

TELECOM IN NORTH TEXAS: A CASE STUDY IN AGGLOMERATION

IF THE 1970s television series “Dallas” were recast in the 1990s, J. R. Ewing’s fortune would likely come from a high-tech start-up rather than an oil inheritance. Dallas’ Texas Instruments, Austin’s Dell Computer and Houston’s Compaq make the most technology-related headlines. However, Texas boasts hundreds of high-tech firms employing about 341,000 workers—second only to California’s 742,200 high-tech workers and followed by 306,300 in New York, according to the American Electronics Association.¹

Despite Austin’s image as Texas’ high-tech Mecca, North Texas has the largest number of high-tech jobs in the state. Dallas/Fort Worth’s 230,000 high-tech workers place the region among the ranks of California’s Silicon Valley in terms of employment. According to the Texas Workforce Commission, most high-tech workers in the North Texas area are employed in the telecommunications industry.

As illustrated in Table 1, nearly half of Texas’ 129,131 telecom jobs are in the Dallas area.² In fact, Richardson’s “Telecom Corridor” is home to the largest concentration of telecom firms in the world—more than 600 within two square miles.³ However, the industry spills out beyond the borders of the Telecom Corridor and accounts for



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TABLE 1
TEXAS TELECOM INDUSTRY

Area	Total employment	Telecom employment	Telecom as a percent of employment	Local telecom as a percent of Texas telecom
Texas	8,677,968	129,131	1.49	100
Dallas	1,781,909	62,741	3.52	49
Fort Worth	698,607	11,487	1.64	9
Houston	1,907,150	16,633	.87	13
Austin	578,421	8,482	1.47	7
San Antonio	665,388	10,404	1.56	8
Other	3,046,493	19,384	.64	15

SOURCE: Texas Workforce Commission, Fourth Quarter 1997.

3.52 percent of all employment in Dallas. This is more than double telecommunications' share of employment in Austin and San Antonio.

This article takes a look at the telecommunications industry that has clustered, or "agglomerated," in North Texas. The telecom industry's high concentration in North Texas means that firms are located quite close to their competitors. We focus on the relationships between the area's telecom companies and the benefits the firms derive from choosing a common location for their businesses.

Telecom in Texas

The Federal Reserve Bank of Dallas informally surveyed telecom businesses in and around Richardson's Telecom Corridor. These companies account for most of Dallas' 62,741 telecom jobs. Our questions addressed five topics: corporate function at the national and regional levels, motivation for locating in North Texas, regional employment, relationships with other companies and customer base. The results are tabulated in Table 2.

The survey revealed two striking characteristics of North Texas' telecom industry. First, an extensive mix of service and manufacturing firms has settled in the area, and second, telecom firms have a strong tendency to locate their headquarters in the North Texas region.

The principal lines of business for telecom firms are (1) providing long-distance, local and wireless communications for businesses and individuals;

(2) operating networks for voice and data, wired and wireless transmissions; (3) building and designing physical infrastructure for operators; and (4) manufacturing equipment ranging from cell phone handsets and fax machines for consumers to the fiber-optic cable, satellites and switches that form net-

works. Individual telecom firms usually engage in more than one of these principal lines of business, but can be roughly categorized into service and manufacturing firms. According to our survey, Nortel, Alcatel and Lucent Technologies are the largest equipment manufacturers in the area, while GTE dominates service provision in terms of employment.

Our survey also indicates the prevalence of international, U.S. and functional-level headquarters in North Texas. Many respondent firms have parent companies in Europe, Asia and other parts of North America. Nevertheless, telecom companies are not simply opening regional offices in North Texas. They are bringing their headquarters to the area. When survey respondents were asked why they chose to locate in North Texas, one of the most common answers was to be closer to other telecom firms.

TABLE 2
NORTH TEXAS TELECOM FIRMS

Year arrived	Company (origin)	Function of Dallas area operations	Business and product lines in region	Dallas area employment
1978	MCI (U.S.)	Engineering headquarters	Long-distance, wireless, Internet service	6,000
1978	Nortel (Canada)	U.S. headquarters	Manufactures switches, base stations, cell phones	8,000
1984	Fujitsu (Japan)	U.S. headquarters	Manufactures switches, base stations, other equipment	1,700
1985	Ericsson (Sweden)	U.S. headquarters	Manufactures switches, base stations, cell phones, displays	3,000
1987	AT&T (U.S.)	Regional headquarters	Long-distance, wireless, Internet service	3,350
1987	Excel (U.S.)	U.S. headquarters	Long-distance service	1,500
1988	GTE (U.S.)	Global headquarters	Long-distance, local, Internet service	14,000
1989	Siemens (Germany)	Branch	Manufactures switches	270
1991	Alcatel (France)	U.S. headquarters	Manufactures switches, base stations, light wave, microwave	5,000
1991	SBC (U.S.)	Wireless headquarters	Local, wireless service	9,000
1992	Nokia (Finland)	Branch	Manufactures wireless monitors, base stations, switches	3,700
1995	PrimeCo (U.S.)	U.S. headquarters	Digital wireless service	1,000
1996	Samsung (Korea)	Global headquarters	Manufactures cell phones	350
1996	Lucent (U.S.)	Branch	Manufactures switches, base stations	5,000
1997	Bosch (Germany)	Branch	Manufactures switches	175
Total employment				62,045

NOTE: This survey was designed to be comprehensive, though not exhaustive.

SOURCE: Federal Reserve Bank of Dallas Survey of Telecom Companies, October 1998.

Closer to the Competition?

Our survey of telecom companies and historical accounts of the region indicate three principal reasons companies have located in and around the Telecom Corridor. First, firms are drawn to the area to be near a supplier or customer. For example, MCI settled in Richardson to be near local start-ups DanRay and Collins Radio, two of its major suppliers. Second, firms come into the region through the acquisition of a local company, such as Nortel through its purchase of DanRay and Alcatel through its purchase of Rockwell International's Network Transmission Systems Division (which had acquired Collins Radio). The final rationale for choosing North Texas, cited by more recent settlers such as Samsung, is to join a well-established telecom region.

Preferring to locate close to the competition may sound counterintuitive, but high-tech firms have a strong tendency to choose a common location, a phenomenon known to economists as "agglomeration." Other, more traditional industries also have a tendency to agglomerate, such as the auto industry in Detroit and the theater business in New York. The traditional benefits from locating close to the competition include the formation of a highly specialized labor force (based on the accumulation of human capital and face-to-face communications), the availability of specialized inputs and the existence of modern infrastructure. High-tech firms enjoy these benefits from agglomeration as well. However, high-tech firms also cluster to take advantage of the most important factor of production in their industry—namely, ideas.

High levels of research and development distinguish high-tech firms, such as those in North Texas' telecommunications industry, from traditional manufacturing firms. Innovation in the telecom industry generates a positive externality that economists refer to as "knowledge spillovers."⁴ When one firm makes an investment to develop a new product or process, a portion of the knowledge generated by that investment may be transmitted, or spill over, to competitors. This transmission of in-

A Tough Call

Dial, wait, listen, talk, hang up. The apparent simplicity of an individual phone call masks the complexity of the hundreds of firms, thousands of workers, miles of wire and multitude of technologies constituting the Texas telecommunications industry.

A complete telephone network relies on three basic types of equipment. Terminal equipment, such as cell phones and fax machines, translates your voice or data into an electronic impulse. Transmission equipment, such as fiber-optic cables in wired communication or radio base stations for wireless, carries the impulses from one point to another. Switching equipment directs traffic within the system to ensure the impulse reaches the intended receiver.

The first phone networks were fairly simple: a stationary phone, cable, and an operator to mechanically direct the call. Today, one company supports its half-million Dallas cellular phone users with a network consisting of approximately 250 radio base stations and five switches. The telecom firms clustered in North Texas provide the equipment and service that make these more complex communications networks possible.

formation takes place through interactions between customers and suppliers, by employees moving from one firm to another, and through informal business and social interaction among members of various companies.

Patents diminish the spillovers associated with an innovation by preventing competitors from simply copying an invention. The knowledge surrounding the innovation is much more difficult to keep proprietary. The closer firms are geographically, the more likely they are to benefit from this flow of information.⁵ In addition to the presence of plentiful suppliers and customers or the possibility of specialized financing, knowledge spillovers drive those North Texas companies that cite "the existence of an established network of telecom firms" as the primary motivation for locating in the area.

The knowledge spillovers that drive telecom agglomeration in North Texas are similar to those at work in Silicon Valley.⁶ The technical community of Silicon Valley is characterized by homo-

geneity of its founders—young, ambitious individuals lacking in industrial experience and migrating from outside the region. The level of informal cooperation among them was high in the early days of the region's development. They all knew each other and went to the same restaurants and bars. They collaborated and shared information as a technological community, in spite of being fierce competitors. Numerous trade associations, industry conferences and clubs, such as the Homebrew Computer Club, became the center of an informal network. A highly efficient job-search network was also essential to Silicon Valley. When employees moved between companies, they took with them the knowledge, skills and experience acquired at their previous jobs. This reinforced a shared technical culture and accelerated the diffusion of technological capabilities and know-how. The region and its network of people replaced individual firms as the locus of economic activity.

By locating close to their competitors, telecom firms in North Texas take advantage of the same type of informal interaction that generates spillovers in Silicon Valley. Ideas are shared between firms and their suppliers, sparking innovations that benefit many other firms in the immediate area. Recruiting efforts by large firms (discussed in the following section) bring workers to North Texas. Spillovers from large, established firms such as GTE and MCI flow to smaller companies throughout the region when workers switch jobs and take their technical skills and training with them. These benefits from a common location are less tangible than things like a common infrastructure and specialized legal, financial and accounting services, but they are no less important.

Competitors Cooperating?

Knowledge spillovers are an indirect benefit firms derive from choosing a common location. North Texas telecom firms gain direct benefits when they take advantage of their proximity to engage in joint projects that expand the entire telecom market.

Brandenburger and Nalebuff (1996) coined the term “co-opetition” to describe when firms cooperate to expand an industry’s market size while still competing for market share. Traditional economic analysis assumes a profit-maximizing firm can gain only at the expense of the competition. Co-opetition considers situations where firms engage in win-win strategies for themselves and their competitors. Examples of co-opetition include research joint ventures, government lobbying efforts by many firms in an industry, and industry (rather than firm-specific) advertising campaigns. Texas’ telecom firms engage in co-opetition when they jointly work to expand their labor market and extend their global influence.

The telecom industry has an insatiable appetite for skilled workers, so North Texas telecom firms are cooperating to attract new workers and train regional residents for telecom jobs. To make it easier for job seekers to find out about the region and its opportunities, area companies launched the “eJobs-Telecom Corridor Program” Web site. The Internet resource features links to Web sites of more than 130 companies through an alphabetical listing; it avoids pushing one company over another by beginning each day at a different letter of the alphabet. Information about the region’s housing, cost of living, climate, recreation and even shopping is also included. By clicking on the “submit resume” button, a job seeker can electronically send a resume to one, six or all of the companies. Through August 1998, 19,000 job seekers had sent 27,000 resumes to 121 companies using the eJobs Web site.

Qualified people are more likely to risk moving to a new area if they have more than one job opportunity. Regardless of which company initially hires a worker, other area firms will benefit from the knowledge the worker acquires at the first firm, should that worker ever switch companies.

Firms are also cooperating with local universities and community colleges to train new workers. Companies including TI, Motorola, SBC and AT&T have each committed \$100,000 per year for the next five years to form an educational consortium with the University of

Texas at Austin, the University of Texas at Dallas, Texas A&M University and Texas Tech University. The consortium will focus on meeting the employment and research needs of Texas-based telecom firms. The Telecom Corridor Technology Business Council, together with Collin County Community College and Richland College, received the largest state Skills Development Fund contract in fiscal 1996–97. The \$2 million trained more than 800 computer technicians and other skilled workers in the Dallas area (Mt. Joy, 1998).

Companies are cooperating with local government entities and each other to expand the region’s international influence and market share. In August 1994 the Richardson Chamber of Commerce created the Telecom Corridor Technology Business Council, the first such organization in Texas. Council objectives are to influence public issues, cooperatively develop programs and services to expand Telecom Corridor companies, facilitate communication between executive peers and create value for the Telecom Corridor and its competitive position in the metroplex and the nation. The council’s board of directors is a prime example of co-opetition. The board includes presidents and vice presidents from companies that fiercely compete for customers, workers and innovations. Nevertheless, the executives cooperate on the council to achieve objectives that benefit all telecom firms in the region.

The co-opetition between businesses has been fostered—not forced—by local government entities. Ron Robinson, president and CEO of the Richardson Economic Development Partnership that generated the Telecom Corridor Technology Business Council, explains government’s role in the region:

The development of the Telecom Corridor...has been entirely private sector driven. While some tax incentives from local government have been provided and some of the start-ups and existing companies depend heavily on federal contracts, the thrust of the entire development has occurred without public sector stimulation. Local government has done what it should do best—provide good government,

superb local services and quality of life factors that complement the workplace. (Robinson, 1995)

The companies concur. None of the firms surveyed listed preferential tax treatment as an incentive for locating in North Texas. Although firms have partnered with local government and each other to promote North Texas’ cluster of telecom companies, the industry’s regional development has occurred with minimal public sector influence.

Fueled by Free Enterprise

The region’s growing telecom industry was made possible by the worldwide movement toward free enterprise. Deregulation and privatization have opened new markets for manufacturers and service providers and have increased competition to develop the next technological innovations.

The North Texas telecommunications industry took off after the Department of Justice and AT&T negotiated a complex restructuring in the early 1980s. The AT&T manufacturing and service monopoly—long supported by federal, state and local regulators who thought competition would result in inferior service—was divided into several local service providers, like Southwestern Bell, and one long-distance provider, AT&T. As the U.S. market opened, competing equipment manufacturers and service providers located in North Texas, joining MCI and its suppliers.

Global telecom privatizations have also benefited the North Texas telecom industry. Alcatel, created by the 1987 French telecom privatization, came to Richardson in 1991 after acquiring a supplier to MCI. MCI, whose engineering division is headquartered in North Texas, acquired Brazil’s long-distance service in 1998 through one of the largest privatization transactions ever.

Increased competition and larger markets have encouraged North Texas firms to develop new transmission, switching and terminal equipment technologies and new services. Richardson start-up Optical Switch Corporation just an-

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IS UNEMPLOYMENT TOO LOW?

How Welfare Reform and Technology Are Creating a New Employment Standard

MUCH HAS BEEN written recently about whether the economy is growing “too fast” and whether the unemployment rate is “too low.” Using jargon such as the “natural rate” of unemployment and the “NAIRU,” pundits point to the low unemployment rate as evidence the United States is on an unsustainable economic course. To use an analogy, a person can sprint for a quarter mile, but the physical laws of nature make it impossible to do so for a marathon. Similarly, the argument goes, the current U.S. rate of unemployment is lower than the economic laws of nature will permit, and it cannot remain at this level without dire consequences for the economy.

Yet, by historical standards, the U.S. unemployment rate is not particularly low. As Chart 1 illustrates, unemployment routinely fell below its current rate during the 1950s and 1960s. Analysts cite a variety of factors to explain its subsequent upward drift, including demographic changes, increased labor-market regulation, a decline in the quality of education and a rise in female labor-market participation. The trend reversed itself in more recent times, with unemployment rates falling to levels more reminiscent of the 1950s than the 1970s. Faced with this decline, economists have lowered a benchmark estimate of sustainable unemployment from 6 percent to 5.5 percent. But is 5.5 percent low enough?

This article examines several factors unique to the 1990s that mark the onset of a “new economy,” one fundamentally different from that of the 1970s and 1980s—and better able to sustain low rates of unemployment. To do so, I examine three questions. First, why might we think that unemployment is

too low? Second, why should we be concerned about low unemployment? And third, has the nature of unemployment changed in such a way that unemployment rates that would have been too low a decade ago are now possible to sustain over the long run without prompting inflation?

A Closer Look at Unemployment

Several factors contribute to unemployment in a market economy. The first of these is the constant process of “creative destruction,” in which old firms are destroyed and new firms are created. These changes sometimes occur within a particular industry as uncompetitive firms downsize in an attempt to become more efficient or when they go out of business and are replaced by more competitive firms. Shifts from one industry to another are also important, as the decline of the American automobile industry and the rise of the computer industry illustrate.

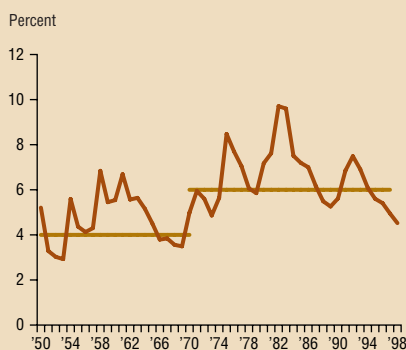
In each case, the normal workings of the economy caused labor turnover. Therefore, even a perfect world in which everyone could work at a desirable job would have at least a small amount of unemployment.

In the imperfect world in which we live, several other factors also contribute to unemployment. One is the degree to which able-bodied individuals have an incentive to work. Opinions on this topic vary widely and are sometimes controversial, but there is little doubt that at least a small number of people do not seek work as eagerly as they could. Some studies have found government welfare programs exacerbate this problem by lessening the consequences of unemployment. In any event, the unemployment rate is likely higher than it could be if everyone were highly motivated to seek work.

The job-search process can also be costly. When unemployed individuals must spend a great deal of time looking for work, or when firms must spend a great deal of time searching for applicants, unemployment will be higher than it would be if people could find jobs more quickly and easily. Technology that reduces job-search time at either end—people finding firms or firms finding people—can reduce the amount of time individuals must look for work and thereby reduce the number of people unemployed at any given time.

Finally, different individuals have different abilities to work. Through no fault of their own, some people have physical or mental impairments that do not affect their desire to work but may affect their capacity to work. To the extent that companies cannot easily accommodate their needs in the workplace, people with disabilities face special obstacles in the job-search

CHART 1
U.S. UNEMPLOYMENT RATE,
1950–98



SOURCE: Board of Governors database.

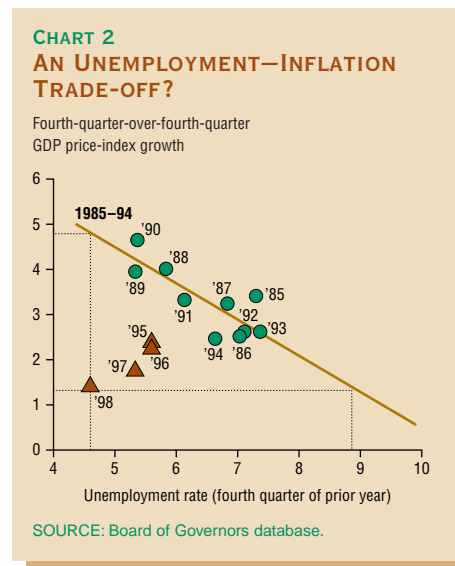
process that lengthen the time they must spend seeking work. This makes the unemployment rate higher than it could be if ways were found for these individuals to perform work more easily. In an era characterized by heightened sensitivity to the physically and mentally challenged, it is especially important to acknowledge this issue and examine the extent to which it has been mitigated by the new economy of the 1990s.

Why We Should Care About Low Unemployment

Given that some unemployment is to be expected even under the best of circumstances, it is natural to ask how low the unemployment rate can go before becoming unsustainable. Until the late 1960s, most economists estimated this “natural rate” of unemployment to be approximately 4 percent.¹ Rising unemployment in the 1970s convinced many that the natural rate had gone up to 6 percent, while the economic boom of the 1990s recently led the federal government to lower its estimate of the natural rate to 5.5 percent.² However, U.S. unemployment now stands a full point below the level deemed unsustainable, and it has remained below 5.5 percent for each of the past three years. Should we be concerned?

When the unemployment rate is unusually low, firms must offer higher wages to attract workers. This may seem beneficial for everyone, but these wage increases are not accompanied by any increase in productivity. The only way companies can pay higher wages for the same output is to raise prices, which causes inflation. Indeed, it was this concern that prompted economists to coin the acronym NAIRU—nonaccelerating inflation rate of unemployment—and later suggest that the current 4.6 percent rate of unemployment is unsustainable.

Anyone who remembers the state of the economy during the Carter administration understands the damage inflation can cause.³ Products suddenly become more expensive, but savings account balances do not magically rise to compensate. And when the infla-



tion rate is both high and erratic, as occurred during the Carter years, people tend to spend their salaries immediately rather than save them because the next month’s inflation could be even higher. This lack of saving hinders banks’ ability to make loans and thereby hinders entrepreneurs’ access to capital, which reduces economic growth and can even cause a recession.

Historically, the Fed is seen as raising interest rates when unemployment is deemed too low in order to slow economic growth and reduce inflationary pressures. Chart 2 plots unemployment and inflation during the 1985–94 period and suggests that low unemployment was generally accompanied by high inflation. If the American economy were behaving in 1998 as it did then, the current 4.6 percent rate of unemployment would be accompanied by an inflation rate of almost 5 percent and the current 1.6 percent rate of inflation would produce an unemployment rate of almost 9 percent. If the so-called Phillips curve depicted in Chart 2 were an immutable law of economics, the current rate of unemployment would provoke grave concern about inflationary pressures.

But something is different now. The low unemployment of the late 1990s has been accompanied by extraordinarily low inflation, as Chart 2 illustrates. While it was fashionable in the early months of below-5 percent unemployment to predict inflation was about to surface, it now appears something in

the American economy has changed. What was thought to be “unsustainable” in the past now appears sustainable. But what is different about the 1990s?

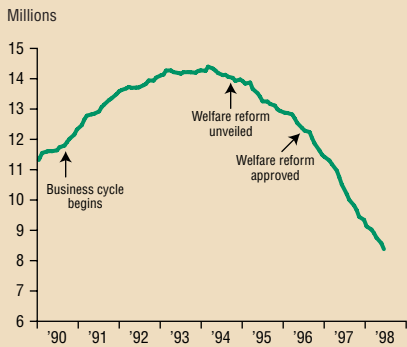
Changes to the Welfare System

The American welfare system, begun in 1936, was designed to help destitute individuals survive the Great Depression. From this laudable goal sprang hundreds of programs to help the needy, from food stamps to Medicaid to a myriad of smaller programs. And what could be wrong with trying to improve the well-being of the poor?

The problem with welfare programs was best captured by Joseph Schumpeter when he said the real tragedy of unemployment is not lack of employment per se but “unemployment plus the impossibility of providing adequately for the unemployed without impairing the conditions of further economic development.”⁴ When the government helps those who do not work, it inevitably creates an incentive for others to collect welfare instead of going to work. Economic research is divided on how large these effects can be, but the basic point remains: there is no way to help the poor without encouraging at least a small number of people to become poor. When people who could work decide to join the welfare rolls, economic output must fall because fewer workers are available to produce it. Hence Schumpeter’s discouraging conclusion that welfare programs harm the economy.

In 1996 President Clinton signed a welfare-reform bill designed to assist those who need it but end assistance to those who do not. The legislation imposed a five-year lifetime limit on welfare reciprocity. It also mandated that no one could receive welfare for more than two years without doing something—such as attending classes or participating in government-run jobs programs—in exchange. Shortly before its passage, the bill’s opponents complained bitterly that welfare reform would simply “punish those least able to cope,”⁵ but data from the past few years tell a different story. As Chart 3 illustrates, welfare reciprocity has fallen dramati-

CHART 3
U.S. WELFARE RECIPIENTS, 1990–98



SOURCE: Administration for Children and Families (part of the Department of Health and Human Services).

cally, beginning at approximately the time when it appeared welfare reform might be enacted into law and continuing into late 1998. This decline is not limited to any particular region of the United States; indeed, the number of people receiving welfare benefits has fallen in every state except Hawaii. This broad-based decline in welfare reciprocity is entirely consistent with a “new economy.”

Some have argued the unprecedented drop in welfare reciprocity is due solely to the booming economy. To shed light on this view, Chart 4 shows GDP and welfare reciprocity growth rates during each business cycle since 1950. Remarkably, the current cycle’s growth rate of 2.26 percent is the lowest in the postwar era while its decline in welfare rolls is the highest of the postwar era. More telling is that the strongest economic expansion occurred at precisely the time welfare reciprocity increased most—the years surrounding the Great Society of the 1960s. Since welfare reciprocity did not fall during the impressive expansions of the past, there is little reason to believe the relatively mild expansion of the 1990s is responsible for the current unprecedented decline in welfare reciprocity.

Why could changes to the welfare system reduce unemployment? As was discussed above, unemployment is determined in part by the job search costs individuals face and by how much incentive they have to find work. When an alternative source of income (such as

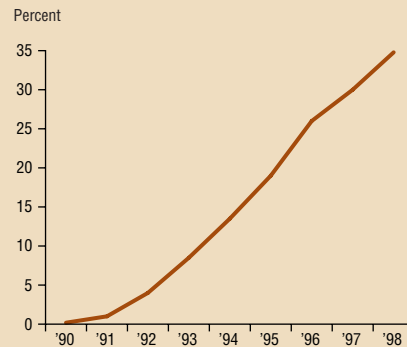
welfare) is available to anyone for as long as they are unemployed, there is less incentive to find work as quickly as possible. On the other hand, when the alternative to work becomes less generous, people who are unemployed have a greater incentive to find new jobs quickly. This both lowers the unemployment rate and reduces the natural rate of unemployment.

Advances in Computer and Communications Technology

Much has been written about the so-called digital divide, which separates computer-savvy individuals from others. Those who understand computers will prosper, the theory goes, while those who do not will lack the most basic skills needed to work in the information age.⁶ This theory makes sense in certain circumstances, but it misses two features of the information age that make the workplace more accessible to everyone: a reduction in job-search costs and an increase in opportunities for the disabled.

One signature feature of the information age is the ability to instantly search help-wanted ads from across the country and make resumes available to employers in all parts of the nation. Until recently, individuals often searched for work by traveling from city to city or spending hours in a library perusing a few major newspapers. Today, anyone

CHART 5
PROPORTION OF U.S. HOUSEHOLDS THAT USE THE INTERNET



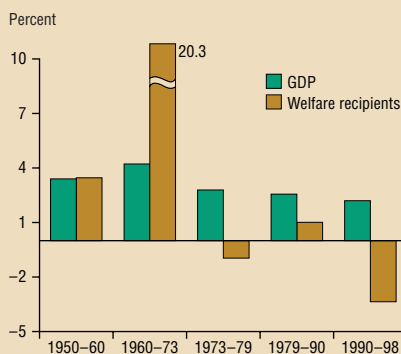
SOURCE: Adapted from Federal Reserve Bank of Dallas 1996 Annual Report.

with access to the Internet can instantly search job listings from around the country. Thousands of companies now post their help-wanted ads on the Internet, and there are more than 200 Internet sites at which job seekers can check job listings or post resumes. The box entitled “Job-Search Sites on the Web” lists a sampling of these sites.

Help-wanted ads in cyberspace would not mean much if ordinary people did not use the Internet daily. As Chart 5 indicates, however, Internet use has soared from essentially zero in 1991 to 35 percent of the population today. In fact, it is estimated that more than 3 million people use the Internet to look for work on any given day.⁷ And as the Internet becomes available through television sets and other devices, even those who know nothing about operating a computer will be able to surf the Web for information. The box entitled “Comments from Online Job-Seekers” contains anecdotes from ordinary people who used these sites to find jobs quickly and easily.

Advances in computer technology also enable those with special needs to find jobs more quickly. Indeed, technological advances have historically helped enable the physically and mentally challenged to become more productive and employable. Those who lack the strength to carry cargo on their backs or lack the experience with animals to haul it via horses can load it into a truck using a cargo mover and then drive it to its ultimate destination.

CHART 4
GDP AND WELFARE GROWTH RATES, BY BUSINESS CYCLE



SOURCE: Administration for Children and Families (part of the Department of Health and Human Services).

Those who lack the manual dexterity to sew can set up a sewing machine and produce clothes. There are many other examples of how machinery has helped reduce the need for physical skills, and, in each case, people who previously lacked the requisite qualifications to work suddenly became as employable as those whose arms were strong or whose fingers were nimble.

In the information age, technological advances have enabled physically and mentally challenged individuals whose lives were largely unassisted by the inventions of the industrial age to be as productive as other employees. One example of this is in the fast-food industry, where workers can take orders from customers without knowing how to add or even how to read; workers simply touch computer-generated pictures of food items to relay an order to the kitchen. And with the advent of voice-recognition technology, even people born with severe physical disabilities are no longer excluded from the benefits of computers.⁸

Job-Search Sites on the Web

Here are 24 of the numerous Internet sites dedicated to facilitating the job-search process.

CareerMosaic	www.careermosaic.com
CareerPath	www.careerpath.com
CareerWeb	www.cweb.com
Career Avenue	www.careeravenue.com
Career Central	www.careercentral.com
Career Connector	www.careerconnector.com
Career Exposure	www.careerexposure.com
Career Journal	www.careerjournal.com
Career Magazine	www.careermag.com
Career Marketplace	www.careermarketplace.com
Career Matrix	www.careermatrix.com
Career Resource Center	www.careers.org
Career Shop	www.careershop.com
Career America	www.careeramerica.com
Career Builder	www.careerbuilder.com
CareerCast Inc.	www.careercast.com
Career City	www.careercity.com
CareerExchange	www.careerexchange.com
CareerExposure	www.careerexposure.com
CareerFairs.com	www.careerfairs.com
CareerGuide	www.careerguide.com
CareerMart	www.careermart.com
CareerPark	www.careerpark.com
CareerSite	www.careersite.com

Comments from Online Job-Seekers

"Who would have ever thought that I would land a career within my major two months prior to graduating from college? I received over twenty responses within just one week after putting my resume on-line." —Anonymous, Job Link USA

"I was in the middle of making a transition from New York to California after my husband's company relocated. That's when I decided to try [the Web site] Job Link USA. Job Link USA sent my resume to thirty companies prior to my relocation. Thanks to Job Link USA I was hired the next week." —Anonymous, Job Link USA

"I found an interesting job posting on the Monster Board [Web site] and in less than a week had the job of my life!!! This was the EASIEST I have ever found employment and will recommend it to everyone looking for their perfect job!" —Kim Porcher, Monster Board

"Within 3 days [after posting resume on Web], I received a call from a prospective employer. A week later I was interviewing at their company headquarters in Boston, and two weeks later...received a job offer for moving to San Francisco." —Babak Ardalan, Monster Board

Computers and the Internet affect the unemployment rate by shortening the time people spend looking for work and increasing the ability of physically and mentally challenged individuals to find jobs. In the past, individuals with special needs might have had to search a very long time until they found a job they could perform unassisted, and anyone who could not find a job in his or her own city might have had to spend weeks or even months drifting from one place to another in search of work. In the information age, however, the disabled can (with the help of technology) perform almost any job as well as and sometimes better than the non-disabled, and it is not uncommon for people to find jobs for which they are well-suited within a matter of days by searching the Internet. This dramatically cuts the time unemployed people must spend searching for work and thereby reduces the rate of unemployment.

Conclusion

For the past several years, the American unemployment rate has been lower than many analysts thought possible yet has not triggered the inflation many analysts regarded as inevitable. This article suggests that welfare reform and information-age technologies may have fundamentally changed the American economy, so that unemployment rates deemed low by the standards of the 1970s and 1980s can be maintained without creating inflationary pressures. This does not mean there is no longer any unemployment rate below which inflation is likely to occur, nor does it mean the Fed should stop watching for signs of inflation. It does mean that changes in technology and government policy are important contributors to low unemployment and that recent changes in these areas are likely at least partially responsible for the remarkably low rate of unemployment in the American economy today.

—Jason Saving

Notes

The author thanks Mike Cox for his helpful observations and Ricardo Laudes for his research assistance.

- ¹ Economists use two similar concepts when discussing unsustainable unemployment: the natural rate of unemployment (the rate that would hold if all markets functioned optimally) and the NAIRU (the lowest rate of unemployment consistent with stable inflation).
- ² 1998 *Economic Report of the President*.
- ³ The late 1970s were also characterized by high unemployment.
- ⁴ Joseph A. Schumpeter, *Capitalism, Socialism, and Democracy* (New York, Harper, 1950).
- ⁵ Former Sen. Bill Bradley of New Jersey, as quoted in "President Praises Senate Changes in Welfare-Reform Bill," *Morning Edition*, National Public Radio, July 24, 1996.
- ⁶ Anna Bray Duff, "Does U.S. Face a 'Digital Divide'? Battle of Haves Vs. Have-Nots Goes High-Tech," *Investor's Business Daily*, August 14, 1998, p. A1.
- ⁷ Daniel Levine, "Your Dream Job: A Click Away," *Reader's Digest*, October 1998, p. 114.
- ⁸ The state of the art in this area is a computer chip that enables users to manipulate physical objects with their minds. Should future scientific research prove fruitful, there may come a time in which people with any form of physical disability can work as efficiently as those without. See Warren King, "New Implant Allows Disabled to 'Will' Computer Functions," *Dallas Morning News*, October 11, 1998, p. A13.

Europe: Risk and Reward Under Monetary Unification

SKEPTICS DOUBTED THAT the politically and culturally diverse nations in the European Union (EU) could ever set aside their differences and unite to form a single currency. However, in the 10-year span since the Delors Report¹ proposed the idea, the economic and monetary union (EMU) has gone from concept to reality for the EU11, as the EMU countries have come to be known.² On January 1, 1999, the EU11 will hand over control of their money supplies to the European Central Bank, and in 2002 the euro—the region's new currency—will officially replace the local currencies.

While the coming of the euro is now a certainty, it is yet to be decided how much, if at all, the euro-zone countries will benefit from the single currency, what the risk of failure is and what implications the union has for the United States.

Benefits to Monetary Union

The motivation behind the EMU may be more political than economic, and many see it as merely the next step toward a more integrated Europe. However, adoption of the euro does have some important economic implications and might provide some economic benefit to the participating countries.

One aim of moving to the single currency is to foster trade not only among the EU11, but also between the EU11 and other countries. Currently, for a German company to purchase goods from France, it would first need to convert Deutsche marks into francs. This poses two problems for the German company. Not only will it incur transaction costs in the conversion, but it also faces the risk that the francs will decline in value once they are purchased. The single currency will virtually eliminate these two problems. Similarly, a firm

from a country outside the EU11 would only need to convert its domestic currency into euros to do business with any of the 11 countries.

Another potential benefit of the monetary union relates to the business cycles of the member countries. As the euro-zone countries' economies become more integrated and the factors of production become more mobile, business cycle swings may become less pronounced and more correlated between countries.

At the moment in Europe, most of such business cycle smoothing occurs not between countries but within a country, where people insulate themselves from large changes in consumption by saving more in good times and less during bad times.³ If the EMU succeeds in making capital more mobile through lower transaction costs and less currency risk, then more risk sharing will occur between countries as cross-ownership of assets increases. If, however, capital movement across borders is being restrained not by transaction costs and currency risk but by informational barriers, then capital movement might not increase that much and business cycle smoothing will not occur to as great an extent. This is potentially the biggest risk the union faces.

The Business Cycle and Potential for Failure

Most of the concerns about the long-term viability of the EMU stem from one basic problem: the countries in the union are often at different points in the business cycle, which means that one country might enter into a recession at the same time the other countries are expanding. Under the EMU, that country would not have monetary policy at its disposal to lift its economy out of recession, nor would it be able to devalue its currency to increase demand for

its products abroad. In the worst-case scenario, if the other countries are experiencing inflation, they may even vote to increase interest rates at a time when a rate cut is most needed by the stagnating country.

In the United States, when one area of the country goes into recession, such as Texas after the 1986 oil-price shock or California in the early 1990s, the U.S. government can use fiscal policy to redistribute income to the suffering region. Also, labor is very mobile between regions, and workers can move rather easily to a healthier area of the country.

The EMU, however, has no central fiscal authority, and cultural differences and labor market issues make workers far less mobile than in the United States. It appears that the only way to insulate EMU countries from adverse economic shocks is through increased capital mobility. As mentioned earlier, however, it is far from certain that capital flows will increase significantly. A possible solution would be to allow governments to temporarily run large budget deficits during rough economic times. Under the current agreement, however, they would not be allowed to do so.⁴

While unemployment in the region has been declining, the euro-zone unemployment rate still stands at 11.1 percent (*Chart 1*). Pressures could mount on the central bank to use monetary policy to alleviate unemployment at the expense of higher inflation, and the disparity in the rates between countries could cause a political rift between high- and low-unemployment countries.

EU leaders are already pressing for lower interest rates, even ahead of the date the European Central Bank starts setting monetary policy.⁵ Many feel that European interest rates should converge to the level of the securities repurchase rate in France and Germany of 3.3 percent—currently the lowest of any of the EU11—or perhaps even lower. Such a

convergence would represent a 0.5 percent cut for the region as a whole.

If the European Central Bank fails to cut rates while the U.S. interest rate continues to fall, the dollar could extend its decline against the European countries and the euro might become *too* strong. This could slow growth for the EU11 and create a conflict between those countries that are export dependent and those that are import dependent. Also, the EMU could be seen as not playing its part in alleviating the global financial crisis.

Implications for the United States

Once in place, the EU11 will represent one of the world's largest markets, rivaling the United States in size (Table 1). The EMU's success or failure could have significant implications for the United States, and a strong EMU could be very beneficial. If the monetary union strengthens the economies of the EU11, it will create a larger market for U.S. products. Having the single currency will also make it easier for U.S. companies that wish to do business in Europe.

A successful euro won't necessarily benefit everyone, however. U.S. ex-

**TABLE 1
EU11 MARKET COMPARED
WITH UNITED STATES**

	EU11	United States
Population (millions)	290	267
Share of world GDP (percent)	19	20
Share of world trade (percent)	19	17
Unemployment (percent)	11.1	4.6
Stock market value (billions)	\$2,248	\$6,726

porters could see some drop-off in demand for their products as the euro-zone countries trade more among themselves. As it stands now, 35.2 percent of EU11 trade is with other EU11 countries. That figure should increase once the monetary union goes into effect.

Furthermore, international holdings of dollars will inevitably drop as a result of the union, particularly if the euro is widely held as a reserve currency. First of all, the demand for dollars from the EU11 will decline because they will no longer need to stabilize the value of their own currencies versus those of the other EU11 countries. Moreover, if countries outside the EMU find that euros are cheaper to acquire and easier to use in transactions, then the euro could gain ground on the dollar as the currency of choice in international reserves. However, because the dollar has a strong history as a store of value and is so widely used and accepted, it is unlikely that it will be supplanted as the preferred reserve currency any time soon.

Conclusion

While politics has to this point been the main driving force behind the European monetary unification, political rifts could also be what one day spell the end of the EMU. The political momen-

tum that has carried it this far will likely help it through tough times in the near future; however, a long period of sustained unemployment or low output growth could lead to a weakening of the union. If transaction costs and currency risk under the current system do not restrain trade and capital movement to a great extent and the EMU fails to bring the business cycles of the EU11 in line, then the benefits from the union would be small.

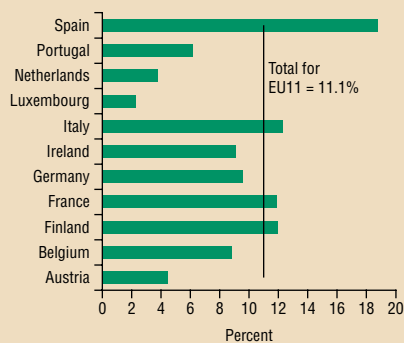
On the other hand, the union could be a boon to trade as transactions become more efficient and the countries of Europe reach a new level of economic and political cooperation. Only time will tell what the actual outcome will be.

—Justin Marion

Notes

- See Jacques Delors et al., *Report on Economic and Monetary Union in the European Community* (Luxembourg: Office for Official Publications of the European Communities, 1989).
- The EMU consists of Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain. Greece has not yet met the criteria for membership, but will probably join by the year 2002.
- See Bent E. Sørensen and Oved Yosha, "International Risk Sharing and European Monetary Unification," *Journal of International Economics* 45, no. 2, August 1998, pp. 211–38. The authors find that among European Community countries, 40 percent of GDP shocks are smoothed at the one-year frequency, with half of that smoothing attributed to corporate saving and the other half to government deficits.
- The Stability and Growth Pact, signed in 1996, will impose fairly severe fines on EMU countries that have government budget deficits exceeding 3 percent of GDP.
- At a recent European Union summit, EU leaders joined in calling for lower interest rates among the EU countries. Italian Prime Minister Massimo D'Alema said, "There is no doubt the hope is for a general reduction in interest rates, starting with Germany."

**CHART 1
DISPARITY OF UNEMPLOYMENT
RATES IN THE EURO ZONE,
JULY 1998**



SOURCE: Eurostat.

THE TEXAS ECONOMY continues to outpace the nation, in spite of being hit with a severe drought, declining exports and downturns in the semiconductor and energy industries. Texas employment grew at a 3.2 percent annual rate in the third quarter, compared with a 1.9 percent increase for the United States. Behind this healthy growth is a thriving service-producing sector, which has partially offset declines in other areas such as manufacturing and energy-related employment. While still sound, employment growth has been trending downward from the strong 4.6 percent increase seen in 1997.

The Texas Leading Index, which has been signaling slower growth since May, fell more sharply in August and September. Weakness was evident across most categories. Low oil prices and declining well permits have been chipping away at the index for most of the year as the energy industry continues to lay off workers. Also dampening the outlook has been an

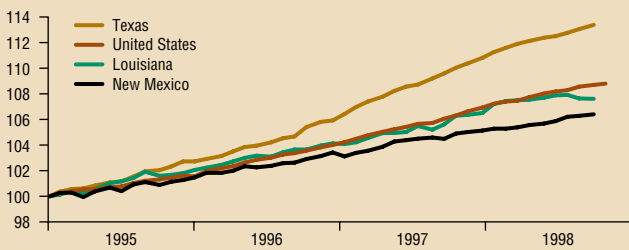
appreciating dollar compared with the currencies of Texas' major trading partners. This will further slow Texas exports, which declined 4.2 percent in the first half of 1998.

The construction sector has been a continuing bright spot for the Texas economy. Low interest rates have fueled a boom in nonresidential and residential construction. Construction contract values for the first nine months were 18 percent higher than a year ago. Backlogs in new home building will feed activity in coming months, but some industry contacts have seen a slight decrease in home sales growth. Also, a slight rise in office vacancy rates and stabilization of rent increases have slowed financing of new projects. However, nonbuilding construction—primarily of roads—has risen in 1998 and should strengthen as states start spending newly allocated federal highway money.

—Sheila Dolmas

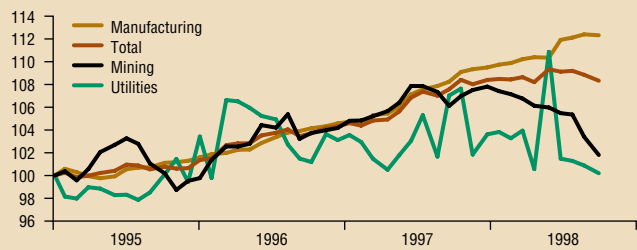
TOTAL NONFARM EMPLOYMENT

Index, January 1995 = 100



TEXAS INDUSTRIAL PRODUCTION INDEX

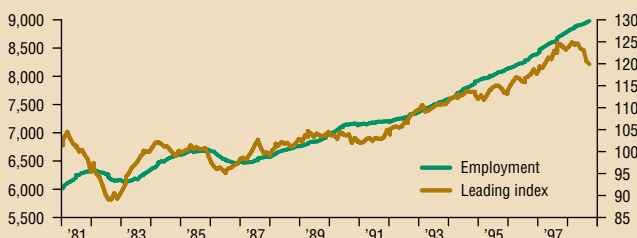
Index, January 1995 = 100



TEXAS LEADING INDEX AND NONFARM EMPLOYMENT

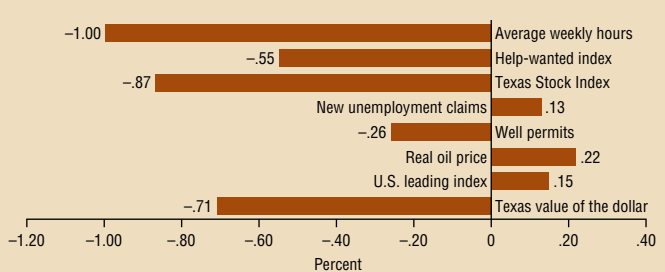
Thousands of persons

Index, 1987 = 100



NET CONTRIBUTIONS OF COMPONENTS TO CHANGE IN LEADING INDEX

July–September 1998



REGIONAL ECONOMIC INDICATORS

Texas employment*

Texas Leading Index	TIPI** total	Texas employment*					Private service-producing	Total nonfarm employment*		
		Mining	Construction	Manufacturing	Government	Texas		Louisiana	New Mexico	
9/98	119.9	128.7	168.4	492.6	1,109.9	1,514.3	5,693.7	8,978.9	1,885.6	721.7
8/98	120.5	129.4	169.7	493.6	1,108.0	1,503.4	5,678.1	8,952.8	1,886.1	720.9
7/98	123.1	129.8	170.3	491.3	1,105.7	1,498.4	5,664.2	8,929.9	1,891.0	720.4
6/98	123.4	129.7	170.8	489.4	1,108.1	1,494.9	5,646.1	8,909.3	1,890.4	718.1
5/98	124.6	130.0	170.8	488.2	1,108.1	1,495.5	5,637.1	8,899.7	1,887.2	716.8
4/98	124.6	128.6	171.1	485.9	1,107.1	1,495.8	5,619.5	8,879.4	1,884.4	716.0
3/98	124.3	129.1	171.1	483.4	1,106.7	1,493.2	5,607.6	8,862.0	1,883.7	714.8
2/98	124.9	128.9	171.1	482.2	1,104.7	1,490.9	5,587.9	8,836.8	1,882.5	714.1
1/98	123.9	128.9	170.3	477.7	1,104.5	1,490.2	5,568.6	8,811.3	1,878.7	714.1
12/97	123.2	128.8	171.2	472.4	1,097.2	1,488.1	5,546.2	8,775.1	1,866.2	713.1
11/97	123.9	128.4	170.6	470.0	1,093.2	1,482.6	5,524.5	8,740.9	1,863.7	712.3
10/97	124.5	128.8	169.8	468.5	1,090.1	1,479.7	5,505.8	8,713.9	1,862.5	711.5

* in thousands

** Texas Industrial Production Index

FURTHER INFORMATION ON THE DATA

For more information on employment data, see "Reassessing Texas Employment Growth" (*Southwest Economy*, July/August 1993). For TIPI, see "The Texas Industrial Production Index" (Dallas Fed *Economic Review*, November 1989). For 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).

Online economic data and articles are available on the Dallas Fed's Internet Web site, www.dallasfed.org.

TELECOM IN NORTH TEXAS

(Continued from page 4)

nounced an optical switching device it claims may be the missing link in making the network of the future a reality. Southwestern Bell recently launched digital cellular phone service that also provides customized news updates.

By promoting freer telecommunications markets, governments have enabled businesses to choose the locations, customers and suppliers that best suit them. Continued privatization and deregulation, along with agglomeration and co-opetition, will leave the North Texas telecom industry well poised to compete in the 21st century.

— Marci Rossell
Meredith Walker

Notes

¹ The American Electronics Association uses 45 Standard Industrial Codes (SIC) to define high-tech, including high-

tech manufacturing, software and computer-related services, and communications services. Because they exclude biotechnology, research and development services, etc., these high-tech employment figures are conservative.

² For our purposes, the telecommunications industry is defined by SIC 366 (Telephone and Telegraph Apparatus; Radio and Television Broadcasting and Communication Equipment; Other Communications Equipment) and 481 (Radiotelephone Communications and Telephone Communications, Except Radiotelephone).

³ Source: Richardson Chamber of Commerce.

⁴ For a survey of the literature on spillovers, see Griliches (1992).

⁵ Jaffe, Trajtenberg and Henderson (1993) provide empirical evidence of the extent to which knowledge spillovers are localized.

⁶ See Saxenian (1994) for a description of Silicon Valley's development.

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