Intangibles: What Put the *New* In the New Economy?

*Leonard Nakamura**

The U.S. economy is often called a new economy. One reason is that newly developed products are everywhere: Microsoft's Windows98, Paramount's movie "Titanic," Pfizer's Viagra, and Gillette's Mach3 razor blades are four prominent examples. Developing each product required its corporate sponsor to invest hundreds of millions of dollars. For example, Gillette invested $700 million to develop the Mach3 razor blade in an effort begun in 1990. Paramount spent over $200 million to bring director James Cameron's vision of "Titanic" to the screen.

*Leonard Nakamura is an economic advisor in the Research Department of the Philadelphia Fed.

These investment expenditures gave rise to economically valuable, legally recognized *intangible assets*, including copyrights ("Titanic" and Windows98) and patents (Viagra and Mach3) that give the investing firms the exclusive right for a certain period to sell the newly developed products. Pfizer sold over $700 million worth of Viagra in 1998 after its introduction in April; "Titanic" sold $1 billion in theater tickets before it entered video sales; and Gillette's Mach3 razor blade was the top seller in the United States by the end of 1998, having secured more than 10 percent of the razor blade replacement market in less than a full year.

Patents and copyrights on new consumer products are not the only types of intangible as-

sets. New processes for making *existing* goods, such as the process for coating cookie wafers with chocolate, and new *producer* goods, like PC servers and fiber optic telephone cables, can also be patented or copyrighted or, perhaps, protected as trade secrets. Other intangible assets are brand names and trademarks, which can help a firm certify the quality of an existing product or introduce new products to potential purchasers. Not only can a reputation for quality persuade shoppers to try an item for the first time, but a clever use of advertisements can go a long way toward targeting precisely those who will gain the most from the product and thereafter become loyal, repeat customers.

Yet, because they are not investments in tangible assets, most expenditures on *intangible* assets are not recognized as investments in either U.S. companies' financial accounts or the U.S. national income and product accounts. This practice may have been reasonable when investment in such assets was a negligible portion of our total investment, but that is no longer the case. In this article, we will look at two key consequences of these accounting conventions. First, not only are reported corporate profits understated, they're understated more than they used to be because corporations are investing more of their cash flow in intangible assets. As a result, U.S. price/earnings ratios are overstated. Second, U.S. national income, saving, and investment are understated because a larger proportion of output is invested in intangibles. As we shall see, growing investment in intangibles also helps explain how the measured U.S. personal saving rate can be near zero even as U.S. wealth has grown considerably. U.S. economic and financial performance is less puzzling when we take this intangible investment into account.[1]

[1]In two previous articles in the *Business Review,* I have explored the consequences of new products and new retail practices for the measurement of inflation and output growth.

TABLE 1

R&D, Tangible Investment, and Advertising Of Nonfinancial Corporations

(as a proportion of nonfinancial corporate gross domestic product)*

Period	Research and Development (%)	Fixed Tangible Investment (%)	R&D and Tangible Investment (%)	Advertising Expenditures (%)
1953-59	1.3	12.6	13.9	4.2
1960-69	1.7	12.7	14.4	3.9
1970-79	1.8	13.9	15.7	3.4
1980-89	2.3	14.1	16.4	3.9
1990-97	2.9	12.6	15.5	4.1

Source: Flow of Funds, National Science Foundation, and McCann-Ericson.

*The gross domestic product originated by a firm is its revenues less purchases from other firms. Nonfinancial gross domestic product can be thought of as total nonfinancial domestic corporate revenues after eliminating double counting due to interfirm transactions. An advantage of using this measure over total revenues as a basis for comparison is that changes in corporate structure—mergers and spinoffs, for example—can affect the amount of interfirm transactions and thus change the amount of total corporate revenues even though total final production is unchanged.

RISING INVESTMENT IN INTANGIBLES...

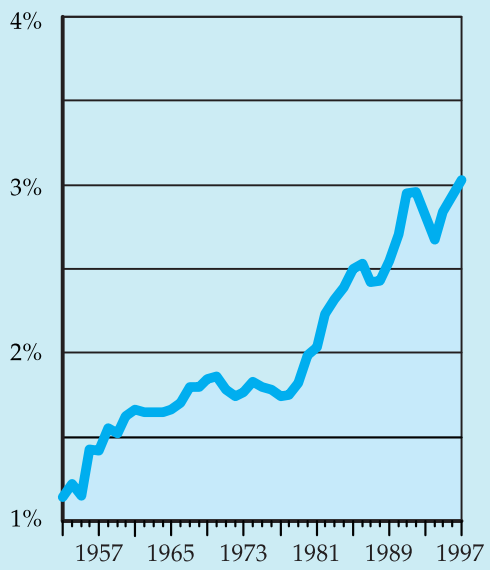
Research and development (R&D) expenditures to create new products have certainly been rising. Looking at the long sweep of U.S. data since 1953, we see that R&D expenditures have more than doubled as a proportion of nonfinancial corporate gross domestic product (GDP) (Table 1 and Figure 1). [2] By contrast, we see that tangible investment in plant and equipment (as a proportion of nonfinancial corporate GDP) was no higher in the 1990s than in the 1950s and 1960s (Table 1 and Figure 2).

During the postwar period, investment spending, including R&D, rose 1.6 percentage points as a proportion of nonfinancial corporate GDP, from 13.9 percent in the 1950s to 15.5 percent in the 1990s. All of this increase was due to R&D expenditures. Looking at Table 1, we can see that if we count R&D as investment, the years since

[2]The data we are discussing are stated in nominal terms, rather than being adjusted for inflation (i.e., in real terms). This distinction is important because prices of some investment goods—such as computers—have been declining rapidly, so firms are able to obtain a lot more computational power for their dollars today than in the past. On the other hand, these rapid technological improvements are not, by and large, reflected in the published deflators for R&D expenditures. Indeed, how to properly deflate R&D expenditures is a substantial, unsolved research question.

FIGURE 1

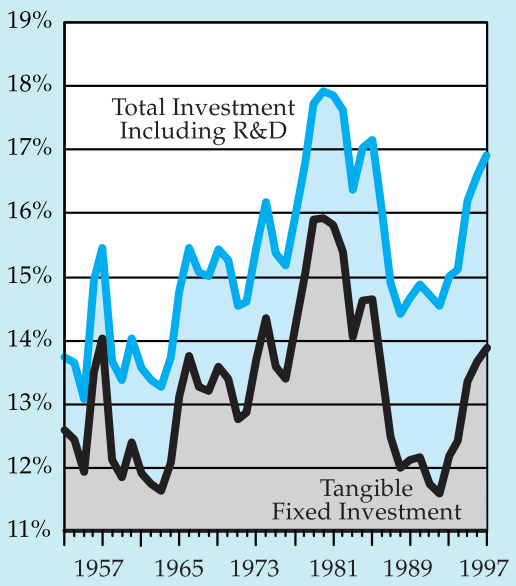
R&D Investment As a Share of Nonfinancial Corporate GDP



Source: Bureau of Economic Analysis: National Income Accounts; Federal Reserve System: Flow of Funds; National Science Foundation; and author's calculations.

FIGURE 2

Gross Investment As a Share of Nonfinancial Corporate GDP



Source: Bureau of Economic Analysis: National Income Accounts; Federal Reserve System: Flow of Funds; National Science Foundation; and author's calculations.

the 1970s have been ones of strong investment.

These calculations do not include a number of expenditures that might also be considered investments. *Advertising and marketing* expenditures are often a crucial cost of selling new goods, and at least some of these expenditures might well be considered investments.[3] U.S. advertising expenditures were high in the 1950s in the consumer boom after World War II, as households caught up with purchases postponed by the war. Then, advertising expenditures slipped through the mid-1970s as the consumer boom slowed. Since bottoming out at 3.2 percent of nonfinancial GDP in 1975, these expenditures have generally been rising along with spending on R&D (Table 1).

One might further argue that the *executive time* spent in support of investment decisions should be included in investment costs. Certainly, employment in executive occupations has grown in the past two decades, rising from less than 9 percent of U.S. employment in 1950, 1960, and 1970, to more than 10 percent in 1980 and more than 14 percent in 1997. (A parallel rise has occurred for manufacturing industries alone.) The rise in R&D expenditures in the 1980s and 1990s has been accompanied by increases in advertising expenditure and executive employment, some part of which was likely a necessary complement to the rise in R&D.

Creativity costs are generally also not included in official investment statistics and appear in the national accounts only as costs of production. For example, the investments made in "Titanic" would not be included in investment expenditures in the national accounts.

Software purchases are generally not considered investments either.[4] Moreover, much of the work done on a computer has an investment element. For example, a substantial part of the work of architects, engineers, artists, photographers, and scientists is now written onto computer disks (including hard drives and removable media), where it can be more easily saved and used in future projects.

These examples suggest that rising R&D expenditures are but one piece of a larger acceleration of intangible investment since the mid-1970s, much of which has not been viewed as investment in our corporate or national accounts.

...LEADS TO RISING STOCK MARKET VALUE OF FIRMS

One surprising aspect of the U.S. economy has been the rapid growth in the value of corporations' stock market equity. The Dow Jones Industrial Average of share prices rose from 933 in 1981 to 9300 in early 1999. This tenfold increase contrasts with the performance of nonfinancial corporations' after-tax reported profits, which went up fivefold, and with the growth of nonfinancial GDP, which went up less than 2.5 times.[5] The swift rise in share prices has led to a rise in the ratio of stock prices to current after-tax profits (called the price/earnings ratio) to a level which, while not unprecedented, has been rare (Table 2 and Figure 3). This turn of events has worried many observers and has raised the possibility that stockholders have become excessively optimistic about the value of U.S. corporations.

[3]New goods, unlike existing goods, are by definition unfamiliar to consumers. Educating consumers about a new good's existence and how to use it raises the value of the corporation's product (so it is an investment in a corporate asset) and raises the benefit received by consumers (so it is a social asset generating consumer surplus). An example is the sales force of a pharmaceutical company that rapidly disseminates information about a new drug.

[4]The Bureau of Economic Analysis has announced that for the national income and product accounts, it is likely to reclassify software purchases as investment.

[5]The growth of the market value of nonfinancial corporate equity, the S&P 500, and the Dow Jones Industrials has been approximately equal over this period.

TABLE 2

Profits and Stock Market Value of Nonfinancial Corporations

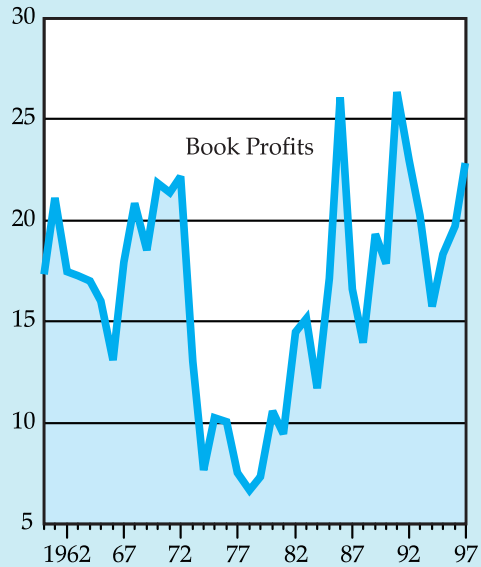
(as a proportion of nonfinancial corporate gross domestic product)

Period	1. After-Tax Book Profits (%)	2. Stock Market Value (%)	Price-Earnings Ratio= (2)/(1)
1953-59	8.8	110	12.56
1960-69	8.3	145	17.48
1970-79	7.7	92	11.90
1980-89	5.2	75	14.55
1990-97	6.3	127	20.21

Source: Bureau of Economic Analysis and Flow of Funds. Book profits are after-tax nonfinancial corporate profits. Stock market value is market value of nonfinancial corporate equity.

FIGURE 3

Price-to-Earnings Ratio, Based on Book After-Tax Earnings of Nonfinancial Corporations



Source: Bureau of Economic Analysis: National Income Accounts; Federal Reserve System: Flow of Funds; National Science Foundation; and author's calculations.

Other things equal, the price/earnings ratio should be high when the expected growth rate of profits (and thus of earnings per share) is high relative to the rate of return that stockholders require on the shares they own. That can happen when profits are temporarily low and expected to bounce back, as was the case during the 1990-91 recession. It can also happen when profits are high, as during the second half of the 1990s, if they are expected to grow rapidly in the future.

But over the long run, profits have tended to grow at the same rate as the economy as a whole. Is there any rational reason to believe that profits should grow strongly in the future and thereby justify the high valuations placed on shares? In fact, there is. As we shall show, rising investment in intangible assets reduces measured current profits and raises expected future profits. Thus, rising new product development can help explain the high price/earnings ratio. To see how investment in intangibles affects reported price/earnings ratios, we first need to think about how we measure profits.

Financial Accounting. The accurate measurement of profit is fundamental to financial accounting. Profit tells us two things: how much revenues exceeded costs (a measure of the economic value of current operations of the firm) and how much the assets of the corporation have increased (before any cash distributions to shareholders). Formally, accountants define profit as

"the excess of revenues over all expenses." Expenses are "the costs of goods, services, and facilities used in the production of current revenue" (Estes, 1981). To the extent that a firm buys things that are not used up in production, those additional costs are investments, not expenses, and are capitalized, that is, considered assets. A capital asset gives rise to an expense only to the extent that the capital asset's value falls while in use, a process called depreciation or capital consumption. The intertwining of the measurement of corporate earnings and corporate assets depends on how we define investment and assets. To understand how our definitions of investment affect our measures of profit, we need to follow the details of corporate profit accounting.

The World According to GAAP. In the United States, corporate books are kept by certified public accountants who apply a set of rules called generally accepted accounting principles (GAAP). According to GAAP, "All R&D costs covered by GAAP are expensed when incurred," that is, R&D costs are treated as part of the current expenses of the firm, and this treatment reduces reported profit.[6] (See the Appendix, *Are All R&D Projects Lemons?*) The only part of R&D costs not expensed is purchases of durable, tangible assets "that have alternative future uses" beyond the project at hand.[7] The rationale for this treatment of R&D is, in part, that firms might be tempted to artificially manipulate profits if R&D were capitalized. For example, by pretending that some ordinary expenses of the business were R&D, the firm might disguise a loss. Another part of the rationale is that R&D expenditures are more speculative than investments in fixed assets (fixed assets may have alternative uses and thus could be sold to others, but the product under R&D may not pan out and therefore have no alternative use).

Notice that expensing R&D, by lowering profits, reduces corporate taxes and thus encourages R&D spending. But there are alternative ways to subsidize R&D if that is what we wish to do. Indeed, the federal government already provides additional subsidies to R&D through the research and experimentation tax credit.

Over the years, studies have relatively consistently shown that a firm's R&D expenditures raise the stock market valuation of that firm by at least an equal amount.[8] This finding suggests that the book value of assets would be a better guide to the true value of a corporation if R&D expenditures were capitalized, that is, treated as long-term investments and depreciated over time.[9]

Indeed, in some industries creativity expenditures are treated just this way. For example, in the film industry, the expenses of making a movie are capitalized, then depreciated over the commercial life of the property.[10] So the investing groups that produced "Titanic" had to forecast the revenues expected from movie theaters, pay-per-view broadcasts, cable TV rights, and video

[6]See Jan R. Williams, chapter 41, p. 41-04. This treatment was formalized in 1974. Before that, most companies followed "the conservative procedure of expensing such costs as incurred, rather than capitalizing any part of them," Johnson and Gentry, p. 443.

[7]That is, a computer purchased for an R&D project can be capitalized to the extent that after its current use, it will retain value because it can be used in future projects. But durable lab equipment whose only use is the project at hand should be expensed.

[8]See, for example, the article by Bronwyn Hall.

[9]Although ideas need not deteriorate over time, they do tend to lose their economic value. In particular, patents and copyrights give their owners monopoly rights over the assets for a limited time (20 years in the case of patents).

[10]Note that even though these creativity expenses are treated as investments and capitalized under GAAP, they are not treated as investments in the national accounts, as discussed earlier.

sales and depreciate the expenses of making the movie over the period in which these revenues were expected to be earned. If investments as risky as films can be capitalized and depreciated, there seems little reason to believe that an acceptable estimate cannot be made for R&D expenditures.

Fortunately, under GAAP, accountants are required to record R&D expenditures separately so that shareholders and others can be aware of them. Thus, we have data to empirically estimate what corporate profits would be if R&D expenditures were treated the same way as tangible investment expenditures.

Can expensing R&D, rather than capitalizing and depreciating it, make an important difference in how we assess the profitability of U.S. firms over the past half century? Consider Table 3. The first column represents after-tax profits of corporations as they are normally reported, so-called book profits, from Table 2. These "book profits" show that profitability as a proportion of corporate product has generally declined. True, earnings in the 1990s are higher than the low earnings of the 1980s, but both are well below earnings in the three other postwar decades. And the price/earnings ratio based on book profits averages 20.21 from 1990 to 1997 compared with only 17.48 in the 1960s.

However, book profits are somewhat deceptive. *Economic profit*s are a better measure (Table 3). For one thing, economic profits correct for the fact that during the 1970s, corporate earnings were bloated by inventory "profits" that corporations earned because inventories they were holding rose in price along with everything else.[11] Furthermore, economic profits also adjust depreciation rates to reflect more accurately the

[11]This adjustment, called the inventory valuation adjustment, removes the part of inventory profit due strictly to inflation and also adopts a uniform convention for the valuation of inventories.

TABLE 3

Profits and Stock Market Value Of Nonfinancial Corporations

(as a proportion of nonfinancial corporate gross domestic product)

	Profits				Price-Earnings Ratios		
Period	1. After-Tax Book Profits (%)	2. After-Tax Economic Profits[a] (%)	3. R&D Adjusted Economic Profits[b] (%)	4. Stock Market Value (%)	5. After-Tax Book Profits (4)/(1)	6. After-Tax Economic Profits (4)/(2)	7. R&D Adjusted Economic Profits (4)/(3)
1960-69	8.3	9.3	9.9	145	17.48	15.67	14.70
1970-79	7.7	6.1	6.8	92	11.90	14.98	13.55
1980-89	5.2	6.2	7.1	75	14.55	12.19	10.53
1990-97	6.3	7.6	8.6	127	20.21	16.62	14.84

[a]After-tax nonfinancial corporate profits with inventory valuation and capital consumption adjustments.
[b]After-tax nonfinancial corporate profits with inventory valuation and capital consumption adjustments were further adjusted as R&D expenditures were capitalized and depreciated as described in the text.

economic lives of corporate tangible assets.[12] Even economic profits, however, treat R&D as an expense rather than as an investment.

How different would profit measures be for nonfinancial corporations if we included R&D expenditures as investments and capitalized and depreciated them? Suppose we use a relatively conservative depreciation period of six years, a figure suggested by the work of Dennis Chambers, Ross Jennings, and Robert Thompson. The third column in Table 3 shows what happens when we capitalize and gradually depreciate R&D expenditures, rather than expensing them.

R&D-adjusted profits are higher than economic profits. On average during the 1990s, R&D-adjusted profits have been 13 percent higher than economic profits and nearly 37 percent higher than book profits. More important, the amount by which R&D-adjusted profits exceed economic profits has been growing. The gap has nearly doubled from the 1960s to the 1990s, rising from 0.6 percent of corporate product to 1 percent. Hence, as we see in the seventh column of Table 3, the adjusted price-earnings ratios of the two periods are roughly equal—about 14.8.

Although other factors are undoubtedly important in explaining stock prices and earnings, treating R&D in a way that parallels treatment of tangible investment expenditures takes an important step toward improving our understanding of current stock market equity values (Figure 4). The low stock market valuations of the 1970s and the relatively high valuations of the 1960s and 1990s are easier to understand.[13]

[12]This adjustment, called the capital consumption adjustment because capital consumption is a synonym for depreciation, is necessary because depreciation charges allowed by tax law often do not match true depreciation.

[13]Still, the 1980s appear somewhat out of line, since stock market valuation in general was very low then.

And R&D is just one example of investment in intangible assets. Adjustments to account for other intangibles would have similar effects.

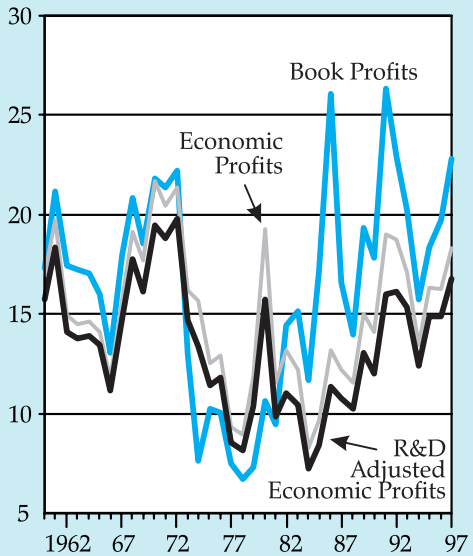
NATIONAL INCOME ACCOUNTING AND INTANGIBLES: RISING WEALTH, FALLING SAVING

The difference in accounting treatment of tangible and intangible assets affects the U.S. national income and product accounts as well as corporate financial statements. By not counting spending on R&D and other intangible assets as investment, our national accounts understate not only investment but also national income and national saving.

Our national income accounts need not use the same investment definitions as do financial accountants; indeed, it is economic profits and

FIGURE 4

Price-to-Earnings Ratios of Nonfinancial Corporations



Source: Federal Reserve Board: Flow of Funds; and author's calculations.

not book profits that fit into our measures of national income. Nevertheless, the national income accounts do not treat spending on intangible assets as investment. Why?

Two Types of Wealth: Intangible and Tangible. Peter Hill, of the Organization for Economic Cooperation and Development and one of the chief modern architects of national accounting systems, has traced the exclusion of intangible assets back to the distinction between goods and services. He argues persuasively that as far back as Adam Smith, goods were material and could be stored while services were immaterial and transitory. This transitory nature meant services could not be counted as assets, but goods could. Logically, then, things counted as investment must be tangible. The role of immaterial assets, such as patents or the goodwill of brand names, was easily downplayed or ignored, given this basic dichotomy. Irving Fisher, the Yale Economics professor who invented the chain-weighted index now used to construct quantity and price indexes in the U.S. national income accounts, began his 1911 classic, *The Purchasing Power of Money*, by defining economics as "the science of wealth" and wealth as "material objects owned by human beings." This definition—that only what is material, and therefore tangible, can constitute wealth—underlies the national income accounting conventions we use to determine asset value, profit, saving, and investment. But as we have seen, tangible assets—equipment, structures, and land—are not the only assets of lasting economic value. Indeed, investment in intangible assets represents a growing proportion of our economy.[14]

More investment and higher profits mean more output and saving, too. Gross domestic product (our primary measure of U.S. production of goods and services) is constructed by summing estimates of the following: production of goods and services used by consumers and by governments, production of goods and services sold to foreigners, investment goods used by businesses, and construction of housing and other buildings. As we have seen, treating spending on intangible assets the same way we treat spending on tangible assets would raise measured business investment. Thus, similar treatment would also raise measured output of goods and services. Making the adjustment for R&D investment alone would raise measured U.S. gross domestic product in the 1990s roughly 1.5 percent.[15]

Treating investment in R&D in the same manner that we treat investment in tangible assets would raise reported national saving, too. National saving is the sum of saving done by households, governments, and businesses. Business saving is defined as retained earnings plus depreciation and amortization allowances. (Thus, business saving is that part of firms' total revenue not paid out to employees, suppliers, creditors, owners, or governments.) Treating investment in R&D the same way we treat investment in tangible assets would not only show that profits—and thus retained earnings—were higher than reported in the 1990s, but it would also make depreciation allowances larger. These two adjustments would raise reported business saving enough to raise reported gross national saving in the 1990s from 15.9 percent to 17.1 percent of GDP.[16]

[14]The Bureau of Economic Analysis has recently published a statistical accounting of R&D investment and assets (a "satellite" account) but has neither incorporated these data into its regular accounts nor kept the data up to date (see the article by Carol Carson, Bruce Grimm, and Carol Moylan).

[15]Between 1990 and 1997, R&D spending by corporations averaged $104 billion per year and GDP averaged $6.81 trillion per year.

[16]Between 1990 to 1997, gross national saving averaged $1.08 trillion per year before adjustment for R&D, but it averaged $1.18 trillion per year adjusted for R&D. GDP after adjustment for R&D averaged $6.91 trillion per year.

These numbers probably understate the importance of investment in intangible assets because they account only for R&D and not other intangible investments. Nonetheless, they make clear that standard measures of investment, output, income, and saving are systematically understated. That understatement has become bigger as intangible investment has become more important.

Though our official statistics rarely treat spending on R&D and other intangible assets as investment, the stock market recognizes that such investments usually generate future profits. That is why investment in R&D generally makes stock prices rise. The resulting capital gains are taxed when realized but are not counted in personal income. That fact helps explain why our official measure of personal saving—saving out of *after-tax* income—fell nearly to zero in 1998. (See *If the Personal Saving Rate Is So Low, Why Are We Becoming Wealthier?*)

CONCLUSION: A NEW PARADIGM?

This article has explored how investment, profit, and saving are understated in our corporate and national accounts, particularly since the mid-1970s, because of our accounting treatment of intangible assets.[17] In fact, the U.S.

If the Personal Saving Rate Is So Low, Why Are We Becoming Wealthier?

We have seen that firms that invest in R&D and other intangible assets generally see the price of their shares rise as a result. Those capital gains are taxed when they are realized, but they are not counted as income in our national accounts. The seemingly paradoxical result is that rapid growth of spending on R&D and other intangible assets can make stockholders' wealth grow rapidly and at the same time make their personal saving rate appear to decline. Indeed, this phenomenon helps to account for the reported decline in the U.S. personal saving rate in the 1990s.

Personal saving is measured as after-tax personal income (also called disposable income) less personal outlays. In our national accounts, capital gains are not included in personal income.[a] But taxes on realized capital gains are part of the taxes subtracted from personal income to get after-tax income. Thus, our definition of personal saving does not count capital gains as income, but does subtract capital gains taxes from income, artificially lowering measured disposable income and personal saving. Consumers have spent an essentially constant fraction of their pre-tax income since 1994. But after-tax income has fallen relative to pre-tax income in part because of unusually high capital gains taxes. So the difference between disposable income and outlays—personal saving—has fallen steadily.

According to the Congressional Budget Office, capital gains realizations likely increased about $230 billion between 1994 and 1997, and capital gains taxes rose by about $40 billion over that same period. This surge in capital gains taxes helps to explain how, in the wake of the extraordinary rise in the U.S. stock market in the 1990s, rising taxes have helped erase the budget deficit and turn it into a surplus.[b]

[a]There is a good reason for this, in that capital gains are large and volatile; in most years the change in the market value of stocks is substantially larger than the change in all other personal income. So if we included capital gains in personal income, variations in personal income would mainly represent the change in the value of stocks.

[b]Another important contributor to the surplus has been rising Social Security payments.

economy is in better condition than statistics suggest. Rising investment in intangible assets helps explain the rising value of U.S. equities. That explanation, in turn, suggests that continued strong economic growth and strong profit growth in the future are not so implausible. The economic growth that ensues from rapid development of new products has largely been hidden from economists because our accounting framework does not reveal this linkage clearly.

However, there can be no guarantee that investment in intangibles will grow as it has in the past two decades. The growth of intangible investment depends on the continuing belief that new products are waiting to be discovered, invented, and created, and the accompanying belief that such products will prove to be profitable. If the expected rate of return to intangible investment were to decline, such investment would slow.

R&D creates risks as well as opportunities. The popularity of new products can cause old product lines to be abandoned and existing businesses to become outmoded. Economist Joseph Schumpeter referred to this process as "creative destruction." In an ideal world, creativity would run ahead of destruction, keeping workers employed and consumption rising at a steady pace. In the real world, the disruptive forces sometimes gain the upper hand, and we encounter widespread unemployment, declines in asset values, and slowdowns in investment in intangibles.

In either case, in good times or in bad, we need to recognize the increasing importance of intangible investment for our economy. Otherwise, statistical conventions can cause us to misread the fundamental forces propelling economic activity.

[17]Additional discussion of how mismeasurement of inflation has contributed to the underestimation of output since the mid-1970s can be found in my 1997 *Business Review* article.

Appendix
Are All R&D Projects Lemons?

Accountants use balance sheets and income statements to illustrate the interrelationship of income, expenses, profits, and assets. Balance sheets present the assets of the firm, such as cash and inventory, and its liabilities, or debts. The excess of assets over the firm's debts is called the book value of equity. (This equity is listed as a liability, since it is "owed" to the owners of the business, so total liabilities, including equity, are equal to total assets.) Income statements present the income and expense flows that determine whether a profit has been made. The difference between book value of equity at the start of an accounting period and at the end of the period equals the profit shown on the income statement for that period.

Take as an example my son, Moses, setting up a lemonade stand. He starts with $5 on hand; at this point his "firm" has a book value of equity of $5 (Balance Sheet 1a). Assume, for the sake of simplicity, that the only cost of production for the lemonade stand is lemons.* Lemons cost 25 cents each, so the $5 is used to purchase 20 lemons, which are in turn used to produce lemonade, which is then sold for $10. Revenues were $10 and expenses were $5, so profit was $5 (Income Statement 1). This $5 profit is reflected in the asset balance sheet, because Moses now has $10 cash-in-hand to prove that his firm's net worth has gone up $5 (Balance Sheet 1b).

Balance Sheet 1a
(beginning of day)

Assets:	
cash	$5
Liabilities:	
Book value of equity:	$5

Income Statement 1

Revenues:	
lemonade	$10
Expenses:	
lemons	$ 5
Profit:	$ 5

Balance Sheet 1b
(end of day)

Assets:	
cash	$10
Liabilities:	
Book value of equity:	$10

Lemons as Tangible Assets. Now suppose that Moses had started with $10 on hand (Balance Sheet 2a). This purchases 40 lemons, 20 of them used to make $10 worth of lemonade, and 20 stored for the next day's business. Again there is a $5 profit, for although $10 was spent on lemons, only $5 worth was used to produce current revenue (Income Statement 2). Twenty lemons went into inventory, the technical term for goods owned by the firm that are available for future use or sale. So the lemonade firm is now worth $15, consisting of $10 cash and $5 in lemon inventory (Balance Sheet 2b).

Balance Sheet 2a
(beginning of day)

Assets:	
cash	$10
Liabilities:	
Book value of equity:	$10

Income Statement 2

Revenues:	
lemonade	$10
Expenses:	
lemons used	$ 5
Profit:	$ 5

Balance Sheet 2b
(end of day)

Assets:	
cash	$10
lemon inventory	$ 5
Liabilities:	
Book value of equity:	$ 15

When a firm invests in tangible assets—in this case 20 lemons—there is no deduction from profit until the assets either are used in production or begin to depreciate or spoil. If assets depreciate, a portion of the initial expense is deducted. The principle is that the facilities used to produce current revenue are a cost only to the extent that their value has declined during use. For example, if four of Moses' lemons spoil, his $5 inventory will decline in value to $4. In this case, the firm's accounts would show spoilage of $1, profits of $4, and a lemonade firm worth $14 (Income Statement 3 and Balance Sheets 3a and 3b).

Balance Sheet 3a
(beginning of day)

Assets:	
cash	$10
Liabilities:	
Book value of equity:	$10

Income Statement 3

Revenues:	
lemonade	$10
Expenses:	
lemons used	$ 5
lemon spoilage	$ 1
Profit:	$ 4

Balance Sheet 3b
(end of day)

Assets:	
cash	$10
lemon inventory	$ 4
Liabilities:	
Book value of equity:	$14

Are All R&D Projects Really Lemons? So far, we have said nothing about intangible investment. Again, let's suppose Moses starts with $10 cash-in hand (Balance Sheet 4a), but let's suppose he is also a designer, who spends $5 developing a lemonade-pitcher design and sells $10 worth of lemonade using $5 worth of lemons. According to standard accounting principles, his firm's total revenue is $10, and the cost of the R&D to design the lemonade pitcher is expensed, that is, counted as a cost of current operations, not as an investment. In other words, the investment in the design of the lemonade pitcher is treated as an additional cost of making the lemonade. The day's profits are zero (Income Statement 4). The accounting value of the lemonade firm is $10, the proceeds from the sale of lemonade (Balance Sheet 4b). Until Moses sells the lemonade-pitcher design, the design's accounting value is zero. If Moses can later sell the lemonade-pitcher design for $10, the firm will recognize a capital gain of $10 and an extraordinary profit of $10. The profit, in accounting terms, will appear out of nowhere. Put another way, accounting procedures treat all R&D efforts as if they are destined to be failures— they produce zero assets until proven otherwise.

Balance Sheet 4a
(beginning of day)

Assets:	
cash	$10
Liabilities:	
Book value of equity:	$10

Income Statement 4

Revenues:	
lemonade	$10
Expenses:	
lemons used	$ 5
design costs	$ 5
Profit:	$ 0

Balance Sheet 4b
(end of day)

Assets:	
cash	$10
Liabilities:	
Book value of equity:	$10

*Thus to avoid cluttering up the analysis, we assume that the sugar, water, cups, and labor normally used in selling lemonade are not necessary in this case or, perhaps more realistically, are supplied free by Moses' dad.

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Do States Respond Differently To Changes in Monetary Policy?

Gerald A. Carlino and Robert H. DeFina

In earlier research we found that monetary policy affects real income quite differently in each of the eight major U.S. regions as defined by the Bureau of Economic Analysis (BEA).[1] In this article, we extend our analysis of the effects of monetary policy to the state level. Extending the evidence to the state level is important for two reasons. First, states within a region may have quite varied responses to monetary policy actions: responses different from one another and from the region's overall response. For example, we found that five of the seven states in the Plains region show an effect below the regional average, and two states, Missouri and Minnesota, show an above-average impact. Missouri and Minnesota account for more than one-half of the personal income in the Plains region.

Second, a state-level study provides 48 individual responses to monetary policy actions, not just the eight responses in our regional study.[2]

*Jerry Carlino is an economic advisor in the Research Department of the Philadelphia Fed and an adjunct professor in the Real Estate Department of the University of Pennsylvania's Wharton School. Bob DeFina is the John A. Murphy Professor in the College of Commerce and Finance, Villanova University, Villanova, Pennsylvania.

[1]See the 1996 article by Gerald A. Carlino and Robert DeFina.

The states, therefore, provide a richer testing ground for determining the sources of the differential responses. Our analysis indicates that state economies with a large proportion of the interest-sensitive industries—construction and durable goods manufacturing—are more responsive to changes in monetary policy than the more industrially diverse states. Our earlier study showed the same is true for regional economies as well. While our earlier analysis indicated that a region's concentration of small firms possibly has an effect on a region's response to changes in policy, no such association was evident for states. Finally, as in our regional study, a greater concentration of small banks is found to decrease a state's sensitivity to monetary policy shocks, contrary to predictions of some economists.

WHAT IS THE EVIDENCE?

Individual States' Responses. We used a statistical technique known as vector autoregression (VAR) to estimate the effects of *changes in monetary policy* on real personal income growth at the state level.[3] The variables in our model included real personal income growth for the state under consideration as well as real personal income growth in each of the eight major regions defined by the BEA.[4] Including income growth in the regions permits feedback effects. The model also included the change in the relative price of energy to account for the effects of oil-price shocks, the change in core CPI to capture underlying trends in the aggregate price level, the change in the index of leading indicators as a parsimonious way to summarize a variety of macroeconomic variables, and the change in the federal funds rate as a measure of changes in monetary policy.[5] The study employed quarterly data for the period 1958-92.

A typical way to summarize the impact of monetary policy on personal income growth is to show how the level of real personal income in a state changes over time because of monetary policy surprises, or shocks. Such shocks are measured by unanticipated changes in the federal funds rate. For example, in the fall of 1994, Fed actions raised the federal funds rate 0.75 percentage point. Shortly before, forecasters had been publicly predicting an increase of 0.25 percentage point. Thus, the additional 0.50 percentage point represented a policy shock.[6] The im-

[2]Since Alaska and Hawaii do not share common borders with any other state, we limited our study to the 48 contiguous states.

[3]See Gerald Carlino and Robert DeFina (1999). A VAR is a widely used modeling technique for gathering evidence on business-cycle dynamics. VARs typically rely on a small number of variables expressed as past values of the dependent variable and past values of the other variables in the model. See Theodore Crone's article for a discussion of VARs as applied to regional analysis.

[4]More precisely, we included the seven regions not containing the state under study, plus the personal income from the region containing the state less that state's income.

[5]The core CPI is the CPI minus food and energy. The change in core CPI and the change in the index of leading indicators are two variables that did not appear in the list of variables for our earlier regional study.

[6]An important part of our study requires the separation of changes in the funds rate that are predictable responses to important indicators of the economy's health from changes in the funds rate that cannot be systematically predicted (policy shocks). The model includes an equation that predicts changes in the federal funds rate on the basis of a year's worth of *past* data for each of the variables in the model (including change in core CPI and the change in the index of leading indicators). Unexpected changes in the federal funds rate are measured by taking the difference between the actual and predicted change. Unexpected changes in the federal funds rate are used to measure monetary policy shocks in the policy simulations that follow. The analysis assumes that unexpected changes in the federal funds rate arise only from policy shocks. Some economists believe that only unanticipated changes in monetary policy affect real eco-

pact of this unanticipated change in monetary policy is measured by the gap between the model's estimate of what real personal income in a state would have been without the monetary policy action and what it turned out to be with it.[7]

We found that an unexpected one-percentage-point increase in the federal funds rate generally reduces real *income growth* temporarily and, thus, leaves the *level* of real personal income below what it otherwise would have been.[8] The model treats tightening and easing of the fed funds rate symmetrically, so that an unexpected cut in the funds rate temporarily raises real personal income growth relative to what it otherwise would have been.

The greatest response to an unanticipated change in monetary policy is not immediate. In fact, real income at the state level is essentially unchanged for two quarters after an unanticipated one-percentage-point increase in the federal funds rate, but then real income declines substantially in most states. The maximum gap between actual personal income and what it would be without the change in monetary policy occurs, on average, about eight to 10 quarters following the policy shock. This general profile is similar to the estimated impact of monetary policy changes on the U.S. economy as reported in other studies.[9] If we look at real personal income's response to an unexpected increase of one percentage point in the federal funds rate, income in the nation falls 1.16 percent (compared with what it would have been) eight quarters after the increase (Figure).

nomic variables. See Shaghil Ahmed's article for a fuller discussion of the distinction between unanticipated and anticipated changes in monetary policy and their effects on real activity.

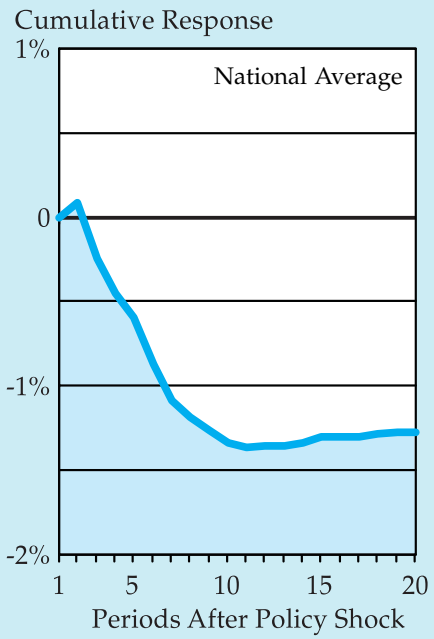
[7]The gap in each period is called the cumulative impulse response.

[8]The question of how monetary policy affects real personal income in the long run remains open. We did not conduct formal statistical tests on the significance of the long-run response and so cannot shed light on the issue. While the graph presented in the text suggests a sustained impact, the effects of policy shocks over long horizons are estimated with less statistical precision than those estimated over short horizons. Since the estimates become less precise, statements about policy's long-term impact become more tenuous.

[9]See, for example, the 1996 study by Eric Leeper, Christopher Sims, and Tao Zha.

FIGURE

Response of Real Personal Income to an Unexpected One-Percentage-Point Increase in the Fed Funds Rate



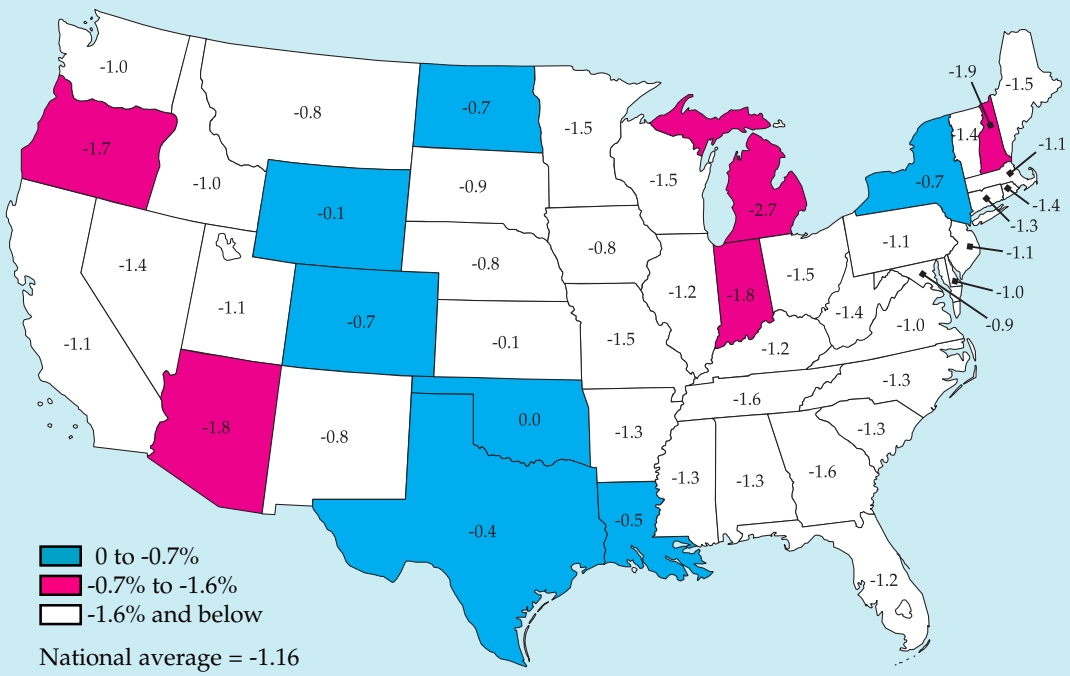
Graph shows the percent difference in real personal income from what it would have been without the unanticipated increase in the fed funds rate.

While the vast majority of state responses follow the general pattern demonstrated by the national average, not all states respond by the same magnitude (see map).[10] Michigan has the largest response: real income fell 2.7 percent eight quarters after a one-percentage-point increase in the federal funds rate. Seven states (Arizona, Georgia, Indiana, Michigan, New Hampshire, Oregon, and Tennessee) respond at least 38 percent again as much as the national average.[11] Possible explanations for this high response include the fact that four of these states (Indiana, Michigan, New Hampshire, and Oregon) have a relatively high concentration of durable goods manufacturing, an interest-sensitive industry. One state (Arizona) has a much higher than average concentration of construction, another interest-sensitive industry. While Georgia and Tennessee do not have an especially high concentration of interest-sensitive industries, they

[10]The cumulative impulse response functions for individual states are shown in our 1999 article on the Internet at www.phil.frb.org/econ/wps/1997/wp97-12.pdf.

[11]The average state response was 1.16 percent with a standard deviation of 0.4684. The seven most responsive states are at least one standard deviation above the average state response.

Response of Personal Income to a One-Percentage-Point Increase in the Fed Funds Rate*



*Eight-quarter cumulative impulse response of personal income

may have large markets for their products in the states that *are* highly responsive to monetary policy shocks; if so, Georgia and Tennessee would tend to be more sensitive to monetary policy actions than their own industrial structures would indicate.[12]

Seven states (Colorado, Louisiana, Oklahoma, New York, North Dakota, Texas, and Wyoming) are the least sensitive to monetary policy shocks, responding no more than 60 percent as much as the national average.[13] Interestingly, the total output of four of these states (Louisiana, Oklahoma, Texas, and Wyoming) includes a high concentration in the extractive industries (drilling and mining). Although these states are found to be the four least sensitive to monetary policy actions, they are buffeted by other types of shocks, particularly shocks to the price of energy. For example, a one-percentage-point decrease in the growth rate of the relative price of energy leaves real personal income in the four states between 1.6 percent (Oklahoma) to 3.2 percent (Wyoming) lower than otherwise after two years. (Personal income fell 1.9 percent in Texas and 2.8 percent in Louisiana in response to this energy price shock.)

By contrast, New Jersey, an energy-consuming state, experiences a rise in personal income of about 2 percent two years after a one-percentage-point decrease in the growth rate of the relative price of energy. We also found that Colorado, New York, and North Dakota tend to be less responsive to monetary policy shocks than the national average. One reason is that production in these states involves relatively small shares of interest-sensitive industries.

Responses of States Within a Region. By using a weighted average of the responses of states within a region, we can form an average response for each of the eight major regions (*Table of Regional Summaries*). The absolute value of these responses ranges from 0.52 in the Southwest to 1.72 in the Great Lakes; in terms of absolute value the national average is 1.16.[14]

Comparisons of states' responses to monetary policy actions reveal that an individual state's response is often quite different from the average response of its region and from the response of the other states in that region. For example,

[12]Since we used broad regional aggregates to capture these spillovers in our model, we are unable to shed any light on the extent to which trade among individual states influences their responsiveness to monetary policy actions.

[13]States were placed in this grouping if their policy response was at least one standard deviation below that of the average state.

[14]Real personal income growth in the Rocky Mountain region also has a relatively small response to monetary policy shocks. Thus, our findings match up well relative to those reported in our earlier article, which found the largest response to monetary policy actions in the Great Lakes region and the least response in the Southwest and Rocky Mountain regions.

Table of Regional Summaries

Region	Average Response*
New England	-1.26
Mideast	-0.91
Great Lakes	-1.72
Plains	-1.14
Southeast	-1.23
Southwest	-0.52
Rocky Mountain	-0.80
Far West	-1.16
All Regions	-1.16

*Eight-quarter cumulative impulse response of real personal income. The regional responses are computed as weighted averages of the individual state responses; the weights reflect each state's share of its region's personal income.

we found that real personal income in the Far West region fell 1.16 percentage points following a one-percentage-point increase in the fed funds rate, matching the average national response. However, two of the four states that make up the Far West region (Oregon and Nevada) are considerably more responsive to monetary policy shocks.

Being part of a region that has a low response to monetary policy actions is no guarantee that each state in the region will respond similarly. Arizona responds more than half again as much as the U.S. average, despite being part of the least responsive Southwest region. In general, there is much less variation in regional responses to monetary policy shocks than in state responses.[15]

WHAT CAUSES THE DIFFERENTIAL STATE RESPONSES TO MONETARY POLICY ACTIONS?

In our regional study, we showed that a region's response to monetary policy is related to its mix of interest-sensitive industries and possibly to its mix of large and small firms. Because small businesses typically have banks as their sole sources of credit they might be considered more sensitive to Fed policy. Our regional study found only slight evidence that economic activity in regions that have high concentrations of small firms was more sensitive to changes in Fed policy. Similarly, some researchers believe that the effects of monetary policy would be greater in regions with a large share of small banks. But our regional study found that the mix of small and large banks has the opposite effect. In another recent study, we looked at how important these factors are in accounting for the different state responses to monetary policy shocks (Appendix).[16] The individual state responses (the estimated values of the cumulative responses shown on the map) were systematically related to variables capturing two of these three factors.

The interest sensitivity of a state's industries is likely to rise with the percent of a state's total gross state product accounted for by construction or durable goods manufacturing. Studies have shown that consumer spending on housing and manufactured goods, especially durable goods, tends to be interest sensitive. Spending on services, in contrast, tends to vary little with interest rates.[17] Our analysis indicates that state economies with a large proportion of construction or manufacturing of durable goods are more responsive to changes in monetary policy than the more industrially diverse states.

On the other hand, the analysis found that states with relatively large shares of output accounted for by the extractive industries and by the finance, insurance, and real estate industries are less sensitive to changes in monetary policy than the more industrially diverse states. This finding suggests that differences in interest-rate sensitivities across industries are one reason for different state responses.[18] Differences in the mix of interest-sensitive industries may explain why the states that make up the Third Federal Reserve District (Pennsylvania, New Jersey, and Delaware) respond somewhat more to monetary policy shocks than other states in the Mideast region. (See *Monetary Policy and the Third District States.*)

[15]The standard deviation of the regional responses is 0.3574; state responses show a considerably larger standard deviation of 0.4684.

[16]See Gerald A. Carlino and Robert DeFina (1998b).

[17]See Paul Bennett's article for a survey of relevant studies.

[18]The finding of high interest-rate sensitivity for states that depend heavily on durable goods manufacturing is consistent with our findings for regions. However, unlike the state-level findings, our regional results did not offer significant evidence that regions that depend on the construction industry have greater responsiveness to monetary policy initiatives. The state-level findings are likely to be more reliable, since they are based on a much larger sample.

Monetary Policy and the Third District States

The responses of the states of the Third Federal Reserve District to monetary policy shocks are similar to one another and to the national average response.[a] The states of the Third District have a somewhat stronger response, however, than the other two states in the Mideast region—Maryland and New York. This stronger response can be attributed, at least in part, to differences in the mix of interest-sensitive industries. For example, New York has a much higher concentration of finance, insurance, and real estate industries (24.3 percent) compared with the average state (14.9 percent), which tends to reduce New York's responsiveness (see the Table). Also limiting New York's responsiveness is its relatively low fraction of construction and durable goods manufacturing.

Share of Total Output Attributable To Selected Interest-Sensitive Industries[b]

State	Construction	Durable Goods	Finance, Insurance, and Real Estate	Policy Response[c]
Delaware	5.0	9.8	19.8	-1.00
Maryland	5.9	7.1	18.1	-0.92
New Jersey	4.4	9.6	18.4	-1.06
New York	3.4	9.4	24.3	-0.72
Pennsylvania	4.5	14.8	15.6	-1.14
U.S. Average	**4.7**	**11.5**	**14.9**	**-1.16**

While Maryland has a somewhat higher share of interest-sensitive construction, Maryland's responsiveness tends to be limited by its relatively low share of interest-sensitive durable goods manufacturing and its relatively high concentration of income from the finance, insurance, and real estate sector. By contrast, Pennsylvania has a relatively high share of durable goods manufacturing and only a slightly above-average share of income from the finance, insurance, and real estate sector. Thus, among the states of the Mideast region, Pennsylvania tends to be the most responsive to monetary policy actions.

Because the policy responses (impulse responses) were estimated over a long period, the industry mix variables given in the table are averaged over 1977-90. However, states have experienced changes in their mix of industries over time, so that long-run averages may not be representative of a state's current industrial structure. Therefore, we also looked at the 1996 share of each state's personal income accounted for by the industries given in the table and found that conclusions based on 1996 shares are consistent with those based on shares averaged over the period 1977-90.

[a]The Third District covers the eastern two-thirds of Pennsylvania, southern New Jersey, and Delaware.

[b]Shares are averaged over the period 1977-90.

[c]Eight-quarter cumulative impulse response in real personal income that results from an unanticipated one-percentage-point increase in the federal funds rate.

At the state level we find no evidence that states containing a larger concentration of small firms tend to be more responsive to monetary policy shifts than states containing small concentrations of small firms.[19] In addition, we found that a region becomes less sensitive to an increase in the federal funds rate as the percentage of small banks in that region increases. This result is inconsistent with the view espoused by Anil Kashyap and Jeremy Stein that small banks do not have as many alternative sources of funds and are therefore affected more by changes in monetary policy.[20] One possibility for the inconsistency is that a bank's asset size may be a poor indicator of its ability to adjust its balance sheet to monetary policy actions. In a study at the Federal Reserve Bank of Boston, Joe Peek and Eric Rosengren suggested that bank capital is a better indicator—better capitalized banks have more and cheaper alternative sources of funds available. Using data for New England banks during the late 1980s and early 1990s, the authors found that the number of loans made by banks that were under regulatory pressure to raise their capital levels did not increase in response to a lower federal funds rate.

[19] According to one theory, Fed actions affect economic activity by altering banks' ability to provide loans. Large firms usually have greater access to alternative, nonbank sources of funds, such as issuing corporate stocks and bonds or commercial paper. We found no evidence, however, that activity in states that have high concentrations of small firms was especially sensitive to changes in Fed policy.

[20] This contrary effect was also found in our regional study.

CONCLUSION

Does monetary policy have differential effects across states? The answer clearly is yes. Comparisons of states' responses to monetary policy actions reveal that an individual state's response is often quite different from the average response of its region and from the response of the other states in that region.

We provided some reasons for the differential policy response across states. The size of a state's response to a monetary policy shock is positively related to its share of construction and durable goods manufacturing and negatively related to its share of extractive industries and the finance, insurance, and real estate industries. A state's concentration of small firms has no significant effect on the size of the state's policy response. Finally, a greater concentration of small banks decreases a state's sensitivity to monetary policy shocks, contrary to the predictions of Kashyap and Stein.

Appendix

The absolute value of the estimated state cumulative responses shown in Table A (and summarized in the map) are used as dependent variables in a cross-state regression equation to explain the differential state responses to monetary policy shocks. An eight-quarter horizon was chosen for the cumulative response because this is generally when Fed policy has its maximum cumulative impact. The independent variables in the model are designed to account for the three reasons given to explain why state responses to monetary policy innovations differ. The shares of a state's gross state product (GSP) accounted for by each of eight major industry groupings are included to capture the effect of monetary policy as a result of the policy's effect on interest rates. The percent of a state's firms (establishments) that are small, defined as the percent of a state's firms with fewer than 250 employees, is included to capture the possible effects of firm size. Two alternative variables are used to capture the effects of bank size—the percent of a state's total loans made by the state's banks at or

Appendix (continued)

TABLE A

Eight-Quarter Cumulative Responses to a One-Percentage-Point Fed Funds Rate Increase (response in percentage points; weight is the state's share of regional personal income.)

New England	Response	Weight
Connecticut	1.2678	0.29
Massachusetts	1.0712	0.47
Maine	1.5099	0.07
New Hampshire	1.9264	0.07
Rhode Island	1.4391	0.07
Vermont	1.4246	0.03

Mideast	Response	Weight
Delaware	1.0018	0.01
Maryland	0.9174	0.10
New Jersey	1.0607	0.20
New York	0.7176	0.44
Pennsylvania	1.1379	0.25

Great Lakes	Response	Weight
Illinois	1.2351	0.30
Indiana	1.8345	0.12
Michigan	2.6634	0.22
Ohio	1.5378	0.25
Wisconsin	1.4604	0.11

Plains	Response	Weight
Iowa	0.8278	0.16
Kansas	0.9653	0.14
Minnesota	1.1982	0.25
Missouri	1.5282	0.29
Nebraska	0.8216	0.09
North Dakota	0.7427	0.03
South Dakota	0.8695	0.04

Southeast	Response	Weight
Alabama	1.3261	0.07
Arkansas	1.3443	0.04
Florida	1.154	0.22
Georgia	1.6084	0.11
Kentucky	1.1599	0.06
Louisiana	0.4935	0.07
Mississippi	1.3004	0.04
North Carolina	1.3404	0.11
South Carolina	1.2816	0.05
Tennessee	1.5632	0.08
Virginia	1.022	0.12
West Virginia	1.3803	0.03

Southwest	Response	Weight
Arizona	1.8006	0.13
New Mexico	0.8182	0.05
Oklahoma	-0.0741	0.13
Texas	0.361	0.69

Rocky Mountain	Response	Weight
Colorado	0.7134	0.50
Idaho	0.9573	0.13
Montana	0.8469	0.11
Utah	1.1396	0.19
Wyoming	0.1109	0.07

Far West	Response	Weight
California	1.1305	0.79
Oregon	1.7168	0.07
Washington	0.9757	0.12
Nevada	1.4356	0.03

below the 90th percentile in assets nationally, and the percent of a state's total loans made by the state's banks at or below the 90th percentile in assets nationally and not part of a bank holding company. Because the estimated long-run responses represent average behavior during the sample period, averaging the data for the explanatory variables is appropriate. Averaging also minimizes the chance that the results depend on the data for a particular year and helps control for business-cycle dynamics. (Data availability limited averaging to the period from the mid-1970s to the early 1990s.)

Two versions of the model are presented in Table B, depending on which of the alternative small-bank variables is used. In model 1, the all-small-banks variable is included, whereas model 2 uses only small banks that are not members of a bank holding company. The results for models 1 and 2 pre-

sented in Table B explain between 61 to 62 percent of the cross-state variation in cumulative responses. The percent of a state's GSP accounted for by the manufacture of durable goods and by construction is positively and significantly related to the size of a state's long-run response to Fed policy shocks; the percent of a state's GSP accounted for by its extractive industries and by the finance, insurance, and real estate industries is negatively and significantly related to its long-run response to Fed policy. These results appear quite reasonable and do not depend on the choice of the loan variable. The importance of the shares of durable goods manufacturing and construction can be interpreted as evidence that monetary policy affects total output because higher interest rates are likely to have profound effects on people's ability to buy houses and other big ticket items, such as autos.

We find no evidence that cross-state variation in the mix of small versus large firms matters. States containing large concentrations of small firms tend to be no more responsive to monetary policy shifts than states containing small concentrations of small firms. In contrast, we find some evidence that a state becomes more sensitive to a monetary policy shock as the percentage of small banks in the state goes down. The estimated coefficients on the small-bank variables are negative in both models 1 and 2 and negative and significant in model 2.

TABLE B
Explaining Cross-State Variation in Policy Responses[a]

Variable[b]	Model 1	Model 2
Intercept	0.2179 (1.5218)	0.3194 (1.4867)
% Agriculture	-0.5071 (1.4005)	-0.3359 (1.3818)
% Mining	-3.4785 (1.7354)**	-3.2890 (1.7157)*
% Construction	20.9681 (8.2570)**	19.5034 (8.1240)**
% Durables Mfg.	5.5628 (1.4791)***	5.5225 (1.4374)***
% Nondurable Mfg.	-0.1964 (1.5781)	-0.0639 (1.5585)
% Transportation	3.4391 (4.4016)	3.3139 (4.2550)
% Wholesale Trade	-0.6849 (4.9399)	-0.3864 (4.8691)
% Retail Trade	-3.0018 (7.6550)	-1.6932 (7.5837)
% FIRE	-5.0091 (2.7362)*	-5.2696 (2.7047)*
% Small Firm	0.0064 (0.0109)	0.0047 (0.0107)
% Small Bank Loans (all banks)	-0.0044 (0.0031)	
% Small Bank Loans (no holding co.)		-0.0076 (0.0042)*
Adjusted R^2	0.6070	0.6191

[a]The dependent variable is the absolute value of the estimated state cumulative responses shown in the table. Standard errors in parentheses. *, **, and *** indicate that a null hypothesis of zero is rejected at the 10%, 5%, and 1% levels, respectively.

[b]Variables are averaged over 1977-90.

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