

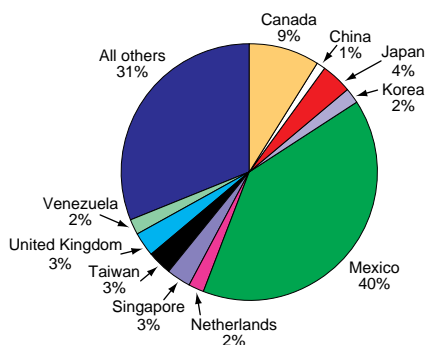
the Southwest ECONOMY

FEDERAL RESERVE BANK OF DALLAS

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Made in Texas: Global Exports Boost State Economy

Chart 1
1994 Texas Exports
(Adjusted for Inflation)



SOURCES: Massachusetts Institute for Social and Economic Research; Federal Reserve Bank of Dallas.

At year-end 1994, Texas' number one trading partner lost half of its buying power in the peso devaluation. Mexico bought 40 percent of Texas merchandise exports last year, and not surprisingly, Mexican demand for Texas goods dropped sharply in early 1995. But just as Texas' prospects for international trade looked their worst, the state's merchandise exports surged to a record-breaking \$17 billion in the first quarter of 1995.

So, why are Texas merchandise exports soaring? While Mexico's demand for Texas goods dropped abruptly, rising demand from Japan, China and other countries pushed Texas exports to unprecedented levels. Much of the rising demand has been for Texas' chemical, electronic, computer and agricultural products.

Exports represent a significant share of Texas' economy, contributing roughly 18 percent of total gross state product, compared with approximately 10.6 percent of total gross domestic product for the nation as a whole.¹ In 1994, Texas' \$60 billion in merchandise exports constituted about 51 percent of the state's total manufacturing sales, up from 44 percent in 1993.

Texas exports stimulated growth in the state even as the national economy weakened. In the first

quarter of 1995, Texas employment growth remained strong, particularly in manufacturing. Preliminary Dallas Fed estimates suggest that the state's total real output soared to an annual rate of 7 percent in the first quarter, up from roughly 4 percent in the fourth quarter of 1994.² In contrast, in the first quarter, U.S. real output increased at an annual rate of 3 percent.

Texas Trades with Many Countries

In recent years, Mexico's rapidly expanding market may have overshadowed growing global demand for Texas goods. More than 50 countries regularly purchase Texas products. Most of these goods are shipped to 10 countries: Mexico, Canada, Japan, the United Kingdom, Taiwan, China, Singapore, Korea, Venezuela and the Netherlands (*Chart 1*). These top 10 markets account for almost 70 percent of Texas merchandise exports. Typically, more than half of those Texas exports are bound for Mexico.³

Over the past seven years, Texas exports to Mexico more than tripled. But as shown in Chart 2, in the last two years, export growth

I N S I D E

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Maquiladoras:
Mexico's Bright Spot

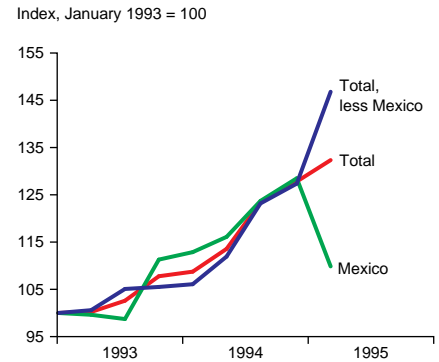
“Texas goods became relatively less expensive in those markets, greatly mitigating the effects of the dollar’s strength relative to the peso.”

to the rest of Texas’ trading partners kept pace with that of Mexico, rising 24 percent. After Mexico’s peso devaluation, exports to these other trading partners surged and helped offset lost trade with Mexico. In the first quarter of 1995, exports to Mexico fell 14 percent. Exports to the rest of Texas’ trading partners jumped 15 percent, resulting in a 4 percent increase in total Texas exports.⁴ As shown in Table 1, rising demand from Japan, Taiwan, China, Korea and the Netherlands boosted Texas’ first-quarter exports.

Other Currency Changes Soften Peso’s Blow

Many factors influenced the demand for Texas exports in the first quarter, but the value of the dollar was perhaps the most important. Between the fourth quarter of 1994 and the first quarter of 1995, the value of the dollar rose 53 percent relative to the peso, greatly increasing the price of U.S. exports to Mexico.⁵ During the same period, however, the value of the dollar relative to most Texas trading partners’ currencies fell. Texas goods became relatively less expensive in those markets, greatly mitigating the effects of the dollar’s strength

Chart 2
Texas Exports to Mexico and the Rest of the World
(Adjusted for Inflation and Seasonal Patterns)



SOURCES: Massachusetts Institute for Social and Economic Research; Federal Reserve Bank of Dallas.

relative to the peso.

An export-weighted value of the dollar helps analysts evaluate the impact of the changing exchange rates of all of Texas’ trading partners. The Texas value of the dollar measures the real dollar/foreign currency exchange rates for 44 countries, weighting them by their importance to Texas trade.⁶ As shown in Chart 3, the total Texas export-weighted value of the dollar increased from October 1994 to March 1995, but not as much as the dollar strengthened against the peso. Even though the value of the dollar fell against the currencies of

Table 1
Top 10 Texas Export Markets, First-Quarter 1995
(Adjusted for Inflation and Seasonal Patterns)

	Percent change in exports	
	From fourth-quarter 1994	From first-quarter 1994
1. Mexico	-14	-4
2. Canada	3	36
3. Japan	37	63
4. United Kingdom	-2	29
5. Taiwan	48	60
6. China	165	275
7. Singapore	7	30
8. Republic of Korea	20	49
9. Venezuela	1	40
10. Netherlands	12	43
Rest of exports (43 countries)	12	25

NOTE: Exports to Mexico would have fallen further without maquiladoras. See related article on page 9.
SOURCE: Massachusetts Institute for Social and Economic Research.

most of Texas' trading partners, the export-weighted value of the dollar increased because Mexico, as the leading trading partner, has the largest weight. In the first quarter of 1995, the total Texas export-weighted value of the dollar rose 14 percent.

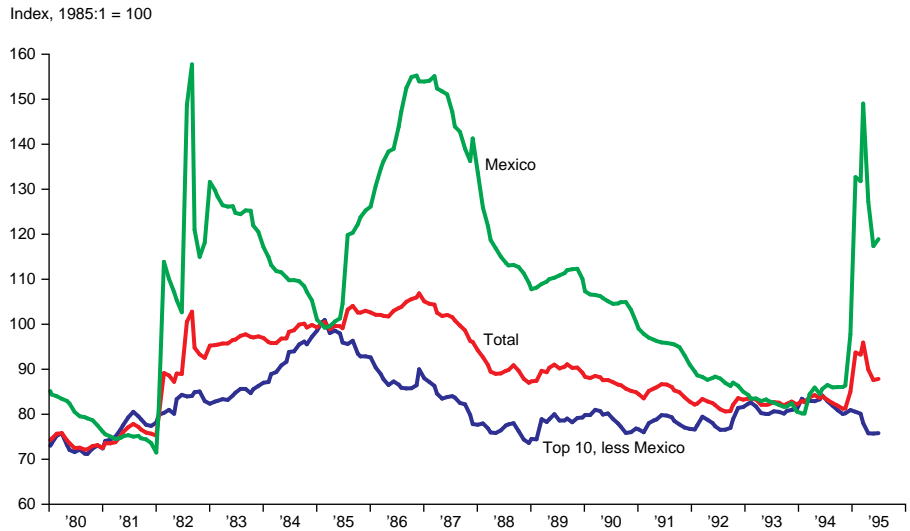
Several Texas Industries Surge

Although Texas ships a variety of products to foreign markets, nearly 90 percent of those goods are from 10 industries. Table 2 ranks Texas' top 10 export industries by the value of sales between first-quarter 1994 and first-quarter 1995. During this period, export growth was driven by strong demand for goods from four industries: chemicals, electronics, industrial machinery (including computers) and agriculture. Together, products from these four industries represented 97 percent of the net gain in Texas exports.

Chemicals. On a year-over-year basis, exports of chemicals and allied products increased 50 percent in the first quarter of 1995, representing 36 percent of the net increase in Texas exports. Strong domestic and international demand for petrochemicals spurred a boom for the Texas chemical industry in 1994. Until recently, however, capacity constraints have limited Texas' exports to the world; most products were consumed by a prospering U.S. economy. In the first quarter of 1995, however, slowing domestic sales allowed Texas manufacturers to meet demand from international customers.

Petrochemicals and related engineering and construction firms have become an important segment of the Texas energy industry.⁷ As a major natural gas processor, the Gulf Coast region is rich with the coproducts necessary to produce petrochemicals. Ethylene and propylene, for instance, are the building blocks for most plastics and rubbers. Global demand for these goods has stimulated the Houston economy and led to several huge expansion projects on the ship

Chart 3
Texas Export-Weighted Value of the Dollar



channel. Construction contractors with roots in the hydrocarbon processing (or petrochemical) industry have diversified to become multinational suppliers of engineering and construction expertise, building major industrial facilities, roads, highways, airports, hotels and resorts around the world. In 1994, five of the top 20 industrial contractors in the world were based in Texas and generated \$4.1 billion in foreign revenues.⁸

Electronics and Electric Equipment. Heavy worldwide demand for semiconductor computer chips and telecommunications equipment helped these industries contribute 27 percent of the net increase in Texas

exports in the first quarter of 1995. Although the United States is still the world's largest semiconductor buyer, global demand is increasing rapidly. Computer chips and other Texas-produced electronic devices are used in an expanding variety of products, including personal computers, cellular telephones, answering machines, cameras, automobiles and microwave ovens. International sales of Texas-produced telecommunications equipment also have been growing rapidly. Texas produces switching components and internal components of state-of-the-art telecommunications networks, such as fiber optic transmission equipment.

Table 2
Top 10 Texas Export Industries, First-Quarter 1995

	Value in millions	Percent change from first-quarter 1994
1. Chemicals	\$3,566	50
2. Electronics and electric equipment	3,377	35
3. Industrial machinery and computer equipment	3,105	25
4. Transportation equipment	1,252	-18
5. Agricultural production—crops	1,093	80
6. Instruments	697	6
7. Food and kindred products	558	6
8. Petroleum and coal products	503	14
9. Fabricated metal products	503	-16
10. Primary metal industries	480	12

SOURCE: Massachusetts Institute for Social and Economic Research.

Global demand has led Texas' high-tech industry to expand rapidly in recent years, leading to construction of several huge factories. Two of the largest microchip manufacturers in the world are located in Austin: Motorola Inc. and Advanced Micro Devices. Motorola is also the world's leading maker of micro-controllers. Applied Materials, also in Austin, is the world's leading producer of wafer fabrications systems and a leading manufacturer of flat-panel display screens used in portable computers and other electronic devices. Texas Instruments, also a major producer of semiconductors, has been expanding in the Dallas area, along with several large telecommunications manufacturers.

Industrial Machinery and Computers. While some electronics produced in Texas are shipped worldwide as parts, other electronics are assembled in the state and exported as industrial machinery and computers. In the first quarter of 1995, computers and nonelectrical equipment represented 19 percent of the net gain in Texas exports.

Many of the world's largest computer manufacturers are located in Texas, including Dell Computer Corp. in Austin, Compaq Computer Corp. in Houston and Texas Instruments in Dallas. These firms have been reporting strong sales, with a backlog of orders for many of their products.

Heavy international demand for oil and gas field equipment has also contributed to exports in this industry. Texas oil service and machinery companies have more than replaced declining domestic oil field activity by expanding into international markets.

Agriculture. Shipments of agricultural crops added 15 percent of the net increase in Texas exports over the past year. Texas crop exports increased 80 percent between the first quarter of 1994 and the first quarter of 1995, and 65 percent of the increase in sales went to China. Exports to China tend to be very volatile, but in the past year, several

factors led China to import large volumes of corn, cotton, edible oil, rice and wheat.⁹

As the nation's number one cotton producer, Texas has benefited as U.S. exports of cotton climbed to their highest level in 70 years. Strong worldwide demand, along with the adverse effects of insect infestations and disease on cotton crops in China, Pakistan and, to a lesser extent, India have contributed to the rise in exports and boom in cotton prices.

Mexico Still Restraining Texas Export Growth

Although exports have diversified the Texas economy, the drop in sales to Mexico has restrained export growth. Total Texas exports grew slightly slower in the first quarter of 1995 than in all of 1994. Export growth would have surged further if sales to Mexico had increased at the same rate as in 1994.

A partial rebound in the value of the peso suggests that exports to Mexico may have picked up in the second quarter (second-quarter state export data were unavailable at press time). As shown in Chart 3, in the third quarter, the value of the dollar depreciated 20 percent relative to the peso, and the Texas export-weighted value of the dollar also fell, declining 8 percent.¹⁰ Still, a weak Mexican economy will continue to restrain Mexico's consumption and restrain Texas' export growth.

—Fiona Sigalla

Notes

¹ Gross state product data for Texas are Federal Reserve Bank of Dallas estimates for 1994, and merchandise exports are from the Massachusetts Institute for Social and Economic Research (MISER). Service exports for Texas and the United States are assumed to equal 40 percent of merchandise exports, which is the average percentage of U.S. service exports to the world.

² See Franklin D. Berger and Keith R. Phillips, "A New Quarterly Output Measure for Texas," Federal Reserve

Bank of Dallas *Economic Review*, Third Quarter, 1995.

³ The export data used in this article were obtained from MISER, which makes adjustments to data from the U.S. Census Bureau, Foreign Trade Division. Exports are measured by state of origin; products are measured from the state where they begin the journey to point of export. This measure may attribute goods to the state where they are warehoused before beginning the journey to point of export. In the case of Texas exports, this measure likely overstates exports to Mexico and understates exports to Canada.

⁴ Exports to Mexico would have fallen further without maquiladoras. (See related article on page 9.)

⁵ The real value of the dollar against the peso, according to the Dallas Fed's Trade-Weighted Value of the Dollar Index, went from 90.1 to 137.8 from the fourth quarter of 1994 to the first quarter of 1995.

⁶ Texas' largest trading partner, Mexico, represents 33 percent of the index. Canada represents 8 percent of the index, Japan 6 percent, the United Kingdom 5 percent and Taiwan 4 percent. Overall, the dollar index represents 91.5 percent of Texas exports.

⁷ Bill Gilmer, "Houston's Economy Continues to Improve," Federal Reserve Bank of Dallas, Houston Branch *Houston Business*, September 1994.

⁸ According to the *Engineering News Record*, four Houston companies (M.W. Kellogg, Raytheon Engineers, John Brown/Davy, and Brown & Root) and one San Antonio company (H.B. Zachary) are listed among the top 20 companies, based on the values of contracts signed in 1994. One other company (Centex of Dallas) is number three in the world in construction revenues but has zero foreign revenues.

⁹ Rising demand and commodity prices, government policies and inadequate transportation and marketing systems were among the factors leading to China's surge in agricultural imports. For more information, see United States Department of Agriculture, Economic Research Service, *Agricultural Outlook*, June 1995.

¹⁰ During the third quarter, the value of the dollar fell 3 percent against the currencies of Texas' other leading trading partners.

Does the CPI Overstate Increases in the Cost of Living?

In June 1995, the Senate Finance Committee appointed a panel of economists to review the accuracy of the consumer price index (CPI) and to estimate the extent, if any, to which the CPI overstates increases in the cost of living.

The impetus for expert review of the accuracy of the CPI does not stem from the desire to have a better measure of inflation per se. Rather, the committee realized that a significant proportion of the budget of the federal government is indexed to the CPI, so any significant measurement error has important budgetary implications.

In testimony before the Senate earlier this year, Federal Reserve Chairman Alan Greenspan noted that about 30 percent of federal outlays are indexed to movements in the CPI, as are about 45 percent of tax receipts. Given the importance of indexed programs and taxes in the budget of the federal government, if the annual inflation adjustments in these programs were reduced by just 1 percentage point, the annual level of the deficit would fall by about \$55 billion after five years, while the cumulative deficit reduction over this period would be nearly \$150 billion, Greenspan estimated. The question is, Does the CPI overstate the true rate of inflation by as much as 1 percent a year?

Two years ago, a Dallas Fed

study of known biases in the federal government's various price indexes noted the remarkable lack of hard evidence on the extent of the potential bias in the CPI.¹ This was surprising, given the great confidence with which many economists tend to assert there is "obviously an upward bias in the reported CPI" and probably at least 2 percentage points a year.

The Dallas Fed study concluded: "In view of the paucity of evidence on the various potential biases in the CPI, we are inclined to think that it is better to err on the side of conservatism in guesstimating the size of the overall bias. A figure of less than 1 percent thus strikes us as a plausible estimate of the overall bias. The true figure could be a lot larger or a lot smaller; at present we simply do not know."

In October 1994, the Congressional Budget Office published its own analysis of the problems with the CPI, concluding that "the amount of bias is not known, [but] the existing empirical evidence, which addresses many but not all of the potential areas of mismeasurement, indicates that the CPI has probably grown faster than the cost of living by between one-fifth and four-fifths of a percentage point in recent years."² In view of the recent resurgence of interest in the problems with accurately measuring changes in the cost of living, it is worthwhile to revisit the issues.

The problems that beset the CPI as a measure of the cost of living can be loosely grouped into two categories. The first category is the set of problems associated with substitution behavior on the part of consumers. The second is the set of problems associated with changes in the quality of goods and the introduction of new goods. This article raises three issues relating to these problems.

First, economists' understanding of the extent of the two classes of problem with the CPI is very skewed. To date, researchers have a much better handle on the extent

of the biases due to substitution than on the biases due to quality change and the introduction of new goods. Furthermore, the biases associated with substitution are quantitatively small.

Second, while quality change and the introduction of new goods potentially pose big problems for the CPI, there is very little hard empirical evidence to suggest that they in fact do so. In discussing the potential problems with the CPI, it is often overlooked that the Bureau of Labor Statistics (BLS) has a variety of mechanisms in place to handle both quality change and the arrival of new goods in the marketplace. The question then becomes not whether the CPI overstates inflation because it neglects these developments, but rather how well the procedures used by the BLS perform relative to a more ideal alternative.

The final point: trying to arrive at an estimate of the overall bias in the CPI is like trying to hit a moving target. The BLS regularly updates its procedures in response to perceived problems with the CPI. Thus, problems that were serious in one time period for a particular category of goods may no longer be an issue. It is not clear that in arriving at an estimate of the overall bias researchers can simply add up the various numbers that have been produced by different studies.

Substitution Biases

Three conceptually distinct types of bias fall under the heading of substitution biases: elementary index functional form bias, commodity substitution bias and outlet substitution bias.

Elementary index functional form bias is a type of bias that arises because the CPI does not actually aggregate the prices of individual commodities, but rather is an aggregation of price indexes. This problem relates to the construction of these elementary price indexes. Why the problem arises relates to the esoterica of index

number construction; essentially, it results from consumers' tendency to respond to sale prices by purchasing more of a good that is on sale. BLS economists estimate that this form of bias may have added 0.4 to 0.5 percentage points to the overall rate of inflation between June 1992 and June 1993.³

Commodity substitution bias is the best known and most extensively studied of the potential biases in the CPI. Substitution bias arises because, while the CPI prices a fixed market basket of goods over time, consumers tend to substitute away from goods that become more expensive and toward goods that become less expensive.

As the price of cellular telephones falls relative to the price of stamps, consumers will make more phone calls and write fewer letters. The CPI fails to take this kind of substitution behavior into account, and as a result, tends to overstate inflation. The consensus estimate is that this form of bias adds about 0.2 percentage points to the overall inflation rate each year, although the exact number will tend to be bigger the further we are from the base year and the greater the change in relative prices.

A potential source of bias that has received a lot of attention recently is the so-called *outlet substitution bias*. The idea here is that the process by which the BLS chooses outlets from which to collect price quotes for inclusion in the CPI may have missed the revolution in retailing. Over the past 15 years or so, low-cost, high-volume discount outlets such as Wal-Mart and Sam's Club have grown rapidly, and shoppers have switched from more traditional outlets toward the newer outlets that offer lower prices. One early estimate of the potential size of this bias put it at 0.25 percentage points per year for the food at home and motor fuel components of the CPI.⁴ However, subsequent research has shown that this figure may be the compounded result of a variety of effects.

Quality Adjustment and New Goods

The essence of the quality adjustment problem is as follows. Suppose the BLS has been tracking the price of some specific brand of VCR for inclusion in the CPI. At some date, the chosen variety of VCR disappears from store shelves, and in its place retailers start offering a new, higher priced model with additional features. How much of the difference in the prices of the new and old models should be treated as a price increase, and how much reflects quality improvement in the VCR? In constructing a measure of the change in the cost of living, it is appropriate to exclude that part of the price increase that results from improvements in the quality of the good.

When facing such a problem, BLS field agents have numerous options. If they deem the new and old products to be essentially the same in a well-defined sense, they include the entire price increase in the CPI and do nothing more. The risk here is that some quality improvements are overlooked, imparting an upward bias to the index. If the new and old products are judged to be different, then BLS agents try to adjust for the quality change before including the price in the CPI. There are many ways to make these adjustments.

For example, BLS agents could make an adjustment based on information received from manufacturers on the cost of the new features, as is often done with autos. Each year when the new models are introduced, the BLS agents obtain cost estimates from manufacturers that allow them to subtract out that component of the price increase that stems from new features. Alternatively, the BLS can make an adjustment using a hedonic regression, which relates the price of a good to its characteristics. However, in many cases neither of these methods can be applied, and the BLS simply imputes the price change for the good in question. That is, the price

that gets entered in the CPI is some average of the prices of similar products.

The imputation procedure does not obviously result in a biased estimate of price change. However, if manufacturers systematically tend to time price increases to coincide with the introduction of new models, imputation may introduce price increases that are *too small* into the CPI, resulting on an overall downward bias. During 1992, some 3.5 percent of retail outlet prices collected for inclusion in the CPI resulted in product substitutions. Of these substitutions, 2 percent were considered "comparable" and no quality adjustment was made. About 0.9 percent of the prices were quality-adjusted through the imputation procedure, while the remaining 0.4 percent were directly quality-adjusted (through the use of either hedonic methods or cost information supplied by manufacturers).

For many categories of goods, it is generally accepted that manufacturers tend to time price increases to coincide with the introduction of new varieties. Two prominent examples are autos and apparel. Recent research by the BLS has compared the results of quality-adjusting the apparel price indexes using traditional and hedonic methods. Researchers have long suspected that the CPI understates inflation in the apparel commodities indexes. Evidence supporting this suspicion is shown in Chart 1, which plots the trend in the apparel commodities component of the CPI and the overall CPI since 1980.⁵ It is clear that from 1981 through 1986 the apparel commodities component of the CPI rose at a slower rate than the overall CPI. This observation, coupled with evidence that apparel inflation was no slower than overall inflation, suggested to the BLS that the procedures for calculating its apparel indexes needed revision.

Two recent studies addressed the issue of quality adjustment in the apparel indexes and found that the traditional methods appeared as

likely to *underestimate* price change as they were to overestimate price change.⁶ The first study showed that an index for women's suits that employed hedonic regressions to determine the comparability of substitutions and in the case of non-comparable substitutions to make direct quality adjustments grew 0.7 percentage points *slower* than the published index, suggesting, as most economists suspected, an upward bias in the published index. However, a similar index for women's coats and jackets was shown to grow 3.9 percentage points *more* than the official index, suggesting the existence of a downward bias in the published index.

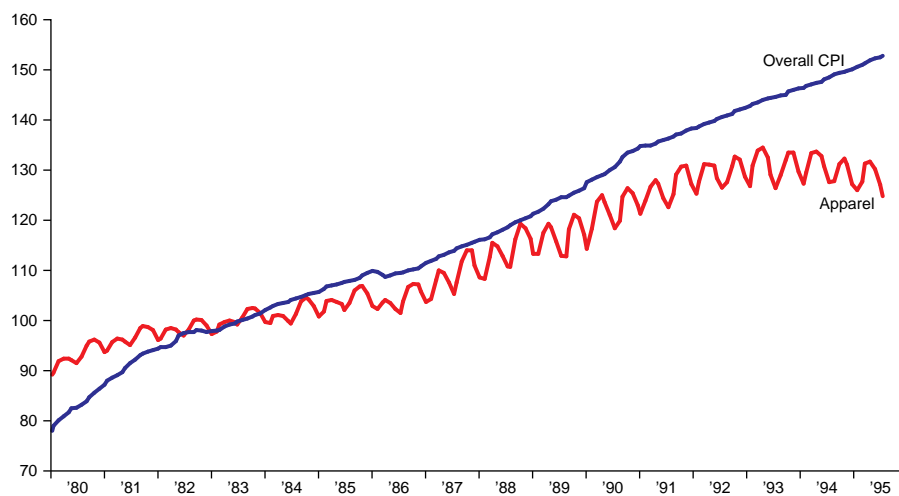
More extensive results are reported in the second study for a broader range of apparel indexes, where it is shown that "While differences are observed between published indexes (those with quality adjustments) and nonhedonic indexes (those without quality adjustments), the results reveal no consistent differences across strata or aggregate level indexes."

What about the problem of new goods? In many ways, the problems posed by the arrival of new goods is similar to that posed by quality change. One way of distinguishing between the two is to classify the quality problem as being the result of some change in a product's characteristics, while the new goods problem is the result of the addition of new characteristics or a rebundling of existing characteristics.⁷ Thus, the invention of the personal computer would be classified as a new goods problem, while improvements in the memory and speed of the personal computer would be classified as a quality problem. There is essentially no empirical evidence on how well the BLS handles the emergence of new goods. Some researchers have made suggestive theoretical calculations that show that the failure to properly account for the introduction of new goods could impart a substantial upward bias to the CPI. But for now, these

Chart 1

The U.S. Consumer Price Index and Apparel Prices, 1980–95

Index, 1982–84 = 100



SOURCE: Bureau of Labor Statistics.

calculations remain speculative.

While it is well-known that the omission of new goods from the consumer price index can cause potentially dramatic overstatement of the rate of inflation, new goods are included in the index through a variety of mechanisms. A recent BLS working paper provides a useful taxonomy of new goods and discusses how the CPI handles each type. This paper distinguishes between replacement items (which are new versions of existing goods that have been, or are about to be, discontinued, such as new model year cars), supplemental items (which are entirely new versions of existing products, such as cereal) and entirely new items (which are not closely related to any existing or previously available item). As a result of changes made in 1978, many new products that emerge are in fact gradually introduced into the CPI.

Calculating the Overall Bias

A hierarchy of evidence is available to address the question of whether the CPI overstates the rate of increase in the cost of living. First, there are those biases that are known to exist and have been quantified. These studies can be

further subdivided between biases for which there have been multiple attempts at quantification (such as the well-known commodity substitution bias) and those for which there have only been one or two studies (such as the bias due to outlet substitution). Then there are those biases that researchers suspect exist but for which they lack quantitative estimates. The primary example here is the problem with accurately measuring changes in the costs of medical care. Even given this classification, we need to distinguish between biases that have been identified and eliminated and biases that have been identified and remain a problem.

Trying to estimate the overall bias in the CPI is like trying to hit a moving target. The BLS has proved to be reasonably diligent in correcting biases in the CPI as soon as their significance becomes evident. Examples include the correction for the treatment of housing and the elimination of the housing depreciation bias. More recently, the BLS has taken steps to alleviate the problems caused by the elementary functional form bias.

One prominent researcher in the theory of price measurement has asserted that the various biases in the CPI are approximately additive.

While in theory the assumption of additivity may be correct, in practice the estimates may be mixing different types of biases. Then there is also the important fact that these estimates of bias come with some sort of standard error.

Nevertheless, there is likely an upward bias in the CPI, and the figure of around 1 percent hinted at by Chairman Greenspan in his testimony earlier this year is as good an estimate as any. The examples of overstatement noted above notwithstanding, it is clear that the bulk of the evidence supports the notion of an upward bias in the index. The BLS is even willing to concede an error of 0.6 percentage points due to substitution biases (see the December 1993 *Monthly Labor Review*). However, absent a comprehensive audit of the CPI (say, along the lines of Robert Gordon's audit of the deflators for producers' durable equipment), there will always be substantial uncertainty surrounding the size of the bias in the CPI. While it is true that most estimates to date have tended toward an upward bias, the standard error, if you will, surrounding these estimates is quite large and possibly of the same order of magnitude as the estimates of the bias itself.

Conclusions

The CPI is the most important measure of inflation the federal government publishes. The widespread use of the CPI to index components of the federal budget means that errors in measuring the CPI have potentially large budgetary implications. The CPI is used to index personal income tax brackets and Social Security and other welfare payments so as to protect taxpayers and Social Security recipients from the pernicious effects of inflation. The idea here is that a taxpayer's liability should not increase just because the price level has increased, if the real purchasing power of his or her income has not gone up also.

On the benefits side, the idea is

that Social Security recipients are entitled to some real amount of purchasing power rather than a nominal amount whose purchasing power is systematically eroded by inflation. However, insofar as the price index used to compensate taxpayers and Social Security recipients for increases in the cost of living overstates the rate at which prices are increasing, taxpayers and Social Security recipients are being overcompensated for inflation and are effectively receiving an additional subsidy from the government. As noted earlier, the potential magnitude of these excess transfers is quite large, and their elimination could go a long way toward eliminating the budget deficit.

Evidence that the CPI overstates the rate of increase in the cost of living is remarkably thin. Researchers do know that, as a result of various types of substitution behavior, the CPI overstates the rate of increase in the CPI by as much as 0.6 percent a year. They have no idea, however, how much quality change and the emergence of new goods adds to this bias. It could be as much as an additional 0.4 percentage points a year, and it could be zero.

What is surprising and often neglected in the debate over the accuracy of the CPI is the fact that the methods employed by the BLS to handle quality change in the CPI seem to be as prone to overcompensate for quality change as they are to undercompensate for quality change, leaving the overall direction of the bias uncertain. In some areas, the BLS freely admits that very little is done to correct for quality change. The prime example is, of course, medical care, where accurate price measurement is fraught with technical and conceptual difficulties. Nonetheless, it is important to keep in mind that just as there are costs to overstating the rate of inflation, so too are there costs to understating it.

—Mark A. Wynne

Notes

- ¹ Mark A. Wynne and Fiona Sigalla, "A Survey of Measurement Biases in Price Indexes," Federal Reserve Bank of Dallas Research Paper, no. 9340, 1993. Also, a version of this paper focusing on the CPI appeared in the Federal Reserve Bank of Dallas *Economic Review*, Second Quarter, 1994.
- ² "Is the Growth of the CPI a Biased Measure of Changes in the Cost of Living?" CBO Papers (Washington D.C.: Congressional Budget Office, October 1994, vii).
- ³ Brent R. Moulton, "Basic Components of the CPI: Estimation of Price Change," *Monthly Labor Review*, December 1993, and Marshall B. Reinsdorf and Brent R. Moulton, "The Construction of Basic Components of Cost of Living Indexes," mimeo, U.S. Department of Labor, May 1994.
- ⁴ Marshall Reinsdorf, "The Effect of Outlet Price Differentials on the U.S. Consumer Price Index," in Murray F. Foss, Marilyn E. Manser and Allan H. Young, eds., *Price Measurements and Their Uses*, NBER Studies in Income and Wealth, vol. 57 (Chicago: University of Chicago Press for National Bureau of Economic Research, 1993).
- ⁵ This chart is adapted from Marshall Reinsdorf, Paul Liegey and Ken Stewart, "New Ways of Handling Quality Change in the U.S. Consumer Price Index," mimeo, U.S. Department of Labor, July 1995.
- ⁶ The relevant studies are Paul Liegey, "Adjusting Apparel Indexes in the CPI for Quality Differences," in Murray F. Foss, Marilyn E. Manser and Allan H. Young, eds., *Price Measurements and Their Uses*, NBER Studies in Income and Wealth, vol. 57 (Chicago: University of Chicago Press for National Bureau of Economic Research, 1993) and "Apparel Price Indexes: Effects of Hedonic Adjustment," *Monthly Labor Review*, May 1994, 38–45.
- ⁷ Dennis Fixler suggests this distinction in "The Consumer Price Index: Underlying Concepts and Caveats," *Monthly Labor Review*, December 1993.

Beyond the Border

Maquiladoras: Mexico's Bright Spot

Two million Mexican workers have lost their jobs since the December 1994 peso devaluation, and some companies in Mexico have even shut down operations. But while most Mexicans must ride out the recession that followed the devaluation, the maquiladora industry is providing one of the country's few bright spots—creating jobs, earning badly needed foreign exchange and attracting direct investment in modern plants.^{1,2}

Because maquiladoras have dollar-denominated budgets but pay costs in pesos, the devaluation brought a substantial, overnight reduction in their peso costs. In this sense, the maquiladora industry benefited from the dollar's higher value relative to the peso in 1995, as evidenced by recent employment numbers.

In the first five months of 1995, maquiladora employment rose 9.7 percent (relative to the year-earlier period) to a total of 617,984 workers. Ciudad Juarez, Chihuahua, across the Mexican-U.S. border from El Paso, Texas, employs the largest concentration of maquiladora workers, with about one-fourth of the total. Maquiladora employment in Juarez grew 12 percent during the first five months of 1995, far surpassing its growth of 6.1 percent in 1994 and 2.3 percent in 1993.

The maquiladora industry should continue to grow this year because of its enhanced cost effectiveness brought on by the peso devaluation. The net gain for maquiladoras in 1995, however, will not equal the rate of devaluation since inflation, especially through peso-wage pressures, will have eroded some of the sector's gains.

Increasing Economic Importance

Even before the devaluation, the maquiladora industry had become an important component of the Mexican economy. In 1994, it contributed nearly \$6 billion in foreign exchange to Mexico, making it the country's second largest source of international reserves. The maquiladora industry's share in total Mexican manufacturing employment reached 26 percent last year, up from just 5.1 percent in 1982.

Maquiladora exports play a significant role in Mexican-U.S. trade. At \$26 billion, 1994 exports represented more than 43 percent of total U.S. imports from Mexico. Maquiladora products represented an even

coincided with the slowdown in the U.S. economy. Since the great majority of maquiladora production is destined for the U.S. market, the industry is particularly sensitive to U.S. growth rates. Thus, with the recovery of the U.S. economy as of 1992 came a resurgence of maquiladora employment growth (Table 1).

Maquiladoras and NAFTA

The maquiladora program will change under the North American Free Trade Agreement (NAFTA). New rules for maquiladoras are taking effect in two phases, the first lasts from 1994 through 2000; the second starts with the next century.

The maquiladora industry's basic operating framework will not change in the first phase, but maquiladoras' access to domestic markets will be gradually liberalized. By 2000, maquiladoras will be able to sell to the domestic market 85 percent of the value of their export production in the preceding year, up from 50 percent in 1993. And in 2001, maquiladoras will be allowed to sell 100 percent of their production domestically.

NAFTA's more important change to the maquiladora program takes place under the second phase. In 2001, the provision that essentially defines the program—that of duty-free importation of inputs into Mexico, *regardless of origin*—is abandoned. Instead, *North American rules of origin* will determine duty-free status for a given import, while duty drawback provisions will apply to non-North American inputs.

By the turn of the century, it is very likely that Mexico will have revised its tariff schedules for third countries in a way that dramatically reduces most duties, especially for the inputs maquiladoras rely on heavily. Mexico's intent, in general,

TABLE 1
Indicators of the Maquiladora Industry

	1994	Year-to-year change (percent)	Annual growth (percent)		
			1993	1992	1991
Plants	2,085	-1.4	1.9	8.4	12.4
Employment (Thousands of workers)	579.4	6.9	7.2	8.2	4.7
Imported raw materials (Billions of dollars)	19.9	14.1	23.2	15.6	16.8
Value-added (Billions of dollars)	5.9	8.6	12.8	16.0	18.4
Gross production (Billions of dollars)	25.8	12.8	20.6	15.7	17.2

higher share, 52 percent, of manufacturing imports from Mexico.

Although the Mexican maquiladora program has existed since 1965, the industry is perhaps best known for its spectacular growth during the 1980s. From 1983 through 1988, the number of maquiladora plants averaged annual growth of 15.9 percent; employment in the industry grew an average 19.7 percent annually in the same period. Other indicators also grew during this period: imported raw materials rose 27.7 percent, value-added rose 20.5 percent and gross production grew by 25.4 percent.

The industry experienced a deceleration during 1989-91, which

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Beyond the Border . . .concluded

will be to ensure that maquiladoras continue to find the Mexican investment climate in 2001 sufficiently attractive to remain in the country. Moreover, it's foreseeable that even zero duties will apply to those inputs that are simply unavailable in North America, as is the case with some electronic components that are produced solely in Asian countries right now. As for the U.S.-imposed duties, these are already low in most cases and should remain low or fall if such duties are found to be negatively affecting maquiladora producers, who come primarily from the United States.

An important side effect of the duty drawback provisions of 2001 is that during the seven-year period 1994–2000, maquiladora producers may encourage third-country suppliers to locate in North America in order to guarantee that duty-free treatment will be preserved after 2000. Another option for maquiladoras is to develop relationships with potential local suppliers that could become new sources to replace third-country suppliers. Either way, the net result should be greater direct investment in the region.

Conclusion

To the extent that NAFTA creates a more competitive Mexican industrial sector, greater potential local sources of supply for the maquiladoras are likely to emerge, especially through joint-venture associations. Thus, as maquiladoras are able to sell more to, and buy more from, their Mexican manufacturing counterparts, they will become more entrenched in the national economy. In essence, these linkages between the maquiladora and nonmaquiladora sectors will end up blending the two into a single, stronger Mexican manufacturing sector.

Although NAFTA brings about the elimination of the maquiladora program in 2001, the program's

reason for being will have also been eliminated. By 2001, Mexican industry will be benefiting from more generalized conditions of freer trade and investment that in the past were associated exclusively with maquiladoras. At the start of the next century, there will probably be few distinguishable characteristics between what is now a maquiladora and a nonmaquiladora operation since by that time maquiladoras, if they desire, can direct their entire production to the domestic market. Conversely, there will be nonmaquiladora plants directing 100 percent of their production to the export market, as the maquiladoras are now required to do. In sum, the maquiladora label may no longer exist by 2001, but the industry itself will have become a critical part of a more modern Mexican manufacturing sector.

—Lucinda Vargas

Notes

¹ A *maquiladora* is typically a foreign-owned manufacturing plant that produces chiefly for exports to the United States.

² This column is based on material that appeared in *Business Frontier*, a publication of the El Paso Branch of the Federal Reserve Bank of Dallas. For more information about the publication, call (915) 521-8231. Back issues are available on the Dallas Fed's online bulletin board Fed Flash, (214) 922-5199 or (800) 333-1953.

Regional Update

The District economy held steady in June. Employment growth was up slightly, thanks to a surge in the service sector. The construction industry showed renewed signs of strength. Manufacturing indicators continue to be weak, however. Overall, economic indicators suggest that the District economy will weaken slightly in the second half of the year, but growth will remain positive.

District employment growth increased slightly to a 2.8-percent annual rate in June, compared with a 2.6-percent annual rate of growth in the first half. Stronger employment growth in Texas in June offset weakness in Louisiana and New Mexico. Most of the faster employment growth was in the service

sector. Strong job growth in communications, business services and hotels outweighed continued weakness in transportation, finance, legal services, and retail and wholesale trade.

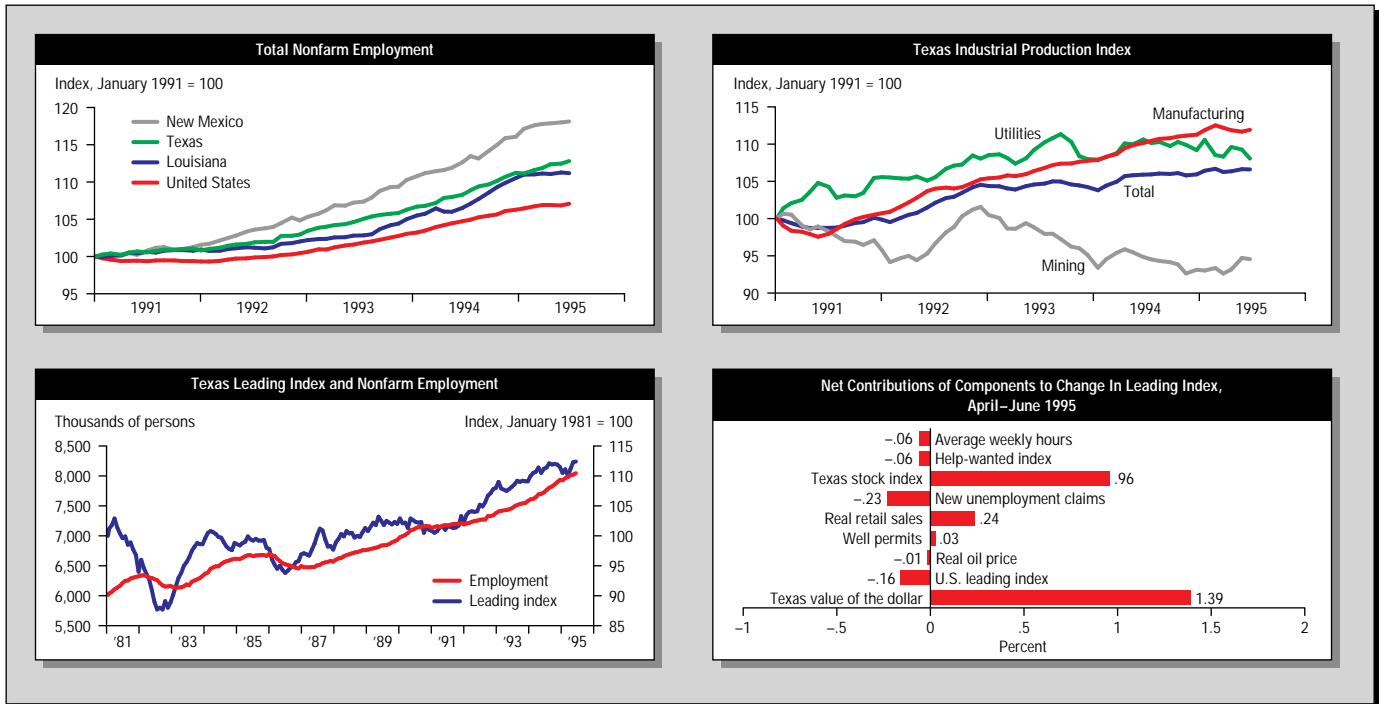
Construction activity showed signs of strength in June. After a very weak first half, contract values picked up in June, led by a surge in highway construction. Residential contract values showed signs of a rebound, and anecdotal reports suggest that new home sales are rising. Nonresidential construction also accelerated, boosted by strong retail and warehouse building.

Manufacturing activity continues to be weak. Manufacturing employment fell in May and June, the first two-month

consecutive decline since early 1993. The manufacturing slowdown has been broad-based, with the exception of continued strong growth in electronics, computers and oil field machinery.

The Texas Leading Index rebounded in the second quarter, following declines since last November. Strong gains in the Texas stock index and a rebound in the Texas value of the dollar have been key sources of strength in the index. Several indicators continue to be weak; the Texas help-wanted index, for instance, declined sharply in June after strong growth throughout most of the first half of 1995. Recent movements in the leading index suggest that the gradual slowing in the Texas economy will continue in the second half of this year but that growth will remain positive.

—Fiona Sigalla



REGIONAL ECONOMIC INDICATORS

Texas Leading Index	Texas Employment							Total Nonfarm Employment		
	TIP1 total	Mining	Construction	Manufacturing	Government	Private service-producing	Texas	Louisiana	New Mexico	
6/95	112.4	119.0	157.1	400.9	1,032.1	1,447.8	5,008.0	8,045.9	1,785.1	687.2
5/95	112.3	119.1	157.7	399.1	1,032.8	1,445.0	4,986.4	8,021.0	1,786.5	686.5
4/95	111.2	118.8	158.1	400.1	1,035.0	1,441.6	4,980.1	8,014.9	1,783.2	685.8
3/95	110.0	118.7	158.6	402.7	1,034.1	1,437.9	4,946.7	7,980.0	1,784.4	685.3
2/95	111.1	119.1	158.3	404.3	1,031.0	1,438.2	4,927.9	7,959.7	1,782.4	684.3
1/95	110.5	118.9	158.3	404.9	1,026.9	1,436.5	4,900.0	7,926.6	1,781.8	681.5
12/94	111.5	118.3	159.1	398.1	1,024.8	1,433.5	4,917.8	7,933.3	1,774.5	675.3
11/94	111.9	118.2	160.1	392.7	1,021.9	1,427.0	4,892.5	7,894.2	1,764.0	674.2
10/94	112.0	118.5	160.7	388.3	1,018.7	1,424.6	4,864.4	7,856.7	1,755.1	669.0
9/94	111.9	118.4	163.1	387.9	1,017.6	1,417.8	4,836.7	7,823.1	1,743.8	664.5
8/94	112.1	118.4	162.8	383.2	1,014.2	1,423.4	4,818.7	7,802.3	1,729.3	658.3
7/94	111.4	118.3	162.5	380.6	1,010.7	1,414.1	4,797.8	7,765.7	1,719.4	660.2

FURTHER INFORMATION ON THE DATA

For more information on employment data, see "Reassessing Texas Employment Growth" (*Southwest Economy*, July/August 1993). For more information on TIP1, see "The Texas Industrial Production Index" (*Dallas Fed Economic Review*, November 1989). For more information on the Texas Leading Index and its components, see "The Texas Index of Leading Indicators: A Revision and Further Evaluation" (*Dallas Fed Economic Review*, July 1990).

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