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THE VULNERABILITY OF THE TEXAS ECONOMY TO WORLD TRADE PATTERNS

A STUDY

PREPARED FOR THE USE OF THE

SUBCOMMITTEE ON ECONOMIC GOALS AND INTERGOVERNMENTAL POLICY

OF THE

JOINT ECONOMIC COMMITTEE CONGRESS OF THE UNITED STATES

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LETTER OF TRANSMITTAL

NOVEMBER 29, 1985.

Hon. DAVID R. OBEY,
Chairman, Joint Economic Committee,
Congress of the United States, Washington, DC.

DEAR MR. CHAIRMAN: I am pleased to transmit this study entitled "The Vulnerability of the Texas Economy to World Trade Patterns." The study examines the relationship between the Texas and world economies. The authors find that the expansion of the Texas economy in the seventies and its weakness since then is strongly related to world trade patterns. With a particular focus on the energy, high-technology and agriculture sectors, the authors note that the high exchange rate value of the dollar and foreign trade practices have played major roles in the sluggish growth of Texas since 1980.

This study is of particular attention because it documents the inability of even our most robust Sunbelt areas to thrive in an adverse international trade environment. Restoring fair and free trade to a world beset with restrictions against American goods would benefit Americans everywhere. And I commend the authors for their work. They are Dr. Bernard L. Weinstein and Dr. Harold T. Gross with the Center for Enterprising at the Edwin L. Cox School of Business, Southern Methodist University, Dallas.

I believe this study will be useful to Members of Congress, the Joint Economic Committee, and the public. The study was coordinated by George R. Tyler of the Committee staff. The study does not necessarily reflect the views of the committee or the subcommittee.

Sincerely,

LLOYD BENTSEN,
Vice Chairman, Subcommittee on Economic Goals and Intergovernmental Policy.

PREFACE

This study on the vulnerability of the Texas economy to world trade patterns was prepared at the request of the Joint Economic Committee of the United States Congress. It documents the degree to which many industries in Texas have been impacted severely by increasing competition in the international marketplace, and assesses the implications of those changes for the State's overall economic health.

Drs. Bernard Weinstein and Harold Gross are, respectively, Director and Assistant Director of the center for Enterprising, an applied business and economics research center in The Edwin L. Cox School of Business. They were aided by Mr. Richard W. Wigley, graduate student assistant. The authors and the Cox School welcome any views or comments prompted by this report.

ROY A. HERBERGER, Jr., D.B.A.,
Dean, Edwin L. Cox School of Business,
Southern Methodist University.

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THE VULNERABILITY OF THE TEXAS ECONOMY TO WORLD TRADE PATTERNS

By Bernard L. Weinstein, Ph.D., and Harold T. Gross, Ph.D.

I. OVERVIEW

Recently, increasing attention has been focused by government, private industry, and the news media on the interrelated phenomena of structural change in many American industries, the comparative strength of the U.S. dollar, and the Nation's large and growing foreign trade deficit. The overarching concern under which these issues are generally subsumed is whether the United States' industrial competitiveness is eroding and, by extension, whether some form of explicit trade policy is needed to restore the Nation's ability to compete. For the most part, this debate has centered on industrial, monetary and commercial trends at the national level: very little attention has been paid to the manner in which established patterns of production and trade at the State or local level has been disrupted by international market forces and government policies.

The purpose of this study is to document the vulnerability of the Texas economy to world trade patterns. Once seen as the archetypical Sunbelt State, Texas has more recently been buffetted severely by changing patterns of world commerce and today boasts an unemployment rate that exceeds the national average. Essentially, this study assesses the extent to which the State has been impacted by the rapidly changing structure of supply and demand for petroleum products and oil field equipment, consumer electronics and processing equipment, and a variety of agricultural commodities. Critical to such an assessment, of course, is an understanding of how market forces and government policies interact to influence international patterns of trade and, hence, the location of production among competing National, State, and local economies. The following section of this study, accordingly, examines briefly the political economy of international trade in order to establish a conceptual context for the examination of the Texas economy undertaken in subsequent sections.

II. THE POLITICAL ECONOMY OF WORLD TRADE

As the title of this section implies, world trade is conditioned by the interaction of political expediences and economic realities. There is little consensus among economists as to which predominate, or as to the nature of the relationship between the two and its influence on the structure of trade. Nonetheless, the separation of international trade into purely political and economic components with the understanding that reality lies in some combination of the two, offers a framework useful for understanding existing patterns of international commerce and their impact on regional or local economies.

In addition to a distinction between the political and economic components of trade, it is also useful for the purpose of this analysis to draw a distinction between the comparatively developed economies of North America, Western Europe and Japan, and developing economies elsewhere in the world, particularly in Asia and the Middle East. This distinction contains no pejorative significance and is made only to note that a particular nation's relative economic status defines, to a large degree, its political and economic obligations and aspirations which, in turn, influence its chosen role in the international marketplace.

Political Expediencies

In the extreme, it can be argued that the developed economies have a strong interest in the preservation of established patterns of production, trade and consumption, while the developing economies have an equally strong interest in the disruption of those patterns. The developed economies, on the one hand, are constrained politically to maintain the relative prosperty of their populaces and, are therefore inclined to pursue policies aimed at the promotion of economic stability through moderate growth in those basic industries upon which that prosperity has traditionally depended. In each of the developed economies, moreover, elaborate "safety nets," ranging from substantial social welfare expenditures to central bank interventions in currency markets, have been erected by the public sector to cushion the private sector against economic instability. The developing economies, on the other hand, are constrained politically to increase rapidly the relative prosperity of their populaces and are therefore inclined to pursue policies aimed principally at the development of export-oriented industries which provide not only jobs and income but, more importantly, foreign currency earnings upon which other domestic social improvements depend. Indeed, to the extent the populace's social and economic expectations are raised by rapid industrialization, political stability, particularly for those governments not popularly elected, may come to depend increasingly upon economic achievement. In contrast to the

safety nets erected in the developed economies, within developing economies governments are more inclined to invest comparatively scarce resources in those industries perceived to be vehicles for social and economic mobility.

These very different sets of political constraints and obligations, conditioned by differing economic circumstances, dictate, to a significant degree, the "trade policies" pursued by nations in the world market. Generally, the developed economies have not pursued trade policies *per se* but have made use of indirect mechanisms such as monetary or fiscal policy to influence trade patterns in a way to promote domestic economic stability. Most developing economies, in contrast, have traditionally pursued aggressive and explicit trade policies that include many of the following: prohibitive tariffs or quotas on imports of foreign commodities, subsidies for research and development, production or marketing activities, and "targeting" of foreign markets for entry with specific products or services.

With regard to actual "trade policies" pursued, the distinction between developed and developing nations may become vague or even disappear. Japan, for instance, has traditionally pursued aggressive policies to protect domestic markets and simultaneously nurture export-oriented industries for competition in foreign markets. Similarly, some Western European nations, notably France, have also displayed a tendency toward chauvinism in the international marketplace. Moreover, both developed and developing nations pursue, from time to time, "trade policies" aimed at geopolitical rather than economic goals. One example is the United States' decision to embargo exports of agricultural and high technology products to the Soviet Union following that nation's invasion of Afghanistan in 1979.

Economic Realities

While public policies can, and frequently do, alter or displace established patterns of trade, it is important to recognize that trade evolves principally from the complex interaction of market forces such as changes in production technologies, factor costs and requirements, and tastes of consumers. The dynamic nature of the marketplace, in turn, causes comparative advantages in the production of commodities to shift constantly and continuously among alternative locations on the economic landscape, although in the short run, patterns of production, trade, and consumption may appear relatively static.

Perhaps the single most important factor motivating the recent apparent shift in comparative advantage for the production of many commodities from the developed to the developing nations is technology: its rapid diffusion and adoption has allowed many developing nations with comparatively abundant and less costly raw materials and human resources to compete successfully in markets dominated formerly by developed nations. The diffusion of technologies to locations possessing a comparative advantage in lower factor costs necessarily entails the migration of production activities to those locations as well, a process that explains the relocation of the textile industry from the United Kingdom, United

States, and Japan to the developing nations, principally Korea, Taiwan, and India. Such a process, inevitably entails profound changes for local or regional economies that experience directly the impacts from industrial change and relocation.

III. WORLD TRADE PATTERNS: THEIR IMPACT ON SELECTED INDUSTRIES IN TEXAS

During the 1970's Texas achieved increasing prosperity principally on the basis of rapid growth in the energy sector, "high technology" manufacturing, and agriculture. Until very recently, the conventional wisdom held that the rapid growth of those industries was attributable mostly to Texas' comparatively good "business climate." In retrospect, however, sharp oil price declines since 1981, structural changes in the high technology sector and a growing lack of competitiveness in agricultural export markets all suggest that Texas' comparative growth and decline is more a consequence of changes in the international marketplace than the relative quality of the business climate. It is the purpose of this section to document the degree to which Texas' energy, high technology, and agricultural industries have been affected by the changing structure of world trade.

A. Energy

After enjoying healthy growth during the 1970's, the energy sector has entered a period of significant retrenchment. Texas' oil field equipment, refining and petrochemical industries have all witnessed substantial reductions of employment in recent years.

The causes of structural change in the energy sector are several and complex. For the most part, however, they are attributable principally to two forces that influence both producers and refiners: (1) changing international and domestic supply-demand relationships and (2) public policy decisions. The more important influence has been, and will likely continue to be, the market place; that is, the changing nature of supply and demand for crude oil and refined products. The consequences of a changing oil industry for Texas, in fact, are simply a local playing out of events that are precipitated elsewhere.

Oil Field Equipment

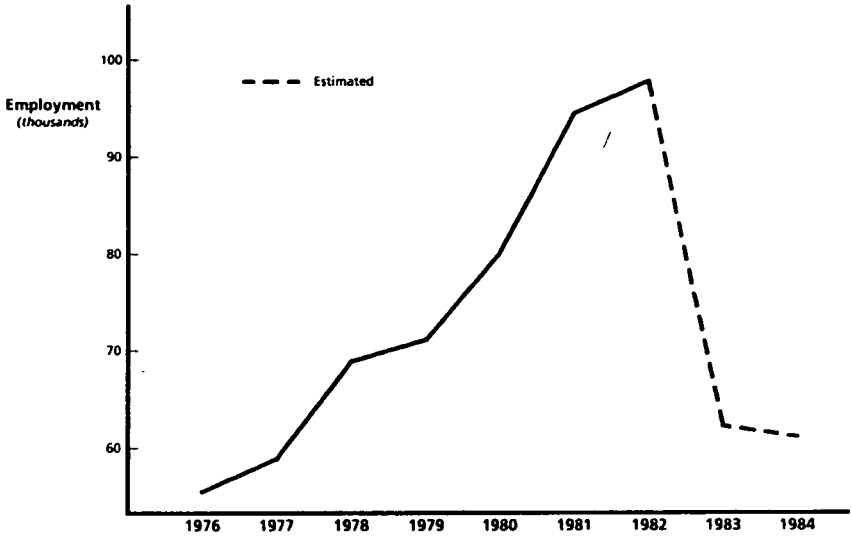
The major influence on oil field equipment production in Texas is the rapidly changing international supply and demand relationship for crude oil. A number of factors influence this relationship, including U.S. and foreign government policies. Beyond any doubt, however, the greatest influence is the international benchmark price for crude oil which has been on a roller-coaster ride during the past decade. From 1976 until 1981, the benchmark price rose sharply to a peak of approximately $35 per barrel, but since 1981 the price has fallen almost as sharply to just over $27 per barrel with some analysts forecasting a further decline to perhaps $18 per barrel by early spring 1986. The steady increase in the benchmark price until 1981 was a reflection largely of OPEC's success in re-

stricting the supply of crude oil reaching the market. Conversely, the rapid decline in the benchmark price since 1981 reflects the cartel's increasing lack of control over world oil supplies and, hence, prices.

Although rising oil prices throughout the last half of the 1970's were harmful to the national economy as a whole, they were a tremendous stimulus to those States with substantial oil reserves, particularly Texas. In short, rising oil pricies, which made exploration and production in those States more profitable, encouraged a flurry of drilling activity. Between 1978 and 1981, for example, the number of active drilling rigs nationwide increased by almost 1000 percent, while real capital outlays for exploration and drilling more than doubled. Most of this expansion occurred in Texas. The Federal Government's decision to deregulate oil prices contributed to this surge of activity, of course, but the major influence was the rapid increase in the benchmark price.

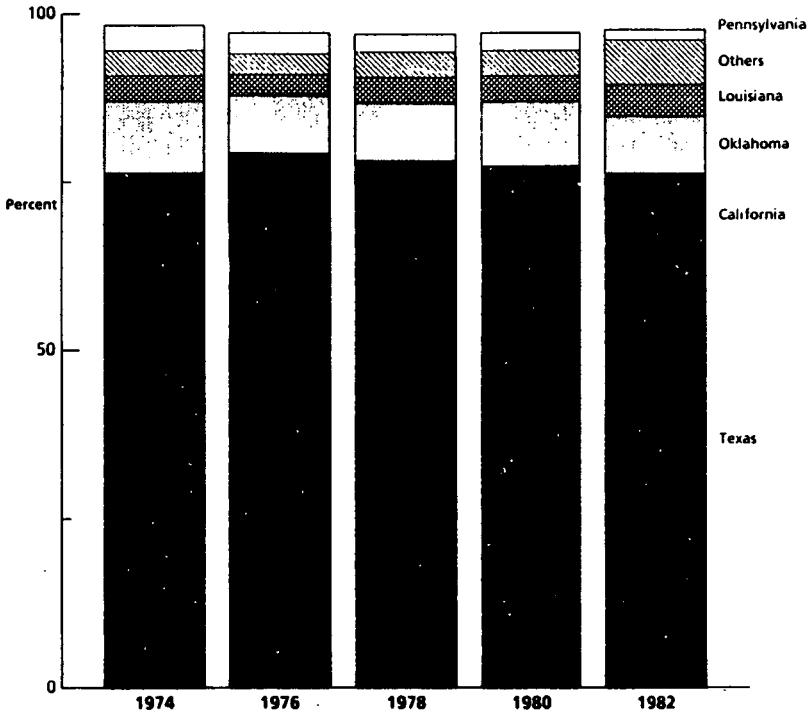
It is useful at this point to distinguish between the short- and long-term influences of oil prices since the former involves something that is known and the latter concerns expectations. While short-term profitability is affected most directly by short-term fluctuations in the benchmark price, decisions concerning the investment of capital resources in drilling and exploration are influenced more strongly by the anticipated long-term *trend* in prices. Upon the recommendation of many industry analysts and economists, enormous capital resources were committed to exploration and production during the late 1970's in the expectation that oil prices would continue to rise indefinitely. This expectation also fueled rapid employment growth in drilling-related manufacturing industries that produce oil field equipment, drilling rigs, pipe and valve, and process control instruments. (See Figure 1.) Not surprisingly, most of this growth occurred in Texas, which has traditionally been a major producer of oil field equipment. (See Figure 2.)

Figure 1
OIL FIELD MACHINERY INDUSTRY EMPLOYMENT, UNITED STATES, 1976–1984



Source: U.S. Department of Commerce, Bureau of Industrial Economics

Figure 2
DISTRIBUTION OF OIL FIELD MACHINERY INDUSTRY EMPLOYMENT BY STATE, 1974–1982

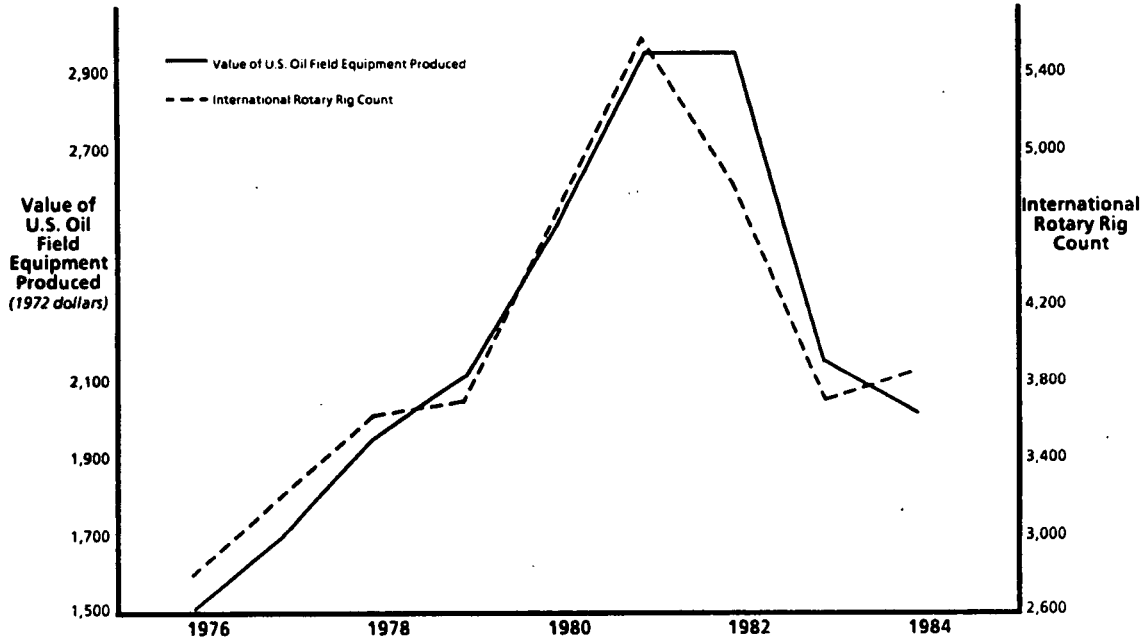


Source: U.S. Department of Commerce, Bureau of Census

But rising oil prices in the late 1970's also encouraged substantial exploration and drilling outside the United States, particularly in the North Sea where the United Kingdom, Norway, and the Netherlands developed large off-shore fields. Similarly, the OPEC nations continued to expand their production and many other developing nations, China for instance, turned to exploration and drilling to enhance their meager foreign currency earnings. As more nations became oil producers, and as the supply of crude oil in the world market increased, OPEC's ability to restrict supply and thereby maintain comparatively high oil prices became increasingly limited. Indeed, by 1982 the world market was glutted with oil, and prices began to tumble as non-OPEC producers began to sell their crude oil at prices well below the OPEC benchmark.

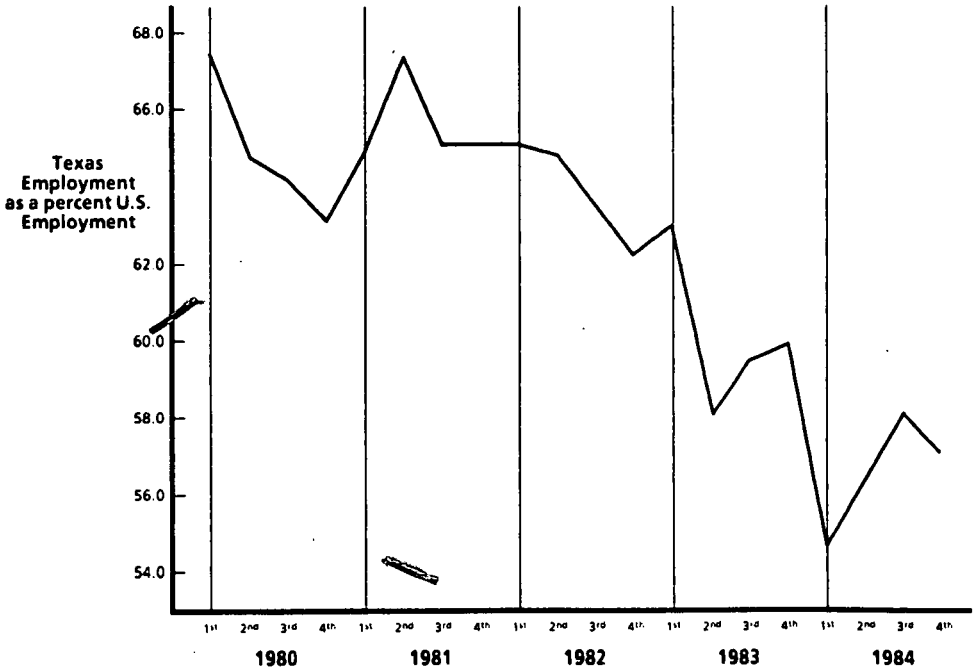
The impact of falling oil prices on exploration and drilling has been dramatic: domestic drilling activity has returned to its 1978 level and real capital expenditures have declined by almost 30 percent. International drilling activity has also plummeted. Not surprisingly, the significantly lower level of exploration and drilling activity has had a severe impact on domestic oil field equipment production. (See Figure 3.) Moreover, the employment consequences of a depressed oil field equipment market have been particularly severe for Texas. (See Figure 4.)

Figure 3
WORLD ROTARY RIG COUNT AND
REAL VALUE OF OIL FIELD EQUIPMENT PRODUCTION, UNITED STATES
1976 – 1984



Source: Hughes Tool Company; U.S. Department of Commerce, Bureau of Industrial Economics

Figure 4
TEXAS OIL FIELD MACHINERY INDUSTRY EMPLOYMENT
AS A PERCENT OF TOTAL U.S. INDUSTRY EMPLOYMENT
1st Q 1980 – 4th Q 1984

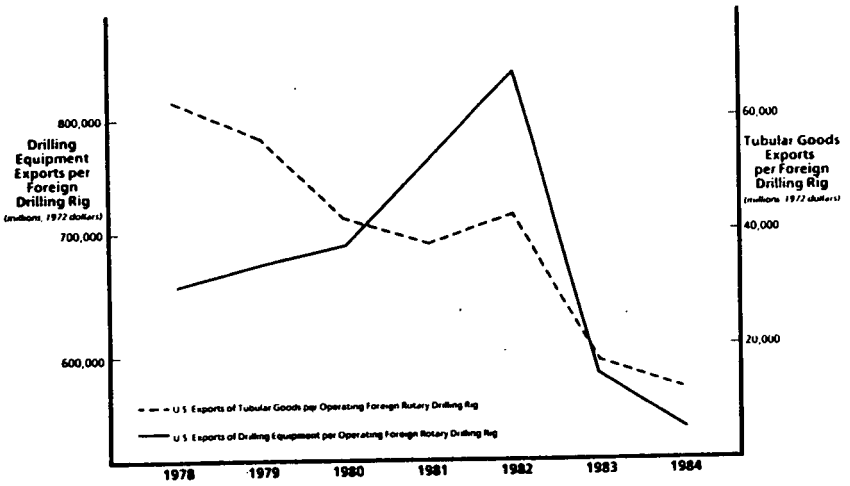


Source: U.S. Department of Labor, Bureau of Labor Statistics; Texas Employment Commission

Nevertheless, the future prospects for this industry in the United States and Texas are solely dependent upon a firming of oil prices. Over the long term, U.S. producers face stiff competition in export markets as well. There are only a handful of U.S. industries more dependent upon foreign sales than the oil field equipment industry. In 1982, 54 percent of the value of goods produced by U.S. firms in this industry was exported. On average, between 1978 and 1984 exports amounted to about 46 percent of total U.S. production. Although the scarcity of comparable international data prevents accurately gauging the U.S. market share of worldwide exports, estimates range upwards of 60 percent. Clearly the long-term future of this industry in the United States and Texas is tied not only to the level of international and domestic drilling activity but also to an ability to remain competitive in foreign markets.

As an indicator of recent performance in this regard, Figure 5 presents the real value of U.S. exports of oil field machinery per operating foreign rig. During the high drilling demand period of 1978 to 1982, the U.S. apparently increased its foreign market share or, given the inaccuracies in using the rig count as a true measure of demand, at least maintained its market share. Only with the joint influence of an increasingly competitive market (as a result of declining drilling activity) and the rising value of the dollar did U.S. firms apparently lose ground to foreign competitors in 1983 and 1984. Dresser Industries of Dallas, for example, reported a decline in export earnings of 6.0 percent between 1983 and 1984.

Figure 5
REAL VALUE OF U.S. OIL FIELD EQUIPMENT AND TUBULAR GOODS EXPORTS PER OPERATING FOREIGN ROTARY DRILLING RIG
1978 - 1984



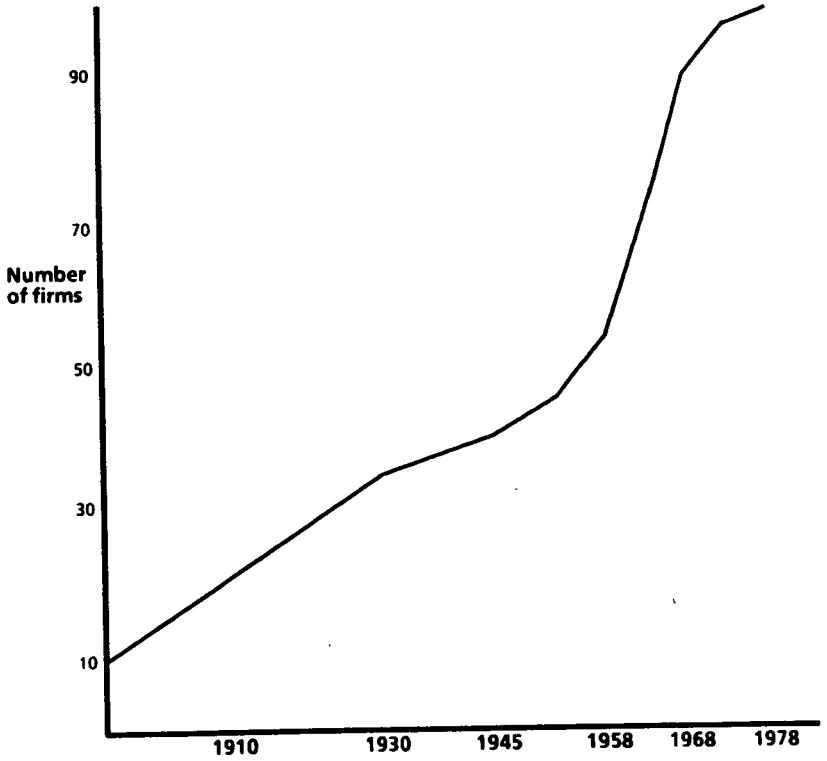
Source: Hughes Tool Company; U.S. Department of Commerce, Bureau of Industrial Economics

As exports have declined, imports have risen. The U.S. oil patch accounts for two-thirds of the global demand for oil country tubular goods, and more than 35 nations are now selling equipment in the U.S. market. In 1975, foreign suppliers had 9.2 percent of the U.S. market, but in the last 2 years their share has soared as high as 70 percent. As a consequence, nearly 20,000 jobs in the tubular goods industry have disappeared, and many of these have been at Texas based companies.

LTV has lost more than $1 billion in the past several years and recently put its energy subsidiaries up for sale. The Lone Star Steel Co. reported operating losses of $39.1 million during the first half of 1985. Halliburton's operating income from oil field products and services has dropped 20 percent over the past year, and the company overall reported a second quarter loss of $479 million. Dresser Industries' net income dropped 50 percent in the second quarter of 1985, and sales of oil field equipment were down about 10 percent. Both Halliburton and Dresser have also lost sales because of the embargo on oil field equipment sales to the Soviet Union. Until 1978, U.S. firms were providing 25 percent of the Soviet's import needs. Today, the U.S. share is less than 1 percent.

The United States must become increasingly concerned over the increasing quality and quantity of foreign competition in the oil field equipment industry. As a result of experience gained in North Sea exploration and production, it is generally agreed that in some areas of the oil field equipment industry (notably seismic surveying) French and British quality rivals our own. Moreover, as can be seen in Figure 6, the number of foreign competitors is rising. This trend is the result of manufacturers' efforts to avoid the vagaries of currency fluctuations through the establishment of foreign subsidiaries as well to comply with "local content" laws of oil producing countries. Indeed, for the first time in history, Saudi Arabia is demanding joint ownership of oil field service operations and wants foreign firms to manufacture locally products like rock bits, valves, and oil field tools. In sum, increasing quality and quantity of foreign competition, coupled with declining drilling activity, will likely result in a steadily declining world market share for U.S. and Texas oil field equipment producers despite our current technological sophistication.

Figure 6
CUMULATIVE NUMBER OF
FOREIGN OIL FIELD EQUIPMENT MANUFACTURERS
BY YEAR OF FIRM FOUNDING



Source: Dun and Bradstreet

Refining and Petrochemicals

As with exploration and drilling, the processing side of the energy sector is also undergoing structural change precipitated largely by the changing market for refined products. On the supply side, domestic refiners have been buffeted by increasing offshore competition, while on the demand side consumer purchases of refined products have been shrinking.

During the late 1970's, domestic refiners made substantial capital investments to expand their capacity. As with investments in exploration and drilling, these expenditures were made largely on the assumptions that crude oil prices would continue to increase and, most importantly, that the demand for refined products would rise despite increases in their price. Accordingly, the 1976-1980 period saw an increase of 38 refineries in the United States as a whole, with 11 of these located in Texas and another 11 in Louisiana. (See Table 1.) The U.S. as a whole increased refining capacity by nearly 3 million barrels per calendar day, with 32 percent of this occurring in Texas alone.

TABLE 1.—*Changes in U.S. Refineries by State, 1975-80*

	Number of refineries, 1975	Change in number, 1975-80	Crude capacity (B/CD 1975)	Change in capacity, 1975-80
Alabama	3	+3	34,375	+107,330
Alaska	4	0	66,050	+47,950
Arizona	1	0	4,000	+2,000
Arkanas	4	0	60,715	+4,485
California	36	+5	1,900,640	+605,730
Colorado	3	+5	60,000	−3,650
Delaware	1	0	140,000	.....
Florida	1	0	5,700	+7,300
Georgia	2	0	18,000	+4,750
Hawaii	2	0	85,000	+28,900
Illinois	11	0	1,168,150	+38,900
Indiana	8	0	563,275	+35,125
Kansas	11	0	447,180	+13,604
Kentucky	3	+	164,000	+80,160
Louisiana	19	+11	1,729,575	+570,400
Maryland	2	0	26,500	+2,000
Michigan	6	0	149,082	−9,007
Minnesota	3	0	199,300	+18,643
Mississippi	5	+2	289,500	+59,350
Missouri	1	0	107,000	−3,000
Montana	8	−2	157,206	−3,306
Nebraska	1	0	5,000	+600
Nevada	.....	+1	.....	+4,275
New Hampshire	.....	+1	.....	+12,800
New Jersey	4	+1	539,000	+151,500
New Mexico	7	+2	103,061	+23,398
New York	2	+1	111,385	+29,465
North Carolina	.....	+1	.....	+11,900
North Dakota	3	0	58,659	+7,200
Ohio	7	0	589,770	+3,180
Oklahoma	12	0	499,815	+60,160
Oregon	1	0	14,000	+1,000

TABLE 1.—*Changes in U.S. Refineries by State, 1975-80*—Continued

	Number of refineries, 1975	Change in number, 1975-80	Crude capacity (B/CD 1975)	Change in capacity, 1975-80
Pennsylvania	11	−1	757,020	+43,500
Rhode Island	1	−1	7,500	−7,500
Tennessee	1	0	43,900	−1,400
Texas	45	+11	3,929,430	+949,445
Utah	6	−2	143,000	+20,930
Virginia	1	0	53,000	.....
Washington	7	0	364,000	+20,400
West Virginia	3	0	19,750	+400
Wisconsin	1	0	45,000	−5,000
Wyoming	12	0	186,870	+12,520
United States	259	+38	14,845,407	+2,945,437

Source: *Oil and Gas Journal*, annual refining surveys, 1975-80.

In retrospect, it is now clear that the U.S. refining industry overreacted to rising refined product prices and overstated the inelasticity of refined product demand. By 1980, the industry was besotted with overcapacity, a result principally of overexpansion and declining refined product demand. Between 1980 and 1984, for example, 106 refineries closed nationwide, with 23 closures occurring in Texas. (See Table 2.) Table 3 lists the inactive refineries in the United States in 1984 by location and size. Most of these are small, with capacity under 50,000 barrels per calendar day. Table 4 focuses explicitly on the Texas Gulf Coast area and shows the amount of restructuring going on in that region in the last 5 years. These data were compiled from a different source than previous tables, and activities in the chemical industry (SIC 28) are included as well as petroleum refining (SIC 29). During the last 5 years, when refining capacity declined in the country as whole, 23 petrochemical plants were downgraded in the Texas Gulf Coast region, downgrading implying partial or complete closure of operations. Texas petrochemical companies were also involved in 41 acquisitions and 16 joint ventures.

TABLE 2.—*Changes in U.S. Refineries by State, 1980 Through 1984*

	Number of refineries, 1980	Change in number, 1980-84	Crude capacity (B/CD 1980)	Change in capacity, 1980-84
Alabama	6	−5	141,750	−61,705
Alaska	4	0	114,000	+24,930
Arizona	1	0	6,000	−1,000
Arkansas	4	0	65,200	+970
California	41	−11	2,506,370	−241,272
Colorado	3	0	56,350	+38,350
Delaware	1	0	140,000	.....
Florida	1	−1	13,000	−13,000
Georgia	2	0	22,750	+6,050
Hawaii	2	0	113,900	−4,400
Illinois	11	−3	1,206,050	−260,050
Indiana	8	−3	598,400	−167,100
Kansas	11	−4	460,784	−122,784
Kentucky	4	−2	244,160	−25,260

TABLE 2.—*Changes in U.S. Refineries by State, 1980 Through 1984*—Continued

	Number of refineries, 1980	Change in number, 1980-84	Crude capacity (B/CD 1980)	Change in capacity, 1980-84
Louisiana	30	−14	2,299,975	−111,182
Maryland	2	−1	28,500	−14,300
Michigan	6	−2	140,075	−20,675
Minnesota	3	−1	217,943	−13,800
Mississippi	7	−2	348,850	+13,550
Missouri	1	−1	104,000	−104,000
Montana	6	0	153,900	−6,400
Nebraska	1	−1	5,600	−5,600
Nevada	1	0	4,275	+225
New Hampshire	1	−1	12,800	−12,800
New Jersey	5	0	690,500	−187,500
New Mexico	9	−6	126,459	−63,409
New York	3	−3	140,850	−140,850
North Carolina	1	−1	11,900	−11,900
North Dakota	3	−1	65,858	−3,058
Ohio	7	−2	592,950	−77,250
Oklahoma	12	−7	559,975	−185,975
Oregon	1	0	15,000	.....
Pennsylvania	10	−2	800,520	−141,820
Tennessee	1	0	42,500	+14,500
Texas	56	−23	4,878,875	−732,975
Utah	8	−2	163,930	−8,980
Virginia	1	0	53,000	−2,000
Washington	7	0	384,400	+26,150
West Virginia	3	−1	20,150	−3,650
Wisconsin	1	0	40,000	−1,000
Wyoming	12	−6	199,390	−36,612
United States	297	−106	17,790,844	−2,654,582

Resource: *Oil and Gas Journal*, annual refining surveys, 1980-84.

TABLE 3.—*Inactive Refineries as of Jan. 1, 1985*

Company	Location	Size, B/CD
Allied Materials Corp	Stroud, OK	8,500
Caribou Four Corners Inc	Woods Cross, UT	8,400
Celeron Oil & Gas Co	Mermentau, LA	14,000
Champlin Petroleum Co	Enid OK	53,800
Dorchester Refining Co	Mt. Pleasant, TX	26,500
Eco Petroleum Inc	Signal Hill, CA	10,000
Eddy Refining Co	Houston, TX	3,500
Flint Chemical Co	San Antonio, TX	1,400
Golden Eagle Refining Co	Carson, CA	16,500
Hill Petroleum Co	Krotz Springs, LA	48,000
Hunt Oil Co	Tuscaloosa, AL	44,500
Independent Valley Energy Co	Bakersfield, CA	28,000
Marlex Oil & Refining Inc	Long Beach, CA	20,000
Mobil Bay Refining Co	Chicasaw, AL	20,000
Natchez Refining Inc	Natchez, MI	15,000
Oklahoma Refining Co	Cyril, OK	9,200
Oklahoma Refining Co	Thomas, CA	9,800
Paramount Petroleum Corp	Paramount, CA	46,500
Port Petroleum Inc	Stonewall, LA	3,200
Powerline Oil Co	Santa Fe Springs, CA	44,120
Quintana Petrochemical Co	Corpus Christi, TX	35,000
Southern Union Refining Co	Lovington, NM	36,100
South Hampton Refining Co	Silsbee, TX	19,000

TABLE 3.—*Inactive Refineries as of Jan. 1, 1985*—Continued

Company	Location	Size, B/CD
Sunland Refining Corp	Bakersfield, CA	15,000
Tesoro Petroleum Corp	Carrizo Springs, TX	26,100
Thriftway Co	Bloomfield, NM	6,515
Tonkawa Refining Co	Arnett, OK	12,000
United Refining Co	Warrent, PA	60,000
USA Petrochem Co	Ventura, CA	27,900

Source: *Oil and Gas Journal*, Mar. 18, 1985.

TABLE 4.—*Restructuring in the Texas Gulf Coast Petrochemical Sectors, 1979–84*

	Number of cases
Acquistions	41
Joint ventrues	16
Upgrading (expansions, increased capacity)	114
Downgrading (partial or complete closure of operations)	23

Source: Bureau of Business Research, University of Texas at Austin.

Increasing oil and refined product prices also encouraged the construction of refining capacity in oil-producing developing nations. During the late 1970's, OPEC nations in the Middle East and North Africa embarked on efforts to develop integrated oil industries—industries that produce and process crude oil. In every instance, these nations sought to increase their foreign currency earnings by entering, and eventually capturing, a share of the market for refined products. The quest for foreign currency earnings, especially U.S. dollars, as a stimulus to the growth of offshore refinery capacity cannot be overstated. For developing nations, foreign currency earnings are a critical source of finance for development projects. Having raised the expectations of their populations, many governments not unwisely perceive such earnings as the key to their survival.

Although little of the planned capacity has become operational as yet, a considerable impact will be felt over the next 3 years. Because this capacity is newer, it is highly automated and, therefore, less labor intensive. Automated refineries abroad possess a critical advantage over American refiners, whose labor costs are increasingly the only variable cost over which control may be exercised. Moreover, because of the political constraints discussed above, many developing nations are fully prepared to input raw materials to their refineries at below cost in order to maintain operations at full capacity.

Some measure of the potential impact of this new capacity may be gained from the beating American refiners have taken over the past 5 years from refiners in Western Europe and the Caribbean. Almost 50 percent of the demand for refined products is for gasoline, and domestic gasoline imports from those regions have grown on an annual basis from about 4 percent of domestic consumption in 1981 to about 7 percent in 1984. In recent months, gasoline imports have exceeded 11 percent of domestic consumption. Some of

this increase can be attributed to the strength of the dollar. But for the most part, the increasing lack of competitiveness on the part of American refiners is attributable to a loss of comparative advantage. It is simply more expensive to produce gasoline in this country than elsewhere. Domestic refineries are comparatively old and labor intensive.

The increasing competition in the manufacture of refined products has been heightened by the declining domestic demand for refined products, principally gasoline. In other words, more refiners are competing for a smaller market. Contrary to expectations, higher oil and refined product prices did discourage demand, largely through conservation. In fact, many industry analysts predict the demand for gasoline to be as much as 25 percent below the 1984 level by 2000.

B. High Technology

Recent developments in the Nation and the State of Texas suggest that the high technology sector is being subjected to the same market forces that have buffeted our traditional manufacturing industries. While the United States clearly retains a comparative advantage with respect to technological innovations, the speed with which these innovations are diffused abroad has accelerated. As a result, domestic manufacturers of high technology products have come under increased pressure from foreign competition in recent years.

A worldwide overcapacity in semiconductors and computers, coupled with the high dollar exchange rate and allegations of predatory pricing tactics by Japanese companies, has staunched the rapid growth that had characterized Texas' high tech sector for so many years. In the second quarter of 1985, for example, profits throughout the U.S. high technology sector fell, with plunging earnings and deficits in the semiconductor industry the primary factor. Dallas-based Texas Instruments recently posted a third-quarter 1985 loss of $82.8 million against an $85.9 million year-earlier profit. Additionally, the company announced plans to close two plants and layoff 2,200 workers.

By one count, nearly 13,000 Dallas-area semiconductor workers have been laid off since the first of the year, including 3,000 at Texas Instruments and about 5,000 at Mostek. Additional layoffs have occurred at Motorola, National Semiconductor, and Advanced Micro-Devices plants across the State of Texas. Apple, Xerox, and Datapoint have also cut back on their Texas-based production due in part to the strong dollar and fierce foreign competition.

A large portion of Texas' high tech activities are defense oriented, and this segment of the market has not suffered greatly from foreign competition. On the other hand, sales to other countries of military hardware produced by Texas companies may be constrained by the high exchange value of the dollar.

C. Agriculture

In a series of articles written two decades ago, the Nobel Prize-winning economist and statistician, Wassily Leontief, demonstrated that despite its status as developed, highly industrialized economy, the United States' principle comparative advantage lay in the provision of agricultural commodities and other raw materials to the

world market. Today, the "Leontief paradox" appears to retain its validity: notwithstanding a wide range of historically recurring problems such as overproduction and indebtedness, American agriculture is regarded generally to be competitive in world markets. American agriculture's comparative advantage is attributable, for the most part, to its propensity to innovate with regard both to products and production processes, as well as its ability to achieve economies of scale. Moreover, Federal loan and price support programs have served successfully to insulate the agricultural sector from cyclical economic shocks and natural disasters that would otherwise hamper its ability to compete. The fact that American agriculture appears generally to retain a comparative advantage, as well as its orientation toward export markets, suggests strongly that recent ills may be attributed principally to the effect of the strong U.S. dollar.

Between 1981 and 1983, the real value of cash receipts from the marketing of American agricultural products grew by only 5.3 percent, down considerably from growth rates posted during the 1970's. (See Table 5.) In Texas, the agricultural sector fared worse during the 1981–1983 period as agricultural cash receipts fell by 4.5 percent. The comparatively slow real growth of agricultural cash receipts in the United States as a whole, and the retrenchment experienced by Texas, can be attributed, for the most part, to substantial declines in cash receipts from exports. Between 1981 and 1983, the real value of U.S. agricultural exports fell by 17.0 percent, and in Texas exports declined by 5.7 percent. (See Table 6.)

TABLE 5.—*Change in Real Value of Agricultural Cash Receipts, United States and Texas, 1981–83*

	Millions		Percent change, 1981–83
	1983	1981	
United States	$96,723	$91,866	5.3
Texas	6,052	6,335	−4.5

NOTE.—Nominal receipts were deflated using the 1983 and 1981 annual average producer price indices (248.2 and 254.9, respectively) for all agricultural commodities (1967 = 100).

Source: U.S. Department of Agriculture; U.S. Department of Labor, Bureau of Labor Statistics; Texas Department of Agriculture.

TABLE 6.—*Change in Real Value of Agricultural Exports, United States and Texas, 1981–83*

	Millions		Percent change, 1981–83
	1983	1981	
United States	$23,460	$28,263	−17.0
Texas	1,583	1,678	−5.7

NOTE.—Nominal exports were deflated using the 1983 and 1981 annual average producer price indices (248.2 and 254.9, respoectively) for all agricultural commodities (1967 = 100).

Source: U.S. Department of Agriculture; U.S. Department of Labor, Bureau of Labor Statistics; Texas Department of Agriculture.

Table 7 shows the commodity distribution of Texas agricultural exports and the sensitivity of selected commodities to export earn-

ings. Cotton and cotton products, wheat, animal products, feed grains and rice are the largest Texas agricultural exports. Of these, rice is the most export sensitive, followed by wheat, cotton and feed grains. Collectively, exports of these commodities account for roughly 15 percent of Texas agricultural cash receipts. Since 1981, however, all of these commodities have fared poorly in export markets. (See Table 8.) Between 1981 and 1983, the real value of Texas cotton exports declined by 48.1 percent; wheat exports fell by 31.7 percent; and, animal product, feed grain and rice exports fell by 12.6, 45.8 and 21.7 percent, respectively. Not surprisingly, the poor export performance of these important Texas agricultural commodities exerted a strongly negative influence on Texas agricultural cash receipts, particularly for those commodities identified previously as being "export-sensitive." From 1981 to 1983, the real value of cash receipts for Texas cotton fell by 34.1 percent. (See Table 9.) Wheat cash receipts declined by 11.5 percent over the same period, while cash receipts from rice dropped by a staggering 67.6 percent.

TABLE 7.—*Commodity Distribution of Texas Agricultural Exports, 1983*

	Percent of total exports	Percent of cash receipts by commodity	Percent of total cash receipts
Cotton, lint, cottonseed	19.4	47.3	5.1
Wheat	15.2	63.8	4.0
Meats, hides, fats, and greases	11.8	6.0	3.1
Feed grains	9.3	24.3	2.4
Rice	5.7	100.0+	1.5
Other	38.6	48.6	10.1

NOTE.—The designation "other" refers to fruits, vegetables, nuts, seeds and poultry products. The proportion of rice exports to rice receipts exceeds 100.0 percent because Texas rice farmers received payment-in-kind (PIK) allotments of rice from the federal government to sell along with rice grown during the 1983 season.

Source: Texas Department of Agriculture.

TABLE 8.—*Change in Real Value of Exports, Selected Texas Agricultural Commodities, 1981-83*

	Millions		Percent change, 1981-83
	1983	1981	
Cotton, lint, cottonseed	$307	$591	−48.1
Wheat	241	353	−31.7
Meats, hides, fats, and greases	187	214	−12.6
Feed grains	147	271	−45.8
Rice	90	115	−21.7
Other	611	134	356.0
Total	1,583	1,678	−5.7

NOTE.—Nominal exports were deflated using the following 1983 and 1981 producer price indices: cotton, 235.6 and 248.0; wheat, 235.7 and 253.9; meats, 242.4 and 250.2; feed, 240.4 and 248.4; rice 240.4 and 248.4; other, 248.2 and 254.9 (1967 = 100).

Source: U.S. Department of Labor, Bureau of Labor Statistics; Texas Department of Agriculture.

TABLE 9.—*Change in Real Value of Cash Receipts, Selected Texas Agricultural Commodities, 1981-83*

	1983	1981	Percent change, 1981-83
Cotton, lint, cottonseed	$647	$982	−34.1
Wheat	378	427	−11.5
Meats, hides, fats, and greases	3,053	2,845	7.3
Feed grains	605	596	1.5
Rice	68	210	−67.6
Other	1,301	1,275	2.0
Total	6,052	6,335	−4.5

NOTE.—Nominal cash receipts were deflated using the following 1983 and 1981 producer price indices: cotton, 235.6 and 248.0; wheat 235.7 and 253.9; meats, 242.4 and 250.2; feed, 240.4 and 248.4; rice 240.4 and 248.4; other, 248.2 and 254.9 (1967 = 100.)

Source: U.S. Department of Labor, Bureau of Labor Statistics; Texas Department of Agriculture.

As was suggested at the beginning of this section, the American agricultural sector appears to retain a sufficient comparative advantage in world markets in terms of resource endowments and technology to suggest that recent ills are a function primarily of the strength of the U.S. dollar. Indeed, this becomes clearly evident in a comparison of changes in prices received by farmers for agricultural commodities denominated in U.S. dollars and Korean Won. (See Table 10.) Korea is a major importer of U.S. and Texas agricultural exports and it is informative to assess the attractiveness of Texas agricultural commodities from the importer's perspective. For three of Texas' five major agricultural export commodities, U.S. dollar prices received by farmers declined between 1981 and 1983. For two commodities, cotton and corn, U.S. dollar prices rose by 25.3 and 16.3 percent, respectively. By contrast, prices for these commodities, denominated in Korean Won, rose substantially between 1981 and 1983. In fact, the "Won price" for both cotton and corn rose significantly faster than the "dollar price" for either commodity between 1981 and 1983. A similar trend would be apparent with respect to the currencies of other agricultural importers.

TABLE 10.—*Change in Average Annual Price Received, Selected Texas Agricultural Commodities, Denominated in U.S. Dollars and Korea Won, 1981-83*

	U.S. dollars		Percent change, 1981-83
	1983	1981	
Cotton, per pound	0.59	0.47	25.5
Wheat, per bushel	3.60	3.65	−1.4
Beef, per one-hundred pounds	59.30	62.40	−5.0
Corn, per bushel	3.35	2.88	16.3
Rice, per hundredweight	9.97	10.40	−4.1

	Korean won		Percent change, 1981-83
	1983	1981	
Cotton, per pound	468.5	318.5	47.1
Wheat, per bushel	2,844.0	2,500.3	13.7
Beef, per one-hundred pounds	46,847.0	42,744.0	9.6
Corn, per bushel	2,646.5	1,972.8	34,1
Rice, per hundredweight	7,876.3	7,124.0	10.6

Note.—The denomination of commodity prices in Korea Won assumes the following average annual exchange rates: 1983, 790/1 and 1981, 685/1.

Source: Texas Department of Agriculture; Chicago Board of Trade.

While Texas' agricultural sector has suffered from significantly lowered export earnings, it probably remains highly competitive in world markets for the long term since its basic comparative advantages—technology and resource abundance—remains undiminished by the strength of the U.S. dollar. As the value of the dollar once again approaches parity with other currencies, U.S. and Texas agricultural exports should regain their former strength.

IV. THE IMPLICATIONS OF INDUSTRIAL CHANGE FOR THE TEXAS ECONOMY

The implications of structural change in Texas' three "basic" industries—energy, high technology, and agriculture—for the overall health of the State's economy are severe. Generally, they are manifested in three, fairly distinct ways: (1) job losses; (2) purchasing power losses; and (3) State tax revenue losses.

EMPLOYMENT RETRENCHMENT

One economic forecasting firm, Data Resources, Inc., has estimated that the strength of the U.S. dollar cost Taxas 68,900 jobs in 1984 alone. But, as was discussed briefly in the preceding examination of the political economy of world trade patterns, monetary or fiscal policy influences, manifested in exchange rate fluctuations, explain only a small part of the recent changes in world trade patterns. Much more important are changes in the supply and demand relationships for numerous agricultural and manufactured commodities, as well as the diffusion of technological innovations from the developed to developing economies. In this broader context, DRI's estimate greatly understates Texas' job losses resulting from changes in world trade patterns.

In a very general sense, it is likely that virtually all of Texas' recent industrial job losses are, directly or indirectly, a consequence of changes in the structure of the international marketplace, whether induced by falling oil prices, Japanese semiconductor production or the effect of the strong dollar on export commodities. Since April 1981, for example, Texas has lost nearly 120,000 jobs in mining, manufacturing, and transportation, most related to contraction in the energy sector. (See Table 11.) The largest loss was posted by the oil field machiney industry, with related industries such as primary and fabricated metal, instruments, chemicals and petroleum refining also posting large losses.

TABLE 11.—*Change in Nonagricultural Employment by Sector and Industry, Texas, April 1981–April 1985*

Sector/industry	Apirl 1985	April 1981	Average annual percent change, April 1981–April 1985
Mining	268,400	275,400	−0.6
Oil and gas extraction	259,000	265,000	−.6
Manufacturing	993,600	1,099,400	−2.4
Primary metal	35,800	51,000	−7.5
Fabricated metal	83,900	100,500	−4.1
Machinery	130,200	187,200	−7.6

TABLE 11.—*Change in Nonagricultural Employment by Sector and Industry, Texas, April 1981-April 1985—Continued*

Sector/industry	Apirl 1985	April 1981	Average annual percent change, April 1981-April 1985
Manufacturing—*Continued*			
Oil field machinery	40,000	77,100	−12.0
Electronic	107,400	104,200	.8
Transportation equipment	78,600	84,600	−1.8
Instruments	22,700	24,600	−1.9
Chemicals	77,100	82,300	−1.6
Petroleum Products	40,700	45,700	−2.7
Construction	434,600	426,300	.5
Transportation	371,000	377,800	−.4
Trade	1,620,900	1,479,400	2.4
Finance, insurance, real estate	424,600	344,800	5.8
Services	1,295,800	1,074,600	5.2
Government	1,141,800	1,009,100	3.4
Total nonagricultural	6,550,700	6,086,800	1.9

Source: Texas Employment Commission.

The employment consequences of structural change in the agricultural sector have been negligible because that sector employs only a very small percentage of Texas' labor force.

PURCHASING POWER LOSSES

The purchasing power losses to the State economy resulting from the loss of approximately 120,000 industrial jobs are potentially quite severe. Either because of the relative productivity of the workers, implying a fairly high skill level, or because of the high degree of unionization throughout much of Texas' energy sector work force, wages received by Texas energy workers are comparatively high, with most estimates ranging from $18 to $22 per hour, or roughly $21,500 annually. Thus, the loss of 119,600 industrial jobs in Texas has probably also resulted in the withdrawal of at least $2.6 billion in purchasing power annually from the State economy.

Nor have agricultural losses been inconsequential. Although the agricultural sector in Texas employs very few workers, its products contribute significantly to the State's personal income, and lower export earnings for cotton, wheat, rice, and feed grains have probably cost the State nearly $900 million (or approximately $570 million in real terms) in purchasing power since 1981.

Inevitably, losses of this magnitude will ripple through other sectors of the Texas economy in the form of significantly diminished demand for products and services. In this sense, the Texas economy will continue to feel the effects of recent structural changes in the world economy for several years to come. Moreover, given the prospect of a sharper drop in oil prices, increasing competition in the high technology sector and the continuing strength of the U.S.

dollar, the world market place will continue to restructure itself, and the effects of that restructuring will continue to be felt in Texas.

State Tax Revenue Losses

Texas' revenue structure is tied very closely to its industrial structure; that is, a substantial portion of the State's revenue is derived from the taxation of Texas' basic industries, particularly those in the energy sector. Texas taxes heavily its energy sector in two ways: first, through severance taxes on the production and regulation of oil and natural gas, and second, through sales taxes on manufactured equipment for the energy sector. By far the most important of these are oil and gas severance taxes which, over the past 5 years, have accounted for at least 20 percent of all annual State tax collections. (See Table 12.)

Table 12.—*State Revenue From Oil and Gas Severance Taxes as a Percentage of Total State Tax Revenues, Selected Years, 1950–85*

	Percent of total tax revenue
Fiscal year:	
1950	26.4
1955	31.1
1960	22.3
1965	16.8
1970	13.6
1975	18.2
1980	22.5
1981	26.8
1982	27.4
1983	26.5
1984	23.8
1985	21.0

Source: Texas Comptroller of Public Accounts.

Although reliable figures are not available, the decline in statewide drilling activity (precipitated by steep declines in the international benchmark price for oil) coupled with retrenchment in the oil field equipment industry, has undoubtedly meant a substantial decline in severance tax collections and sales tax revenues from the sale of equipment. It has been estimated, however, that for every drop of $1 in the price of a barrel of oil, the State loses $40 million in severance taxes, $30 million in sales taxes on equipment, and $30 million more in franchise and other indirect taxes, for a total of $100 million. Naturally, a drop in the price of crude oil to somewhere between $15 and $18 dollars per barrel promises even more severe fiscal problems for Texas.

Conclusion

While not all of Texas' current economic problems can be attributed to international developments and changing world trade patterns, clearly the decline in oil prices, the high exchange rate for the dollar, and unfair trade practices by certain foreign suppliers are taking their toll on the Texas economy. With additional foreign

capacity coming on line in energy, electronics, and agriculture, the competitive pressures on a wide range of Texas industries and companies are sure to intensify in the years ahead. Texas businesses have been players in the world marketplace for decades, and they can meet these challenges if allowed to compete on a level playing field.

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