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# New England Economic Review

Federal Reserve Bank of Boston

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# Contents

**Are We Experiencing a Credit Crunch?**

*Richard F. Syron*

In his statement before the Subcommittee on Domestic Monetary Policy of the Committee on Banking, Finance and Urban Affairs on the availability of credit, Bank President Richard F. Syron discusses the "credit crunch." He describes how developments in the financial and real sectors of the economy led to restricted credit availability, and why the situation has become particularly acute in New England.

Mr. Syron concludes by considering the outlook for the future, cautioning against making the 1990s a period of excessive credit contraction, a mirror image of the mid 1980s when expectations were overly optimistic. Painful as the high unemployment rate and the drop in real estate prices are, they will provide the catalyst for restoring New England's competitive position in manufacturing, which requires land and labor costs more in line with costs in the rest of the nation. 3

**"Whither New England?"**

*Stephen K. McNees and Geoffrey M.B. Tootell*

This article attempts to identify precursors, or indicators, of New England employment. The predictive power of a diverse array of variables is calculated and compared. However, because no single variable is likely to contain all information of predictive value, the article then explores alternative methods of combining several variables into an index or statistical "model" of New England employment growth. The variables are separated into regional, national, and expectational in order to measure the predictive value of each type of information.

In both in-sample and out-of-sample tests, a model that included all categories of variables was the most successful. However, relative to its in-sample fit, every model performed poorly out of sample. The reason for this breakdown is clear—the models were fit during the "Massachusetts Miracle" while their predictive power was tested over the New England bust. The lack of a theoretical model and deficiencies in the available data make a purely statistical approach to predicting the New England economy suspect. Some insights can be gained, however, by surveying the New England economy in a broader historical context. 11

# Contents

**The Role of Services in New England's Rise and Fall: Engine of Growth or Along for the Ride?**

*Lynn E. Browne*

The downturn in the New England economy has surprised almost everyone by its severity and breadth. Even those who foresaw that the rapid expansion of the mid 1980s could not be sustained warned of slower growth rather than sharp contraction. This article assesses the role played by services and financial services in New England's fluctuating economic fortunes.

The author examines the size of the nationally oriented component of financial and other services and the stability of a more services-oriented economy. If financial and other services can serve as regional economic drivers in a significant way, these industries are a potential source of regional economic recovery and economic development initiatives should take these industries into account. 27

**Changes in the Structure of Wages: A Regional Comparison**

*Ramon Vilches*

This article sets out to examine changes in the structure of men's wages in the 1980s, on a regional basis. The analysis corroborates evidence presented by other authors of a rising return to skill in the United States during the decade. It also demonstrates that the changes in wage structure were not uniform across regions.

The wages of college graduates rose in all regions relative to the less educated, but to varying extents and perhaps for different reasons. The study finds that changes in relative supplies of labor were generally not behind the rising returns to skill. Rising returns to college education coincided with increases in the supply of more educated workers, indicating increased relative demand for such workers. 45

# Are We Experiencing a Credit Crunch?

*Richard F. Syron*

*President, Federal Reserve Bank of Boston. Statement before the Subcommittee on Domestic Monetary Policy of the Committee on Banking, Finance and Urban Affairs, U.S. House of Representatives, May 8, 1991.*

Mr. Chairman and distinguished members of the Subcommittee on Domestic Monetary Policy, I am pleased to appear before you to discuss current questions about the availability of credit. As you are all aware, this has been an issue of particular concern in New England. The lessons learned from our experience during both the credit laxity of the mid 1980s and the ensuing reaction should assist us in avoiding similar credit difficulties in the future.

In the hope of providing some perspective on these problems, I will begin by attempting to define what is commonly called a "credit crunch." I will then describe how developments in the financial and real sectors of the economy led to restricted credit availability, and why the situation has been particularly acute in New England. Finally, I will conclude with the outlook for the future, and caution that while we do not want to return to the credit conditions of the mid 1980s, which often were characterized by excessive credit expansion, we also must make sure that the 1990s do not become a period of excessive credit contraction.

## *Definition of a Credit Crunch*

One particular difficulty with the debate over the credit crunch is that the term is used to describe a variety of credit conditions. Few borrowers believe they should ever be refused credit, and they interpret a denial as evidence of broader credit problems rather than a problem specific to the project for which they seek credit. Few loan officers believe that they ever refuse credit for profitable projects, but the uncertainties surrounding any project and the underlying health of the economy make credit assessments essentially judgmental. The natural gap between optimistic borrowers and skeptical lenders is inherent to the credit process. Even during periods of rapid credit expansion, some

borrowers will be denied credit that would certainly be granted in a world with complete information and no uncertainties. Thus, anecdotal evidence of credit denials is hardly evidence of a credit crunch.

Perhaps the best definition of a credit crunch can be reached by determining whether current lending patterns conform to standard practices at the same phase of previous business cycles. Clearly, lending behavior must change over the business cycle. Because credit evaluation is so dependent on expectations, the outlook for projects can vary significantly depending on whether lenders expect the economy to contract or expand. If credit conditions during recessions were to be compared to conditions during expansions, all recessions would qualify as credit crunches. Thus, a more useful definition of credit crunch asks whether credit availability is unusually restrictive for the current stage of the business cycle.

Historically, credit crunches have been associated with disintermediation, the loss of bank deposits when higher rates of return on assets were available from outside the banking sector. In the absence of regulation, depository institutions would normally have responded to such a loss of funds by raising the rates they paid on deposits; however, this was prevented in the past by ceilings on interest paid on bank deposits. The extent of bank losses of deposits would vary across institutions, depending on their depositors' sensitivity to return differentials, but most depository institutions responded to periods of disintermediation by tightening credit. As market interest rates dropped, the ceilings on bank deposit rates would become nonbinding and disintermediation and the so-called "credit crunch" would end.

## *The Current Capital Crunch*

Our current credit problems are not the result of a drain of bank deposits, to be ended by lower interest rates. In substantial measure this period of tight credit is the result of a loss of bank capital, rather than a loss of deposits. The shrinking availability of credit from banks thus may be more accurately characterized as a capital crunch rather than a credit crunch.

This capital crunch has been uneven in its effects on our depository institutions. Equity capital losses have been particularly large in the Northeast, where banks have suffered extensive loan losses as a result of declining real estate prices and a bubble in real estate lending in the mid 1980s. Similarly, not all borrowers are equally affected by problems in the banking sector, since many borrowers depend almost entirely on financing unassociated with banks. Therefore, the current capital crunch primarily affects bank-dependent borrowers located in sectors of the country that have experienced large losses of capital.

Banks are but one of many sources of financing for many borrowers, particularly large ones. Depository institutions play a declining role in providing funds to the nonfinancial sector of the economy (Figure 1). The recent drop in the flow of depository credit primarily reflects the loss of intermediation services of the thrift industry. However, all depository institutions have had a diminished role in lending, as an increasing number of nonfinancial firms directly accessed national and international financial markets and many consumer and mortgage loans were held by nondepository institutions as a result of securitization. In addition, other financial intermediaries have begun to compete in markets traditionally dominated by depository institutions. This competition is likely to increase, as problems in the banking sector limit the ability of banks to compete effectively with other financial institutions.

*In substantial measure, this period of tight credit is the result of a loss of bank capital, rather than a loss of deposits.*

Thus, large firms and borrowers whose loans can easily be securitized will not be seriously hurt by the erosion in some banks' capital positions. The sector most likely to be affected is made up of small firms, which traditionally have relied heavily on bank credit to finance their operations. Banks have focused on this sector because lending to small firms requires an understanding of the local economy, the characteristics of small businesses, and the business acumen of management. Banks' expertise in evaluating and monitoring credit, particularly for these small privately held firms, has not been seriously invaded by competition from other financial intermediaries. But if this important source of financing is lost, small firms have few credit alternatives.

Existing relationships between borrowers and

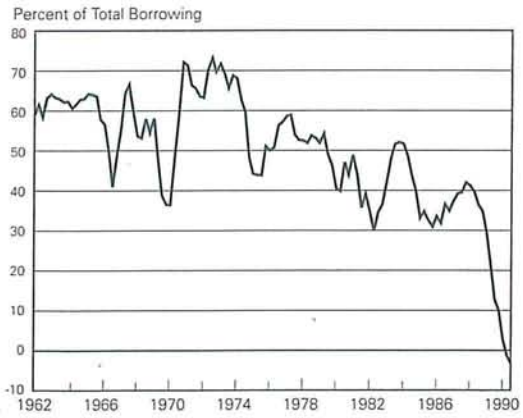
lenders are particularly important and often difficult to replicate for small businesses. Thus, when a current lender to small firms either goes out of business or cuts back its lending activity, many companies have an extraordinarily difficult time in developing new access to credit. A primary reason for this is the simple economics of business lending. In many ways, the costs of gathering and evaluating information are as great for a one-hundred-thousand-dollar loan as for a loan ten times that size.

Small businesses in New England have been particularly hurt by the capital crunch because the loss of bank capital is greatest in this region, which is also hardest hit by the recession (Figure 2). While the nation as a whole has maintained a relatively stable rate of growth of both bank capital and assets, the New England experience has been quite different. Capital and assets grew rapidly during the mid 1980s but have declined sharply since then.

The loss of bank capital in New England is particularly troubling. With little prospect of issuing new stock in the current economic environment, banks can restore their capital-to-asset ratio only by retaining more earnings and shrinking their assets.

Figure 1

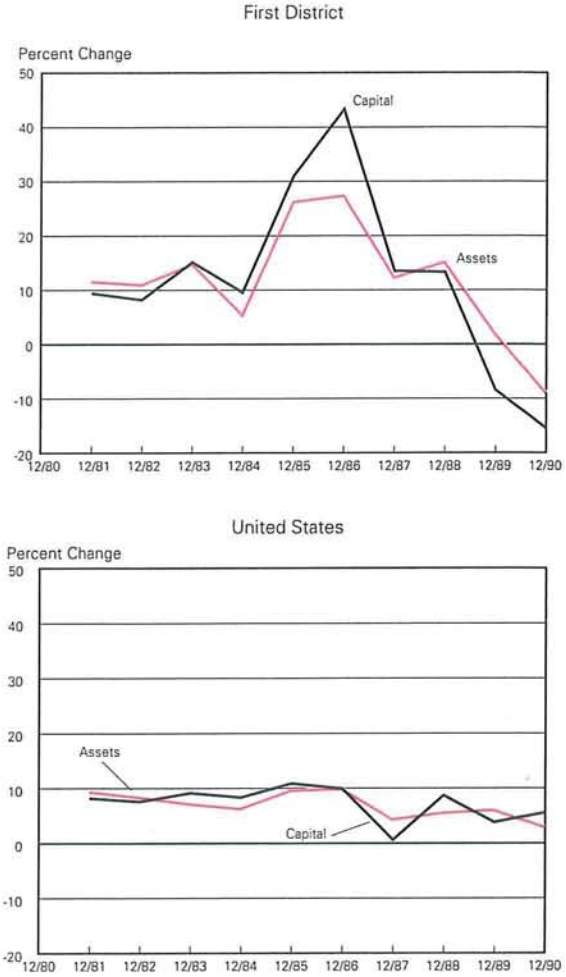
*Funds Advanced by Commercial and Savings Banks Relative to Total Net Borrowing by the Domestic Nonfinancial Sector*




Source: Federal Reserve Board, Flow of Funds Release, Z-7.

Figure 2

*Percentage Change in Capital and Assets of Commercial and Savings Banks*



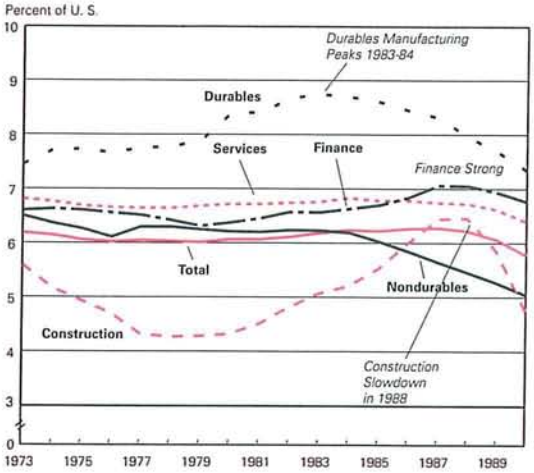

Source: Call Report data for FDIC-insured institutions.

Many institutions in New England have been reducing their dividends and contracting their lending. In some areas this has made loans unavailable to otherwise creditworthy borrowers who are dependent on bank financing.

It is the loss of bank capital that differentiates credit availability at this stage of the current business cycle from similar periods previously. Thus, the an-

Figure 3

*New England Employment as a Percentage of United States Employment, Major Industry Groupings*




Rising construction and finance offset weak manufacturing in the late 1980s.

Source: U.S. Bureau of Labor Statistics.

swer to whether we are experiencing a credit crunch is yes, at least in that respect. Regions that have lost substantial bank capital are experiencing tighter credit conditions than they would otherwise. The major cause of this credit crunch is not monetary policy or changes in bank regulation, however, it is the loss of bank capital resulting from excessive credit growth during the mid 1980s. To understand our current problems with credit availability, it is essential to understand the changes in bank lending patterns that occurred in the 1980s.

## *Economic and Financial Developments in the 1980s*

During the 1980s, many regions experienced business cycles out of sync with the country as a whole. The Southwest experienced an oil cycle, many Midwestern states experienced a farm cycle, and New England experienced a real estate cycle. Each of these cycles in the real economy has an analog in the financial economy.

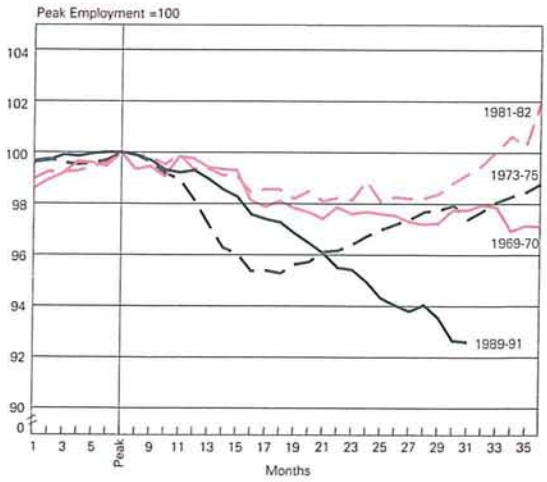
During the 1980s, employment in New England increased gradually but steadily despite only modest increases in the population (Figure 3). However, this smooth growth in New England employment as a whole masked large swings in several industry groups. Manufacturing of durable goods, a traditional strength of New England, grew rapidly in the late 1970s and early 1980s, fueled by growth in computer and other high technology companies. However, employment in these industries peaked by 1984 and declined for the rest of the decade as New England computer manufacturers lost market share.

This decline in manufacturing did not cause a drop in overall employment because of a simultaneous increase in construction employment. New England's share of construction employment started to increase in the late 1970s and rose very sharply after 1983. The construction boom, in turn, helped stimulate support industries such as financial services. Thus, the decline in one of our major industries, durable goods manufacturing, was camouflaged by the extraordinary increase in construction and related industries.

Figure 4

*Employment in Massachusetts during Periods of Recession*

(Indexed to the Peak)




Source: *New England Economic Indicators* Database.

Such explosive growth in real estate was not sustainable in a region with only small increases in population. By the late 1980s the construction boom turned to bust, and that decline plus continuing weakness in manufacturing spilled over to other sectors of the regional economy. The result has been the worst drop in employment experienced in New England in the past two decades (Figure 4). In the previous three recessions, employment declines subsided approximately 10 months after the peak. By contrast, New England employment has been declining for the past 25 months and the trough may not occur until late this year or early next year.

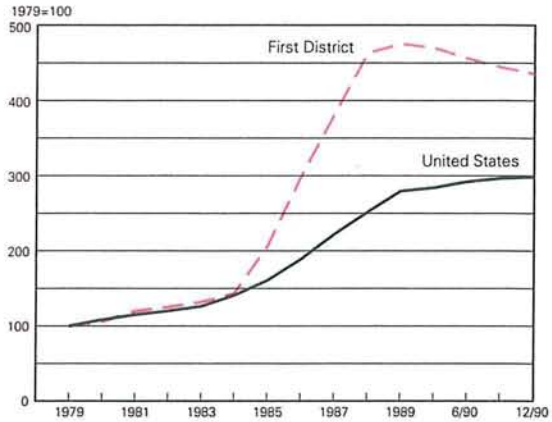
Drops in employment of this magnitude were bound to have reverberations in the financial sector. Moreover, because the construction boom was financed almost entirely by credit, the banking sector had a large exposure to any downturn in real estate. Depository institutions had many incentives to expand their real estate portfolios. Losses from Third World loans, farm loans, and oil loans encouraged the large New England banks to look for lending opportunities within their own region. Smaller thrift institutions, flush with new funds from conversion to stock ownership, were also aggressively seeking new lending opportunities. The rapid expansion of real estate lending in New England (Figure 5) led to a relaxation of lending standards. While real estate lending roughly doubled nationwide between 1984 and 1988, real estate lending in New England grew nearly fourfold.[1] This caused bank performance to be tied to the health of the real estate market. In 1990 real estate loans comprised about one-half of all loans and leases for New England commercial banks, a dramatic increase from less than one-third in 1985. On a purely anecdotal basis, in my conversations with bankers I have been struck by how much the very vocabulary we use reflects this increase in real estate lending. You could close your eyes and think you were talking to thrift bankers ten years earlier. Many of our institutions had essentially become real estate lenders rather than traditional commercial bankers.

At first, increasing bank exposure to the real estate market was quite profitable. New England house prices, which in 1984 were already 35 percent higher than those in the nation as a whole, had increased so rapidly that by 1987 they were twice the national average (Table 1). These price increases outstripped the ability of both individuals and firms to pay, resulting in excess capacity. As this excess capacity increased over time, real estate prices softened and then began to fall. This has been even more

Figure 5

*Real Estate Lending by Commercial and Savings Banks*

First District versus United States 1979 to 1990




Note: The sharp increase in First District real estate lending from 1984 to 1987 is due in part to an increase in the number of FDIC-insured institutions.

Source: Call Report data for FDIC-insured institutions.

Table 1

*Housing Cost Increases in Massachusetts, 1984–90*

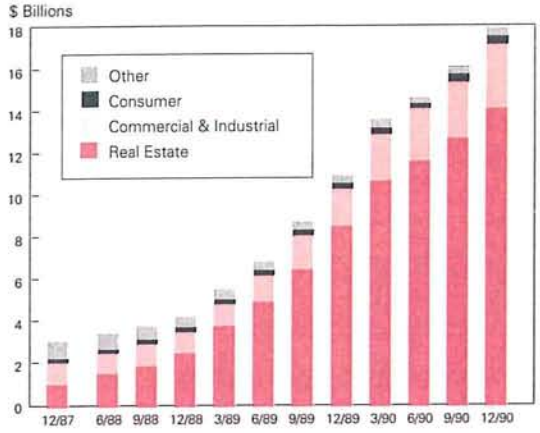
| | 1984 | 1987 | 1989 | 1990 |
|---|---|---|---|---|
| Housing Prices (000) | | | | |
| United States | $ 72.4 | 85.8 | 93.1 | 95.5 |
| Boston Metropolitan Statistical Area | $ 98.0 | 176.5 | 181.9 | 174.2 |
| Boston/U.S. (U.S. = 100) | 135 | 206 | 195 | 182 |
| Massachusetts Wages Relative to Wages in the United States (U.S. = 100) | | | | |
| Annual Pay—Private Sector | 100 | 108 | 112 | n.a. |
| Average Hourly Earnings of Mfg. Production Workers | 92 | 99 | 104 | 104 |

n.a. = not available.

Source: *New England Economic Indicators* Database; U.S. Department of Labor, *Employment and Earnings*, and the National Association of Realtors.

Figure 6

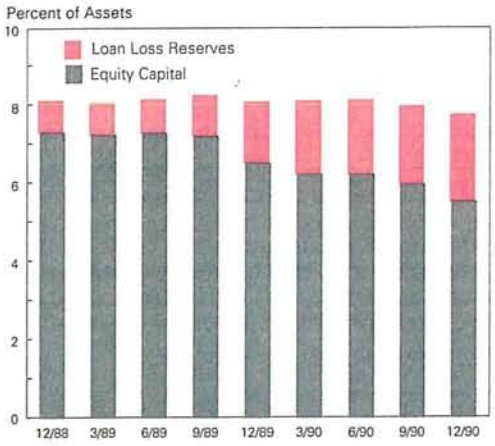
*Nonperforming Assets of First District Commercial and Savings Banks*




Source: Call Report data for FDIC-insured institutions.

Figure 7

*Ratio of Capital to Average Total Assets at First District Commercial and Savings Banks*




Source: Call Report data for FDIC-insured institutions.

true of commercial real estate than of the residential sector. Given the large exposure of New England depository institutions in real estate, this caused substantial problems for the banking sector.

## *The Current Situation*

The drop in real estate prices caused a substantial increase in nonperforming assets, much of it in real estate loans (Figure 6). As nonperforming assets grew, banks were forced to increase their loan loss reserves, resulting in lower capital (Figure 7). Even worse, this decline may not yet fully reflect the extent of the problem. Nonperforming assets as a percentage of equity plus reserves have been rising through the end of 1990, indicating that further losses of bank capital are still possible (Figure 8). The capital position of many institutions has become sufficiently impaired that downsizing has been necessary. While most downsizing has involved selling or securitizing assets, banks have also tightened their credit standards.

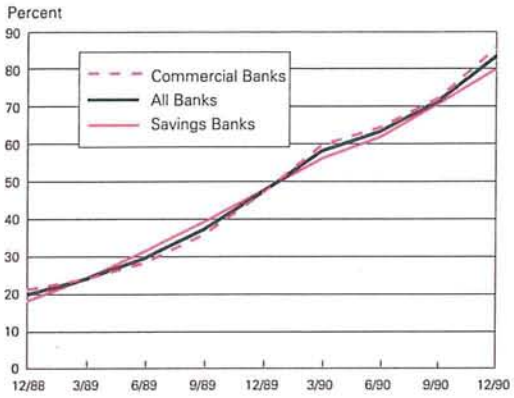
During the explosive growth in lending in New England during the 1980s, credit controls at some institutions had become lax. Most banks have responded to the increase in nonperforming loans by reevaluating loan practices established during the boom, and some banks have concluded that more conservative lending standards are required. Correction of imprudent lending practices was indeed a necessary condition for restoring some stability to the New England banking market. Nonetheless, the shortage of capital and the need for many institutions to downsize have made credit availability more difficult, particularly for small firms, which are most dependent on banks for financing.

Problems with credit availability are measured periodically by a survey conducted by the National Federation of Independent Business (Figure 9). In the survey they ask, "Are loans easier or harder to get than they were three months ago?" They subtract responses of "easier" from responses of "harder": therefore, an increase reflects tighter credit conditions. Small businessmen surveyed in New England during the boom thought that credit conditions were easier than did their counterparts in the rest of the country. However, since the late 1980s the survey indicates a substantial increase in New England respondents who believe that credit is tighter. This survey, along with considerable anecdotal evidence, suggests that small business has recently experienced significantly more difficulty in obtaining credit.

Figure 8

*First District Commercial and Savings Banks*

Nonperforming Assets as a Percentage of Equity plus Reserves



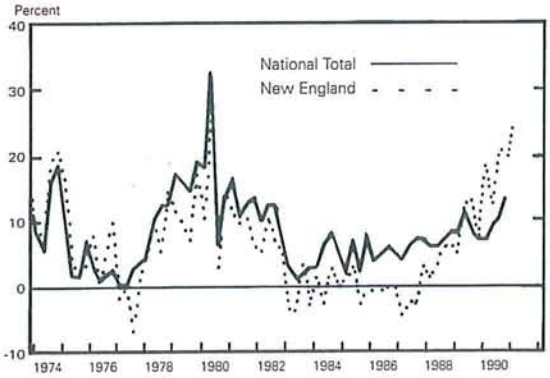

Source: Call Report data for FDIC-insured institutions.

## *The Outlook and Policy Implications*

At least in New England, the 1980s was a period of excessive lending. In response to the large loan losses that occurred as a result of this "bubble," banks and bank regulators naturally have reevaluated lending practices. A return to more prudent lending is essential for the financial health of the banking industry. However, we must ensure that the early 1990s do not become a mirror image of the mid 1980s. Given that credit judgments by both bankers and regulators ultimately reflect human sentiments, it can be expected that to some extent the overly optimistic expectations of the 1980s may be replaced by overly pessimistic expectations in the 1990s. With respect to the regulators, and I certainly include myself in that group, I believe the more valid criticism relates to how we reacted to the boom in the 1980s and whether we should not have done more to dampen it, rather than to the degree of overreaction that has occurred since. While this is strictly my personal view, I do believe a shift in regulatory sentiment about some New England institutions may have occurred that, while understandable or even appropriate on a case-by-case basis, may have been perverse for the econ-

Figure 9

*Small Business Credit Conditions* [a]



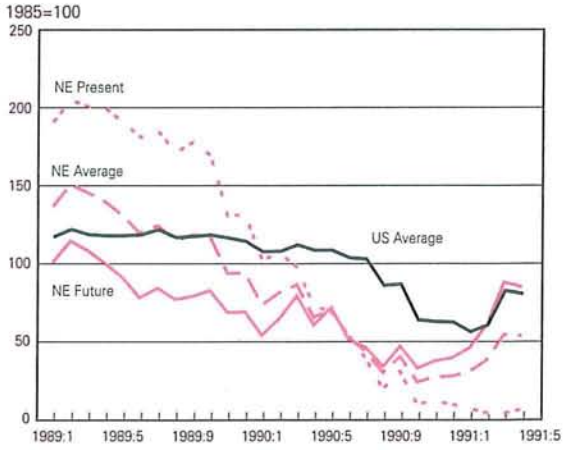

[a] Measured by the NFIB survey. Responses indicating credit harder to get minus responses indicating credit easier to get.

Source: Survey by National Federation of Independent Business.

Figure 10

*Consumer Confidence Index*

(1989:1 to 1991:4)




Source: The Conference Board.

omy as a whole. Any such possible overreaction by regulators and banks is now dissipating, however.

Despite the many problems with credit availability, we are finally beginning to see a few rays of hope. As our most troubled institutions are restructured to bring in new capital, many financial institutions are once again in a position to provide loans to creditworthy borrowers. Painful as the high unemployment rate and the drop in real estate prices are, they will provide the catalyst for restoring New England's competitive position in manufacturing, which requires land and labor costs more in line with costs in the rest of the nation. Finally, any restoration of the economy requires a restoration of consumer confidence, which now appears to be improving (Figure 10). As economic activity resumes, a more sustainable rate of economic growth and a more viable banking sector will emerge in New England as in the rest of the country. The painful lesson for everyone that emerges from the New England experience is that avoiding booms, which become bubbles, is the only way to prevent busts.

I hope we have all learned that. Thank you for the opportunity to testify.

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[1] A part of the increase shown for New England is accounted for by an increase in the number of FDIC-insured institutions.

# "Whither New England?"

*Stephen K. McNees and Geoffrey M. B. Tootell*

*Vice President and Economist, and Economist, respectively, at the Federal Reserve Bank of Boston.* *The authors are indebted to Kim Gilbo, Jeff Liebman, and Adam Rosen for research assistance.*

The New England economy has undergone a striking change from the "miraculous" boom of the mid 1980s to a seemingly bottomless bust in the early 1990s. Were there advance warnings of this sea change? When will the decline end? How strong will the recovery be?

This article addresses these questions by attempting to identify precursors, or leading indicators, of economic activity in New England. It opens by seeking to distinguish between those variables that tend to lead economic activity in New England and those that do not. Because no single variable is likely to contain all information of predictive value, the article then explores alternative methods of combining several variables into an index or statistical "model" of New England economic activity. In the process of constructing these models, several issues arise: (1) the relative importance of regional and national indicators; (2) the relative importance of financial and nonfinancial indicators; (3) the relative importance of "actual" historical data and "expectational" or "forward-looking" data, such as forecasts; and (4) the relationship between in-sample "fit" and post-sample performance.

Given the multidimensional nature of the issues, the article constructs and tests several alternative models. Given the provisional, exploratory nature of the search, only time can tell which, if any, of these alternatives will prove successful in anticipating the future of the New England economy.

## *I. Measurement of Regional Economic Activity*

The phrase "economic activity" could refer to the region's production, its income, or its employment. The only available measure of the region's production is the U.S. Bureau of Economic Analysis estimate of Gross State Product. While Gross State Product is invaluable for histor-

ical analysis of the region's productive activity, the fact that it has been estimated only on an annual basis severely limits its use for analyzing short-term developments. A more practical problem with using Gross State Product for current analysis and forecasting is its lack of timeliness—as of mid 1991, the latest available estimate of GSP was still for calendar year 1986.

State personal income is a more timely measure. It is estimated for each quarter and becomes available about four months after the quarter has ended. For example, the estimate of state personal income in 1990:IV was published on April 17, 1991. Personal income is a relatively good measure of a region's economic well-being but is not a particularly good measure of its economic activity, since it does not distinguish between income derived from economic activity within the region and that from outside the region. In addition, personal income is measured in current dollars. It is not clear what portion arises from price changes as opposed to changes in economic activity.

Relative to production and income, employment is a still more timely measure of regional economic activity, and the concept of employment is relatively easy to quantify. Employment is estimated regularly in two ways: on a household survey basis (EH), and on the basis of employers' payrolls (EP). Monthly estimates of household employment are available with only a one-month lag for the major industrial states like Massachusetts, while estimates of payroll employment carry a two-month lag for all New England states. For example, estimates of January household employment in Massachusetts and of December payroll employment for each New England state became available in early February. Given the difficulty of measuring the stock of capital and the flow of capital services, as well as the procyclical nature of labor productivity, employment is a relatively close proxy for economic activity. Thus, largely because of its availability and timeliness, but also because of its intrinsic importance, employment in New England will be used as the measure of its economic activity.

*The main reason to focus on New England is not a conceptual one: that is the way most data are collected and analyzed.*

A more difficult issue than measuring economic activity is the definition of a region. Geographic regions do not, in general, conform to either political jurisdictions or units of economic analysis. Economic theories have been established for individuals, firms, countries, and groups of countries, by location and even by geographic clustering or agglomeration. None of these concepts necessarily corresponds closely to the geographic regions defined by the Census Bureau. It would be tempting to hypothesize that factors of production, especially labor, are completely mobile within geographic regions, but relatively immobile across regions. Yet, it is not at all obvious that mobility is greater between southern Connecticut and northern Maine than between northern Maine and Canada or between southwestern New England and New York. The main reason to focus on New England is not a conceptual one; that is the way most data are collected and analyzed.

## *II. Why Is New England Distinctive?*

On the most general level, the relationship between New England and the nation can be considered in two ways. On the one hand, New England can be viewed as a very small, totally open economy, having both a common currency and virtually no barriers to trade with other regions. New Englanders deal in national financial markets and face federal tax and expenditure programs. The United States economy is, in effect, a large common market. It would be surprising if any segment of a unified market were not ultimately driven by its "exports" to and "imports" from the rest of the country. In a fundamental sense, New England's economy is inextricably and closely tied to the United States.

On the other hand, the New England economy can be thought of as unique: it is geographically compact and relatively remote from other parts of the country; its climate and natural resource endowments are dissimilar to many other regions; in addition, because nearly one-half of its population is concentrated in Massachusetts and more than three-quarters in Massachusetts and Connecticut, the New England economy is subject to a relatively similar set of regulations and tax codes. Perhaps most impor-

Table 1
*Percentage Composition of Regional Gross Product, 1986*

| Industry | New England | Southeast Seaboard | Midwest | Farm Belt | Southwest | Far West |
|---|---|---|---|---|---|---|
| Agriculture, Forestry, and Fisheries | .9 | 1.3 | 2.3 | 9.8 | 2.1 | 2.3 |
| Mining | .1 | .4 | 1.2 | 3.5 | 11.4 | 1.2 |
| Durable Goods Manufacturing | 16.2 | 8.2 | 15.4 | 8.1 | 7.1 | 11.8 |
| Nondurable Goods Manufacturing | 6.8 | 9.5 | 9.5 | 7.0 | 7.8 | 5.4 |
| Transportation, Communications, and Utilities | 7.4 | 9.3 | 9.6 | 10.7 | 10.6 | 8.5 |
| Finance, Insurance, and Real Estate | 18.0 | 17.9 | 15.9 | 16.6 | 13.8 | 17.1 |
| Services | 19.0 | 17.9 | 15.6 | 13.1 | 13.8 | 18.7 |
| Government | 9.7 | 13.3 | 10.3 | 11.2 | 12.0 | 12.4 |
| Other | 21.9 | 22.2 | 20.2 | 20.0 | 21.4 | 22.6 |

New England: ME, MA, RI, CT, VT, NH.
Southeast Seaboard: NY, NJ, DE, MD, DC, VA, NC, SC, GA, FL.
Midwest: PA, WV, KY, TN, AL, AR, MO, IL, WI, MN, MI, OH, IN.
Farm Belt: IA, KS, NE, CO, WY, ID, MT, ND, SD.
Southwest: MS, LA, TX, NM, OK, AK, HI.
Far West: UT, AZ, CA, NV, OR, WA.
Source: U.S. Bureau of Economic Analysis, Gross State Products computer tape, and authors' calculations.

tantly, New Englanders often think of themselves as a region. Given this perceived internal cohesion, it is not surprising to find that the New England economy is not always "in sync" with the country as a whole.

In fact, New England is not simply a miniature version of the country. As shown in Table 1, the region's industrial mix is quite distinctive. Of the nine industrial categories shown, New England ranked at either the high or the low extreme for seven, and is thus disproportionately affected by shifts among these categories. This idiosyncratic industrial structure creates the possibility that economic conditions in the United States and New England may diverge.

Nationally, movements away from full employment are the net result of supply and demand shocks to all of our industries. A region composed of an industrial mix or set of endowments different from the nation's is subject to a larger set of these employment disturbances. Supply and demand surprises that offset each other within the nation as a whole can have large effects on undiversified regions. Thus, the short-run disturbances that affect the endowments, firms, or industries of a region can cause dislocations in that area not experienced by the nation. It is these short-run employment dislocations that are examined in this paper; the potential sources for these swings in regional employment are briefly discussed in this section.

However, more than imperfect regional diversification is required for a region to suffer fluctuations of employment away from its equilibrium path that are not experienced by the nation; imperfect labor mobility and some wage stickiness are also necessary. If wages and prices were perfectly flexible, and labor somewhat immobile, only real wages would fluctuate, not employment.[1] The differing economic performances in various areas of the country would be reflected in different gross outputs in these areas, but employment levels would remain unchanged.[2] Furthermore, if labor were completely mobile, while wages and prices were sticky, then the employment growth of any given area would not be a variable of economic concern, as decline in one area would be completely offset by growth in another; if oil reserves were depleted in Alaska and all the workers immediately shifted to other areas/firms/industries, output and employment in the geographical region known as Alaska would be affected but no unemployment or wasted resources would occur. Thus, only when some factor immobility is present do local disturbances cause the wasted resources that motivate examination of regional employment growth.[3] And the performance of the Southwest in the 1980s, and New England currently, reveals that the long-run factor mobility that exists in the United States can be too slow to prevent significant economic losses.

Given this labor immobility, diversification by industry and by firm is required to avoid regional employment movements away from equilibrium levels independent of the nation. A New England computer company whose product suddenly becomes obsolete is a good example of a firm-specific demand disturbance. Since the computer is rejected by consumers, the usual demand for this company's product would spill over to its competitors. This bad investment decision by the New England manufacturer would actually benefit the other companies in the industry. If every firm in the industry were located in New England, workers from one computer company would simply file over to the others, and regional employment would not be affected. If, on the other hand, the failing computer firm were the sole producer in the region, the other computer companies would not be there to hire the laid-off workers. However, even if New England is diversified as to computer firms, but disproportionately dependent on computer manufacturing, a decrease in the demand for computers as a whole would produce employment declines in New England relative to the nation. With some factor immobility, nondiversification either by firm or by industry can lead to divergences from the national performance.

*New England will not remain permanently out of step with the rest of the nation.*

Even when regions are diversified, the immobility of certain regional endowments can also cause regional performance to diverge from national conditions. Anything that affects the productivity of these region-specific factors of production will affect the economic performance of that area relative to the nation. The simplest example of such a disturbance is a local drought, where agricultural production and employment fall in the region but not in the rest of the country. Differences in regional endowments can also affect regional employment in the same way as undiversified industrial mix; the rise and fall in oil prices, and the ensuing effect on the economy of the Southwest, is an example of an endowment disturbance that resembles a demand shock on an undiversified region. Disturbances that affect the productive capacity of the region through shocks to the regional endowments can also cause divergent regional performance.

Finally, the national economy affects regional economic conditions even if the region is perfectly diversified. A national downturn will usually decrease the demand for many of a region's products. If the region were as diversified as the nation, the national decline would be emanating from many of the region's industries; if the region were not perfectly diversified, and if its industries were not directly responsible for the national decline, regional performance would be affected because income in its largest export market had declined. The only way a region can avoid a nationally driven downturn is if the industries in the area are acyclical; in this case, the national economy would not affect regional activity, but the firms in the area would still be susceptible to the forces specific to its firms, its industries, and its regional endowments, discussed above.[4] Thus, a nationally diversified region eliminates all regional employment movements not associated with national economic conditions, while a region immune to national shocks is prone to the more local sources of fluctuations.

In short, both national and regional factors can be expected to have an influence on New England's employment. Major swings in employment are dominated by national business cycles. Yet, because of the uniqueness of the region's industrial mix, the regional impact will not be a simple reflection of national trends. Similarly, the myriad of forces that affect the location of a firm or worker within the country will enter into regional, but not necessarily national, data. Any attempt to predict regional employment growth must include both national and regional variables in order to capture both sources of regional employment fluctuations.

## *III. Indicators of New England Employment*

It is important to distinguish between the official Index of Leading Indicators of the U.S. economy and the broader definition of indicators used here. The official Index is designed to anticipate turning points in the national business cycle—peaks and troughs—as designated by the National Bureau of Economic Research. Its focus is binary—whether the economy is in an expansion phase or a contraction (recession) phase. In contrast, applied forecasting commonly uses the word "indicator" in a much broader sense:

any currently available information presumed to be associated with the future values of a variable of interest. Here, as is typically the case, the presumed relationship is not binary but a continuous, quantitative one with payroll employment in New England.

Any variable can serve as an indicator because no structural or causal relationship is implied. The only requirement for a successful indicator is that it be closely associated with the future values of the predicted variable. The relationship between an indicator and the predicted variable should also be fairly direct—if an indicator works only when embedded in a multivariate model or filtered with complex statistical techniques, it would seem as (more) appropriate to regard the model or the filter, rather than the indicator, as the predictor. The essence of the pure indicator approach is its simplicity: observing an indicator has clear, direct implications for the forecast.[5]

Table 2
*Regional Indicators of Employment Growth in New England*
Monthly Bivariate Regression Results, Sample Period 1983:02 to 1990:09

| Indicator | Number of lags | Standard Error | $\bar{R}^2$ | F-test Significance |
|---|---|---|---|---|
| 1 CRNE | 1 to 21 | .0027376 | .44 | **** |
| 2 ICNE | 0 to 15 | .0027690 | .43 | **** |
| 3 CTNE | 1 to 16 | .0027732 | .43 | **** |
| 4 HWNE | 1 to 17 | .0028857 | .38 | **** |
| 5 RSNE | 2 to 16 | .0029094 | .37 | **** |
| 6 HSNE | 1 to 19 | .0029650 | .35 | **** |
| 7 EPNE | 1 to 15 | .0029690 | .35 | **** |
| 8 BPNE | 1 to 23 | .0029963 | .33 | *** |
| 9 BPSNE | 1 to 21 | .0030094 | .33 | *** |
| 10 ICENE | 0 to 24 | .0030159 | .32 | *** |
| 11 ICSNE | 0 to 14 | .0030936 | .29 | *** |
| 12 RURMA | 0 to 23 | .0031630 | .26 | *** |
| 13 CNNE | 1 to 20 | .0031859 | .25 | *** |
| 14 URMA | 0 to 14 | .0031859 | .25 | *** |
| 15 NBINE | 2 to 16 | .0033044 | .19 | *** |
| 16 ECNE | 3 to 22 | .0033985 | .14 | ** |
| 17 EHMA | 0 to 10 | .0034050 | .14 | ** |
| 18 RSNNE | 2 to 13 | .0034133 | .13 | ** |
| 19 EINE | 3 to 22 | .0034268 | .13 | ** |
| 20 LFMA | 0 to 4 | .0034492 | .12 | *** |
| 21 CPIB | 1 to 24 | .0034593 | .11 | * |
| 22 AWHNE | 1 to 14 | .0035198 | .08 | * |
| 23 PREB | 0 to 0 | .0036163 | .03 | ** |
| 24 TEMPB | 0 to 4 | .0036679 | .00 | * |
| 25 ERNE | 3 to 3 | .0036878 | -.01 | * |
| 26 AHENE | 1 to 1 | .0036890 | -.01 | * |

****F-test significance is less than .0001.
*** F-test significance is between .0001 and .01.
** F-test significance is between .01 and .1.
* F-test significance is greater than .1.
Note: Column 3 represents monthly standard errors.
Definitions of the indicators may be found in Appendix Table A1.

Table 2 shows the results of regressing New England's monthly employment growth on lagged values of 25 potential regional indicators, defined in the Appendix to this article. The first lag is determined by data availability: each month, actual values of the financial variables and several labor market variables are known before that month's New England employment growth. For example, in the first week in February, when we learn New England's December employment, we already know what happened in January in the financial markets and the national employment situation, and we have some information on regional labor markets in January (initial claims, Massachusetts' unemployment rate, and employment measured on a household survey basis). Thus, this information can be used to predict New England employment in January, which will not be announced until early March. At the same time, most other indicators will be available only through December, and a few regional variables (for example, electricity use and new business incorporations) will be available only for still earlier months. Thus, depending on the timing of the availability of the indicator, it may be lagged not at all, or from one to three months.

The last lag for each potential indicator, as well as the ranking of the indicators, was selected to minimize the standard error of the regression. The start and end of the distributed lag for each indicator are shown in the second column and the standard error in the third column of the table.

Of the 26 regional indicators, six predicted payroll employment in New England (EPNE) better than its own recent history: three were measures of construction activity, the value of residential (CRNE) and total (CTNE) construction contracts and house sales (HSNE); two were measures of labor market conditions, initial claims for unemployment insurance (ICNE) and help wanted advertising (HWNE); the other relatively good indicator was retail sales (RSNE).

At the other extreme, several regional indicators were not very reliable: electricity sales, whether commercial (ECNE), industrial (EINE), or residential (ERNE), did not fare well; retail sales of nondurable goods (RSNNE) was far inferior to total retail sales;

neither the Boston Consumer Price Index (CPIB) nor average hourly earnings of manufacturing workers (AHENE) performed well. Somewhat surprisingly, Massachusetts employment data, as measured on a household basis (EHMA) or by the size of its labor force (LFMA), both available a month *before* data on New England employment measured on a payroll basis, and even average weekly hours (AWHNE), a leading indicator on a national basis, were not good predictors. Not at all surprisingly, the two "ringers" included to test whether this method would reject them were poor indicators—the deviations of Boston's temperature (TEMPB) and its precipitation (PREB) from normal.

Between these extremes, several indicators enjoyed a moderate success. These included building permits, both total (BPNE) and for single-family units (BPSNE); the Conference Board's indexes of New England consumer sentiment (ICSNE) and consumer expectations (ICENE); the Massachusetts unemployment rate (URMA) and the ratio of Massachusetts unemployment to the national rate (RURMA); the value of nonresidential construction contracts (CNNE); and the volume of new business incorporations (NBINE).

Table 3 replicates Table 2 over a longer sample period and includes national as well as regional indicators. Five of the top ten indicators are national and are measures of the labor market: payroll employment (EP), the unemployment rate (UR), help wanted advertising (HW), civilian household employment (EH), and average weekly hours (AWH). The top 20 indicators include six additional national variables. Two are financial variables: the spread between the rates on six-month commercial paper and Treasury bills (SPRED6), and the slope of the yield curve between 10-year and 1-year Treasury securities (TILT101). One is a labor market measure, initial claims for unemployment insurance (IC); and the other three are manufacturers' new orders for consumer goods and materials industries (NOC); building permits (BP); and personal consumption expenditures (PCE). Thus, the top 20 indicators of monthly employment in New England include nine regional variables, four components of the Index of Leading Indicators and two components of the NBER's Experimental Index of Leading Indicators, plus five national variables not included in any of the standard leading indicator indexes.

Among the less successful national indicators were (1) the Index of Leading Indicators (ILI) and several of its components—the real money supply

Table 3
*Regional and National Indicators of Employment Growth in New England*
Monthly Bivariate Regression Results, Sample Period 1976:02 to 1990:09

| Indicator | Number of lags | Standard Error | $\bar{R}^2$ | F-test Significance |
|---|---|---|---|---|
| 1 EP | 0 to 5 | .0031485 | .34 | **** |
| 2 HWNE | 1 to 13 | .0032997 | .28 | **** |
| 3 CRNE | 1 to 22 | .0033097 | .27 | **** |
| 4 EPNE | 1 to 15 | .0033303 | .26 | **** |
| 5 UR | 0 to 23 | .0033571 | .25 | **** |
| 6 HW | 1 to 14 | .0033665 | .25 | **** |
| 7 EH | 0 to 7 | .0034017 | .23 | **** |
| 8 CTNE | 1 to 23 | .0034280 | .22 | **** |
| 9 AWH | 0 to 23 | .0034405 | .21 | **** |
| 10 HSNE | 1 to 24 | .0034461 | .21 | **** |
| 11 IC | 0 to 23 | .0034539 | .21 | **** |
| 12 NOC | 1 to 22 | .0034789 | .20 | **** |
| 13 ICNE | 0 to 20 | .0034883 | .19 | **** |
| 14 BPNE | 1 to 24 | .0034926 | .19 | *** |
| 15 BPSNE | 1 to 24 | .0035054 | .18 | *** |
| 16 SPRED6 | 0 to 13 | .0035348 | .17 | **** |
| 17 URMA | 0 to 10 | .0035429 | .17 | **** |
| 18 TILT101 | 0 to 18 | .0035431 | .17 | *** |
| 19 BP | 1 to 24 | .0035554 | .16 | *** |
| 20 PCE | 1 to 5 | .0035618 | .16 | **** |
| 21 M2 | 0 to 22 | .0035621 | .16 | *** |
| 22 SLACK | 0 to 4 | .0035843 | .15 | **** |
| 23 DTILT101 | 0 to 18 | .0036113 | .13 | *** |
| 24 ILI | 1 to 23 | .0036159 | .13 | *** |
| 25 SM | 1 to 24 | .0036291 | .13 | *** |
| 26 RFF | 0 to 20 | .0036464 | .12 | *** |
| 27 BV | 2 to 24 | .0036470 | .12 | *** |
| 28 IIP | 1 to 3 | .0036572 | .11 | **** |
| 29 LF | 0 to 16 | .0036648 | .11 | *** |
| 30 RURMA | 0 to 21 | .0036696 | .11 | ** |
| 31 MTS | 2 to 13 | .0036829 | .10 | *** |
| 32 VP | 1 to 23 | .0036903 | .10 | ** |
| 33 SLOPE1OFF | 0 to 8 | .0036912 | .10 | *** |
| 34 LFMA | 0 to 17 | .0037097 | .09 | ** |
| 35 PILT | 1 to 4 | .0037131 | .08 | *** |
| 36 COPE | 1 to 12 | .0037178 | .08 | *** |
| 37 UOD | 1 to 21 | .0037499 | .07 | ** |
| 38 DDEFAULT | 0 to 14 | .0037531 | .07 | ** |
| 39 DEFAULT | 0 to 5 | .0037603 | .06 | ** |
| 40 YD | 1 to 12 | .0037691 | .06 | ** |
| 41 AWHNE | 1 to 24 | .0037804 | .05 | * |
| 42 DSPRED6 | 0 to 13 | .0037816 | .05 | ** |
| 43 CNNE | 1 to 18 | .0038019 | .04 | * |
| 44 AHENE | 1 to 10 | .0038412 | .02 | * |
| 45 PREB | 0 to 0 | .0038570 | .01 | ** |
| 46 DSLOPE10FF | 0 to 24 | .0038696 | .01 | * |
| 47 SP | 0 to 1 | .0038840 | .00 | * |
| 48 AHE | 0 to 3 | .0038885 | .00 | * |
| 49 TEMPB | 0 to 0 | .0038910 | .00 | * |

****F-test significance is less than .0001.
*** F-test significance is between .0001 and .01.
** F-test significance is equal to .01 or between .01 and .1.
* F-test significance is greater than .1.

Note: Mnemonics ending in NE, MA or B indicate that the variable is a measure for New England, Massachusetts or Boston respectively. Column 3 represents monthly standard errors. Definitions of the indicators may be found in Appendix Table A1.

(M2), sensitive material prices (SM), contracts and orders for plant and equipment (COPE), vendor performance (VP), unfilled orders for durable goods (UOD), and stock prices as measured by the S&P500 (SP); (2) the components of the index of coincident indicators except for payroll employment—personal income less transfer payments (PILT), the index of industrial production (IIP), and manufacturing and trade sales (MTS); (3) financial market indicators—the first difference of the slope of the yield curve between 10-year and 1-year Treasury Securities (DTILT101), the federal funds rate (RFF), the spread between 10-year Treasuries and the federal funds rate (SLOPE10FF), the difference between AAA and Baa rated corporate bonds (DEFAULT), the first difference of DEFAULT (DDEFAULT), the first difference of the spread between the rates on six-month commercial paper and Treasury bills (DSPRED6), and the first difference of SLOPE10FF (DSLOPE10FF); and (4) several miscellaneous potential indicators—the change in book value of manufacturing and trade inventories (BV), the civilian labor force (LF), persons working part-time for economic reasons (SLACK), disposable personal income (YD), and average hourly earnings (AHE).

Table 4 covers the same indicators and sample period as Table 3 with all information measured on a quarterly rather than a monthly frequency. This allows the addition of several variables that are available only on a quarterly basis as well as forecasts of three quarterly variables. Ideally, forecasts of New England employment (EPNE) would have been used. Unfortunately, only forecasts of national variables were available—specifically, the one-quarter ahead forecasts of U.S. payroll employment (FEP), of employment based on the household survey (FEH), and of real GNP (FRGNP) were examined.

While Table 4 broadly reflects Table 3, the quarterly results differ from the monthly in several aspects. The most striking is the decline in the rank of several national labor market indicators: EP, which was highest ranked on Table 3, declines to 28th on Table 4; UR falls from 5th to 23rd; AWH drops from 9th to 21st; and IC from 11th to 22nd. All these monthly indicators apparently benefited from their timeliness, since each was available before New England employment for the same month. This advantage of timeliness is apparently sharply reduced when the data are smoothed by measuring at quarterly frequencies.

The second difference is that the forecasts were among the best indicators. All three "expectational"

Table 4
*Regional and National Indicators Of Employment Growth in New England*
Quarterly Bivariate Regression Results, Sample Period 1976:II to 1990:III

| Indicator | | Number of lags | Standard Error | $\bar{R}^2$ | F-test Significance |
|---|---|---|---|---|---|
| 1 | HWNE | 1 to 4 | .0044460 | .65 | **** |
| 2 | CRNE | 1 to 7 | .0048839 | .58 | **** |
| 3 | HW | 1 to 1 | .0052232 | .52 | **** |
| 4 | EPNE | 1 to 8 | .0052791 | .51 | **** |
| 5 | HSNE | 1 to 8 | .0054647 | .48 | **** |
| 6 | RURMA | 1 to 7 | .0055854 | .45 | **** |
| 7 | URMA | 1 to 3 | .0055990 | .45 | **** |
| 8 | BPNE | 1 to 7 | .0056531 | .44 | **** |
| 9 | ICNE | 1 to 6 | .0056674 | .44 | **** |
| 10 | BPSNE | 1 to 8 | .0058570 | .40 | **** |
| 11 | FEP | 0 to 0 | .0059070 | .39 | **** |
| 12 | CTNE | 1 to 6 | .0059088 | .39 | **** |
| 13 | FEH | 0 to 0 | .0059342 | .38 | **** |
| 14 | PCE | 1 to 5 | .0059546 | .38 | **** |
| 15 | ILI | 1 to 8 | .0059565 | .38 | **** |
| 16 | EH | 1 to 4 | .0060520 | .36 | **** |
| 17 | BP | 1 to 8 | .0060761 | .35 | *** |
| 18 | FRGNP | 0 to 0 | .0061452 | .34 | **** |
| 19 | MTS | 1 to 3 | .0061505 | .34 | **** |
| 20 | SPRED6 | 1 to 3 | .0061641 | .33 | **** |
| 21 | AWH | 1 to 7 | .0061945 | .33 | *** |
| 22 | IC | 1 to 7 | .0062882 | .31 | *** |
| 23 | UR | 1 to 2 | .0063089 | .30 | **** |
| 24 | M2 | 1 to 8 | .0063431 | .30 | *** |
| 25 | BV | 1 to 8 | .0063619 | .29 | *** |
| 26 | VP | 1 to 8 | .0065152 | .26 | *** |
| 27 | NOC | 1 to 5 | .0065152 | .26 | *** |
| 28 | EP | 1 to 8 | .0065195 | .26 | *** |
| 29 | SLACK | 1 to 1 | .0065346 | .25 | **** |
| 30 | SLOPE1OFF | 1 to 3 | .0065413 | .25 | *** |
| 31 | TILT101 | 1 to 2 | .0065733 | .24 | *** |
| 32 | RGNP | 1 to 3 | .0065970 | .24 | *** |
| 33 | IIP | 1 to 3 | .0066324 | .23 | *** |
| 34 | PILT | 1 to 1 | .0066758 | .22 | *** |
| 35 | RFF | 1 to 7 | .0068184 | .19 | ** |
| 36 | YPNE | 2 to 8 | .0068597 | .18 | ** |
| 37 | DDEFAULT | 1 to 5 | .0068969 | .17 | ** |
| 38 | DEFAULT | 1 to 6 | .0069217 | .16 | ** |
| 39 | UOD | 1 to 8 | .0069353 | .16 | ** |
| 40 | COPE | 1 to 6 | .0069505 | .15 | ** |
| 41 | CNNE | 1 to 8 | .0069895 | .14 | ** |
| 42 | YD | 1 to 4 | .0070240 | .14 | ** |
| 43 | DTILT101 | 1 to 8 | .0070720 | .12 | ** |
| 44 | SM | 1 to 1 | .0070901 | .12 | *** |
| 45 | AWHNE | 1 to 7 | .0071690 | .10 | ** |
| 46 | LFMA | 1 to 5 | .0072311 | .08 | ** |
| 47 | LF | 1 to 1 | .0072320 | .08 | ** |
| 48 | AHENE | 1 to 3 | .0073801 | .05 | * |
| 49 | AHE | 1 to 8 | .0073808 | .05 | * |
| 50 | ICS | 1 to 2 | .0074464 | .03 | * |
| 51 | DSPRED6 | 1 to 3 | .0074896 | .02 | * |
| 52 | DSLOPE10FF | 1 to 8 | .0074922 | .02 | * |
| 53 | SP | 1 to 1 | .0076177 | −.02 | * |
| 54 | TEMPB | 1 to 1 | .0076193 | −.02 | * |
| 55 | PREB | 1 to 1 | .0076219 | −.02 | * |

****F-test significance is less than .0001.
*** F-test significance is between .0001 and .01.
** F-test significance is between .01 and .1.
* F-test significance is greater than .1.

Note: Mnemonics ending in NE, MA or B indicate that the variable is a measure for New England, Massachusetts or Boston respectively. Column 3 represents quarterly standard errors. Definitions of the indicators may be found in Appendix Table A1.

variables were among the eight best national indicators and 18 best overall indicators, even though none are designed to predict New England's employment. A final notable difference is that the composite Index of Leading Indicators (ILI) is a superior quarterly indicator to any of its components.

In broad terms, the problem is not a lack of good indicators but rather that dozens of plausible candidates can be found. Numerous indicators show a high, significant correlation with employment in New England (EPNE), but even the best indicator is far from perfect. The multiplicity of good but not perfect indicators raises the question of whether a composite index or multivariate model would be an even better precursor of employment growth in New England. This is the focus of the following section.

## *IV. Building Multivariate Models of New England Employment*

The previous section of this article analyzed the relationship between New England employment growth and individual indicators, using several different information sets. This section explores the relationship between the region's employment growth and many variables simultaneously. The value of the various information categories is also examined further; the performance of regional, national, and expectational sets of variables are all compared to the predictive power of simple lagged values of the dependent variable. This analysis allows an exploration of the source of the predictive power of these variables. Thus, a model will be constructed for each data set, and the in-sample performance of each model will be compared.

The statistical gains from using multivariate rather than bivariate analysis could be important. First, many variables may appear to lead the growth in New England employment simply because they are correlated with other, "true" leaders. For example, using bivariate analysis, residential construction seems to lead employment growth, but when both building permits and construction contracts are included in the analysis, the construction variable becomes unimportant. Residential construction has no marginal predictive power once building permits are taken into account. Conversely, a variable may prove to be more important once other variables are accounted for, as it picks up "partial" elements of employment that others do not capture. Furthermore, a multivariate study allows the relative importance, or the weight, of each indicator to be determined by the regression analysis.

The multivariate approach, however, has several drawbacks. The models created here are not structural models but statistical ones. Interpretation of the coefficients as structural parameters should be avoided. Furthermore, this analysis runs the risk of "over-fitting." As we have seen, candidates for inclusion in a model are numerous, each with its own distributed lag. At the same time, the available sample size for many variables is relatively short. This poses a dilemma: the better the sample period is "mined," the fewer the degrees of freedom to estimate the coefficients, and the less reliable these estimates become. Because of this danger, the next section contains out-of-sample tests; the remainder of this section concentrates on in-sample performance.

The differences in the data sets occur over several dimensions: regional and national, actual and forward-looking, and financial and nonfinancial. New England employment growth is estimated as functions of the variables in these information sets available at the time the prediction would be made. For example, the estimate of the employment growth in the second quarter of 1991 would use all information released as of the first week in May. The importance of the increased timeliness of the financial variables is examined by separating each series into the chronological quarterly lag, and a monthly (April) update; this is one way to observe whether the explanatory power of these financial variables derives from long lags or their relative timeliness. Along the geographic dimension, the regional information set contains less timely data than the national information; one might, therefore, expect the national model to perform better in sample. On the other hand, to the extent that regional employment diverges from the national performance, the regional information should conform more closely to the variable of interest. Finally, the expectational information set is forward-looking, whereas the variables in the other models are all historical, or predetermined; thus, the value of judgment can be explored. Breaking up the information sets allows an exploration of the importance of these dimensions.

The construction of each model began with the bivariate analysis in the previous section. The potential indicators having the strongest bivariate relationship with regional employment growth were first combined to form a base model. All the remaining variables were then added to the base equation, one at a time. The most significant added variable was

Table 5
*Multivariate Models of New England Employment*
Sample Period: 1976:I to 1988:IV

| The Models | SER |
|---|---|
| I. Autoregressive: | |
| EPNE = C + EPNE(1–8) | 2.1576 |
| II. Regional: | |
| EPNE = C + EPNE(1–3) + ICNE (1–3) + CNNE(1–3) + HWNE(1) | 1.4599 |
| III. National: | |
| EPNE = C + EPNE(1–3) + DSLOPE1OFF(1–3) + HW(1–2) + COPE(1–3) + MTRD | 1.4517 |
| IV. Expectational: | |
| EPNE = C + EPNE(1–7) + FEP | 1.6924 |
| V. All Information Sets: | |
| (A) EPNE = C + EPNE(1–4) + HW(1–5) + COPE(1–5) + DDEFAULT(1–2) + HWNE(1–8) + MTRD + FEP + ILI(1–4) + BP(1–3) | .71674 |
| (B) EPNE = C + EPNE(1–4) + HW(1–3) + COPE(1–3) + DDEFAULT(1–3) + ILI(1–4) + SLACK(1–4) + CNNE(1–4) + DSLOPE1OFF(1–3) + AWHNE(1–2) + RGNP(1–2) + FEP | .56451 |

The numbers in parentheses are the lags of each variable used in the equation.

then included in the fundamental equation in the next round. This procedure was then repeated with the new base model. This process continued until no more variables could be added to the base equation, and all the included variables were significant. One drawback to this methodology is that the final model may be dependent on both the original base equation used and the order of acceptance of the added variables. For this reason, several different routes to arrive at the final equation were taken; the final equation in each information set turned out to be fairly robust to different routes.

Table 5 contains the models identified for each information set. The standard error of each regression (SER), in annualized rates, is given alongside the variables in each equation. The simple autoregressive model in equation I, using only the lags of New England employment growth, provides a convenient standard of comparison. A large body of previous research suggests that an autoregressive model is a reasonably high standard for comparison in this type of analysis, as it is known to produce relatively accurate one-period-ahead forecasts (Zellner and Palm 1974). The number of lags of each independent variable included in this and the other models was determined using Akaike's Information Criterion.[6] This method of selection tends to keep the lag length short and, thus, helps prevent the over-fitting to which this statistical method is prone.

The second equation in Table 5 gives the in-sample performance based solely on the regional information set. In addition to lags of the dependent variable, labor market and construction variables are important.[7] Initial claims for unemployment insurance (ICNE) and help wanted advertising (HWNE) are two labor market series often promoted as leading indicators of employment; both variables gain from timeliness—claims are available weekly and firms advertise a job opening *before* they fill it. The construction variable (CNNE) is also a traditional candidate for a leading indicator. The value of new construction contracts is similar to building permits, but it gives a dollar value to future work. As with building permits, the signing of the contract should portend future employment increases in the construction sector.

What is surprising about the equation is not the variables included, but rather the variables that are missing. The regional indicators do not closely resemble the components of the national Index of Leading Indicators. Good reasons can be found for this discrepancy. First, national leading indicators attempt to predict turning points of the business cycle, not employment growth. Employment is only one of several elements of the national coincident series. Furthermore, many of the data available at the national level are not available at the regional level and certainly not in a timely manner. What, for example, is the regional money supply? Also, many of the regional counterparts to the national Index that are available did not perform well. Building permits and average workweek, both contained in the national Index, do not help explain future regional employment growth; their failure could be due to the different dependent variable they are attempting to predict on the regional level. Even with this parsimonious equation, however, the standard error of the fitted regional model is two-thirds of the standard error of the autoregressive equation.

The national data set suggests how strongly the regional economy has been linked to the economic performance of the rest of the country. Labor market variables are prominently represented in the national equation, as they are in the regional model. U.S. help

wanted advertising and the most recent monthly trade component of the national payroll employment figures are both important for explaining New England employment growth. Use of the monthly number brings more timeliness to the quarterly data even though its contribution is, in general, small. The importance of the rate of growth in contracts for plant and equipment (COPE) is not surprising, as it is a component of the national Index of Leading Indicators.

As with the regional model, what is most surprising about the national model is the indicators that do not enter the equation. The financial variables examined by Friedman and Kuttner (1990) and Stock and Watson (1989) did not perform as well as they have on national variables, although DSLOPE10FF does seem to help predict New England employment growth performance. Again, note that the increased timeliness of these financial series was not important, as the current monthly update did not enter the national equation. The standard error of the national equation is only slightly lower than its regional counterpart but 33 percent lower than the baseline autoregressive equation, suggesting the strength of the linkage between the national economy and New England's.

A perfect indicator of New England employment would, of course, be a "rational," efficient forecast of the region's employment. Unfortunately, that ideal indicator does not exist. The few documented forecasts that could be found were available only on an irregular basis. Cursory examination suggested these limited forecasts did not encompass all available information with predictive content. Forecasts of national data are regularly available and, as revealed earlier, highly correlated with employment growth in New England. As expected, the forecast of national payroll employment was the best predictor of New England employment. Forecasts of national household employment and real GNP had no independent explanatory power once that forecast was included. The expectational equation, however, does not fit as well as the regional or national equations, although it does outperform the autoregressive equation. Part of the failure of the expectational equation relative to its competition is due to the difference between the forecasted variable, national employment growth, and the dependent variable, New England employment growth. The link between national and regional employment movements is not a perfect one, and the correspondence between New England employment growth and real GNP is even weaker. The expectational variables could efficiently use all relevant information, but since the target is different, this test would not reveal that efficiency.

The best model is likely to combine the information from all sets. Building such a model raises several important questions. Are the other data sets proxies for the regional data, or do they play some independent role in predicting New England employment? What is the predictive power of traditional indicators once forward-looking expectational variables are added to the model?

The results of these tests are given in equations V (A) and V (B). The national variables tend to dominate the equations. In equation V (A), lags of New England employment and help wanted advertising are the only regional variables that survive. National help wanted also remains in the equation. The importance of the national series relative to their regional counterparts is vividly illustrated when examining building permit data, where national building permits strongly dominate the best regional building permit variable, both in sample and out of sample.

*The best model is likely to combine the information from all sets of variables.*

This result seems surprising, as one might expect the national variable to serve at best as a proxy for its regional analog. One reason this national variable dominates may be that it is measured more precisely. Furthermore, national building permits represent the demand not just for construction workers but for all laborers who produce construction materials, wherever these materials are used. The construction supplies business could easily be more important for a region's employment than the construction of housing as such. Therefore, on a more fundamental level no reason exists to believe that a regional variable must outperform its national counterpart.

Equation (B) in section V of Table 5 reports an alternative full information set model to Equation (A). Equation (B) is meant to exemplify a difficult problem. This model is derived from a different baseline equation and a different ordering of the selection of the variables added to the baseline. It is a sign of the robustness of (A) that (B) contains most of its varia-

bles; only regional help wanted, national building permits, and the monthly trade component of payroll employment have been dropped. Equation (B), however, includes two more indicators than equation (A); by adding even more variables, the ability of the equation to fit in sample is improved; its standard error is lower than that of Equation (A). The problem of over-fitting in sample will be examined in the next section, where out-of-sample tests will reveal whether the additional variables really help predict employment growth. Equations V (A) and (B) highlight the difficulties encountered with too many possible indicators and not enough data; at some stage judgment must be used. By reporting two of these models, one basis for such judgments is revealed.

Equations V (A) and (B) contain other important implications. The expectational variable remains in both models. Forecasts of national employment growth provide information beyond the information contained in the "actual" indicator variables, although the forecasts do not replace the more traditional indicators. These "judgment" or forecasting models contain useful information on future employment growth. Furthermore, a financial variable, DDEFAULT, survives in both full information equations. Again, however, the timeliness of the financial data is not important for the prediction of regional employment, as the financial variables' quarterly lags, not their monthly updates, are significant.

The in-sample performance of the full information sets is far superior to their competitors. The standard error in V (A) and (B) is one-half that of their closest rival, the national equation, and about one-fourth that of the autoregressive equation. Based solely on this information, equation V (A) or (B) should be used to predict future employment growth in New England. The standard error, however, only reveals how well the equation has done in the sample period, not how well it will forecast. The best in-sample equation is not necessarily the best predictor out of sample. One reason for this result is possible over-fitting of the data. Because so many variables were examined, the possibility is high of finding a series that moved with future employment growth only by chance over that sample period, where no stable relationship exists. Over a different sample, or outside of that sample, a series may have absolutely no relationship to the dependent variable. One way to test for this over-fitting is to see how the equations perform out of sample. Thus, the performance of each equation in out-of-sample forecasting is examined in the next section.

## *V. Post-Sample Performance*

The previous section identified models based on four different information sets as well as two "global" models based on all information sets combined. Because all the models included lagged values of employment in New England (EPNE), all models will by construction fit the sample period at least as well as model I, the autogressive model. Similarly, the global models, V (A) and V (B), must necessarily fit the sample data at least as well as the single information set models. The information about how well the models fit the sample data describes how the models were created and how their coefficients were estimated, but does not provide much assurance about how well the models would perform in "real time" outside the fit period.

To get some idea of their predictive properties, the models, which had been fit to the 1976:I–1988:IV period, were used to estimate how they would have performed over the period from 1987:I to 1991:I. The two-year overlap represents a compromise between the desire for more degrees of freedom in the fit period and the desire to observe a longer, "post-sample" performance period.[8] Thus, all models were reestimated each quarter, using only information available prior to the forecasts, to simulate what their forecasts would have been if they had been used to forecast the past four years.

Table 6 provides various summary error statistics for each of the models described in Table 5. Column 1 shows the root mean squared error (RMSE) of each model; Column 2 gives the ratio of each model's RMSE to that of equation I, the autogressive model used as a standard of comparison. Column 3 provides the ratio of the post-sample RMSE to the in-sample SER, to gauge the relationship between forecast accuracy and fit. Columns 4 and 5 present information for the mean absolute errors (MAE), which do not penalize large errors disproportionately. Column 6 gives the mean error, predicted less actual employment growth, to measure the bias in the models' forecasts.

Not surprisingly, all of the models tend to overestimate employment growth in the last four years. As seen in column 6, the overestimation is by far the worst for models III and IV, which contain no regional indicators. The overestimation is fairly small for the global models, well below that of the autogressive standard of comparison.

The purely regional model II shows relatively little tendency to overestimate but also was not

Table 6
*Post-Sample Performance of the Multivariate Models, 1987:I to 1991:I*

| Equation | RMSE (1) | $\frac{RMSE_i}{RMSE(I)}$ (2) | $\frac{RMSE}{SER}$ (3) | MAE (4) | $\frac{MAE_i}{MAE(I)}$ (5) | MEAN (6) |
|---|---|---|---|---|---|---|
| I | 1.94 | 1.00 | .90 | 1.74 | 1.00 | 1.08 |
| | (2.13) | (1.00) | (.99) | (1.60) | (1.00) | (1.01) |
| II | 1.80 | .93 | 1.23 | 1.48 | .85 | .33 |
| | (2.18) | (1.02) | (1.57) | (1.68) | (1.05) | (.42) |
| III | 1.86 | .96 | 1.28 | 1.50 | .86 | 1.0 |
| | (1.92) | (.90) | (1.68) | (1.51) | (.94) | (1.23) |
| IV | 2.62 | 1.35 | 1.55 | 2.12 | 1.22 | 1.75 |
| | (2.62) | (1.23) | (1.59) | (1.94) | (1.20) | (1.76) |
| V (A) | 2.42 | 1.25 | 3.38 | 1.84 | 1.06 | .96 |
| | (1.55) | (.73) | (2.82) | (1.17) | (.73) | (.80) |
| (B) | 1.59 | .82 | 2.82 | 1.30 | .75 | .19 |
| | (1.43) | (.67) | (2.97) | (1.07) | (.67) | (.25) |

Numbers in parentheses are the summary error statistics compared to the pre-benchmark revisions of 1989–90.
RMSE is the root mean squared error and MAE is the mean absolute error. Columns (2) and (5) compare the forecast error of the given equation relative to equation I.

particularly accurate. Indeed, over this test period, neither the regional information set alone nor the national information set alone could significantly improve upon the simple, autoregressive model's forecasts. The model containing the national employment forecast alone was distinctly inferior to the autoregressive standard of comparison. This suggests that using *only* regional information or *only* national information may not improve upon a fairly simple autogressive model forecast.

The global models are more difficult to evaluate. Taken at face value, model V (A) was somewhat inferior to the autoregressive model and model V (B) somewhat superior. Although the superiority could have been overstated by the partial overlap of the fit and test periods, the performance out of sample of the global (B) model relative to the autoregressive in the 1989:I–1991:I period is identical to that in Table 6. Model (B) does well out of sample; unfortunately, model (A) completely falls apart, reducing the faith one can put in these models.

On the other hand, both of the global models clearly outperformed the autoregressive model in predicting New England employment growth, as measured prior to the March 1991 rebenchmarking of the 1989 and 1990 data (Cronkhite 1989). It is important to recall that the 1990 data are subject to further revision in 1992. How that revision affects these results remains to be seen. In addition, some forecast users care less about the ultimate revised estimate than they do about the earlier estimates. These forecast users could be particularly impressed by the performance of "global" models. The lesson to them seems clear—neither a simple autoregressive model nor a combination of that model with a single information set (regional or national indicators) seems sufficient to generate the best forecast. Apparently, all types of information must be combined to make the best forecast.

## *VI. New England Employment in Perspective*

New England's employment experience measured relative to the nation's is depicted in Figure 1. The past 40 years can be divided into three different periods: (1) a period of slow, but steady decline; (2) a period of gains, or at least stability, with respect to the rest of the nation; and (3) the recent sharp decline.

From 1950 to 1975, New England's employment slowly but steadily declined from 7.4 percent of U.S. employment to 6.0 percent. From 1971 through 1989, New England's employment fluctuated between 6.0

and 6.3 percent of national employment. From one perspective, this period could be viewed as one in which New England employment simply reflected the nation's. Yet, behind this apparent stability, the New England economy had clearly gone out of sync with the rest of the country. The region's unemployment rate fell from almost 30 percent *above* the national average in 1973 (6.1 percent versus 4.8 percent) to nearly 50 percent *below* the national average in 1987 (3.3 percent versus 6.2 percent). Thus, the similarity between the region's and the nation's employment growth was based on a trend that obviously could not be sustained and almost certainly would eventually be reversed. Although it was difficult to predict exactly when the trend would end, New England clearly could not perpetually gain relative to the rest of the nation and was extremely unlikely to sustain an unemployment rate of 3 percent, only one-half the national average.

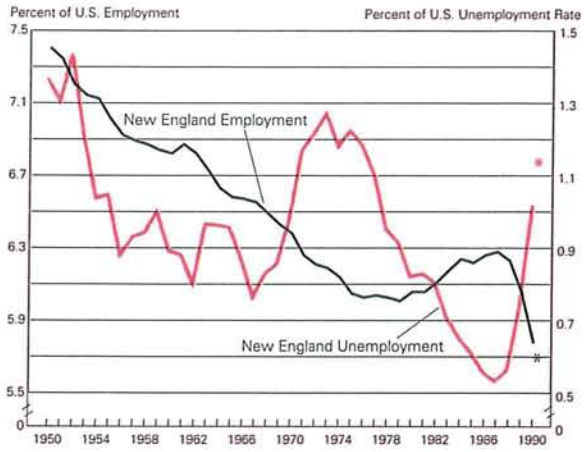
After several years with an unemployment rate below 4 percent, by 1988 labor scarcity and costs in New England had risen at the same time that national employment was accelerating. By 1989, when national employment growth slowed, New England's employment growth had turned negative. Still, it was possible to regard this period as simply a restoration of a more normal relationship between the regional and national unemployment rates, as the region's unemployment rate remained below the national average until mid-1990.

By early 1991, it became clear that the new trend of New England's employment falling behind that of the nation would not end once a more "normal" (long-run equilibrium) unemployment relationship was restored. Just as the extended period of outpacing the rest of the nation fed on itself and overshot the region's productive capacity, the period of reversal was feeding on itself and overshooting any conception of a "normal" role for the region.

Figure 1

*New England Employment and Unemployment Rate*

(as a percentage of the United States)




* = value in 1991:I.

From this perspective, it is easy to see why 1971–87 indicators of New England employment had difficulty anticipating what would happen in 1988–90. New England's employment growth, which had simply mimicked the nation's for more than a decade, suddenly appeared to have come "unhinged" from the nation's.

As shown on Table 7, New England employment growth had been at least as highly correlated with the past growth of national employment as with its own past values. This relative correlation pattern held for the past 40 years as well as in each decade. In contrast, over the past five years, 1986–90, this structure has broken down. (See row 6 in table 7.) Recent employment in New England is virtually uncorrelated with national employment growth but closely related to its own recent behavior.

This historical review suggests a broad outline of the prospects for employment in New England. In the very short term, the employment losses that have already occurred are feeding on themselves, estab-

Table 7

*New England Employment Growth*

Correlation Coefficients

| | (t-1) | | (t-2) | |
|---|---|---|---|---|
| Sample Period | National | Regional | National | Regional |
| 1950:I–90:IV | .54 | .43 | .26 | .16 |
| 1950:I–59:IV | .56 | .29 | .23 | .12 |
| 1960:I–69:IV | .46 | .32 | .23 | −.14 |
| 1970:I–79:IV | .61 | .57 | .39 | .20 |
| 1980:I–89:IV | .49 | .50 | .19 | .16 |
| 1986:I–90:IV | .29 | .89 | .07 | .79 |

lishing a downward momentum that is difficult to reverse quickly. Even if a national recovery starts in mid 1991, as is widely expected, employment growth in New England seems likely to continue to decline.

The gap between New England and the nation cannot continue to grow indefinitely, however. When the nation returns to high employment levels or perhaps even labor scarcity, due to slower increases in population and female participation, the availability of labor in New England will both attract new jobs and slow the growth of the New England labor force. New England will not remain permanently out of step with the rest of the nation.

The exact timing of these changes is, of course, highly uncertain. All of the models developed here indicate the decline is not yet over—employment will fall again in the second quarter. Yet, under the assumption that the recession ends soon, these models do suggest that employment will decline less than 1 percent from mid 1991 to mid 1992, a rate far more moderate than the 3 percent rate of decline in the last two years. Assuming a sustained national expansion, New England employment can be expected to start to grow again before mid 1992.

## *VII. Summary*

This article has investigated various precursors of economic activity in New England. It opened by arguing that employment is the best measure of the region's economy. Timeliness of data was the primary practical consideration, but employment is also intrinsically important as it is closely tied to the region's well-being.

It next examined the definition of a geographic region, noting that it corresponds to neither a political nor a traditional economic unit of analysis. The analogy with a country in international economics is flawed because all resources are interregionally mobile in the long run. The concept of a region is based on a temporary immobility of labor. Because of this immobility and the absence of perfect price flexibility, a region is subject to both region-specific and national cyclical forces. A region's economy floats on the national sea while being buffeted by local tides and winds.

The article then examined numerous individual data series to assess their value as indicators of future employment growth in New England. Over a fairly short, recent period, the best monthly indicators seem to be the measures of the value of residential (or total) construction contracts as well as labor market data such as initial claims and help wanted advertising. Over a somewhat longer time period, several measures of national employment conditions—payroll employment, unemployment, help wanted advertising, average weekly hours, and initial claims—seemed as valuable monthly indicators as the strictly regional series. Perhaps surprisingly, few of the financial market indicators that have become so popular as national indicators fared well for regional employment.

The success of the national labor market indicators stems partly from their timeliness—they are the first nonfinancial indicators to become available. This inference is supported by examining quarterly indicators of New England employment, as timeliness is less crucial for smoothed, lower-frequency data. The best quarterly indicators were primarily those derived from regional labor market data (help wanted advertising, lagged employment, the New England unemployment rate relative to the national rate, the Massachusetts unemployment rate, and initial claims) and regional construction data (on construction, home sales, and building permits). The only top indicators from the national data set were help wanted advertising and forecasts of next quarter's national employment growth.

The article next considered how these indicators could best be combined in a multivariate index or model. The procedure followed was to separate the data series into several distinct information sets: regional, national, expectational, and "global" (that is, all information sets combined). An autoregressive model was developed as a standard of comparison to judge the contribution of the various information sets.

Without a rigorous theoretical or structural framework, model construction is subject to the problem of "over-fitting" or data mining. With this problem in mind, the models were fit to data through 1988 to reserve the more recent experience for post-sample evaluation of the models.

Post-sample evaluation suggested that none of the individual information sets—regional, national, or expectational—could add to the ability of the autoregressive model to predict the recent decline of employment in New England. When all information sets were combined, the results were mixed; the global models were better than the autogressive model at predicting the employment data prior to the rebenchmarking, but one model was slightly more accurate and another less accurate in predicting the latest available data.

Given the extreme conditions in the post-sample test period, these results offer some encouragement that a multivariate model based on all information sets can help to predict employment in New England. At the same time, a number of considerations—the shortness of the test period, the instabilities of the models' coefficients, the deterioration of the models relative to their in-sample fits, and the fact that only one of the two models could add much to the simple autoregressive model—all argue for caution in relying on these precise specifications.

A broader message does seem clear, however. Predicting employment in New England must rely on several types of information: the recent history of New England employment, regional indicators drawn from the construction and labor markets, national economic indicators, and forward-looking "expectational" variables. Each type of information provides a different insight into the myriad of forces affecting the New England economy.

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[1] This assumes, for ease of exposition, that workers' labor supply is completely inelastic.

[2] The assumption here is that industry shocks nationally net out to zero so that no national effects take place, only effects due to nondiversification.

[3] If capital is perfectly, instantaneously, mobile, even regionally fixed labor will always be fully employed. Furthermore, the more immobile these two factors of production, the more important are nontraded goods in the region.

[4] Note that the effect of the shocks discussed in this section may be amplified by the regional multipliers that result from the reaction of the nontraded goods sector. These regional multipliers are merely a reaction to these other shocks and derive from the assumption of factor immobility in the short run.

[5] See McNees (1989) for a more complete discussion of the indicator approach and its application to inflation forecasting.

[6] Specifically, Akaike (1973) suggests choosing the optimal lag length by minimizing

$$-2\ln(\text{maximum likelihood}) + 2\,(\text{number of lags}),$$

which penalizes the selection of longer lag lengths. In the autoregressive equation in Table 5, the optimal lag length selected is 8 quarters. The value of the criterion at 3 lags was almost identical, which explains why the bivariate work looks at 3 lags, for parsimony.

[7] Preliminary multivariate tests using regional consumer expectations show this variable has promise as a leading indicator of New England employment growth. Because this variable is only available over a short sample, multivariate analysis can only be preliminary. So far, however, it performs much less strongly than the bivariate analysis suggests.

[8] The basic rankings in Table 6 remain the same when the post-sample period is constrained to the 9 quarters not used in the model building, 1989:I–1991:I. This overlap is not affecting the results.

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Appendix Table A1

## *Employment Market Indicators*

| Regional | National | Variable Definition[a] |
|---|---|---|
| EPNE | EP | Payroll employment, nonagricultural establishments; percent change, annual rate.[b] |
| HWNE | HW | Index of help-wanted advertising in newspapers. |
| ICNE | IC | Average weekly initial claims for state unemployment insurance.[c] |
| URMA | UR | Civilian unemployment rate. Regional variable is for Massachusetts, both are first differences. |
| EHMA | EH | Civilian employment, household survey. |
| LFMA | LF | Civilian labor force, total. |
| AWHNE | AWH | Average weekly hours of production workers, manufacturing.[c] |
| AHENE | AHE | Average hourly earnings of production workers, manufacturing. |
| RURMA | | Ratio of the civilian unemployment rate for Massachusetts to that of the United States, level. |
| | SLACK | Persons at work part-time for economic reasons, nonagricultural industries. |
| | MTRD | Trade component of national payroll employment for the month preceding the prediction. |
| Construction Market Indicators | | |
| BPNE | BP | Index of housing authorized by local building permits, private.[c] |
| BPSNE | | Housing permits authorized, single units. |
| HSNE | | Total existing home sales, single-family, condo and co-op, thousands of units. |
| CTNE | | Value of total construction contracts index, 1980 = 100. |
| CRNE | | Value of residential construction contracts index, 1980 = 100. |
| CNNE | | Value of nonresidential construction contracts index, 1980 = 100. |
| Miscellaneous Indicators | | |
| | RGNP | Gross national product, 1982 dollars. |
| | PCE | Real personal consumption expenditures, total. |
| RSNE | | Total retail sales index, 1980 = 100. |
| RSNNE | | Retail sales index, nondurable goods, 1980 = 100. |
| CPIB | | Consumer price index for Boston, 1982–1984 = 100. |
| PREB | | Precipitation. Deviation from monthly mean of Boston, first difference. |
| TEMPB | | Temperature. Deviation from monthly mean of Boston, first difference. |
| ECNE | | Commercial electricity sales, millions of kilowatt-hours. |
| EINE | | Industrial electricity sales, millions of kilowatt-hours. |
| ERNE | | Residential electricity sales, millions of kilowatt-hours. |
| NBINE | | New business incorporations. |
| YPNE | | Personal income, 1982 dollars. |
| National Nonfinancial Indicators | | |
| | ILI | Composite index of leading indicators (with trend adjustment). |
| | COPE | Contracts and orders for plant and equipment.[c] |
| | NOC | New orders (net) for consumer goods and materials, 1982 dollars.[c] |
| | VP | Vendor performance, companies receiving slower deliveries.[c] |
| | SM | Change in sensitive materials prices, smoothed.[c] |
| | IIP | Index of total industrial production.[b] |
| | YD | Disposable personal income, 1982 dollars. |
| | PILT | Personal income less transfer payments, 1982 dollars.[b] |
| | UOD | Change in manufacturers' unfilled orders, durables.[c] |
| | BV | Change in book value of manufacturing and trade inventories. |
| | MTS | Manufacturing and trade sales, 1982 dollars.[b] |
| Financial Variables | | |
| | RFF | Effective rate on federal funds, level. |
| | M2 | Money supply, M2 in 1982 dollars.[c] |
| | SP | Standard & Poor's Composite Stock Price Index, Common Stocks.[c] |
| | SPRED6 | Yield on six-month commercial paper minus the yield on six-month Treasury securities, level. |
| | DSPRED6 | First difference of SPRED6. |
| | TILT101 | Yield on Treasury securities at a constant maturity of one year minus the yield on Treasury securities at a constant maturity of 10 years, level. |
| | DTILT101 | First difference of TILT101. |
| | SLOPE10FF | Effective rate on federal funds minus the yield on Treasury securities at a constant maturity of 10 years, level. |
| | DSLOPE10FF | First difference of SLOPE10FF. |
| | DEFAULT | Yield on Moody's AAA corporate bonds minus the yield on Moody's Baa corporate bonds, level. |
| | DDEFAULT | First difference of DEFAULT. |
| Expectational Variables | | |
| | FRGNP | Forecast of real GNP. |
| | FEP | Forecast of payroll employment. |
| | FEH | Forecast of household employment. |
| ICSNE | ICS | Index of consumer sentiment, University of Michigan survey, level.[c] Regional variable is the index of consumer confidence, Conference Board Survey, level.[c] |
| ICENE | ICE | Index of consumer expectations, University of Michigan Survey, level.[c] Regional variable is from Conference Board Survey, level.[c] |

[a]Variables are annualized percent changes, unless otherwise indicated.

[b]Component of index of coincident indicators.

[c]Component of index of leading indicators.

# The Role of Services in New England's Rise and Fall: Engine of Growth or Along for the Ride?

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The downturn in the New England economy has surprised almost everyone by its severity and breadth. Even those who foresaw that the rapid expansion of the mid 1980s could not be sustained warned of slower growth rather than a sharp contraction. Several factors account for this failure to predict the region's decline. Most important, the region's manufacturing sector was expected to perform much more strongly. Between 1984 and 1990, New England lost over 240,000 jobs—more than 15 percent of 1984 manufacturing employment. Almost all of this decline reflected a loss in the region's share of U.S. manufacturing employment. This was not supposed to happen; New England's share of U.S. manufacturing had grown during the late 1970s and early 1980s and it was widely believed that the increased importance of high technology industries in New England's manufacturing mix had made the region more, not less, competitive.[1] As a consequence, forecasters persisted for some years in expecting the decline in the region's manufacturing to end.

Second, the weakness in manufacturing was "masked by the spectacular surge in the construction sector" (Moscovitch 1990, p. 62). Increases in construction and related employment more than offset the decline in manufacturing during the mid 1980s. More generally, rapid growth in almost all the nonmanufacturing industries caused the region to achieve unprecedented levels of prosperity. The regional unemployment rate fell to 3.1 percent in 1988. In the face of such a record, it would have been a brave forecaster indeed who suggested that the region was about to suffer a serious downturn.

This is not to say that the loss of manufacturing jobs and the increased dependence upon construction and other nonmanufacturing industries did not make some observers uneasy. Manufacturing has long been seen as providing the impetus to a region's economic growth, with most nonmanufacturing activity dependent upon what is happening in the local manufacturing sector as well as on demographic trends.

However, the unease did not turn to alarm, first, because the decline in New England's manufacturing sector was expected to end and, second, because the events of the mid 1980s suggested an alternative model of regional economic development.

Both New England's own economic success in the face of declining manufacturing employment and the strong economic performance of the neighboring New York City area seemed to argue that certain financial and other services could play the role of regional economic drivers in the manner traditionally attributed to manufacturing. In this model, dubbed the "Manhattan effect" by one analyst, growth is driven by the activities of firms such as insurance companies, investment banks, mutual funds, consulting firms, and computer software companies (Norton 1987). In contrast to traditional financial and other services activities, these companies frequently serve national and international markets. Far from being dependent upon the local economy, the expansion of these firms serves as a stimulus. With growth propelled by these nationally oriented services and financial services companies, New England's continued prosperity did not appear so puzzling. The construction boom, while extraordinary, seemed justified by the rapid expansion in such industries.

*It would have been a brave forecaster indeed who suggested in 1988 that the region was about to suffer a serious downturn.*

Do New England's current difficulties invalidate this services-driven model of regional development? Certainly, financial and other services have not been able to sustain the regional economy. On the contrary, with the region's banking industry facing severe problems and growth in services grinding to a halt, it would appear that most financial and other services remain very dependent upon the local economy. The prevailing view today is that the rise in real estate values and the surge in construction stimulated the growth in financial and other services, rather than the reverse.

However, another possibility is that the services-driven model remains valid, but that the more nationally oriented services ran into problems in the late 1980s and could no longer function as engines of growth. In support of such a view is the sharp curtailment in national financial services employment, and particularly employment in the New York City area, following the stock market crash of 1987.

This article attempts to assess the role played by services and financial services in New England's fluctuating economic fortunes. How large is the nationally oriented component? And is a more service-oriented economy a more stable economy, or do services become less stable as they assume greater importance? If financial and other services can serve as regional economic drivers in a significant way, these industries are a potential source of regional economic recovery and economic development initiatives should take these industries into account.

Part I reviews employment patterns in the 1980s, focusing on 1984 to 1987. In that period, overall growth remained strong, even as manufacturing declined. Part II proposes two explanations for the strong growth in this period—one in which construction played the role of economic driver, one in which growth was generated by nationally and internationally oriented financial and other services industries. Parts III and IV look at the market orientation of New England's services and its finance, insurance, and real estate (FIRE) industries. Part V considers whether states with larger shares of employment in services and FIRE are more stable. Conclusions follow.

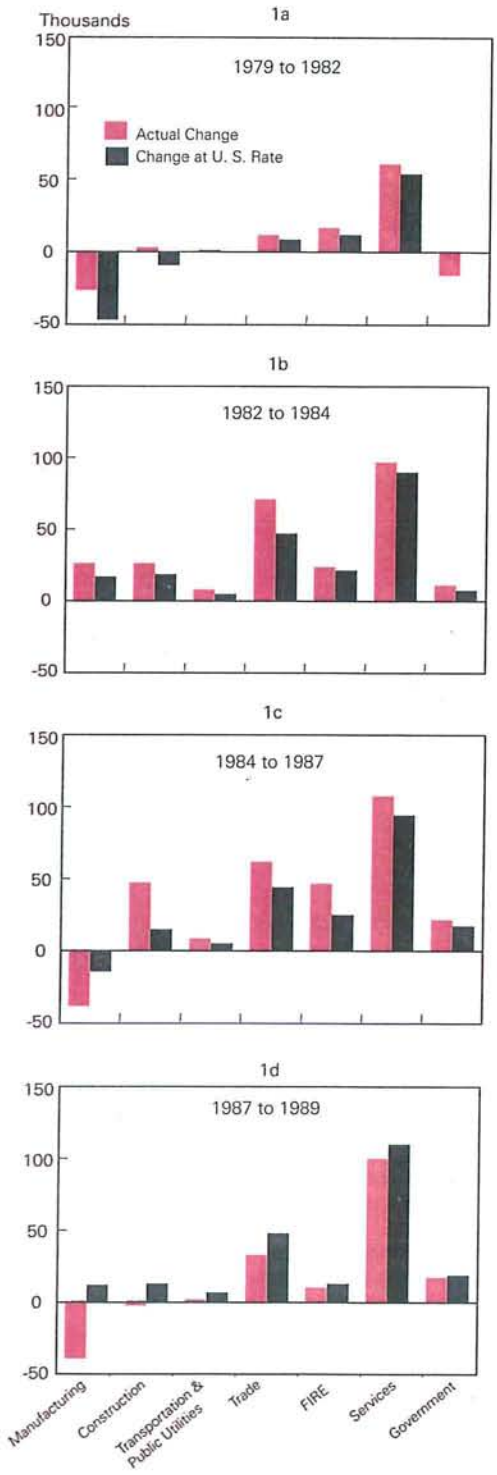
## *I. Employment Patterns of the 1980s*

For New England, the decade of the 1980s consisted of four distinct periods. These periods, 1979–82, 1982–84, 1984–87 and 1987–89, differed in terms of the region's overall rate of growth, the relationship between the region and the nation, and the performance of the region's key industries.

*1979–82.* This was a period of recession. Total employment growth was sluggish, but stronger in New England than the nation. Figure 1a compares the employment changes in the region's major industries with the changes that would have occurred if New England's experience had been the same as the nation's. As can be seen, all major industries except government fared better in the region than the nation. However, the manufacturing and construction sectors accounted for most of the difference between New England and the nation. (Manufacturing and mining have been combined in these figures because

Figure 1

*Annual Employment Changes in New England*




Source: See Table 1.

both industries are commonly seen as regional economic drivers; mining is insignificant in New England.)

*1982–84.* During the early stages of the recovery, growth in New England continued to surpass that in the nation, with all major industries growing more strongly in the region (Figure 1b).

*1984–87.* As the expansion progressed, growth in New England accelerated and became more unbalanced (Figure 1c). Employment in the manufacturing sector fell sharply, more sharply than in the recession years. In contrast, construction employment in the region soared. Rapid growth in finance, insurance, and real estate (FIRE) also contributed importantly to the region's overall vigor, as did continued strength in trade.

*1987–89.* The final years of the decade saw a pronounced slowdown in employment growth in New England. The manufacturing sector continued to shrink. Construction turned down and growth slowed in the other major industries (Figure 1d).

From this brief review, 1984–87 stands out as the critical period. This was the time when warnings of problems ahead would have been helpful. By 1988 the regional decline was already in the works. It also appears to be the period when the region's current problems developed. Before 1984, the various components of the New England economy were more or less in sync. Manufacturing, the traditional engine of regional economic growth, had performed better in New England than the nation in the recession and the early years of the recovery. Given this strength in manufacturing, conventional wisdom would lead one to expect a relatively strong performance from other sectors of the economy. Between 1984 and 1987, by contrast, manufacturing weakened, but growth accelerated in construction and remained strong in the rest of the economy.

## *II. Two Views of Growth, 1984–87*

The acceleration of construction employment and the strength of trade and services, at a time when manufacturing employment was declining, fly in the face of the conventional model of regional growth. In 1990, Moscovitch argued that construction and related industries took over as the economic engine for the region; the jobs and income generated by growth in this sector had a multiplier effect on the rest of the economy akin to that associated with manufacturing. A variant on this view has recently been suggested by

Case (1991): the wealth created by the escalation in housing values was a powerful spur to consumption, as well as construction, and stimulated the growth in trade and services. For a time, this growth in the rest of the economy fed back and reinforced the demand for real estate and the expansion of construction.

Eventually, however, the rapid growth in construction produced market saturation. And market saturation led in turn to declining real estate values and a sharp falloff in construction. This removed the underpinnings of the region's prosperity, setting in motion a downward spiral. Falling construction employment and declining real estate values negatively affected other sectors of the economy, exacerbating the weakness in the real estate market and further depressing construction.

At the time, however, New England's prosperity seemed solid enough. Concern was expressed about the weakness in manufacturing, especially high tech, but this weakness was expected to be short-lived.[2] Additionally, the strong growth of services and FIRE was seen as generated by companies selling in national and international markets rather than to the more traditional, locally oriented services firms. Anecdotal evidence to support such a view was abundant. Mutual funds such as Fidelity and Scudder, insurance companies such as John Hancock and Aetna, consulting firms such as the Boston Consulting Group and Bain, software companies such as Lotus and Cullinet were doing well and were clearly national rather than local players.

The growth of such companies, far from being driven by construction, contributed to the demand for office space and indirectly, residential and retail space. Just as manufacturing had fostered the expansion of other sectors, so too the growth of these financial and other services was thought to be creating opportunities for suppliers and, through the generation of jobs and income, providing a general stimulus to the economy.

In the "services as economic driver" view of the mid 1980s, the boom in construction and real estate would still have come to an end. With construction employment growing more than 10 percent per year, the capacity of the industry would eventually outstrip the ability of the economy to absorb new housing and new commercial and industrial space. However, the effect of a leveling off or even a falloff in construction would not be very serious. While growth in trade and those portions of services and FIRE that were truly local would be adversely affected by a decline in construction, the nationally and internationally oriented services and FIRE companies would continue to expand. Overall growth would be slower without the added stimulus of construction; but with slow growth in the working-age population, such a slowdown was compatible with continued low unemployment rates and high levels of prosperity.

Of course, were nationally oriented FIRE and services to encounter difficulties, the situation would be very different. But this seemed a remote possibility, as services and FIRE were thought to grow through bad times and good. Indeed, it was commonly observed that a more services-oriented economy, such as New England was becoming, was a more stable economy.

*In the "services as economic driver" view of the mid 1980s, the boom in construction and real estate would still have come to an end.*

Was the idea that nationally and internationally oriented services and financial services could sustain the regional economy misguided? Was the region's prosperity in the mid 1980s really built on a construction and real estate boom that was destined to end? Or did growth in nationally oriented segments of FIRE and services drive the region's strong performance in the mid 1980s and was the region's subsequent decline attributable to difficulties in these industries? The two alternatives are not mutually exclusive. Moscovitch, while emphasizing the prominence of construction in the region's rise and fall, considers insurance and private education to be part of New England's economic base and, like manufacturing, capable of stimulating growth.

The two views have implications for the region's future and for economic development strategies. The degree to which New England is "overbuilt" depends, in part, upon this issue. If much of the demand for housing and commercial space was ultimately generated by the construction and real estate industries themselves, the overhang is likely to be considerably larger than if the underlying source of demand was the growth in nationally and internationally oriented financial and other services indus-

tries. While the latter industries may be experiencing problems today, their problems are not as severe as those in construction and real estate.

Moreover, if nationally and internationally oriented financial and other services industries did contribute importantly to New England's prosperity from 1984 to 1987, they may do so again. Recent reports by Howell (1990) and Porter (1991) paint rosy pictures of the future of Boston and Massachusetts, respectively, based upon the areas' suitability as locations for knowledge-based services. If, however, New England's financial and other services are primarily local in their orientation and their growth was a response to developments in other sectors, the region's prosperity remains heavily dependent upon its manufacturing sector.[3] Policymakers looking for ways to foster economic development would want to pay considerable attention to services industries in the first instance, but focus more on manufacturing in the second.

One implication of both views is that economists do not know enough about the nonmanufacturing segments of the economy and their links to one another. For example, while the view that some elements of services and FIRE compete in national rather than local markets gained adherents in the 1980s, little thought was given to how this national orientation might affect their growth. Services continued to be seen as a reliable, ever-expanding generator of jobs and it was commonly asserted that a more services-dominated economy was a more stable economy. Historically, employment in services and financial services industries has been more stable than manufacturing employment, but the services industry of historical experience may not be the services industry of today.

## *III. A Closer Look at the Composition of Growth in Services and FIRE*

A first step to understanding the role of services and FIRE in New England's fluctuating economic fortunes is to look more closely at where the growth occurred. Was it in real estate or insurance or health care? One's model of the regional growth process may differ depending upon which industries grew most rapidly in the years 1984 to 1987 and which led the subsequent slowdown.

Table 1 shows the composition of the growth in New England's services and FIRE employment during the boom years from 1984 to 1987. Also shown is the growth that would have occurred if employment in the individual services and FIRE industries had increased at the same rate in New England as the nation. (Appendix Tables A1 and A2 present year-by-

Table 1
*Changes in New England Employment, Compared to Changes if New England Grew at the U.S. Rate, 1984–87*
Thousands

| Industry | Annual Change | Change if N.E. Grew at U.S. Rate | Difference |
|---|---|---|---|
| Services | 108 | 98 | 9 |
| Hotels and Other Lodging Places | 5 | 3 | 1 |
| Personal Services | 11 | 9 | 2 |
| Private Households | −1 | −1 | ... |
| Business Services | 37 | 34 | 3 |
| Auto Repair, Services, Garages | 4 | 3 | 1 |
| Miscellaneous Repair Services | 1 | ... | 1 |
| Amusement and Recreation Services | 4 | 3 | 1 |
| Motion Pictures | ... | ... | ... |
| Health Services | 16 | 23 | −7 |
| Legal Services | 5 | 4 | 1 |
| Education Services | 5 | 5 | ... |
| Social Services | 7 | 7 | ... |
| Museums, Botanical, Zoological Gardens | ... | ... | ... |
| Membership Organizations | 3 | 2 | 1 |
| Miscellaneous Services | 10 | 5 | 5 |
| Finance, Insurance, Real Estate | 47 | 25 | 22 |
| Banking and Other Credit Agencies | 10 | 5 | 5 |
| Security & Commodity Brokers and Services | 3 | 2 | 1 |
| Insurance Carriers | 6 | 5 | 1 |
| Insurance Agents, Brokers and Services | 3 | 2 | 1 |
| Real Estate | 21 | 9 | 13 |
| Combined Offices | ... | ... | ... |
| Holding and Other Investment Companies | 3 | 1 | 2 |

Note: Components may not sum to totals because of rounding.
... = less than 0.5.
Source: U.S. Bureau of Economic Analysis Regional Economic Information System, employment data and author's calculations.

year patterns of employment in New England and the nation for services and FIRE, respectively.) If nationally and internationally oriented services and FIRE companies served as regional engines of growth during the mid 1980s before sputtering late in the decade, one would expect the composition of their growth to differ from both the national pattern and the pattern that would arise if construction were the driver. Specifically, one would expect nationally and internationally oriented activities to figure more prominently in the mix of new jobs. By contrast, if construction propelled economic growth, one would expect more locally oriented activities, particularly those with a direct tie to construction or real estate, to exhibit particular strength.

### *Services*

As can be seen from Table 1, roughly one-third of the services jobs created in New England between 1984 and 1987 were in business services. However, New England's experience in this regard was not very different from that elsewhere. Although business services grew more strongly in New England than the nation during this period, the difference was small (9.1 percent per year compared to 8.4 percent).

*Difficulties in services did not precipitate the regional downturn.*

Business services is a very diverse grouping. It includes computer services and other activities commonly cited as examples of nationally and internationally oriented services industries.[4] However, it also includes a number of activities that, superficially at least, seem local in character, such as window cleaning and temporary help services.

Health services ranked next as a source of new services jobs, although it grew less rapidly in New England than in the nation. Personal services and miscellaneous services were also important generators of employment opportunities. Personal services includes laundry and other stereotypically local services. Miscellaneous services, which grew considerably faster in New England than in the country as a whole, includes accounting, engineering, and architectural services.[5] Companies in these industries could serve a national clientele, but they could also be locally oriented; and engineering and architectural services are closely linked to construction.

Thus, a closer look at the composition of the increase in services does not resolve whether nationally oriented services played a key role in maintaining the region's high growth rate or whether the growth in services was largely a response to the strength in other sectors. In particular, the large increase in business services and the rapid growth in miscellaneous services could be compatible with either scenario. Subsequent sections consider the local or national orientation of these and other services industries.

Difficulties in services did not precipitate the regional downturn, however. As can be seen from the year-by-year employment changes in Appendix Table A1, growth in services employment, including business and miscellaneous services, remained strong in New England in 1988—after construction and overall employment had started to slow—before weakening in 1989. It should also be noted that the weakness in business and miscellaneous services in 1989 was not part of a national slowdown. This pattern seems more consistent with services responding to developments in other sectors of the regional economy than with their being an independent cause of the regional downturn.

### *Finance, Insurance, and Real Estate*

Growth in finance, insurance, and real estate was much stronger in New England than the nation from 1984 to 1987. All the major segments of the industry grew more rapidly in the region, but banking and real estate accounted for most of the overall difference (Table 1). Roughly 45 percent of the jobs added in FIRE during this period were in real estate. Insurance carriers, which are generally thought to be a nationally oriented industry, accounted for less than 15 percent of the regional increases in FIRE. Thus, the growth of New England's FIRE industry during the mid 1980s clearly had a large local component with a direct tie to construction and real estate. However, the yearly changes in FIRE employment, shown in Appendix Table A2, reveal an interesting pattern. Something or some things cooled the expansion in FIRE in 1988 and that something was not unique to New England. Nationally, growth slowed sharply. Most segments of the industry were involved—banking, securities, insurance carriers. The situation worsened in 1989; slower growth in some industries became no growth.

As FIRE had been a rapidly growing segment of the New England economy, this slowdown undoubtedly contributed to the regional downturn. While the slowdown in construction, which began at the same time, may have been part of the same phenomenon, the fact that nationally FIRE ran into difficulties points to an influence from outside the region.

### *A Bad Time for Financial Services and Real Estate*

The finance, insurance, and real estate industry suffered a number of blows in the second half of the 1980s, starting with the Tax Reform Act of 1986. Among New England bankers, developers, and others, tax reform is commonly cited as an important contributor to the decline in the market value of rental properties. Tax reform, it is said, took many investors out of real estate.

While the incentive to invest in other assets was also reduced by the Tax Reform Act, certain categories of real estate were particularly affected by the curbs imposed on tax shelters. This result was foreseen by policy-makers, even welcomed. By removing tax-created biases in favor of certain investments, the overall efficiency of investment would be increased. Since real estate had previously been favored, more uniform tax treatment of different assets would necessarily affect it adversely. Moreover, at least some analysts recognized that such a shift might have painful consequences.[6]

*The problems in FIRE in New England were not only a product of regional overbuilding, but also a reflection of forces originating outside the region.*

Aaron, in the winter of 1987, observed (p. 10):

> While the tax reform will have only modest effects on the economy as a whole, it will have important impacts on particular industries and companies. For example, the cost of capital for such 'tax shelter' investments as office buildings and multifamily housing will increase. . . . And when tax incentives, which have contributed to overinvestment in favored activities, are reduced, the adjustments may be difficult and protracted. For example, the vacancy rates for offices, which exceed 20 percent in many cities and which are attributable in part to tax shelters that encouraged construction. . . will take many years to decline to economically efficient levels.

Hints of trouble ahead also emerged in the securities industry in 1986 with revelations of insider trading involving employees of Drexel, Burnham, Lambert. Drexel had largely created the junk bond market, which had generated huge profits for the securities industry. Some observers believe that Drexel's difficulties eventually contributed to the decline in the demand for junk bonds and a slowdown in merger and acquisition activity.

A more obvious turning point for the securities industry was the stock market crash of October 1987. The crash had a number of consequences that shifted the industry from go-go expansion to retrenchment. First, the crash caused losses at some important securities companies. Second, even before the crash, securities companies were becoming concerned that expenses were growing faster than revenues; the crash provided a rationale for painful cost-cutting. Third, the crash scared off some investors, so that the brokerage business slowed following the crash. Finally, by raising the specter of recession, the crash increased investor skittishness about junk bonds: would highly leveraged borrowers be able to handle their debt service obligations?

In the banking industry, problems with energy, agricultural, and real estate loans in the mid 1980s caused many bank failures in the central and southwestern portions of the country. Thrift institutions began to incur huge losses in 1987, for similar reasons. Nor did the large banks come through 1987 unscathed. Led by Citicorp, most of the largest banks established substantial reserves against their loans to less developed countries; earnings were reduced and some banks suffered sizable losses. These difficulties prompted both legislative and regulatory changes, significantly altering the industry's mode of operation.

These developments, in conjunction with the national character of the slowdown in FIRE, suggest that the problems of the industry in New England were not only a product of regional overbuilding, but also a reflection of forces originating outside the region. To some degree at least, events in FIRE may have been a cause—as well as a result—of the downturn in construction and the decline in real estate values.

In summary, the extraordinarily rapid growth of FIRE in New England during the mid 1980s was due largely to the sectors linked most closely to the

construction and real estate boom—real estate itself and banking. However, forces external to the region seem to have played a role in the sector's subsequent downturn. In the case of services, industries that may include both nationally and locally oriented elements were responsible for much of the employment increase.

## *IV. Market Orientation*

The variation in location quotients provides a rough indicator of the national or local orientation of different industries (Groshen 1987; Keil and Mack 1986). Location quotients are ratios, comparing industries' shares of employment in an area with their shares of employment nationwide:

$$\frac{x_{ij}/x_j}{X_i/X}$$

where $x_{ij}$ is employment in industry i in area j
$x_j$ is total employment in area j
$X_i$ is national employment in industry i
$X$ is total employment in the nation.[7]

Location quotients are commonly interpreted as indicating the degree to which industries sell outside the local area. A location quotient exceeding 1, meaning that an industry's share of employment in an area is greater than its share of employment nationwide, is often said to signify that a portion of the area's output is sold to the rest of the country. Conversely, a location quotient of less than 1, indicating that the industry is less important in the area than it is elsewhere, implies that the area is importing from other parts of the country.

Such reasoning has led to using the variation in location quotients to measure industries' market orientation. Large variations, with some areas having very high location quotients and other areas location quotients well below 1, indicate substantial exporting and importing by different parts of the country. These industries would be considered more national in their market orientation than industries that account for similar shares of employment in all areas and for which the location quotients are all close to 1.

This argument, that large variations in location quotients indicate more nationally oriented industries while small variations are associated with industries serving local markets, is subject to several caveats. First, if areas have different consumption patterns or industry practices, location quotients can vary for purely local industries.[8] In many cases, common sense enables one to determine whether differences in location quotients reflect local preferences or a more national market orientation.

A second difficulty is that low variation in location quotients may reflect the industry's locational requirements, or lack thereof, more than its market orientation. The location quotient approach to identifying national industries assumes that areas specialize.[9] However, much trade, among nations as well as among different parts of the country, takes place within a given industry. An industry that has fairly general input requirements may account for similar shares of employment in a number of places (so that location quotients are close to 1); but trade may still occur because the products of one firm differ from those of another.[10] The broader the industry grouping and the more diverse the elements it encompasses, the more likely it is that trade will take place within the industry and that the variation in location quotients will understate the national orientation in the industry. Last, the variation in location quotients indicates general tendencies. It does not mean that every firm in a national industry has a national customer base.[11] And in an industry that is primarily local, some firms may sell in national markets.

Table 2 shows the standard deviations of the location quotients for the major industry groupings for all states and states with populations in excess of 3 million.[12] Also shown are the industries' shares of U.S. total employment and the location quotients for the New England region as a whole, Connecticut, and Massachusetts.

The pattern is generally consistent with conventional wisdom. Resource-dependent industries exhibit the greatest variation in location quotients. For mining, in particular, the industry's location is dictated by the availability of key resources; a few states supply the rest of the country. At the other end of the spectrum is retail trade, which is generally regarded as locally oriented and which does indeed seem to account for similar fractions of employment in most states. Manufacturing, usually considered a national industry, is distributed less uniformly than services and FIRE, which traditionally have been seen as more local. The relatively high variation for government reflects the concentration of federal workers in the District of Columbia and the presence of military bases in some lightly populated states.

New England appears to be an importer of farming and mining products. The low share of

Table 2
*Standard Deviations of Location Quotients, Major Industries—1989*

| Industry | Standard Deviations | | Share of U.S. Employment (%) | Location Quotient | | |
|---|---|---|---|---|---|---|
| | All States | Large[a] States | | New England | Connecticut | Massachusetts |
| Farm | 1.14 | .67 | 2.3 | .25 | .18 | .12 |
| Agricultural Services, Forestry, Fisheries | .72 | .38 | 1.0 | .97 | .83 | .86 |
| Mining | 2.17 | 1.59 | .7 | .13 | .17 | .10 |
| Construction | .21 | .15 | 5.3 | 1.08 | 1.04 | .97 |
| Manufacturing | .37 | .29 | 14.7 | 1.12 | 1.24 | 1.04 |
| Transportation, Public Utilities | .17 | .13 | 4.7 | .80 | .84 | .82 |
| Wholesale Trade | .20 | .16 | 4.9 | 1.00 | 1.03 | 1.09 |
| Retail Trade | .10 | .06 | 16.6 | 1.00 | .96 | .99 |
| FIRE | .18 | .18 | 7.6 | 1.08 | 1.39 | 1.08 |
| Services | .15 | .12 | 27.0 | 1.10 | 1.04 | 1.21 |
| Government | .31 | .17 | 15.2 | .80 | .76 | .79 |

[a]Populations exceeding 3 million in 1988 (AL, AZ, CA, CT, FL, GA, IL, IN, KY, LA, MA, MD, MI, MN, MO, NC, NJ, NY, OH, OK, PA, SC, TN, TX, VA, WA, WI).
Source: See Table 1.

employment in transportation and public utilities is attributable to transportation and may simply reflect the region's high density. Low government employment means that New England "imports" federal government services; the region may also have a lower-than-average preference for the activities of state and local government workers.[13]

New England's relatively large share of employment in manufacturing would suggest that the region is a net exporter of manufactured products to the rest of the country, while the high fraction of employment in construction appears, with hindsight, to have been an aberration.[14] Both the low variation in location quotients and common sense would argue that construction is a local industry.

The high shares of employment in FIRE and services could indicate that New England exports to other areas but might also mean that New England has a preference for such activities. The low variation in location quotients suggests that these are not national industries. However, such broad aggregation may hide much intra-industry exchange, creating an impression of more local orientation than is actually the case. Services, in particular, is composed of many distinctive industries. Different states may specialize in different industries; but when these diverse industries are combined, the shares of employment in the aggregate are similar.

Accordingly, Table 3 breaks manufacturing, FIRE, and services into their major components. Since manufacturing industries, with a few exceptions, are thought to serve national markets, one might reasonably infer that those segments of the services and FIRE industries with standard deviations similar to those in manufacturing are also nationally rather than locally oriented (Groshen 1987).

As can be seen, the standard deviations for most industries in Table 3 are considerably larger than those for their broad groupings, indicating more specialization and presumably more exporting and importing among different parts of the country. Most manufacturing industries appear more national in their orientation than most industries in the services and FIRE categories. Only two manufacturing industries have standard deviations of location quotients as low as the majority of those in services and FIRE. Moreover, these two—stone, clay, and glass, and printing and publishing—have a clearly local element. Indeed, stone, clay, and glass is sometimes used as an example of an industry that tends to locate close to its markets because of the broad availability of resources and the high cost of transporting the product given its value. Printing includes newspapers, most of which serve a local or possibly regional market; many commercial printing jobs are custom orders for local clients.

Within FIRE, the securities and commodities industry seems to have a national orientation matching that of many manufacturing industries. The industry is concentrated in New York, but Massachusetts also

Table 3

*Standard Deviations of Location Quotients for Manufacturing; Finance, Insurance and Real Estate; Services—1989*

| Industry | Standard Deviations: All States | Standard Deviations: Large States | Share of U.S. Employment (%) | Location Quotients: New England | Location Quotients: Connecticut | Location Quotients: Massachusetts |
|---|---|---|---|---|---|---|
| Manufacturing | .37 | .29 | 14.7 | 1.12 | 1.24 | 1.04 |
| Food and Kindred Products | .66 | .34 | 1.2 | .48 | .45 | .45 |
| Textile Mill Products | 2.21 | 2.82 | .5 | .88 | .27 | .76 |
| Apparel and Other Textile Products | .91 | .94 | .8 | .54 | .37 | .72 |
| Paper and Allied Products | .89 | .70 | .5 | 1.43 | .86 | 1.19 |
| Printing and Publishing | .31 | .30 | 1.2 | 1.15 | 1.17 | 1.24 |
| Chemicals and Allied Products | 1.52 | .68 | .8 | .72 | 1.35 | .62 |
| Petroleum and Coal Products | 1.00 | 1.12 | .1 | .24 | .09 | .35 |
| Tobacco Manufacturers | 2.73 | 3.57 | ... | .09 | .34 | .01 |
| Rubber and Misc. Plastics | .62 | .59 | .6 | 1.09 | .92 | 1.05 |
| Leather and Leather Products | 2.37 | 1.09 | .1 | 2.98 | .34 | 1.95 |
| Lumber and Wood Products | 1.42 | .67 | .6 | .81 | .31 | .25 |
| Furniture and Fixtures | 1.10 | 1.06 | .4 | .54 | .44 | .47 |
| Primary Metal Products | .85 | .92 | .6 | .75 | 1.03 | .57 |
| Fabricated Metal Products | .56 | .57 | 1.1 | 1.23 | 1.88 | 1.09 |
| Machinery except Electric | .58 | .54 | 1.6 | 1.46 | 1.48 | 1.64 |
| Electric and Electronics Equipment | .54 | .39 | 1.5 | 1.59 | 1.46 | 1.71 |
| Transportation Equip. excl. M.V. | 1.04 | 1.14 | .9 | 1.84 | 4.40 | .84 |
| Motor Vehicles and Equipment | 1.46 | 1.83 | .6 | .14 | .24 | .10 |
| Stone, Clay, and Glass Products | .43 | .32 | .5 | .79 | .53 | .69 |
| Instruments and Related Products | .62 | .63 | .5 | 2.08 | 2.07 | 2.60 |
| Miscellaneous Manufacturing Industries | 2.14 | .39 | .3 | 2.44 | 1.52 | 1.62 |
| Finance, Insurance, Real Estate | .18 | .18 | 7.6 | 1.08 | 1.39 | 1.08 |
| Banking & Other Credit Agencies | .25 | .15 | 2.0 | 1.06 | 1.18 | 1.10 |
| Security & Commodity Brokers & Services | .61 | .78 | .4 | 1.06 | .96 | 1.51 |
| Insurance Carriers | .45 | .48 | 1.1 | 1.73 | 3.14 | 1.38 |
| Insurance Agents, Brokers and Services | .25 | .15 | .8 | .93 | .93 | .97 |
| Real Estate | .28 | .29 | 3.0 | .94 | 1.10 | .90 |
| Combined Offices | .67 | .41 | ... | 1.79 | 2.00 | 1.61 |
| Holding and Other Investment Offices | .59 | .32 | .4 | 1.05 | 1.12 | 1.25 |
| Services | .15 | .12 | 27.0 | 1.10 | 1.04 | 1.21 |
| Hotels and Other Lodging Places | 2.01 | .32 | 1.3 | .90 | .57 | .82 |
| Personal Services | .14 | .09 | 2.1 | .97 | .93 | .97 |
| Private Household | .37 | .37 | 1.1 | .70 | .74 | .58 |
| Business Services | .24 | .21 | 6.3 | 1.07 | 1.08 | 1.22 |
| Auto Repair, Services, and Garages | .13 | .12 | 1.0 | .91 | .77 | .92 |
| Miscellaneous Repair Services | .25 | .12 | .5 | .89 | .87 | .86 |
| Amusement and Recreation Services | .44 | .24 | 1.1 | .96 | .90 | .92 |
| Motion Picture | .45 | .55 | .2 | .65 | .63 | .74 |
| Health Services | .18 | .17 | 6.2 | 1.20 | 1.16 | 1.27 |
| Legal Services | .58 | .25 | .9 | 1.08 | 1.06 | 1.22 |
| Educational Services | .52 | .45 | 1.4 | 2.00 | 1.46 | 2.62 |
| Social Services | .28 | .28 | 1.3 | 1.30 | 1.08 | 1.47 |
| Museums, Botanical, Zoological Gardens | .89 | .69 | ... | 2.00 | 1.58 | 2.81 |
| Membership Organizations | .39 | .18 | 1.3 | 1.00 | 1.10 | .99 |
| Miscellaneous Services | .25 | .21 | 2.1 | 1.09 | 1.01 | 1.25 |

Note: ... = less than .05.
Source: See Table 1.

has a relatively large fraction of employment in this industry. Insurance carriers also fall in the manufacturing range; and the New England states, especially Connecticut, are exporters to the rest of the country. Banking, along with the agent side of the insurance business, appears to be very locally oriented. Given the apparently local orientation of banking, how should one interpret New England's relatively large share of employment in this industry? One possibility is that the region's share of employment in banking and also in holding and investment offices, which includes bank holding companies, is related to the real estate boom. New England's location quotients for these industries were considerably lower (closer to 1) earlier in the decade.

Of the services industries, hotels and lodging places appears very oriented to a national market because tourism is so important to some of the smaller, lightly populated states. Museums, legal services, and educational services are also distributed unevenly. Museums is a tiny industry, even in Massachusetts where its share of employment is three times the national average. The national orientation of legal services is due largely to the concentration of lawyers in the District of Columbia. New England's above-average share of employment in legal services could indicate the presence of firms serving a national clientele or simply a local taste for litigation.

Education services have often been cited as an important export industry for New England and the figures in Table 3 tend to confirm this. The variation in location quotients is fairly high and New England's share of employment is far above that nationally.[15] Most of the remaining services appear to be distributed fairly broadly, suggesting a more local market orientation. New England's relatively high shares of employment in health and social services could simply reflect higher local use of such services. Business services warrants a closer look, however. It is a large, diverse industry. Its distribution appears very uniform, but it includes a number of firms commonly cited as examples of nationally oriented services companies.

The components of both business and miscellaneous services are presented in Table 4.[16] Computer and data processing services, research and testing, and management and public relations appear to be the most nationally oriented; and New England, especially Massachusetts, has relatively large fractions of employment in all three areas. In both New England and the nation, however, roughly one-half of business and miscellaneous services is composed of building services and other activities that appear very local in nature.

In summary, the market orientation of services and FIRE, as indicated by the variation in location

Table 4
*Standard Deviations of Location Quotients, Business and Miscellaneous Services, 1989*

| | Standard Deviations | | | Location Quotient | | |
|---|---|---|---|---|---|---|
| Industry | All States | Large States | Share of U.S. Employment (%) | New England | Connecticut | Massachusetts |
| Advertising | .38 | .45 | .2 | .77 | .88 | .81 |
| Credit Reporting and Collection | .33 | .27 | .1 | .78 | .61 | .96 |
| Mailing, Reproduction, Stenographic | .43 | .40 | .2 | 1.12 | 1.67 | 1.10 |
| Services to Buildings | .35 | .21 | .7 | 1.04 | 1.25 | 1.15 |
| Misc. Equipment Rental and Leasing | .36 | .42 | .2 | .65 | .54 | .65 |
| Personnel Supply Services | .31 | .18 | 1.4 | .98 | 1.07 | 1.06 |
| Computer and Data Processing Services | .56 | .58 | .7 | 1.25 | .90 | 1.84 |
| Miscellaneous Business Services | .27 | .20 | 1.1 | .88 | .86 | .92 |
| Engineering and Architectural Services | .33 | .31 | .7 | 1.26 | 1.05 | 1.45 |
| Accounting, Auditing, and Bookkeeping | .25 | .22 | .5 | .97 | .99 | 1.07 |
| Research and Testing Services | 1.09 | .53 | .5 | 1.32 | .74 | 1.70 |
| Management and Public Relations | .60 | .43 | .5 | 1.24 | 1.06 | 1.64 |

Note: These figures are not exactly comparable to those in Table 2 and 3. Footnote 16 explains the difference.
Source: U.S. Bureau of Labor Statistics, ES-202 data and author's calculations.

Table 5
*Composition of Employment According to Market Orientation, 1989*
Percent

| | Share of Total Employment (percent) | | | |
|---|---|---|---|---|
| | US | NE | CT | MA |
| Nationally Oriented Industries[a] | 26.2 | 27.4 | 28.6 | 27.7 |
| Farm | 2.3 | .6 | .4 | .3 |
| Agricultural Services, Forestry, Fisheries | 1.0 | 1.0 | .8 | .9 |
| Mining | .7 | .1 | .1 | .1 |
| Manufacturing[b] | 11.7 | 14.1 | 15.8 | 12.8 |
| FIRE—National | 1.5 | 2.4 | 3.9 | 2.1 |
| Securities & Commodity Brokers and Services | .4 | .4 | .4 | .6 |
| Insurance Carriers | 1.1 | 1.9 | 3.4 | 1.5 |
| Combined Offices | ... | ... | ... | ... |
| Services—National | 4.5 | 6.4 | 5.1 | 8.2 |
| National Business and Miscellaneous[c] | 2.8 | 3.3 | 2.8 | 4.2 |
| Motion Picture | .2 | .2 | .2 | .2 |
| Education | 1.4 | 2.8 | 2.1 | 3.7 |
| Museums | ... | .1 | .1 | .1 |
| Government—Federal | 4.4 | 2.9 | 2.4 | 2.8 |
| Mixed FIRE and Services[d] | 5.0 | 5.0 | 4.6 | 5.0 |
| Locally Oriented Industries | 68.8 | 67.6 | 66.8 | 67.8 |
| Construction | 5.3 | 5.8 | 5.5 | 5.1 |
| Manufacturing—Local | 2.9 | 2.4 | 2.3 | 2.4 |
| Transportation and Public Utilties | 4.7 | 3.8 | 4.0 | 3.8 |
| Wholesale Trade | 4.9 | 5.0 | 5.1 | 5.4 |
| Retail Trade | 16.6 | 16.7 | 15.9 | 16.4 |
| FIRE—Local | 5.7 | 5.6 | 6.3 | 5.6 |
| Services—Local | 17.8 | 19.0 | 18.7 | 19.9 |
| Government—State and Local | 10.9 | 9.3 | 9.1 | 9.2 |

Note: Components may not add to totals because of rounding.
... = less than 0.05.

[a]Industries were classified as national if the standard deviations of location quotients for large states exceeded 0.35. Manufacturing, Services, and FIRE were allocated according to the industry standard deviations in Tables 3. Private households, however, were considered local. The choice of 0.35, while somewhat arbitrary, was based on the text discussion of the market orientation of manufacturing.

[b]Food and kindred products, printing and publishing and stone, clay, and glass were considered local manufacturing.

[c]Business and miscellaneous services were allocated using the location patterns shown in Table 4 and the employment shares indicated by Table 3.

[d]Services and FIRE industries for which the standard deviation exceeds 0.35 for all states but not for large states.

Source: Author's calculations based on Tables 2, 3, and 4.

quotients, is more local than that for manufacturing. However, some services and FIRE industries appear to serve national markets and these tend to account for larger fractions of employment in New England than the nation. In particular, New England as a whole seems to be a supplier of insurance and education services to other parts of the country, while at least Massachusetts seems to be an exporter of securities services, computer programming, research and management consulting.

These more nationally oriented industries account for a significant fraction of employment in New England, as can be seen from Table 5. Although the bulk of FIRE and services is more locally oriented, the national element accounts for 8.8 percent of New England's total employment. To put this in perspective, manufacturing, excluding a few locally oriented industries, accounts for about 14 percent of regional employment.

This review of the composition of New England's services and FIRE industries also sheds light on the role played by construction and real estate. Construction itself accounted for 5.8 percent of New England employment in 1989. But another 6 percent of employment was in real estate, building services, engineering and architectural services, and banking—all of which appear locally oriented according to this analysis and all of which have close ties to construction and real estate.

Table 6
*Volatility of Major U.S. Industries, 1970 to 1989*

| Industry | Standard Deviations of Percentage Changes in Annual Employment |
|---|---|
| Total | 1.68 |
| Farm | 1.94 |
| Agricultural Services, Forestry, Fisheries | 1.76 |
| Mining | 6.83 |
| Construction | 4.67 |
| Manufacturing | 3.81 |
| Transportation, Public Utilities | 1.98 |
| Wholesale Trade | 1.80 |
| Retail Trade | 1.56 |
| FIRE | 1.88 |
| Services | 1.21 |
| Government | .87 |

Note: Total employment is less volatile than employment in most industries because the industries are not synchronized and an increase in one may offset a decrease in another.

Source: See Table 1.

## V. *Volatility of Services-Based Economies*

Conventional wisdom holds that economies that are more services-oriented are also more stable, less subject to cyclical and other fluctuations. Indeed, in the early 1980s when New England's performance surpassed the nation's by a substantial margin, it was commonly asserted that the region's industry mix, with its relatively large shares of employment in high tech manufacturing—viewed then as recession-proof—and in services, made New England less vulnerable to economic downturns than many parts of the country or even the New England of the past.

The logic is simple. Employment in services and other services-producing industries, such as FIRE and trade, is less volatile than employment in manufacturing or mining (Table 6). Therefore, the more services employment in the mix, the less volatile will be overall employment. Even those concerned about the long-term shift in employment from manufacturing to services have usually not disputed claims that greater services orientation implies more stability.

Table 7 presents the results of regressions relating the volatility of overall state employment to the share of employment in services plus FIRE. (Appendix Tables A3 and A4 substitute FIRE and services, respectively, for the combination of the two.) Volatility is measured as the standard deviation of annual changes in employment. In some of the regressions, additional explanatory variables have been included: the shares of employment in the highly volatile mining and durables manufacturing sectors; state size (as measured by employment), on the grounds that large states might be more diversified and therefore more stable; and the percentage increase in overall employment over the relevant time span.

As can be seen from the results, the presumption that more services employment, or here, more employment in both services and FIRE, confers greater stability does not have a solid foundation. Larger fractions of employment in these industries are not associated with less volatile state economies. The relationship between volatility and employment in services and FIRE was negative in the 1980s; but the relationship was not statistically significant, indicating an association so weak or unstable that it could be attributable purely to chance. (Although the conclusions are generally the same if one substitutes either services or FIRE for the combination of the two, the relationship between volatility and share of employment in FIRE alone was negative and statistically significant for larger states in the 1980s.)

Table 7
*Volatility of State Employment Relative to Share of Employment in Services and FIRE*
Dependent Variable = standard deviation of percent change in annual state employment

| | 1970–1989 | | | | 1970–1979 | | | | 1980–1989 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All States | | Large States | | All States | | Large States | | All States | | Large States | |
| Constant | 2.3 | 1.7 | 2.2 | .9 | 1.7 | 1.5 | 1.5 | .5 | 2.4 | 1.2 | 3.2 | 1.3 |
| | (3.9) | (2.9) | (3.6) | (1.9) | (2.3) | (2.0) | (1.7) | (.8) | (4.8) | (2.0) | (5.0) | (2.0) |
| FIRE and Services Share | −.43 | −2.5 | −.29 | −.75 | 1.5 | −2.9 | 2.8 | 2.1 | −1.6 | −.03 | −4.2* | −2.4 |
| | (−.2) | (−1.3) | (−.13) | (−.44) | (.5) | (−1.0) | (.8) | (.8) | (−1.0) | (−.02) | (−2.0) | (−1.3) |
| Mining Share | | 10.7* | | 11.0* | | −16.3* | | −22.3* | | 15.2* | | 21.3* |
| | | (2.6) | | (2.5) | | (−2.6) | | (−3.1) | | (3.4) | | (3.5) |
| Durables Share | | 4.0* | | 7.3* | | 4.1 | | 4.8* | | 4.5* | | 9.7* |
| | | (2.2) | | (4.7) | | (1.8) | | (2.7) | | (2.3) | | (4.0) |
| Average Total Employment | | −.02 | | −.03 | | .02 | | −.04 | | −.03 | | −.02 |
| | | (−.6) | | (−1.1) | | (.3) | | (−1.1) | | (−1.2) | | (−.7) |
| % Change in Total Employment | | .01* | | .01* | | .04* | | .03* | | .01 | | .01 |
| | | (5.1) | | (5.1) | | (4.6) | | (4.9) | | (1.8) | | (1.4) |
| $\bar{R}^2$ | −.02 | .38 | −.04 | .55 | −.01 | .27 | −.01 | .53 | −.0005 | .16 | .1 | .46 |

Note: Industry employment shares are the average employment in the particular industry divided by the average total employment for the time period.
*Statistically significant at .05 level; t-statistics in parentheses.

Table 8
*Volatility of State Employment, 1970 to 1989*

| | Standard deviation of employment changes | Services and FIRE share of employment (percent) | Mining share of employment (percent) | Durables share of employment (percent) | Employment Growth (percent) | Average Employment (000s) |
|---|---|---|---|---|---|---|
| Most Volatile States | | | | | | |
| Alaska | 5.2 | 23.7 | 2.9 | 1.4 | 115.2 | 241.5 |
| Wyoming | 3.8 | 23.0 | 10.4 | 1.9 | 64.9 | 234.2 |
| Michigan | 3.2 | 27.0 | .4 | 20.5 | 32.7 | 3,987.9 |
| Arizona | 3.1 | 32.6 | 1.6 | 8.9 | 153.5 | 1,245.5 |
| Nevada | 3.1 | 47.8 | 1.4 | 2.6 | 176.9 | 443.7 |
| Least Volatile States | | | | | | |
| North Dakota | 1.4 | 27.1 | .3 | 5.6 | 35.6 | 835.7 |
| Hawaii | 1.4 | 31.4 | ... | 1.0 | 62.7 | 536.3 |
| Nebraska | 1.5 | 24.9 | 1.5 | 2.2 | 34.3 | 334.1 |
| D.C. | 1.5 | 37.4 | ... | .3 | 15.9 | 692.5 |
| New York | 1.5 | 36.1 | .1 | 9.2 | 18.3 | 8,636.4 |
| Greatest Concentration in Services plus FIRE | | | | | | |
| Nevada | 3.1 | 47.8 | 1.4 | 2.6 | 176.9 | 443.7 |
| D.C. | 1.5 | 37.4 | ... | .3 | 15.9 | 692.5 |
| New York | 1.5 | 36.1 | .1 | 9.2 | 18.3 | 8,636.4 |
| Florida | 2.6 | 34.6 | .3 | 5.5 | 132.9 | 4,607.1 |
| Massachusetts | 2.1 | 34.9 | .1 | 12.9 | 42.7 | 3,090.8 |
| Smallest Concentrations in Services plus FIRE | | | | | | |
| North Carolina | 2.2 | 21.7 | .2 | 10.0 | 57.6 | 3,015.4 |
| South Carolina | 2.0 | 21.8 | .1 | 7.7 | 59.1 | 1,494.3 |
| Mississippi | 2.0 | 21.8 | 1.0 | 12.0 | 31.3 | 1,061.4 |
| Wyoming | 3.8 | 23.0 | 10.4 | 1.9 | 64.9 | 234.2 |
| West Virginia | 1.8 | 23.4 | 7.6 | 9.2 | 16.1 | 727.8 |
| New England Concentrations in Services plus FIRE | | | | | | |
| Massachusetts | 2.1 | 34.9 | .1 | 12.9 | 42.7 | 3,090.8 |
| Connecticut | 2.1 | 31.8 | .1 | 18.9 | 45.8 | 1,662.2 |
| Vermont | 1.9 | 30.8 | .3 | 13.4 | 72.9 | 261.2 |
| New Hampshire | 2.8 | 30.0 | .1 | 14.4 | 106.0 | 478.1 |
| Rhode Island | 2.3 | 29.3 | .1 | 17.3 | 29.7 | 477.3 |
| Maine | 1.9 | 26.5 | .1 | 8.1 | 62.7 | 544.9 |

Note: ... = less than 0.05.
Source: See Table 7.

Although the presence of more services and FIRE employment does not significantly reduce volatility, by the same token these industries do not add to volatility. In contrast, the share of employment in durables manufacturing was positively linked to volatility. Particularly in the 1980s, states with more durables manufacturing experienced greater fluctuations in their overall employment. Faster-growing states also tended to be more volatile states. Somewhat surprisingly, large size does not significantly reduce volatility despite the potential for diversification within as well as among industries. The link between employment in mining and volatility is also puzzling, with more mining associated with greater volatility in the 1980s but less volatility in the 1970s.

One reason why the share of employment in services and FIRE does not result in more stable employment is that the degree to which industries move together can be as important as the volatility of individual industries (Rosengren 1990). If industries rise and fall at similar times, total employment will fluctuate more than if the industries' patterns offset one another or are simply unrelated. Thus, if many services and FIRE activities serve a local market—as they do—state employment in these industries will mirror the patterns of the more volatile sectors. This

co-movement may offset any stabilizing effect from greater services employment.

Moreover, in the preceding sections it was argued that a high share of employment in an industry could be taken as an indication that the industry serves a national rather than a local market. Thus, the nature of the services and FIRE industries may be different—and possibly more volatile—in those states where these industries are largest. Again, however, the volatility of individual industries is only part of the story. If the nationally oriented services industries do well when other nationally oriented industries do poorly, the overall pattern of employment may be fairly stable.

The bottom line is that a higher fraction of employment in services and FIRE is no guarantee of stability. As can be seen from Table 8, some of the most volatile states have large shares of employment in services and FIRE and some of the states with the largest shares of employment in services and FIRE are quite volatile. The New England states are neither the most volatile nor the most services-oriented.

## *VI. Conclusions*

In conclusion, one can tell two stories explaining why New England achieved such a remarkable level of prosperity in the 1980s despite declining manufacturing employment and why the ensuing downturn has been so severe. In one, an unsustainable construction and real estate boom took over as the regional engine of growth. In the other, the impetus to growth was provided by nationally oriented FIRE and services industries, which subsequently ran into difficulty. An examination of the composition and timing of the changes in FIRE and services employment tends to support the critical role played by construction and real estate. Although nationally oriented FIRE and services industries grew strongly in the mid 1980s, more locally oriented segments of the industries, particularly those with links to construction and real estate, accounted for disproportionate shares of the new jobs. External factors may have contributed to regional difficulties in FIRE, however, and to the bursting of New England's construction and real estate bubble.

Even if nationally oriented FIRE and services industries were not the primary shapers of the region's economic fortunes, they account for a larger fraction of employment in New England than the nation and they grew vigorously during the 1980s while manufacturing was declining. Thus, policymakers seeking ways of reviving the regional economy should not neglect these industries. But whether nationally oriented services and FIRE can function as regional engines of growth in the manner traditionally associated with manufacturing remains an open question; and contrary to conventional wisdom, a larger fraction of employment in services industries is no guarantee of stability—as New England's recent experience has proven.

Appendix Table A1

## *Employment Changes in the Services Industries, New England and United States 1984–89*

Thousands

| | New England | | | | | | United States | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Employment in 1984 | Change in 85 | 86 | 87 | 88 | 89 | Employment in 1984 | Change in 85 | 86 | 87 | 88 | 89 |
| Services | 1,914 | 125 | 98 | 99 | 116 | 83 | 28,975 | 1,687 | 1,291 | 1,454 | 1,706 | 1,624 |
| Hotels and Other Lodging Places | 73 | 5 | 4 | 6 | 5 | 3 | 1,420 | 78 | 48 | 75 | 80 | 75 |
| Personal Services | 118 | 19 | 8 | 6 | 8 | 7 | 2,133 | 321 | 117 | 58 | 131 | 123 |
| Private Households | 69 | −2 | −1 | −2 | −2 | −3 | 1,637 | −41 | −10 | −35 | −58 | −59 |
| Business Services | 377 | 41 | 36 | 35 | 39 | 18 | 5,822 | 614 | 450 | 523 | 592 | 545 |
| Auto Repair, Services, Garages | 60 | 5 | 4 | 3 | 2 | 2 | 1,107 | 83 | 41 | 55 | 44 | 59 |
| Miscellaneous Repair Services | 31 | 1 | 3 | −1 | 2 | 2 | 650 | 13 | 22 | —21 | 34 | 27 |
| Amusement and Recreation Services | 71 | 4 | 3 | 4 | 2 | 3 | 1,253 | 43 | 54 | 64 | 37 | 83 |
| Motion Pictures | 12 | ... | 1 | ... | ... | ... | 292 | 8 | 14 | 7 | 11 | 6 |
| Health Services | 509 | 18 | 10 | 20 | 20 | 28 | 6,822 | 279 | 278 | 380 | 321 | 392 |
| Legal Services | 63 | 5 | 6 | 5 | 2 | 2 | 1,015 | 65 | 64 | 60 | 44 | 44 |
| Education Services | 205 | 11 | 4 | ... | 3 | 5 | 1,688 | 66 | 37 | 25 | 61 | 36 |
| Social Services | 96 | 7 | 7 | 7 | 10 | 7 | 1,242 | 90 | 86 | 88 | 109 | 117 |
| Museums, Botanical, Zoological Gardens | 5 | ... | ... | ... | 1 | ... | 39 | 3 | 4 | 3 | 4 | 3 |
| Membership Organizations | 88 | 1 | 2 | 6 | 8 | 2 | 1,545 | 2 | 8 | 84 | 110 | 33 |
| Miscellaneous Services | 136 | 9 | 11 | 10 | 16 | 6 | 2,310 | 62 | 80 | 88 | 187 | 141 |
| % Change in Total Services | | 6.5 | 4.8 | 4.6 | 5.2 | 3.5 | | 5.8 | 4.2 | 4.6 | 5.1 | 4.6 |
| Memo: | | | | | | | | | | | | |
| % Change in Construction | | 12.3 | 13.5 | 11.9 | 4.6 | −5.2 | | 5.8 | 4.6 | 2.5 | 3.5 | 1.7 |
| % Change in Total Employment | | 3.8 | 3.2 | 3.6 | 2.7 | .3 | | 3.1 | 2.0 | 2.7 | 3.0 | 2.4 |

Note: Components may not sum to totals because of rounding. ... = less than 0.5.
Source: See Table 1.

Appendix Table A3

## *State Volatility and Share of Employment in FIRE*

Dependent Variable = standard deviation of percent change in annual state employment

| | 1970–1989 | | | | 1970–1979 | | | | 1980–1989 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All States | | Large States | | All States | | Large States | | All States | | Large States | |
| Constant | 2.4 | 1.5 | 2.0 | .9 | 1.6 | 1.2 | 1.4 | .8 | 2.6 | 1.6 | 2.9 | 1.2 |
| | (4.8) | (3.0) | (4.7) | (2.6) | (2.6) | (1.7) | (2.6) | (1.5) | (6.3) | (3.2) | (6.4) | (2.5) |
| FIRE Share | −3.1 | −8.9 | 2.8 | −4.1 | 8.8 | −7.2 | 12.7 | 5.8 | −10.5 | −7.5 | −13.4* | −12.2* |
| | (−.4) | (−1.1) | (.4) | (−.8) | (.8) | (−.6) | (1.4) | (.7) | (−1.7) | (−1.1) | (−2.1) | (−2.2) |
| Mining Share | | 10.8* | | 11.0* | | −15.4* | | −22.0* | | 14.4* | | 23.9* |
| | | (2.6) | | (2.6) | | (−2.4) | | (−3.0) | | (3.2) | | (4.1) |
| Durables Share | | 4.2* | | 7.5* | | 4.4* | | 4.6* | | 4.2* | | 10.2* |
| | | (2.4) | | (4.8) | | (2.0) | | (2.6) | | (2.2) | | (4.5) |
| Average Total Employment | | −.01 | | −.02 | | .02 | | −.04 | | −.02 | | −.01 |
| | | (−.3) | | (−.9) | | (.3) | | (−1.1) | | (−.6) | | (−.6) |
| % Change in Total Employment | | .01* | | .01* | | .03* | | .03* | | .02* | | .02* |
| | | (5.0) | | (4.9) | | (4.4) | | (4.6) | | (2.1) | | (2.1) |
| $\bar{R}^2$ | −.02 | .38 | −.03 | .56 | −.01 | .26 | .03 | .53 | .04 | .18 | .12 | .52 |

Note: Industry employment shares are the average employment in the particular industry divided by the average total employment for the time period.
*Statistically significant at .05 level; t-statistics in parentheses.

Appendix Table A2

## *Employment Changes in FIRE Industries, New England and United States 1984–89*

Thousands

| | New England | | | | | | United States | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Employment in 1984 | Change in 85 | 86 | 87 | 88 | 89 | Employment in 1984 | Change in 85 | 86 | 87 | 88 | 89 |
| Finance, Insurance, Real Estate | 515 | 39 | 49 | 52 | 20 | 0 | 8621 | 491 | 424 | 379 | 241 | 149 |
| Banking and Other Credit Agencies | 135 | 7 | 13 | 11 | 3 | −1 | 2397 | 81 | 109 | 71 | 0 | 8 |
| Security & Commodity Brokers and Services | 23 | 2 | 2 | 6 | 2 | 0 | 407 | 21 | 44 | 65 | 10 | −7 |
| Insurance Carriers | 138 | 5 | 7 | 5 | −1 | −1 | 1296 | 31 | 73 | 47 | 27 | 17 |
| Insurance Agents, Brokers and Services | 45 | 2 | 2 | 4 | 4 | 1 | 858 | 18 | 30 | 78 | 55 | 19 |
| Real Estate | 153 | 23 | 21 | 20 | 9 | 0 | 3283 | 329 | 153 | 67 | 125 | 91 |
| Combined Offices | 2 | 0 | 0 | 0 | 0 | 0 | 26 | 0 | −1 | −3 | 1 | 0 |
| Holding and Other Investment Companies | 19 | 1 | 4 | 5 | 1 | 0 | 355 | 11 | 16 | 53 | 22 | 21 |
| % Change in Total FIRE | | 7.5 | 8.8 | 8.6 | 3.0 | −.1 | | 5.7 | 4.7 | 4.0 | 2.4 | 1.5 |
| Memo: | | | | | | | | | | | | |
| % Change in Construction | | 12.3 | 13.5 | 11.9 | 4.6 | −5.2 | | 5.8 | 4.6 | 2.5 | 3.5 | 1.7 |
| % Change in Total Employment | | 3.8 | 3.2 | 3.6 | 2.7 | .3 | | 3.1 | 2.0 | 2.7 | 3.0 | 2.4 |

Note: Components may not sum to totals because of rounding.
Source: See Table 1.

Appendix Table A4

## *State Volatility and Share of Employment in Services*

Dependent Variable = standard deviation of percent change in annual state employment

| | 1970–1989 | | | | 1970–1979 | | | | 1980–1989 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All States | | Large States | | All States | | Large States | | All States | | Large States | |
| Constant | 2.2 | 1.5 | 2.4 | .9 | 1.8 | 1.4 | 1.7 | .5 | 2.2 | 1.0 | 3.2 | 1.2 |
| | (4.2) | (2.9) | (3.6) | (1.6) | (2.7) | (2.0) | (1.7) | (.6) | (4.8) | (1.9) | (4.6) | (1.6) |
| Services Share | −.30 | −2.4 | −1.2 | −.6 | 1.3 | −3.1 | 2.6 | 2.8 | −1.2 | .53 | −5.1 | −2.2 |
| | (−.1) | (−1.1) | (−.4) | (−.3) | (.4) | (−1.0) | (.5) | (.7) | (−.6) | (.3) | (−1.8) | (−.9) |
| Mining Share | | 11.2* | | 11.0* | | −15.8* | | −22.5* | | 15.4* | | 21.1* |
| | | (2.7) | | (2.5) | | (−2.6) | | (−3.1) | | (3.4) | | (3.3) |
| Durables Share | | 4.0* | | 7.3* | | 4.1 | | 4.9* | | 4.6* | | 9.6* |
| | | (2.2) | | (4.6) | | (1.8) | | (2.7) | | (2.4) | | (3.9) |
| Average Total Employment | | −.03 | | −.03 | | .008 | | −.04 | | −.04 | | −.02 |
| | | (−.7) | | (−1.2) | | (.1) | | (−1.0) | | (−1.2) | | (−.9) |
| % Change in Total Employment | | .01* | | .01* | | .04* | | .03* | | .01 | | .01 |
| | | (5.0) | | (5.2) | | (4.6) | | (5.0) | | (1.7) | | (1.2) |
| $\bar{R}^2$ | −.02 | .38 | −.03 | .55 | −.02 | .27 | .03 | .53 | −.01 | .16 | .08 | .44 |

Note: Industry employment shares are the average employment in the particular industry divided by the average total employment for the time period.
*Statistically significant at .05 level; t-statistics in parentheses.

[1] Many analysts now believe that the competitiveness of New England's manufacturing sector was undermined by the rapid increases in wages and other costs of doing business that occurred during the region's years of prosperity. However, the effect of higher costs on manufacturing competitiveness did not receive much attention until late in the decade; and some might argue that higher cost factors are still of lesser importance than defense cuts and the problems facing high tech industries from market shifts and new competitors.

[2] In particular, the decline in the foreign exchange value of the dollar in 1986 and 1987 was expected to invigorate New England manufacturing, which has traditionally exported more than manufacturing nationwide.

[3] Boston might still prosper as a supplier of financial and other services to the metropolitan area or even the New England region. The terms local and national are used loosely here to indicate a general orientation.

[4] The U.S. Bureau of Economic Analysis data used in this article are based on the 1972 SIC industry divisions; this classification assigns management and public relations, research and development laboratories, and several other industries to "business services." In the 1987 SIC divisions these industries are combined with miscellaneous services in "engineering, accounting, research, management and related services."

[5] Refer to footnote 4.

[6] That the possibility of such adverse consequences did not generate more protest seems, in retrospect, rather puzzling. Perhaps the momentum behind tax reform made protest appear fruitless. Perhaps those most obviously hurt, syndicators of tax shelters and their investors, did not have enough standing with the public or Congress to affect the outcome, while the many real estate and mortgage brokers, banks, insurance companies, and other individuals and institutions that had benefited indirectly from tax-induced increases in real estate values and frequent transactions were not fully aware of their vulnerability. Certainly in New England in 1986, rising real estate values and high levels of both turnover and new construction were generally seen as reflecting economic fundamentals rather than the artificial stimulus of tax shelters.

[7] An equivalent expression compares an area's share of national employment in an industry with its share of total U.S. employment:

$$\frac{x_{ij}/X_i}{x_j/X}$$

[8] If local residents prefer some goods and services over others, the fraction of employment devoted to the preferred industries will be higher than elsewhere even if all the industries' output is consumed locally.

[9] Areas with plentiful natural resources specialize in resource-based industries and sell the output to the rest of the country; areas well endowed with professional and technical workers specialize in high technology industries.

[10] Although classified within the same industry, the products may perform somewhat different functions. One firm may offer higher service quality at a higher price. Reputations may vary.

[11] For industries producing intermediate products, sales to other parts of the country may be indirect rather than direct. An example is the auto industry and its suppliers. If the original equipment auto parts industry is concentrated in the same areas as the auto industry, the former will appear as a nationally oriented industry even though its primary customer is located close by. The location quotient concept is based not on distance, but on the extent to which local production is for local consumption.

[12] The standard deviations for the large states probably provide the better indication of market orientation. In very small states location quotients can be quite extreme and may produce a distorted picture of the industry's pattern of location. However, for some industries, the difference between the standard deviations for the large states and all states may be meaningful. For example, the greater variation in hotels and lodging places for all states (shown in Table 3) reflects the importance of tourism to low population states.

[13] New England's low share of government employment may be related to its high share of employment in educational services. As noted later in the text, educational services appears to be a national industry but the extent of its national orientation may be overstated to the degree that states substitute private for public education.

[14] Other data sources indicate that construction employment in New England has fallen sharply since 1989 and is now a smaller fraction of overall employment.

[15] It should be recognized, however, that education services includes only private education. More employment in private education might be associated with less publicly provided education and less employment in government, rather than the export of education services.

[16] A closer examination of business services requires switching to the Bureau of Labor Statistics' ES-202 employment data. The ES-202 data classify industries according to the 1987 SIC code while the BEA data used elsewhere in this article are based on the 1972 SIC code. The 1987 SIC code combined several industries formerly in business services with miscellaneous services to form the category engineering, accounting, research, management and related services. The BLS and BEA data also differ in that the BEA figures include the self-employed.

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# Changes in the Structure of Wages: A Regional Comparison

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Several authors have documented dramatic changes in the structure of wages in the United States in the 1980s.[1] Specifically, their findings have shown a trend of rising returns to skill. Skill, as discussed here, refers to those human capital characteristics most relevant to the productivity of labor: education and experience.

During much of the post-World War II period, the structure of men's wages (the relative returns to different levels of skill) remained remarkably stable. A break with past experience first occurred in the 1970s. In that decade, the earnings of young, college-educated males declined precipitously relative to the earnings of their less skilled counterparts (Freeman 1976, 1977, 1978). The collapse of the relative wage structure in the 1970s lent itself to a simple unified explanation: large baby-boom cohorts flooded labor markets with the most educated young males the United States had up to then witnessed. The declines in the returns to skill were thus well explained by the large shifts in the relative supplies of young male college graduates.[2]

The more recent twist in the structure of wages, a reversal of the experience of the 1970s with a sharp rise in the returns to college education, has intrigued economists because of its magnitude and because of economists' inability to identify one primary overarching explanation. The changes in the 1980s cannot, for instance, readily be attributed to changes in the relative supplies of skill groups. Despite the cresting of the baby boomers' entry into the labor markets, the U.S. trend toward an ever more educated labor force has proceeded. With the absorption of the baby-boom cohorts, the trend is also toward an older, and presumably more experienced, labor force. The experience of the 1980s portends significant economic consequences, as already manifested in the "good jobs, bad jobs" debate and concerns over "the vanishing middle class."[3]

This article focuses on changes in the structure of men's wages in the 1980s.[4] Its purpose is to document the rising returns to skill in the

nine U.S. census regions.[5] The regions differ considerably in the composition of their labor forces, their industrial structures, and their economic experiences. As all these factors have a bearing on the wage structure, the changes were not likely to have been uniform across all regions, or homogeneous in their sources. Examining the interregional variation in wage structures may shed some light on the relevant forces at play.

The article has five sections. Section I documents the changes in regional wage structures between 1979 and 1988, using estimates of the returns to various skill levels based on Current Population Survey (CPS) data. Section II examines how shifts in industrial and occupational patterns provide a partial explanation of the observed changes. Section III considers as potential explanations both technological change and "outsourcing," defined here as shifts of production to low-wage areas, focusing on the manufacturing industry. Section IV considers regional variations in the relative supply of and demand for different skill levels. The final section draws conclusions.

## I. *Changes in Regional Wage Structures*

The CPS data analyzed in this study provide information on individuals' income, education, and other demographic and labor market characteristics. To characterize the changes in the structure of wages, each individual observation was first classified into one of four education groups and one of five potential experience groups. (Details of the data and methodology may be found in the Appendix.) The education groups corresponded to individuals possessing less than 12 years of education (dropouts), 12 years (high school graduates), 13 to 15 years (some college), and those with 16 or more years (college graduates).

Individuals' hourly wages were calculated, in log form, from their annual income, number of weeks employed, and average number of hours worked per week. The resulting wage data were then analyzed using "hedonic" log-wage regressions. The basic regression model, Model I, estimates the hourly wages as a function of dummy variables corresponding to each education and potential experience class (the human capital variables) and other demographic variables thought to explain the distribution of wages. Separate regressions were run for 1979 and 1988 for each of the nine census regions, as well as for the United States as a whole.[6] The coefficients of the human capital variables provide estimates of the returns to a given level of either education or potential experience, all else being equal. These coefficients are reported in Appendix Table A1 and are presented in a more intuitive manner in Table 1, which shows the wages of one education group relative to another. The rising returns to education, and to college education in particular, are apparent.

In the United States the ratio of male college

Table 1
*Relative Wages of Men and the Changes between 1979 and 1988*

| | College/Dropout Wage | | Percentage Point | College/High School Wage | | Percentage Point | High School/ Dropout Wage | | Percentage Point |
|---|---|---|---|---|---|---|---|---|---|
| Region | 1979 | 1988 | Change | 1979 | 1988 | Change | 1979 | 1988 | Change |
| United States | 1.65 | 1.89 | 24 | 1.32 | 1.53 | 21 | 1.24 | 1.24 | 0 |
| New England | 1.75 | 1.80 | 5 | 1.42 | 1.51 | 9 | 1.23 | 1.19 | −4 |
| Middle Atlantic | 1.75 | 1.92 | 17 | 1.45 | 1.60 | 15 | 1.21 | 1.20 | −1 |
| East North Central | 1.51 | 1.76 | 25 | 1.29 | 1.46 | 17 | 1.16 | 1.21 | 5 |
| West North Central | 1.54 | 1.75 | 21 | 1.26 | 1.46 | 20 | 1.23 | 1.20 | −3 |
| South Atlantic | 1.77 | 1.97 | 20 | 1.41 | 1.62 | 21 | 1.26 | 1.22 | −4 |
| East South Central | 1.58 | 1.86 | 28 | 1.21 | 1.51 | 30 | 1.31 | 1.23 | −8 |
| West South Central | 1.69 | 1.99 | 30 | 1.36 | 1.53 | 17 | 1.24 | 1.30 | 6 |
| Mountain | 1.53 | 1.82 | 29 | 1.25 | 1.45 | 20 | 1.23 | 1.26 | 3 |
| Pacific | 1.55 | 1.88 | 33 | 1.24 | 1.48 | 24 | 1.25 | 1.26 | 1 |

Note: Footnote 7 explains how relative wages are calculated from the coefficients of the model I log–wage regression.
Source: Appendix Table A1 and author's calculations.

graduates' wages to the wages of high school graduates (college/high school wage) rose from 1.32 to 1.53 between 1979 and 1988 and the ratio of college graduates' wages to the wages of men who had not completed high school (college/dropout wage) rose from 1.65 to 1.89.[7] By contrast, the wage differential between high school graduates and dropouts remained roughly the same. In other words, the return to a college education increased in the 1980s, not the return to education generally.[8]

*The rising returns to education, and to college education in particular, are apparent.*

A similar pattern occurred in all nine of the census regions, with the returns to college graduates rising relative to both dropouts and high school graduates. These increases varied considerably, however. The increases in the college/dropout wage ranged from a notably low 5 percentage points in New England to the 33 percentage point jump in the Pacific states. The rise in the college/high school wage ranged from the low 9 percentage point gain experienced in New England to the 30 percentage point increase in the East South Central region.[9]

Changes in relative wages can be attributable to changes in the relative supplies of various skill groups, changes in relative demands for these skills, or institutional changes in the labor markets. The increasing returns to skill in the 1980s have given rise to several possible explanations. Of these, the most promising include shifts in product demand, skill-biased technological change, and shifts in production to low-wage areas (outsourcing), all demand-side hypotheses. In the next two sections the data are analyzed for evidence conforming to the predictions arising from these hypotheses.[10]

## II. Industry and Occupation Shift Effects

One of the more plausible explanations for the rise in returns to skill in the 1980s is shifts in product demand. Murphy and Welch (1989) in particular champion this explanation, emphasizing the role of international trade. The product demand shift explanation begins by recognizing that the distribution of human capital is not uniform across industries. Some industries employ more highly educated labor than others. Some industries, manufacturing and construction being the most obvious, rely less on ability gained through formal education and more on skills acquired through apprenticeship or on-the-job training.

Murphy and Welch posit that the unprecedented trade deficits of the 1980s reflected shifts in product demand that adversely affected industries employing disproportionately large numbers of less educated workers. The most notable example is the manufacturing sector, where a flood of imports contributed to a contraction of employment. The adverse shifts in the relative demand for the less educated in manufacturing spilled over to other labor markets so the net effect was a decline in overall relative demand.[11]

The effects of the trade deficits in the 1980s as interpreted by Murphy and Welch are closely linked with the "good jobs, bad jobs" debate. Manufacturing has historically been a high-wage industry. Thus, the relative (and absolute) decline of employment in manufacturing constrained what had been the primary sector where less educated workers could obtain wages comparable to those of their more educated counterparts (partially as a result of union wage bargaining). Not only were the returns to the less educated affected by the decline in the relative demand for this skill group, but also the employment opportunities available to the less educated were subsequently more concentrated in lower-wage industries, the services industries in particular.

The shifts in employment between industries could therefore explain at least part of the increasing returns to skill witnessed in the 1980s. This shift in industrial structure from manufacturing to services, while a trend nationwide, has varied in magnitude among regions. One could logically expect the industry shift hypothesis to prove more fruitful in some regions than others. And to the extent that the changes in the sectoral distribution of employment were the result of product demand shifts, measuring the effects of industry shifts on the wage structure provides a proxy for the effects of product demand shifts, although not testing for the latter directly.

### *Industry Shifts*

Blackburn, Bloom, and Freeman (1989b) tried to isolate the industry shift effect by forcing the returns to industry affiliation to remain constant while ac-

counting for changes in industry affiliation. This study performs a similar test at the regional level. The test involves pooling the data from the two CPS cross-sections, 1979 and 1988. Shifts in employment between sectors are controlled for by the inclusion of dummy variables denoting industry affiliation. (See the Appendix, Section II, for details.) The resulting model, Model II, yields estimates of the returns to education in the study years after accounting for the movement of labor between sectors, but holding relative sectoral wages constant. If industry shifts explain part of the changes in the wage structure, the estimated returns to education generated by Model II should be smaller than those resulting from Model I.

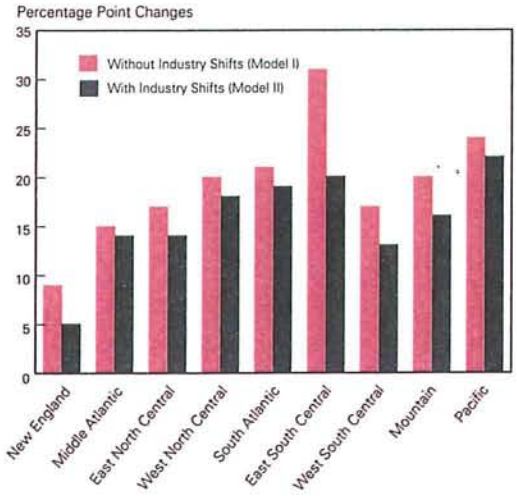
Figure 1 compares the percentage point increases in the college/high school wages generated by Model II with those produced by Model I.[12] Industry shifts do, indeed, appear to explain some of the increase in the returns to college graduates. The increases in the college/high school wages are smaller in all regions when industry affiliation is taken into account.[13] Industry shifts appear to have been particularly important in the East South Central region, accounting for a large fraction of a very large increase in the college/high school wage. Industry shifts also explain a sizable portion of the changes that occurred in New England, but the absolute magnitude of these effects was smaller than in other regions.

The proportion of the changes in the wage differentials explained depends not only on the sheer movement of labor between industries but also on the differences in returns to skill between industries. If labor moves between two low-wage industries, such a shift would contribute little to the change in relative wages. On the other hand, if employment shifts from the high-wage manufacturing sector to the low-wage retail sector, one would expect a more sizable impact on relative wages. Indeed, in the East South Central region, the higher-wage manufacturing, construction, and transportation, communications and utilities industries all lost employment shares, while the low-wage retail sector expanded its share of male employment faster than in any other region. In New England, the share of male employment in manufacturing shrank more than in most regions, but the growth of the construction sector and the transportation, communications and utilities sector (also high-wage) was by far the greatest in the nation.[14] Therefore, while industry shifts seem to explain a considerable portion of the changes in wage differentials in New England, the overall magnitude of the changes was small, possibly because of alternative

Figure 1

*Changes in College/High School Relative Wages of Male Workers, 1979 to 1988, Without and With Industry Shifts*

(A Comparison of Models I and II)




Source: Table 1, and author's calculations as described in the Appendix.

high-wage employment opportunities for the less educated.

The point remains, however, that industry shifts appear to have contributed to the rising returns to skill, with the contributions across the nine regions ranging from almost negligible to quite substantial. Where industry shift effects explain little, within-industry effects should be examined.

### *Within-Industry Effects*

Within-industry effects include changes in the average wages of a given sector. These may result from product demand changes that affect an industry's profitability, or from changes in the industry's wage-setting institutions.[15] The decline of union membership (and thus, presumably, workers' bargaining power) in the 1980s is a prime example of the latter. Wage concessions granted by work forces in the 1980s, in response to declining international competitiveness or other factors adversely affecting profitability and employment, may have contributed to changes in labor's share of industry rents (average industry wages).

To analyze the contribution of within-industry

Table 2
*Relative Wages of Men and the Changes between 1979 and 1988, Taking Account of Industry and Occupational Effects*

| Region | College/Dropout Wage 1979 | College/Dropout Wage 1988 | Percentage Point Change | College/High School Wage 1979 | College/High School Wage 1988 | Percentage Point Change | High School/Dropout Wage 1979 | High School/Dropout Wage 1988 | Percentage Point Change |
|---|---|---|---|---|---|---|---|---|---|
| United States | 1.48 | 1.55 | 7 | 1.26 | 1.34 | 8 | 1.17 | 1.16 | −1 |
| New England | 1.48 | 1.43 | −5 | 1.29 | 1.27 | −2 | 1.15 | 1.13 | −2 |
| Middle Atlantic | 1.40 | 1.64 | 24 | 1.25 | 1.42 | 17 | 1.13 | 1.15 | 2 |
| East North Central | 1.46 | 1.52 | 6 | 1.28 | 1.32 | 4 | 1.14 | 1.16 | 2 |
| West North Central | 1.44 | 1.44 | 0 | 1.26 | 1.28 | 2 | 1.14 | 1.13 | −1 |
| South Atlantic | 1.48 | 1.59 | 11 | 1.25 | 1.40 | 15 | 1.18 | 1.14 | −4 |
| East South Central | 1.49 | 1.50 | 1 | 1.21 | 1.32 | 11 | 1.23 | 1.14 | −9 |
| West South Central | 1.48 | 1.65 | 17 | 1.30 | 1.37 | 7 | 1.14 | 1.20 | 6 |
| Mountain | 1.42 | 1.49 | 7 | 1.26 | 1.30 | 4 | 1.13 | 1.14 | 1 |
| Pacific | 1.36 | 1.45 | 9 | 1.17 | 1.29 | 12 | 1.16 | 1.13 | −3 |

Note: Footnote 7 explains how relative wages are calculated from the coefficients of the model III log–wage regression.
Source: Appendix Table A2 and author's calculations.

effects, industry and occupation affiliation variables were added to Model I to arrive at Model III. The addition of these variables will account for industry shift effects but, in contrast to the analysis performed with Model II, the coefficients of the industry variables are allowed to vary between 1979 and 1988. The coefficients for the human capital variables are presented in Appendix [1]Table A2 and the estimated changes in the college/high school wage are shown in Table 2.

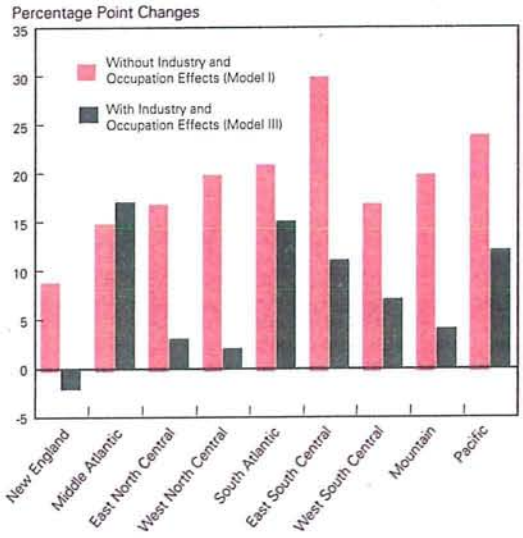
Most of the patterns obtained previously remain intact: an increase in the returns to skill (both education and potential experience) and a rise in the relative wages of the most educated. The inclusion of industry and occupation variables, however, significantly reduces the magnitude of the changes in the college/high school and college/dropout wages. The increase in the college/high school wage in the United States diminishes to 8 percentage points (compared to the 21 percentage point increase in Model I) while the college/dropout wage increases only 7 percentage points (compared to 24 percentage points). Clearly, the combination of shifts among industries and occupations and changes in the returns to various industries and occupations explain much of the increasing returns to a college education.

Nevertheless, as can be seen from Figure 2, the ability of industry and occupation variables to account for a portion of the changes in the wage

Figure 2

*Changes in College/High School Relative Wages of Male Workers, 1979 to 1988, Without and With Industry and Occupation Effects*

(A Comparison of Models I and III)




Source: Table 1, and author's calculations as described in the Appendix.

differentials fluctuates among regions. The addition of these variables, for example, eliminates most of the increase in the returns to college education in the East North Central and West North Central regions, but explains comparatively little of the changes in the South Atlantic states and seemingly none of the change in the Middle Atlantic region.

Curiously, in New England the addition of the industry and occupational variables actually reverses the direction of changes in the returns to education. In this region, the returns to all three education groups (high school, some college, and college graduates) *fell* relative to the earnings of dropouts. The college/high school wage, which in 1979, at 1.29, was higher than the U.S. ratio, fell to 1.27 in 1988, yielding the lowest relative wage of all regions (Table 2). These results suggest that the relatively high average wages enjoyed in New England in the 1980s were not the result of relatively greater returns to education and may reflect the high level of economic activity.

## *III. Technological Change and Outsourcing*

Two alternative explanations competing with (but not mutually exclusive of) product shifts are technological change and outsourcing to other regions and abroad. Technological change as an explanation refers to the possibility that production processes in recent years favored intellectual over, say, physical skills. An example of this would be the widespread adoption of computers in the workplace, a technology hypothetically biased in favor of the more educated. Thus, in competitive labor markets, where labor is remunerated according to its marginal product, the net effect of education-biased technological change would be a shift in relative wages favoring the most educated workers.

*"Outsourcing" and technological change are both consistent with disproportionate losses of job opportunities among less educated workers within a given industry.*

"Outsourcing," as used here, refers to U.S. firms shifting production to low-wage areas (which may include regions of the United States).[16] Anecdotal evidence for this explanation abounds in the manufacturing sector. The rise of the "maquiladora" facilities across the border in northern Mexico, the shift in production of computer components to the Asian "Newly Industrialized Countries," and the domestic decrease in the number of production relative to non-production workers in the manufacturing sector are all phenomena conforming to the notion of outsourcing.

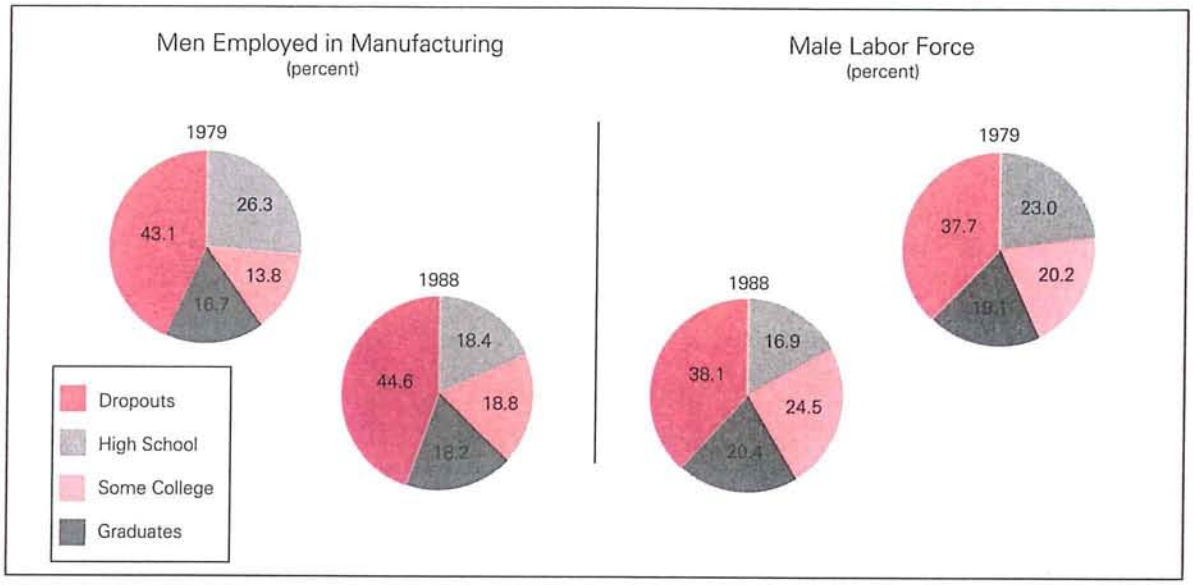
Outsourcing and technological change are considered jointly here because data supporting one hypothesis also tend to support the other. Both are consistent with disproportionate losses of job opportunities among less educated workers within a given industry. These losses would then spill over into other sectors causing a relative demand shift, in aggregate, against the less educated. Both explanations are thus associated with increases in the relative wages of the more educated.

In considering the two hypotheses, the focus remains the male labor force and the changes occurring in a single sector: manufacturing. One indication that the changes occurring in manufacturing have favored the most educated is a shift toward a more educated work force. As can be seen in Figure 3, the fraction of U.S. men employed in manufacturing who were college graduates rose from 13.8 percent in 1979 to 18.8 percent in 1988, while dropouts' share of the manufacturing work force fell from 26.3 percent to 18.4 percent. These shifts were somewhat larger than those occurring in the total male labor force. The shift to a more educated manufacturing work force took place all across the country; in most regions, the increase in the education level in manufacturing exceeded that in the total labor force (Table 3). The experience in the manufacturing sector, in sum, supports popular perceptions of disproportionately large employment losses among the least educated. This pattern, furthermore, is in agreement with the concepts of outsourcing and technological change favoring the more educated.[17] Variations among regions raise the possibility of distinguishing between the two.

The concept of outsourcing manufacturing production to lower-wage locations would predict the following effects: (1) higher-wage regions within the United States would see their share of U.S. manufacturing jobs decline while lower-wage regions would gain; (2) this shift would be more pronounced for less

Figure 3

*Educational Level of U.S. Male Workers, 1979 and 1988*




Source: U. S. Bureau of the Census, *Current Population Survey,* 1980 and 1989.

Table 3

*Changes in the Composition of the Male Work Force by Years of Education, 1979 to 1988*

Percentage Points

| | Total Male Work Force Years of Education | | | | Manufacturing Years of Education | | | |
|---|---|---|---|---|---|---|---|---|
| Region | <12 | 12 | 13–15 | 16+ | <12 | 12 | 13–15 | 16+ |
| United States | −6.0 | .5 | 1.3 | 4.3 | −7.9 | 1.5 | 1.5 | 5.0 |
| New England | −8.1 | .5 | 1.8 | 5.7 | −8.2 | .8 | .5 | 6.9 |
| Middle Atlantic | −7.1 | .4 | .7 | 6.0 | −7.4 | 1.7 | .5 | 5.2 |
| East North Central | −6.6 | .2 | 2.5 | 4.4 | −7.8 | −.6 | 3.0 | 5.4 |
| West North Central | −7.0 | .2 | 1.0 | 5.8 | −9.0 | 7.3 | −4.9 | 6.5 |
| South Atlantic | −7.9 | 3.2 | .8 | 3.9 | −10.2 | 6.3 | 1.3 | 2.6 |
| East South Central | −9.1 | 5.0 | 1.5 | 2.7 | −12.1 | 4.8 | 2.1 | 5.2 |
| West South Central | −6.0 | −1.0 | 2.0 | 5.0 | −10.0 | 2.3 | −.4 | 8.1 |
| Mountain | −1.8 | −.5 | .9 | 1.4 | −1.3 | .5 | −5.6 | 6.4 |
| Pacific | −1.2 | −.9 | .2 | 2.0 | −6.0 | −.4 | 4.4 | 2.0 |

Source: U.S. Bureau of the Census, *Current Population Survey,* 1980 and 1989, and author's calculations.

educated workers, who are concentrated in production (rather than management, R&D, sales or general support); and (3) these differential shifts would be reflected in college wage premiums, with the returns to college education increasing more in the higher-wage regions that were losing manufacturing jobs.

As can be seen from Table 4, shifts in overall manufacturing employment provide some support for the first element in this chain. Three regions, New England, the Middle Atlantic, and the East North Central, saw their shares of U.S. manufacturing employment decline. All three had manufacturing wages above the national average in 1988.

When the focus turns to the shifts among dif-

Table 4
*Changes in Regional Shares of U.S. Manufacturing Employment by Education Group between 1979 and 1988, and Relative Manufacturing Wages in 1988*

| | Percentage Point Changes in Share of U.S. Manufacturing Employment | | | | | Relative Wages (U.S. = 100) |
|---|---|---|---|---|---|---|
| Region | All | Dropouts | High School | Some College | Graduates | 1988 |
| New England | −.9 | −1.0 | −.9 | −1.3 | −1.1 | 109.4 |
| Middle Atlantic | −3.0 | −2.6 | −3.0 | −3.2 | −3.6 | 107.8 |
| East North Central | −3.9 | −4.0 | −5.7 | −1.7 | −1.1 | 107.8 |
| West North Central | .3 | −.6 | 1.2 | −2.1 | .9 | 92.7 |
| South Atlantic | 3.0 | 3.4 | 4.4 | 2.7 | 1.1 | 92.3 |
| East South Central | 0 | −.3 | .6 | .3 | .8 | 87.5 |
| West South Central | 1.3 | .9 | 1.4 | .5 | 2.8 | 91.9 |
| Mountain | 1.1 | 1.4 | .9 | .3 | 1.3 | 93.3 |
| Pacific | 2.0 | 2.8 | 1.2 | 4.5 | −1.0 | 100.2 |

Note: Wages were calculated from the average log wages for each region and U.S. sample.
Source: U.S. Bureau of the Census, *Current Population Survey*, 1980 and 1989, and author's calculations.

ferent education groups, support for the outsourcing hypothesis weakens. In the Middle Atlantic states and New England, the loss of manufacturing jobs was not concentrated among the least educated, as outsourcing would suggest. The Middle Atlantic states and New England experienced bigger declines in their shares of U.S. college graduates employed in manufacturing than in their shares of total manufacturing employment. Among the regions gaining manufacturing share, the West South Central experienced a much larger increase in its share of highly educated manufacturing workers than in its share of total manufacturing employment. Only the East North Central and South Atlantic regions seem to fit the regional outsourcing explanation. The employment losses in the East North Central were disproportionately among the less educated, while the employment gains in the South Atlantic were concentrated in this group.

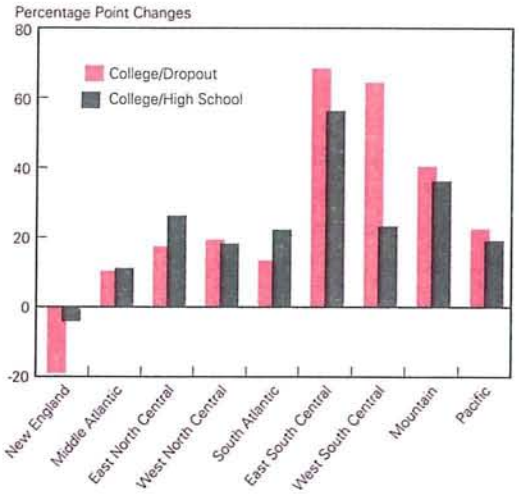
To test the final element in the outsourcing argument, Model I was applied to data on males employed in the manufacturing sector. The results of these regressions show a familiar pattern: the returns to college graduates increased in the United States and in eight of the nine regions (Appendix Table A3). The sole exception was New England. A comparison of Figure 4 with Figure 1 reveals that the increases in the college graduate wage premiums varied more for manufacturing than total employment. The increase in the college/high school wage for all industries, measured by Model I, ranged from 9 percentage points in New England to 30 in the East South Central. In the manufacturing sector, changes in the college/high school wage ranged from a 9 percentage point decline in New England to a 56 percentage point increase in the East South Central region. Such results suggest that the forces behind the changes in the wage structure operated more powerfully on the manufacturing sector than on the economy as a whole, or that different or additional forces were at work in manufacturing.

Do these results support the concept of outsourcing in manufacturing? If outsourcing between regions were a major factor, one would expect to find greater than average increases in college premiums in the regions that lost shares of manufacturing employment (New England, the Middle Atlantic, and the East North Central). Instead, the college/high school wage in manufacturing fell in New England and increased less in the Middle Atlantic states than in those regions whose share of U.S. manufacturing employment increased. Once again, only the East North Central region seems to fit a regional outsourcing explanation. Here the college/high school wage increased somewhat more than average.

Outsourcing to foreign countries might still account for the changes in the wage structure, even if outsourcing from high-wage to low-wage regions does not. The decreases in dropouts' shares of manufacturing employment support this notion. These losses were generally greater than the losses occurring in other industrial sectors. As most other sectors

Figure 4

*Changes in College/Dropout and College/High School Relative Wages in Manufacturing, 1979 to 1988*




Source: Table A3, and author's calculations as described in the Appendix.

are much less actively involved in trade and have limited capability to shift operations overseas, this pattern is in accordance with possible outsourcing to other nations.

Technological change is another possible explanation of the changes occurring in the manufacturing sector. The shifts in manufacturing employment toward greater reliance upon the more educated were substantially greater than comparable changes in the male labor force, and are consistent with a story of education-biased technological change. This is further supported by the sharp rise in the returns to education in the manufacturing sector. That such changes were generally greater in manufacturing than in the economy as a whole would imply that education-biased technological change was more prevalent in that sector. Perhaps competitive pressures associated with the trade deficit caused new technologies to be adopted more rapidly in manufacturing. Perhaps the new technologies were simply more easily implemented in manufacturing. If technological change can occur unevenly, however, many sectoral and regional patterns can be compatible with its influence and its value as an explanation is compromised.

## *IV. Demographics and Relative Supply Changes*

The declines in returns to education that occurred in the 1970s were, as previously mentioned, largely attributable to the increases in the relative supply of college-educated individuals as the baby-boom cohorts entered the labor market. It is only natural, then, to look to the supply side for some explanation of the increasing returns witnessed in the 1980s.

Unlike the demographic phenomena of the 1970s, however, no clear-cut supply-side explanation can be made for the changes that took place in the 1980s. On the most elementary level, the evidence confounds the issue, as the educational attainment of the labor force continued to rise. The percentage of the labor force with less than 12 years of education declined and the percentage with more than 16 years (college graduates) increased in all nine regions. Moreover, with respect to the college/high school wage differential, the increases in the college graduate share of the labor force exceeded the increases in the high school graduate share in all regions except the East South Central.

However, the increasing returns to college have reportedly been greatest among young males, and a comparison of these increases with changes in the supply of college educated young men suggests that supply factors did make some contribution. A regression using Model III but with the sample limited to males with one to ten years of potential experience (henceforth referred to as "young males") corroborates the large relative wage gains of young college graduates. The returns to education are presented in Appendix Table A4 and the changes in the college/high school wage are shown in Table 5.

In the United States, the college/high school wage for young males increased nearly 12 percentage points, versus the roughly 8 percentage point increase among all males. The differences at the regional level were in some cases much greater, in others surprising. The college/high school wage among young males in the East North Central region increased 22 percentage points, while among all males the college/high school wage increased only 3 percentage points. The East South Central region, meanwhile, was surprising in that the college/high school relative wage increased over 11 percentage points among all males yet declined by 25 percentage points among the least experienced.

Katz and Revenga (1989) argue that slower

Table 5

*Ratio of College to High School Graduates among Young Males[a] and All Males in the Labor Force and the Change in the College/High School Wage, 1979 to 1988*

| Region | Male Labor Force | College/High School Graduates 1979 | College/High School Graduates 1988 | Percentage Point Change in College/High School Wage |
|---|---|---|---|---|
| United States | Young: | .58 | .64 | 12 |
| | All: | .54 | .64 | 8 |
| New England | Young: | .67 | .83 | 1 |
| | All: | .65 | .79 | −2 |
| Middle Atlantic | Young: | .66 | .72 | 21 |
| | All: | .52 | .66 | 17 |
| East North Central | Young: | .47 | .58 | 22 |
| | All: | .42 | .53 | 3 |
| West North Central | Young: | .54 | .66 | 1 |
| | All: | .45 | .58 | 2 |
| South Atlantic | Young: | .54 | .63 | 2 |
| | All: | .55 | .61 | 15 |
| East South Central | Young: | .47 | .48 | −25 |
| | All: | .42 | .43 | 11 |
| West South Central | Young: | .51 | .54 | 19 |
| | All: | .51 | .66 | 7 |
| Mountain | Young: | .65 | .52 | 20 |
| | All: | .64 | .69 | 4 |
| Pacific | Young: | .77 | .77 | 21 |
| | All: | .79 | .87 | 12 |

[a]"Young Males" refers to those with 1 to 10 years of potential experience.

Source: U.S. Bureau of the Census, *Current Population Survey*, 1980 and 1989; Appendix Tables A2 and A4; and author's calculations.

growth in the numbers of U.S. male college graduates partly explains the rising returns to education among younger males. And as can be seen from Table 5, the ratio of college graduates to high school graduates did not increase as much for young males (.58 to .64) as it did for all males (.54 to .64).

At the regional level as well, some of the difference between the experience of young males and that of all males seems attributable to changes in the supply of college graduates relative to high school graduates. In five of the nine regions, the ratio of college graduates to high school graduates did not increase as much for young men as it did for all men; and in four of these five regions, the increase in the college/high school wage was greater for the younger group (Table 5). Moreover, in the West South Central and Mountain regions, where the disparity between the educational gains of all men and those of younger men was largest, the college wage premium increased much more for younger men. The experience of the South Atlantic also tends to support the notion of labor supply effects: the increase in the ratio of college graduates to high school graduates was larger for young men than for all men and the college wage premium increased much more modestly for younger men than for all men.

While differences in the relative supplies of college graduates appear to fit some of the changes in relative wages, in a few cases they complicate the issue. In the East North Central region, the ratio of college graduates to high school graduates increased similarly for young males and all males. Despite this similarity, the college wage premium increased much more for younger workers. The experience of the East South Central states was also puzzling. Here, the ratio of college graduates to high school graduates increased only slightly among both younger men and all men. However, the college wage premium rose for all men, while it fell for the youngest group.

The bottom line remains that changes in the relative supplies of college graduates cannot by themselves explain the increases in the relative wages of the most educated. Relative demand shifts must have occurred over the period, at times overwhelming the effects of supply changes. This, in fact, was the conclusion reached by Murphy and Welch (1988) in a very detailed study of relative demand changes and subsequently corroborated by other authors.

### *Unemployment Rates*

Unemployment rates offer one informal means of representing the interactions between relative demands and supplies. At the national level, the relative availability of college graduates increased. The unemployment rates for college and high school graduates were roughly the same in 1988 as 1979, however. This suggests that the shift in relative demand for college graduates kept pace with their increase in relative supply.

The stability at the national level masks striking differences among the regions, as can be seen in Table 6. In four regions, unemployment rates increased among both high school and college graduates. In the West South Central and Mountain states, these increases were substantial and fairly similar.

In the East South Central and West North Central regions, the percentage point increases were considerably larger for high school graduates than college graduates, indicating that while demand grew more slowly than supply for both groups, college graduates were favored. In the South Atlantic and Pacific regions, college graduates were again favored as unemployment rates fell for them and increased for high school graduates. And in the Mid Atlantic, unemployment rates fell for both groups, but more for college graduates.

In New England and the East North Central region, unemployment rates for high school graduates fell while rates increased for college graduates. Here it would seem that relative demand shifts favoring college graduates did not outweigh the expansion in the relative supply of college graduates. New England was also the only region in which the college wage premium did not increase in the 1980s, after taking into account industry and occupation effects. The general decline in New England's unemployment rate suggests, however, that this result was due more to a strong demand for high school graduates than to weak demand for college graduates.

Can the changes in unemployment rates explain the changes in the relative wages across the regions? In other words, can the changes in unemployment rates proxy for supply and demand shifts, reconciling the changes in both? The Phillips curve literature postulates an inverse relationship between changes in wages and unemployment rates, with higher unemployment rates associated with slower wage growth. If high school and college graduates could not be substituted in the workplace, a Phillips curve type of relationship could be estimated for each skill group independent of the other. Of course, there is substitutability, though less than perfect, between skill groups. The wage of each skill group should therefore depend not only on its own unemployment rate but also, at the margin, on that of the other skill group.

Accordingly, regional changes in relative wages were related to changes in the unemployment rates for high school and college graduates. Specifically, changes in the college/high school wage were assumed to be an inverse function of the changes in college and high school graduate unemployment rates. The college/high school wage should increase in response to a decline in the unemployment rate for college graduates. A decline in the unemployment rate for high school graduates, on the other hand, should be associated with an increase in the high school graduate wage and, thus, a decline in college/high school wage.

This relationship was estimated using a simple ordinary least squares method (Table 7). The esti-

Table 6
*Changes in U.S. and Regional Unemployment Rates for Men, 1979 to 1988*

| | | All | Dropouts | High School | Some College | Graduates |
|---|---|---|---|---|---|---|
| Unemployment Rate | | | | | | |
| United States | 1979 | 13.7 | 19.5 | 15.1 | 12.1 | 6.1 |
| United States | 1988 | 13.0 | 19.7 | 15.4 | 11.2 | 6.0 |
| Percentage Point Change in Unemployment Rate, 1979–88 | | | | | | |
| United States | | −.7 | .2 | .3 | −.9 | −.1 |
| New England | | −3.3 | −7.0 | −2.6 | −4.0 | .9 |
| Middle Atlantic | | −1.5 | −1.7 | −.9 | 2.3 | −2.0 |
| East North Central | | −2.2 | −1.1 | −1.3 | −3.3 | .5 |
| West North Central | | 1.1 | 3.9 | 2.4 | 1.2 | .4 |
| South Atlantic | | −1.5 | −3.5 | .3 | 1.0 | −1.5 |
| East South Central | | 1.8 | 1.3 | 3.8 | 3.0 | 1.1 |
| West South Central | | 3.1 | 6.5 | 3.5 | 2.1 | 3.9 |
| Mountain | | 3.7 | 7.8 | 3.5 | 3.2 | 2.9 |
| Pacific | | −1.6 | .7 | .5 | −4.6 | −1.9 |

Note: These unemployment rates are significantly higher than those normally published, as they represent a summation of all individuals experiencing any unemployment in a given year.
Source: U.S. Bureau of the Census, *Current Population Survey*, 1980 and 1989, and author's calculations.

mated coefficients are plausibly signed and the changes in the two unemployment rates appear to explain a portion of the changes in relative wages. These results suggest that a more rigorous analysis would show that, while supplies of more educated men were increasing, demand shifts favoring the more educated were even greater, producing the rising returns to education witnessed in the 1980s.

Table 7
*Results of Regressing the Change in the College/High School Relative Wage on the Changes in the Inverse of the Unemployment Rates of the Two Groups*
Dependent Variable = the percentage point change in college/high school relative wage (from Table 1).

| | |
|---|---|
| Constant | .17<br>(13.9) |
| X1 | .54<br>(2.3) |
| X2 | −5.81<br>(−4.1) |
| $\bar{R}^2$ | .65 |

where X1 = 1/CUR88–1/CUR79, where CUR is the unemployment rate for college graduates (Table 6).

X2 = 1/HUR88–1/HUR79, where HUR is the unemployment rate for high school graduates (Table 6).

Figures in parentheses are t-statistics.
Number of observations = 9.

## V. Conclusions

This study set out to examine changes in the structure of men's wages in the 1980s on a regional basis. The analysis corroborates evidence presented by other authors of a rising return to skill in the United States during the decade. It has also demonstrated that the experience of a changing wage structure has not been uniform across regions. The wages of college graduates rose in all regions relative to the less educated, but to varying extents and perhaps for different reasons. Both demand and supply shifts were sufficiently varied between regions to cause sizable differences in the movement of relative wages.

Changes in industry employment patterns (shifts between sectors) appear responsible for some of the increases in relative wages, again to a differing degree among the regions. The rise in the wages of the most educated, relative to the less educated, is smaller when changes in industry affiliation are accounted for. Changes within industries, in occupational patterns, and in returns to occupations also contributed to changes in the returns to education in all regions.

The analysis of the effects of industry shifts and within-industry changes, while not providing direct evidence, conforms to arguments that large product demand shifts changed employment patterns and returns to skill in the 1980s, favoring more educated workers. The data were examined for patterns supporting outsourcing and skill-biased technological change as explanations. During the 1980s, manufacturing employment shifted within the United States to lower-wage regions. The shifts were not concentrated among the least educated, however, as a simple version of outsourcing might predict (assuming production workers are generally less educated than non-production workers). Thus, with the exception of the East North Central region, the changes in returns to skill in the regional manufacturing sectors do not support outsourcing between regions as a major factor behind the changes in wage structures. Outsourcing to low-wage foreign nations remains a possible cause of these changes, however. The move towards more educated manufacturing work forces in all regions is consistent with what might be expected if outsourcing to low-wage foreign nations and skill-biased technological change were taking place. The rising returns to skill in manufacturing witnessed in almost all regions (New England being the sole exception) provide indirect support for these hypotheses.

The study also finds that changes in relative supplies of labor were generally not behind the rising returns to skill. Changes in the regional labor forces indicate increasing relative supplies of more educated workers. Thus, changes in relative wages cannot be attributed primarily to changes in labor supplies as Freeman (1977, 1978) and Welch (1979) concluded with respect to the wage changes of the 1970s. Relative supply changes may nevertheless have made some contribution, particularly in the case of young males, among whom the growth in the relative supply of college graduates slowed.

Analysis of unemployment rates in the nine regions suggests that the influence of relative supply shifts was offset by shifts in relative demand. The changes in relative supplies were linked to demand shifts through a Phillips curve type of relationship. Lower unemployment rates among college graduates

were associated with greater increases in the college wage premium, as were higher unemployment rates among high school graduates. In New England, a vigorous economy and an exceptionally strong demand for less educated workers relative to supply seems to account for the unusually small increase in the college premium in that region.

Documenting the changes in the wage structures at a regional level raised more questions than it answered. No single explanation seems to cover the bulk of the changes in wage structures during the 1980s. This is in stark contrast to the experience of the 1970s. Thus, while this study has documented the regional experiences of the 1980s and pointed to some promising explanations, it leaves a wide research agenda open for the future.

## Appendix: The Data and Methodology

### *I. Model I—Returns to Education and Experience*

The data used for this study were taken from the March 1980 and 1989 *Current Population Surveys* (CPS), which included income and employment data for 1979 and 1988, respectively. Individual CPS observations included in this analysis were restricted to civilian men, aged 18 to 65, employed in 1979 and 1988. Individuals reporting more than one employer during the year or individuals identifying themselves as self-employed or having worked without pay were excluded.

Based on the actual years of schooling completed, each individual was categorized as a dropout (less than 12 years of education), a high school graduate (12 years), an individual with some college education (13 to 15 years), or a college graduate (16 or more years of schooling).

Potential experience was proxied by a function used by Mincer (1974) and now conventional in the literature:

$$\min(\text{Age} - \text{Years of Schooling} - 6, \text{Age} - 18).$$

Observations were then classified by potential experience of 1 to 10, 11 to 20, 21 to 30, 31 to 40, and 41 or more years. With four education classes and five potential experience classes, each observation thus fell into one of 20 education/experience cells.

Hourly wages were proxied using data on annual income, weeks employed, and hours worked per week as reported from the supplementary questionnaires of the March surveys. Wages were converted to real terms by deflating incomes using the Personal Consumption Expenditure Implicit Price Deflator.

One problem confronting the user of CPS income data arises from the top-coding of respondents' incomes, which truncates the true distribution. In the March 1980 CPS, for example, salary and wages earned in 1979 were top-coded at a maximum of $50,000. The 1989 survey top-coded salary and wages at $99,999. Following Kosters (1989), this problem was addressed by fitting a Pareto distribution to the observations in each of the 20 education/experience cells. Using a method of maximum likelihood estimation, an estimate of the mean of the true incomes of those individuals reporting the maximum top-coded incomes was thus obtained within each cell.

The data were analyzed using hedonic log-wage multivariate regressions of the following basic form:

$$\ln W = \alpha_0 + \sum_{j=1}^{3} \beta_j E_j + \sum_{k=1}^{4} \gamma_k X_k + \sum_{m} \delta_m Z_m + \xi$$

where w is the real hourly wage; $E_j$ is a dummy variable representing high school graduates, some college, and college graduates; $X_k$ is a dummy variable for each potential experience class; $Z_m$ is one of a list of demographic variables affecting wages, as described below; and $\xi$ is an error term.

The hedonic log-wage regression equations have the desirable property that the resulting coefficients provide estimates of the "characteristic returns" to the various labor groups. The coefficient for college graduates ($\beta_3$), for example, can be interpreted as the average labor market return to sixteen or more years of education, other things equal. It is thus an estimate of the log wage differential received by a college graduate above the basic rates paid to dropouts.

Variables identifying race or ethnic group (black and Hispanic) were included to control for the possible discrimination effects. Marital status was also controlled for by a dummy variable. A dummy variable was also included identifying residence outside a Standard Metropolitan Statistical Area (SMSA), acknowledging the historically lower wages paid outside SMSAs. Lastly, variables identifying full-time workers having worked less than a full year and part-time workers employed either for a full year or a portion thereof were included to distinguish the desirability of different employment terms. The above constitutes the basic model or Model I.

Because of the large number of variables, only the coefficients for the human capital variables are presented in the appendix tables. These coefficients estimate the returns to each education (or experience) class relative to the earnings of a male with less than a high school education (and 10 or less years of experience). For example, in Table A1 the coefficient for a high school education in 1979 shows male U.S. high school graduates earned a "wage premium" of .219 log points or nearly 25 percent more than a male with less than twelve years of education; college graduates tended to earn .500 log points (65 percent) more than males with less than twelve years of education.

Table A1

*Returns to Years of Education and Potential Experience for Male Workers, 1979 and 1988*

Estimated Coefficients from Model I

| | Years of Education[a] | | | Years of Potential Experience[b] | | | |
|---|---|---|---|---|---|---|---|
| Region | 12 | 13–15 | 16+ | 11–20 | 21–30 | 31–40 | 41+ |
| 1979 | | | | | | | |
| United States | .219 | .289 | .500 | .247 | .320 | .322 | .236 |
| New England | .207 | .319 | .558 | .264 | .345 | .382 | .310 |
| Middle Atlantic | .189 | .271 | .561 | .286 | .384 | .402 | .281 |
| East North Central | .152 | .199 | .409 | .293 | .349 | .375 | .262 |
| West North Central | .204 | .281 | .432 | .231 | .315 | .308 | .166 |
| South Atlantic | .230 | .346 | .572 | .245 | .309 | .327 | .255 |
| East South Central | .267 | .291 | .458 | .230 | .323 | .280 | .191 |
| West South Central | .217 | .281 | .526 | .255 | .301 | .242 | .199 |
| Mountain | .205 | .210 | .426 | .185 | .286 | .237 | .235 |
| Pacific | .226 | .289 | .441 | .216 | .289 | .299 | .212 |
| 1988 | | | | | | | |
| United States | .213 | .339 | .637 | .275 | .397 | .407 | .401 |
| New England | .178 | .291 | .587 | .215 | .305 | .319 | .260 |
| Middle Atlantic | .185 | .378 | .653 | .258 | .391 | .401 | .358 |
| East North Central | .190 | .325 | .567 | .246 | .429 | .442 | .441 |
| West North Central | .182 | .318 | .559 | .270 | .382 | .374 | .359 |
| South Atlantic | .196 | .344 | .678 | .296 | .370 | .404 | .465 |
| East South Central | .207 | .333 | .622 | .227 | .449 | .399 | .280 |
| West South Central | .259 | .331 | .687 | .304 | .382 | .420 | .448 |
| Mountain | .233 | .300 | .601 | .273 | .393 | .409 | .422 |
| Pacific | .235 | .355 | .630 | .322 | .432 | .390 | .346 |

Note: Standard errors are suppressed for the sake of brevity. A t-test on the null hypothesis that a given estimated coefficient is not significantly different from zero allowed rejection of the null for each and every human capital variable at a 99 percent confidence level in every regional cross-section as well as the United States. An f-test performed on each cross-section rejected the null hypothesis that the human capital and demographic variables are jointly insignificant in explaining the variation in the dependent variable, also at a 99 percent confidence level. Finally, an f-test performed for each sample year rejected the null hypothesis in each case that the regional coefficients are not significantly different from those estimated for the entire U.S. sample, again at a 99 percent confidence level.

[a]Education groups for this study are: less than 12 years of education (dropouts); 12 years (high school graduates); 13 to 15 years (some college); 16 or more years (college graduates).

[b]Potential experience groups are: 1 to 10 years of potential experience; 11 to 20; 21 to 30; 31 to 40; 41 or more.

Source: U.S. Bureau of the Census, *Current Population Survey*, 1980 and 1989; author's calculations.

Dummy variables identifying industry of employment and occupation group were added to the basic model to arrive at Model III. The inclusion of industry affiliation variables is justified on three grounds. First, industry variables in hedonic log-wage regressions proxy workplace characteristics that may enter the decision-making process of a worker seeking employment. Work in a hazardous industry such as mining is less desirable, all else equal, than less hazardous employment. A potential worker must therefore be compensated with a risk premium. Second, the industry dummies control for the employment shifts between industries, which have an impact on the wage structure since average wages vary between industries. A final justification for the inclusion of industry variables is provided by the efficiency wage literature. Variables identifying industry affiliation may control for "rents," which vary among industries and which may be paid to workers in the form of efficiency wage premiums. Occupational groups were also distinguished by dummy variables to account for job characteristics necessitating differential compensation and for job-specific capital not captured by education and potential experience proxies. These variables also control for shifts in occupational patterns.

## II. Model II—Industry Shift Effects

The cross-sectional data for 1979 and 1988 were pooled. A dummy variable t was constructed where t equaled one for 1988 observations, zero otherwise. The basic hedonic log-wage equation, Model I, was modified to include industry affiliation variables, along with the human capital variables, with the following form:

$$\ln w = \alpha_o + \sum_{j=1}^{3} \beta_j E_j + \sum_{j=1}^{3} B_j E_j t + \sum_{k=1}^{4} \gamma_k X_k$$

$$+ \sum_{k=1}^{4} Y_k X_k t + \sum_{i} \phi_i I_i + \sum_{m} \delta_m Z_m + \sum_{m} D_m Z_m t + \xi$$

This equation yields distinct estimates of the characteristic returns to education and experience for 1979 ($\hat{\beta}_j$, $\hat{\gamma}_k$) and 1988 ($\hat{B}_j$, $\hat{Y}_k$) while estimating constant average industry wage effects ($\hat{\phi}_i$) for both years.

Table A2

*Returns to Years of Education and Potential Experience for Male Workers, 1979 and 1988*

Estimated Coefficients from Model III

| | Years of Education[a] | | | Years of Potential Experience[b] | | | |
|---|---|---|---|---|---|---|---|
| Region | 12 | 13–15 | 16+ | 11–20 | 21–30 | 31–40 | 41+ |
| 1979 | | | | | | | |
| United States | .161 | .215 | .389 | .214 | .276 | .272 | .210 |
| New England | .137 | .195 | .393 | .234 | .282 | .330 | .242 |
| Middle Atlantic | .120 | .164 | .340 | .248 | .338 | .332 | .242 |
| East North Central | .133 | .182 | .379 | .251 | .314 | .321 | .242 |
| West North Central | .134 | .196 | .365 | .204 | .270 | .273 | .184 |
| South Atlantic | .165 | .239 | .389 | .190 | .240 | .250 | .205 |
| East South Central | .208 | .217 | .401 | .195 | .276 | .255 | .166 |
| West South Central | .129 | .186 | .394 | .223 | .268 | .215 | .190 |
| Mountain | .120 | .122 | .350 | .172 | .266 | .215 | .215 |
| Pacific | .149 | .198 | .305 | .199 | .244 | .245 | .191 |
| 1988 | | | | | | | |
| United States | .146 | .215 | .441 | .237 | .334 | .335 | .343 |
| New England | .119 | .151 | .355 | .176 | .264 | .290 | .220 |
| Middle Atlantic | .138 | .269 | .492 | .225 | .346 | .338 | .324 |
| East North Central | .146 | .231 | .420 | .214 | .356 | .358 | .341 |
| West North Central | .123 | .201 | .367 | .201 | .293 | .277 | .313 |
| South Atlantic | .127 | .202 | .463 | .211 | .326 | .294 | .319 |
| East South Central | .131 | .202 | .407 | .166 | .372 | .312 | .214 |
| West South Central | .185 | .211 | .499 | .265 | .305 | .348 | .374 |
| Mountain | .134 | .176 | .399 | .230 | .320 | .353 | .379 |
| Pacific | .119 | .186 | .370 | .286 | .370 | .317 | .297 |

Notes and Source: See Table A1.

Table A3

*Returns to Years of Education and Potential Experience for Males Employed in Manufacturing, 1979 and 1988*

Estimated Coefficients using Model I Approach

| | Years of Education[a] | | | Years of Potential Experience[b] | | | |
|---|---|---|---|---|---|---|---|
| Region | 12 | 13–15 | 16+ | 11–20 | 21–30 | 31–40 | 41+ |
| 1979 | | | | | | | |
| United States | .227 | .296 | .591 | .218 | .303 | .328 | .269 |
| New England | .231 | .361 | .756 | .229 | .332 | .364 | .300 |
| Middle Atlantic | .188 | .285 | .650 | .256 | .381 | .397 | .306 |
| East North Central | .196 | .262 | .512 | .245 | .318 | .331 | .314 |
| West North Central | .160 | .211 | .493 | .214 | .267 | .345 | .257 |
| South Atlantic | .276 | .346 | .764 | .251 | .355 | .383 | .305 |
| East South Central | .245 | .313 | .531 | .192 | .296 | .245 | .273 |
| West South Central | .137 | .236 | .498 | .165 | .159 | .171 | .069 |
| Mountain | .157 | .150 | .390 | .130 | .274 | .278 | .206 |
| Pacific | .252 | .292 | .480 | .205 | .298 | .331 | .291 |
| 1988 | | | | | | | |
| United States | .195 | .370 | .716 | .267 | .414 | .436 | .498 |
| New England | .160 | .373 | .661 | .255 | .335 | .338 | .280 |
| Middle Atlantic | .171 | .315 | .703 | .235 | .380 | .361 | .410 |
| East North Central | .156 | .306 | .642 | .264 | .474 | .511 | .531 |
| West North Central | .150 | .224 | .606 | .196 | .393 | .356 | .413 |
| South Atlantic | .210 | .434 | .823 | .286 | .346 | .372 | .540 |
| East South Central | .235 | .424 | .869 | .255 | .424 | .519 | .612 |
| West South Central | .316 | .519 | .828 | .260 | .455 | .466 | .553 |
| Mountain | .146 | .221 | .629 | .359 | .574 | .589 | .739 |
| Pacific | .240 | .399 | .612 | .264 | .349 | .435 | .625 |

Notes and Source: See Table A1.

Table A4

*Returns to Years of Education among Young Males (Males with 1 to 10 Years of Potential Experience), 1979 and 1988*

Estimated Coefficients from Model III

| Region | Years of Education[a] 12 | 13–15 | 16+ |
|---|---|---|---|
| 1979 | | | |
| United States | .153 | .223 | .384 |
| New England | .117 | .131 | .325 |
| Middle Atlantic | .148 | .211 | .323 |
| East North Central | .177 | .210 | .359 |
| West North Central | .026 | .106 | .249 |
| South Atlantic | .117 | .239 | .438 |
| East South Central | .165 | .246 | .358 |
| West South Central | .095 | .202 | .284 |
| Mountain | .133 | .131 | .355 |
| Pacific | .123 | .194 | .310 |
| 1988 | | | |
| United States | .151 | .237 | .470 |
| New England | .113 | .200 | .326 |
| Middle Atlantic | .201 | .401 | .537 |
| East North Central | .072 | .175 | .426 |
| West North Central | .069 | .190 | .297 |
| South Atlantic | .152 | .185 | .489 |
| East South Central | .122 | .220 | .331 |
| West South Central | .216 | .256 | .551 |
| Mountain | .181 | .258 | .553 |
| Pacific | .136 | .236 | .484 |

Notes and Source: See Table A1.

[1] A partial list of the recent work in this area would include: Blackburn, Bloom and Freeman (1989 a,b); Bound and Johnson (1989 a,b); Katz and Revenga (1989); Kosters (1989); and Murphy and Welch (1988, 1989).

[2] Welch (1979) corroborated Freeman's work, carefully relating the declines in the returns to education and in the wages of young males to the expansion of the relative supply of young educated males.

[3] Concern over "good jobs" versus "bad jobs" was expressed early on by Bluestone and Harrison (1982). A useful survey of the debate may be found in Loveman and Tilly (1988). Questions regarding a proximate issue, "the vanishing middle class," were first raised by Kuttner (1985), and have since been addressed by Bradbury (1986, 1990) and Levy (1987, 1989), among others.

[4] The need to limit the scope of this study required excluding females. While the wage structure for females also evinced rising returns to skill in the 1980s, the differences between females' and males' experiences demand separate studies.

[5] The nine U.S. census regions are New England (CT, MA, ME, NH, RI, VT), the Middle Atlantic (NJ, NY, PA), the East North Central (IL, IN, MI, OH, WI), the West North Central (IA, KS, MN, MO, ND, NE, SD), the South Atlantic (DC, DE, FL, GA, MD, NC, SC, VA, WV), the East South Central (AL, KY, MS, TN), the West South Central (AR, LA, OK, TX), the Mountain (AZ, CO, ID, MT, NM, NV, UT, WY), and the Pacific (AK, CA, HI, OR, WA).

[6] For the nation as a whole, 1979 and 1988 represent roughly comparable points in the business cycle. Unemployment rates in these years were similar. Thus, the rise in returns to skill at the national level does not simply reflect a phase of the business cycle. However, unemployment rates in some of the regions changed substantially over the period. Moreover, unemployment rates differ considerably from one region to another. Thus, some of the observed changes in the returns to skill at the regional level and some of the variations among regions may reflect changes and variations in general labor market conditions.

[7] As the estimated wages have been calculated in log form, the ratio of real hourly wages of any two skill groups is obtained simply by exponentiating the difference of the respective groups' estimated log wages.

[8] Using different methodologies other authors have found roughly equivalent increases. Blackburn, Bloom, and Freeman (1989b), for example, find that the college/dropout relative wage increased from 1.584 in 1979 to 1.878 in 1988 among males aged 25 to 64. Bound and Johnson (1989a) find that the college/high school relative wage increased from 1.30 to 1.57 among males with five years of potential experience. Katz and Revenga (1989) find that the college/high school relative wage increased 14 percent among males between the ages of 18 and 65.

[9] The returns to skill gathered through experience also increased among males between 1979 and 1988. In the nation and eight of the nine regions, the experience-earnings profile of males steepened, as wage gains were proportionately greater among the most experienced. New England was an exception to the trend; the returns to all the more experienced cohorts fell relative to those of the least experienced.

[10] Bound and Johnson (1989a,b) provide more exhaustive summaries of the possible explanations for the rising returns to skill. They also give examples of possible methods for testing the various hypotheses directly and the difficulties associated with each test.

[11] Murphy and Welch (1988) compile evidence corroborating this line of argument, though it has not gone unchallenged. Bound and Johnson (1989a), for example, find that product demand shifts cannot explain the bulk of the relative wage changes witnessed in the 1980s.

[12] It should be recognized that Models I and II are not strictly comparable. In particular, the intercept terms differ between 1979 and 1988 in Model I, but Model II implies a common intercept.

[13] These results are generally consistent with those of other studies: specifically, Blackburn, Bloom, and Freeman (1989b) found industry shift effects accounted for 23 to 30 percent of the change in earnings differentials among males between the ages of 25 to 64, and 17 to 24 percent of the changes among males 25 to 34 years of age.

[14] These observations are based upon the changes within each region in the distribution of employment of males meeting the specifications discussed in the Appendix. The resulting distribution does not coincide with the distribution of employment of all males in the nation and in each region.

[15] Freeman and Katz (1988) explore the issue of employment and wage response to changes in product demand and find empirical evidence for a trade-off between the two. Surprisingly, they find that wage response is greater in unionized than in non-unionized industries.

[16] The term outsourcing is also used to describe a firm's contracting out of activities rather than performing them internally. Much of this contracting out should be picked up in the industry and occupational variables. For example, the effect of manufacturers contracting with janitorial services to clean their buildings should be picked up in the shift from manufacturing to services.

[17] This evidence also raises a point of contrast to product demand shifts as an explanation. If an industry suffers adverse product demand shifts, the skill group most concentrated in that sector will suffer the greatest employment losses in absolute number if all skill groups incur a certain percentage cut in employment. The burden, however, lies on the product demand shift hypothesis to explain why some skill groups should suffer a greater percentage loss of their shares of employment in response to the shift.

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