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President's Perspective



By simply trading ones and zeros in electronic spectra, the Federal Reserve can transfer trillions of dollars per day between financial institutions.

Technology is at the core of the Federal Reserve System's operations, and we exploit it in every way possible to provide our services efficiently and effectively—ultimately delivering economic benefit for the American people.

By simply trading ones and zeros in electronic spectra, the Federal Reserve can transfer trillions of dollars per day between financial institutions, lend funds through the discount window and auction government Treasuries. We also monitor the health of the banking system and collect, categorize and correlate data for economic reporting and analysis to conduct monetary policy. We keep our thousands of employees connected and working—all with the aid of sophisticated computing and information technologies.

The System's "digital power plant" contains mainframe computers capable of processing billions of instructions per second,

thousands of servers and desktop computers for back-office operations, and customized robots and machines to handle our highly sophisticated logistics business.

We also use robots and machines to help us ship, receive, sort and inventory paper checks, cash and coin. Each year, the Federal Reserve processes approximately 37 billion Federal Reserve notes, the folding currency in Americans' wallets. We have machines to count, sort and scan money to ensure that each bill is genuine and fit for recirculation. And we have equipment that can digitize billions of checks into computer images, transmit them and convert the images back into paper for presentation to the paying banks.

These are just a few examples of how technology has permeated our everyday work, transforming our business in new and exciting ways and allowing us to meet the massive—and continually growing—financial demands of our nation. Our operations continue to succeed because we combine the best and brightest people with the latest and greatest technologies.

A handwritten signature of Richard W. Fisher in gold ink, written in a cursive style.

Richard W. Fisher
President and CEO
Federal Reserve Bank of Dallas



Revising the Texas Index of Leading Indicators

By Keith R. Phillips and José Joaquín López

We suggest changes to the Texas Leading Index that generally reflect the growing importance of services and globalization.

The Texas Leading Index (TLI), produced monthly by the Federal Reserve Bank of Dallas, combines eight measures that tend to anticipate changes in the Texas business cycle by about three to nine months.

The TLI was first published in the Dallas Fed's *Economic Review* in July 1988. The index's approaching 20th anniversary provides an apt occasion to review its real-time performance and look at ways it might be improved to keep up with the changing structure of the Texas economy and the availability of new data sources.

We find that the TLI performed well in the one recession since 1990 and, used in a model forecasting Texas employment, has done well in real time when compared with other forecasts. Although the current version of the TLI works reasonably well, we suggest changes to the TLI that generally reflect the growing importance of services and globalization and the reduced impor-

ance of energy production in Texas business cycles.

Measuring Performance

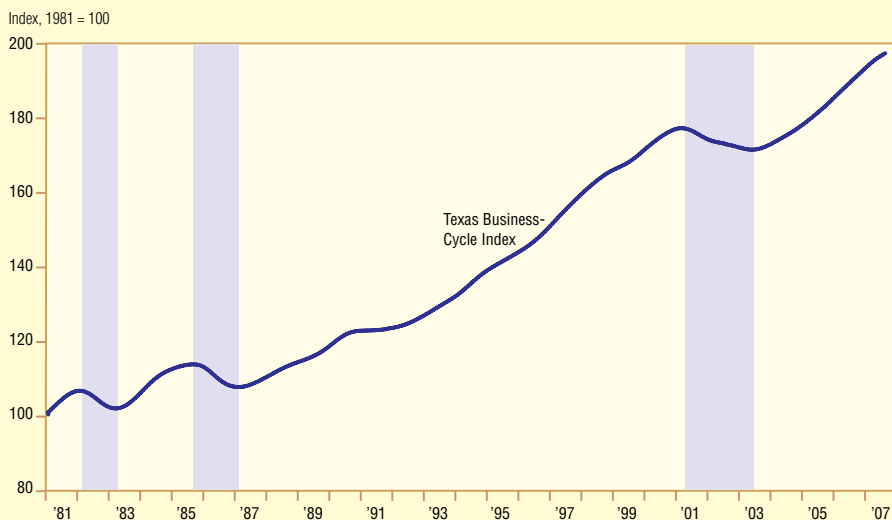
The current TLI's components are average weekly hours in manufacturing, an index of state help-wanted advertising, an index of real stock prices of Texas-based companies, initial claims for unemployment insurance, permits to drill oil and gas wells, the real price of West Texas Intermediate crude oil, a weighted exchange rate based on Texas exports and the U.S. leading index.

How did these indicators perform? A simple chart of the TLI plotted with turning points in the economy would seem to provide a good indication of how well the index did in foreshadowing changes in the business cycles. This analysis, however, encounters two complications. First, there's no state-level counterpart to the committee that determines business cycles for the nation, so we must first define the state economy's peaks and troughs. Second, revisions to the index can distort its real-time performance—what you see now may not be what you saw when it mattered most.

We rely on the Dallas Fed's Texas Business-Cycle Index to determine turning points for the state economy.¹ It shows three distinct periods of recession since 1981 (*Chart 1*). The 1982–83 slump followed a national downturn. The 1986–87 episode reflected the oil bust and real estate problems that followed. The 2001–03 recession started with troubles in the tech sector.

To map the national business cycle, the National Bureau of Economic Research (NBER) Dating Committee looks at a host of broad indicators but places particular emphasis on real GDP. Because the peaks and troughs are tied to particular months and real gross domestic product is quarterly, the NBER also focuses on monthly data, placing particular emphasis on two measures—real personal income less transfer payments, and nonfarm employment.²

Chart 1
Texas Experiences Three Recessions Since 1981



NOTE: Shaded bars indicate recession.
SOURCE: Federal Reserve Bank of Dallas.

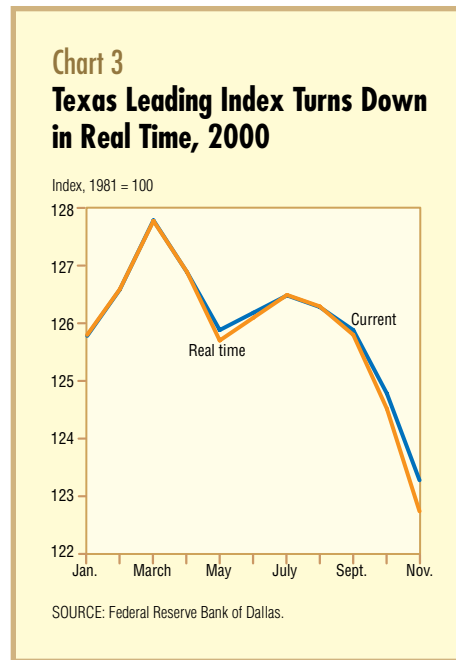
As far as possible, the Texas Business-Cycle Index incorporates data on the state level that's similar to what the NBER uses at the national level.

The index combines the movements of three broad measures of the Texas economy—real state GDP, nonfarm employment and the unemployment rate. Personal income less transfer payments isn't available monthly at the state level, although the quarterly values are used in calculating Texas' quarterly real GDP.³

With a gauge of Texas' business cycles, we compare the TLI and the state's nonfarm employment with shaded areas that indicate recessions (*Chart 2*). Looking at the period since 1990, the TLI turned down 13 months prior to the recession that began in April 2001 and turned up eight months prior to the expansion that began in July 2003.

The TLI provides a partial real-time representation because revisions are allowed for only the previous seven months. For example, the data currently go through September 2007, including revisions from February. With the October TLI, revisions will extend from March.

This system incorporates recent data updates but doesn't allow routine annual revisions to impact the historical data. As a result, the index retains key information over time. Regarding the recession signal, for example, real-time TLI data through No-



vember 2000 were very close to the current version and clearly showed a decline in the index beginning in April 2000 (*Chart 3*).⁴

While the TLI foreshadowed the 2001 recession, the index was quite volatile. It had brief periods of downturn that were followed by slower job growth but not actual recessions. For example, the TLI's decline from May to November 1998 wasn't followed by recession, but job growth did slow sharply from an annual rate of 3.6 per-

cent in the second half of 1998 to 1.1 percent in the first half of 1999. The index also turned down for several months in 1987–88, 1993 and 1994–95.

A recession rule is one way to deal with these events. One version might require the leading index to decline for at least four months, with a cumulative decrease of at least 3.7 percent, to warrant a recession signal. Following this rule would have meant no false signals in the past and still given us a lead time of four months for the recession that began in 2001 and at least five months for the downturn that began in 1981. However, the signal would have lagged behind the recession that began in late 1986 by four months.

Infrequent recessions limit the number of observations to judge leading indexes' performance. While an index or component must perform well at turning points, more information can be gathered about its relationship to the economy by examining how the series tracks some economic measure on a month-to-month basis.

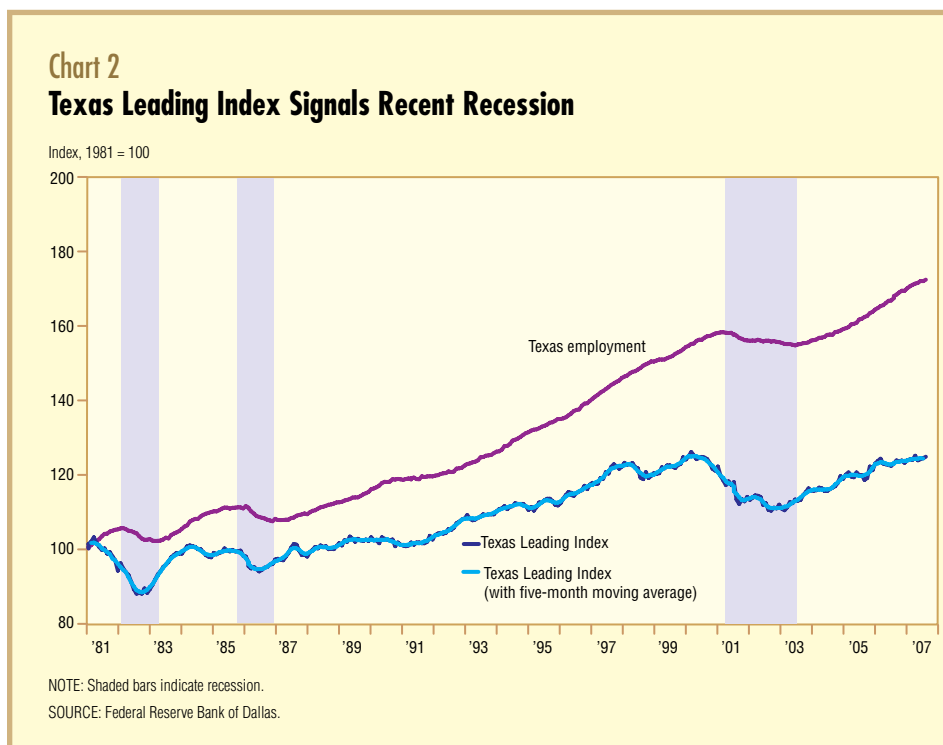
With so few recession observations, we prefer to use a regression model to analyze all past TLI movements and forecast whether a recession is likely to occur.

Nonfarm employment gives a timely, broad reading on the Texas economy. The Dallas Fed uses changes in employment and the TLI to forecast job growth. Looking at the forecast's real-time performance provides an idea of the leading index's ability to anticipate movements in the Texas economy.

Since 1994, the Dallas Fed job growth projections have been included in the Arizona State University business school's Western Blue Chip Economic Forecast. Each year, the publication looks back to determine which annual job-growth forecast turned out to be closest to the actual. Among an average of eight Texas forecasters, the Dallas Fed model was most accurate in seven of the past 12 years. The next most accurate forecaster was closest in three of those years.

Revising the Index

Traditionally, leading indexes have been weighted toward measures of the manufacturing industry, a more cyclically sensitive part of the economy. In recent years, however, Texas has joined the nation in a shift away from goods production and toward the service sector.



Dallas Fed economist D'Ann Petersen noted an important implication of this development: "Shifting the employment base from goods to services changes the way economies perform when hard times hit. Employment usually holds up better in services than in goods when economies slip into recession."⁵

Have changes in Texas' economic structure given rise to new leading indicators? Have some original indicators lost their predictive power? To account for structural changes in the Texas economy, we test the predictive ability of new variables and retest the forecasting properties of the original components. To do this, we adapted the scoring procedure used by the Conference Board for the U.S. leading index, which assesses data on consistent timing, economic

significance, statistical adequacy, smoothness, timeliness and conformity.⁶

We considered seven potential variables for inclusion in a revised TLI. Four of them had turning points that led changes in the Texas business cycle and did well on our statistical evaluations. They are:

- **Consumer confidence.** Available since 1981, the Conference Board's Consumer Confidence Index for the West South Central region measures public sentiment about the economy in Texas, Arkansas, Louisiana and Oklahoma. It peaked six months before the recessions of 1982 and 2001 and 10 months prior to the 1985 recession (*Chart 4A*).

- **Real retail sales.** While real retail sales were included in the 1990 revision, the Department of Commerce stopped

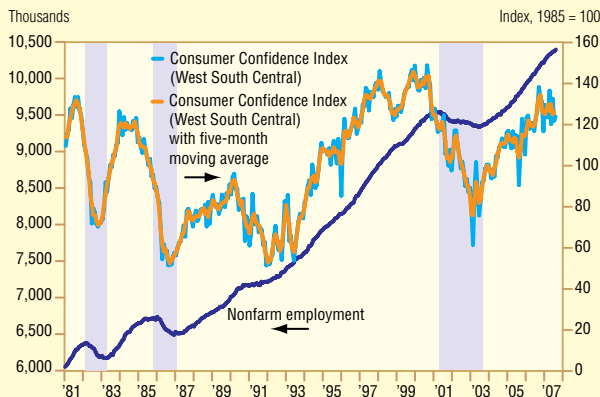
producing monthly data by state in the mid-1990s. The Texas Comptroller of Public Accounts releases quarterly retail sales estimates, which the Dallas Fed converts to monthly data through sales tax rebates and retail employment.⁷ Real retail sales in the state peaked in March of 2000, one year before the most recent recession (*Chart 4B*).

- **Real exports.** Available from the Census Bureau since 1994, Texas real exports started declining seven months prior to the last state recession (*Chart 4C*).

- **Jobs in employment services.** Businesses will often let go of temporary workers first when demand weakens and hire them first when conditions improve (see "Spotlight," page 10). Jobs in employment services, which includes temporary employment agencies and job placement

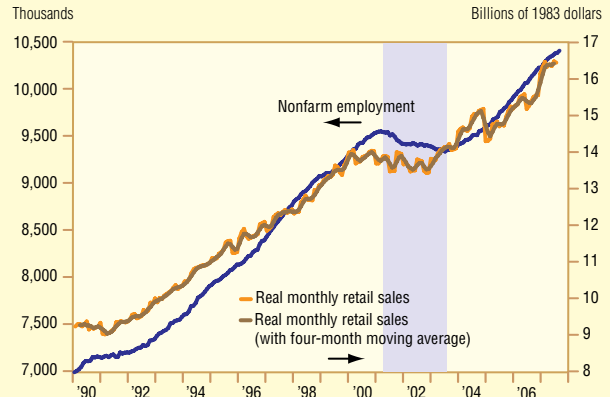
Chart 4
Top Four Indicators for Revised Texas Leading Index

A. Consumer Confidence Leads Changes in Texas Business Cycle



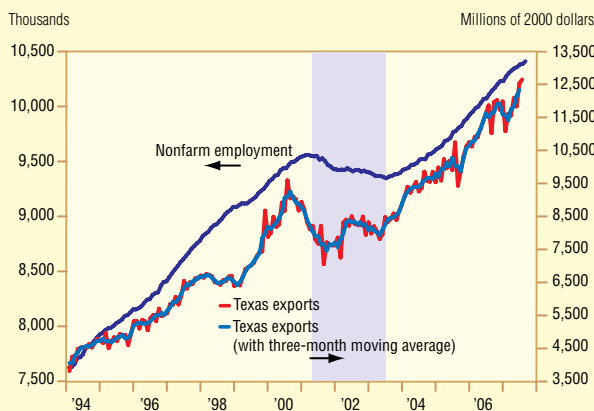
SOURCES: Federal Reserve Bank of Dallas; Conference Board.

B. Retail Sales Show Leading Ability



SOURCES: Federal Reserve Bank of Dallas; authors' calculations with data from the Texas Comptroller and Dallas Fed.

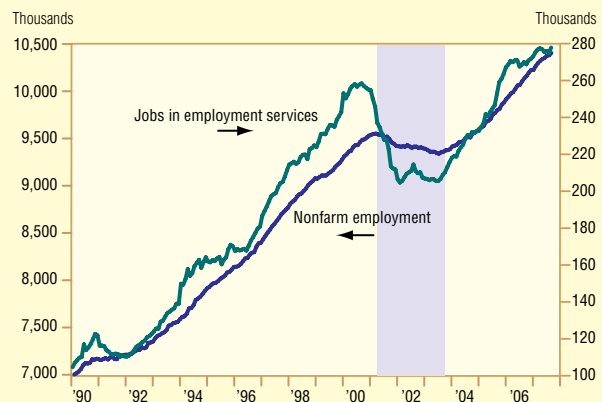
C. Texas Exports Move Ahead of Overall Economy



SOURCES: Federal Reserve Bank of Dallas; Census Bureau.

NOTE: Shaded bars indicate recession.

D. Jobs in Employment Services Lead Overall Job Growth



SOURCE: Federal Reserve Bank of Dallas.

*We will monitor
the new Texas
Leading Index
over the next
12 months to
study its real-time
performance.*

services, started to decline six months prior to the most recent recession (*Chart 4D*).

We tested three other potential leading indicators—the real value of nonresidential construction, a new measure of help-wanted advertising that takes into account the shift to the Internet, and jobs in business and professional services. They didn't show a statistically significant leading ability or weren't as significant as a similar variable already included.

Real nonresidential construction contract values, which can reflect fixed business investment, had cycles consistent with the Texas business cycle but failed statistical tests on its leading capacity. A help-wanted index adjusted to account for the migration of advertising to the Internet wasn't as significant as the standard measure using percent changes.⁸ Jobs in employment services showed better performance than jobs in the broader category of business and professional services.

What about the existing indicators? Four of them failed our scoring procedure, suggesting they should be dropped from the index. Somewhat surprisingly, the U.S. leading index wasn't significant. Two other indicators, real oil prices and well permits, didn't show a statistical leading relationship with Texas employment, most likely a reflection of the energy industry's declining importance in the Texas economy.

Results for the Texas Trade Weighted Value of the Dollar Index were mixed. Our tests showed some statistical significance over the entire period, but it seems to vanish after 1990. The addition of real exports provides a more direct measure of globalization's impact on the Texas business cycle.

Evaluating the New Index

What emerges is a new Texas Leading Index—still experimental—that retains average weekly hours in manufacturing, help-wanted advertising in the state, real stock prices of Texas-based companies and initial claims for unemployment insurance. To these holdovers, we add regional consumer confidence, real retail sales, real exports and jobs in employment services.⁹

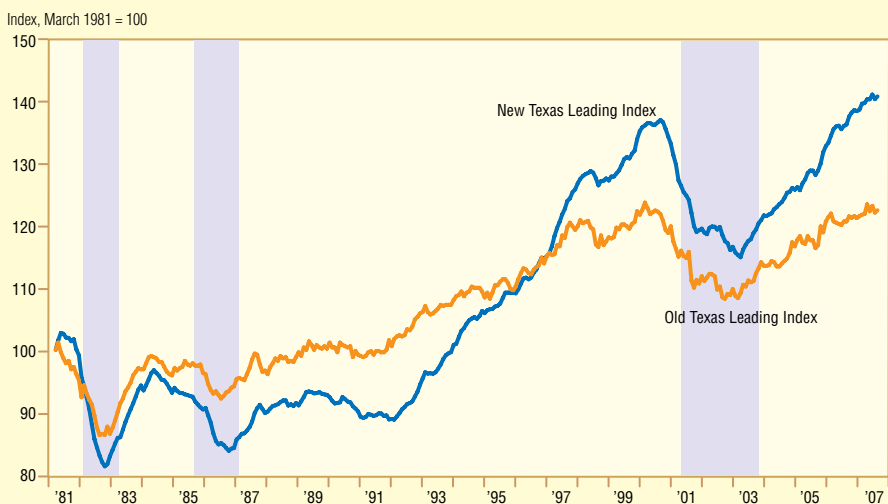
The new TLI is smoother, yet still leads the Texas economy's turning points (*Chart 5*). It declines somewhat more steeply than the old one prior to the slowdown in 1991. While this might be regarded as a false signal, this period was very close to a recession. From October 1990 to March 1992, jobs grew at an annual pace of only 0.7 percent, and real state GDP declined slightly in fourth quarter 1990 and first quarter 1991. The Texas Business-Cycle Index was barely positive, which means that the economy just missed a recession.

The new TLI has a close relationship with Texas employment (*Chart 6*). In the forecasting model of Texas employment, successfully used in the Western Blue Chip survey, substituting the new TLI for the old TLI results in a slightly lower standard error of the estimate. While this gives some support to the new TLI, we won't immediately replace the existing index but will monitor the new TLI over the next 12 months to study its real-time performance. A comparison over at least a year will be needed to accurately gauge the performance of the new index.

What signals are we getting from the revised TLI? The latest reading—for the three months ending in October 2007—ebbed slightly (*Chart 7*). A sharp drop in average weekly hours in manufacturing led the decline, followed by less dramatic reductions in consumer confidence, help-wanted advertising and Texas stock prices. Texas exports and retail sales sent positive signals.

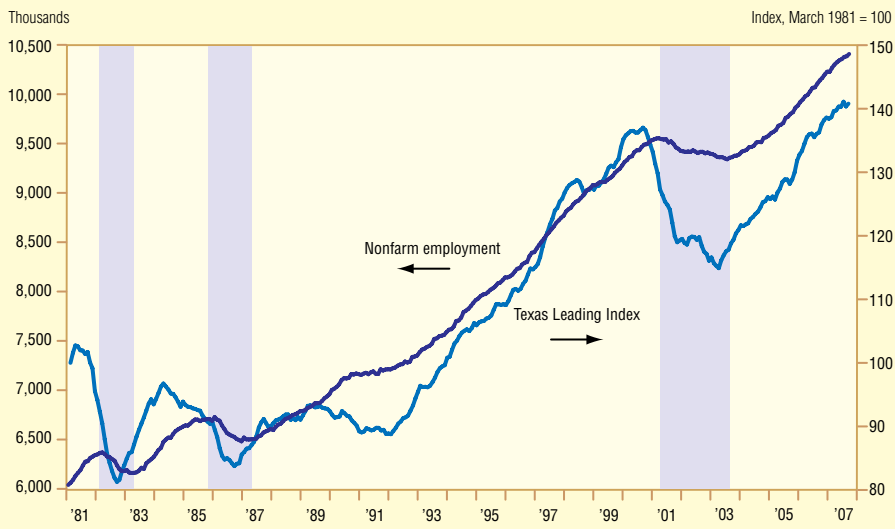
Overall, movements in the index suggest that job growth in Texas will likely slow over the next three to nine months

Chart 5
New Texas Leading Index Smoother Than Current Index



NOTE: Shaded bars indicate recession.
SOURCE: Federal Reserve Bank of Dallas.

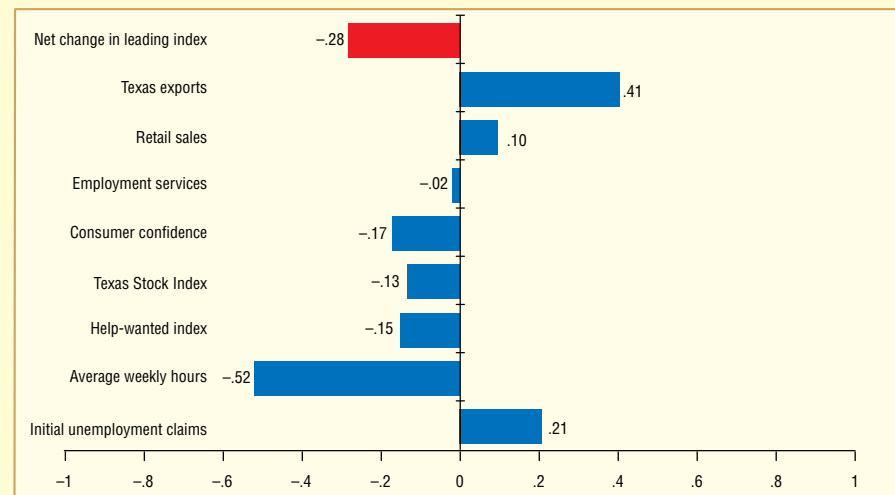
Chart 6
New TLI Leads Texas Job Growth



SOURCE: Federal Reserve Bank of Dallas.

Chart 7
New TLI Declines in Recent Months

(Net contribution to index, August–October 2007)



SOURCES: Federal Reserve Bank of Dallas; Conference Board; Census Bureau; authors' calculations with data from the Texas Comptroller and Dallas Fed.

but a recession remains unlikely. The Texas forecasting model based on changes in the index predicts job growth will be 2.1 percent in 2008, down from 3.3 percent in 2007.

Phillips is a senior economist and policy advisor and López is an economic analyst at the San Antonio Branch of the Federal Reserve Bank of Dallas.

Notes

The authors would like to thank Anil Kumar and Mine Yücel for helpful comments.

¹ For a description of the Texas Business-Cycle Index, see "A New Monthly Index of the Texas Business Cycle," by Keith R. Phillips, *Journal of Economic and Social Measurement*, vol. 30, no. 4, 2005.

² See www.nber.org/cycles/recessions.html.

³ For a description of quarterly Texas real GDP, see "A New Quarterly Output Measure for Texas," by Franklin D.

Berger and Keith R. Phillips, Federal Reserve Bank of Dallas *Economic Review*, Third Quarter 1995.

⁴ Data were published in "Regional Update," Federal Reserve Bank of Dallas *Southwest Economy*, January/February 2001. See dallasfed.org/research/swe/2001/swe0101e.pdf.

⁵ "Texas Transitions to Service Economy," by D'Ann Petersen, Federal Reserve Bank of Dallas *Southwest Economy*, May/June 2007.

⁶ The Conference Board's scoring process is described in more detail in its *Business Cycle Indicators Handbook*, available at www.conferenceboard.org/publications/describebook.cfm?id=852. Our measure of conformity differs from the one used by the Conference Board. We statistically test the relationship between movements in a candidate series and movements in Texas employment at least three months later. The series scores high on conformity if its changes are followed by changes in employment three, four, six or more months later.

⁷ Monthly retail sales were estimated using quarterly retail sales and monthly sales tax rebates from the Texas Comptroller of Public Accounts and retail trade employment.

⁸ An article in the Federal Reserve Bank of San Francisco's *Economic Letter*, Jan. 26, 2005, recommends using a Hodrick-Prescott (HP) filter to separate out trend movements and to then use cyclical movements as the leading indicator. We use the HP filter to separate out the trend in the Texas help-wanted index, although the current index construction and evaluation use percent changes in the components, which is another way to eliminate the trend in the data.

⁹ Several of the new components are filtered with a three-month moving average before inclusion in the index. This is necessary because of a high degree of noise in the data, which would have resulted in very low weights. Tests for the months for cyclical dominance in each of these variables reveal that at least a three-month moving average is needed for the trend-cycle movements to overcome the noise in the series. The Months for Cyclical Dominance measure is produced with the X-11 seasonal adjustment process.

Staying Aloft in Today's Turbulent Skies

Southwest Airlines executive chairman Herb Kelleher, a member of the Dallas Fed's board of directors, gives a front-line executive's view of the economy and the changes buffeting one of Texas' most important industries.

When asked about the secret to Southwest Airlines' success, Herb Kelleher jokingly replies, "Charismatic leadership." Beyond that, being the only major U.S. airline to make a profit every year since 1972 has come down to three factors: having a contrarian strategy and sticking to it, keeping costs down in good times so the company is prepared for the bad times and—perhaps most important—treating employees well and trusting them to do their jobs.

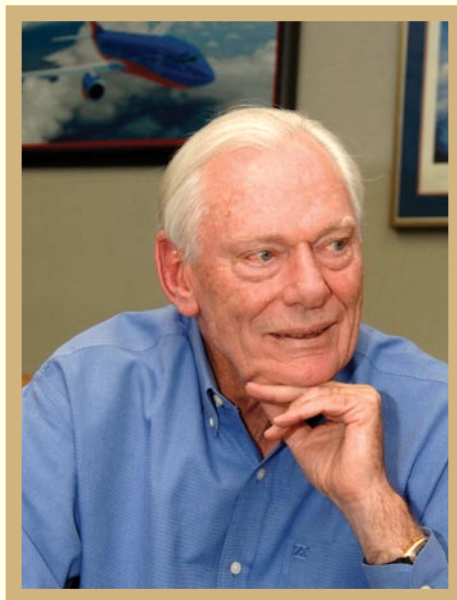
Kelleher joined with Rollin King to create Southwest Airlines in 1967. After four years of legal challenges from existing carriers, the fledgling airline finally began operations in 1971 with a fleet of three Boeing 737s that served Dallas, Houston and San Antonio. Southwest began to grow by emphasizing low fares, friendly service and quick ground operations that kept planes in the air. With a fleet of more than 500 aircraft, Southwest now offers more than 3,300 flights a day, serving 63 cities coast to coast.

Q. Some analysts worry that the U.S. economy is slowing. What do you see from your vantage point?

A. What we have seen is a gradual softening that started at the beginning of this year. If you look at the consumer confidence readings from the Conference Board or the University of Michigan, you can see there has been a downward trend.

For us, the trend wasn't totally manifest until the second quarter, but there's little doubt that many people are getting a little more cautious with their discretionary spending. Consumer demand is looking somewhat dicey, and the public seems increasingly skittish about the prospects for the U.S. economy.

Q. What about the Eleventh District, consisting of Texas and parts of Louisiana and New Mexico? How are things faring in our neck of the woods?



A. We had been saying for some time that the Eleventh District was a standout, a star with respect to airline bookings. But from the perspective of passenger traffic, we can no longer say that the district is head and shoulders above the rest of the country. Today, it's sort of in the middle of the pack relative to the rest of the country and continuing to exhibit a gradual downward trend in demand for domestic travel.

Q. Are there areas of the country that remain standouts?

A. At this juncture, we're characterizing "no change" from last year's bookings, on a capacity-adjusted basis, as doing "pretty well" relative to peer districts. On that basis, Cleveland and Kansas City appear to be strengthening, and Boston and New York are still relatively strong.

Q. How is the glum turn in the consumer's psyche impacting the way airlines conduct their day-to-day domestic business?

A. All major U.S. airlines are now reducing domestic seating capacity and/or paring back the rate of domestic expansion in response to weakening absolute demand across the nation. That's part of why load factors right now are so great. So much capacity has been taken out. The players that had been growing fast are slowing down, and we have started to see some airlines cancel or delay plans to add planes to their domestic fleets.

Q. How has the recent run-up in oil prices affected the outlook?

A. Thanks to the globalization of business and the weakening dollar, the major international airlines reported good third quarter earnings. But I suspect that the increase in jet fuel prices will translate into flattish to down earnings for the industry as a whole for the fourth quarter. It's also probably impacting how passengers view travel.

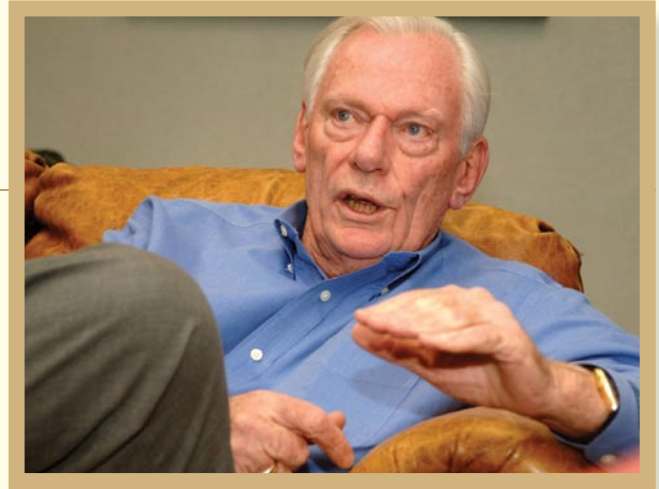
In the past, a big spike in gasoline prices would push more travelers to fly. But today, because of the pocketbook toll of high gasoline prices and the angst about the economy, I suspect some people are deciding not to take discretionary trips at all.

There are other possible responses to the long rise we've seen in oil prices. It has caused airlines to try to persuade engine makers to expedite efforts to make more fuel-efficient engines. On this count, we've made much greater strides in efficiency than other industries. In the past 25 to 30 years, we've decreased fuel use per seat by 50 percent. Of course, we can go only so far. You can't realistically expect to fly an airplane using wind power or electricity.

Q. Are there other factors impacting the bottom line today?

A. It may surprise most Americans to learn that the industry is beating itself to death to fill airplanes at 1990s fare levels, when we take inflation into account. About 70 to 75 percent of an airline's costs are fixed. On any flight taking off, you've already paid for everything from the crew that's flying the plane to the jet fuel that's providing the power. So if

“In the broadest sense, it seems to me that globalization has for some time held down the cost of living in this country.”



you have 20 empty seats, it's best to fill them at some price rather than not fill them at all. That's why you hear about a goodly number of fare increases but see relatively little in the way of higher average fares actually paid.

Q. What are these signals telling us about the outlook for the economy?

A. Some analysts regard airline bookings as a lagging indicator, but I have always seen them as somewhat of a leading indicator. Saying that always reminds me of a speech I gave in San Antonio back in the 1980s, when things were turning down in Texas. At the time, bookings in San Antonio were down 15 percent, which compelled me to inform my audience that though they might not know it, they were currently in a recession. And it soon became evident that they were.

Q. So are we in a recession?

A. I would say “probably,” if I were only looking at the traditional domestic indicators that I always have. But we're not in a recession; if we were, things would look much worse than they do at the moment.

I have thought about this a lot and venture the difference may be globalization and diversification, which have strengthened our overall economy. Something has indeed

changed. In the absence of globalization and diversification, I suspect we would be in a recession right now.

In the broadest sense, it seems to me that globalization has for some time held down the cost of living in this country. That's one reason why I suspect that in the absence of globalization, we would be in a recession.

Q. How has globalization affected the airline industry?

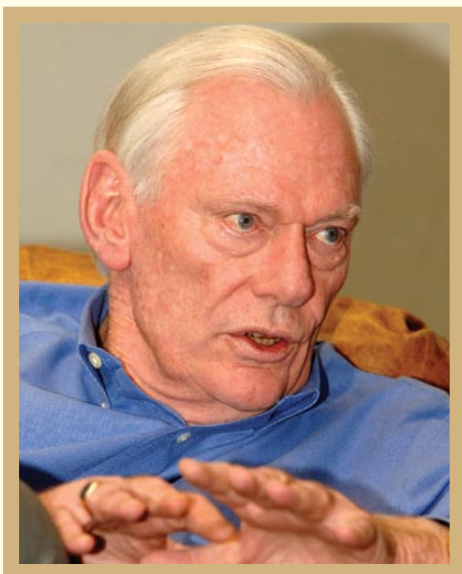
A. We've seen a very vivid, concrete and compelling manifestation of the effects of globalization, a trend that really picked up steam three to four years ago and has accelerated ever since. At the time, the United States had begun to succeed in pushing for “open skies,” whereas opportunities to fly between two countries had previously been much more curtailed.

Even where you don't have open skies, you have markets that are liberalizing using bilateral agreements. China is a great example. There has been an enormous percentage expansion with respect to the number of flights permitted; the restrictions have been loosened.

Q. How has this shift toward a globalized airline industry affected U.S. carriers?

A. Our big international carriers have benefited from globalization by effectively connecting the business world. It's not only that there is comparatively less competition than on domestic routes. The weakening dollar is also providing a boost to international carriers to the extent they receive payments in foreign currencies, such as the strong euro.

In essence, globalization has produced a prolific source of international passengers at higher fare levels. This is a sea change for the entire industry. I can think back to a time when the international aspects of the industry were not so prosperous, but today that has turned around.



Q. Are there any risks that accompany a globalizing airline industry?

A. There is something looming out there—more flights and new competition. As international restrictions continue to fall away, the number of flights and competitors is growing. Start-up low-fare carriers, for instance, are now operating between the United Kingdom and the U.S. I have little doubt that you will see more low-cost incursions into the global market.

Q. Ryanair has been mentioned as a candidate for just that and been characterized as Europe's Southwest Airlines.

A. We have just begun to hear talk that Ryanair might begin to fly between Europe and the U.S. Michael O'Leary is a fabulous and charismatic leader for Ryanair, and he's built Europe's largest low-cost carrier and exhibited a willingness to break molds. In yet another manifestation of how much things are changing, Ryanair recently tried to buy Aer Lingus, which amounts to a low-cost carrier in this country trying to buy one of the smaller old-line legacy carriers.

Q. Is there a message for existing international carriers?

A. As international flight restrictions continue to disappear, the sustained move toward greater competition will trigger the next major transformation in the industry. If there's a message, I suppose it could be that international travel won't be an endless cornucopia of prosperity for the current players. But that should come as no surprise. In the airline industry, you always have to keep a close eye on the future.

As the Texas economy expanded over the past two decades, firms increasingly relied on temporary workers to fill short-term and seasonal staffing needs. In 1990, these employees accounted for less than 1.5 percent of Texas jobs. After peaking in 1999 and taking a recessionary dip, the number rebounded to 2.7 percent this year (*Chart 1*).

Employing temporary workers, or “temps,” has obvious advantages. Temps offer firms the flexibility to hire quickly for short periods or for short-term positions that could later become permanent. Adding permanent employees, on the other hand, is an expensive and resource-consuming process that firms—particularly mid-sized businesses—might see as a restraint to growth.

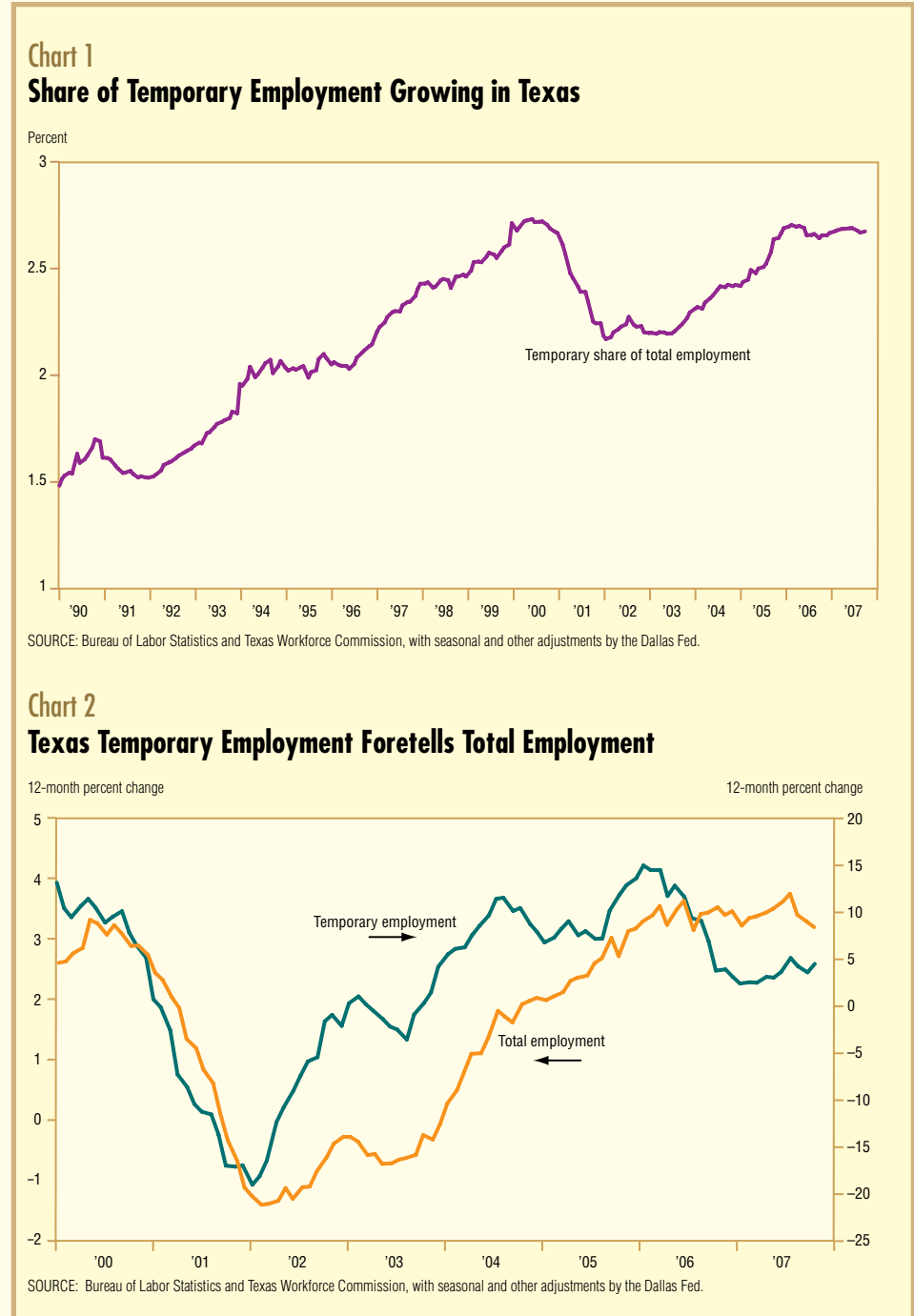
The flexible nature of temporary employment allows firms to easily add temp workers in anticipation of stronger economic activity and shed them quickly if they anticipate a weaker economy. In either case, hiring and firing are easier and cheaper with temporary workers, which suggests they usually feel the effects of business cycles before permanent workers do.

In Texas, changes in temporary employment do seem to precede those in total employment (*Chart 2*). Econometric analysis confirms that the temporary workforce has been a reliable predictor of total employment, with each 10 percent change implying a 0.7 percent change in the overall number of jobs.

It takes about five months for total private employment to arrive fully at the level predicted by changes in temporary employment. In October 2007, Texas temporary employment growth stood at 4.5 percent, suggesting that overall employment will pick up slightly in spring 2008.

Most temps are placed through staffing agencies, which help find positions and broker wages and incentives for these workers. Temp agencies also streamline the process for hiring firms.

Although temporary employees typically don't receive the same health and retirement benefits as permanent or full-time employees, they benefit from flexibility in scheduling of



shifts and working hours. In addition, temp agencies can sometimes negotiate better wages, which the hiring companies are usually willing to pay in lieu of benefits.

Since the 2000 tech bust, many Texas corporations in the high-tech sector have been using temporary workers. Full-time

employment and output in these companies haven't yet regained the lofty heights of the late 1990s, so it seems that temps are here to stay, especially as these firms attempt to maximize profit and enhance efficiency in a competitive environment.

—Raghav Virmani

Globalizing Texas: Direct Investment and Business Cycles

By Anil Kumar

In Austin, South Korea's Samsung Electronics Co. makes semiconductors. In San Antonio, Japan's Toyota Motor Corp. turns out Tundra pickups in a plant built on a former cattle ranch. Along the Gulf Coast, the American subsidiary of France's Air Liquide produces oxygen, nitrogen, argon and hydrogen for Texas-based industries. The Dallas area provides a U.S. base for several foreign telecommunications firms—Canada's Nortel Networks, Finland's Nokia Inc., Sweden's Ericsson Inc. and Japan's Fujitsu Ltd.

Hundreds of foreign companies, employing almost 400,000 workers, have put down roots in Texas. The highest concentration of jobs is in manufacturing, but more foreign firms are finding their way into services. Early this decade, Texas exceeded the nation in attracting foreign direct investment (FDI) assets, but the state has since lost its edge. Its FDI-related employment as a share of overall jobs ranks in the middle of the pack.

In the September/October issue of *Southwest Economy*, an article on globalizing Texas focused on export growth and related employment, including jobs in high tech.¹ Analyzing foreign investment in the state offers further insight into the Texas economy in an era of rapid globalization.

Have these deeper economic connections to the rest of the world affected Texas' output and employment? One model finds that over the past two decades the state's gross domestic product has become increasingly correlated with economic activity in the largest foreign economies. Globalization's business-cycle links, however, include many crosscurrents, creating uncertainty about how overseas events might impact the Texas economy.

This isn't a satisfying answer. Unfortunately, many globalization issues are elusive at the state level. The biggest hurdle is data on states' trade and investment flows, which are either not collected or not reliable. Although we can shed light on aspects of Texas' globalization, considerable blind spots remain.

SECOND OF TWO PARTS

Foreign Direct Investment in Texas

Cross-border capital flows are widely used as an indicator of globalization. Analysts divide the incoming money into three categories—portfolio equity, portfolio debt and foreign direct investment.² Unfortunately, data on equity and debt flows aren't available at the state level, leaving FDI the only source of information on financial globalization in Texas.

The state's central location, relatively low production costs, diversified industrial base and technological sophistication have lured many foreign multinationals. According to the Bureau of Economic Analysis (BEA), the total value of property, plants and equipment of the Texas nonbank affiliates of these companies exceeded \$103 billion in 2005, second only to California's \$123 billion.

As a share of state GDP, however, FDI in Texas has slipped in recent years (*Chart 1*). Since 1999, the affiliates' FDI fixed assets—plant, property and equipment—have fallen from 14 percent to 11 percent of state GDP, equaling the national average in 2005.

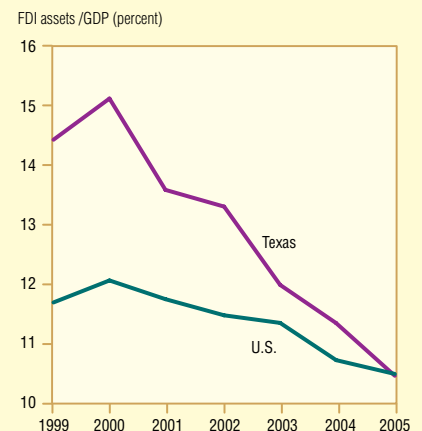
Texas' decline, as well as the slight ebb in the U.S. trend, may have begun with the recession in 2001 and the global economic slowdown that followed. Another factor may be the growing attraction of China, India and other emerging economies, now serious competitors for FDI dollars.

For the subset of Texas companies with at least 50 percent foreign ownership, the decline in FDI fixed assets as a percentage of GDP was fairly widespread across industries, with manufacturing suffering the greatest losses. However, services, real estate, and professional and technical services showed gains in FDI fixed assets.

Shifting the focus to jobs, the BEA reports that the broad category of all foreign affiliates had 388,000 Texas employees in 2005, giving the state the nation's third-largest total. Adjusted for size, Texas' FDI

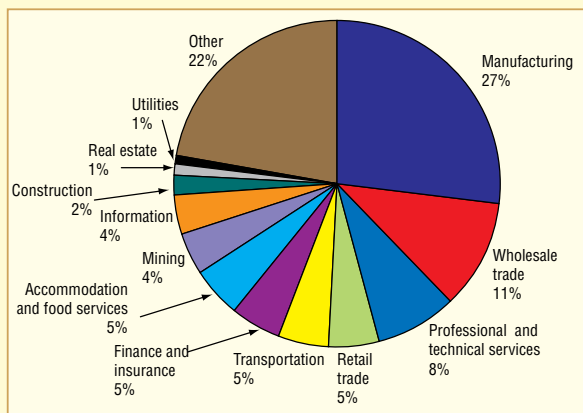
Globalization's business-cycle links include many crosscurrents, creating uncertainty about how overseas events might impact the Texas economy.

Chart 1
FDI Fixed Assets/GDP Declines Faster for Texas Than for U.S.



SOURCE: Bureau of Economic Analysis.

Chart 2
Sectoral Composition of Texas FDI Employment, 2002



SOURCES: Bureau of Economic Analysis; Census Bureau.

looks less formidable; it ranked 33rd in the percentage of employment by affiliate firms. Employment echoes the trends in fixed assets, sliding from 4.7 percent of total employment in 2000 to 4.2 percent in 2005.

Texas employment by foreign affiliates is fairly broad-based when measured at the sector level (*Chart 2*). Manufacturing accounted for 27 percent of the state's FDI-related jobs in 2002, just slightly below the nation's 29 percent. Texas had a relatively large share of its FDI employment in wholesale trade, professional and technical services, information and mining, while the U.S. had a larger share of its FDI job total in retail trade and finance and insurance.

In recent years, the share of manufacturing in total FDI has declined in both Texas and the nation, contributing to a rise in the share of services' employment in foreign-owned affiliates (*Chart 3*). For Texas, industry-level data for the affiliates reveal job gains in such sectors as wholesale trade, retail trade, and real estate and leasing. In percentage terms, real estate and leasing was the fastest growing, with a 60 percent increase in affiliate jobs from 2002 to 2005.

The burgeoning importance of services FDI in Texas is part of a worldwide trend. According to *World Investment Report 2004*, a United Nations publication, services industries accounted for more than two-thirds of world FDI inflows in 2002 and increased their share in total FDI stock from less than half in 1990 to about 60 percent in 2002.³

By establishing a presence in overseas markets through FDI, multinationals overcome the inherent difficulties in trading services, expanding the sector's presence in

the global economy.

When it comes to region of origin for FDI-related jobs, considerable similarity exists between the U.S. and Texas. For both, European companies provide the largest share by far (*Chart 4*). They account for almost two-thirds of the FDI-related jobs in the state. U.K. investors are the largest employers for both Texas and the U.S., followed by the French and Dutch in Texas and Germans and French in the U.S.

Given Mexico's proximity to Texas and the market opening under the North American Free Trade Agreement, it's not surprising to find that Mexican companies have been more active in Texas than the nation. They're responsible for 4 percent of Texas' FDI-related jobs, compared with just 1 percent for the United States. Asia-Pacific countries, including Japan, constitute a larger share of FDI employment in the U.S. (15 percent) than in Texas (12 percent).

Texas' record on FDI is mixed. The sheer size of FDI fixed assets and FDI-related employment reflects the state's success in attracting overseas investors. Recent declines in FDI intensity, however, suggest that the state has lost some of its appeal—

particularly for manufacturers. On a positive note, the state has seen a faster trend toward FDI in services than the nation.

Business Cycles

Globalization can strengthen or weaken links between business cycles in different countries through several channels. The most important are trade and financial flows. World financial markets clearly rise and fall together, but it's less easy to discern how trade and cross-border investment influence the movement of real economic variables, such as output and employment.

It may seem natural for trading partners' economies to move together as a demand shock in one country ripples through others via imports and exports. However, the principle of comparative advantage governs trade, suggesting that economies specialize in different products and industries.

If countries' industrial bases are very different, industry-specific shocks in one nation are less likely to be transmitted overseas. This specialization effect of trade weakens the correlation between business cycles across borders. If most trade is within the same industry, however, these shocks can create linkages between two countries' business cycles.

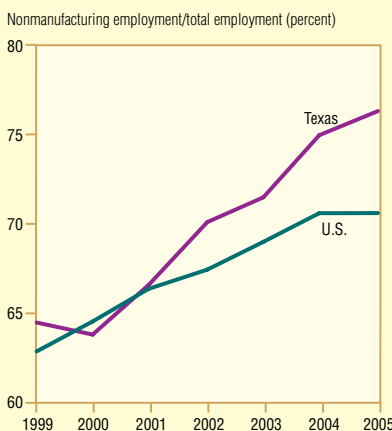
The effects of financial globalization on business cycles may also be ambiguous. On one hand, movements in international financial markets tend to be contagious, which could increase the likelihood of business cycles moving in tandem. On the other hand, integration of the world's capital markets may also promote specialization and allow countries to diversify by investing in foreign countries, thereby diluting links between business cycles.

These complexities make it difficult to identify the effect of trade and financial openness on business cycles. Despite increasingly rapid globalization, the correlation between the cyclical component of GDP in the U.S. and other economies has weakened since the 1980s.⁴

This doesn't seem to be the case for Texas (*Chart 5*).⁵ The correlation of Texas' business cycles with the rest of the world's—represented for our purposes by the large, developed countries of Britain, France, Japan, Germany, Canada and Italy—has increased considerably since the 1980s.

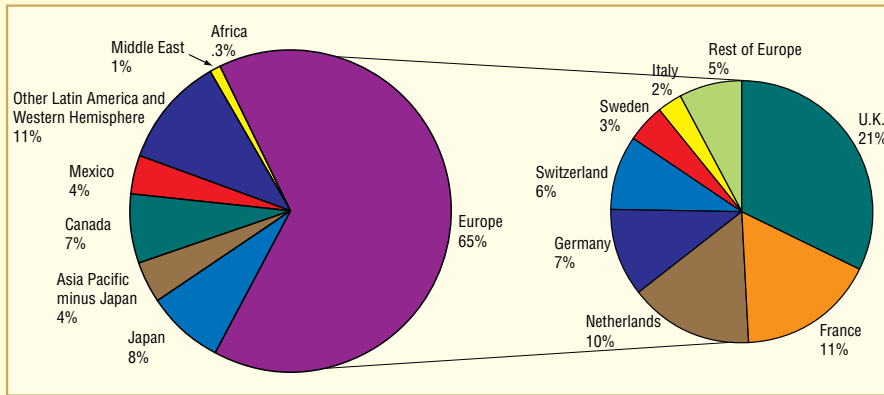
With the complex linkages between globalization and business cycles, a stronger relationship may not necessarily mean that Texas has become more globalized than the

Chart 3
Nonmanufacturing Employment Share Surges in FDI Firms



SOURCE: Bureau of Economic Analysis.

Chart 4
Country Distribution of Texas FDI Employment, 2005



SOURCE: Bureau of Economic Analysis.

The correlation of Texas' business cycles with the rest of the world's has increased considerably since the 1980s.

nation. Indeed, data limitations at the state level create obstacles to pinpointing exact sources of this difference. However, the correlation does signify that global economic forces have become increasingly important in shaping the Texas economy through channels independent of the nation.

Globalization's Implications

Our two-part exploration of globalizing Texas points to a state economy that's fairly well integrated with the rest of the world. Texas exports more of its output than the nation and employs more of its workers in export-related jobs. It also scores higher on export sophistication.

But not all readings are bullish. Texas' exports are less diversified than the nation's, and the state hasn't done as well in seizing opportunities in such fast-growing economies as Brazil, Russia, India and China. While Texas still has a large stock of assets owned by foreign affiliates, it has slipped back to the national average with the decline of FDI as a share of state GDP.

The forces of globalization have been advancing rapidly in recent years and are likely to continue to shape the U.S. and Texas economies. We can expect trade, foreign investment and global competition to create exciting opportunities as well as challenges for the state's businesses and workers. The availability of better data at the state level would improve our ability to fully grasp globalization's implications for the Texas economy.

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Notes

The author thanks Keith R. Phillips for useful comments.

¹ "Globalizing Texas: Exports and High-Tech Jobs," by Anil Kumar, Federal Reserve Bank of Dallas *Southwest Economy*, September/October 2007, pp. 11–13, 16.

² The Bureau of Economic Analysis defines ownership of at least 10 percent of a U.S.-based enterprise as foreign direct investment. Smaller interests are classified as portfolio investments. For some measures, the BEA looks at only foreign majority ownership—above 50 percent.

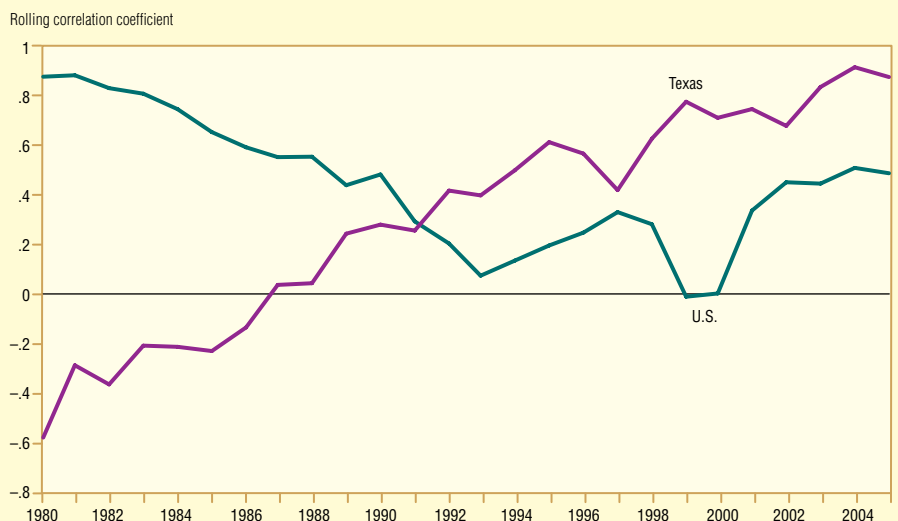
³ *World Investment Report 2004: The Shift Towards Services*, United Nations Conference on Trade and Development, October 2006.

⁴ "Why Has the U.S. Economy Become Less Correlated with

the Rest of the World?" by Jonathan Heathcote and Fabrizio Perri, *American Economic Review, Papers and Proceedings*, vol. 93, no. 2, May 2003, pp. 63–69. Also see "How Does Globalization Affect the Synchronization of Business Cycles?" by M. Ayhan Kose, Eswar S. Prasad and Marco E. Terrones, *American Economic Review, Papers and Proceedings*, vol. 93, no. 2, May 2003, pp. 57–62; and "How Much Does International Trade Affect Business Cycle Synchronization?" by William Gruben, Jahyeong Koo and Eric Millis, Federal Reserve Bank of Dallas Working Paper no. 0203, Aug. 26, 2002.

⁵ Chart 5 plots 10-year rolling correlations of detrended log of annual GDPs of Texas and other economies. The series were detrended using the HP filter. Annual GDP data are from the World Bank's World Development Indicators database for G7 countries; Texas data are from BEA 1970–2006.

Chart 5
Business-Cycle Correlations with Largest Foreign Economies Stronger for Texas Than for U.S.



NOTE: Countries include Britain, France, Japan, Germany, Canada and Italy.

SOURCES: World Bank's WDI database; Bureau of Economic Analysis.

QUOTABLE: “Although the slowing in employment growth is broad based, the goods sector is weakest, reflecting the downturn in housing and job losses in manufacturing.”

— Mine Yücel, Vice President



WIND POWER: Texas Takes Lead in Yet Another Energy Source

For decades, Texas has been the nation’s leader in crude oil and natural gas production. Now, the state has climbed to the top in wind power.

The American Wind Energy Association reports that Texas had 3,953 megawatts of capacity at the end of the third quarter, topping California’s 2,376 megawatts. Texas had another 1,357 megawatts under construction, compared with 45 megawatts for California.

Texas has been rapidly adding wind power capacity in recent years, allowing it to vault over California in 2006. The state’s wind farms can now produce enough electricity to supply the average daily needs of more than 1 million of Texas’ 7.5 million households.

Most commercial wind power relies on giant turbines,

with blades 70 to 100 feet long mounted on towers as tall as 300 feet. These modern windmills incorporate computer technology that can adjust the blades’ angle of attack to boost efficiency.

The state’s greatest wind power potential lies in the Panhandle, along the Gulf Coast south of Galveston and in the mountain passes and ridges of southwest Texas’ Trans-Pecos region. Three of the nation’s five largest wind farms are in Texas, led by the 420-turbine Horse Hollow project that spreads across 47,000 acres near Abilene.

Like oil and gas, wind farms pay royalties to landowners, including farmers, ranchers, state agencies and the University of Texas System.

—Richard Alm



TEXAS PLACES: Kerrville Area’s Economy Rises with Retirees

Kerrville continues to attract retirees to its Hill Country setting. The influx has helped boost jobs, per capita personal income and land values in and around Kerrville, a town of 23,000 located 65 miles northwest of San Antonio.

Kerrville’s share of population over age 65 is three times the state average. As more retirees have moved in, jobs have been created in retail, financial services and health care. From 2003 to 2006, Kerr County employment growth averaged 4.3 percent a year, above Texas’ 2.9 percent.

Per capita income grew 4.8 percent from 2000 to 2005, topping the state’s 2.8 percent. In 2005, Kerr County per capita income was \$33,473, compared with \$32,460 for Texas.

Land values are rising, too. According to Texas A&M’s

Real Estate Center, rural land values in the crescent formed by Kerr, Bandera, Blanco and Kendall counties doubled from 2002 to 2006. The average price of \$7,086 per acre ranks among the highest in a state that averages \$1,825 per acre.

Anecdotal reports suggest the Kerrville area has attracted many retirees from Houston, a number of whom receive royalty payments. Data back to 1974 show a strong correlation between the real price of West Texas Intermediate oil and Kerr County per capita income relative to the nation.

With the baby boom generation entering retirement years and energy prices high, Kerrville should see continued income and job gains.

—Michelle Hahn and Keith Phillips



SPORTS BIZ: Winning NFL Teams May Pay Off in the Pocketbook

By piling up wins in the regular season, the Dallas Cowboys could be giving the North Texas economy a boost. At least that’s the implication of a new study that finds metropolitan areas’ per capita personal income rises with the on-field success of their National Football League teams.

Other studies have detected income gains when the home team wins the Super Bowl, but economists Michael C. Davis of the University of Missouri–Rolla and Christian M. End of Xavier University in Ohio find a statistically significant impact from even regular season victories.

Their reasoning centers on psychological connections that lead to greater worker productivity. When NFL teams win, their fans take a more positive view of their own compe-

tencies in mental, social and motor skills.

“The joy experienced by fans of successful teams may ‘spill over’ and positively influence job satisfaction as well as their performance at work,” the authors suggest in an economic study prepared for an upcoming issue of the journal *Economic Inquiry*.

Davis and End find no similar gains from victories by major league baseball or National Basketball Association teams.

What about the state’s other team? The Houston Texans aren’t winning as often as the Cowboys—but the Davis and End study suggests they’re still making a positive contribution to the Houston area economy.

—Richard Alm

Texas Growth Slows but Remains Healthy

Although still outperforming the nation, the Texas economy weakened toward the end of the year. Manufacturing and housing have been the most fragile sectors, but growth has moderated in other areas as well.

After a robust increase of 3.9 percent through June, employment growth was 1.9 percent from July through September and 2 percent in October. Both figures are subject to revision.

The goods sector has been the major drag on economic activity, reflecting the downturn in housing and related weakness in manufacturing (*Chart 1*). Manufacturing jobs have been declining for the past three months, although employment gains remain positive for producers of wood, cement, petrochemicals, machinery, paper and food.

The single-family housing sector remains weak. Builders continue to pull back on new-home construction, leading to a persistent fall in single-family building permits, contract values and housing starts (*Chart 2*).

Sales of existing homes remain on a downward track (*Chart 3*). Inventories of ex-

isting homes for sale have risen to just over the equilibrium mark of six months. New-home inventories are somewhat higher, ranging from 7.6 months in Austin to 6.1 months in San Antonio.

Delinquent subprime mortgages continue to inch up in Texas. The state's delinquency rate is higher than the national average, but its foreclosure rate remains below the nation's.

Nonresidential and nonbuilding construction has held up well despite the housing sector's troubles. Demand for apartments has picked up and multifamily construction is robust, with permits on the increase (*Chart 4*). Given the tighter credit conditions, people who do not qualify for mortgages are seeking apartments.

As oil prices have climbed, activity has increased in the energy industry. Even though the oil and gas extraction sector is less than 2 percent of total employment in Texas, it has added 16,400 jobs year-to-date—making up 6.3 percent of the total job gains in 2007. The Texas rig count stands at

860, with almost 85 percent of domestic rigs exploring for natural gas.

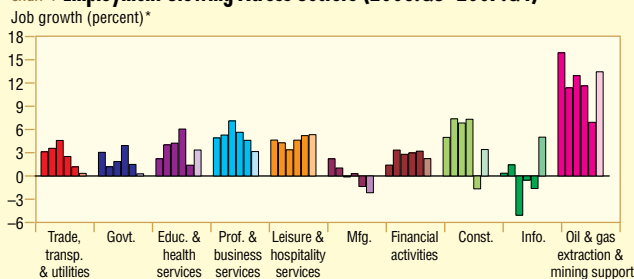
Texas exports were up 5.5 percent in the third quarter. The largest increases were 12 percent to the European Union and 9.5 percent to Latin America (excluding Mexico). Exports to Asia were up a meager 2.2 percent, while exports to China declined. The dollar has maintained strength relative to the peso, and exports to Mexico rose a modest 3.2 percent in the third quarter.

Overall, employment data and anecdotal sources point to a weaker Texas economy, but one that is still quite healthy and stronger than the national economy.

The Texas economic outlook is positive moving into 2008. Housing woes are beleaguering the national economy, but Texas housing markets, while weak, have held up better than many other areas of the country. Although high oil prices pinch Texas consumers as much as those in other states, Texas gets an offset because it's the nation's top oil and gas producer.

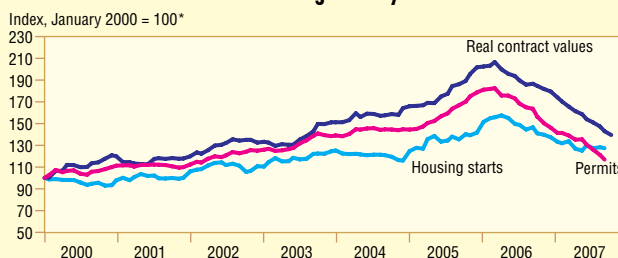
—Mine Yücel and Mike Nicholson

Chart 1 Employment Slowing Across Sectors (2006:Q3–2007:Q4)



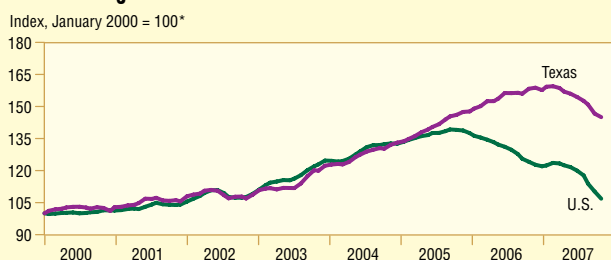
* Quarter-over-quarter, annualized. Q4 value is for October 2007, annualized.
NOTE: Percent is industry employment share of total employment in October 2007.
SOURCES: Bureau of Labor Statistics; Texas Workforce Commission; seasonal and other adjustments to Texas data by the Dallas Fed.

Chart 2 Texas Builders Pull Back on Single-Family Homes



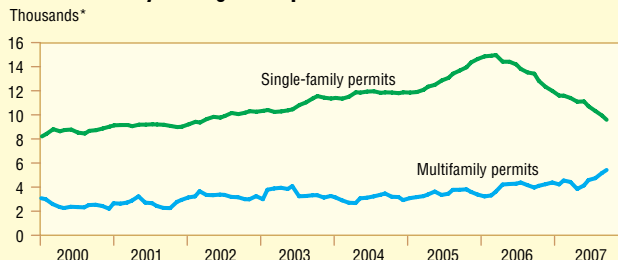
* Five-month moving average, seasonally adjusted.
SOURCES: Census Bureau; McGraw-Hill Construction; F.W. Dodge; Bank of Tokyo-Mitsubishi UFJ; seasonal and other adjustments to Texas data by the Dallas Fed.

Chart 3 Existing-Home Sales Down



* Six-month moving average.
SOURCES: Texas Real Estate Center; seasonal and other adjustments to Texas data by the Dallas Fed.

Chart 4 Multifamily Building Picks Up the Slack



* Five-month moving average.
SOURCE: Census Bureau; seasonal and other adjustments to Texas data by the Dallas Fed.

Economic Letter

Insights from the Federal Reserve Bank of Dallas

Why did the housing crisis occur, when will it end and is it spilling into the broader economy? Dallas Fed economists examine these issues and the financial market turmoil that followed. Look for their research reports in the November and December issues.

- **November:**
The Rise and Fall of Subprime Mortgages
- **December:** *From Complacency to Crisis: Financial Risk Taking in the Early 21st Century*

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