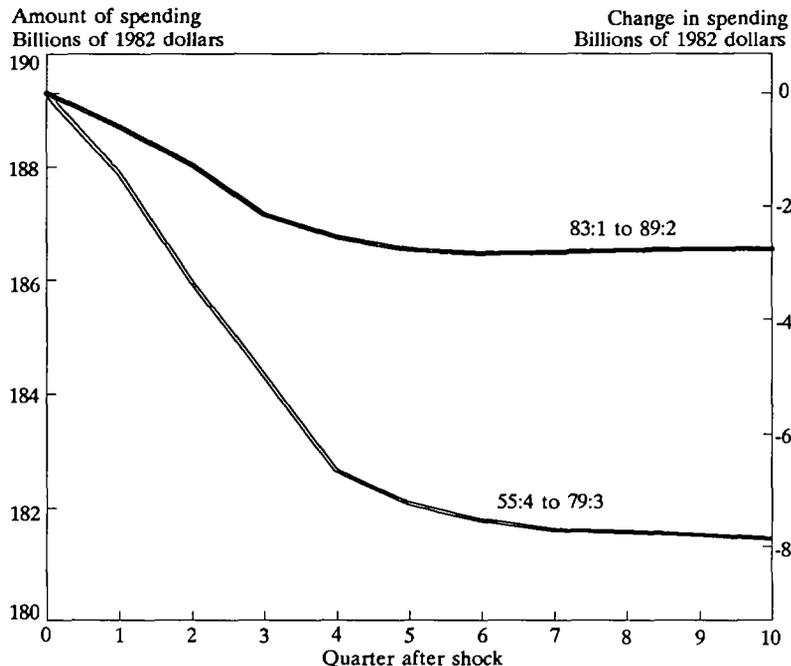
Evidence from the BVAR model

Results are presented for housing, consumption, business fixed investment, the foreign sector, and finally, real GNP. While the federal funds rate generally contributed significantly to explaining output in the earlier sample period, the funds rate was generally not significant in the later sample period. One possible explanation for this finding is that, while output was sensitive to the federal funds rate in the earlier period, it was completely interest insensitive in the later period. An alternative interpretation is that output was somewhat less interest sensitive in the post-1982 period than in the earlier period but that a shortage of data makes estimates of this effect imprecise.¹⁸ Accepting this alternative explanation implies that the estimated direction of the change in output's interest sensitivity is more reliable than its estimated size.

In all sectors except business fixed investment and net exports, evidence supports a reduced interest sensitivity of output. While evidence for business fixed investment is inconclusive, evidence for net exports shows a

¹⁸ Another possible explanation is that the economy has grown steadily since 1982, and, therefore, output has not contracted in response to an increase in interest rates. Reestimating the model for the period starting in 1979:Q1 and ending in 1989:Q2, however, yields a similar decline in the economy's interest sensitivity in all sectors except net exports. Thus, despite the inclusion of more volatile data from the early 1980s, evidence still suggests a decline in the economy's interest sensitivity. Moreover, when the model is estimated for the entire period from 1955:Q4 to 1989:Q2, the federal funds rate is generally significant, and the interest sensitivity of sectoral and aggregate output is an average of interest sensitivities in the two subperiods. Therefore, as would be expected, including data from the 1980s in the early sample period reduces estimated interest sensitivities.

CHART 1
Effect of higher interest rates on residential investment



Note: Curves show the effect of a permanent one-percentage-point increase in the federal funds rate. Quarterly figures are annualized. Base quarter is 1989:Q2.

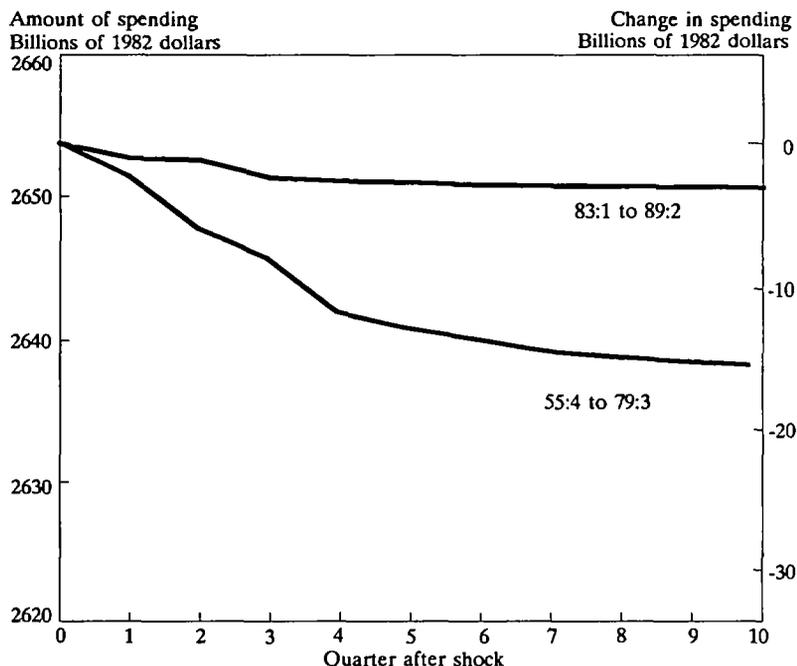
Source: Author's estimates, based on model described in text.

change in the direction of interest rate effects. Ignoring business fixed investment and adding together results for the other individual sectors imply a reduced interest sensitivity of aggregate output. Results for real GNP confirm this reduced interest sensitivity and are broadly consistent with the sum of the individual sectors.

Housing. The strongest evidence of a change in the economy's interest sensitivity comes in the housing sector. Chart 1 shows the effect on residential investment spending of a permanent one-percentage-point increase in the

federal funds rate. Before 1980, this interest rate change caused residential investment to fall about \$7 billion after six quarters. Today, according to the BVAR, the effect is down to about \$2 billion. This empirical evidence is thus consistent with observations about institutional change in the housing industry. Financial market deregulation and innovation apparently have reduced the interest sensitivity of housing. If these results hold up as more evidence accumulates, the housing sector can no longer be the fulcrum of monetary policy it once was.

CHART 2 Effect of higher interest rates on consumption



Note: Curves show the effect of a permanent one-percentage-point increase in the federal funds rate. Quarterly figures are annualized. Base quarter is 1989:Q2.

Source: Author's estimates, based on model described in text.

Consumption. Consumption spending displays an even bigger dollar reduction in interest sensitivity than housing (Chart 2). Before 1980, a permanent one-percentage-point increase in the federal funds rate led to a \$15 billion reduction in consumer spending. After 1982, the effect had fallen to about \$3 billion.¹⁹ Because consumption represents a much larger sector

of the economy than housing, however, this effect actually implies a smaller percentage change in consumption. In other words, the interest sensitivity of consumption was relatively low before 1980. Therefore, the decline in consumption's interest sensitivity was relatively small. Nevertheless, because consump-

¹⁹ Results for consumption of durable goods (not shown) indicate that today spending on durable goods is virtually interest insensitive, whereas before 1980 a one-percentage-

point increase in the federal funds rate led to an \$8 billion reduction in consumer durables spending. Thus, as would be expected, most of the former interest sensitivity of consumption was in durable goods.

tion represents a large share of GNP, even a small reduction in consumption's interest sensitivity has important ramifications for GNP and monetary policy. If the results for consumption hold up, financial market innovations and the decline in disintermediation would appear to be more important influences on the interest sensitivity of consumption than the advent of ARMs and the rise of home equity loans and consumer debt.

Business fixed investment. No statistically significant relationship could be found between business fixed investment and the federal funds rate in either the pre-1980 period or the post-1982 period.²⁰ As a result, no forecasts are plotted. Although it may seem surprising that no significant relationship can be found in a sector that simple economic theory suggests is highly interest sensitive, the result is not unusual. The result is not unusual because interest rates are only one component of the real cost of capital. Other components include the inflation rate, tax rates, and the cost of equity. When interest rates rise at the same time as inflation, for example, one component of the cost of capital partly offsets the other. Furthermore, increases in interest rates are often associated with economic upturns, the very kind of economic environment that is favorable to investment.²¹ Thus, it is actually not very surprising that the BVAR cannot identify the interest sensitivity of investment, much less changes in interest sensitivity since 1982.

The failure of the model to detect a signifi-

cant relationship between the federal funds rate and investment, however, does not diminish the potential importance of structural changes. For example, no model would likely show the effects of the huge run-up of business debt because the economy has not suffered a downturn since this run-up occurred. Policymakers must, therefore, use considerable judgment in assessing the importance of business debt. Recent history provides no clear evidence on possible effects of this debt on business spending in even a mild recession.

Foreign Trade. Just as the interest sensitivity of net exports has changed since 1982, so has the direction of the effect. This change in the pattern of response of net exports to an increase in the federal funds rate is shown in Chart 3. The chart shows that before 1980 an increase in the federal funds rate caused net exports to rise. This increase in net exports could be the result of higher interest rates reducing income, and therefore, imports. It could also result from higher financing charges on imported durable goods, such as automobiles. After 1982, however, the chart shows that an increase in the federal funds rate caused net exports to fall. Today, price effects apparently dominate income effects.²² Higher interest rates

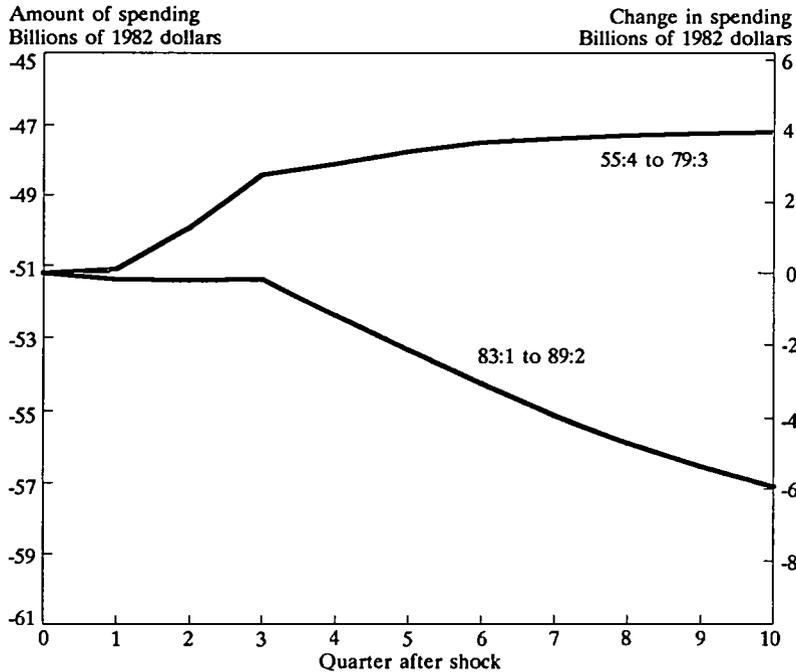
²⁰ Also, no statistically significant relationship was found in any period between spending on producers' durable equipment and the federal funds rate.

²¹ See, for example, Dudley 1989.

²² The importance of price effects after 1980 may be the result of the switch from fixed to floating exchange rates in 1973. Real exchange rates fluctuated much less during the fixed exchange rate regime than they do in today's floating exchange rate regime. However, when the sample was split at 1973, an increase in the federal funds rate still increased rather than decreased net exports. The same was true for a sample split at 1979. These results did not change when lags of real GNP and the real exchange rate were added to the BVAR. Thus, while the results are puzzling and of questionable statistical significance, the dominance of price effects over income effects seems to be a characteristic of only post-1982 data.

CHART 3

Effect of higher interest rates on net exports



Note: Curves show the effect of a permanent one-percentage-point increase in the federal funds rate. Quarterly figures are annualized. Base quarter is 1989:Q2.

Source: Author's estimates, based on model described in text.

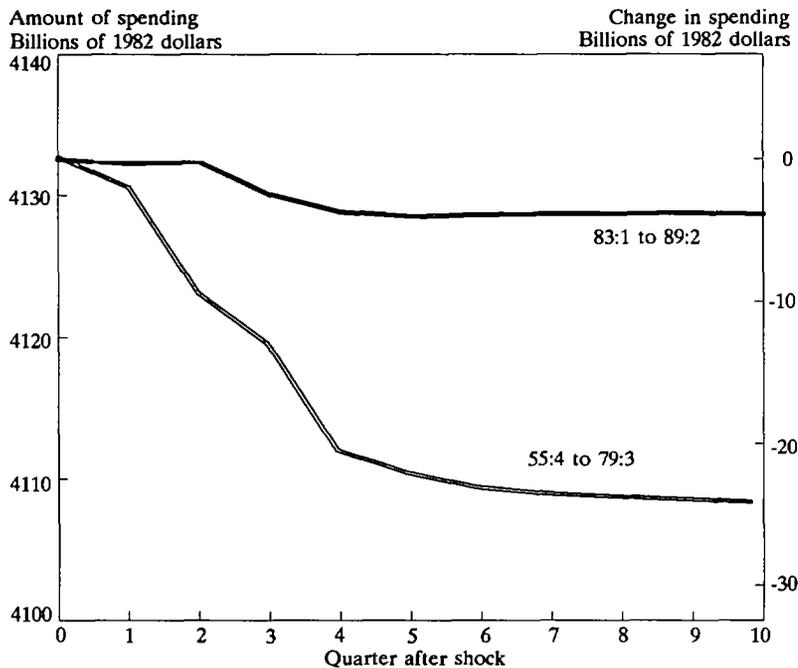
cause the dollar to appreciate, which in turn causes exports to fall and imports to rise.

The change in the interest sensitivity of net exports has important ramifications for monetary policy. First, a tightening of monetary policy now causes net exports to contract. To the extent other sectors of the economy contract less than in the past, net exports now carry a larger burden of the economy's adjustment to changes in monetary policy. Second, because net exports react so slowly to changes in the federal funds rate, monetary policy affects net exports much more slowly. As Chart 3 shows, a change in the funds rate has no significant

effect on net exports until after three quarters. Efforts by monetary policymakers to smooth fluctuations in the business cycle must, therefore, be made much further in advance than in the past. In other words, actions taken by policymakers today affect net exports and, through net exports, the economy as a whole, only after three quarters. After that, monetary policy actions continue to have real effects long into the future.

Real GNP. Ignoring business fixed investment and adding together the results for the other individual sectors imply that aggregate output declines when the federal funds rate

CHART 4
Effect of higher interest rates on real GNP



Note: Curves show the effect of a permanent one-percentage-point increase in the federal funds rate. Quarterly figures are annualized. Base quarter is 1989:Q2.

Source: Author's estimates, based on model described in text.

rises.²³ This decline, however, is less in the post-1982 period than in the pre-1980 period. The estimated interest sensitivity of real GNP, shown in Chart 4, confirms this effect. The difference reported in the chart between the decline in GNP in the later period and the

decline in the earlier period is about \$20 billion. The same difference obtained by adding together sectoral changes reported in Charts 1 to 3 is about \$8 billion. The difference between these two separate estimates of the change in the interest sensitivity of real GNP is partly attributable to sectors that have been ignored in the analysis. The difference between these two estimates, however, also highlights the imprecision of the results for both sectoral output and real GNP, particularly in the post-1982 sample. Nevertheless, the economy's overall interest sensitivity appears to have declined.

Furthermore, the decline in GNP is slower

²³ This result does not imply that monetary policy can permanently affect real output. The Federal Reserve cannot permanently fix the federal funds rate, as assumed in the forecasts, at a level inconsistent with market forces. Moreover, the results are fully consistent with the view that monetary policy cannot affect the economy's long-run real growth rate.

to materialize and faster to bottom out in the post-1982 economy. While in the earlier period real GNP fell roughly \$10 billion by the second quarter after the interest rate shock, in the later period, GNP was almost unchanged. And while in the earlier period real GNP continued to fall until about the seventh quarter, GNP stopped falling after about four quarters in the later period. Thus, according to these estimates, for a monetary policy action to have the same effect on real GNP today as it did in the past, policy would have to move the federal funds rate sooner and by much more. Policy actions might also have to be sustained for a longer period.

Comparison with other studies

The results from the BVAR are somewhat different from results reported in other studies. However, other studies generally use longer term interest rates than the BVAR. While most studies report changes in sectoral interest sensitivities, these studies differ on the size of sectoral changes and the overall impact of these changes on real GNP. For example, one study (Friedman 1989) reports results that are very similar to results from the BVAR for consumption, but different for housing, investment, and net exports. While housing displays a sharp decline in interest sensitivity in the study, its interest sensitivity is greater than estimated by the BVAR, both before and after 1980. Furthermore, the study finds significant effects of monetary policy on investment—in particular, a greater short-run interest sensitivity of investment in new equipment in the 1980s than earlier. Finally, the study finds a decline in the interest sensitivity of net exports in the 1980s, which is consistent with the BVAR's short-run results but different from its longer run results.

Together, the sectoral results of the study imply that the relationship between interest rates and real GNP is little changed in the 1980s. The differences between the study's results and those of the BVAR again point to imprecise estimates of changes in the economy's interest sensitivity.²⁴

Monetary policy implications

The empirical results from the BVAR have potentially important implications for monetary policy. They differ from other studies that imply only the channels of influence of monetary policy, not its overall potency, have changed. Interpreting the results as qualitatively correct, but quantitatively unreliable, implies that the economy's overall interest sensitivity has decreased but that the size of the decline is uncertain. Thus, the main implications of the results are that the effects of monetary policy-induced changes in interest rates on real output are less pronounced, take longer to be realized, and are more uncertain today than in the past.

To the extent that any given change in the federal funds rate ultimately causes smaller changes in real output, monetary policymakers would have to move interest rates more to generate the same outcome as in the past. How much more policymakers would have to move interest rates and for how much longer is uncertain. Nevertheless, stabilizing fluctuations in

²⁴ Another study (Bosworth 1989) finds that housing is now somewhat less interest sensitive than in the past and that the interest sensitivity of net exports has increased a little in the short run but accumulates over several years. The main implication for aggregate output is that changes in interest rates now take longer than in the past to affect real GNP.

real output could cause greater interest rate volatility than in the past. Furthermore, if policymakers influence inflation indirectly by influencing real output, larger increases in interest rates than in the past would be needed to slow real economic activity and, thereby, to reduce inflation. Such an interest rate increase would affect housing disproportionately, although by much less than in the past. Unlike in the past, however, interest rate increases would also depress net exports.

The longer it takes monetary policy actions to affect real output, the greater is the premium on accurate economic forecasts in formulating monetary policy. The primary source of a longer policy transmission lag, according to the empirical results in this study, is net exports, which now appear to respond much slower to interest rate hikes. This longer lag means that monetary policymakers must respond earlier if monetary policy is to stabilize output fluctuations. If policymakers merely respond as they have in the past, their actions might come too late and only exacerbate output fluctuations. Longer policy transmission lags, therefore, magnify the need for better and longer term economic forecasts.

Finally, the empirical evidence implies greater uncertainty about the real effects of monetary policy actions today relative to the past. Because structural changes have occurred relatively recently, estimates of their effect on the economy's interest sensitivity are highly imprecise. As a result, uncertainty about both the sensitivity of real output to interest rate changes and the length of policy transmission lags is greater today than in the past. Moreover, the effects of some structural changes are currently impossible to estimate. No one knows, for example, what effect the huge run-up in cor-

porate debt will have in a recession because no recession has occurred since corporations began their unprecedented accumulation of debt. Because of this increased uncertainty of the effects of monetary policy on real output, policymakers need to exercise caution in carrying out monetary policy. Greater uncertainty about the effects of monetary policy would make arguments against "fine tuning" the economy even more compelling today than in the past.

Summary

Empirical evidence suggests a reduction in the economy's overall interest sensitivity. This reduction in interest sensitivity is not spread equally across all sectors of the economy, however. Residential investment and consumption are less interest sensitive, while net exports now fall rather than rise in response to an interest rate hike. No conclusions can be drawn from available evidence on business fixed investment. In addition to a decline in the overall sensitivity of the economy to a change in interest rates, the time between a change in the federal funds rate and its effect on output has become longer. This lag in the transmission of monetary policy to the economy and its associated uncertainty could pose new and challenging problems for monetary policy.

III. CONCLUSIONS

Financial market deregulation and innovation, along with the rising importance of international trade in both goods and capital, have changed the structure of the economy and the conduct of monetary policy. Not only has the Federal Reserve had to reduce its emphasis on

the monetary aggregates as targets of monetary policy, but also policymakers have had to reconsider the channels of monetary policy transmission.

Evidence suggests that today interest sensitive sectors such as housing play less of a role in the transmission of policy and that net exports play more of a role. But because of the transmission lag between interest rate changes and their effect on net exports and the economy,

policymakers must respond more quickly to economic shocks. Otherwise, policy actions might come too late and possibly exacerbate the problems they were designed to correct. Complicating policy decisions, however, is considerable uncertainty about the exact nature of the economy's interest sensitivity in the 1980s. Only with experience and more observation will this uncertainty diminish.

Appendix

The BVAR Model

This appendix describes the Bayesian vector autoregressions (BVARs) used in the text to determine changes in the economy's interest sensitivity. After providing technical details of the approach, the appendix describes the BVAR's advantages and disadvantages over more structural models. Finally, the appendix compares the overall interest sensitivity of the BVAR with the interest sensitivity of other, more structural models.

Each BVAR consisted of an output equation and a federal funds rate equation. A separate BVAR was estimated for each concept of output—residential fixed investment, consumption, business fixed investment, net exports, and real GNP. For aggregate output and all of the sectors except net exports, the BVAR included a constant term, four lagged values of aggregate or sectoral output growth, and four lagged values of changes in the federal funds rate. For net exports, the BVAR was specified in levels rather than rates of change.

The means of the prior distribution on all coefficients on lagged variables were set equal to zero, except the first own lag on net exports in the net export equation, which was set equal to one. In forecasting output, the federal funds rate was made exogenous so that, in effect, only the output equations were used to generate the results.¹

The advantage of the BVAR approach is that it uses the same basic specification for each sector and requires only a few economic variables. The use of relatively few variables is an advantage because of a lack of data covering the period since many structural changes occurred. Bayesian estimation was chosen over ordinary least squares because, even with only a few variables, the number of observations is insufficient to obtain adequate estimates of the

¹ Complete estimation results are available from the author upon request.

relatively large number of coefficients in the model².

The main disadvantage of the BVAR is that any change found in the interest sensitivity of the economy cannot be traced to a particular cause or a particular type of structural change. Nevertheless, the approach can be used to determine overall changes in each sector's interest sensitivity. The approach can also determine whether these changes are consistent with the structural developments identified in the first section of the article.

But can a BVAR adequately capture the effect of the federal funds rate on economic activity, much less capture changes in this effect? One way to answer this question is to compare the BVAR with other, more complex economic models. Ignoring the possibility of structural changes in the 1980s, Chart A-1 compares the interest sensitivity of output in the BVAR with the interest sensitivity of output in two other models of the economy.³ Specifically, the chart shows the predicted reaction of real GNP in each model to a permanent one-percentage-point increase in the federal funds rate. The two alternative models are the Fairmodel and the Data Resources, Inc. (DRI) model. Each simulation starts from the actual level of real GNP in the second quarter of 1989. Results are normalized so that, with no interest rate change, output would remain constant at its

second-quarter 1989 level.⁴

Despite its relative simplicity, the BVAR exhibits characteristics that are qualitatively similar to those found in much larger structural models of the economy. For example, in the first year after the increase in the federal funds rate, all three models predict a gradual decline in real GNP. Furthermore, the three models forecast levels of real GNP in the first year that are within about \$1 billion of each other.

Differences in model forecasts clearly exist, but these differences point more to uncertainty in the effect of the federal funds rate on real output than to shortcomings of the BVAR. Moreover, these differences appear even though the models do not reflect any uncertainty about recent structural changes in the economy. In the Fairmodel—a relatively small structural model of the U.S. economy—an increase in the federal funds rate immediately reduces real GNP by about \$1 billion. After two and a half years, the effect is a \$10 billion reduction in real GNP. In contrast, an increase in the federal funds rate has no immediate effect on real GNP in the DRI model—a much larger structural model of the U.S. economy. But after two and a half years, the DRI model predicts about a \$35 billion decrease in real GNP. The BVAR

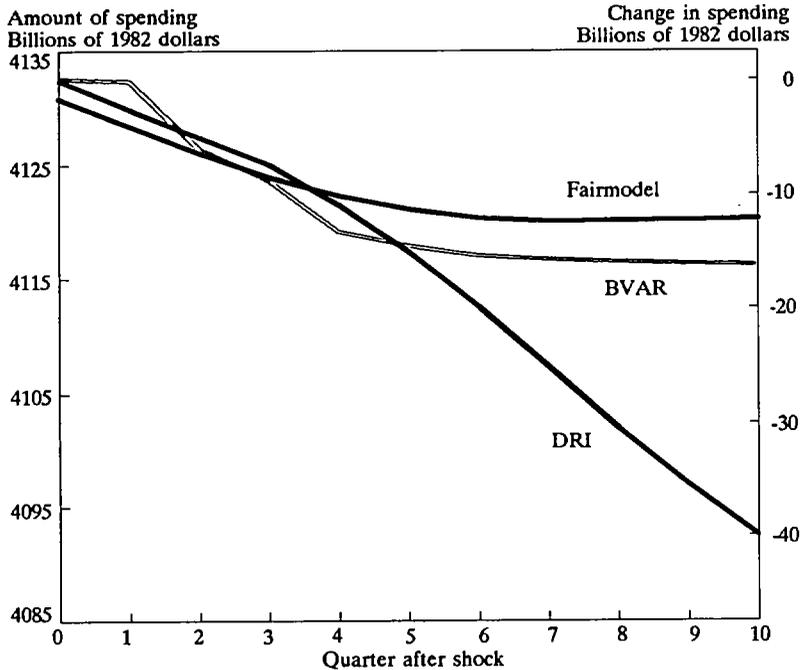
² This overparameterization of the model would lead to large out-of-sample forecast errors. For more on Bayesian vector autoregressions, see Todd 1984.

³ The estimation period for the BVAR is 1955:Q4 to 1989:Q2. Computing quarterly rates of change and creating lagged variables, however, require data from 1954:Q3.

⁴ Specifically, output was forecast twice by each model—once assuming the federal funds rate remains constant at its 1989:Q2 level and once assuming the federal funds rate rises by one percentage point in 1989:Q3 and permanently stays at the new higher level. The differences between these two forecasts were plotted for each model, starting at the level of real GNP in 1989:Q2. The Fairmodel, however, was actually simulated starting in 1989:Q2, but the results were carried forward by one quarter and inflated by the ratio of actual real GNP in 1989:Q2 to real GNP in 1989:Q1.

CHART A-1

Effect of higher interest rates on real GNP in three models



Note: Curves show the effect of a permanent one-percentage-point increase in the federal funds rate. Quarterly figures are annualized. Base quarter is 1989:Q2.

Source: DRI is based on the September 1989 quarterly U.S. model supplied by Data Resources, Inc. Fairmodel is based on the April 1989 quarterly U.S. model supplied by Macro, Inc. BVAR is based on model described in text.

displays less of a short-run effect than either Fairmodel or DRI, but displays a longer run effect that is close to an average of the two alternative models.⁵

Because the BVAR is broadly represen-

tative of other models of the economy, it can be used with some confidence to examine changes in the economy's interest sensitivity. Although evidence from larger structural models such as DRI would also be useful, such models are not suited to examining recent structural change. Because of their large size, they cannot be estimated for periods as short as the 1980s. Thus, only the BVAR is used to estimate changes in the economy's interest sensitivity.

⁵ The short-run result is not surprising since the BVAR, by definition, rules out contemporaneous effects.

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Changes in Tenth District Industrial Structure, 1963-86: Evidence from New State Data

By Glenn H. Miller, Jr.

New data on state output by industry show that the industrial structures of the U.S. economy and the Tenth District economy differ significantly. The chief difference between the two economies is the greater importance of agriculture and mining in the district economy. While the industrial structures of the two economies remain quite different, the district economy has undergone some significant changes in industrial structure in recent decades. Among the most important changes are the reduced role of mining and the increased role of manufacturing in district economic activity. Thus, by the mid-1980s the district economy was becoming more like the national economy.

Until recently, studies of regional economies have suffered from data limitations. Studies of economic growth and industrial

structure in states or in multistate regions have depended mainly on employment and personal income data, the principal data available at the subnational level. In contrast, studies of the national economy have generally used total output data, such as GNP, in discussing economic growth, and data on output by industry in analyzing changes in industrial structure. Similar output data have not been available for states. Due to the lack of such output data, studies of regional economies have yielded only limited results.

New data were released last year that correct this deficiency in regional data availability and make regional output studies possible. The Commerce Department's Bureau of Economic Analysis (BEA) published annual estimates of gross state product (GSP) by industry for each state for the period from 1963 to 1986.¹ With the new GSP estimates, researchers and policy-

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¹ Construction of the GSP estimates is discussed briefly in the appendix to this article.

makers can now compare consistent output estimates for all states. These estimates are more comprehensive than traditional measures and may be more appropriate measures of economic growth and change at the state level.

This article points out the benefits of the new GSP estimates in comparison with traditional regional indicators and then uses the GSP data to examine changes from 1963 to 1986 in industrial structure in the Tenth District. The article concludes that the importance of agriculture and mining still distinguish the district economy from the nation's, although strong growth in manufacturing and a decline in mining have made the district more like the United States as a whole.

The first section of the article explores the uses of the new GSP data for regional analysis and suggests the data will be most useful for studying long-run growth trends and long-run changes in industrial structure. The second section discusses industrial change in the context of district growth and shows both the continued importance of district resource-based industries and the increasing importance of manufacturing in the Tenth District.

I. GROSS STATE PRODUCT: BENEFITS AND USES

The GSP estimates offer observers of regional economies both benefits and shortcomings. The estimates serve well as indicators of regional economic activity due to their comprehensiveness and consistency across states. The data do have shortcomings of timing and timeliness. On balance, though, the GSP estimates are potentially quite useful for studying long-run growth trends and long-run changes in industrial structure.

Benefits

One benefit of the BEA estimates of GSP is that the published measures are regarded as official estimates. As a result, the BEA estimates are soon likely to take precedence over various unofficial estimates of GSP, based on estimation approaches that have existed for 20 years or more. Because unofficial estimates have been made by university economists and others for a variety of purposes, those estimates are not necessarily comparable across states. Thus, another significant benefit of the BEA's estimates is their comparability among all states. Furthermore, because unofficial estimates of GSP are often "blow-up" approximations based primarily on earnings data, they lack the comprehensiveness made possible by BEA's incorporating state estimates of indirect business tax liabilities and capital charges.²

The GSP estimates also compare favorably with other official data series used as indicators of state and regional economic activity, such as employment and personal income. The GSP estimates compare favorably because, unlike the employment and income data, the GSP data represent comprehensive output measures, both in the aggregate and by industry.

GSP is a more comprehensive indicator of economic activity than is total personal income, because GSP includes estimates of all capital charges, indirect business tax liabilities, labor compensation, and proprietors' income. Indirect tax liabilities and some capital charges are excluded from personal income estimates. Total personal income, on the other hand,

² For a discussion of the official estimates, see Renshaw and others 1988. For an evaluation of the BEA data, including comparisons with other data on state economic activity, see Giese 1989.

includes income from sources other than returns received for services used in current production. Moreover, within the personal income data set, only earnings data (labor compensation plus proprietors' income) are available by industry and by state. Using these narrower series to analyze industrial structure changes at the state or regional level can lead to serious distortions when other components of total output vary substantially (Renshaw and others 1988).

The GSP data also have advantages over employment data. While employment data are comprehensive in their coverage of nonfarm economic activity, they omit the farm sector and also have other shortcomings in comparison with GSP. Employment data measure just one input to the productive process. Because the employment data do not include hours worked, they do not provide a complete measure of the labor input. Moreover, employment data are not always a sufficient indicator of economic activity, as evidenced by the contrasting behavior of employment and output in the manufacturing sector. From 1963 to 1986, for example, manufacturing employment in the United States increased less than 1 percent per year, while U.S. manufacturing output as shown in the GSP estimates increased more than 3 percent per year.

Comparing GSP and employment indicators

Using the GSP data to study economic growth and industrial change in the Tenth District yields a number of conclusions different from those suggested by using the nonagricultural payroll employment data. Three main differences result from using the two indicators.

The first difference concerns overall

growth in economic activity. Nonfarm employment in the district grew slightly faster on average than U.S. nonfarm employment from 1963 to 1986. The GSP data, however, show that the district economy, including the farm sector, grew more slowly than the national economy during that period. As a result, the district contribution to U.S. total output was slightly smaller in 1986 than in 1963.

The second difference concerns the performance of the agricultural sector. District growth in agricultural GSP was considerably faster on average from 1963 to 1986 than national agricultural growth. Consequently, district agriculture contributed a significantly larger share of U.S. agricultural output in 1986 than in 1963. The employment data are necessarily silent on these matters, because they include only nonagricultural payrolls.

The third difference concerns the performance of the district mining sector. The employment data suggest little change in the relative position of the district mining sector from 1963 to 1986. The GSP data, however, show a significant weakening in district mining activity. The GSP data show district mining output declining on average from 1963 to 1986, compared with slow growth in national mining output. As a consequence, the district contribution to U.S. mining output was substantially smaller in 1986 than in 1963.

The GSP and employment indicators essentially agree on the performance of the manufacturing sector. District manufacturing output and employment both grew substantially faster than U.S. manufacturing and employment from 1963 to 1986, and a significant increase in the district share of national manufacturing activity is evident in both the GSP and the employment data.

Shortcomings and uses

While the GSP estimates are both comprehensive and comparable output measures, they suffer from problems of both timing and timeliness. With regard to timing, only annual estimates of GSP are published. Because quarterly or monthly data are important for analyzing business cycles, GSP data may contribute little to regional business cycle studies. With regard to timeliness, the reporting lag for GSP data is quite long. Data for 1986 were not published until mid-1988, and future reporting lags are likely to be at least as long. Reporting lags of such length greatly lessen the usefulness of GSP data for current analysis and forecasting purposes (Schmidt and Loseke 1989).

In spite of these weaknesses, the GSP data are useful in analyzing long-run growth trends and long-run changes in industrial structure. Such analysis is not simply of historical interest. Regional economists are aware that economic growth is an evolutionary process, and that decisions and developments of the past greatly influence current developments and future possibilities (Perloff and others 1960, p. vi). As a result, understanding past regional growth patterns is a necessary foundation for understanding economic activity both now and in the future. Regional economists also recognize the importance of long-run changes in industrial structure for forward-looking analysis.

As the various industries within a given region expand or decline or change in nature, the consequence for the region is not merely the sum total of these individual industry changes. What evolves is a total pattern of economic development which is itself a significant force in future changes (Perloff and others 1960, p. 486).

II. TENTH DISTRICT GROWTH AND INDUSTRIAL CHANGE

Long-run changes in industrial structure and differences in industry growth rates are at the heart of the evolutionary process of regional economic growth and development. Thus, understanding fundamental economic change in the Tenth District requires the examination of specific economic activities at the industry level. Differences in growth rates by industry—for example, weakness in mining and strength in manufacturing—have heavily influenced industrial change in the district. Moreover, because the overall performance of the district economy comprises all its various industry changes, the pace of district total output growth reflects the ebbs and flows in the district's individual industries. This section discusses changes in district industrial structure, emphasizing the importance of agriculture, mining, and manufacturing. The section then briefly reviews growth trends in total output in light of growth performance by industry.

Overview of industrial change

Industrial change in the Tenth District, both in terms of changes in the district's industrial structure and in terms of the district's contribution to U.S. output, is influenced heavily by differences in growth rates by industry.³

³ Industrial structure is characterized according to the contributions of individual industries to total output. An industry's contribution to a state's total output as measured by its GSP is called the gross product originating in that industry. An industry's gross product originating—also called its value added—may be defined in two equivalent ways. It

Changes in industrial structure. In both 1963 and 1986, the industrial structures of the district and U.S. economies differed in much the same way. In both years, agriculture, mining, and transportation contributed more to district total output than to U.S. total output (Chart 1).

While the importance of resource-based industries remains the major difference between the district and the United States as a whole, the two have also grown somewhat more alike in industrial structure. In 1986, the same four industries were the primary contributors to both Tenth District and national total output: manufacturing, services, FIRE (finance, insurance, and real estate), and government (Chart 1). The major change in district industrial structure from 1963 to 1986 was the disappearance of mining from the list of the district's four largest industries, as shown by share of total district GSP. Strong growth in district manufacturing and weakness in the district mining sector resulted in the displacement of mining by manufacturing as the industry contributing most to district total GSP.

Share of U.S. output. Changes in the district's growth rates and industrial structure alter the district's contribution to national output, both in total and by industry. From 1963 to 1986, the district's contribution to total U.S. output changed only slightly (Table 1). In 1963, district states produced 7.5 percent of total U.S. output. In 1986, after nearly 25 years of district

equals the sum of the industry's factor payments and non-factor costs, just as it is shown in the appendix that GNP measured on the income side equals the sum of factor charges and nonfactor charges against GNP (left side of Table A-4). An industry's gross product originating also may be defined as the total value of its output (sales plus inventory change) less the value of its consumption of purchased materials and services inputs.

TABLE 1
Tenth District real GSP as a share of U.S. real GSP, by industry, 1963 and 1986 (percent)

<u>Industry</u>	<u>1963</u>	<u>1986</u>
Total	7.5	7.2
Agriculture	11.9	13.7
Mining	20.4	15.2
Construction	7.4	7.4
Manufacturing	4.6	5.7
Transportation	8.2	8.5
Wholesale trade	6.7	6.4
Retail trade	7.2	7.1
FIRE	7.0	6.6
Services	6.3	6.3
Government	7.3	7.6

**Addendum: Total output
valued in billions of 1982 dollars**

United States	1,863	3,681
Tenth District	140	264

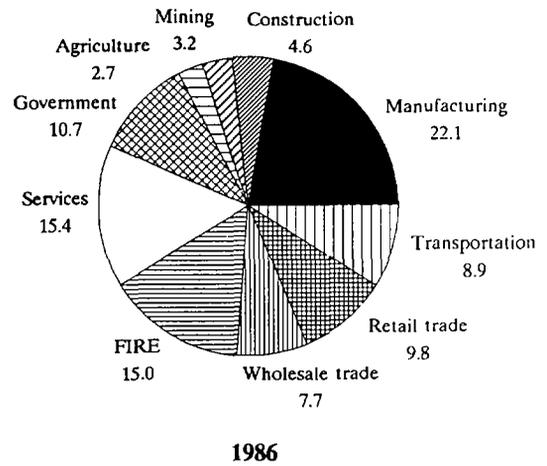
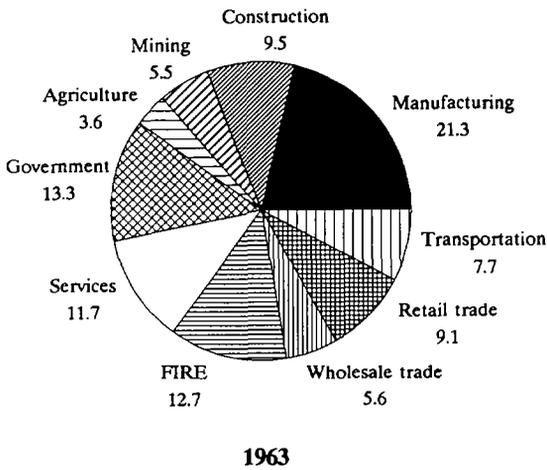
Source: U.S. Department of Commerce, Bureau of Economic Analysis

growth slower than the nation's, the district's share slipped to 7.2 percent.

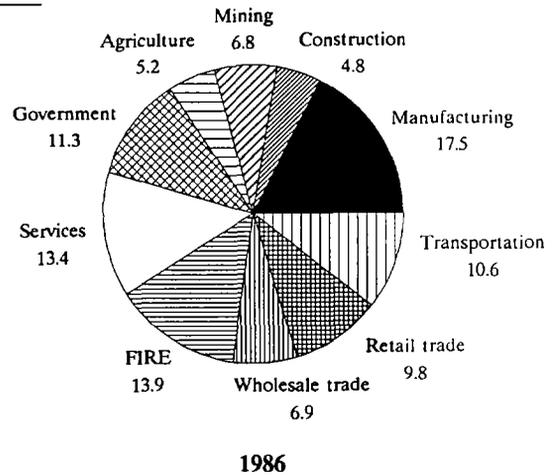
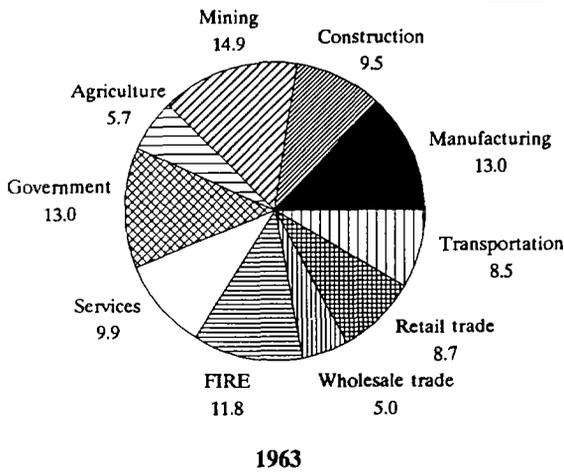
Overall, district shares of U.S. output by industry changed only moderately from 1963 to 1986. For three industries, however, the district contribution changed more significantly. District shares for agriculture, mining, and manufacturing changed by a full percentage point or more. The district's share of total U.S. agriculture and manufacturing output was significantly larger in 1986 than in 1963, while the district's share of national mining output was substantially smaller (Table 1).

CHART 1
Real GSP by industry as share of total GSP
(percent)

United States

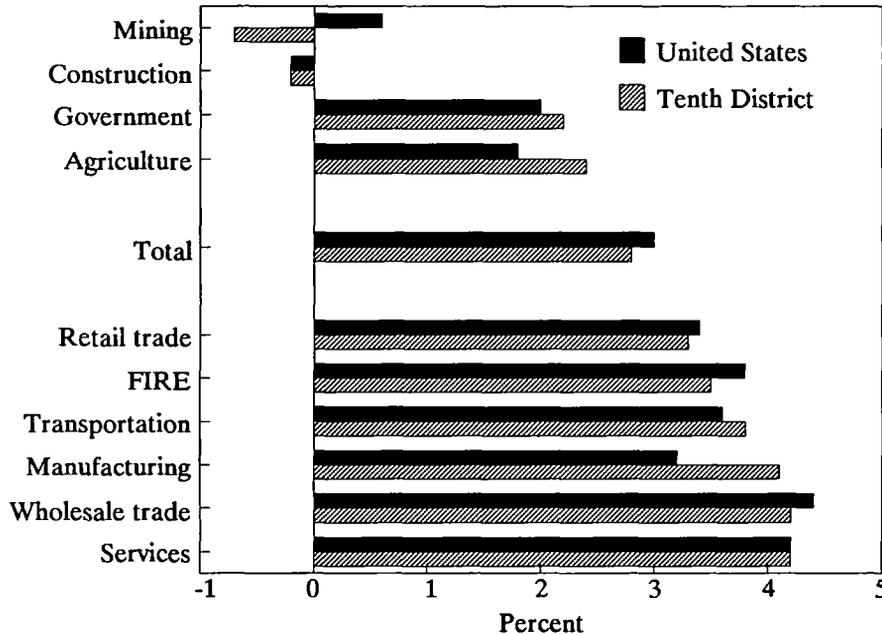


Tenth District



Source: U.S. Department of Commerce, Bureau of Economic Analysis

CHART 2
Real GSP growth by industry in the U.S. and Tenth District, 1963-86
 (average annual percent change)



Source: U.S. Department of Commerce, Bureau of Economic Analysis

Resource-based industries and manufacturing

Two important elements of change in the district economy from 1963 to 1986 emerge from the preceding discussion. One is the continued importance of the region's resource-based industries, agriculture and mining, in spite of the reduced strength in mining. The second is the changing importance of manufacturing for both the district's output growth and its industrial composition.

These continuities and changes can be analyzed further using the information on growth

in real GSP by industry (Chart 2). This information offers two kinds of comparisons. First, for either the district or the nation, growth in any industry can be compared with the same region's total growth. Such comparisons can identify industries as fast growing or slow growing. From 1963 to 1986, for example, manufacturing grew faster than total growth in the district and in the nation, making it a fast growing industry in both the district and the nation. Second, for any industry, growth in the district can be compared with growth in the United States. Manufacturing, for example, grew substantially faster in the district than in

the nation from 1963 to 1986.

Agriculture. The relative importance of agriculture to the district economy is apparent from the GSP data. In both 1963 and 1986, agriculture contributed more to district total output than to national output. Agriculture was a slow growth industry in both the district and the United States from 1963 to 1986. That is, district agricultural output grew more slowly than total output in the district, and U.S. agriculture grew more slowly than U.S. total output (Chart 2). At the same time, however, district agriculture grew substantially faster than U.S. agriculture. Because of that growth differential, the district's contribution to total U.S. agricultural output was significantly larger in 1986 than in 1963 (Table 1). Agriculture's share of total district output remained about the same in 1986 as in 1963, however (Chart 1). Overall, the district continues to have abundant agricultural resources, many of which have little alternative use.

Mining. The declining relative importance of mining in the district is also apparent from the GSP data. Mining, like agriculture, was a slow growth industry in both the district and the United States from 1963 to 1986. Contrary to agriculture's performance, however, district mining grew slower than U.S. mining (Chart 2). Indeed, the real output of the district mining sector declined from 1963 to 1986. In 1986, the district contribution to total U.S. mining output was substantially smaller than it was in 1963 (Table 1). And, mining's relative contribution to total district output in 1986 was only about half as large as in 1963 (Chart 1).

The performance of district coal mining contrasted with the performance of district oil and gas extraction. Coal mining was the strongest growing segment of the district min-

ing sector. Coal mining growth averaged 10 percent per year from 1963 to 1986, with its highest growth years in the late 1970s and early 1980s. Coal's share of district mining GSP rose from 1 percent in 1963 to 12 percent in 1986. District oil and gas extraction declined about 1 percent per year on average over the period. As a result, the oil and gas extraction share of district mining GSP fell to 81 percent in 1986 from 94 percent in 1963.

A possible interpretation of the district mining sector's comparative weakness might involve the relative importance of the oil and gas sector. Oil and gas extraction was a larger share of mining output in the Tenth District than in the United States during this period. The district oil and gas industry was relatively mature and did not benefit from output-increasing features of the national industry, such as off-shore drilling and the opening of the Alaskan fields.

Manufacturing. The strong growth and increasing importance of the district's manufacturing sector are clearly evident from the GSP data. From 1963 to 1986, district manufacturing growth averaged 4.1 percent per year—faster than the national growth of 3.2 percent (Chart 2). Consequently, district manufacturing made up about 5.7 percent of U.S. manufacturing output in 1986, up from about 4.6 percent in 1963 (Table 1).

Manufacturing also became a larger share of total district output. In 1963, manufacturing contributed 13 percent of district total output—less than mining's share and equal to the government's share (Chart 1). But, by 1986 the manufacturing share of district total output—17.5 percent—was larger than the output share of any other major industrial division.

Durable goods manufacturing in the district

Industry growth trends and industrial structure in district states

Total output growth

Total output growth among district states varied greatly from 1963 to 1986, as measured by GSP. Colorado's growth of 4.2 percent per year outpaced the nation's 3 percent growth. Growth in the six other district states ranged from 2.3 percent to 2.6 percent per year, far less than Colorado's growth rate and well below the national average (Table 2).

No district state—not even Colorado—grew faster than the nation in either the mid-1960s or the mid-1980s. Missouri's real output growth kept pace with the nation's from 1982 to 1986, however, and nearly did so from 1963 to 1967—probably because Missouri's economy resembles that of the nation. From 1982 to 1986, while the nation as a whole was recovering rapidly from recession, total district growth was held back by output declines in Oklahoma and Wyoming and slow growth in New Mexico.

In the 1970s, the output growth rates of individual states varied. Colorado grew substantially faster than the United States in each period. Missouri grew more slowly than the United States in all three periods, especially from 1977 to 1982, when Missouri suffered far more from the brief 1980 recession than did the nation. Relatively slow GSP growth in Kansas and Nebraska from 1977 to 1982 was still enough to outpace the even slower U.S. growth in that period. Strong growth years in the late 1960s, and again in the late 1970s and early 1980s, gave Oklahoma faster output growth

than the United States from 1967 to 1972 and again from 1977 to 1982. New Mexico and Wyoming growth far surpassed U.S. growth from 1972 to 1982, as those two states posted their highest growth rates in the 1963-86 period.

Industry growth and structure in district states

Comparing state and U.S. industry growth rates from 1963 to 1986 reveals a great deal of diversity (Table A-1). The comparison between Colorado and the nation is the simplest, because output growth in every major sector of the Colorado economy was greater from 1963 to 1986 than growth in corresponding sectors of the national economy. The only other district state coming close to such a relationship was Oklahoma, which posted growth equal to or greater than the national pace in every industrial sector except mining.

Manufacturing was the industry in which the most district states had output growth faster than the nation's. All district states except Wyoming recorded faster growth in factory output from 1963 to 1986 than occurred in the United States as a whole.

Changes in industrial structure from 1963 to 1986 were quite consistent across district states (Tables A-2 and A-3). Manufacturing contributed a larger share of total output in 1986 than in 1963 in every state but Wyoming. Mining made up a smaller share of total output in 1986 than in 1963 in all district states except Missouri. Mining still provided a substantial

TABLE A-1
Real GSP growth by industry, 1963-86
(Average annual percent changes)

<u>Industry</u>	<u>US</u>	<u>Tenth District</u>	<u>CO</u>	<u>KS</u>	<u>MO</u>	<u>NE</u>	<u>NM</u>	<u>OK</u>	<u>WY</u>
Agriculture	1.8	2.4	3.1	2.6	0.8	3.4	1.3	3.0	-1.1
Mining	0.6	-0.7	1.2	-5.0	2.6	-7.9	0.1	-0.7	0.7
Construction	-0.2	-0.2	1.2	-1.1	-1.6	-2.5	-1.5	-0.2	3.4
Manufacturing	3.2	4.1	5.4	3.9	3.3	4.6	6.6	5.1	0.0
Transportation	3.6	3.8	5.6	3.4	2.9	3.4	4.4	3.9	5.0
Wholesale trade	4.4	4.2	5.5	5.0	3.0	4.1	4.9	4.5	6.1
Retail trade	3.4	3.3	4.9	2.4	2.9	2.1	3.8	3.8	3.3
FIRE	3.8	3.5	4.5	2.9	2.9	2.8	4.9	3.8	4.9
Services	4.2	4.2	5.5	3.9	3.7	3.5	3.9	4.3	3.4
Government	2.0	2.2	2.8	2.1	1.8	1.6	2.0	2.2	2.9
Total	3.0	2.8	4.2	2.3	2.6	2.6	2.6	2.6	2.3

Source: See Table 1.

TABLE A-2
Industry output as a share of total GSP, 1963
(Percent)

<u>Industry</u>	<u>US</u>	<u>Tenth District</u>	<u>CO</u>	<u>KS</u>	<u>MO</u>	<u>NE</u>	<u>NM</u>	<u>OK</u>	<u>WY</u>
Agriculture	3.6	5.7	4.1	8.0	4.9	12.9	3.6	4.0	4.8
Mining	5.5	14.9	7.8	16.3	0.4	4.0	33.4	30.8	48.3
Construction	9.5	9.5	11.2	8.4	10.6	11.0	8.1	7.3	8.3
Manufacturing	21.3	13.0	11.5	13.9	21.0	9.8	3.2	9.0	4.7
Transportation	7.7	8.5	7.9	9.0	10.0	9.2	6.5	7.0	6.6
Wholesale trade	5.6	5.0	5.2	4.1	7.0	5.4	2.9	4.2	1.6
Retail trade	9.1	8.7	9.1	8.8	10.0	9.9	7.1	7.3	5.0
FIRE	12.7	11.8	13.9	12.3	13.2	14.8	7.9	9.1	6.8
Services	11.7	9.9	11.9	8.4	11.7	10.1	10.2	7.8	5.2
Government	13.3	13.0	17.5	10.8	11.1	13.0	17.2	13.6	8.8

Source: See Table 1.

TABLE A-3
Industry output as a share of total GSP, 1986
(Percent)

<u>Industry</u>	<u>US</u>	<u>Tenth District</u>	<u>CO</u>	<u>KS</u>	<u>MO</u>	<u>NE</u>	<u>NM</u>	<u>OK</u>	<u>WY</u>
Agriculture	2.7	5.2	3.2	8.6	3.3	15.5	2.6	4.4	2.2
Mining	3.2	6.8	4.0	3.0	0.4	0.3	18.9	14.6	33.4
Construction	4.6	4.8	5.8	3.9	4.1	3.4	6.3	4.0	10.8
Manufacturing	22.1	17.5	15.0	20.0	24.7	15.4	7.6	15.9	2.8
Transportation	8.9	10.6	10.7	11.5	10.7	10.9	9.6	9.5	12.2
Wholesale trade	7.7	6.9	7.0	7.5	7.8	7.6	4.3	6.4	3.6
Retail trade	9.8	9.8	10.8	9.0	10.6	8.9	9.3	9.5	6.3
FIRE	15.0	13.9	14.9	14.1	14.2	15.4	13.0	12.0	12.1
Services	15.4	13.4	15.8	12.1	15.0	12.3	13.3	11.5	6.7
Government	10.7	11.3	12.8	10.4	9.3	10.5	15.0	12.4	10.1

Source: See Table 1.

share of state output in New Mexico, Oklahoma, and Wyoming, however. Mining's decline in importance was most significant in Colorado and Kansas.

Changes in the relative contribution of agriculture to state total output were mixed. In the district's two most agricultural states—

Kansas and Nebraska—agriculture provided a larger share of total output in 1986 than in 1963; the same was true for Oklahoma. In the other four district states, agriculture was a less important source of total output in 1986 than in 1963. In those four states, agriculture's contribution was closer to the national average.

grew more rapidly from 1963 to 1986 than non-durable goods manufacturing. Consequently, durables output increased from 56 percent of district manufacturing GSP in 1963 to 63 percent in 1986, despite the decline of motor vehicle output from its peak. Output of instruments and electrical equipment grew rapidly from 1963 to 1986, albeit from small bases. The manufacture of transportation equipment other

than motor vehicles turned around in the 1970s and increased strongly toward the end of the period, after dipping slightly in the early 1980s.

The total growth outcome

Total output—a composite of the output of individual industries—grew slower on average in the Tenth District than in the nation from

TABLE 2
Real GSP growth, 1963-86
(Average annual percent changes)

	<u>1963-67</u>	<u>1967-72</u>	<u>1972-77</u>	<u>1977-82</u>	<u>1982-86</u>	<u>1963-86</u>
United States	4.60	2.85	2.56	1.28	4.35	3.00
Tenth District	3.44	3.10	2.83	2.52	2.10	2.80
Colorado	2.80	5.54	4.79	3.87	3.43	4.16
Kansas	3.06	2.36	1.84	1.41	3.22	2.31
Missouri	4.32	2.57	2.20	0.26	4.36	2.59
Nebraska	3.64	2.75	2.34	1.66	2.74	2.57
New Mexico	1.22	2.61	4.06	3.41	1.38	2.64
Oklahoma	4.11	3.17	2.20	4.42	-1.45	2.57
Wyoming	1.86	2.31	4.61	5.95	-4.48	2.28

Source: U.S. Department of Commerce, Bureau of Economic Analysis

1963 to 1986, but district output grew faster in some subperiods. Real output in the district grew 2.8 percent annually from 1963 to 1986, just slightly slower than total U.S. growth of 3.0 percent (Chart 3). While output grew faster on average in the nation from 1963 to 1986, output grew faster in the district in the 1970s—especially if the 1970s period is stretched to include the years from 1967 to 1982 (Table 2).⁴

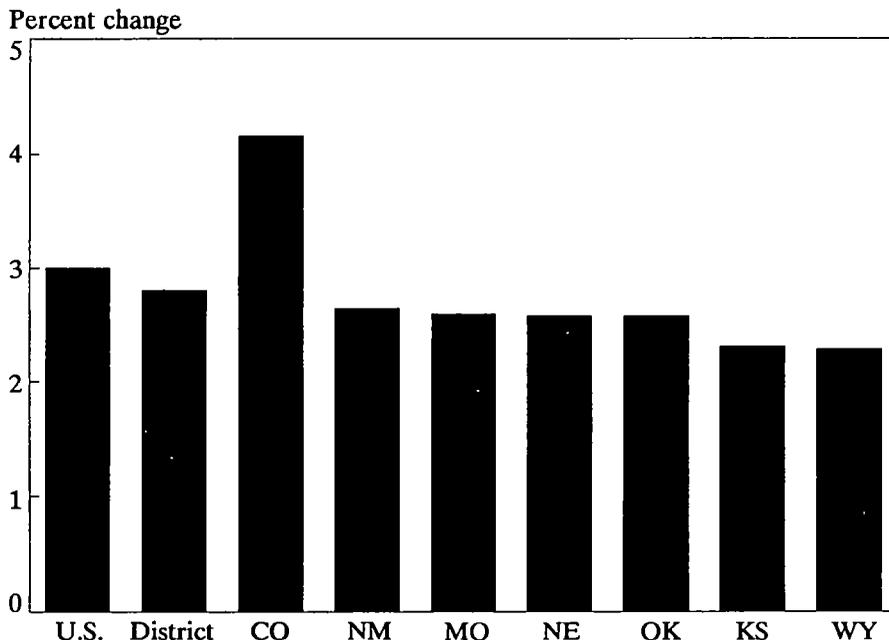
During the three subperiods from 1967 to 1982—the “stretched 1970s”—district growth outpaced U.S. growth, as nearly all major

industries grew faster in the district. District manufacturing growth outpaced growth in the nation primarily because nondurables output growth in the district held up well in the early 1980s. Exceptions to faster growth in the district were mining, which grew slower in the district than in the nation for most of the period, and agriculture, which suffered a period of weakness in the mid-1970s.

Real output grew faster in the nation than in the district both in the mid-1960s and in 1982-86, the first four years of the present business cycle expansion. From 1963 to 1967, U.S. growth surpassed district growth in every major industry but three—agriculture, manufacturing, and government. From 1982 to 1986, the only industry to grow faster in the district than in the nation was agriculture. District manufacturing nearly kept pace with national manufacturing growth from 1982 to 1986, but output from the district’s mining sector fell sharply due to steep declines in both oil and gas extraction and metal mining.

⁴ Beginning and ending years for the subperiods are the benchmark years for the GSP estimates, except 1986, which is the most recent year for which an estimate is available. Benchmark years were chosen to identify subperiods on the presumption that benchmark year estimates are better than those for intervening years. The choice of benchmark years to identify subperiods generally provides economically meaningful periods. For example, 1982-86 includes those years of the present business cycle expansion for which GSP estimates are available. All of the benchmark years but one were national business cycle expansion years; 1982 was a recession year.

CHART 3
Real GSP growth in the U.S. and Tenth District, 1963-86
(average annual percent change)



Source: U.S. Department of Commerce, Bureau of Economic Analysis

Long-run forces have thus shaped a slow growing district economy that in the mid-1980s still differed from the U.S. economy primarily because of the importance of the district's resource-based industries, agriculture and mining. While agriculture has maintained its importance in the district, mining has declined somewhat. Manufacturing, on the other hand, has flourished. These long-run patterns of industrial change are themselves significant forces for future change. Forward-looking analyses and prescriptions for the district economy must acknowledge these trends and the plausibility of their continuation.

III. SUMMARY

The recently published GSP data permit the study of long-run regional economic performance based on comprehensive output estimates. Such a study of the Tenth District shows that, after nearly 25 years of growth and change, the district economy has become somewhat more like that of the United States as a whole. The district also retains much of its industrial distinctiveness, however. Agriculture and mining (in spite of its decline) remain relatively more important to the district than to the nation. But manufacturing, while

still less important to the district than to the United States, has become an increasingly larger share of district output. These changes have occurred in the context of slower total output growth in the district than in the nation as

a whole. The fundamental trends discussed in this article have helped shape the district economy and are likely to shape its performance in the future.

Appendix

Gross state product: definition and construction

The BEA defines gross state product as follows:

GSP is the gross market value of the goods and services attributable to labor and property located in a state. It is the state counterpart of the nation's gross domestic product (GDP) (Renshaw and others 1988, p. 30).

Both GSP and GDP refer to where output is produced and not to where ownership of the factors of production resides. GSP is the total output produced in a state and is that state's contribution to U.S. GDP.

Understanding the construction of GSP can be aided by a brief review of how GNP, the most widely used measure of national output, is measured. While GSP is more closely parallel to GDP than to GNP, the construction of the GSP estimates is discussed in comparison with GNP because data and information on GNP are more readily available. GNP is measured at market value and includes only output in the form of final sales plus business inventory change, in order to avoid double-counting of goods and services embedded in final products. In its most familiar form of presentation, GNP is shown as the sum of purchases by major spending sectors of the economy. These are called the product components of GNP and together represent the product approach to measuring total output (right side of Table A-4).

Like private bookkeeping, national income and product accounting is a double-entry

system. Total national output, or GNP, equals the total income flows generated in producing that output. As a result, GNP can be measured from the income side as well as from the product side of the accounting system. GNP as measured on the product side and on the income side is conceptually the same thing. When actually estimated for a particular period, they differ by a relatively small amount called the statistical discrepancy, because they are measured independently.

The income side measure is made up of what are called "charges against GNP," which are the costs incurred and profits earned in the production of GNP (left side of Table A-4). Total charges against GNP on the income side are separated into factor charges and other charges. Factor charges represent the returns to productive factors for their services—labor compensation, proprietors' income, rental income of persons, corporate profits, and net interest. The other charges are composed primarily of indirect business tax liabilities and capital consumption allowances. Indirect business tax liabilities include sales, excise, and property taxes. These tax liabilities are not earned income but are included in the market value of output and thus are included in charges against GNP on the income side of the national accounts. Capital consumption allowances are mainly depreciation charges representing the using up of fixed capital in the production of output. Because depreciation costs are embedded in the market value of output, they

**TABLE A-4
National income and product account, 1987**

<u>Income-side components</u>	<u>\$ Billions</u>	<u>Product-side components</u>	<u>\$ Billions</u>
Compensation of employees	2,683.4	Personal consumption expenditures	3,012.1
Proprietors' income	312.9	Gross private domestic investment	712.9
Rental income	18.4	Net exports	-123.0
Corporate profits	310.4		
Net interest	353.6	Government purchases	924.7
Indirect business taxes	376.1		
Capital consumption allowances	480.0		
Statistical discrepancy	-8.1		
GNP	4,526.7	GNP	4,526.7

Source: See Table 1.

also appear on the income side of the national accounts as a charge against GNP.

Just as GNP can be measured from the income side, the BEA measures GSP from the income side to estimate the gross market value of a state's output. Four components, or charges to GSP, are estimated: compensation of employees, proprietors' income, indirect business tax liability, and other, mainly capital-related, charges. The last component includes rental income, net interest, corporate profits, and capital consumption allowances. The four

components are summed to give the GSP estimate of the goods and services produced by labor and property located in a state.

GSP is estimated both in nominal (current dollar) terms and in real (constant dollar) terms. While the nominal series may be used for analyzing such things as the differential regional effects of relative price changes, estimates of real GSP provide the data for analysis of changes in the physical volume of output. Real GSP estimates in constant 1982 dollars are based on national price deflators by industry.

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