BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Long-Term Economic Planning Needed In Oil- And Gas-Producing States

The State budgets and economies of Texas, Oklahoma, and Louisiana rely heavily on the oil and gas industry. With rising energy prices, the region's potential overdependence on this industry is masked by current economic prosperity. Heavy reliance in the region on diminishing, nonrenewable resources should invite continued reassessment; long-range planning is needed.

We recommend that existing Federal planning assistance programs include a focus on the specific issue of how the region should deal with declining oil and gas resources. Congressional oversight can help make sure that existing planning processes pay attention to this important, long-term regional issue, which could have significant implications for the U.S. economy.

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

This report stresses the need for long-term planning and policy formulation for the Southwest region, defined herein as the Nation's major, contiguous, oil- and gas-producing States--Texas, Oklahoma, and Louisiana. Recommendations are presented for the major Federal agencies having broad, planning assistance responsibilities--the Department of Commerce's Economic Development Administration, the Department of Housing and Urban Development, and The Ozarks Regional Commission. Our basic message is that the several existing planning assistance programs should focus on potential fiscal and economic base dislocations stemming from declining petroleum production and reserves.

The Southwestern States' public and private sectors depend heavily on the oil and gas industry, which is relatively healthy, stimulated by increasing demand and rising energy prices. But the current activity in these industries cannot persist indefinitely; the nonrenewable resources are inevitably diminishing.

A region's long-term fiscal and economic vitality and resiliency depend largely upon diversification. Appropriate means exist for encouraging diversification through planning decisions and policies. The complexities and difficulties involved do not negate the need.

A major function of any planning activity is to anticipate future developments that should be considered in current decisions and policies. The Federal Government has a strong interest in encouraging such planning. This is attested to by various examples, including major corporations, such as Chrysler; major cities, such as New York; and major regions, such as New England (recall its decline as a leading textiles manufacturing area).

This analysis is one in a series of planned GAO reports on the Nation's regions. The Southwest was studied because the region's long-term problems are masked by current prosperity, and the region's dominant economic sector, energy, is of overriding national importance.

We are sending copies of this report to the Director, Office of Management and Budget, the Secretary of Commerce, the Secretary of Housing and Urban Development, the Governors and Congressional delegations of the three States, The Ozarks Regional Commission, and the Joint Economic Committee.

Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

LONG-TERM ECONOMIC PLANNING NEEDED IN OIL- AND GAS-PRODUCING STATES

D I G E S T

For most of this century, the fiscal and economic condition of the southwestern States (Texas, Oklahoma, and Louisiana) has been inextricably linked to oil and gas activities. However, the region's oil and gas reserves and production have been declining since the early 1970s, and prospects for this trend to reverse are not good. Yet continued heavy reliance on decreasing resources has caused little concern for diversification planning, perhaps largely because rising energy prices are stimulating the region's economy and generating increased public sector revenues.

Although the Southwest region currently is fiscally and economically healthy, troublesome trends strongly indicate that long-range planning is needed. Through appropriate oversight, the Congress can help assure that potentially severe economic dislocations in the Southwest's basic industry are anticipated in time to take mitigating actions and, thus, to preclude the need for huge Federal aid expenditures in what could become a distressed area.

HIGH RELIANCE ON OIL AND GAS REVENUES: SEVERANCE TAXES, RENTS, AND ROYALTIES

Historically, direct mineral revenues (severance taxes, rents, and royalties) have been a large part of the southwestern States' budgets. During 1960-78, the three States' direct mineral revenues, as a share of the region's own-source general revenue, averaged 21.8 percent, ranging from a high of 26.8 percent in 1961 to a low of 15.4 percent in 1973; the 1978 figure was 21.2 percent. Louisiana showed the strongest reliance on oil and gas revenues, collecting close to $195 per person in 1978. (See p. 15.)

ECONOMIC DEPENDENCE ON PETROLEUM AND RELATED INDUSTRIES

In 1977, at least 1 of every 13 regional employees worked in petroleum and related industries and 12 percent of the region's total payroll dollars was paid by these industries. (See p. 41.)

Generally, the region's petroleum and related industries are heavily concentrated within certain cities and counties. Areas having heavy concentration of petroleum and related industries become vulnerable as nonrenewable oil and gas resources are depleted. The region's vulnerability can be decreased through diversification; however, the incentive to diversify is hampered by the high profits, wages, and taxes currently provided by these industries.

REGIONAL OIL AND GAS PRODUCTION OUTLOOK

The likely crude oil outlook for Texas, Oklahoma, and Louisiana is a continuation of the current trend of decreasing production, especially in Texas. In broad terms, only under the most optimistic of assumptions could oil production levels of the 1970s be maintained. A turnaround is more possible for natural gas production than for oil, but unlikely. Even though exploration for natural gas is up markedly in all three States, production is likely to continue to decline during the 1980s. Texas may experience the most extensive drop in gas production, mainly because oil production is expected to drop. (Frequently, gas is found dissolved in oil.) (See p. 57.)

LITTLE PLANNING BY STATES TO DIVERSIFY REVENUE SOURCES AND ECONOMIC BASES

The three States' interest in long-term fiscal planning generally has lessened in recent years as energy prices have increased. Also, the States do not have specific economic

development policies to encourage diversification which would counterbalance their dependence on the oil and gas industry. (See p. 90.)

However, the Governor of Texas recently initiated a comprehensive planning project to identify trends and decide where the State ought to be in the year 2000. Two issues already identified as needing attention are the long-range consequences of shifts in the composition of Texas' economy and the impacts of declining oil and gas reserves on State revenues.

LITTLE ENCOURAGEMENT BY THE FEDERAL GOVERNMENT TO FOSTER DIVERSIFICATION PLANNING

The major Federal agencies which have planning assistance programs--the Economic Development Administration (EDA), the Department of Housing and Urban Development (HUD), and the Ozarks Regional Commission (ORC)--are not addressing possible long-range fiscal and economic base problems in the Southwest stemming from the region's heavy reliance on the oil and gas industry. The current regional development strategy prepared by EDA's southwestern office contains no goals or objectives regarding the issue. Similarly, HUD's 701 planning program has not focused on the southwestern oil and gas issue. An Ozarks Regional Commission representative said that long-range fiscal and economic base diversification planning relative to the oil and gas industry was probably an issue which the Commission should have thought of on its own. (See p. 111.)

RECOMMENDATIONS

The Secretary of Commerce should have the EDA see that Federal, State, and substate planning processes focus on the Southwest's oil and gas issue. These efforts should be coordinated with those of ORC. (See pp. 135-136.)

The Secretary of Housing and Urban Development should see that the 701 planning program's administrator direct area offices in Texas, Oklahoma, and Louisiana to consider the oil and gas issue in reviewing program applications and overall program designs. Further, these offices should be aware of and support other Federal agencies' issue-oriented efforts. (See pp. 136-137.)

GAO recommends that the Congress oversee the Federal agencies' progress in meeting GAO recommendations concerning regional strategies and/or planning assistance programs. The Congress could require the applicable Federal agencies to follow a common regional strategy or action plan. (See p. 137.)

AGENCY COMMENTS

GAO sent draft copies of this report to the Federal and State agencies contacted during the course of the study. In general, their comments were positive with many praising the study, while others were very careful to define or clarify the positions of their agency vis-a-vis the report's message. A few, however, felt that GAO did not prove the need for long-range planning. GAO continues to believe this report does document such a need. (See p. 139.)

Contents

ABBREVIATIONS

BLS	Bureau of Labor Statistics
EDA	Economic Development Administration
GAO	General Accounting Office
HUD	Department of Housing and Urban Development
ORC	Ozarks Regional Commission
SIC	Standard Industrial Classification
SMSA	Standard Metropolitan Statistical Area

TABLES

TABLES (cont.)

TABLES (cont.)

FIGURES

FIGURES (cont.)

CHAPTER 1

INTRODUCTION

For most of the twentieth century, the fiscal and economic health of the southwest region 1/ has been inextricably linked to oil and gas activities. For 1979, in terms of relative contributions to national oil production, the States of Texas, Louisiana, and Oklahoma ranked first, third, and fifth. 2/ In natural gas production, they ranked second, first, and third. Obviously, then, these resources are an important source of State revenue and have played a major role in the general economic development of the Southwest region.

The industrial development of Texas, for example, was based largely on the State's endowment of natural resources. Indeed, one analyst has stated that petroleum launched Texas into the industrial age and "presents a classic case of an economic take-off into sustained growth based on a supplementary leading growth sector." 3/ That is, Texas' petroleum refining industry supplemented a national, more fundamental leading growth sector--the automobile industry. When large amounts of oil were first discovered in Texas in 1901 at Spindletop, no immediate matching market existed. Oil was being used primarily as an illuminating fuel. The introduction of widely affordable automobiles greatly increased demand and made oil the "titan of the Southwest." 4/

How does the oil and gas industry stand today relative to the region's fiscal structure and economic base, and what is the outlook? One need not be a petroleum engineer or an economist to realize that the market situation has changed dramatically since the early part of this century. Gone are the days of energy made cheap by abundant supplies and

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1/In this report, we will refer to the States of Texas, Oklahoma, and Louisiana as "the Southwest," "the Southwest region," or "the region."

2/Alaska was second and California fourth.

3/Joseph Bryan Adair, "An Aggregate and Sectoral Analysis of Economic Growth in Texas 1914-1972" Ph.D. dissertation, The University of Texas at Austin, August 1978.

4/Ibid., p. 83.

relatively soft demand. 1/ Quite the reverse situation is true today, which raises the specter of potential, long-range fiscal and economic problems for the Southwest.

POTENTIAL REGIONAL PROBLEMS-- RELIANCE ON DECLINING RESOURCES

The Southwest's production of oil and gas has been declining since the early 1970s. Oil and gas will not become totally depleted, but increasingly expensive to produce. Domestic supplies will be generated by increasingly high cost means, such as secondary and tertiary recovery techniques, and from remote and expensive areas, such as offshore. Thus, even given price decontrol, the trend of falling production will not stop, but, at best, will only slow in the rate of decline (see ch. 4).

Despite declining oil and gas production, the southwestern States' budgets and economies continue to rely heavily on these resources. For instance, taxes on mineral extraction account for about 19 percent of these States' total tax revenues, whereas the national average is only 3.7 percent for the 32 States that impose a severance tax (see ch. 2). Between 1972 and 1977, the region's economic base has become more concentrated in petroleum and related industries, reversing a prior downward trend. This is reflected by overall increased employment and payrolls in these industries compared with other sectors of the region's economy (see ch. 3).

Potential regional problems stemming from fiscal and economic dependence upon oil and gas may, at first, appear to be solely a matter of State concern. However, the Federal Government has a strong interest in planning for the continued viability of the Southwest region.

GOVERNMENT INTEREST IN LONG-TERM REGIONAL PLANNING

The Federal Government has a strong, vested interest in regional economic development planning. Among other things,

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1/In fact, during the 1970s, energy became a highly publicized national issue, particularly after October 17, 1973, when the Organization of Petroleum Exporting Countries announced its embargo. Also, in 1973, regulatory agencies in Texas and Louisiana raised the States' crude oil prorationing quotas to 100 percent, virtually ending production controls. Even before 1973, though, the production allowables were beginning to increase. In Texas, for instance, the average annual allowable was 27 percent in 1962, 52 percent in 1969, 72 percent in 1970, and 94 percent in 1972.

the overall performance of our national economy depends on the aggregate economic health of the Nation's regions. In turn, regional economic performance frequently depends on key industrial or agricultural activities. For instance, the Great Lakes' economy, particularly in and around Detroit, is closely linked to automobile manufacturing; the Midwest's economy depends largely on food and fiber production; and the Southwest's economy has the majority of the Nation's oil and gas industry. Thus, due to such regional concentrations and other factors, broad, national economic policies can have varying inter- and intraregional effects.

Moreover, regional economies do not respect political boundaries. Places of production and manufacturing, lines of transportation, and the location of natural resources, such as oil and gas, frequently overlap State lines. Thus, individual States may face a number of obstacles in attempting to solve predominantly regional problems. For instance, neighboring States may be uncooperative or give uncoordinated responses. Another obstacle could be inconsistent methods of data collecting. Another, perhaps more significant obstacle, could be a lack of policy and program continuity caused by changeovers in a State's administration. Accordingly, when regional problems arise, Federal attention often is requested.

Over the years, Federal involvement has resulted in a multitude of arrangements devised to deal with common State and sub-State problems and those that transcend State boundaries. There has been a rapid increase 1/ of Federal assistance in the form of various grant programs administered through highly autonomous organizations. Virtually every Federal agency is now responsible for administering one or more categories of grants-in-aid to States and sub-State organizations. 2/ Federal entities which have planning assistance responsibilities for the Southwest region include the Department of Commerce's Economic Development Administration (EDA), the Department of Housing and Urban Development (HUD), and the Ozarks Regional Commission (ORC). 3/

1/For example, Federal aid to State and local governments grew 14.9 percent annually during 1955-78, increasing from $3.2 billion to $77.9 billion.

2/The Federal grant-in-aid system consists of three general kinds of grants--categorical, block, and general revenue sharing.

3/Texas, Oklahoma, and Louisiana are three members of the Commission.

By encouraging long-term planning, the Federal Government can help to avert problems in Texas, Oklahoma, and Louisiana resulting from diminishing, nonrenewable oil and gas resources. The Congress has both oversight and policymaking responsibilities regarding long-term planning for the Southwest's continued economic and fiscal stability. Planning for the region inevitably involves energy issues, as the region's hydrocarbon resource base diminishes. This report contains information, analyses, and suggestions which should be helpful to the Congress in its oversight and policymaking roles regarding the region's interrelated issues of energy, economic development, fiscal stability, and long-term planning.

There are, of course, many varieties and meanings of "planning." As we used it, "* * * planning is the organized and continuous interaction of goal definition, problem analysis, policy development, program design, resource allocation, and performance evaluation." 1/ Thus, planning and policy formulation become inseparable elements of a single process.

The New York City experience offers an interesting example of the need for long-term planning, since the root of the city's problems was deterioration in the fiscal and economic base. This deterioration was observed years before 1975, when the financial community refused to accept the city's money market instruments and a budget crisis ensued. To help alleviate cash flow problems, the Federal Government, in the New York City Seasonal Financing Act of 1975, authorized up to $2.3 billion in seasonal loans to the city. Later, additional assistance was provided as guarantees of city securities under the New York City Loan Guarantee Act of 1978, which authorized the Secretary of the Treasury to guarantee up to $1.65 billion in city securities to be sold only to city or State agency employee pension funds. Those guarantees were to form the basis for a $4.5 billion financing package in which banks and the public would participate. 2/

1/Council of State Governments, State Planning: Intergovernmental Policy Coordination, (Washington, D.C.: U.S. Department of Housing and Urban Development, Office of Policy Development and Research, August 1976), p. 13.

2/See GAO reports, "The Long-Term Fiscal Outlook for New York City," PAD-77-1, April 4, 1977, and "New York City's Fiscal Problems: A Long Road Still Lies Ahead," GGD-80-5, October 31, 1979.

The Chrysler Corporation offers another example of the need for long-term planning. During the 1970s, the automobile industry misread the change in consumer preferences for smaller cars. Detroit apparently believed the preference shift to more fuel-efficient cars was temporary. Economic activity in the region is now suffering because of the failure to interpret and correctly adjust to the permanent change in consumer choice. To continue operating, the Chrysler Corporation has requested and received substantial Federal Government assistance in the form of loan guarantees.

Though not as recent, New England, which over time lost out competitively to the South in textiles manufacturing, offers another example of a regional economy that has suffered because the full significance of economic shifts was not seen. During the Industrial Revolution, New England's innovations in tools and machinery attracted the textile production industry. At that time, textile production was very much a high-technology industry--a technology not easily imported by other regions. But the development of interchangeable parts and other developments helped to shift coarse goods production from New England to the South during 1880-1910.

During this time, while the production process for coarse cotton goods was becoming less dependent on New England's resources, the region's textile industry was still growing because of regional specialization in the industry's more sophisticated aspects of finishing. It was not until after World War II, when production processes and machinery designs had matured sufficiently, that virtually all lines of cotton textile production and textile machinery manufacturing relocated in the South.

With the example of New England in mind, we emphasize that the purpose of long-term planning and policy formulation is not to reverse or counter natural economic forces. Such policies, as one writer has noted, would "not only be futile but inconsistent with national objectives of economic growth and productivity." 1/

1/William C. Freund, "Can Quotas, Tariffs, and Subsidies Save the Northeast?" in George Sternlieb and James W. Hughes Revitalizing the Northeast--Prelude to an Agenda (New Brunswick: The Center for Urban Policy Research, Rutgers University, 1978), p. 202.

Rather, the purpose of long-term planning is to lessen the impact or likelihood of problems by:

> "* * * actions which are carried out systematically over a long period of time. Resources must often be committed long before the results will be seen. * * * a problem might be avoided or made much less severe if it were anticipated and action were taken before the problem became serious." 1/

Diversification, particularly that of a region's economic base, falls into the category of potential problems that requires many years of resource commitments. To date, however, none of the various federally assisted planning programs has developed a coordinated or comprehensive regional plan or strategy to minimize potential fiscal and economic base dislocations in the Southwest region as oil and gas production declines.

Planning, as used in any context, is a tool to enhance flexibility, which is important in dealing with dynamic uncertainty. Petroleum futures definitely fit this classification, because they are based on numerous unknown variables--remaining recoverable resource quantities, future price levels, technological breakthrough possibilities, etc.

From one perspective, this report is a form of planning. But more needs to be done by all levels of government to maintain a continuing awareness of dependencies on diminishing petroleum resources. The following chapters show a need for such planning by

- --detailing the extent of the States' fiscal (ch. 2) and economic (ch. 3) reliance on the oil and gas industry,
- --discussing the regional oil and gas production outlook (ch. 4), and
- --examining current State (ch. 5) and Federal (ch. 6) planning efforts.

1/"Long-Range Analysis Activities In Seven Federal Agencies," U.S. General Accounting Office, PAD-77-18, December 3, 1976; p. i.

OBJECTIVE, SCOPE, AND METHODOLOGY

As mentioned previously, the Federal Government has a strong interest in balanced regional growth and appropriate long-term economic development planning to achieve and maintain balanced growth. The major objective of this study is to ascertain the scope of long-range economic planning in one specific region--the Southwest.

To assure a broad-based perspective in planning for economic development and stability, we based our study on three methods of inquiry. First, we reviewed pertinent literature in economics and planning and found that long-range planning for regions is all too often an exercise in hindsight rather than foresight. That is, recognizing options to counteract unwanted shifts in an economy's major sectors generally occurs only after the events happen. Second, we gathered data on economic activity of both the public and private sectors in the Southwest region. Through various analytical techniques, including shift-share analysis (relative changes in employment by industry), forecasting, and comparing regional trends with national trends, we tried to quantify the region's economic and fiscal reliance on the oil and gas industry. Third, we interviewed public officials at State and Federal levels to obtain their views on the role of planning for economic development and stability relative to the region's heavy reliance on the oil and gas industry. Did they think planning was necessary? Are they doing any planning at the present time?

Each chapter reflects the use of one or more of these three methods. A more detailed discussion of the scope and methodology used in each chapter is given in appendix I.

Collectively, using the oil and gas industry as a case study, the chapters emphasize the importance of long-term planning. The case study approach is not intended to subrogate other planning needs. Although not addressed in this report, there are other natural resource depletion issues that also cause concern and warrant long-term planning attention.

For example, under much of the northwestern areas of Texas and Oklahoma is the Ogallala Formation, a major aquifer (underground water source) which supports the irrigation needs of the area's large agricultural economy. Irrigation pumpage from the aquifer accelerated in the 1950s with the availability of low-cost natural gas. The expansion of irrigated land, in turn, resulted in expansion of associated agribusiness, which includes pumps, tubular goods, sprinklers, fertilizers, pesticides, processing plants, and farm equipment.

However, groundwater, like oil and gas, is an exhaustible resource which is being progressively, and in some areas, rapidly depleted or made uneconomically recoverable by rising energy costs. This situation could have adverse economic effects in the region, such as:

--reduced overall income levels associated with irrigation and agribusiness activities;

--reduced tax revenues to local, State, and Federal governments; and

--increased public costs to provide job training, income support, and other welfare costs for the unemployed or underemployed. 1/

Again, while our report does not address natural resources such as groundwater and arable land, the concept and importance of long-term planning are still equally applicable to those and other exhaustible resources. Indeed, as indicated above, in certain areas there may be inseparable interrelationships among natural resources such as groundwater and the hydrocarbon energy base.

These interrelationships are not discussed in our report. The report also has several other limitations. For instance, the development of Mexico's abundant energy resources--and the planning implications for the Southwest region--are not addressed. Also, although adjustments to the exhaustion of energy resources are likely to be more private than public, there is no discussion of the role of the private sector in planning responses. Further, discussion of the Federal role is limited to the major entities which have direct economic development and planning assistance responsibilities, such as the Economic Development Administration. Comparatively, this agency's budget is only a minimal part of total Federal outlays in the region. Other Federal activities, such as defense procurements and installations, and interstate highway subsidies, probably have bigger, though more indirect, effects on the region's economy.

Nonetheless, even with these limitations in mind, we believe the report is fairly comprehensive and should be helpful to policymakers in assessing long-term planning needs.

1/Much of the preceding discussion is based on Six-State High Plains--Ogallala Aquifer Area Study Interim Report, January 1979, submitted to the EDA, U.S. Department of Commerce, by the study's general contractor, Camp Dresser & McKee, Inc.

CHAPTER 2

HIGH RELIANCE ON OIL AND GAS REVENUES: SEVERANCE TAXES, RENTS, AND ROYALTIES

During most of the 1900s, the southwestern States have relied heavily on oil and gas revenue from severance taxes, rents, and royalties. Severance taxes are State taxes imposed distinctively on the removal of natural resources, e.g., oil, gas, other minerals, timber, fish, etc., from land or water. The tax base is either the value or quantity of products removed or sold. In 1978, severance taxes constituted 19 percent of State tax revenue for the region, compared to an average of only 3.7 percent for the 32 States imposing a severance tax. Another major revenue source, rents and royalties from leasing State-owned lands for mineral exploration and development, totaled over $1.2 billion nationally, and 56 percent of this amount was collected by Texas, Oklahoma, and Louisiana. Much of the region's oil and gas revenue is statutorily earmarked to fund key public services, such as education and highways.

Unquestionably, the region has reaped substantial revenue benefits from its position as the Nation's leading producer of oil and gas; however, since these resources are depletable, the heavy reliance on petroleum revenues should be reassessed continually. This chapter analyzes the southwestern States' reliance on oil and gas revenues. The analysis centers around three areas:

--the relative contributions from oil and gas, historical and current, to the States' budgets;

--the extent to which key public services are funded by oil and gas revenue; and

--the outlook for continued reliance in the short run, and the less certain prospects in the long run.

Historically, mineral wealth has played an important role in the fiscal health of Texas, Louisiana, and Oklahoma. These States lead the Nation in severance tax revenues, currently ranking first, second, and third among the 32 States that collect severance taxes. The public sector's relative fiscal dependency on the extraction industry has increased as energy prices have risen, even though production has declined.

SEVERANCE TAXES, RENTS, AND ROYALTIES WELL ESTABLISHED

Reliance on mineral wealth as a revenue source was well established in all three States by the 1920s. Public officials realized that mineral resources were part of the region's natural heritage and that unlike timber wealth in the Northwest or grain abundance in the north-central region, mineral resources could not be renewed. To finance public services and slow the use of the resources, severance taxes were established. 1/ Such taxes, however, are not the only source of revenue from the extraction industry. Private entrepreneurs can purchase the right to search for and extract minerals on State-owned lands. Public domain mineral rights have contributed substantial rental and royalty revenue to the States.

Before discussing the specifics of budget reliance on oil and gas, it is important to describe the broad budgetary picture. General revenue comprises three separate revenue sources--intergovernmental revenue, tax revenue, and nontax (own-source) general revenue. 2/ In 1978, tax revenue for Texas was 59.4 percent of general revenue, slightly below the national norm of 59.9 percent, but for both Oklahoma and Louisiana the shares were substantially lower, 55.5 and 53.9 percent (see figure 1). For the nontax (own-source) general revenue component, Texas had the lowest percentage (15.4), while Louisiana had the highest percentage (17.3). Interestingly, all three States were above the national average of 11.8 percent nontax general revenue. Figure 1 raises two key questions: how much of these States' tax revenue is derived from severance taxes, and how much do rents and royalties contribute to nontax general revenue?

Historically, the region's public sector reliance on oil and gas revenues has been remarkably high. For the period 1960-78, severance taxes averaged 19.7 percent of the three States' total tax revenue (see figure 2). Rents and royalties during this period averaged 30.4 percent of the States' nontax general revenue (see figure 3). The collective importance of these direct mineral revenues is shown in figure 4. During 1960-78, the three States' direct mineral revenues (i.e., severance taxes, rents, and royalties) as a share of the

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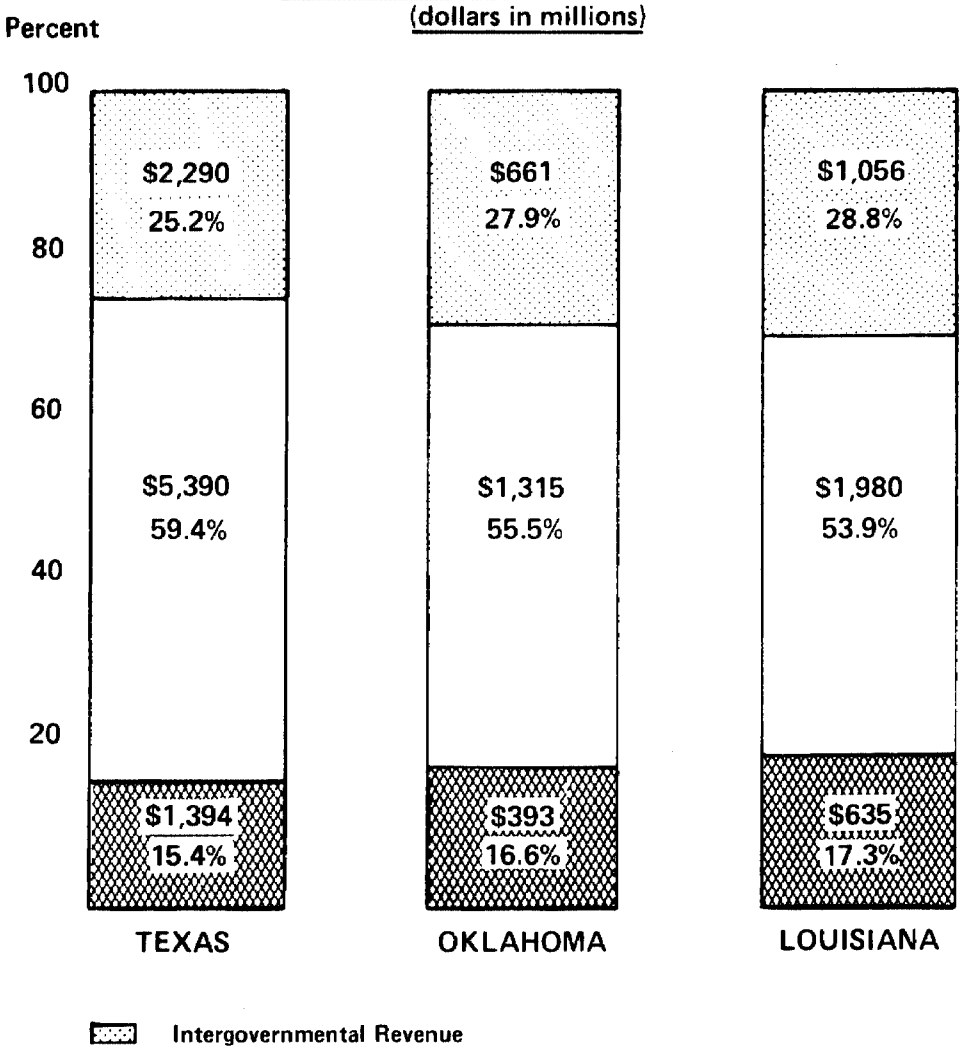
1/See app. II for a brief synopsis of public policy and constitutional perspectives on severance taxes.

2/The Bureau of the Census explicitly defines nontax (own-source) general revenue as "miscellaneous general revenue."

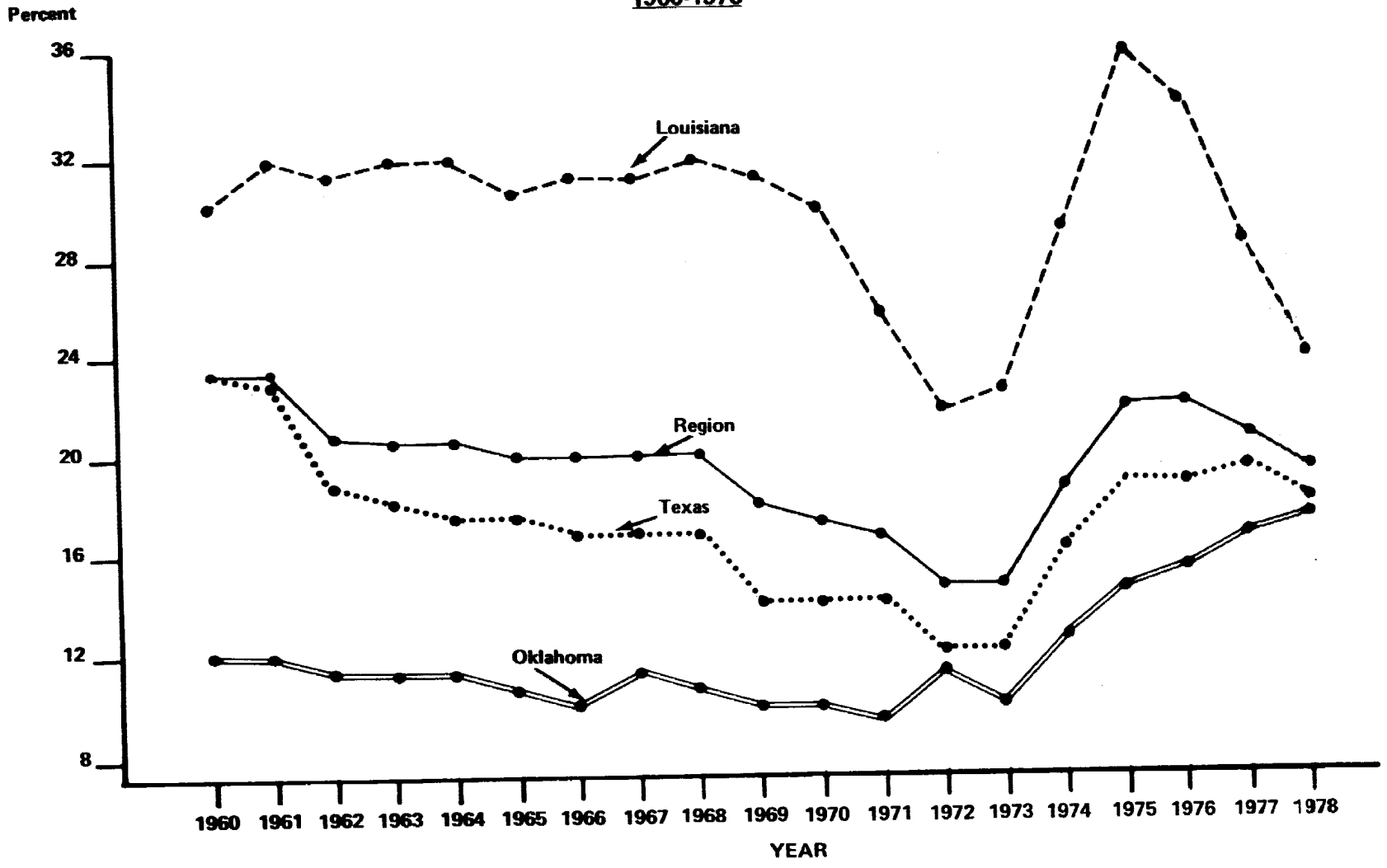
Figure 1

Percent Distribution of State General Revenue by Major Components in Fiscal Year 1978
(dollars in millions)



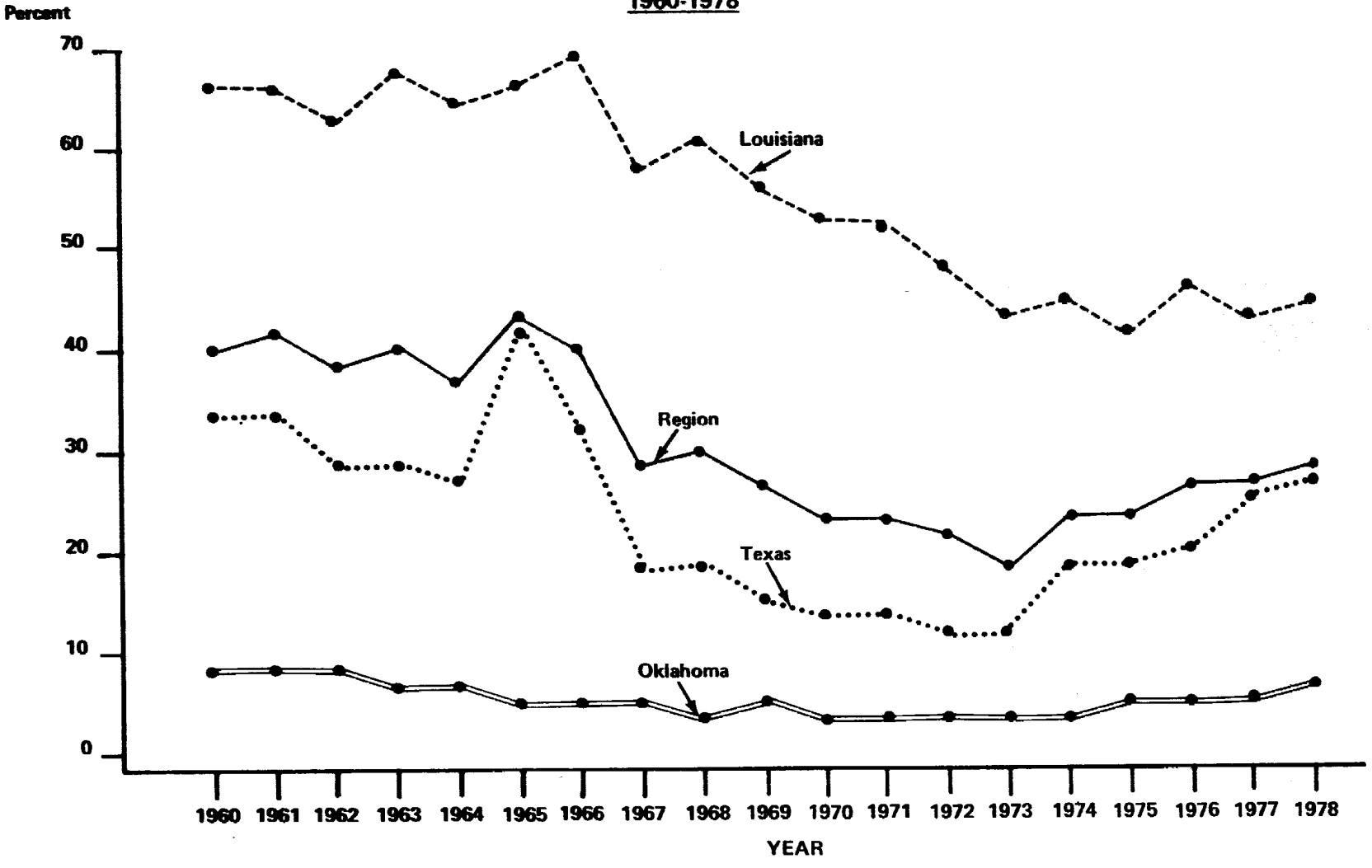
Source : U.S. Bureau of Census, State Government Finances in 1978, Series GF78 No.3, and GAO staff computations.

Figure 2
Severance Taxes as a Percent of Total Tax Revenue
1960-1978



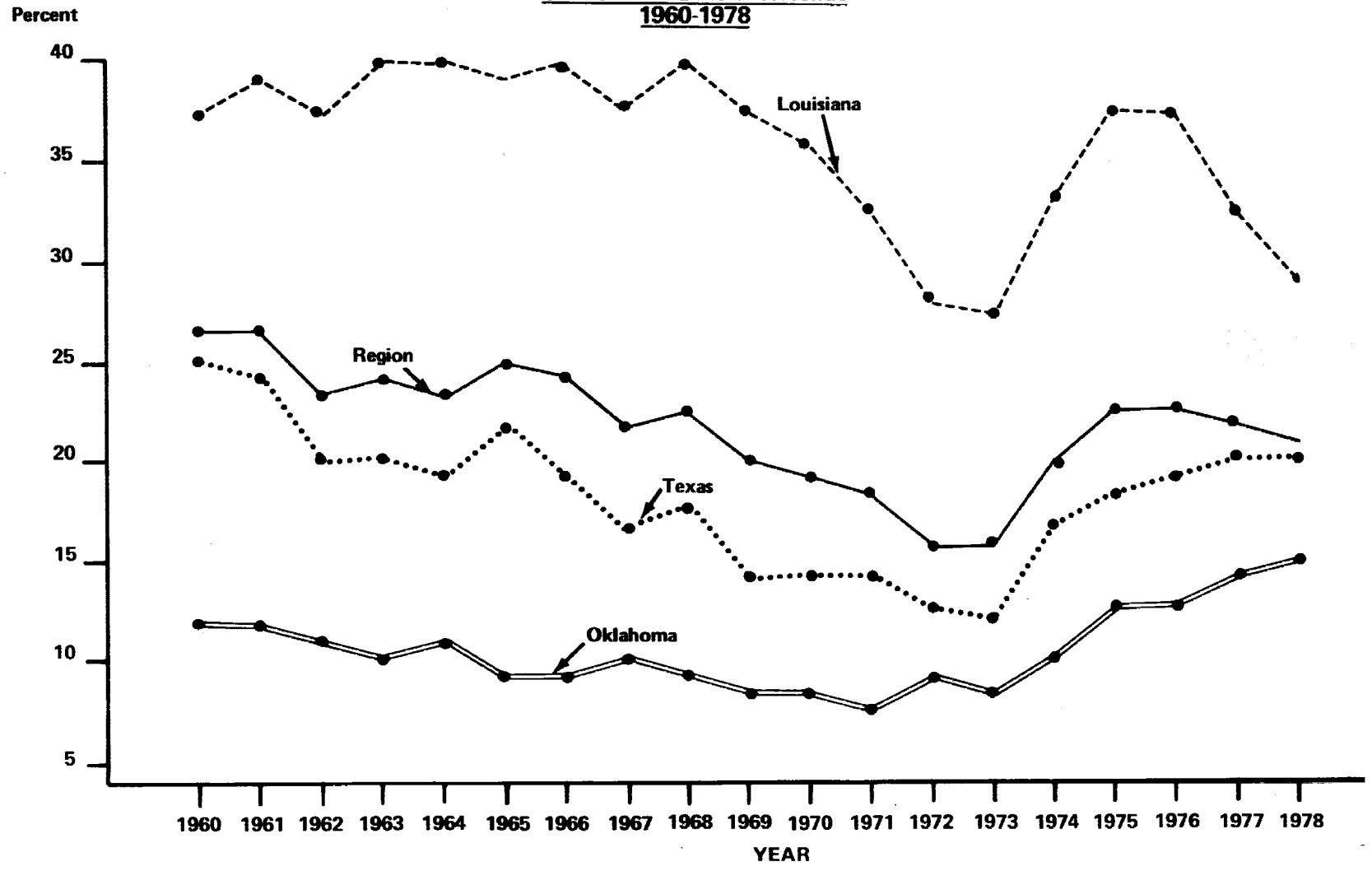
Source: See table 27.

Figure 3
Rents and Royalties as a Percent of Non-Tax (Own-Source) General Revenue
1960-1978



Source: See table 28.

Figure 4
Severance Taxes, Rents, and Royalties as a Percent of Own-Source General Revenue 1960-1978



Source: See table 29.

region's nontax general revenue averaged 21.8 percent, ranging from a high of 26.8 percent in 1961 to a low of 15.4 percent in 1973; the 1978 figure was 21.2 percent. The following sections give more detailed analyses of these oil and gas revenues' relative importance in recent years, particularly in the post-embargo era.

CURRENT DIRECT MINERAL REVENUES OVER HALF THE NATION'S TOTAL

In fiscal year 1978, the southwestern States' collections from severance taxes, rents, and royalties amounted to $2.35 billion, 1/ over 60 percent of the Nation's $3.71 billion total for these oil and gas revenue sources (see table 1). Texas alone collected over $1 billion in direct revenue from mineral wealth during fiscal year 1978--slightly more than $102 for every person in the State, which is more than twice the per capita national average for State corporate income tax collections. Oklahoma, meanwhile, collected less than one-fifth of the Texas sum, but on a per capita basis was not far behind Texas with revenues of about $90 for every Oklahoma resident.

Louisiana, on the other hand, showed the strongest reliance on these revenue sources, collecting close to $195 per person. Viewed from an income perspective, Louisiana's dependency is more than twice as large as the other two States. Louisiana collected almost $33 in oil and gas revenues for every $1,000 of State personal income whereas Texas and Oklahoma collected $15 and $14.

Other regional-national comparisons in table 1 further highlight the importance of oil and gas revenues in the Southwest. Nationally, tax revenues from mineral extraction amounted to $17 per person in 1978. In the Southwest region, however, mineral extraction enriched public treasuries by

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1/ In addition to severance taxes, rents, and royalties, other State fiscal collections from the oil and gas industry include corporate franchise taxes and sales taxes. We did not attempt to quantify these, but the amount is probably quite substantial, considering the industry's importance to the region's economy (see ch. 3). Also, the industry accounts for a significant share of local property taxes. For example, the Mid-Continent Oil and Gas Association has estimated that the oil and gas industry in Texas pays about $400 million annually, which is slightly more than 10 percent of all local property taxes collected in the State.

Table 1

Collections from Severance Taxes, Rents, and Royalties for the Southwest and the Nation in Fiscal Year 1978

	Texas	Oklahoma	Louisiana	Southwest region	Nation
Severance taxes (in millions)	$ 959,686 (72%)	$230,368 (90%)	$476,829 (62%)	$1,666,883 (71%)	$2,494,328 (67%)
Rents and royalties (in millions)	373,089 (28)	25,928 (10)	286,293 (38)	685,310 (29)	1,220,408 (33)
Total direct revenues from mineral wealth (in millions)	1,332,775 (100)	256,296 (100)	763,122 (100)	2,352,193 (100)	3,714,736 (100)
Total direct revenues from mineral wealth per person	102.41	88.99	194.18	118.65	17.08
Total direct revenues from mineral wealth per $1,000 of personal income	15.27	14.36	32.91	18.33	2.46

Source: U.S. Bureau of the Census, State Government Finances in 1978, Series GF78 No. 3 and GAO staff computation.

almost $119 per resident, close to seven times the national average. On a wealth basis, the differential is even higher, at 7-1/2 times the national average of $2.46 per $1,000 of personal income. In short, then, these data illustrate the region's very heavy reliance on oil and gas revenues.

INCREASED DEPENDENCY SINCE 1973

In the late 1960s and early 1970s, tax revenue for the three southwestern States increased, following national trends of rapid expansion of the State-local sector. Severance tax collections also were rising, but not as fast as tax revenue. Thus, severance taxes as a share of total tax revenue were falling. Figure 2 shows that the region became less dependent on severance tax revenue during this period. Then, in 1973, the trend reversed and dependency rose quickly over the next 2 years.

What is the reason for the gradual decline, then the sharp increase in dependency on severance tax revenue? A statistical model would be necessary for a comprehensive determination of causes, but several economic factors are likely candidates. One possibility is that the cycle in figure 2 simply reflects the business cycle for the aggregate economy. But if this is the case, it is difficult to explain why the share was so stable during the early and mid-1960s. More direct reasons could be price and production changes for oil and natural gas during the period. It is also important to consider actions taken by the State governments, such as tax rate changes, that affect the share.

The Texas pattern of dependency was one of relative stability during the mid-1960s. In the late 1960s and early 1970s, dependency dropped, while severance tax revenue grew at a slow but stable rate, indicating that other tax revenue expanded more rapidly. Severance tax revenues increased dramatically when the OPEC cartel quadrupled "world" oil prices in 1973. Between fiscal years 1973 and 1974, Texas tax collections from crude oil production rose 65 percent and gas production taxes rose 39 percent.

Table 2 illustrates the dramatic rise in prices for oil and gas produced in Texas. The most significant jump in oil prices occurred in 1974; in 1975 gas prices registered a similar acceleration. In the last few years, Texas crude oil prices have risen at a lower rate than gas prices. The continued significant rise in gas prices is partly due to the State's shift from the regulated interstate market to the unregulated intrastate market. These price increases resulted in an appreciable growth in natural gas tax revenue, which

in 1977 surpassed collections from the traditionally important oil production tax for the first time.

Oklahoma's dependency on severance taxes as a major revenue source is the lowest in the region. Yet this dependency grew steadily from 10 percent in 1973 to 17.5 percent in 1978. During the 1970-78 period, Oklahoma's overall tax revenue grew at an average annual rate of 13.4 percent. Severance and income taxes rose noticeably faster than other taxes, resulting in substantially less dependency on sales taxes. Among other reasons, this shift resulted from State legislated rate increases in 1971 for both severance and income taxes.

Table 2

Texas Crude Oil and Natural Gas Prices
Fiscal Years 1973-78

Fiscal year ended August 31	Crude oil average prices		Natural gas average prices	
	Dollars per barrel	Annual percent change from previous year	Cents per thousand cubic feet	Annual percent change from previous year
1973	3.59		18.58	
1974	6.12	+70.5	25.58	+37.6
1975	7.36	+20.3	44.29	+73.1
1976	8.04	+9.2	64.24	+45.0
1977	8.33	+3.6	84.00	+30.8
1978	9.00	+8.0	97.93	+16.6

Source: Texas Comptroller of Public Accounts, Office of Planning and Research, Fiscal Notes, October 1979.

In contrast to Oklahoma, Louisiana's dependency on severance taxes is the highest in the region. Figure 2 shows that Louisiana was hit hardest during the 1968-73 period when its share dropped almost 10 percentage points. In 1972 severance tax collections declined on an absolute basis. At that point the Louisiana legislature, in a special session, switched the tax base on oil from an 18- to 26-cent range per barrel (depending on quality) to 12.5 percent of value, the highest rate in the region (see app. II). The tax rate on natural

gas was increased from 3.5 cents per thousand cubic feet (or 11.5 percent of value, whichever was greater) to 7 cents per thousand cubic feet, but the tax base of quantity, rather than value, was maintained. Increases in price, along with the tax rate change, assured large gains in severance tax collections during the 1974-76 period, but declining production caused absolute drops in severance tax collections in both 1977 and 1978.

Taxes, however, are not the only source of revenue from the extraction industry. As mentioned earlier, rental and royalty revenues from State-owned lands are also important. In fiscal 1979, the three States received over $685 million from rental and royalty agreements. Figure 3 illustrates that the cyclical pattern of rents and royalties as a share of nontax general revenue is similar to the severance tax share pattern in the previous figure. Again, Louisiana ranks highest in dependency (close to 50 percent in recent years), Texas is next, and Oklahoma is lowest.

In short, the region's reliance on oil and gas revenue sources has been high over the entire 1960-78 period. The general evidence indicates that reliance is sensitive to price increases, production decreases, and State-legislated tax changes. Over the latter part of the period, reliance fell and then rose as States tried to maintain the degree of revenue reliance that existed during the relatively stable 1960s. The region, apparently, is reluctant to lose even part of its oil and gas revenue.

Revenues, however, are only one side of the budget. Expenditures are the other side. How are oil and gas revenues divided among numerous public services? Are some public services more dependent on these revenues than others?

EARMARKING REVENUE FOR KEY PUBLIC SERVICES

We have presented strong evidence of dependency on oil and gas revenues, but this dependency is not spread evenly across all public services. Key public services receive disproportionate amounts of oil and gas revenues through the somewhat controversial process of earmarking tax revenues.

Texas--education

Education receives, through constitutional dedication, close to one-fourth of all Texas' severance tax revenues. Additionally, education receives statutorily dedicated money from the Omnibus Tax Clearance Fund and money from rents and royalties.

As shown in table 3, almost three-fourths of fiscal year 1979 severance tax revenues were dedicated to the Omnibus Tax Clearance Fund. Revenues from several different taxes are placed in this fund, but oil and gas tax revenues constitute over 55 percent of the fund. Money is distributed from the fund to "priority allocations," some of which are educational programs. Table 4 presents the priority allocations in 1979, showing that allocations to education programs (the Foundation School Program and the Teachers' Retirement Program) composed 53 percent of the total.

In addition to financing from tax revenues, education also receives financing from rents and royalties. About 9 percent of Texas' production is from State-owned lands. During the 1800s, Texas used its public domain for various purposes--attracting military service recruits, encouraging settlement, financing internal improvements, and prompting

Table 3

Apportionment of Oil and Gas Revenues to Various State Funds in Texas, Fiscal Year 1979

Fund	Percent of severance taxes	Fund	Percent of rents & royalties
Education Fund	24.8	Permanent School Fund	73.1
Omnibus Tax Clearance Fund a/	74.5	Permanent University Fund	26.5
Tax Enforcement Fund	0.7	Texas A&M Mineral Investment Fund	0.1
		Department of Corrections Mineral Fund	0.1
		Other Funds	0.2
Total	100.0	Total	100.0

a/This fund contains revenue from various taxes and is dedicated to priority allocations (see table 4).

Source: Texas Comptroller of Public Accounts.

Table 4

Priority Allocations from Texas' Omnibus Tax Clearance Fund in Fiscal Year 1979

	(millions)	
State Highway Fund	$ 99.1	7.2%
Farm-to-Market Road Fund	15.0	1.1
Medical Assistance Fund	324.5	23.5
Children's Assistance Fund	43.2	3.1
Teachers' Retirement Program	317.9	23.0
Foundation School Program (funds for elementary and secondary education)	414.6	30.0
Excess to General Revenue	166.4	12.1
Total	$1,380.7	100.0%

Source: Texas Comptroller of Public Accounts.

railroad construction. Now, in accordance with the Texas constitution, the land's oil and gas leases are used largely to benefit education--principally (as shown in table 3) a Permanent School Fund for public schools and the Permanent University Fund for the University of Texas.

Oklahoma--education and roads

In Oklahoma, as in Texas, educational programs receive a large share of mineral-generated revenue. The Teacher Retirement System receives almost 29 percent of oil and gas severance tax revenue; the State Land Office Permanent Fund, which mainly finances education, receives over 90 percent of rent and royalty revenue (see table 5). The State also returns taxes to the local level, specifically for schools and roads. These taxes, however, are returned only to counties producing oil and gas. Yet, production is so widespread that 72 of Oklahoma's 77 counties received funds in fiscal year 1979 (see table 6). Oklahoma has more budgetary flexibility than Texas since over half of Oklahoma's severance tax revenues are distributed in the general revenue fund.

Louisiana--practice dropped in 1974

In the past, Louisiana earmarked oil and gas revenues to various funds, but in 1974, adoption of a new State constitution virtually eliminated this practice. Currently, almost all oil and gas revenue (i.e., severance tax collections, rents, and royalties)--as well as revenue from other

Table 5

Apportionment of Oil and Gas Revenues to Various State Funds in Oklahoma, Fiscal Year 1979

Fund	Percent of severance taxes	Fund	Percent of rents & royalties
General revenue fund	55.6	State land office permanent fund a/	92.0
Teacher retirement system	28.5	State board of affairs b/	1.9
Counties for highways	7.2	Mineral leasing fund	5.5
Counties for schools	7.2	Other funds	0.6
Tax commission fund	1.4		
State examiner and inspection fund	0.1		
Total	100.0	Total	100.0

a/This fund distributes money primarily to education.

b/This fund distributes money primarily to mental health and rehabilitation services.

Source: State of Oklahoma, Comptroller, Office of Budget and Accounting.

major sources which are not constitutionally dedicated--is credited to a single fund, the Bond Security and Redemption Fund. 1/ Obviously, the primary purpose of this fund is to secure general obligation bonds. But once the primary purpose is met, additional money in this fund can be distributed to other funds. So even though specific severance tax earmarking

1/Beginning in 1981, some severance revenue will be channeled into a permanent fund called the Enhanced Mineral Income Trust Fund (see ch. 5).

Table 6

Gross Production Taxes Returned to Local Government for Schools and Roads
Fiscal Year Ended June 30, 1979

Amounts returned	Number of counties receiving returned taxes for: Schools	Roads
$ 0 - $ 999	6	6
1,000 - 9,999	5	5
10,000 - 49,999	10	10
50,000 - 99,999	13	13
100,000 - 499,999	25	25
500,000 - 999,999	11	11
1,000,000 +	2	2
Total number of recipient counties	72	72
Total gross production taxes returned	$17,206,832.52	$17,150,064.65

Source: Oklahoma Tax Commission, State Payments to Local Governments, 1979.

to education and other parish 1/ functions ceased in 1974, these functions have not suffered drastic cutbacks.

For example, teachers' salaries are set by the legislature and appropriated from the Bond Security and Redemption Fund. Also, from this fund the State returns 20 percent of oil and gas severance tax revenues to the respective producing parish (up to a maximum of $500,000 a year). These returned funds go into the parish's general revenue fund and are not earmarked for any specific function. Perhaps Louisiana, in dropping the earmarking practice, was searching for more budgetary flexibility.

1/In Louisiana, a parish is equivalent to a county.

PROBLEMS WITH EARMARKING

The Southwest region has relied heavily on earmarking to distribute oil and gas revenues. Many fiscal analysts criticize earmarking because it introduces rigidity into the budgetary process. That is, earmarking--along with expenditure limitations, tax rate ceilings, and federally mandated expenditures--leaves State policymakers with less flexibility than is needed during times of shrinking real budgets and increasing economic uncertainty. Thus, functions receiving relatively large shares of oil and gas revenues reap appreciable gains as these revenues increase, and likewise may suffer considerably if these revenues contract.

CONTINUED RELIANCE ON OIL AND GAS REVENUES

The short-term forecasts are for further dependency increases as oil and gas price regulations are incrementally lifted. The long-term outlook for dependency on oil and gas revenue is uncertain; future price and production levels will determine whether revenues are stable or volatile. The only certainty is that the nonrenewable resource base is shrinking. Thus, a gradual relaxing of dependency and long-term planning for alternative revenue sources are appropriate.

Optimistic short-term outlook

Deregulation of oil and gas prices will bring about further price increases and provide an incentive to increase production. In the short run, deregulation will increase State revenues for Texas, Oklahoma, and Louisiana. Most forecasters agree that the increase will be substantial, but a wide margin of error exists between various estimates. For example, Texas' Comptroller of Public Accounts forecasted a conservative $13.1 billion increase in the State's oil and gas revenues between 1980 and 1990. At the other end of the spectrum, the Northeast-Midwest Institute 1/ estimated oil and gas revenues for Texas would increase by $33.2 billion over the same period.

One reason for the wide range in estimates is that no one knows how quickly suppliers can respond to price increases. Because severance tax revenues depend on both the price and quantity of petroleum produced, it is possible for a rise in price to be nullified by a drop in production.

1/A nonprofit research corporation created by a coalition of Congressmen.

Severance tax revenues from oil production in Texas, for example, fell between fiscal year 1976 and 1977 because the drop in production offset the increase in the average price per barrel. No one is projecting a revenue decrease in the short run, but in the long run, revenues could easily deviate from the short-term trend.

Uncertain long-term outlook

Due to numerous uncertainties, long-run projections are less clear than short-run estimates. As discussed in chapter 4, there is no agreement on the quantity and quality of undiscovered deposits and reserves. Nor is it known how responsive producers can be to price increases. New wells are not created overnight. As price increases stimulate the search for new oil and gas, they will stimulate research and development of alternative energy sources, which could lower demand for petroleum and affect tax revenues. Thus, uncertainties about production levels, price changes, suppliers' response time, and technology's effect in making substitutions feasible reduce the probability that short-term trends will continue steadily.

Another uncertainty, perhaps the most important, is political. One expert argued, "Focusing analysis on a nonpolitical [energy] future is an escape, intentional or not, from grappling with the ambiguous realities of the past and present situation." 1/ The Congress has acted on a windfall profits tax for petroleum producers, and other congressional actions may be forthcoming. All aspects of energy are becoming increasingly "politicized" and subjected to national scrutiny--even areas traditionally left to a State's individual discretion, such as natural resource taxation. There is, for instance, growing dialog about redistributing the producing States' "windfall" revenues from deregulated prices. Redistributing a State's tax revenues is an extremely controversial issue. Constitutional questions regarding the State's right to tax are at the heart of the matter.

In any event, a more likely political reaction to windfall severance tax revenue may be a rethinking of Federal formula grants. Tax effort, a component in many formula grants, will rise in all oil-producing States. To avert an increase in the relative share of grant dollars flowing into oil- and gas-producing States, regional coalitions may push

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1/David Howard Davis, Energy Politics, second edition (New York: St. Martin's Press, 1978), p. 11.

to redesign the various formulas so tax effort is less heavily weighted. 1/

To briefly summarize, this chapter has shown that the fiscal health of the Southwest region's public sector is integrally connected to the extraction segment of the oil and gas industry. The public sector obtains slightly more than 20 percent of its revenue from minerals extraction--in the form of severance taxes, rents, and royalties--while nationally the comparable figure is slightly less than 3 percent. Despite declining oil and gas production levels, in the short term it appears that revenues will at least stabilize (and perhaps even increase significantly) as prices are deregulated. In the long run, the outlook is less clear, not only for the region's public sectors but also for the private sectors or economic bases (discussed in the next chapter).

1/"A slew of political coalitions--for example, the Coalition of Northeastern Governors, the New England Caucus, the Northeast-Midwest Economic Advancement Coalition--has been formed in the North to press for the redirection of Federal spending and other legislation that would channel greater benefits to the slow-growing States of the Northeast and north-central regions of the country." Bernard L. Weinstein and Robert E. Firestine, Regional Growth and Decline in the United States--The Rise of the Sunbelt and the Decline of the Northeast (New York: Praeger Publishers, 1978), p. v.

CHAPTER 3

ECONOMIC DEPENDENCE ON PETROLEUM AND RELATED INDUSTRIES

For many decades, the oil and gas industry has been vitally important to the economy of the three-State region. In 1977, at least 1 of every 13 employees in the region worked in petroleum and related industries and 12 percent of the region's total payroll was paid by these industries. 1/ Although impressive, these figures understate these industries' importance; the figures include neither the indirect effects on employment in supply industries nor the induced effects of the employees' purchasing power in the general economy.

Using employment and payroll data, this chapter discusses various aspects of the region's petroleum and related industries' importance, focusing on

--the region's share of national petroleum and related industries;

--regional, compared to national, changes in these industries;

--the region's specialization in these industries;

--the intraregional areas of industry concentration; and

--the region's economic outlook.

DEVELOPMENT OF OIL AND GAS PRODUCTION

Oil was first discovered and produced in Texas, Oklahoma, and Louisiana in the early 1890s and 1900s. The Spindletop field in Beaumont, Texas, was discovered on January 10, 1901, and spurred drilling along the Texas-Louisiana border. A new era had arrived.

Oklahoma's development paralleled that of Texas and Louisiana, with discoveries like the gigantic Glenn Pool in 1907. When Oklahoma became a State in that year, it simultaneously became the Nation's largest oil-producing State.

1/Appendix III explains choice of employment and payrolls as measures of economic importance and lists the industries used in this chapter by standard industrial classification (SIC).

Oklahoma's production peaked 20 years later, and Texas subsequently became the biggest oil-producing State.

In all three States, as well as the industry as a whole, the pattern of production in the early years was boom and bust. One large discovery after another increased the supply and drove down prices. Fields 1/ were quickly put into production (overproduction in many cases) because the courts ruled that oil belonged to the landowner or lessee who produced it--although oil could be located in a reserve which ran under many leaseholders' properties. This "rule of capture" resulted in emphasis on maximum production, possibly to the detriment of the fields as a whole.

Thus, for some years production in the region was uncontrolled; no thought was given to depleting the resources or damaging the environment. Frequently, oil was pumped from the ground wastefully. Then the three States finally regulated production--first to insure efficient recovery, and later to insure stable prices. Texas, Oklahoma, and Louisiana all enacted conservation and prorationing 2/ laws between 1900 and 1920.

During the early 1900s, gas was considered a byproduct of oil production and was not a sought-after commodity. 3/ Gas was used for such tasks as home heating, but it could only be piped short distances. As technological innovations increased, a pipeline strong enough to carry gas long

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1/Many of these early fields, unmanaged and overproduced, were to be opportunities for enhanced oil recovery in later years.

2/Prorationing is the restriction of oil and gas production by a State regulatory commission, usually on the basis of market demand. Prorationing involves allowables which are assigned to fields, and from fields to leases, and then allocated to individual wells. In Texas, for example, the amount of allowable yearly average production dipped to as low as 27 percent in 1962, and it did not reach 100 percent allowable until 1973. Oklahoma and Louisiana both have similar laws, as do six other States. California and Alaska are the principal producing States that do not use market demand prorationing.

3/Natural gas can be either associated or nonassociated. Associated gas is found in oil; nonassociated gas is a reserve consisting of gas alone. Before the development of interstate markets, if a gas-only well was found, it usually was not developed.

distances was developed. But although high strength steel was developed in the 1930s, it was not until after World War II that large diameter pipelines, suitable for natural gas, were put into production. Then the uses of natural gas as a national energy source increased dramatically. For example, during the 1947-59 period, gas production increases in Texas, Oklahoma, and Louisiana averaged 9.18 percent, 5.16 percent, and 13.54 percent a year. In Louisiana alone, gas production went up 359 percent during this period.

In the 1960s, natural gas production continued to grow, but the rate probably could have been higher than it actually was. In the 1960s and even in the 1970s, natural gas production was constrained by a slowing of additions to proven reserves caused, in part, by governmental actions. Natural gas production dropped in Texas and Louisiana after 1972 and remained relatively unchanged in Oklahoma. Proven natural gas reserves have fallen, however, in all three States each year during 1970 to 1978, even though exploration and drilling for natural gas increased.

A system of pipelines, adequate for oil, and refineries had developed and expanded as the region's newly discovered crude oil contributed more and more to the developing automobile industry. Gasoline production soared as the automobile made its impact on society.

In addition, the petrochemical industry, which uses both unrefined and refined petroleum products to produce such items as automobile tires and nylon hose, developed along the waterways of Texas and Louisiana.

Production increased in the 1950s

Oil reserves in Texas, Oklahoma, and Louisiana rose rapidly in the 1950s, due to various factors such as high market demand, intensive exploration and development, and technological change. For the three States, oil reserves grew from about 13 billion barrels in 1945 to 21 billion barrels at the beginning of the 1960s, an average annual increase of about 3.27 percent. The three States' oil production increased 18.3 percent from 1950 to 1951, reflecting Korean War demand. Likewise, drilling and exploration surged about the same time. The average rotary rig activity count for Texas, Oklahoma, and Louisiana peaked in 1951, 1953, and 1956, respectively. Only recently has drilling and exploration approached these peak activity rates.

Oil production increased in the 1950s, partly through the method of secondary recovery by water flooding. 1/ Oklahoma was especially changed by enhanced oil recovery (primarily water flooding). In 1949, 11.1 percent of Oklahoma's production came through enhanced oil recovery; by 1959 it was 34.1 percent. Texas showed a similar but smaller gain, increasing from 17.4 percent to 27.2 percent. Louisiana's production from enhanced oil recovery decreased over the same period; although, in actual figures, enhanced oil production was about 19 million barrels in both 1949 and 1959.

In short, during the 1950s and 1960s, enhanced recovery methods helped Texas and Oklahoma maintain oil production in their older fields. More recently, in 1970, enhanced oil recovery represented 52.9 percent, 52.1 percent, and 26.4 percent of production in Texas, Oklahoma, and Louisiana. In the future, forms of enhanced recovery other than water flooding are expected to play an increasing part in the three States' production.

Overall economic development

Energy-based taxes have contributed significantly to regional tax coffers. This has been particularly true recently, because severance taxes on oil and natural gas are based on value (price times quantity), 2/ and prices of these commodities have been rising faster than those of other commodities.

Oil and gas tax revenues have allowed regional property taxes to remain low. Texas has no personal income tax, and the rates in Oklahoma and Louisiana are nominal (see ch. 5). The low taxes, combined with available and, until recently, inexpensive energy sources and good transportation (including water transportation along the gulf coast and Mississippi River) have attracted myriad industries to the area.

Around 1960, regional and national employment in crude petroleum and natural gas (SIC 131) began declining as

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1/In this secondary recovery method, water is injected into the reservoir to force additional oil out of rock formations and into the well bores of producing wells.

2/In Louisiana, natural gas taxes are based on quantity alone (see app. II).

production allowables, 1/ prorationed on estimates of market demand and already below maximum efficient rates, were sharply reduced in response to increased imports of low-priced foreign oil. However, in 1973, OPEC reduced quantities and raised prices significantly on their exports. Consequently, demand for domestic oil increased, market-demand prorationing was abandoned, and the downward trend in crude petroleum and natural gas industry (SIC 131) employment has reversed. Although 1972-77 employment gains were modest, the lag factor between exploration and production must be considered. Employment in exploration and other contract services, such as surveying, excavating, drilling, and cementing (SIC 138), increased sharply between 1972 and 1977. In Texas alone, the number of operating drilling rigs increased from an average of 328 in the first quarter of 1973 to 867 in the first quarter of 1979, although the number has since decreased, owing partially to uncertainty over the windfall profits policy.

Regional and national employment trends in these industries have largely coincided during this period. This is hardly surprising, since regional employment in many of the industries accounts for large percentages of national industry employment.

A SIGNIFICANT SHARE OF EMPLOYMENT IN PETROLEUM AND RELATED INDUSTRIES

Throughout the 1962-77 period, regional employment in petroleum and related industries accounted for a large percentage of national industry employment, ranging from 23 to 29 percent. Table 7 shows industry employment for the region and each State and the percentage of national industry employment.

Throughout the period, the region accounted for approximately 70 percent of miscellaneous oil- and gasfield services (SIC 1389) employment and 60 percent of crude petroleum and natural gas (SIC 131) employment. Since crude oil production, which is included in SIC 131, is prorationed among States, the region's and States' shares of national industry employment

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1/Major oil discoveries around 1930 led to a dramatic decline in crude oil prices--from the 1920 peak price of $3 a barrel to 10 cents a barrel in 1931. States responded with regulations to limit production to protect prices. Challenges to the legality of these regulations were overcome, and production was prorationed to insure price.

Table 7

Number of Employees and Percent of National Employment for Petroleum and Related Industries by State and Region 1962, 1967, 1972, and 1977

SIC	Industry	State/ region	Number of employees (000s omitted) mid-March payroll 1962	1967	1972	1977	Percent of national total 1962	1967	1972	1977
131	Crude petroleum and natural gas	Texas	46.4	36.4	28.0	36.9	36.2	35.3	33.0	35.1
		Oklahoma	16.4	11.0	8.5	9.9	12.8	10.7	10.0	9.4
		Louisiana	15.2	15.8	14.9	16.2	11.9	15.3	17.5	15.4
		Region	78.0	63.2	51.4	63.0	60.9	61.3	60.5	59.9
132	Natural gas liquids	Texas	5.9	4.6	4.2	4.9	46.1	47.9	57.5	47.1
		Oklahoma	2.5	1.2	.6	1.1	19.5	12.5	8.2	10.6
		Louisiana	2.4	2.1	1.0	1.5	18.8	21.9	13.7	14.4
		Region	10.8	7.9	5.8	7.5	84.4	82.3	79.4	72.1
1381	Drilling oil and gas wells	Texas	19.2	16.4	14.7	24.7	37.2	35.5	32.7	33.5
		Oklahoma	5.6	3.9	3.4	7.0	10.8	8.4	7.6	9.5
		Louisiana	8.2	10.1	9.7	14.8	15.9	21.9	21.6	20.1
		Region	33.0	30.4	27.8	46.5	63.9	65.8	61.9	63.1
1382	Oil and gas exploration services	Texas	3.8	2.7	6.1	8.8	46.9	35.5	48.0	43.1
		Oklahoma	1.3	.7	1.0	1.3	16.0	9.2	7.9	6.4
		Louisiana	.9	1.6	1.2	3.6	11.1	21.1	9.4	17.6
		Region	6.0	5.0	8.3	13.7	74.0	65.8	65.3	67.1
1389	Oil- and gasfield services NEC a/	Texas	23.0	22.1	22.4	44.7	43.1	38.9	38.6	40.3
		Oklahoma	6.2	6.6	5.1	12.5	11.6	11.6	8.8	11.3
		Louisiana	7.8	10.7	13.3	21.1	14.6	18.8	22.9	19.0
		Region	37.0	39.4	40.8	78.3	69.3	69.3	70.3	70.6
28	Chemicals and allied products	Texas	43.1	51.5	54.1	71.6	5.6	5.9	6.4	8.1
		Oklahoma	1.7	1.8	1.4	2.1	.2	.2	.2	.2
		Louisiana	18.8	19.6	22.2	30.2	2.4	2.3	2.6	3.4
		Region	63.6	72.9	77.7	103.9	8.2	8.4	9.2	11.7
291	Petroleum refining	Texas	36.6	31.2	33.7	31.9	28.1	29.0	32.4	31.8
		Oklahoma	6.6	4.4	4.2	3.9	5.1	4.1	4.0	3.9
		Louisiana	9.8	8.5	9.3	8.5	7.5	7.9	8.9	8.5
		Region	53.0	44.1	47.2	44.3	40.7	41.0	45.3	44.2
3533	Oilfield machinery	Texas	18.5	20.9	20.3	38.5	59.7	60.8	56.5	66.4
		Oklahoma	4.1	4.0	3.9	6.2	13.2	11.6	10.9	10.7
		Louisiana	.8	1.0	1.6	1.9	2.6	2.9	4.5	3.3
		Region	23.4	25.9	25.8	46.6	75.5	75.3	71.9	80.4
492	Gas production and distribution	Texas	18.4	17.9	18.7	19.6	13.1	12.5	12.8	15.9
		Oklahoma	3.7	3.7	3.4	4.9	2.6	2.6	2.3	4.0
		Louisiana	6.5	6.3	5.5	3.5	4.6	4.4	3.8	2.8
		Region	28.6	27.9	27.6	28.0	20.3	19.5	18.9	22.7
Aggregated petroleum and related industries		Texas	214.9	203.7	202.3	281.7	16.2	14.8	15.1	18.9
		Oklahoma	48.1	37.2	31.6	48.9	3.6	2.7	2.4	3.3
		Louisiana	70.3	75.8	78.6	101.2	5.3	5.5	5.8	6.8
		Region	333.3	316.7	312.5	431.8	25.1	23.0	23.3	29.0

a/Not classified elsewhere.

Sources: Developed by GAO staff using data from Bureau of Census, U.S. Department of Commerce, County Business Patterns 1962, Parts 1, 8A, and 8B, County Business Patterns 1967, CBP-67-1, CBP-67-20, CBP-67-38, and CBP-67-45, County Business Patterns 1972, CBP-72-1, CBP-72-20, CBP-72-38, and CBP-72-45, and County Business Patterns 1977, CBP-77-1, CBP-77-20, CBP-77-38, and CBP-77-45, Washington, D.C.: Government Printing Office, 1963, 1968, 1973, and 1979.

remained relatively constant in spite of fluctuations in the number of employees.

Between 1962 and 1977, the region's share of petroleum refining (SIC 291) employment ranged from about 41 to 45 percent of the total. Between 1962 and 1967, the region's share of national petroleum refining (SIC 291) employment increased slightly from 40.7 to 41.0 percent, although regional employment fell by almost 9,000--from 53,000 employees to 44,100. Between 1967 and 1972, regional employment and its percentage of national employment in petroleum refining increased, but both fell slightly between 1972 and 1977.

In the very large chemicals and allied products industry (SIC 28), regional employment and its percentage of national industry employment increased steadily; employment grew from approximately 63,600 to 103,900 between 1962 and 1977. Another regional growth industry was oilfield machinery manufacturing (SIC 3533); between 1962 and 1977, the number of regional employees approximately doubled (from 23,400 to 46,600). In addition, regional employment in the small oil and gas exploration services industry (SIC 1382) more than doubled, ending the period with approximately 13,700.

Texas

Between 1962 and 1977, Texas had the highest employment in the region in all the industries listed in table 7. This dominance is explained largely by the State's large land area and labor force.

Throughout the 1962-77 period, Texas had the majority of national employees in the large oilfield machinery industry and accounted for about two-thirds of national industry employees by 1977. Also, throughout the period (1962-77), Texas accounted for almost one-third of the national employees in petroleum refining, almost one-third in the crude oil and natural gas industry, and consistently accounted for a large percentage of employees in all segments of SIC 138. For example, in SIC 1381, drilling oil and gas wells, Texas accounted for between approximately 33 and 37 percent of national employment; in SIC 1382, oil and gas exploration services, Texas averaged over 40 percent; in SIC 1389, miscellaneous oil- and gasfield services, Texas accounted for an average of 40 percent of national employment. Additionally, in the small natural gas liquids industry (SIC 132), Texas accounted for approximately 50 percent of national industry employees.

Louisiana

In general, although Louisiana's share of total industry employment was smaller than Texas' share between 1962 and 1977, the two States had the same important industries except in oilfield machinery manufacturing, which is important in Texas but insignificant in Louisiana. However, these States' relative national importance in some industries varied between time periods. For example, Louisiana's percentage of national employment in crude petroleum and natural gas peaked for the 1962-77 period in 1972 (17.5 percent), although number of employees declined, and this was the year that Texas' employment in this industry accounted for its lowest percentage of national employment (33 percent). The opposite was true in the small natural gas liquids industry; in 1972, Louisiana had its lowest percent of national employment in this industry for the 1962-77 period (13.7 percent), and Texas had its highest percent (57.5).

Oklahoma

Landlocked Oklahoma has virtually no petrochemical industry, unlike the other two States; however, between 1962 and 1977, the State had significant employment in several petroleum and related industries. Table 7 shows that Oklahoma accounted for between approximately 9 and 13 percent of national industry employment in crude petroleum and natural gas, oilfield machinery, and miscellaneous oil- and gasfield services.

The region

In 1977, the region peaked in number of employees (approximately 431,800) and its share of national employment (29 percent) for aggregated petroleum and related industries (see table 7). However, while these figures indicate that the regional growth rate exceeded the national growth rate for these aggregated petroleum industries between 1962 and 1977, they do not compare growth rates to other industrial activity. Such comparison rates are important in identifying industrial categories which are declining or growing in national importance.

Increasing impact between 1972 and 1977

Between 1972 and 1977, regional employment and payroll growth rates for aggregated petroleum and related industries were higher than national growth rates both for these industries and for all industries combined, reversing trends in the previous decade. Analysis of 1972-77 growth rates shows

that, nationally, these aggregated petroleum industries were decreasing slightly in employment importance while increasing in payroll importance when compared with overall national growth rates. Nationally, employment in these aggregated industries grew 11 percent between 1972 and 1977, compared with 12 percent for all industries; in payrolls these growth rates were 66 percent and 58 percent. The region had a competitive advantage in both employment and payrolls in these aggregated industries during this period. That is, regional growth rates were higher than national growth rates for the aggregated industries; employment grew 38 percent regionally compared with 11 percent nationally; and payroll increases were 116 percent and 66 percent. During the 1972-77 period, the percentage increases in average pay were: 56 percent for regional aggregated petroleum industries, 50 percent for national aggregated industries, and 41 percent for all national industries, giving the region a competitive advantage in an industrial sector with wages that grew faster than the national average.

The 1972-77 employment and payroll rates of change differ significantly from the 1962-72 rates. Between 1962 and 1972, both employment and payroll national growth rates in the aggregated industries were substantially lower than national growth rates for all industries; national employment growth rates were 1 percent for aggregated industries compared with 33 percent for all industries; payroll growth rates were 62 percent and 110 percent. Further, between 1962 and 1972, the region experienced a competitive disadvantage in both employment and payrolls in these aggregated industries with a percentage decline in employment. Regional rates of change compared with national rates of change for these aggregated industries show that, regionally, employment declined 6 percent while increasing 1 percent nationally. In payrolls, the aggregated petroleum industries grew both nationally and regionally but at lower rates than the overall national rate. While national payrolls for all industries grew 110 percent between 1962 and 1972, national payrolls in aggregated industries grew 62 percent and regional payrolls in aggregated industries grew 50 percent. Thus, in both employment and payrolls, the region had a competitive disadvantage in aggregated petroleum industries, and these industries were declining in national importance. Growth rates for average pay for the 1962-72 period were 57 percent for all national industries, and approximately 60 percent for both regional and national aggregated petroleum industries.

As expected, the greatest regional employment decline during the 1962-72 period occurred between 1962 and 1967 and

coincided with the lowest production allowables. 1/ Employment in aggregated petroleum industries declined regionally by 5 percent and grew nationally by only 4 percent. In comparison, national employment in all industries increased 21 percent.

Growth rates are used to describe changes in employment, payrolls, or other factors 2/ for a given period through shift-share analysis, discussed in the following section.

SHIFT-SHARE ANALYSIS

Shift-share analysis is one of a number of methods used by regional economists concerned with regional growth differentials. Shift-share basically measures the total change in a region's economic performance relative to the Nation for a given time period.

The growth rates previously given make up the three components in shift-share analysis; these components are explained below.

--The national component uses the overall national growth rate for employment in an industry 3/ to show the number of regional industry employees at the end of the period if regional industry employment grew at the overall national rate. This component is derived by multiplying regional industry employment at the beginning of the period by the overall national growth rate. (If both national and regional industry growth rates were the same as the overall national rate, this would be the only component, since the other two components, which measure differences, would equal zero.)

1/For example, during the years 1962 through 1967, Texas' annual average allowables were 27, 28, 28, 29, 34, and 41 percent.

2/One other factor commonly used is value added. Value added is not included in this report. However, it was included in a background paper for this chapter ("The Role of the Oil and Gas Industry in the Economic Development of the Southwest"), produced by the Southwest Center for Economic and Community Development, The University of Texas at Dallas.

3/Throughout this section "payrolls" may be substituted for "employment" and "aggregated industries" may be substituted for "industry" where appropriate.

--The industrial mix component uses national growth rates for the industry and all industries combined to show the change in number of employees due to the industry's relative national importance. This component is derived by multiplying beginning regional industry employment by the difference in the national growth rates for the industry and for all industries.

--The competitive component uses regional and national industry growth rates to show the change in employment due to the region's competitive position in the industry. This component is derived by multiplying beginning employment by the difference in regional and national industry growth rates.

These three components, when summed, show the total change in employment during the period.

Figure 5 depicts shift-share analysis for regional employment in aggregated petroleum and related industries for the 1962-72 and 1972-77 periods. This graph shows that in 1962, 333,309 people were employed in the region's petroleum industries. If regional employment had grown between 1962 and 1972 at the national rate for all industries, regional employment would have grown by 111,098 (333,309 x 0.3333) to 444,407. 1/ However, regional employment declined to 312,462 because these aggregated industries were declining in national importance, and the region had a competitive disadvantage. The national aggregated industries' growth rate was lower than the overall national growth rate, and this difference (0.0122 - 0.3333 = -0.3211) multiplied by employment at the beginning of the period yields a decrease of 107,017. At this point, the net gain in employment would have been 4,081 employees (111,098 - 107,017) for a total of 337,390 regional employees in 1972. However, as previously stated, the ending employment was 312,462, and the difference reflects the region's competitive disadvantage, i.e., the difference between regional and national rates of change for aggregated industries (-0.0625 - 0.0122 = -0.0747). This difference times beginning employment is -24,928, and the net decline in regional employment was 20,847 (which is -24,928 + 4,081), for an ending regional employment figure of 312,462.

In the 1972-77 period, the national growth rate for aggregated industries was only slightly lower than the growth

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1/All shift-share analyses were made by computer, and growth rates to four decimal points were printed. Since computations were not limited to four decimal points, figures may vary slightly.

employment in these industries had grown at the overall national rate between 1967 and 1972, the gain would have been 31,900 employees; however, the region lost 4,234 employees, a difference of 36,134. This difference is less than one-half the unfavorable difference in the 1962-67 period. Between 1967 and 1972, regional and national rates of change in each of the petroleum and related industries compared unfavorably with the overall national rate of change with the exception of the small oil and gas exploration services industry; the regional industry employment growth rate (65.51 percent) and the national industry growth rate (65.69 percent) greatly exceeded the overall national growth rate of 10.07 percent.

The majority of employment growth in exploration services occurred in Texas, where the growth rate was 126.82 percent. Whereas 1977 Texas employment in this industry, if projected at the overall national rate, would have been 2,963, actual employment was 6,106, a positive difference of 3,963. Approximately 48 percent of this difference (1,497) was attributable to the industry's growth in national importance, and approximately 52 percent (1,646) was attributable to the State's competitive advantage.

During the 1967-72 period, the regional growth rate of first quarter payrolls in aggregated industries (33.78 percent) slightly exceeded the national growth rate for these industries (33.49 percent) but trailed the overall national growth rate of 46.11 percent. If regional first quarter 1972 payrolls in aggregated industries had grown at the overall national rate, first quarter 1972 payrolls would have been $882,602,000; however, actual first quarter payrolls were $808,134,000, a negative difference of $74,468,000.

Reversal of trends in 1972-77

Whereas the national employment growth rate in aggregated industries (10.89 percent) was slightly lower than the national overall growth rate (12 percent), regional employment in these aggregated industries grew at a rate of 38.17 percent (over three times the overall national growth rate). The region ended the 1972-77 period with 431,716 employees, and the competitive component accounted for 85,221 of the total increase in employment (119,254).

Louisiana, which had more favorable employment rates of change than the other two States in the two previous periods, had the lowest employment growth rate (28.71 percent) of the regional States in 1972-77. In another reversal of the previous decade's trend, from 1972 to 1977 Oklahoma had the

highest employment growth rate (54.79 percent) in aggregated industries among the regional States.

In first quarter payrolls, the national overall growth rate of 57.89 percent for 1972-77 explains $467,864,000 of the $933,788,000 increase (from $808,134,000 to $1,741,921,000). An additional $67,021,000 was due to these aggregated industries increasing in national importance, and the balance of the increase ($398,903,000) was due to the region's competitive advantage.

The region's overall employment growth rates exceeded national overall rates between 1962 and 1977

The region's overall employment growth rates are compared with the Nation's overall growth rates below.

	1962-67	1967-72	1972-77
Region	26.3%	17.3%	25.9%
Nation	21.1	10.1	12.0

These regional overall growth rates and the region's industry-specific growth rates account for the changes in each industry's employment as a percentage of the total regional employment.

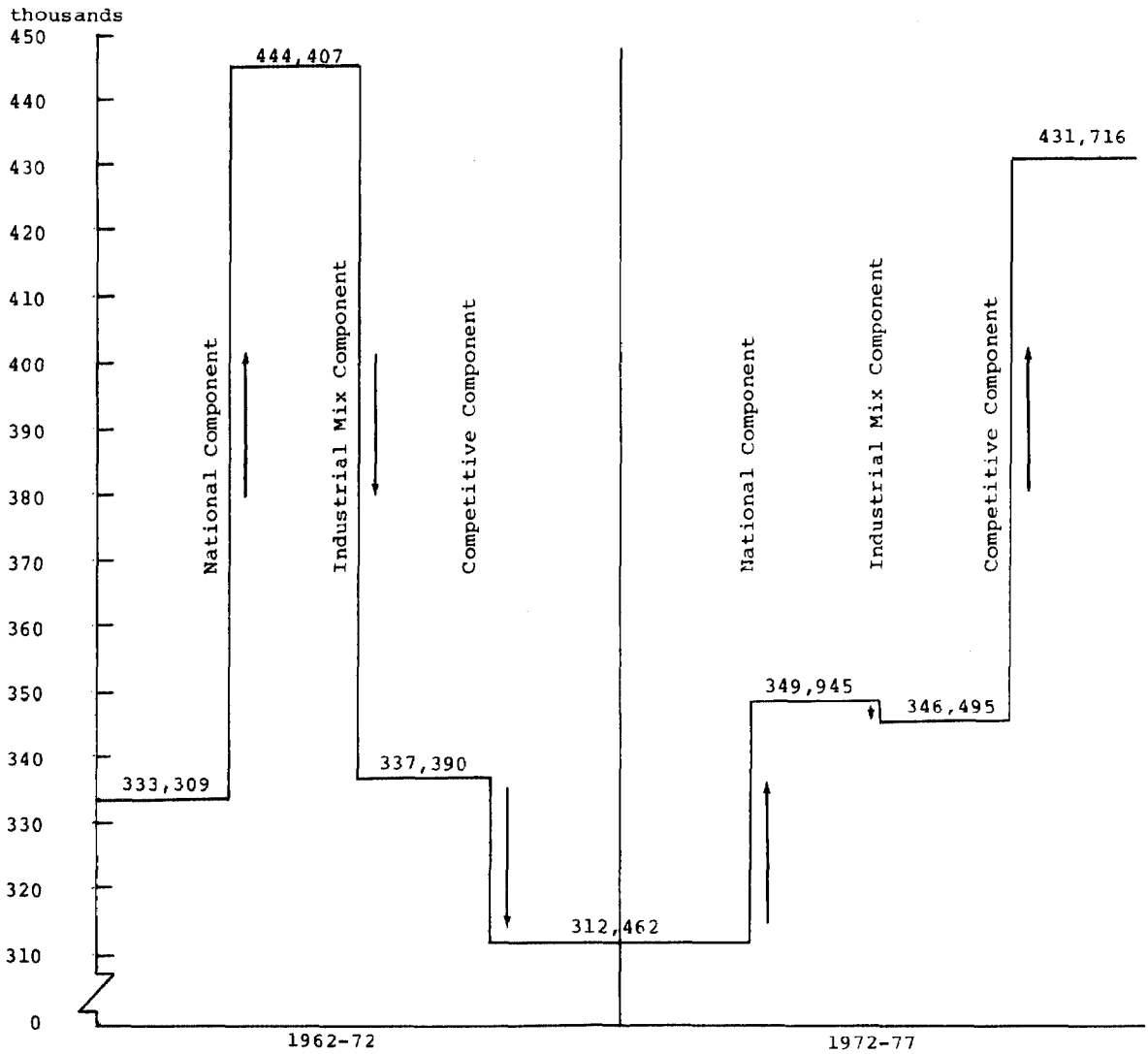
IMPORTANCE TO LOCAL EMPLOYMENT AND PAYROLLS

During the period covered in this section, 1962-77, petroleum and related industries provided significant regional employment and payrolls, as follows:

	1962	1967	1972	1977
Employment				
Texas	10.35%	7.79%	6.49%	7.07%
Oklahoma	11.04	7.13	5.19	6.59
Louisiana	12.01	9.77	9.22	9.72
Region	10.76	8.10	6.81	7.49
Payrolls				
Texas	15.89%	11.89%	10.10%	11.14%
Oklahoma	15.06	9.53	7.27	9.84
Louisiana	19.67	15.26	15.04	17.15
Region	16.49	12.28	10.65	12.08

Figure 5

Shift-Share Analysis, Regional Employment, Aggregated Petroleum, and Related Industries 1962-72 and 1972-77



Sources: Developed by GAO staff based on analysis in Edgar M. Hoover's An Introduction to Regional Economics (New York: Alfred A. Knopf, Inc., 1971), and using data from Bureau of the Census, U. S. Department of Commerce, County Business Patterns 1962, Parts 1, 8A, and 8B, County Business Patterns 1972, CBP-72-1, CBP-72-20, CBP-72-38, and CBP-72-45, and County Business Patterns 1977, CBP-77-1, CBP-77-20, CBP-77-38, and CBP-77-45 (Washington, D.C.: Government Printing Office, 1963, 1973, and 1979).

Table 8

Regional Employment in Petroleum and Related Industries as a Percentage of the Total and Coefficients of Specialization 1962, 1967, 1972, and 1977

SIC	Industry	Industry employment as a percentage of the total for mid-March payroll				Coefficient of specialization for selected industries Difference between region and U.S.							
		1962	1967	1972	1977	1962		1967		1972		1977	
						+	-	+	-	+	-	+	-
131	Crude petroleum and natural gas	2.52	1.62	1.12	1.09	2.22		1.42		.97		.93	
132	Natural gas liquids	.35	.20	.13	.13	.32		.18		.12		.11	
1381	Drilling oil and gas wells	1.07	.78	.61	.80	.95		.69		.53		.69	
1382	Oil and gas exploration services	.19	.13	.18	.24	.17		.12		.16		.21	
1389	Oil- and gasfield services NEC a/	1.20	1.01	.89	1.36	1.08		.90		.79		1.19	
28	Chemicals and allied products	2.05	1.86	1.69	1.80	.28		.22		.22		.43	
291	Petroleum refining	1.71	1.13	1.03	.77	1.41		.93		.85		.62	
3533	Oilfield machinery	.75	.66	.56	.81	.68		.59		.50		.72	
492	Gas production and distribution	.92	.71	.60	.49	.60		.44		.35		.30	
	Aggregated petroleum and related industries	10.76	8.10	6.81	7.49								
	All other industries						-7.71		-5.49		-4.49		-5.20
	Coefficient of specialization					7.71	-7.71	5.49	-5.49	4.49	-4.49	5.20	-5.20

a/Not classified elsewhere

Sources: Developed by GAO staff using data from U.S. Department of Commerce, Bureau of the Census, County Business Patterns 1962, Parts 1, 8A, and 8B, County Business Patterns 1967, CBP-67-1, CBP-67-20, CBP-67-38, and CB-67-45, County Business Patterns 1972, CBP-72-1, CBP-72-20, CBP-72-38, and CBP-72-45, and County Business Patterns 1977, CBP-77-1, CBP-77-20, CBP-77-38, and CBP-77-45 (Washington, D.C.: Government Printing Office), 1963, 1968, 1973, and 1979.

Regional employment increased from 1962 to 1977

Between 1972 and 1977, the region's employment in aggregated petroleum and related industries as a percent of total employment increased, partially offsetting the decline of the previous decade.

Between 1962 and 1967, the region's sharp employment decline in aggregated industries, coupled with a regional increase in overall employment, caused aggregated industries' employment as a percentage of the total to decrease from 10.76 percent to 8.10 percent, as shown in the first two columns of table 8. This decrease was across the board; the greatest decrease occurred in crude petroleum and natural gas (SIC 131), which declined from 2.52 percent to 1.62 percent of the region's total employment. Employment in petroleum refining as a percentage of the total also decreased sharply --from 1.71 percent to 1.13 percent.

This decrease in aggregated petroleum and related industries' employment continued between 1967 and 1972, while overall employment rose, with the result that, by 1972, employment in these aggregated industries accounted for only 6.81 percent of the total. Further declines occurred in crude petroleum and natural gas and petroleum refining employment as a percentage of the total in the 1967-72 period.

Between 1972 and 1977, despite an overall regional employment growth rate of 25.9 percent, which was over twice the overall national growth rate, the high regional employment growth rate in aggregated industries (38.17 percent) accounted for these industries providing 7.49 percent of total employment in 1977 compared with 6.81 percent in 1972. Between 1972 and 1977, gains and losses in individual industries' employment as a percent of total were mixed. The most significant gain was in miscellaneous oil- and gasfield services (from 0.89 percent to 1.36 percent of the total), while the most significant loss was in the continually declining petroleum refining industry (from 1.03 percent to 0.77 percent of the total).

Throughout the 1962-77 period, regional employment in chemicals and allied products remained strong. On the other hand, gas production and distribution employment as a percentage of the total declined throughout the 1962-77 period. Oilfield machinery manufacturing showed its strongest performance at the end of the 1962-77 period.

Table 9

Texas Employment in Petroleum and Related Industries
as a Percentage of the Total and Coefficients of Specialization
1962, 1967, 1972, and 1977

SIC	Industry	Industry employment as a percentage of the total for mid-March payroll				Coefficient of specialization for selected industries Difference between Texas and U.S.							
		1962	1967	1972	1977	1962		1967		1972		1977	
						+	-	+	-	+	-	+	-
131	Crude petroleum and natural gas	2.24	1.39	.90	.93	1.94		1.19		.75		.77	
132	Natural gas liquids	.29	.17	.14	.12	.26		.15		.13		.10	
1381	Drilling oil and gas wells	.92	.63	.47	.62	.80		.54		.39		.51	
1382	Oil and gas exploration services	.18	.10	.20	.22	.16		.09		.18		.19	
1389	Oil- and gasfield services NEC a/	1.11	.85	.72	1.12	.99		.74		.62		.95	
28	Chemicals and allied products	2.07	1.97	1.73	1.80	.30		.33		.26		.43	
291	Petroleum refining	1.76	1.19	1.08	.80	1.46		.99		.90		.65	
3533	Oilfield machinery	.89	.80	.65	.97	.82		.73		.59		.88	
492	Gas production and distribution	.89	.69	.60	.49	.57		.42		.35		.30	
	Aggregated petroleum and related industries	10.35	7.79	6.49	7.07								
	All other industries						-7.30		-5.18		-4.17		-4.7
	Coefficient of specialization					7.30	-7.30	5.18	-5.18	4.17	-4.17	4.78	-4.78

a/ Not classified elsewhere

Souce: Developed by GAO staff using data from U.S. Department of Commerce, Bureau of Census, County Business Patterns 1962, Part 1 and Part 8B, County Business Patterns 1967, CBP-67-1 and CBP-67-45, County Business Patterns 1972, CBP-72-1, and CBP-72-45, and County Business Patterns 1977, CBP-77-1 and CBP-77-45 (Washington, D.C.: Government Printing Office), 1963, 1968, 1973, and 1979.

Percentage of total employment is the basis for the coefficient of specialization, which is also given in table 8. The last eight columns in this table show either positive or negative deviation between regional and national employment by industry as a percentage of total employment. The positive or negative total, which must equal each other since they are based on 100 percent employment, is known as the coefficient of specialization. The higher the value for a given set of industries, the greater the deviation of an area's industrial mix from the national industrial mix. This deviation indicates specialization. (Both regional and national percentages could be decreasing and yield the same differences.)

The region's coefficients of specialization show that regional and national employment for these categories as a percentage of total employment generally moved together throughout the period. The significant exception was in chemicals and allied products, in which regional specialization increased. Regional employment in chemicals and allied products was 2.05 percent of the total in 1962, and the deviation from the Nation's industry employment as a percentage of the total was 0.28 percent; in 1977, regional industry employment was 1.80 percent of the total with a deviation from the Nation's total of 0.43 percent.

Texas

Between 1972 and 1977, Texas' employment in petroleum and related industries as a percentage of the total employment increased despite an increase in total employment of 28 percent. Table 9 shows that the most significant 1972-77 increases, both as a percentage of total employment and as a component of the coefficient of specialization, occurred in miscellaneous oil- and gasfield services (SIC 1389). Oilfield machinery manufacturing (SIC 3533) also showed significant increases in both measurements. Texas' coefficients of specialization were lower than either Oklahoma's or Louisiana's for 1962, 1967, and 1977. In 1972, Texas' coefficient of specialization was lower than Louisiana's but higher than Oklahoma's.

Oklahoma

Oklahoma's employment in petroleum and related industries as a percentage of the total had a larger net decrease between 1962 and 1977 than either Texas' or Louisiana's; Oklahoma's net decrease was 4.45 percent, compared to 3.28 percent for Texas and 2.29 percent for Louisiana. Employment in Oklahoma petroleum and related industries as a percentage of the total increased between 1972 and 1977, while total State employment increased by 22 percent.

Table 10

Oklahoma Employment in Petroleum and Related Industries as a Percentage of the Total and Coefficients of Specialization 1962, 1967, 1972, and 1977

SIC	Industry	Industry employment as a percentage of the total for mid-March payroll				Coefficient of specialization for selected industries Difference between Oklahoma and U.S.							
		1962	1967	1972	1977	1962		1967		1972		1977	
						+	-	+	-	+	-	+	-
131	Crude petroleum and natural gas	3.76	2.11	1.40	1.33	3.46		1.91		1.25		1.17	
132	Natural gas liquids	.58	.23	.10	.14	.55		.21		.09		.12	
1381	Drilling oil and gas wells	1.29	.75	.56	.94	1.17		.66		.48		.83	
1382	Oil and gas exploration services	.30	.14	.16	.18	.28		.13		.14		.15	
1389	Oil- and gasfield services NEC a/	1.43	1.25	.84	1.69	1.31		1.14		.74		1.52	
28	Chemicals and allied products	.39	.34	.23	.28		-1.38		-1.30		-1.24		-1.09
291	Petroleum refining	1.50	.84	.70	.53	1.20		.64		.52		.38	
3533	Oilfield machinery	.94	.76	.64	.84	.87		.69		.58		.75	
492	Gas production and distribution	.85	.71	.56	.66	.53		.44		.31		.47	
	Aggregated petroleum and related industries	11.04	7.13	5.19	6.59								
	All other industries						-7.99		-4.52		-2.87		-4.30
	Coefficient of specialization					9.37	-9.37	5.82	-5.82	4.11	-4.11	5.39	-5.39

a/ Not classified elswhere

Source: Developed by GAO staff using data from U.S. Department of Commerce, Bureau of the Census, County Business Patterns 1962, Part 1 and Part 8A, County Business Patterns 1967, CBP-67-1 and CBP-67-38, County Business Patterns 1972, CBP-72-1 and CBP-72-38, and County Business Patterns 1977, CPB-77-1 and CBP-77-38 (Washington, D.C.: Government Printing Office), 1963, 1968, 1973, and 1979.

Table 10 shows that Oklahoma's employment in chemicals and allied products as a percentage of the total is considerably less than the Nation's (an anomaly among regional States). This table (when compared with tables 9 and 11) also shows the following changes in Oklahoma industries' employment as a percentage of the total relative to other regional States:

--while Oklahoma's employment in crude petroleum and natural gas as percentage of the total was greatest in the region in 1962 and 1967, Oklahoma has since ranked between Louisiana and Texas;

--Oklahoma's 1962 prominence in miscellaneous oil- and gasfield services (SIC 1389) faded to second place behind Louisiana in the succeeding periods.

Louisiana

Louisiana's aggregated petroleum industries employment as a percentage of the total in 1977 almost matched the percentage in 1967 after a period of decline between 1967 and 1972; however, a net loss exists for the 1962-77 period (see table 11). The recent reversal of the 1962-72 downward trend in employment as a percentage of the total occurred while total employment was increasing by 22 percent.

The composition of the aggregated percentage changed considerably throughout the 1962-77 period. In Louisiana the percentage of employees in micellaneous oil- and gasfield services (SIC 1389) consistently increased; and since 1967, the percentage of employees in chemicals and allied products has increased. Additionally, in Louisiana, these two industries (SICs 1389 and 28) showed the greatest positive differences between the State and the Nation in 1977.

The region

Between 1962 and 1977, the regional composition changes in petroleum and related industries were unfavorable from a payroll-generating viewpoint. For example, each regional State had fewer employees in petroleum refining in 1977 than in 1962, and this industry had the highest average payroll of the petroleum sector in both years. 1/ Table 12, which gives employment and average payroll ranking by industry for the region in 1962 and 1977, shows that petroleum refining employment ranked third in 1962 and sixth in 1977. In chemicals and allied products, regional employment rose from second

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1/Average payroll is first quarter payroll divided by number of employees in mid-March payroll.

Table 12

Employment and Average Payroll Ranking for the Three-State Region, 1962 and 1977

SIC	Description	Employment		Average payroll	
		1962	1977	1962	1977
131	Crude petroleum and natural gas	1	3	4	3
132	Natural gas liquids	8	9	3	2
1381	Drilling oil and gas wells	5	5	6	5
1382	Oil and gas exploration services	9	8	8	9
1389	Oil- and gasfield services NEC a/	4	2	9	6
28	Chemicals and allied products	2	1	2	4
291	Petroleum refining	3	6	1	1
3533	Oilfield machinery	7	4	5	7
492	Gas production and distribution	6	7	7	8

a/Not classified elsewhere.

Source: Developed by GAO staff based on County Business Patterns 1962, Part 1, Part 8A, and Part 8B and County Business Patterns 1977, CBP-77-20, CBP-77-38, and CBP-77-45 (Washington, D.C.: Government Printing Office), 1963 and 1979.

to first while average payroll moved from second to fourth. Similar movements occurred in oilfield machinery manufacturing; employment rose from seventh to fourth and average payroll declined from fifth to seventh. In crude petroleum and natural gas, employment declined from first to third while average payroll rose from fourth to third. Conversely, miscellaneous oilfield services (SIC 1389), which moved from fourth to second in employment also gained in average payroll ranking--moving from ninth to sixth.

Despite the regional shift to lower paying petroleum and related industries, payrolls in these aggregated industries accounted for significant percentages of total regional payrolls throughout the 1962-77 period, and reduction of these payrolls would result in considerable dampening of these States' economies. This is particularly true for Louisiana and much less so for Oklahoma. Areas of industry concentration within these States would bear the brunt of payroll reductions.

Table 11

Louisiana Employment in Petroleum and Related Industries as a Percentage of the Total and Coefficients of Specialization 1962, 1967, 1972, and 1977

SIC	Industry	Industry employment as a percentage of total for mid-March payroll				Coefficient of specialization for selected industries Difference between Louisiana and U.S.							
		1962	1967	1972	1977	1962		1967		1972		1977	
						+	-	+	-	+	-	+	-
131	Crude petroleum and natural gas	2.60	2.03	1.75	1.55	2.30		1.83		1.60		1.39	
132	Natural gas liquids	.41	.28	.11	.15	.38		.26		.10		.13	
1381	Drilling oil and gas wells	1.40	1.30	1.13	1.42	1.28		1.21		1.05		1.31	
1382	Oil and gas exploration services	.14	.21	.15	.35	.12		.20		.13		.32	
1389	Oil- and gasfield services NEC a/	1.33	1.38	1.56	2.02	1.21		1.27		1.46		1.85	
28	Chemicals and allied products	3.22	2.52	2.61	2.90	1.45		.88		1.14		1.53	
291	Petroleum refining	1.67	1.10	1.08	.81	1.37		.90		.90		.66	
3533	Oilfield machinery	.13	.13	.19	.18	.06		.06		.13		.09	
492	Gas production and distribution	1.11	.82	.64	.34	.79		.55		.39		.15	
	Aggregated petroleum and related industries	12.01	9.77	9.22	9.72								
	All other industries						-8.96		-7.16		-6.90		-7.43
	Coefficient of specialization					8.96	-8.96	7.16	-7.16	6.90	-6.90	7.43	-7.43

a/Not classified elsewhere.

Source: Developed by GAO staff using data from U.S. Department of Commerce, Bureau of the Census, County Business Patterns 1962, Part 1 and Part 8A, County Business Patterns 1967, CBP-67-1 and CBP-67-20, County Business Patterns 1972, CBP-72-1 and CBP-72-20, and County Business Patterns 1977, CBP-77-1 and CBP-77-20 (Washington, D.C.: Government Printing Office), 1963, 1968, 1973, and 1979.

Louisiana's industries concentrated in two SMSAs

In 1978, the Baton Rouge and the Lake Charles standard metropolitan statistical areas (SMSAs) accounted for 56.8 percent (approximately 25,000 employees) of two of the State's most important industries--chemicals and allied products (SIC 28) and petroleum and coal products (SIC 29). More importantly, from a regional viewpoint, 8.2 percent of Baton Rouge's and 15.9 percent of Lake Charles' nonagricultural employees were in these industries. 1/

The Baton Rouge SMSA lies along the Mississippi River while the Lake Charles SMSA is contiguous to the Beaumont-Port Arthur-Orange SMSA in Texas, where these two classifications (SICs 28 and 29) accounted for 17.6 percent of nonagricultural employment.

Oklahoma's industries concentrated in a few counties

Oklahoma, Tulsa, and Washington Counties had approximately 25,000 employees (over 60 percent of the State total) in the mining sector in 1975. 2/ Between 1973 and 1975, mining sector employment increased by over 20 percent in Oklahoma County and approximately 18 percent in Washington County, while it decreased by 10 perent in Tulsa County. During the 1956-73 period, Oklahoma's mining employment dropped from 52,900 to about 36,000 employees. However, in response to higher petroleum and natural gas prices, employment had increased to about 40,000 employees by 1975. 3/

Of special importance is the percentage of total county employment in an industry. Figure 6 shows the counties in

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1/This data is from the Bureau of Labor Statistics (BLS) and was used in lieu of census data which, in some cases, listed a range (e.g., 2500 to 5000) for employment. BLS data, unlike census data, uses nonagricultural rather than total employment; however, the difference is small.

2/Gerald M. Lage, Ronald L. Moomaw, and Larkin Warner, A Profile of Oklahoma Economic Development 1950-1975, (Oklahoma City: Frontiers of Science Foundation of Oklahoma, Inc., 1977), p. 65.

3/In Oklahoma, the oil and gas sector accounted for 95 percent of mining sector employment in 1975.

AREAS OF PETROLEUM INDUSTRY CONCENTRATION

Petroleum and related industries activity is concentrated within the region, and this concentration increases economic vulnerability to industry downturns. Much of this concentration, particularly in petroleum refining and chemcials and allied products, is in Texas and Louisiana along the gulf coast and in Louisiana along the Mississippi River. These waterways provide easy access to foreign crude petroleum, which accounted for over 40 percent of the crude petroleum refined in Texas and Louisiana at the end of 1978.

Texas' industries concentrated along the gulf coast

The gulf coast of Texas has a phenomenal share of the State's and the Nation's employment in chemicals and allied products (SIC 28) and petroleum and coal products (SIC 29). (In Texas, employment in petroleum refining accounts for over 90 percent of SIC 29 employment.) In 1977, over 40,000 employees in chemicals and allied products (56 percent of the State's industry total) were in five adjoining counties in the Houston area. Three of these counties had approximately 25,000 employees (72 percent of the State's and 24.8 percent of the Nation's employment in petroleum and coal products); over 13,000 of these were in Jefferson County, site of Port Arthur, Texas.

Harris County, Texas, payroll exceeded $21 billion in 1977

Houston, the county seat of Harris County, is known as "the Oil Capitol of the World," with reason. Harris County had over 67,000 employees in petroleum and related industries in the first quarter of 1977; the annual payroll exceeded $1 billion (see table 13). The prime employment classification was oilfield machinery, with 24,051 people; the county's annual payroll of over $372 million in this classification accounted for almost half the national industry payroll. Harris County's payroll in oilfield machinery manufacturing was almost matched by the chemicals and allied products industry payroll which was $366 million. In aggregate, the industries listed in table 13 accounted for 7.3 percent of county employment and 10.2 percent of county payrolls.

which mining employment exceeded 10 percent of the total county employment in 1959 and/or 1975. Though the number of employees in some of these counties may be small, a decrease in employment would severely affect these counties' economies.

Decrease in employment would have severe economic effects in some areas

A downturn in petroleum and related industries' employment would affect some regional areas more than others. For some small isolated areas where these industries account for a large percentage of employment, an employment decrease would have severe economic effects. In addition, some heavily populated areas would also suffer. For example, one out of every six workers in the adjoining Lake Charles and Beaumont-Port Arthur-Orange SMSAs is employed in two industrial classifications (SICs 28 and 29).

Petroleum and related industries' payrolls are generally greater than average. For example, the industries shown in table 13 account for 7.3 percent of Harris County employment and 10.2 percent of payrolls. Because of these higher payrolls, an employment decrease in these industries would have a greater dampening effect on the economy than decreased employment in some other industries.

Eventually the regional economy, particularly in industry-concentrated areas, must adjust to depleting, nonrenewable petroleum resources.

OUTLOOK SUGGESTS ECONOMIC ADJUSTMENTS NEEDED

The outlook for national energy supplies runs the gamut from the extreme pessimism of neo-Malthusians, 1/ who see the end of a "golden age," to the extreme optimism of the advocates of the "First Law of Disney," who believe that "wishing will make it so." 2/

1/Thomas Malthus' 1798 study on population and its economic effects prompted Thomas Carlyle to name economics "the dismal science."

2/William H. Miernyk, "Regional Economic Consequences of High Energy Prices in the United States" in William H. Miernyk Frank Giarrantani and Charles F. Socher, eds., Regional Impact of Rising Energy Prices (Cambridge, Mass: Ballinger Publishing Company, a subsidiary of J.B. Lippincott Company, 1978), p. 14.

Table 13

Employment and Payroll Data for Harris County, Texas
in Selected Industries
by Standard Industrial Classification (SIC)
1977

SIC	Industry	Employees for week including March 12	Annual payroll ($1,000)	% State industry		% National industry	
				Employees	Annual payroll	Employees	Annual payroll
131	Crude petroleum and natural gas	6,069	122,112	16.4	18.1	5.8	6.5
132	Natural gas liquids	223	4,620	4.5	5.1	2.1	2.4
138	Oil- and gasfield services	9,594	159,923	12.2	13.8	4.7	5.2
28	Chemicals and allied products	18,354	366,399	25.6	28.8	2.1	2.6
291	Petroleum refining	8,963	182,274	NC a/	NC a/	8.9	9.0
3533	Oilfield machinery manufacturing	24,051	372,058	62.5	63.6	41.4	42.5
	Total selected industries	67,254	1,207,386	NC a/	NC a/	4.9	5.5
	Total all industries	925,257	11,842,851				
	Selected industries % of all industries	7.3%	10.2%				

a/Not calculable since State data is not given.

Source: U.S. Department of Commerce, Bureau of the Census, County Business Patterns 1977, CBP-77-1 and CBP-77-45 (Washington, D.C.: Government Printing Office, 1979).

Regional crude oil production, which constitutes a large percentage of national production, is expected to continue its decline despite increased exploration and drilling activity and enhanced recovery techniques (see ch. 4). The Nation's position as an oil importer increases vulnerability in industries with forward and backward linkages to petroleum production (e.g., oilfield machinery manufacturing and petroleum refining).

In 1979, U.S. exports of oilfield machinery exceeded $2 billion. Markets for oilfield machinery circle the globe and include China, the United Kingdom, and numerous South American and Middle Eastern countries. Competition from other industrial nations in this lucrative market should be expected, and the three-State region, which has the majority of the industry's employees, is particularly vulnerable.

In addition, oil-producing countries are expected to integrate vertically. That is, they will develop industries for their crude oil from production to end products. Since the regional refining industry has relied increasingly on foreign crude oil, a precipitous loss of these resources would have a severe economic impact.

The domestic petrochemical industry, very important in Texas and Louisiana, faces increased competition from abroad. This industry proliferated during the 1960s when domestic prices for heavy oil products exceeded world market prices and U.S. protectionist policies prohibited importation of these products. As a result,

> "Many existing domestic [petrochemical] plants based on natural gas liquids cannot be economically converted to heavy liquids and will eventually become obsolete and noncompetitive in world markets." 1/

The regional economic impact resulting from decreased employment in petroleum and related industries will depend on the region's ability to absorb these displaced workers into industries with comparable pay, but the region may be unable to attract new industries as it has done in the past. As previously mentioned, the region's low tax rates and

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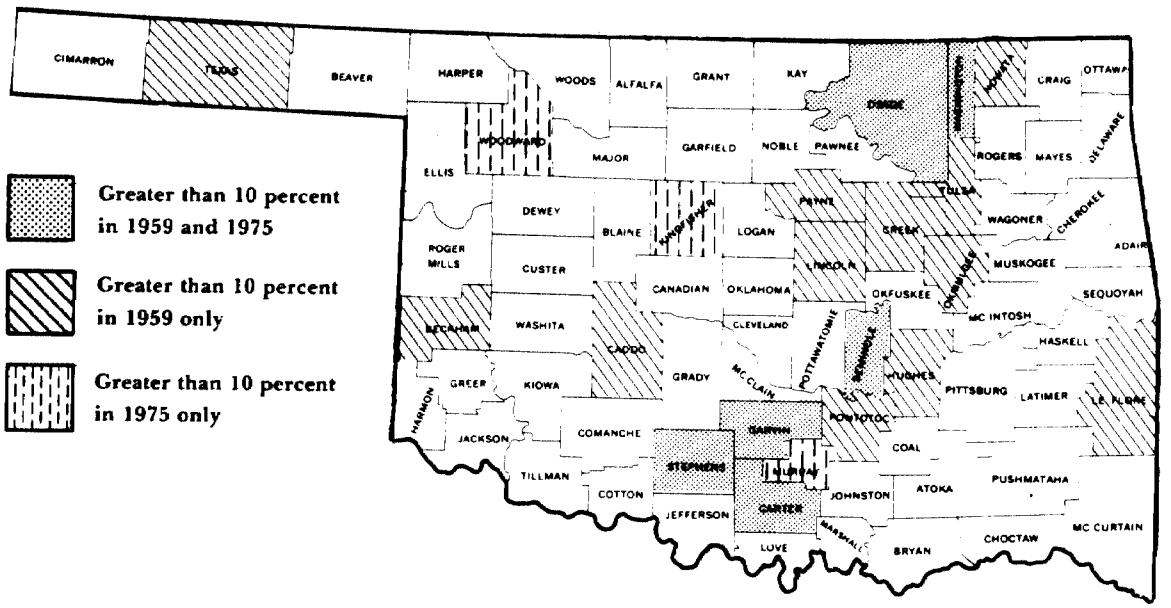
1/Werner C. Brown, "Petrochemicals and Our Energy Policies," in G.H. Cummings and W.B. Franklin, eds., Declining Domestic Reserves--Effect on Petroleum and Petrochemical Industry (New York: American Institute of Chemical Engineers, 1973), p. 21.

Figure 6
Oklahoma Counties In Which Mining Employment Was Greater Than 10 Percent Of Total Covered Employment In 1959 And /Or 1975



Source: Gerald M. Lage, Ronald L. Moomaw, and Larkin Warner, A Profile Of Oklahoma Economic Development 1950-1975, Oklahoma City: Frontiers of Science Foundation of Oklahoma, Inc., 1977.

CHAPTER 4

REGIONAL OIL AND GAS PRODUCTION OUTLOOK

Texas, Oklahoma, and Louisiana today produce over 50 percent of the Nation's oil and almost 80 percent of the Nation's gas. However, production cannot be expected to continue at this rate. Oil and gas are finite resources. The Southwest's longstanding, nationally important oil production has come from extensive proven reserves. 1/ But these reserves peaked for the three States in 1961, following strong demand, record levels of exploration and drilling, and improvements in enhanced oil recovery during the 1950s.

Texas and Oklahoma have not had much success in finding new, large oil fields in the post-World War II era. Louisiana, on the other hand, saw the growth of offshore oil and the opening of many large, new fields in the 1950s and early 1960s. 2/ But, these additions have not been sufficient to offset production declines. Production peaked in all three States in the early 1970s to start a downward slide which still continues.

Oil exploration and drilling is increasing in Texas and Oklahoma but decreasing significantly in Louisiana. Moreover, the rate of finding oil per foot drilled has dropped in all three States. Consequently, only enhanced oil recovery or improvement in the finding rate offers the possibility of reversing the drop in proven oil reserves. While breakthroughs are possible, many experts feel that enhanced oil recovery will not have a marked effect until after the 1980s.

During the 1980s, only under the most optimistic of assumptions could the three States' oil production return to the levels of the 1970s. A more likely outlook for the three States is a continuation of the trend of diminishing reserves and decreasing oil production. Compared to oil production, the outlook for natural gas production in the three States is much more uncertain, although generally more favorable. However, if drilling levels start to fall off or grow more

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1/Proven reserves are defined by the American Petroleum Institute as those reserves "which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions."

2/The recently discovered Tuscaloosa Trend seems promising, but it is extremely deep so gas and oil will be costly to extract.

available and inexpensive energy sources attracted numerous industries. However, as oil and gas resources are depleted, either severance tax rates must increase or other tax revenues must be found if the State governments are to maintain their levels of services. In addition, increasing transportation costs will affect locational decisions, and energy-intensive industries will move near their energy sources.

Despite this vulnerability, petroleum and related industries are profitable, pay higher than average wages, and provide significant tax revenues. Consequently, there is no incentive to diversify. Diversification may occur, if ever, only after the region's economy has suffered.

Government actions have affected the size of proven reserves

Various governmental actions have had substantial impacts in determining how oil and gas markets operate and in shaping the industry. One action was a 1954 Supreme Court decision that the Federal Power Commission had a legal responsibility to regulate natural gas prices in interstate markets. In the early 1960s, the Commission developed a two-tier price structure for natural gas--one price for "old" gas and another for "new" gas. Some observers claim that such governmental price controls contributed to the natural gas shortage of the early 1970s:

> "How likely is it that the Commission in fact induced a significant shortage [in natural gas] by setting new gas prices below the long-term costs of exploration and development? An examination of the methods used by the agency to set area prices suggests that the answer must be 'highly likely'." 1/

Regulated or controlled gas prices had at least two effects. One, the lower prices helped create consumer demand. Second, they reduced the incentive to explore and find new gas. In some respects, these effects are offsetting. For instance, the increased demand meant decreasing the amount of gas available for future production. On the other hand, acting as a disincentive for exploration, the lower prices helped to "conserve" reservoirs which might have been discovered or developed. In any event, the differential between regulated and "free market" prices is substantial; a later section will briefly discuss effects of price decontrol and "windfall profits."

Oil prices, like natural gas prices, have also been influenced by Federal Government restrictions. In 1959, for example, import quotas were imposed to protect domestic, independent producers from relatively cheap foreign oil. 2/ (The difference was about $2.00 per barrel; whereas domestic

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1/Robert J. Kalter and William A. Vogely, editors, Energy Supply and Government Policy, (Ithaca, New York: Cornell University Press, 1976), p. 175.

2/Later, the import quotas were defended on the basis of national security, i.e., it was unwise to rely on unstable foreign sources.

slowly than projected and finding rates continue to decline, Texas, Oklahoma, and Louisiana could experience a substantial drop in gas production.

This chapter defines a likely range of oil and gas production outlooks for the three southwestern States. While one cannot foresee the future, broad trends and factors that will shape the future of oil and gas production are known.

EFFECT OF RESERVES ON OUTLOOK

One factor that will affect the oil production outlook in the three States is the age of reserves. In 1977, 65 of the 100 largest operating fields in the United States were located in Texas, Oklahoma, and Louisiana. Most of the large Texas and Oklahoma fields were discovered before 1950. Texas has 36 of the largest fields, but only 3 of these were discovered after 1950. Furthermore, only one of these three was discovered after 1960. Oklahoma has 5 of the Nation's 100 largest fields, but only 1 was discovered after 1950. In contrast, Louisiana has 24 of the largest fields, 16 of which were discovered after 1950. Louisiana's growth has come in offshore fields in the Gulf of Mexico. However, the first successful venture into open, unprotected waters was in 1938--the Creole field, 1.5 miles from Louisiana's shore in 26 feet of water. Later, in 1947, the Ship Shoal Block 32 field had the first oil well "out of sight of land." 1/

Presently, the same conditions of intensive exploration and market demand exist, as they did in the 1950s, but the three States may not, because of factors referred to earlier, be able to generate the same boom in reserves and production. Since the rate of finding new, large deposits of oil in Texas, Louisiana, and Oklahoma is falling, the key questions become: "What role will technological change play in oil production?", "How much oil is left to find?", and "How fast can oil be found and produced?"

Proven reserves, for both oil and gas, serve as the inventory from which production comes. Without sufficient additions, the inventory of oil and gas resources will support given production levels only for so long. If the overall size of the inventory is lowered, either the rate or the extent (remaining time) of production will be affected.

1/Mid-Continent Oil and Gas Association, Louisiana Division, "Louisiana Oil and Gas Facts", 17th edition, p. 4.

less risky forms of exploration (primarily outpost/ extension drilling) have also experienced higher percentage * * *[increases] in drilling footage (a 42 percent increase between 1973 and 1977) than has new field wildcat drilling." 1/

Whether similar changes have occurred in the Southwest is not clear, as the following table indicates.

Table 14

Oil Drilling Footage Ratios: New Field Wildcat to Development

	Ratios		
Year	Texas	Louisiana	Oklahoma
1970	.22	.12	.06
1971	.16	.15	.04
1972	.19	.14	.03
1973	.15	.05	.03
1974	.22	.14	.05
1975	.19	.16	.03
1976	.19	.14	.03
1977	.20	.19	.04
1978	.20	.16	.03

Source: Developed by GAO staff from various publications of the American Association of Petroleum Geologists. Adjustments were made to add unsuccessful drilling attempts to successful attempts (see app. V for description of methodology).

If the States' efforts were directed to development drilling at the expense of exploratory efforts, this trend would be reflected as smaller ratios in more recent years. However, except for 1973, the ratios are relatively unchanged.

What has happened, indisputably, is that price controls have created a gap between the domestic price of oil and the world market price. The greater the gap, the greater the chance that oil and gas producers were tempted to wait for decontrol before going ahead with extensive exploration programs. This is especially true if price controls did not

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1/Mark J. Frederiksen, U.S. Department of Energy, An Analysis of the Productivity of Domestic Petroleum Exploration (DOE/EIA-0102/7), July 1978, p. iv.

oil was about $3.25 per barrel, imports were about $1.25 per barrel delivered to the East Coast.) The quotas, in force until about 1973, worked to hold out oil imports. In turn though, less imports meant using more domestic crude oil, thereby decreasing the Nation's potential future production.

Another governmental action which has affected the potential for near-term oil production was the adoption of oil price controls in 1971, under President Nixon's wage-price freeze. While world market oil prices surged in 1973, domestic price controls were extended. Domestically, a multi-tiered price system was developed--for "old," "new," "stripper," and "released" oil. 1/

One impact of such price controls apparently has been industry emphasis on developing existing fields over exploring for new fields:

> "[The] main reason, of course, for the overwhelming popularity of development drilling over wildcatting has been the continuing actions by governments to water down incentives through price controls and taxes. Oil companies have found it prudently advisable in many cases to develop the reserves they already have before spending big dollars going after the deep, remote and expensive prospects." 2/

A study by the U.S. Department of Energy stated the national perspective as follows:

> "Following the increase in petroleum prices in 1973, onshore drilling efforts have been directed more towards development activities than toward exploration. By 1977, development drilling had increased by 73 percent over its 1973 level whereas new field wildcat exploratory footage increased by only 23 percent. The

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1/"Old" oil was produced from properties developed prior to 1973; its price was that as of May 15, 1973, plus $1.35 a barrel. "New" oil was produced from properties developed after 1972; its price was uncontrolled. Later, "new" oil was recontrolled, with a price ceiling set about 10 percent below world market prices. "Stripper" oil, i.e., oil from wells producing less than 10 barrels a day, was exempted from price controls. "Released" oil was old oil decontrolled to encourage producers to expand output.

2/"Development Drilling Paces Oilfield Activity," Petroleum Engineer, January 1978, p. 19.

However, even though affected by governmental and business decisions, nonrenewable natural resources are subject to physical limitations or trends, some of which are discussed in the following section. Just as a building does not spring up overnight, a major industry does not change rapidly. By reviewing the physical trends in oil and gas exploration, finding rates, and production, it is possible to estimate a reasonable range of production limits for the 1980s.

RECENT TRENDS--LOOKING MORE BUT FINDING LESS

Production and potential production of oil and gas are dependent upon the inventory of known or proven reserves. Changes in the size of reserves come from either production or "additions to reserves." Without additions to reserves, production would soon halt. For instance, if production were to continue at 1978 levels and no other changes occurred in proven reserves, Texas would have no proven oil reserves left after about 7-1/2 years.

However, proven reserves are only a part of existing resources--a large portion is yet undiscovered, both gas and oil. 1/ The rate at which these undiscovered resources are added to proven reserves is a key factor in determining the level of production. In turn, this rate of additions to reserves depends on two factors--success in finding the resource (i.e., drilling productivity), and the diligence with which the resource is sought.

One measure of the success of finding reserves is the amount of reserves found per foot of drilling. Not all wells are successful, but by using a composite figure which includes both successful and unsuccessful attempts, as well as considering the size of the reserve additions, it is possible to get an indication of the productivity of drilling efforts. The following table shows the finding rates for oil and

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1/For an area which roughly encompasses Texas, Oklahoma, and Louisiana, the U.S. Geological Survey has estimated that the range (at 95 and 5 percent probability, respectively) of undiscovered, recoverable oil is 12 to 38 billion barrels; the estimated range (at the same probabilities) for natural gas is 170 to 398 trillion cubic feet.

allow the companies to recapture the full costs of high risk exploration.

It is clear that, given incremental decontrol of oil and gas prices and passage of the Windfall Profits Act, the Government will continue to have an impact on the economic determinants of oil and gas production. The Windfall Profits Act, which places separate tax rates on different types of oil, may influence the industry's investment decisions:

> "Varying tax rates will induce producers to invest where they can make the most profit, not necessarily produce the most barrels of oil * * *." 1/

The same article quotes officials of Energy Reserves Group, a Wichita, Kansas, independent:

> "The lower excise tax rate on newly discovered oil, in relation to other crude categories, will shift additional emphasis and spending toward exploration drilling * * *." 2/

However, since final regulations and guidelines have not been established and interpreted, it is not clear what impact, if any, the Act will have on the production picture. Decontrol of oil prices is to occur by October 1, 1981. But the Windfall Profits Act will be in effect until either $227.3 billion is collected or January 1991, whichever comes later. So the windfall profits tax can be expected to continue the Government's involvement in shaping the economic determinants of domestic oil production through the 1980s. Similarly, much the same can be said for the Government and natural gas. The National Gas Policy Act, for example, extends multi-level price controls on various types of new gas through 1985.

In short, throughout the 1980s, the Government will probably continue to set the business climate within which the search for and production of oil and gas are conducted. This heightens the uncertainty in projecting oil and gas production in Texas, Louisiana, and Oklahoma, especially since governmental actions can be relatively arbitrary and unpredictable.

1/"Excise Tax Will Impair U.S. Crude Production," Oil and Gas Journal, April 14, 1980, p. 51.

2/Ibid., p. 51.

1973. However, there is some volatility in the figures, e.g., note the change in Louisiana's natural gas finding rate for 1975-1976.

If the finding rate is an indicator of success in finding new reserves, then the level of drilling is certainly an indicator of the diligence with which the search is made. The table below gives the level of drilling effort for oil and gas in the three States:

Table 16

Drilling Footage for Crude Oil and Nonassociated Natural Gas 1970-78
(Millions of Feet)

	Crude oil			Nonassociated natural gas		
Year	Texas	Oklahoma	Louisiana	Texas	Oklahoma	Louisiana
1970	27.24	9.91	14.33	12.54	4.09	10.63
1971	24.96	8.01	12.00	12.67	3.24	11.64
1972	25.22	7.15	11.21	14.12	5.15	12.80
1973	24.26	6.30	10.00	19.95	6.13	14.31
1974	27.22	8.65	9.07	22.97	8.07	11.22
1975	35.54	11.11	9.35	26.12	7.14	12.68
1976	36.35	13.82	8.65	28.32	8.21	13.70
1977	42.82	13.61	8.46	33.80	10.67	14.65
1978	40.81	15.60	9.13	39.37	13.96	17.44

Source: Developed by GAO staff from various publications of the American Association of Petroleum Geologists. Adjustments were made to add unsuccessful drilling attempts to successful attempts (see app. IV for description of methodology).

Table 16 clearly shows that natural gas drilling levels are growing in all three States. In Texas and Oklahoma, the growth has been spectacular and consistent; Texas, for example, had an annual growth rate of 15.37 percent in footage drilled for the period shown. Louisiana, however, had a considerably lower growth rate, 6.38 percent annually.

nonassociated gas for Texas, Oklahoma, and Louisiana for roughly the last decade: 1/

Table 15

Finding Rates for Crude Oil and Nonassociated Natural Gas 1970-78

Year	Crude oil finding rates (barrels per foot drilled)			Nonassociated natural gas finding rates (thousands of cubic feet per foot drilled)		
	Texas	Oklahoma	Louisiana	Texas	Oklahoma	Louisiana
1970	5.52	7.92	33.22	263.00	323.45	360.45
1971	5.59	9.13	27.62	233.61	228.94	434.17
1972	4.78	8.87	25.77	219.51	228.85	278.98
1973	6.08	2.96	20.49	133.43	173.09	203.74
1974	4.38	4.18	24.22	121.72	117.66	242.05
1975	4.73	5.38	33.28	90.05	175.05	258.09
1976	4.38	3.72	34.05	98.45	157.66	165.97
1977	2.65	3.52	21.50	101.61	83.81	188.18
1978	3.08	3.63	15.95	62.16	73.54	157.65

Source: Developed by GAO staff from various publications of the American Association of Petroleum Geologists and the American Petroleum Institute/American Gas Association.

As shown, the finding rates tend to support other evidence that suggests that exploration companies have had to drill deeper in their search for gas and oil, and moreover, when found, the reserves have been smaller, especially after

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1/Only 1970s' data are shown because many analysts believe that the decade is more representative of future trends in domestic oil and gas production than either the 1950s or the 1960s.

until the late 1980s or early 1990s. Then, new techniques could have a substantial impact as shown by one study's estimate that a program of enhanced oil recovery in Texas would add about 150 million barrels of production annually. 1/

Finally, two other trends are of particular interest in discussing the future of oil and gas production in the three States. These are the recent trends in production and reserves levels. The following table shows the Southwest's oil and gas production during the 1970s:

Table 17

Crude Oil and Natural Gas Production in Texas, Oklahoma, and Louisiana, 1970-79

Year	Crude oil (millions of barrels)			Natural gas a/ (billions of cubic feet)		
	Texas	Oklahoma	Louisiana	Texas	Oklahoma	Louisiana
1970	1,249.76	223.75	907.03	8,358	1,595	7,788
1971	1,223.12	213.16	935.13	8,551	1,684	8,081
1972	1,301.23	206.96	896.08	8,658	1,807	7,973
1973	1,294.29	191.26	831.47	8,514	1,771	8,242
1974	1,260.71	177.78	736.57	8,171	1,639	7,754
1975	1,221.66	163.16	655.54	7,486	1,605	7,091
1976	1,186.62	160.97	615.39	7,192	1,727	7,007
1977	1,137.71	156.22	562.63	7,051	1,770	7,215
1978	1,076.02	152.57	532.90	6,548	1,774	7,476
1979 (est.)	1,024.92	144.91	489.83	6,410	1,765	7,280

a/Gas production includes both associated and nonassociated gas.

Source: American Petroleum Institute publications.

1/E. Alan Lohse, Texas Governor's Energy Advisory Council, Assessment of Enhanced Recovery Technology As a Means for Increasing Total Crude Oil Recovery in Texas, January 6, 1975, p. 21.

Although not as steady as the growth in gas drilling, oil drilling footage also shows gains in Texas and Oklahoma. Oil drilling footage was dropping somewhat in Texas through 1973, but then jumped up about 11 percent a year. Oklahoma had a similar surge after 1973, with oil drilling footage increasing 19.88 percent annually. Only Louisiana failed to grow, but more surprisingly, the drilling rate dropped off fairly evenly at about 5 percent a year.

In Louisiana, both the drop in oil drilling footage and the slower rate for gas drilling relative to the other two States could reflect exploration companies' views of the long-term potential for finding additional, significant reserves of oil and gas in the State. If so, this represents a significant change in the oil and gas potential for the State. Earlier in this chapter, it was pointed out that Louisiana had the newest major fields of the three States. It may be that the potential has diminished in Louisiana. Drilling statistics show a drop in new field wildcat drilling in offshore Louisiana and an increase in drilling in the northern part of the State. This may be because the offshore and southern Louisiana have peaked and exploration efforts by necessity have turned northward.

Another avenue available for increasing crude oil production in Texas, Oklahoma, and Louisiana is enhanced oil recovery. Secondary recovery through water flooding is a characteristic of present operations in all three States. 1/ However, experts look to other forms of enhanced oil recovery as a means of producing some of the approximately 60 percent of the oil left in the ground after conventional or primary production techniques have been exhausted. Although new enhanced recovery techniques show promise, most experts believe that, because of a variety of economic and technical barriers, the technologies will not have a significant impact

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1/A. F. Van Everdingen, senior vice president of DeGolyer and MacNaughton, has suggested that additional water flooding on intensive scale could result in a marked increase in production in older fields. Nationally, he feels that an extensive program would add 120 billion barrels to proven oil reserves and would require no new technology. (The 120-billion-barrel figure is about equal to the amount of oil produced in the U.S. since the 1930s.) Since such a program would deal with existing fields and known technology, it could be implemented quickly. If Mr. Van Everdingen is correct and a program is undertaken, it could greatly improve the oil potential for the three States.

experienced an even sharper drop in gas production (24.7 percent) than it did in oil production (20.8 percent) during 1973-79. As a result, Louisiana gas production surpassed Texas production in 1977 for the first time in the last 10 years, according to table 17.

Equally interesting is the trend in oil and gas proven reserves during the 1970s, presented in the table below:

Table 19

Crude Oil and Natural Gas Proven Reserves
1970-78

Beginning of year	Crude oil proven reserves (millions of barrels)			Natural gas proven reserves (trillions of cubic feet) a/		
	Texas	Oklahoma	Louisiana	Texas	Oklahoma	Louisiana
1970	13,063	1,389	5,689	106.35	16.95	82.96
1971	13,195	1,351	5,710	101.47	15.71	78.63
1972	13,023	1,404	5,399	95.04	14.49	74.97
1973	12,144	1,303	5,028	84.94	14.10	69.15
1974	11,756	1,270	4,576	78.54	13.39	64.05
1975	11,001	1,232	4,226	71.04	13.08	61.31
1976	10,080	1,239	3,827	64.65	12.44	57.50
1977	9,226	1,186	3,470	62.16	11.71	52.69
1978	8,467	1,121	3,113	54.60	11.46	49.67

a/Gas reserves includes both associated and nonassociated gas.

Source: American Petroleum Institute publications.

The table shows that crude oil reserves dropped in all three States during 1973-78. Also, natural gas reserves declined every year during 1970-78 in each State. This means that a larger percentage of dwindling oil and gas reserves are being produced each year.

As shown, crude oil production dropped substantially after 1973 in all three States. By 1979, Texas had lost 20.8 percent of its 1973 production level; Oklahoma lost 24.2 percent; and Louisiana dropped an incredible 41.4 percent. The drop in production would have been even more severe in Texas, if the State had not increased its production from known reserves, i.e., gone to a faster depletion of its resources. Texas production, as a percentage of known reserves, went from 9.6 percent in 1970 to 12.7 percent in 1978. Fully a third of Texas 1978 oil production came from a faster depletion of the reserves. If these loss rates continue to 1990, crude oil production in Texas and Oklahoma would be about one-half their 1973 levels and in Louisiana about one-fourth, as reflected in the following percentage extrapolations:

Table 18

Projected Crude Oil Production for 1990
Based on Recent, Actual Production
(Millions of Barrels)

Year	Texas	Oklahoma	Louisiana
1979 (est.)	1,024.92	144.91	489.83
1985	811.06	109.80	228.57
1990	668.02	87.12	185.67

Source: Percentage extensions of data in table 17.

As these simple extensions indicate, if recent trends continue, the three States' combined oil production in 1990 would be 1.376 billion barrels less than in 1973.

Gas production, as table 17 shows, was a much more mixed picture than oil during 1973-79. Texas' gas production experienced an average annual decline of 4.62 percent, whereas Oklahoma's production was relatively unchanged. Louisiana's 1979 production was about 1 trillion cubic feet below the State's 1973 production. However, this decline was not consistent throughout the 1973-79 period, as gas production rose in 1978 and then dropped in 1979.

In short, current natural gas production, unlike crude oil production, has remained relatively close to the production levels of the early 1970s, with one exception. Texas

growth rates approach national levels, which have been forecast as 6 percent annual growth through 1985 and then 4 percent annually through 1990. 1/ While individual differences in oil and gas prices, as well as drilling prospects in other areas of the country, may affect the amount and mix of drilling done in the Southwest, the "best" case drilling rates are not outside the realm of possibility--especially given the national forecasts mentioned above. Nonetheless, the "best" case drilling growth rates are accurately described as optimistic.

1980-90 OUTLOOK FOR OIL UNFAVORABLE

Under optimistic ("best" case) assumptions about finding rates and drilling levels, Texas projected crude oil production could return to levels of the early 1970s (see table 20). Under the same type of optimistic assumptions, Oklahoma would reach record crude oil production levels. Whether these levels are obtainable is questionable. It would take record drilling levels, plus consistently high finding rates, to result in the "best" case crude oil production levels. Louisiana, under the optimistic conditions used in the "best" case, shows a continued decline in oil production, although not as steep as during the 1970s. (For example, Louisiana's average annual decline in oil production during 1973-79 was 8.44 percent, compared to 1.41 percent annually for the "best" case's 1980-90 projections.) In all three States, substantial reversals of current trends would have to occur if the "best" case were to be realized.

Even though the "best" case has a low probability of occurrence, it has value in that it sets the expected upper limit of performance. That is, the "best" case puts in quantitative terms the impact of increased drilling levels and extraordinary finding rates--extraordinary because, while the finding rates used are historical rates (early 1970s), they are associated with lower drilling levels. Assuming that good prospects are drilled first, the finding rate should begin to drop as drilling levels rise and, in fact, that is the case (except for Louisiana in which finding rates and drilling rates both are dropping).

Unfortunately, as table 20 shows, the "worst" case is as bad as the "best" case is good. The "worst" case is based on the most recent relationships for finding oil and is more

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1/See, e.g., "Equipment Supplies Tighten as U.S. Drilling Rises," Oil and Gas Journal, March 17, 1980, p. 86; and "Ample Drilling Equipment Seen for Busy Year in U.S.," Oil and Gas Journal, April 7, 1980, p. 31.

In summary, the general, recent trends in crude oil may be characterized as looking more and finding less. Production is strongly downward in all three States.

The general picture for natural gas exploration, finding, and production during the 1970s differs among Texas, Oklahoma, and Louisiana, but exploration was up significantly, finding rates were going down, and reserves went down in all three States. Producers in Louisiana and Oklahoma partially mitigated their circumstances by producing a greater percentage of the States' reserves. However, without an increase in reserves additions, this approach could mean lower production in the future.

The following sections present crude oil and natural gas production projections for 1980-90 using three scenarios or sets of conditions--optimistic ("best" case), pessimistic ("worst" case), and average ("mean" case). In all three cases, the projections were made through a form of trend extrapolation. In each of the three States, certain historical relationships among production, reserves, and drilling and finding rates were applied to future circumstances. (See appendix V for a more detailed discussion of methods used.) The methodology basically assumes there are fixed quantities of crude oil and natural gas in each of the three States which can be found and produced. Successful exploration and production are limited, however, to rates clearly established by past performance. No breakthroughs in technology are assumed. Rates of drilling, finding, and producing are used from the 1970-78 period (most current data) to encompass the latest standards of the art. The projections are presented as indicators of the end results of present trends and not as predictions of what will happen. Forecasting is an endeavor fraught with uncertainty. So we intend here to illustrate what could happen under reasonable assumptions, and to underscore the need for long-term diversification.

The oil drilling levels used in the "best" cases for Texas and Oklahoma are linear regression extensions of the States' 1970-78 trends. In order for the projected drilling levels to be met, Texas drilling would have to grow steadily about 4.25 percent per year; Oklahoma drilling would have to grow 5.01 percent per year. Louisiana's "best" case for oil drilling was projected by simply reversing the overall decline of the 1970s; this was arbitrarily deemed the most plausible estimating approach.

In the "best" case projections, Texas' and Oklahoma's oil drilling is assumed to grow at a slower rate than their gas drilling, but each State's combined oil and gas drilling

likely to happen. Under pessimistic assumptions, all three States would continue the oil production decline of the post-1973 period. Louisiana and Oklahoma would experience more moderate declines than they have in the past. Texas, however, would drop faster than its post-1973 average decline.

The "worst" case places emphasis on the latest performance trends. Consequently, Texas oil production drops more severely than Oklahoma's or Louisiana's. Texas crude oil production has been declining at an ever-increasing rate since 1973, whereas Louisiana and Oklahoma appear to have had large production drops followed by smaller percentage drops.

The "mean" case is an attempt to develop a projection which represents a likely or more probable future. Under this case's assumptions, Louisiana and Texas would experience continued drops in crude oil production, but at slower rates than their decline in the 1970s. Oklahoma, on the other hand, would experience a moderate rise in oil production, and by 1990 would return to the State's 1973 level of production.

This does not mean that we are predicting either a rise in Oklahoma's production or a slower decline in Texas' and Louisiana's production. It means that, if the future replicates the past, then the end result would be these projections. The "mean" case, in effect, assumes that the following decade, the 1980s, will look like the average of the last decade. A further assumption is that the conditions which resulted in the speed-up in drilling continue in the future.

In summary, the outlook for oil production is not too favorable. Louisiana, under optimistic assumptions, would still experience continued decline. Texas could return to past production levels only if optimal conditions existed. Under more pessimistic assumptions, Texas would face the same kind of overall, drastic drop in oil production that Louisiana and Oklahoma have already gone through.

The "mean" case, which assumes continued growth in drilling and slightly higher than recent finding rates, is probably a bit wishful but still a good extension of recent trends. Under this set of circumstances, Oklahoma's oil production could begin to turn around in the 1980s. But, Texas and Louisiana, unlike Oklahoma, would continue their downward slide in oil production.

In short, one must be an optimist to forecast a reversal of the current declining oil production trends in Texas, Oklahoma, and Louisiana. A more likely course of events is a continued decline in oil production from dwindling reserves.

Table 20

Projected Crude Oil Production for 1980-90 (Millions of Barrels)

Year	Texas			Oklahoma			Louisiana		
	"Best" case	"Worst" case	"Mean" case	"Best" case	"Worst" case	"Mean" case	"Best" case	"Worst" case	"Mean" case
1980	949.6	867.2	902.6	176.8	135.4	145.1	462.0	428.8	447.2
1981	961.6	800.2	869.6	210.4	129.4	148.5	449.9	387.8	421.6
1982	978.7	741.4	843.8	243.1	124.2	152.4	439.8	352.3	399.3
1983	1,000.3	689.8	824.4	275.1	119.7	156.7	431.4	321.5	379.8
1984	1,025.9	644.5	810.2	306.4	115.8	161.4	424.3	294.7	362.5
1985	1,054.9	604.8	802.2	337.2	112.4	166.5	418.4	271.2	347.2
1986	1,087.0	570.0	798.4	367.2	109.5	171.9	413.5	250.7	333.5
1987	1,121.8	540.4	796.9	397.4	107.0	177.2	409.4	233.0	322.1
1988	1,159.0	512.6	797.6	426.9	104.8	182.4	405.9	217.7	312.5
1989	1,198.2	489.1	800.1	456.1	102.9	187.5	403.1	204.5	304.5
1990	1,239.2	468.5	804.4	485.1	101.2	192.4	400.7	193.1	297.9

Source: Developed by GAO staff using the methodology and data sources described in appendix V.

1970s is highly unlikely. When the main industry of a region is expected to contract substantially, State and local public officials should be aware of potential effects and take steps to forestall severe economic dislocations.

OUTLOOK FOR NATURAL GAS MORE FAVORABLE THAN OIL, BUT WITH DECLINING PRODUCTION

Future gas production, while perhaps subject to more projection uncertainty than oil, is basically more favorable than the preceding crude oil outlook. In fact, if the conditions assumed under the optimistic case were prevalent, all three States would have record or unprecedented natural gas production levels. 1/ (See tables 21, 22, and 23.) However, as mentioned earlier, the "best" cases use early-1970s finding rates, and the possibility of achieving such rates with ever-increasing drilling levels is limited.

The "worst" case natural gas projections show a decline in production for all three States. Texas has the fastest decline rate, at 4.16 percent per year, followed by Louisiana at 1.90 percent per year, and Oklahoma with a 1.24 percent decline per year. These rates of decline are about the same as the changes experienced during 1973-79, in which Texas' natural gas production dropped 4.62 percent annually and Louisiana's, 2.05 percent. Oklahoma gas production was relatively unchanged during 1973-79; consequently, the "worst" case projection represents a significant change.

The "mean" case shows results considerably less optimistic than the "best" case and more closely related to the "worst" case for two of the States, Texas and Louisiana. Oklahoma, however, has a significantly higher growth rate (2.47 percent) in gas production in the 1980s under the conditions assumed in the "mean" case. Texas and Louisiana do not fare as well; the tables reflect yearly declines of about 2 percent and 1 percent for the States, respectively.

In summary, compared to oil, natural gas production in the three States could have a brighter future if optimistic conditions prevail. However, if drilling levels start to fall off or grow more slowly than projected, and if finding rates continue to decline, the States could be faced with the bleak prospect of a significant drop in gas production--a drop which would rival the States' oil production decline of the 1970s.

As mentioned previously, these projections illustrate what could happen under three reasonable scenarios. The scenarios indicate that returning to the production levels of the early

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1/Separate estimates were made for associated and non-associated gas because the former depends on levels of oil production.

Table 22

Projected Natural Gas Production in Oklahoma for 1980-90
(Billions of Cubic Feet)

	"Best" case			"Worst" case			"Mean" case		
Year	Non-associated	Associated	Total	Non-associated	Associated	Total	Non-associated	Associated	Total
1980	1,328.6	465.9	1,794.5	1,118.1	356.8	1,474.9	1,145.9	382.4	1,528.3
1981	1,531.5	554.5	2,086.0	1,104.0	341.0	1,445.0	1,162.4	391.3	1,553.7
1982	1,742.0	640.6	2,382.6	1,091.7	327.3	1,419.0	1,183.2	400.7	1,583.9
1983	1,959.0	725.0	2,684.0	1,080.9	315.4	1,396.3	1,208.0	412.9	1,620.9
1984	2,181.7	807.4	2,989.1	1,071.5	305.2	1,376.7	1,236.7	425.3	1,662.0
1985	2,409.4	888.6	3,298.0	1,063.3	293.1	1,356.4	1,269.1	438.8	1,707.9
1986	2,641.5	968.5	3,610.0	1,056.1	289.0	1,345.1	1,304.8	453.0	1,757.8
1987	2,877.4	1,047.3	3,924.7	1,049.8	282.0	1,331.8	1,340.0	467.0	1,807.0
1988	3,116.7	1,125.0	4,241.7	1,044.3	276.2	1,320.5	1,374.8	480.7	1,855.5
1989	3,358.8	1,201.9	4,560.7	1,039.5	271.2	1,310.7	1,409.2	494.1	1,903.3
1990	3,603.6	1,278.4	4,882.0	1,035.3	266.7	1,302.0	1,443.4	507.0	1,950.4

Source: Developed by GAO staff using the methodology and data sources described in appendix V.

Table 21

Projected Natural Gas Production in Texas for 1980-90 (Billions of Cubic Feet)

Year	"Best" case			"Worst" case			"Mean" case		
	Non-associated	Associated	Total	Non-associated	Associated	Total	Non-associated	Associated	Total
1980	4,433.3	1,426.8	5,860.1	3,986.5	1,303.0	5,289.5	3,978.0	1,356.2	5,334.2
1981	4,695.2	1,444.9	6,140.1	3,791.8	1,202.3	4,994.0	3,784.7	1,306.6	5,091.3
1982	4,986.5	1,470.5	6,457.0	3,618.0	1,114.0	4,737.0	3,621.4	1,267.8	4,889.2
1983	5,304.1	1,503.0	6,807.1	3,462.7	1,036.5	4,499.2	3,485.1	1,238.7	4,723.8
1984	5,645.1	1,541.5	7,186.6	3,324.0	968.4	4,292.4	3,373.3	1,216.9	4,590.2
1985	6,007.1	1,585.0	7,592.1	3,200.1	908.7	4,108.8	3,284.0	1,205.3	4,489.3
1986	6,387.8	1,633.3	8,021.1	3,089.5	856.5	3,946.0	3,215.0	1,199.6	4,414.6
1987	6,785.3	1,685.6	8,470.9	2,990.6	812.0	3,802.6	3,159.3	1,197.4	4,356.7
1988	7,197.7	1,741.5	8,939.2	2,902.4	770.2	3,672.6	3,115.0	1,198.4	4,313.4
1989	7,623.4	1,800.4	9,423.8	2,823.5	734.9	3,558.4	3,080.9	1,202.2	4,283.1
1990	8,061.0	1,862.0	9,923.0	2,753.1	703.9	3,457.0	3,056.8	1,208.6	4,265.4

Source: Developed by GAO staff using the methodology and data sources described in appendix V.

CHAPTER 5

LITTLE PLANNING BY STATES TO DIVERSIFY REVENUE SOURCES AND ECONOMIC BASES

Texas, Oklahoma, and Louisiana officials recognize that oil and gas production and reserves are declining in their States. Generally, however, with the possible exception of Texas, the southwestern States are not undertaking comprehensive planning activities to help preclude dislocations that could result from the region's relatively high dependence, both in their fiscal structure and economic base, on the oil and gas industry.

Planning and policy formulation, as noted in chapter 1, are inseparable elements of a single process. A "typical rational planning or policy-making model" includes various phases (see fig. 7). The latter segment of this chapter will address State economic planning basically in terms of two phases--goals formulation and implementation. 1/ Evaluation of economic base diversification planning is particularly amenable to this limited, dual focus because economic development is both a goal to be established by policymakers and a function to be implemented by line agencies.

On the other hand, since taxes, inextricably, are very sensitive to political exigencies, this chapter initially addresses fiscal planning from two other perspectives. The first, recognizing that need awareness is a prerequisite to policy formulation, discusses the extent of the States' interest in fiscal planning relative to declining oil and gas production. The second discusses potential alternative revenue sources.

1/The basic focus on just two of the planning phases shown in figure 7 is because, generally, goals formulation and implementation are the topics of most interest to congressional readers and other policymakers. However, this does not mean that the other planning phases are unimportant. To the contrary, any planning must involve base-level or foundational activities such as gathering, processing, and forecasting data, updated as new information becomes available. In recent years, computer modeling has enhanced the sophistication of such efforts. For interested readers, appendix VI gives a brief discussion of Texas', Oklahoma's, and Louisiana's use of computer modeling for fiscal and economic planning.

Table 23

Projected Natural Gas Production in Louisiana for 1980-90 (Billions of Cubic Feet)

	"Best" case			"Worst" case			"Mean" case		
Year	Non-associated	Associated	Total	Non-associated	Associated	Total	Non-associated	Associated	Total
1980	5,982.0	646.4	6,628.4	5,422.8	599.9	6,022.7	5,414.2	625.7	6,039.9
1981	6,384.4	629.4	7,013.8	5,296.8	542.5	5,839.3	5,293.5	589.8	5,883.3
1982	6,776.5	615.3	7,391.8	5,187.4	492.9	5,680.3	5,200.7	558.6	5,759.3
1983	7,159.7	603.5	7,763.2	5,092.5	449.8	5,542.3	5,097.7	531.4	5,629.1
1984	7,535.2	593.6	8,128.8	5,010.1	412.3	5,422.4	5,055.2	507.2	5,562.4
1985	7,904.0	585.4	8,489.4	4,938.5	379.4	5,317.9	5,030.9	485.7	5,516.6
1986	8,267.1	578.5	8,845.6	4,876.4	350.7	5,227.1	5,022.6	466.6	5,489.2
1987	8,625.1	572.8	9,197.9	4,822.5	326.0	5,148.5	5,022.0	450.6	5,472.6
1988	8,978.7	567.9	9,546.6	4,775.6	304.6	5,080.2	5,028.0	437.2	5,465.2
1989	9,328.5	564.0	9,892.5	4,735.0	286.1	5,021.1	5,050.4	426.0	5,476.4
1990	9.675.1	560.6	10,235.7	4,699.7	270.2	4,969.9	5,066.1	416.8	5,482.9

Source: Developed by GAO staff using the methodology and data sources described in appendix V.

FISCAL DIVERSIFICATION PLANNING-- LESSENED INTEREST AND RELUCTANCE IN USING ALTERNATIVE REVENUE SOURCES

Regional oil and gas production began to decline in the early 1970s. At that time, State officials expressed much concern about the outlook for severance taxes and other petroleum revenue. Since then, oil and gas prices have risen substantially, lessening regional concern about a need for fiscal diversification planning or use of alternative revenue sources.

Interest in fiscal planning wanes as energy prices rise

In 1973, the Louisiana legislature switched the State's severance tax base on oil production from volume to gross value, which leads to increased revenues so long as price increases out-pace production decreases. Also in 1973, the severance tax rate on natural gas production was raised, but the tax base was not switched from volume to value. Recently, however, legislative members have considered such a switch as a means to offset production declines.

Oklahoma's current severance tax rates, 7 percent of value on both oil and gas, were set in 1971. These ad valorem tax bases--plus the State's high number of stripper wells, whose production is free from price controls--have mitigated fiscal concerns about declining production. For example, over 80 percent of Oklahoma's crude oil wells are stripper wells--accounting for almost half of the State's production. So, even though the average oil well production in Oklahoma is relatively low, e.g., only about 5.5 barrels per day in 1978, much of the production is effectively valued at world market prices. This largely explains why, of the three southwestern States, Oklahoma's severance tax collections show the most consistent increases in recent years (see fig. 2).

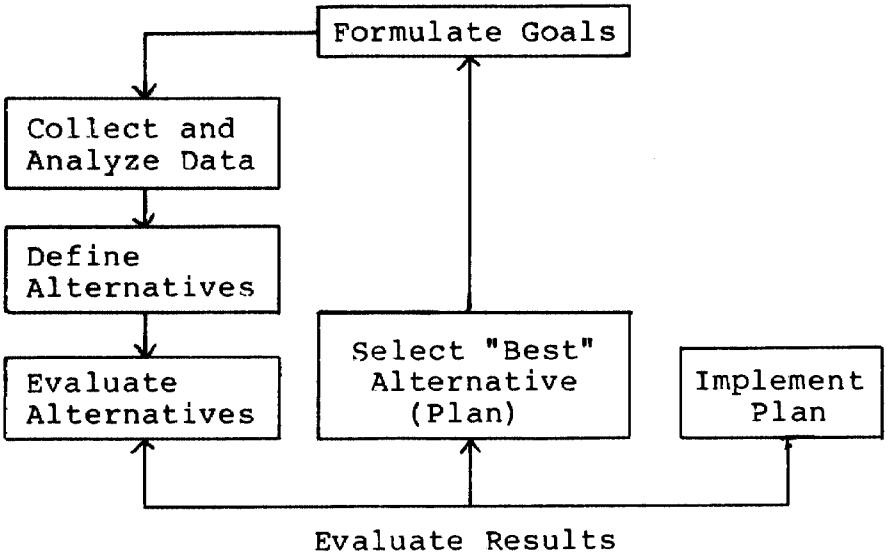
The Oklahoma legislature has no ongoing studies or revenue projections regarding oil and gas severance taxes, according to the Director, Fiscal Services Division, State Legislative Council. His comments are paraphrased as follows:

--There is no doubt that declining production might eventually cause fiscal problems in Oklahoma if oil and gas prices do not continue to rise.

--The legislature does not know when to look at this problem. Much of the State's revenue is channeled,

Figure 7

Phases of a Typical Rational Planning or Policy-Making Model



"The following policy instruments may be valuable in the various stages of the planning process:

1. Formulating Goals: gubernatorial addresses, goal statements, program budgets, issue papers.
2. Collecting and Analyzing Data: information systems, issue papers, program budgets, state plans.
3. Defining Alternatives: gubernatorial addresses, state plans, issue papers.
4. Assessing Alternatives: policy budgets, state plans, issue papers.
5. Selecting an Alternative: gubernatorial address, program budget, state plan, executive order.
6. Implementation: budgets, regulatory tools, state aid, administrative procedures, executive orders.
7. Evaluation: information systems, issue papers, budgets."

Source: Council of State Planning Agencies, Statewide Policy Instruments, Washington, D.C., 1977, pp. 5 and 7.

Comparatively, in summary, interest among the three States in long-term fiscal planning, while somewhat mixed, generally has lessened in recent years. Louisiana's fiscal planning relative to oil and gas has been largely reactive, consisting of adjusting severance tax rates and bases. Oklahoma's position--based on small-scale, deregulated production--is more fortuitous (for now) than planned. Texas, on the other hand, seems concerned about the longer view, though perhaps more for local property taxes on petroleum reserves than for State severance revenue. In any event, rising petroleum prices have, to a great extent, lessened concern in all three States about oil and gas revenues as production declines.

In the long run, however, reserves of both oil and gas are finite. Moreover, as the States become increasingly urbanized and industrialized, their budgets and expenditures will surely rise, and alternative revenue sources may be needed:

> "* * * it is evident that demographic growth and decline * * * will continue to have substantial fiscal effects upon the public sector in both growing and declining areas. * * * the growing regions that now accurately proclaim their low-tax fiscal climates will likely find it increasingly difficult to hold the line on taxes as the new residential populations and expanding economic enterprises demand both a higher and a broader level of public services."
>
> * * * * *
>
> "* * * the continued expansion of the Sunbelt will bring with it a relatively larger state-local public sector--a reasonable expectation indeed in light of the region's traditionally low levels of public services with respect to the national average." 1/

Alternatives available but not used

Reliance on alternative revenue sources, a policy long advocated by the Advisory Commission on Intergovernmental

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1/Bernard L. Weinstein and Robert E. Firestine, Regional Growth and Decline in the United States - The Rise of the Sunbelt and the Decline of the Northeast, (New York: Praeger Publishers, 1978), pp. 126 and 149.

by law, into specific funds. Such earmarking could be an obstacle to long-term fiscal planning.

--The general approach of the legislature probably will be to wait until a crisis occurs. Therefore, it may be awhile before there is any planning for possible declining revenues from oil and gas. After all, Oklahoma's legislative motto can be described as: "If it isn't broken, don't fix it."

Of the three States reviewed, Texas' current severance tax rates on oil and gas have been established the longest, remaining unchanged since 1951 and 1969, respectively. Yet, interestingly, Texas seems to have the most concern for long-term planning relative to petroleum revenues. Recently, for instance, the Governor asked the Texas Research League 1/ to study the long-range fiscal impacts of declining oil and gas production and reserves in Texas. The study was just beginning at the time of our inquiry. The League's Vice President for Research informed us that the study would concentrate on local property taxes. His comments in explaining this emphasis are paraphrased below.

--Local governments in Texas tax mineral reserves (oil and gas in place) and oilfield equipment on an ad valorem basis.

--Such property taxes are a significant source of revenue locally. An "off-the-head estimate" of total local ad valorem taxes on oil and gas reserves and equipment is, conservatively, $350 to $400 million a year. These taxes probably equal about 10 percent of all property taxes collected in the State.

--School districts in Texas are financed largely by local property taxes. In some districts, oil and gas revenue may provide 80 to 90 percent of the districts' total revenue. Declining oil and gas reserve levels are already causing problems in some districts.

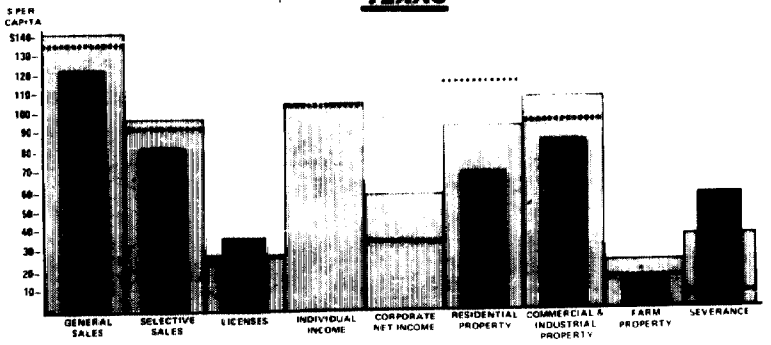
The League spokesman commented that, in contrast to the immediate impact on local governments, fiscal impacts on State government revenues probably will be more gradual. Thus, to be useful to State planners, the League hopes to project State revenues to the year 2000.

1/The League is a privately funded, taxpayers' research association. The Governor's request letter to the League is dated August 30, 1979.

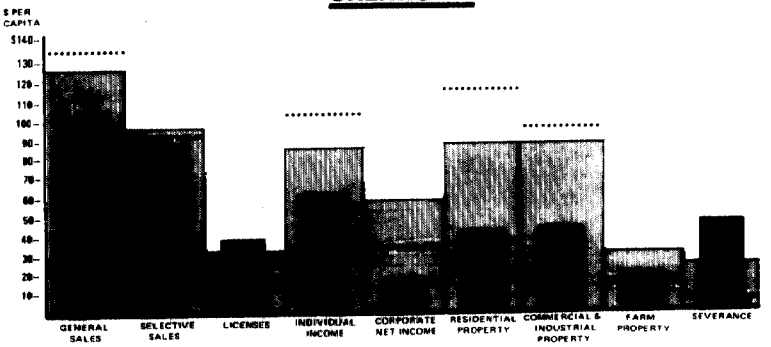
Figure 8

PER CAPITA TAX REVENUE AND CAPACITY FOR STATE AND LOCAL GOVERNMENTS, BY TYPE OF TAX IN 1975

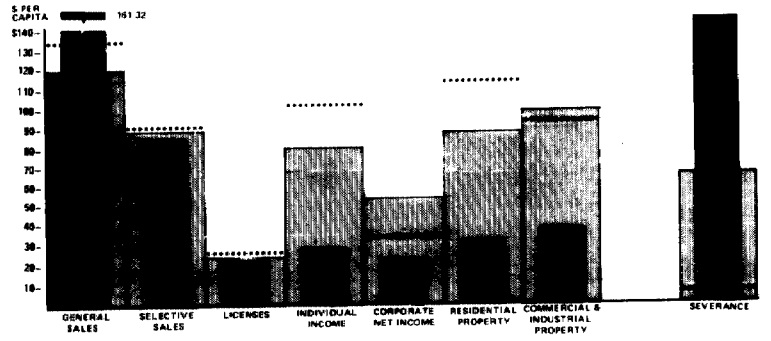
TEXAS



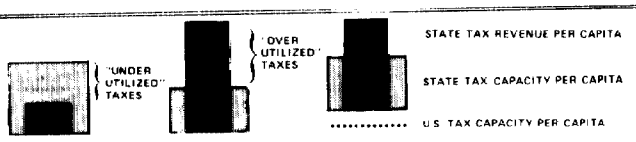
OKLAHOMA



LOUISIANA



KEY



SOURCE: D. KENT HALSTEAD, TAX WEALTH IN FIFTY STATES, U.S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE, NATIONAL INSTITUTE OF EDUCATION, 1978

Relations (ACIR), has not been well received by the Southwest region. In reference to the most widely-used State revenue sources, i.e., sales and income taxes, the Southwest region has unused tax capacity relative to national norms, but has been unwilling to use this capacity for several understandable reasons. Instead, interest continues to center around energy-based revenue options.

Excess fiscal capacity compared to national norms

States without mineral wealth and severance taxes must support public services from a wide variety of other tax sources--personal and corporate income, sales, property, etc. The States in the Southwest region use similar taxes, but the rates are considerably lower than in States lacking mineral wealth. Oklahoma's sales tax, for example, is the lowest in the Nation, at 2 percent in 1978. Texas has the lowest motor fuel sales tax with a rate of 5 cents per gallon of gasoline, and is one of four States 1/ that tax neither personal nor corporate income, although it does have a corporate franchise tax.

Figure 8 gives a graphic perspective of how Texas, Oklahoma, and Louisiana compared with the Nation for various taxes in 1975. The dotted lines indicate the U.S. average tax capacity based on the ACIR "representative tax system" approach to measuring fiscal capacity. 2/ For example, corporate income tax capacity for the United States is $31 per capita. In Texas, Oklahoma, and Louisiana, the respective capacities are $58, $59, and $54 per capita (the light shaded amount), well above the national capacity. Yet, the respective tax revenues are below capacity at $0, $16, and $21 per capita (dark shaded area). With the exceptions of general sales taxes in Louisiana and licenses in the other two States, the only tax in which effort is greater than capacity is the severance tax. According to the ACIR's representative tax

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1/The other States are Nevada, Washington, and Wyoming.

2/The representative tax system defines the tax capacity of a State and its local governments as the amount of revenue they could raise (relative to other State-local governments) if all 50 State-local systems applied identical tax rates (national averages) to their respective tax bases. However, tax capacity measured this way should not be interpreted as ideal, but rather as a normative measure of what revenue potential would exist under typical taxing conditions.

usually given to explain the current population and business shift towards the Sunbelt. 1/

To some extent, a State's tax structure reflects a composite of attitudes regarding the roles of government and business. Southwestern States pride themselves on providing a good business climate--two aspects of which are lower tax burdens and less expansive public sectors relative to national averages. These comments are not made as criticism, but rather to emphasize that regional differences exist and are slow to change or coalesce. Understandably, then, when a need for additional revenue is indicated, the first impulse of southwestern legislators is to revise or expand severance taxes or seek alternative energy-based taxes. 2/

Various energy-based taxes proposed

Besides revising existing severance taxes, the States have enacted or proposed various other energy-based taxes. Louisiana, for example, has enacted a "first-use tax," which is levied on the "* * * introduction for the first time into the economy of the state natural gas which has not been otherwise or elsewhere subject to taxation by or within the United States." Basically, this means that the tax is on natural gas from the outer continental shelf--Federal offshore waters. The legislation states that the tax "* * * shall be deemed a cost associated with uses made by the owner in preparation of marketing of the natural gas" and shall not be construed "as imposing any tax on the production, severance, or ownership of natural gas produced outside of the boundaries of the state of Louisiana * * *." 3/

In Texas, various alternative energy revenue sources have been considered, including severance taxes on lignite and uranium. Presently, oil, gas, cement, and sulphur are subject to severance taxes in Texas. The State has never taxed lignite or uranium production. But, this may change as more electric generating plants are built to use lignite

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1/See, e.g., "Taxbelt Versus Growbelt," Wall Street Journal, September 24, 1979.

2/Although all three State legislatures have entertained proposals to expand energy-based taxes, only Louisiana has resorted to frequent changes in the severance tax rate (see appendix II).

3/Louisiana House Bill No. 768, regular session, 1978, Act no. 294.

system, Louisiana overutilizes the severance tax by $79 per capita, while Texas and Oklahoma overutilize the tax by $18 and $23 per capita, respectively.

A brief summary perspective is presented in table 24, which compares the three States with the Nation in terms of overall fiscal capacity and tax effort (tax effort is defined as the extent to which a given State makes use of its fiscal capacity). Notice that all three States have above average capacity, but below average tax effort. The clear implication is that, if need be, traditional taxes could easily be used more extensively to finance public services.

Table 24

Fiscal Capacity and Tax Effort Indices for all State-level Taxes in 1975

	Texas	Oklahoma	Louisiana	Nation
Fiscal capacity	113	102	103	100
Tax effort	68	71	82	100

Source: D. Kent Halstead, Tax Wealth in Fifty States; U.S. Department of Health, Education, and Welfare; National Institute of Education, 1978, table 9.

Yet, such flexibility is constrained by several factors, including legislation. All three States, for instance, have legislated rate restrictions on one or more traditional taxes. Louisiana has even placed several taxing restrictions into the State constitution. For example, a constitutional amendment is required to change the Louisiana income tax rate structure, which taxes income up to $10,000 at 2 percent, income between $10,000 and $50,000 at 4 percent, and income in excess of $50,000 at 6 percent.

As mentioned earlier, such taxing restrictions can reduce budgetary flexibility. On the other hand, taxing limitations are not singularly negative in their impact--at least not for the legislating State. They can, for instance, contribute to an interstate advantage in terms of relatively lower tax burdens. A lower tax burden is one of the many reasons

corporate and personal income taxes, which contribute about 29 percent of the State's total tax revenue. Also, as table 25 shows, the growth rate in these income taxes has been very close to that for severance taxes in recent years.

Table 25

Average Annual Growth Rate in Oklahoma Tax Revenues

	Average Annual Growth Rate (Percent)		
	1950-1960	1960-1970	1970-1978
Severance taxes	5.1	4.2	21.3
Income taxes	5.8	10.7	19.9
General sales tax	5.0	5.4	12.6
Selective sales taxes	5.6	5.9	6.9
Other taxes	7.6	8.0	11.1
Total State tax revenue	5.5	6.5	13.4

Source: Robert L. Sandmeyer, Dale Wasson, and Rudy I. Greer, Report: A Study of Oklahoma State Taxes (Stillwater: Oklahoma State University, February 1979), p. 27.

Moreover, Oklahoma, in contrast to Texas and Louisiana, is neither adjacent to the outer continental shelf nor as heavily sited with refineries, as noted earlier. So, here, a refinery tax would be significantly less important relative to severance tax revenue, and a first-use tax would be basically inapplicable.

In summary, due largely to energy-based taxes, the southwestern States, relative to other State and local governments, have been able to rely less on traditional taxes. Further, recent petroleum price increases have largely deflated the region's interest in alternative revenue sources. In fact, the few initiatives for alternative revenues have been limited mainly to the energy tax base--such as Louisiana's "first-use tax" and Texas' proposed refinery tax. Given the region's long-standing, comparative advantage in energy production, this focus is understandable, particularly during a period frequently characterized as the era of the taxpayers' revolt.

Yet, the States' present fiscal flexibility may not continue over the long run because fossil fuels are nonrenewable

as a boiler fuel and as the nuclear power industry expands. However, estimated revenues from any prospective lignite and uranium severance taxes are relatively inconsequential compared to current oil and gas severance tax revenues. For example, assuming 10 percent severance taxes on lignite and uranium, estimated revenue for 1980 from these sources would be $12 million and $16 million, respectively. 1/ In comparison, Texas' 1978 oil and gas severance tax collections were almost $1 billion.

Another energy-based tax being considered, however, could replace much of the current oil and gas severance taxes. This is a refinery tax, a controversial and long-debated potential revenue source for Texas. Imposing a processing tax on the refining industry has been a topic of legislative discussion in the State for over 30 years.

Opponents of the tax argue that, in the short run, it would cause a shifting of inputs to out-of-State refineries having excess capacity, and in the long run, it would discourage further refining industry investment in Texas. On the other hand, the refinery tax's proponents argue that Texas' attractive business climate is based on factors much more significant than taxes, and additionally, the State's vast, interdependent network of capital investments--consisting of transportation systems (including pipelines and port facilities), refineries, and petrochemical plants--would be almost prohibitively expensive to replace elsewhere.

In any event, the precedents for taxing crude oil refining are few; so, little evaluative experience is available. Unless such a tax is actually imposed, its effects will remain only speculative. To date, imposition of a refinery tax, although much discussed, has had insufficient support for passage.

Oklahoma has given less consideration to alternative energy taxes than either Texas or Louisiana. For example, an analyst at the Oklahoma Tax Commission stated that concern about severance tax collections is premature now. Little concern about severance taxes means, in turn, even less about alternative energy taxes.

Additionally, Oklahoma is perhaps more amenable to non-energy or traditional taxes. Oklahoma already has both

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1/Texas House Study Group, Special Legislative Report, "New and Expanded Sources for State Revenue," 1977 (as reported in Texas Energy Issues: 1978, Lyndon B. Johnson School of Public Affairs, University of Texas at Austin, 1978), p. 61.

Typically, these two elements, policy planning and functional implementation, are organizationally separate in State governments. Policy planning, for instance, is usually the responsibility of an office or unit within the Governor's office. But, functional activities, such as promoting specific economic development opportunities to support established policy, are handled by a line agency, as are other functions of State government--education, transportation, and water resources management, to name but a few. This organizational arrangement for economic development, in essence, highlights the distinction between policy planning as an executive management tool and economic promotion as a functional activity of State government.

These perspectives are clarified in the sections below, which give comparative discussions of economic development planning--both policy planning and functional planning and the interactions or links between the two--in Texas, Oklahoma, and Louisiana. Another perspective which became evident during our review is that planning or policy making is not a straightforward process, but rather is very fragmented, often disorderly, and seldom fits the "typical rational model" presented in figure 7. Thus, while it is true that the three southwestern States do not have statewide policies encouraging economic base diversification specifically relative to the oil and gas industry, the States' planning processes have generated some policy instruments which address this issue--but presently mostly only in a piecemeal or peripheral fashion.

It is perhaps axiomatic that policy instruments, to be effective, should be brought together under a deliberate plan. Of the three States discussed, Texas seems to be making the most progress toward developing deliberate, long-range plans. Because Louisiana is the most heavily dependent of the three States upon the oil and gas industry, the planning processes in that State are addressed first.

Policy and functional planning in Louisiana

We contacted various planning elements in Louisiana in both the executive and legislative branches of State government (see fig. 9). The Louisiana executive branch agency most directly responsible for statewide policy formulation is the State Planning Office.

State Planning Office

This office has not formulated a policy regarding diversification relative to the oil and gas industry. When

natural resources. Even in the short run, the public revenue benefits of higher oil and gas prices may not accrue totally to the producing States' coffers. As discussed in chapter 2, the outlook is highly uncertain because energy is an overriding national issue and may distort the traditional taxation boundaries between layers of Government.

For periods of uncertainty, planners should define a wide range of alternatives. This is true not only for public sector revenue needs but also for the private sector, i.e., the region's economic base.

ECONOMIC BASE DIVERSIFICATION PLANNING LIMITED BY SEVERAL OBSTACLES

The more diversified a State's economic base, the less dependent the economy is on the fortunes of any one industry. Even though Texas, Oklahoma, and Louisiana have organizational structures to develop economic base diversification strategies, the various planning bodies in the States are limited by several obstacles. The most significant is a general absence of policy guidance. Another obstacle, endemic to any long-term, governmental planning efforts, is lack of political continuity, i.e., changeovers in administrations, programs, and personnel.

Guidance and implementation largely missing

The three southwestern States do not have specific statewide policies of encouraging diversification to counterbalance their dependence on the oil and gas industry. Instead, the few existing economic development policy goals are very broad, often implicit or unstated, and are usually synonymous with providing more jobs and raising income levels. These implicit policy goals, in turn, are being implemented by functional line agencies such as industrial development departments or commissions. Not surprising in the absence of specific diversification goals, these agencies' efforts consist almost solely of industry-attraction programs, with little or no consideration or evaluation of the new employment sources' energy-intensiveness or linkages to the oil and gas industry.

Economic development often is definitionally imprecise, including as it does many kinds of concepts--ranging from promoting balanced and diversified economic growth to achieving equitable income distribution. Nevertheless, as the preceding paragraph implies, economic development should be both a policy or goal to be established centrally by State government and a function to be implemented by line agencies.

queried about the need for such a policy, the office's director responded that the world has enough oil and gas for another 300 years, the industry is not playing out in Louisiana, and that, if anything, it is growing.

Created in the Office of the Governor, the State Planning Office represents Louisiana on matters related to long-range planning and is responsible for comprehensive, statewide planning. Regarding such planning, however, the director pointed out that their office has basically a monitoring or coordinating role. There is no State plan for Louisiana in the sense that one document gives an overall plan for the State. Rather, comprehensive planning is done on a functional level; each agency or department is responsible for its own plan. One of the State Planning Office's monitoring roles is to maintain awareness of what is being done or planned programmatically by each functional State agency--such as the Department of Commerce, the Department of Natural Resources, and the Department of Urban and Community Affairs.

Department of Commerce's
Office of Commerce and Industry

Commerce and Industry representatives informed us that this office does not have a formal economic development plan for the State and its various economic sectors, including the oil and gas industry. Rather, the Office of Commerce and Industry, they said, is basically a marketing organization which tries to attract manufacturing industries to Louisiana; this is done by advertising and through a promotional team which travels throughout the Nation.

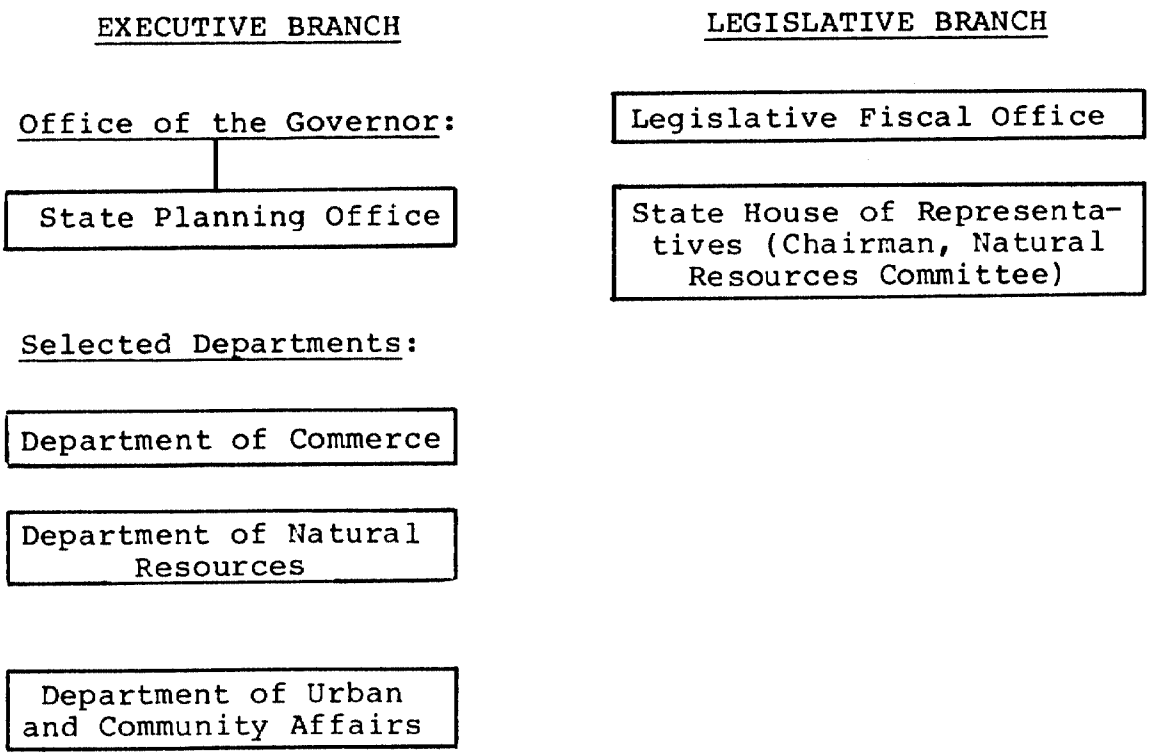
Commenting further, the Commerce and Industry representatives said they saw no need for their office to have a formal plan for economic base diversification in general and certainly not one related specifically to the oil and gas industry. Regarding the general disclaimer, they explained that almost all companies have a unique set of location criteria. With a plan, the office would find itself trying to make a client company conform to the plan rather than trying to be responsive to that company's particular needs.

Commerce and Industry officials gave several reasons for the specific disclaimer relative to oil and gas industry planning, which are paraphrased as follows.

--Any potential problems are very long-range, perhaps 40 or 50 years into the future. The State still has many petroleum deposits or reserves yet to be discovered and developed. One estimate is that Louisiana

Figure 9

State Planning Elements in Louisiana Contacted by GAO



Notes:

A reorganization of the executive branch of State government began in Louisiana in January 1975 and was completed in the latter part of 1978, after over 3-1/2 years of effort. The reorganization effort consolidated approximately 300 independent State agencies, boards, and commissions into 20 departments and the Office of the Governor. So, basically, there are now only 20 officials, besides the Governor and lieutenant governor, ultimately responsible for executive branch functions. Also, for the first time, the Governor is able to appoint many of the department secretaries, who combine to make up his cabinet of officials. This means that the gubernatorial seat in Louisiana is a strong leadership position; the Governor can exert policy leadership over various departments without being challenged by other elective executive officials or by independent agencies.

making the area attractive for certain types of industries. This happened back in the early 1950s when strawberry crops declined in the State. In essence, this office would view a decline in the oil and gas industry no differently than a decline in strawberry production--it frees up a labor force for other opportunities. 1/

Speculatively, for instance, there may be future opportunities for cotton and related industries if petroleum chemicals become too expensive. People will stop buying polyester clothes and demand more cotton fabrics. Louisiana could become a prime location for the garment industry.

In short, the Office of Commerce and Industry representatives' comments about their absence of oil and gas industry planning can be summarized in three points. One, any potential problems are too far away to plan now; two, no planning is needed because adequate petroleum reserves are available; and three, if a decline over the long run does occur, natural market forces are best able to offset any dislocations.

While the Louisiana Office of Commerce and Industry has no explicit diversification strategy relative to the oil and gas industry, the office's work as an industry-attracting agency inevitably results in economic base diversification to some extent. Office representatives informed us that the agency stresses solicitation of labor-intensive over capital-intensive industries. This preference reflects a frequently-mentioned State policy document. Published as Louisiana: Priorities for the Future, 2/ this document is the one source referred to us as containing specific policy goals for statewide economic development and other functional areas. The Priorities policy document recognized petrochemicals and capital-intensive industries as being vital to the State, but the number one, industrial inducement priority was stated

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1/In commenting upon a draft of this report, the Office of Commerce and Industry emphasized that the Office's reference to agricultural production (whether strawberries, cotton, etc.) as a replacement opportunity for any decline in the oil and gas industry was simply one example used in a wide-ranging conversation of how natural market forces work.

2/The Priorities effort, which establishes broad goals for the 1980s, was jointly sponsored by the Governor, the State legislature, and the Council for a Better Louisiana.

has remaining reserves equal to cumulative production to-date in the State. Many of these deposits are deep and will require drilling efforts using more capital and labor than present methods. Price increases will make these efforts economically practical. So, while overall production may still decline, the increased exploratory and developmental efforts will maintain, and perhaps even increase, economic activity as measured by employment and value-added.

--A sudden and severe drop-off in production would, of course, be calamitous for the State. But, any trend will likely be spread over 40 years or more. In such a case, Louisiana will increasingly become an exporter of oil and gas services and technology. This is already happening somewhat; e.g., Louisiana supplied much of the technology and personnel for the North Sea drilling.

--The oil and gas industry really consists of two broad sectors. One is exploration and production. The other is petroleum refining and chemicals manufacturing. Even if the first sector does decline, the second will be assured of a continued supply of feedstocks once Louisiana's offshore superport is constructed.

--Moreover, even assuming that the first sector (exploration and production) does decline over time and cause dislocations, anticipating such a decline or separating out a particular economic sector for special effort is not the business of the Office of Commerce and Industry. The office has no direct control over economic sectors; rather, its role is one of getting more or better jobs for people out of work or with low family incomes. Additionally, in an area which has a high concentration of oil and gas industry, such as Baton Rouge, high wage scales make it very difficult to diversify. That is, in attracting and retaining high quality workers, minimum-scale growing industries just cannot compete with high-paying refining and petrochemical plants.

--In any event, if secular trends or declines do occur, they will create opportunities within the market place that tend to remedy the situation almost without any assistance from Commerce and Industry. Over time, industries will migrate or relocate to take advantage of profit opportunities. For example, if an agricultural area declines, more labor is available for the job market. A labor surplus depresses wages,

besides being unnecessary, such planning was not within the scope of the office's mission. They said the Department of Natural Resources was the agency responsible for managing the State's oil and gas resources and addressing the long-range outlook for related industries.

Department of Natural Resources

When questioned about long-range diversification planning, a department representative answered that, should Louisiana need to move away from a petroleum-based economy, the prospects for a smooth transition are good. Due to the temperament of its people and a favorable industrial/regulatory environment, he said Louisiana could move much faster than most parts of the country. If necessary, the chemical industry could use input or feedstock substitutions. But, more likely, gas as a fuel source would be replaced and its value as a feedstock would increase.

Moreover, the department representative added that Louisiana should not be forced to use coal, although it does not fear using it. To the contrary, he said the State plans to encourage the use of coal where economical, and is even trying to get a coal slurry pipeline from Wyoming to Louisiana. Given the State's existing water supplies and transportation systems, he thinks Louisiana will fare well in a coal age; e.g., there will still be a place for energy-intensive industries in Louisiana.

Department of Urban and Community Affairs

The department's assistant secretary commented that there has been no real acknowledgment (and none is likely in the next several years) of potential economic problems stemming from declining oil and gas production. This State official noted, for instance, that the bulk of the department's local planning assistance funds goes to southern Louisiana (which contains most of the State's oil and gas) to help communities cope with pressures from intense oil and gas exploration and development efforts.

In other words, much of the department's assistance is focused on current "boom" planning needs with little concern for any longer run or potential downside effects in the oil and gas sectors of the State. Similarly, the legislative branch contacts we queried were concerned primarily with "immediate" issues.

as "the attraction of labor-intensive industries to all regions of the State."

Even in the absence of the Priorities goal statement, Commerce and Industry in actual practice would still seem to give more attention to labor-intensive industries. Office representatives commented, for instance, that their staff tends to concentrate on industries that can best use the office's services. In many cases, labor-intensive industries tend to be the best suited, they said, because capital-intensive industries often have their own plant location specialists.

In March 1978, the Office of Commerce and Industry retained the Fantus Company, a subsidiary of Dun and Bradstreet Companies, Inc., to evaluate Louisiana's location potential and identify manufacturing industries amenable to attraction efforts. Fantus, in January 1979, reported market and investment opportunities in Louisiana for producers of (1) construction machinery, (2) metal pipes and fittings, (3) automotive replacement parts, (4) marine electronics, (5) industrial controls (such as resistors and resistor units, solenoid switches, and electronic timing devices), (6) drugs and pharmaceuticals, (7) sporting goods and athletic equipment, and (8) business forms and envelopes. 1/ Commerce and Industry representatives said the office was using the Fantus reports by concentrating industry-attraction efforts on firms which manufactured the targeted or suggested products.

In concluding, the Commerce and Industry representatives reiterated that their office was not doing specific long-range planning relative to the oil and gas industry because,

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1/Fantus prepared a separate report or study on each of these industries. Generally, each report contains the following introductory comment:

"This study presents the market and investment opportunities available in Louisiana for producers of [these products]. Other manufacturers with similar production inputs will find that the study addresses many of their locational concerns as well, thus permitting a ready evaluation of Louisiana as a potential location for future operations. A cost/profit simulation clearly demonstrates how a typical industry producer serving selected growing markets can enhance profitability by establishing a production facility in Louisiana. Using this simulation as a benchmark, producers in other sections of the country can better understand the cost advantages inherent at a Louisiana location."

finds a feature of the tax unconstitutional, the State may be able to salvage the concept by remedial legislation. However, if the tax is conceptually unconstitutional, the State will have to look for another revenue source.

--Also, sometime in 1980, the Natural Resources Committee will probably propose a bill to change the severance tax base on natural gas from volume to value. That should generate more income as prices rise.

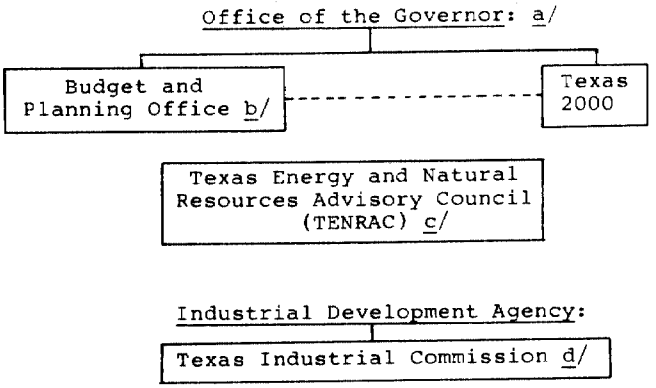
--Concerning transition planning, the legislature has sponsored several initiatives, including, in 1979, creation of the "Enhanced Mineral Income Trust Fund." 1/ The fund's corpus could be substantial if deregulation leads to increased severance collections and if any "windfall profits" taxes are not prohibitive. Rather than spending the increased collections or giving general tax rebates, the legislature proposed the trust fund as a substitute asset account. But, trust-fund-type legislation is primarily for the transition period; other solutions will eventually be necessary. The fund's interest income will be available for State operations; the corpus will not.

1/Title 30, Louisiana Revised Statutes (1950), sections 301-303. The policy and purpose section, 301, states:

> "It is the determination of the legislature that the production of natural resources, more particularly oil and gas, will within the years to come, decline steadily, and that the revenues generated by these resources will decline as well, thereby decreasing the amount of funds which the state shall have to operate and carry out the function which it has been assigned to accomplish. In order to preserve the benefits of these natural resources for future generations and to prevent the wasteful expenditures of revenues produced from these natural resources and to prevent in the future a situation wherein the citizens of the state will be unduly burdened with excessive taxes, it is the purpose of this Chapter, to provide the establishment of a trust fund into which the revenues from the oil and gas production of the state shall be deposited and shall remain, to be invested by the treasurer of the state as provided by law, and the interest thereon made available to the general fund to be used for the operation of the state."

Figure 11

State Planning Elements Contacted in Texas by GAO



Notes:

a/By law, the Governor is the State's chief planning officer. However, institutionally, the gubernatorial position in Texas faces leadership obstacles in that a small but important group of agency heads, such as the comptroller, are independently elected.

b/The director informed us that 80 percent of the office staff is committed to budgeting activities and is not actually involved in long-range planning of any kind. The office's planning activities primarily involve attracting and tracking Federal funds and serving as a clearinghouse for Federal and State funded projects and programs. Thus, the office's planning function is fairly synonymous with grants administration.

c/TENRAC is the State agency which maintains an energy simulation model, called the "Texas Energy-Economic Forecasting Model." The model is used to analyze the impacts of various energy supply and demand conditions on the Texas economy and to provide information on energy policy alternatives. For example, an early report generated was "An Economic Analysis of Declining Petroleum Supplies in Texas: Income, Employment, Tax, and Production Effects as Measured by Input-Output and Supply-Demand Simulation Models," Project No: S/D-2 and S/D-3, February 1975. Currently, TENRAC is working on the Texas Energy Policy Project, which is intended to integrate and further develop analytic tools for use in guiding Texas energy policy decisions.

d/The Texas Industrial Commission is the State agency responsible for planning and operating programs to encourage private sector industrial and economic development in the State. The commission aids in the State's economic planning and development, essentially by attracting and locating new industry and promoting the expansion of existing industry. The commission carries out this two-pronged effort, job creation and community development, through its four divisions--Industrial Development, International Development, Community Development, and Operations. Within the Operations Division is the Research and Program Development Department. This department plays an important role in helping the commission carry out its responsibilities by participating in research projects to study "current critical points in the state's economic structure."

This Louisiana legislation is a reaction to a Federal law, the "Powerplant and Industrial Fuel Use Act of 1978", P. L. 95-620. The Federal law really gives the State a deep, basic problem. The basis for Louisiana's growth and wealth has long been oil and gas. The availability of these energy resources as boiler fuels attracted industry to Louisiana. Why should Louisiana now have to switch from oil and gas to hard coal, which is not indigenous to this area and must be imported from as far away as Wyoming? The transportation costs and problems, plus other transshipment diseconomies stemming from inability to capitalize on the region's comparative advantage in petroleum resources, could result in a comedy of horrors.

--Nevertheless, Louisiana is doing some things to prepare for a coal future. The State has passed legislation permitting a coal slurry pipeline. Also, a very comprehensive reclamation act opens the door for lignite mining in Louisiana.

--On the other hand, a duck cannot be made a chicken. The oil and gas industry will be viable in Louisiana for a very long time. Only about 15 percent of the State's petroleum in known structures has been developed. Louisiana is an oil and gas State and that is why industry locates here. Louisiana attracts few large, market-oriented manufacturers because the State's population density/distribution mix is not conducive to such industries. The reality is that Louisiana is best suited for energy-related development.

The committee chairman commented, in summary, that Louisiana will try to take full advantage of its indigenous resources and keep resident industries supplied for as long as possible. In this regard, much of Louisiana's planning is to overcome Federal acts that constrain the State's full use of its own resources.

Concluding observations

Generally, Louisiana's executive branch agencies assumed that long-range planning relative to the oil and gas industry was either another agency's responsibility or, for various reasons, was seen as not being needed. The most frequently cited reason was a perception that sufficient oil and gas resources would be available well into the next century. Although the legislative branch has actively sponsored energy legislation, much of it seems to be singularly designed to

--Another piece of transition legislation is the "Louisiana Fuel Protection Act of 1979." 1/ The Act reflects the fact that much of Louisiana's planning is in reaction to what the Federal government is doing. Frequently, the State has to wait for the Federal Government to come up with some new policy or act and then react to it rather than plan constructively ahead.

1/Title 51, Louisiana Revised Statutes (1950), sections 1600-1606. Some extracts from section 1601 are:

"A. The industrial base of the state of Louisiana, upon which the economy of the state is heavily dependent, is highly energy intensive.

"B. The primary industrial and powerplant energy sources in the state of Louisiana are natural gas and petroleum.

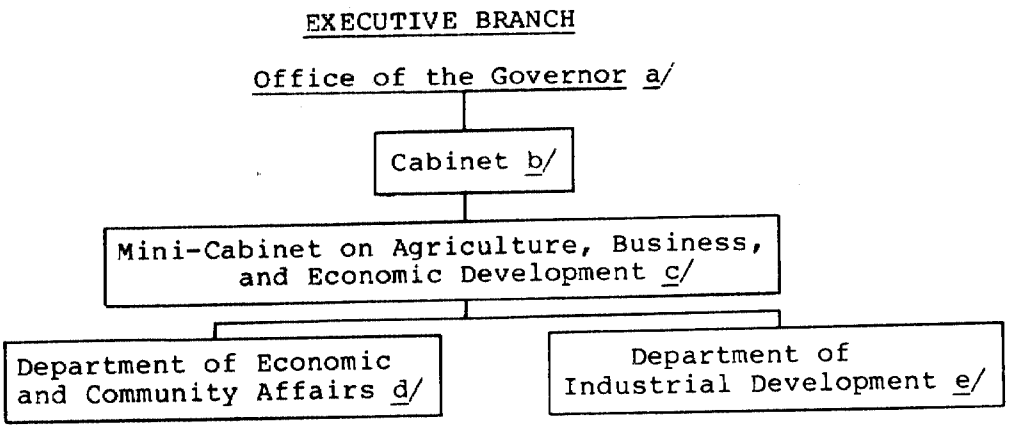
"C. The Congress of the United States has enacted Public Law 95-620, the "Powerplant and Industrial Fuel Use Act of 1978", which, among others, has as its purpose the discouragement, prohibition, or minimization of the use of natural gas and petroleum as a primary energy source and the encouragement of the greater use of coal and other alternate fuels in lieu of natural gas and petroleum as a primary energy source, including the use of coal in existing and new electric powerplants and major fuel-burning installations."

* * * * *

"G. It is within the police power of the state and in the public interest of the state to insure that measures will be taken to avoid, if possible, or ameliorate the effects of mandated use of coal or other alternate fuel and conversion of the state's industrial and powerplant fuel requirements from natural gas and petroleum to coal or other alternate fuels and, where use and conversion are mandated or undertaken, to insure that such use and conversion occur with a minimum of adverse economic effect on the state and that to the maximum extent possible measures be taken to insure that natural gas affected by this conversion be retained within the state of Louisiana."

Figure 10

State Planning Elements in Oklahoma Contacted by GAO



Notes:

a/Effective gubernatorial leadership in Oklahoma frequently depends upon cooperation from a number of independently elected agency officials. To strengthen their executive policymaking roles, recent Governors have relied upon cabinets and mini-cabinets, composed of both elected and appointed agency heads, but chaired largely by appointees.

b/The Governor's cabinet consists of the Lieutenant Governor and, among others, seven individuals who are mini-cabinet heads: (1) Secretary of State, (2) director of the Department of Industrial Development, (3) director of the Department of Economic and Community Affairs, (4) commissioner of Public Safety, (5) State Welfare director, (6) chancellor of the State Board of Regents, and (7) director of the Department of Tourism and Recreation.

c/The Mini-Cabinet on Agriculture, Business and Economic Development is one of seven mini-cabinet groups created by gubernatorial executive order. These groups oversee 204 State agencies, boards, commissions, councils, compacts and offices in the executive branch.

d/The Department of Economic and Community Affairs plays a major role in processing Federal funds in Oklahoma. Its director serves as secretary of the Governor's cabinet and sits on all mini-cabinets.

e/The Industrial Development Department's executive director serves as chairman of the Mini-Cabinet on Agriculture, Business, and Economic Development.

retain oil and gas resources and related revenues within the State. This is a predictable and very understandable regional reaction to the national issue of rising energy demand and decreasing domestic production. Yet, such a reaction may be counterproductive to long-run, regional diversification needs. Nonetheless, for the immediate future at least, Louisiana's planning posture perhaps can be characterized by the adage: "We'll continue to dance with what brought us here."

Policy and functional planning in Oklahoma

Figure 10 shows the planning elements contacted in Oklahoma. The State's two principal economic planning agencies are the Department of Economic and Community Affairs and the Department of Industrial Development; the department heads serve as chairmen of the cabinet and mini-cabinet, respectively.

Department of Economic and Community Affairs

This department has not formulated a diversification policy relative to the oil and gas industry. The director's comments are paraphrased as follows:

--Oklahoma has two long-range economic problems, the State's dependence on oil and its dependence on agriculture. Obviously, dependence on depletable oil and gas resources creates a need for planning.

--But Oklahoma really has not done much planning. Most planning activity relates to the State budget. Generally, the executive and legislative branches think of planning solely in terms of balancing next year's budget. That is the extent of any sort of comprehensive planning done at the State level; beyond that, the planning process is virtually nonexistent.

--Fortunately, though, Oklahoma will not deplete its oil and gas resources next year; so, there is time to plan. This agency has an opportunity to do some excellent comprehensive planning during the next few years. The agency's planning processes were recently changed to emphasize comprehensiveness. Beginning in fiscal 1981, the agency will have one plan, interrelating various functional components, such as housing, economic development activity, manpower training, etc.

Department of Industrial Development

Is there any concern that the oil and gas industry could decline as a major economic sector in Oklahoma? The responses to this question, made by a department representative, the industrial division's director, are paraphrased below:

--The Department, although it is aware of petroleum's importance to Oklahoma's economy, is not responsible for this issue. There is no foreseeable decline in the industry within Oklahoma. If oil and gas resources are rapidly depleted, only a few energy-intensive companies would suffer, such as glass and fertilizer manufacturers.

--Also, Oklahoma has few chemicals manufacturers; so the employment and payroll multipliers are not as large here as in Louisiana. Within basic oil and gas industries, the main employment loss, if any, would be in drilling and production. But that segment of the industry is increasingly active now and no decline is foreseen in the near future.

--The State's diversification efforts center around the decline of agriculture. The department is trying to attract light manufacturing industries to rural areas to absorb agricultural unemployment. This reflects the basic purposes of the Industrial Development Department, namely, to create jobs and, concomitantly, to strengthen the State's tax base.

In short, these comments from an industrial development spokesman show that Oklahoma is not undertaking functional planning to diversify the State's economy relative to the oil and gas industry, principally because the department sees no need to do so at this time. Similarly, responses from the director of the State's economic and community development planning agency indicate that the issue is not being addressed in terms of policy formulation. Rather, current attention is being given to developing a planning process which, as planning horizons are pushed out beyond 1 year, may eventually address the issue of natural resource depletion.

Policy and functional planning in Texas

Figure 11 shows the planning elements contacted in Texas. Currently, according to a Texas Industrial Commission spokesman, the State does not have an economic development or

--This focus may not immediately address the oil and gas depletion issue. But, this planning concept is a step in the right direction, especially when one considers that the State has not had a broad-based planning program nor one that looks more than 1 year into the future.

--Ultimately, the economic development component of the plan will have to address the oil and gas issue. This agency has to start looking 5 years ahead. The first step is to plan comprehensively for 1 year. As the planning processes develop, the agency should be able to expand its planning horizons from 1 year to 2, to 3, and then to 5 years. This will give the State some lead time to address the issue.

--The important question is the potential impact of diminishing oil and gas resources on State revenues. Revenues have been fairly consistent for a number of years, so there has been no real pressure for concern. Forecasting efforts to date have been piecemeal, done mainly by universities or research groups. These efforts have not been integrated into the State's planning framework.

--Here also, State revenue forecasting must expand beyond its present 1-year outlook to about 5 years. This will give the State lead time to broker its financial resources among competing priorities. Lead time is needed because most of what the legislature appropriates each year is fixed; brokering takes place on the margin. The functional agencies which do a good job of long-range planning will be more competitive for funding in the brokering process.

--It is hoped that the Governor's cabinet will help to foster this process. The cabinet administers most Federal programs in Oklahoma and is working in that direction. As soon as the State is able to plan its financial resources 5 years ahead, there will be pressure to think about what resources are going to be available in 10 years. Knowledge creates a demand for more knowledge. The State must begin to expand its planning horizons to have lead time to consider potential, long-run problems, such as the oil and gas issue.

In summary, the director reiterated that Oklahoma's planning processes, though fledgling at this point, are beginning to move in the right direction.

diversification strategy relative to the oil and gas industry. However, the Governor has recently initiated "Texas 2000" to develop a comprehensive, long-range plan for the State.

Texas 2000

The general thrust of this project, initiated by the Governor in 1979, is to identify trends facing the State, decide where the State ought to be in the year 2000, and plan what needs to be done to reach intermediate and final objectives. The project is to be accomplished in several phases, beginning with an information and data base building phase, followed by issue analysis, goal setting, and implementation and evaluation phases. 1/

Texas 2000's steering committee 2/ recognizes that the State should have long-range planning in order to maximize the time between problem identification and response. Frequently, for instance, the legislative and public consensus necessary to generate action on an issue is slow to form.

Late in 1980, the steering committee is to present to the Governor a report of critical issues which will need managing during the next 20 years. Two issues already identified by the committee involve a need to address the long-range consequences of: (1) shifts in the composition of Texas' economy and population, and (2) the impact of declining oil and gas reserves on State revenues. 3/ Basically, these issues, when further developed, will include our review's subject--the need for fiscal and economic base diversification.

Whether these issues can be addressed, especially in terms of implementing any policy formulated, is another question. The steering committee has recognized, for example, that long-term planning efforts in Texas face several obstacles:

--existing data and information bases are incomplete, incompatible, inconsistent, or unused;

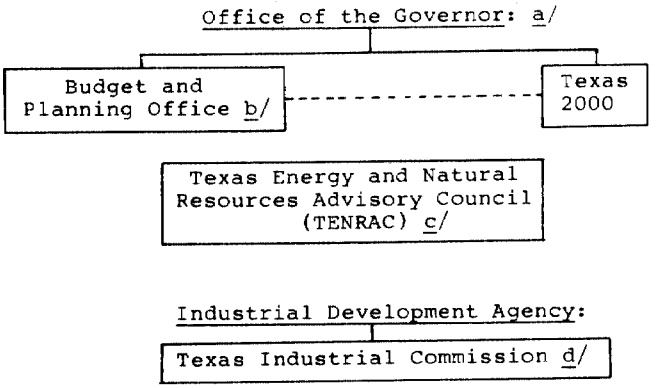
1/Note the similarity of this planning process to that presented in figure 7.

2/The committee's membership includes the Lieutenant Governor; House Speaker; Director, Governor's Budget and Planning Office; and the Governor's Chief Policy Adviser.

3/As discussed earlier in this chapter, the revenue issue is being studied by the Texas Research League.

Figure 11

State Planning Elements Contacted in Texas by GAO



Notes:

a/By law, the Governor is the State's chief planning officer. However, institutionally, the gubernatorial position in Texas faces leadership obstacles in that a small but important group of agency heads, such as the comptroller, are independently elected.

b/The director informed us that 80 percent of the office staff is committed to budgeting activities and is not actually involved in long-range planning of any kind. The office's planning activities primarily involve attracting and tracking Federal funds and serving as a clearinghouse for Federal and State funded projects and programs. Thus, the office's planning function is fairly synonymous with grants administration.

c/TENRAC is the State agency which maintains an energy simulation model, called the "Texas Energy-Economic Forecasting Model." The model is used to analyze the impacts of various energy supply and demand conditions on the Texas economy and to provide information on energy policy alternatives. For example, an early report generated was "An Economic Analysis of Declining Petroleum Supplies in Texas: Income, Employment, Tax, and Production Effects as Measured by Input-Output and Supply-Demand Simulation Models," Project No: S/D-2 and S/D-3, February 1975. Currently, TENRAC is working on the Texas Energy Policy Project, which is intended to integrate and further develop analytic tools for use in guiding Texas energy policy decisions.

d/The Texas Industrial Commission is the State agency responsible for planning and operating programs to encourage private sector industrial and economic development in the State. The commission aids in the State's economic planning and development, essentially by attracting and locating new industry and promoting the expansion of existing industry. The commission carries out this two-pronged effort, job creation and community development, through its four divisions--Industrial Development, International Development, Community Development, and Operations. Within the Operations Division is the Research and Program Development Department. This department plays an important role in helping the commission carry out its responsibilities by participating in research projects to study "current critical points in the state's economic structure."

which has been described by the American Institute of Planners and the Council of State Governments as follows:

> "To play a significant role in * * * economic development, and to make measurable impact on * * * economic situations over the long haul, States must be able to mount a sustained effort. An economic strategy demands sufficient continuity to assure implementation." 1/

> Yet, "[the] U.S. system of government does not readily encourage the adoption of long-term commitments on matters of public programs. Program directions and the appropriations which support them must be renewed periodically. This renewal requirement neither discounts the need for planning nor denies the merits of long-range planning. The requirement does underscore, however, the limitations inherently imposed upon a 'state plan' and upon the commitment which a plan, when adopted, purports to represent. Elected political authorities are bound by the time limitations upon their terms of office. These limitations tend to reduce the political incentives which othewise might encourage incumbent officials to concentrate greater attention upon long term matters. Hence, limitations upon political authority increase the difficulty of producing public and long-range state plans (not restricted to public improvements) at the central policy level, although they need not inhibit planning as a process, or the publication of plans as documents at other levels within the government. To observe that this is the case does not, of course, constitute a criticism of political leaders, nor is it a complaint against the political system. It is simply a recognition of one constraint upon plans, because our political system does not contain built-in incentives for long-range planning." 2/

1/David K. Hartley, American Institute of Planners, Economic Development Through State Planning, (Washington, D.C.: Office of Economic Research, Economic Development Administration, U.S. Department of Commerce, August 1976), p. 36.

2/Council of State Governments, State Planning and Federal Grants, (Chicago: Public Administration Service, 1969), pp. 51-52.

--the State currently lacks long-range policy planning that is integrated and comprehensive; and

--existing State government institutions may not be presently capable of responding to the long-range policy planning needs and issues identified by the committee.

Another, and, perhaps the most substantial, obstacle to long-term planning by any governmental entity is political discontinuity.

Texas Industrial Commission

An agency representative, an economist, informed us that the commission is not researching or developing economic base diversification strategies, either for the short-term or the long-term for Texas. The commission is encouraging industries to locate in Texas, but not because of any "diversification strategy." People talk about planning but none exists.

The commission representative also said that Texas is not trying to attract industries to counterbalance a long-established trend toward energy-related and energy-intensive industries. Energy is the most dynamic sector in the State's economy; there is a shortage and the free market is growing in that area as fast as it can.

The commission economist commented further that historically, Texas has had periods of booms and busts. Currently, Texas is enjoying the upside and not planning for the downside. 1/ However, Texas 2000 is concerned with planning for the downside.

Long-term planning limited by political discontinuity

Officials in each of the three States we visited pointed out various examples of the political discontinuity problem,

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1/This perspective is reflected somewhat in the commission's annual report for 1974-75:

> "Texas has one of the strongest economies of the nation. We have not been as adversely affected by the recession as other parts of the Nation. I believe one factor was the high demand for energy and the increase in manufacturing levels for petroleum-related equipment."

CHAPTER 6

LITTLE ENCOURAGEMENT BY THE FEDERAL GOVERNMENT TO FOSTER DIVERSIFICATION PLANNING

Based on our review of current planning efforts, we find that virtually no Federal planning assistance program addresses possible long-range fiscal and economic base problems in the Southwest stemming from the region's heavy reliance on the oil and gas industry. This chapter addresses the absence of Federal involvement in encouraging long-range planning. Discussion centers around three agencies--the Department of Commerce's Economic Development Administration (EDA), the Department of Housing and Urban Development (HUD), and the Ozarks Regional Commission (ORC). Each of these administers planning assistance programs which are or can be regional in scope.

EDA CAN BE MORE ISSUE ORIENTED

EDA programs in the Southwest (see fig. 12) have not focused on the region's fiscal and economic base reliance on the oil and gas industry and the related need for long-range planning. However, the agency--through its regional strategy framework, which includes planning assistance programs--probably could have a substantial role in addressing this issue.

Little recognition beyond being aware of the oil and gas issue

The economic development strategy prepared by EDA's Southwestern Regional Office for fiscal 1979 clearly recognized the seriousness of depleting oil and gas resources; the issue is presented in the strategy's "overview" section as follows:

> "It is estimated that 75 percent of the energy consumed in the United States is produced from oil and natural gas. Collectively the five States in the southwestern region [primarily Texas, Oklahoma, and Louisiana] produce more than 80 percent of the Nation's oil and natural gas. Depletion of these resources will have a monumental effect on the economy of these States in the not too distant future." (Underscoring supplied.) 1/

1/Economic Development Administration, Southwestern Regional Office, "Regional Economic Development Strategy, Fiscal Year 1979," p. 2.

In short, these comments are saying that State governments frequently lack the capacity or "institutional memory" to implement plans beyond the term of the incumbent Governor, especially given the fact that key agency "directors and other appointed senior staff tend to reflect the Governor's viewpoint and change jobs when the administration changes." 1/

In any State, political discontinuity is always a potential obstacle to effective, long-range planning. Nonetheless, there is nothing intrinsically incompatible between politics and State planning. States, as basic units in the American political system, can undertake planning activities to help manage or shape their own economies. The Federal Government, as the major source of planning funds, can help assure that State planning processes not only have a degree of continuity but also include a focus on important multi-State or regional issues.

1/David K. Hartley, op. cit., p. 38.

Notes:

a/The agency provides assistance through a fairly broad range of programs; fiscal year 1978 funding in Texas, Oklahoma, and Louisiana was over $34 million:

Program	Amount (000s omitted)	Percent
Public works	$ 17,972	52.8
Business development loans and guarantees	4,738	13.9
Technical assistance	775	2.3
Economic adjustment assistance	8,071	23.7
Economic development planning grants	2,504	7.4
Total	$ 34,060	100

Although some of these programs are centrally managed and approved by headquarters' divisions, all applications for EDA assistance still must pass through the responsible regional office for review and comment.

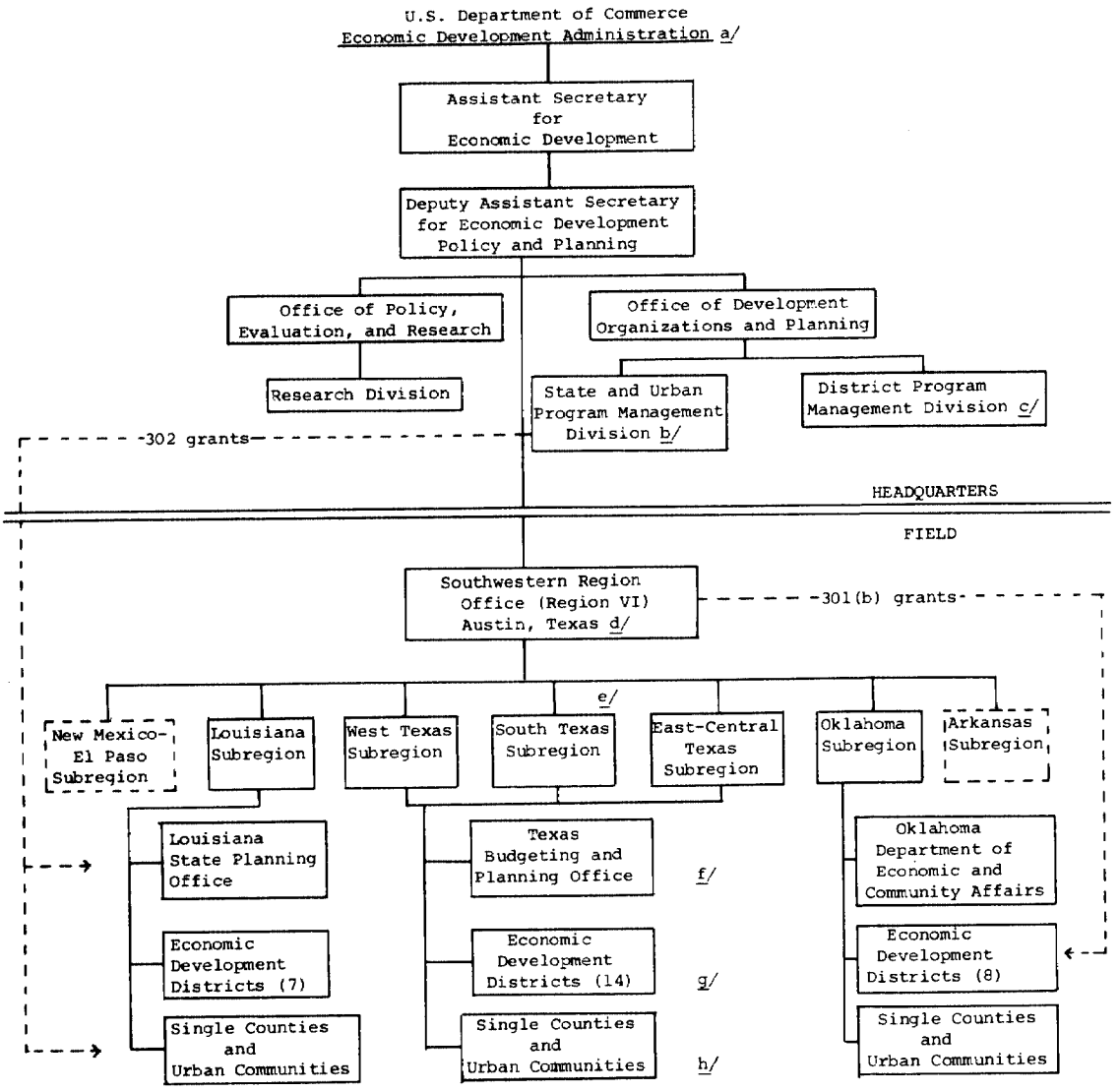
b/This headquarters' division centrally administers the 302(a) program for State planning assistance and urban planning assistance. The purpose of 302(a) grants is to foster capacity-building or a planning process, rather than to require specific outputs, such as a planning document. Thus, grantees need not have an Overall Economic Development Program (see g/) to be eligible for 302(a) funding. However, urban areas must have an overall plan or strategy to be eligible for other EDA assistance, such as public works projects. Even though the 302(a) program is centrally managed, the applications from State and urban grantees are still routed through the regional office, as noted above.

c/A district planning program that has been decentralized to regional offices is 301(b) grants. These grants are made to Economic Development Districts (see g/) to support planning staffs--here again, a capacity-building purpose.

d/The primary function of the Southwestern Regional Office is to direct EDA resources (see a/) to economically distressed areas throughout the five-State region. Surprisingly, 373 (or 75 percent) of the region's 502 counties meet poverty eligibility criteria. According to agency officials, one reason for such high percentages (not

Figure 12

EDA Organization for Economic Development Policy and Planning for the Southwest



Surprisingly, however, this synopsis is the only mention of the issue in the strategy; for example, the "goals and objectives" section is completely silent on this point. Further, the following year's strategy (fiscal 1980) dropped the issue altogether.

In explanation, representatives of the regional office's planning division offered several comments, which are paraphrased as follows:

--The 1979 regional strategy did mention potential problems about the States' dependence on oil and gas resources and derivative industries. However, EDA regions do not develop strategies, per se. That is, the regional office does not take a particular issue, such as economic base diversification for the region, and then design a plan or strategy to solve the problem.

--Rather, the Southwestern Regional Office's strategy document is better described as a regional status report and a funds-distribution mechanism.

--Regarding the former, for instance, the regional strategy document presents various measurements (per capita income, poverty statistics, unemployment data, etc.) of the region's economic health and also identifies the number of areas eligible for EDA assistance.

--The strategy document serves as a funds-distribution tool by establishing criteria for designating "priority funding areas" and for selecting types of projects.

--Essentially, to reiterate, the document is not a regional strategy in the sense of identifying regional (multi-State) issues, such as natural resource dependency, and assuring that EDA resources are issue-oriented--rarely are State and sub-State applications evaluated in relation to such issues. Evaluation is generally limited to the proposal's relation to the applicant's Overall Economic Development Program [see fig. 12, g/].

--In any event, it would be difficult for the region to develop an issue-oriented strategy because some of EDA's programs are managed centrally by headquarters.

--Moreover, the agency is concerned primarily with current issues. Basically, the Regional Office does not see the States' (Texas, Oklahoma, and Louisiana) fiscal and economic dependence on the oil and gas

unique to the Southwest) is that it is difficult to remove counties from the eligibility list once their economic health has improved.

e/The southwestern region is divided into seven subregions; each is served by an Economic Development Representative. These representatives serve as focal points for providing districts and communities information about available EDA programs and review applications being forwarded to the regional office.

f/Louisiana's State Planning Office, Texas' Budget and Planning Office, and Oklahoma's Department of Economic and Community Affairs are the agencies which receive 302(a) planning assistance funds (see b/) in these States. As discussed in chapter 5, none of these grantees has developed a policy or strategy regarding fiscal or economic diversification relative to the oil and gas industry.

g/Section 403 of the Public Works and Economic Development Act of 1965, as amended, authorizes the formation of Economic Development Districts, to help solve job and income problems. The district program is a Federal-local delivery system, providing a link and support mechanism for helping counties and small communities improve their economic health.

To be designated an Economic Development District, a qualified area must develop an Overall Economic Development Program document, which meets the statutory requirement that EDA assistance (funding for public works and business development projects) be consistent with an approved overall program for the economic development of the district.

h/Some cities and counties which are not in Economic Development Districts (see g/) may still receive EDA assistance. Such areas may qualify as a special impact area or a redevelopment area (e.g., a pocket of poverty, such as where an area with high unemployment is surrounded by relatively well-off areas).

--Moreover, even though the 302(a) program is managed centrally by headquarters, all applications from Texas, Oklahoma, and Louisiana go through the Southwestern Regional Office for review and comment. So, even here, the regional office can exercise considerable influence.

In concluding, the Region VI Coordinator opined that, while EDA headquarters probably would not mandate a focus on the Southwest's oil and gas issue, headquarters certainly would not object to regional office initiatives. This opinion is somewhat reflective of the EDA Assistant Secretary for Economic Development's guidelines for preparing regional strategies which state, in part, that:

> "The selection of projects cannot be accomplished by formula. Project selection must ultimately be the product of the good judgment of the Regional Director and the regional staff. Nevertheless, there are certain principles which must be followed in the selection of projects. These principles, in order of importance, can be stated as follows:
>
> "a. Relationship to economic development. The more closely a project is related to economic development, as distinguished from general community development, the more weight it should be given in the selection process. * * *
>
> "b. Strategic planning. EDA should encourage sound economic development planning. More weight should be given to projects which are an integral part of a plausible and practical economic development strategy, as opposed to isolated projects or projects whose strategic relationship is forced or tenuous." (Underscoring supplied.)
>
> * * * * *
>
> "f. Timeframe. In general, projects whose impact will be felt sooner, should be given consideration over projects whose impact may be over a medium or longer term. * * * However, such preferences as these should be applied with caution and good judgment. EDA does not mean to rule out sound long term strategic planning." (Underscoring supplied.) 1/

1/Economic Development Administration Directives System, Bulletin No. 85-78: Assistant Secretary's Instructions for Fiscal Year 1979, December 14, 1978, pp. 14-15.

industry as being a current problem. But, it is a very serious, potential problem. There should be an indepth analysis of what needs to be done. This analysis is something that the agency's research division 1/ (at headquarters) should be doing.

In summary, the regional office representatives' comments were that the regional strategy has not been used to address the region's oil and gas dependency, for various reasons--the strategy is not really a strategy; the regional office does not control all EDA programs in the region; and the issue is not current, but long-range.

However, the Washington 302(a) Program Specialist for the Southwestern Regional Office emphasized that the regional office does have authority to address regional concerns, such as the oil and gas issue. His comments are paraphrased as follows:

--Even though regional strategies are a relatively new concept within EDA, a region can develop a strategy to focus on a particular issue.

--For instance, to help assure that a specific issue, such as diversification relative to the oil and gas industry, is being addressed, the regional office could require that applicable areas' Overall Economic Development Programs recognize the issue and show in their strategies and project requests how they plan to deal with the issue. The regional office is really in the best position to identify regional issues and to assure that the region's various Overall Economic Development Programs address such issues. After all, the Overall Programs themselves are developed with EDA planning assistance funds, either 301(b) or 302(a), as applicable. [See fig. 12.]

--The 301(b) program is decentralized, i.e., applications are approved by the regional office. Thus, the regional office could disapprove certain applications deemed inconsistent with the regional strategy.

1/The research division's activities are discussed later in this chapter.

are pushed out beyond 1 year, may eventually address the issue of natural resource depletion.

The head of the 302(a) program in Texas' Budget and Planning Office stated that, in his opinion, the economic importance of the oil and gas industry in the State does not pose a serious problem because areas such as Houston, are very diversified. The office's Executive Director commented that the office's planning function is fairly synonymous with grants administration rather than long-range planning. However, the Executive Director is a steering committee member of Texas 2000, a comprehensive, long-range planning effort, one focus of which includes consideration of the fiscal impacts of declining oil and gas reserves. The committee anticipates that a portion of the State's 302(a) funds will be allocated to the project.

301(b) program
not issue oriented

As shown in figure 12, another applicable planning assistance program is 301(b) grants to Economic Development Districts. However, the program officer for Region VI emphasized that the program is to foster a district-level planning capacity, rather than mandate or suggest that specific development or diversification issues be addressed. His explanatory comments are paraphrased as follows:

--EDA's planning assistance aid, as is that of other Federal programs (such as HUD's 701 Comprehensive Planning Assistance Program), is based on a building block or bottom-up approach, which begins at local levels (communities, counties, and districts).

--Planning must begin at the bottom, the local levels. The people there are closest to the problems. They are best able to identify and decide how to solve important issues.

--So, a primary focus of EDA's planning assistance is to help assure that local levels have the capacity to plan. The agency thus provides funds to support a continuing planning staff.

In summary, the program officer's comments were that the 301(b) program is not designed to be issue directive or suggestive.

On the other hand, as was pointed out by several other officials, there is nothing incompatible between a bottom-up approach to planning and the agency's becoming more involved

Planning assistance programs relatively passive

As mentioned above, an integral part of EDA's programmatic activity is the agency's comprehensive economic development planning programs, such as the 302(a) and 301(b) programs shown in figure 12. The purpose of these assistance programs is to foster development and continuity of planning processes,

> "* * * to help States, communities, and multicounty development districts define and achieve their economic goals through orderly and coordinated long-range planning." (Underscoring supplied.) 1/

As discussed below, these planning programs' managers have not encouraged applicable grantees to include a focus on the oil and gas diversification issue.

Lack of diversification policies by 302(a) State government grantees

One of the goals of EDA's 302(a) planning assistance funding to State governments "is to improve the coordination between State policy development and the activities of sub-State districts." 2/ As discussed in chapter 5, the Southwest region's 302(a) State government grantees--Louisiana's State Planning Office, Oklahoma's Department of Economic and Community Affairs, and Texas' Budget and Planning Office--have not formulated diversification policies relative to the oil and gas industry. 3/ For example, when queried about petroleum policy issues, the Director of Louisiana's State Planning Office responded that the world has enough oil and gas for another 300 years. The Director of Oklahoma's 302(a)-recipient agency commented that the State's dependence on depletable oil and gas resources does create a need for long-range planning but current attention is being given to developing a planning process which, as planning horizons

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1/Economic Development Administration, 1978 Annual Report, p. 23.

2/Economic Development Administration, 1978 Annual Report, p. 26.

3/Louisiana, however, has just completed a strategy document which may form the basis for diversification planning (Louisiana Economic Development Investment Strategy," Louisiana State Planning Office, July, 1980).

the agency's existing legislative authority is clearly broad enough to permit the Division's focusing on the oil and gas issue.

--However, while the EDA is interested in long-range planning, such interest generally is for poor or distressed areas and not for oil and gas areas.

--In essence, only current problems receive attention.

As the reader may surmise from these discussions, "current" is the recurring and operative word used by EDA officials--in both the region and headquarters. In effect, the Southwest's fiscal and economic reliance on the oil and gas industry generally is not seen as an EDA issue because such reliance is not viewed as a current problem. Yet, in our opinion, being current is simply a matter of perspective. Today's current problems were yesterday's long-range problems. Long-range planning is important so that current action can minimize expected long-term problems. EDA's charter is such that the agency should anticipate long-range regional problems.

(Footnote 3/ continued)

vitality of the High Plains Region, the Secretary of Commerce * * * is authorized and directed to study the depletion of the natural resources of those regions * * * presently utilizing the declining water resources of the Ogallala aquifer, and to develop plans, to increase water supplies in the area and report thereon to Congress * * * In formulating these plans, the Secretary is directed * * * to examine the feasibility of various alternatives to provide adequate water supplies in the area * * * to assure the continued economic growth and vitality of the region * * *."

The Congress, in October 1976, authorized $6 million for the study, designed to focus on the economic future of those areas in Texas, Oklahoma, Kansas, Colorado, New Mexico, and Nebraska which draw water from the dwindling Ogallala aquifer. A High Plains Study Council (with representatives from the six States and EDA) was formed to guide the comprehensive (42 months) study and assure a coordinated strategy to address the area's problems.

in assuring that important regional issues are addressed. The building block principle is not disturbed if the regional office requires district planning to include a focus on long-range problems, a comprehensive program approach, rather than deal solely with immediate or current concerns, a project-by-project approach, as is often the case now. In fact, the former approach accords with the statutory purpose that "assistance be available for planning for economic development prior to the actual occurrences of economic distress in order to avoid such condition * * *." 1/

Research activities fail to address the issue

Basic and applied economic research designed to meet EDA's planning and operating needs is a primary function of the agency's research division (see fig. 12). This function includes:

> "* * * the design and use of information systems; the analysis of regional, State, and local economic conditions; the study of changing economic, demographic, and political structures and institutions; and the development and use of appropriate projections, analytical tools, and impact analyses." (Underscoring supplied.) 2/

The research division representatives informed us that the agency has not undertaken or planned research regarding the issue of the Southwest's fiscal and economic dependence on the oil and gas industry. Their additional comments are paraphrased as follows:

> --The division probably does have a role in this issue. Perhaps the best fit in terms of a parallel precedent is the "Six-State High Plains-Ogallala Aquifer Area Study," which required special legislation 3/; but

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1/Public Works and Economic Development Act of 1965, as amended; P.L. 89-136; 42 U.S.C. 3121.

2/Economic Development Administration, 1978 Annual Report, p. 28.

3/The study's intent, as stated in the Water Resources Development Act of 1976, is:

> "Sec. 193. In order to assure an adequate supply of food to the Nation and to promote the economic

or issues as a requirement for 701 program assistance. That is not the nature of the program. The program's purpose is to enhance planning capabilities at State and local levels.

--However, despite the general non-issue-directive nature of the 701 program, the agency has occasionally created aid packages to assist planners confronted with specific needs, such as for the long-term needs of areas experiencing rapid growth (and decline) related to energy. 1/

--Along this line, the 701 program certainly can be used for long-range planning projects, such as diversifying a region's economic base. This use or purpose would fall within the 701 Program's three broad national objectives. 2/

--Assuming a need is shown, there are a number of ways in which 701 planning assistance can focus on the oil and gas diversification issue. The most appropriate way, from HUD's viewpoint, is for State and sub-State applicants to identify the issue in their request for funds.

--Another way is for the area offices to take the initiative (in approving 701 applications) by requiring that applicable Overall Program Designs [see fig. 13, d/] include a focus on the oil and gas issue. But, the area offices would first

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1/For example, an applicable planning document is: U.S. Department of Housing and Urban Development, Office of Community Planning and Development, Rapid Growth from Energy Projects - Ideas for State and Local Action - A Program Guide, HUD-CPD-140, April 1976.

2/Specifically, the applicable national objective is presented in the Federal Register as follows:

"This rule focuses the Comprehensive Planning Assistance (701) Program more directly toward the achievement of the following three National Policy Objectives as expressed by the President in * * * [his] Urban Policy statement to Congress on March 27, 1978: * * * (3) promotion of orderly and efficient growth and development." (Underscoring supplied.) Federal Register; Vol. 44, No. 183; September 19, 1979; p. 54432.

HUD's COMPREHENSIVE PLANNING ASSISTANCE (701) PROGRAM NOT DIRECTIVE

Similar to EDA's planning programs, HUD's Comprehensive Planning Assistance Program has not focused on the southwestern oil and gas issue. This program, perhaps better known as the 701 Program, 1/

> "* * *is a continuing effort by the Federal Government to encourage and financially support general purpose State and local government, and regional combinations of local governments, in upgrading their comprehensive planning and executive management capabilities." 2/

The 701 program has been described as the broadest of Federal planning programs, because it is the only one which provides assistance to all governmental levels for a full array of comprehensive planning activities. Given the program's broad applicability to State and sub-State needs, HUD, as EDA, could have an important role in assuring that the Southwest's oil and gas dependency issue is addressed.

Yet, the agency's role, though clearly relevant to long-term planning, may not readily be used to address this important regional issue. For example, as shown in figure 13, the 701 program's policy and operational procedures are established by HUD's Office of Planning and Program Coordination. The office's acting deputy director emphasized that HUD headquarters, in all likelihood, would not consider having the agency's southwestern area offices include a focus on the oil and gas issue. His comments are paraphrased as follows:

- --The 701 program has been largely decentralized; area offices are now responsible for reviewing applications and granting awards.

- --Every State or area-wide organization receiving 701 assistance must develop an Overall Program Design [see fig. 13, d/] which must include a housing and a land use element. Generally, except for these two requirements, HUD does not mandate specific planning projects

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1/The program is authorized by Section 701, Housing Act of 1954, 68 Stat. 640 (40 USC 461).

2/U.S. Department of Housing and Urban Development, 701 Comprehensive Planning Assistance, HUD-CPD-112(2), August 1977, p. 1.

Notes:

a/The Assistant Secretary for Community Planning and Development has the primary responsibility for administering the 701 program.

b/Under the direction of the Assistant Secretary (a/), the Office of Planning and Program Coordination develops program policy and operational procedures.

c/Under the guidance and monitoring of the central office (b/), the regional office carries out operations and project administration. However, the 701 program generally has been decentralized to area offices.

d/Essentially, HUD's area offices are in charge of the 701 program. Once headquarters has allocated (by formula) 701 funds to the regions, the area offices negotiate directly with State government (e/) and certain metropolitan area (g/) applicants.

As part of their request package for 701 funds, each applicant must submit an Overall Program Design. This is a 3-year work program (to be updated annually) which focuses on specific objectives to be achieved by the applicant. A comprehensive plan is the end product of this process.

e/The State government 701 grantees in the Southwest are Texas' Budget and Planning Office, Oklahoma's Department of Economic and Community Affairs, and Louisiana's Department of Urban and Community Affairs. Recall that the Texas and Oklahoma agencies are also recipients of 302(a) funds (see fig. 12, f/).

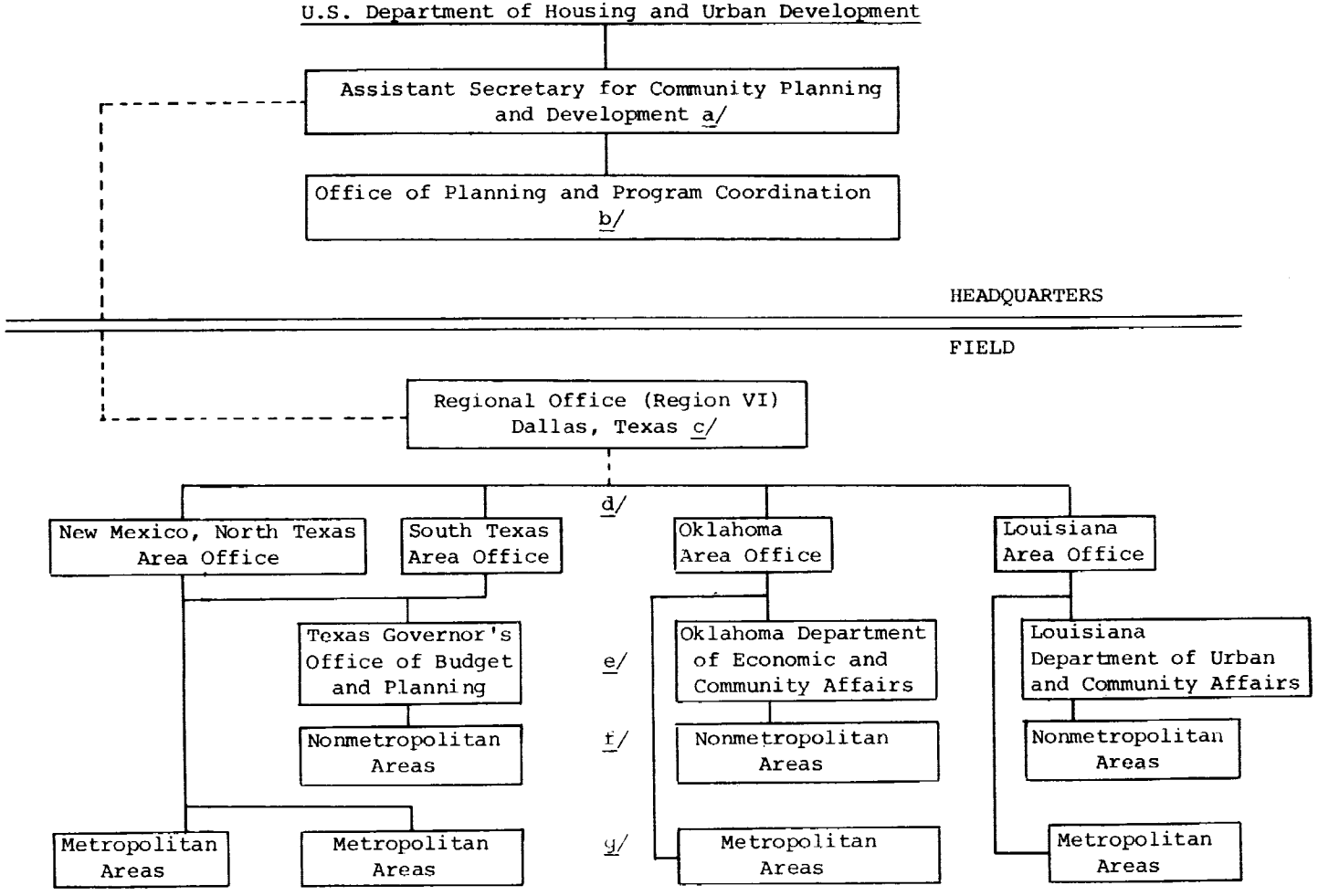
The State government grantees determine how 701 resources are distributed to non-metropolitan areas (f/).

f/Nonmetropolitan areas include planning organizations whose jurisdiction should include one or more counties and one or more units of local government but may not include any portion of a metropolitan area. These organizations receive 701 assistance through the State.

g/Metropolitan areas include planning organizations whose jurisdiction should include the SMSA plus any contiguous county or counties now urbanized or likely to become urbanized in the foreseeable future. These organizations receive 701 assistance directly from the area office or through the State agency.

Figure 13

HUD Organization for the Comprehensive Planning Assistance (701) Program for the Southwest



"The Ozarks Region has a great many mineral resources. Most of these, however, are owned and controlled by economic interests and public agencies which are national in character. Thus, they are utilized in response to national needs and constraints, and there are few opportunities to exert regional influence upon their development.

"* * * The complex nature of the federal regulation of energy use makes it difficult to understand how the region's energy resources can be factored into a regional development program, but continued study will be devoted to this problem." 2/

However, an ORC staff member, the Program Officer for Energy, informed us that since 1976 the Commission has proposed several energy-related, technical assistance projects--some of which perhaps could even be viewed as being preliminary projects to focusing on the suggested fiscal and economic base dependency issue. One project, for instance, involved identifying and evaluating energy policy alternatives for the region and the States. 3/ The project's purpose was to identify and evaluate energy policy alternatives for the region. As stated in the project study:

"A major factor in economic stability and development is the availability of natural gas and other energy resources to fuel the region's industries and electric utilities which have depended on natural gas as a prime fuel.

"* * * The continued economic growth and well-being of the Ozarks region will depend on the ability of the

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(Footnote 1/ continued)

"initiate and coordinate the preparation of long-range overall economic development programs for such regions, including the development of a comprehensive long-range economic plan approved by the Secretary [of Commerce]."

2/Ozarks Regional Commission, Economic Development Action Plan, Executive Summary, July 1976, p. 5.

3/Ozarks Regional Commission, Regional Energy Alternatives Study, August 1977. The study was performed under contract to the ORC by Mathtech, Inc., Princeton, New Jersey.

need permission from headquarters to require such a focus through 701 planning.

--In any event though, insofar as concerns Texas, Oklahoma, and Louisiana, the central issue is perhaps a need to plan for current prosperity rather than for very long-range downside effects.

--In this perspective, the Congress is unlikely to look with favor on any suggestion that long-range planning is needed for the Southwest. HUD headquarters, at least, is not likely to suggest that area offices in the Southwest focus on this issue. The agency is more concerned with real, immediate problems and expects more short-range benefits from grantees' planning efforts.

In essence, should these comments represent HUD's unalterable position, then 701 assistance is likely to address the Southwest's oil and gas dependency issue in piecemeal fasion, at best, if at all. That is, while initiatives may be proposed by State and sub-State grantees, such action alone is not sufficient to assure either a regional perspective or a continuing effort.

ORC's REGIONAL ACTION PLAN NOT FOCUSED ON THE FISCAL AND ECONOMIC BASE ISSUE

ORC's Economic Development Action Plan ("Regional Action Plan") recognizes the importance of nonrenewable energy resources in meeting the region's energy needs, such as fueling the region's industries and electric utilities. The plan, however, does not address the region's fiscal and economic base reliance on the oil and gas industry and the related need for long-range planning (see fig. 14). But, Commission representatives were much more receptive of the issue than either EDA or HUD.

The Commission's 1976 plan 1/ addresses hydrocarbon resources only in very general terms. For example, some pertinent excerpts are:

1/This "Regional Action Plan", only ORC's second but still the most recent, was prepared pursuant to Section 503(a)(2) of the Public Works and Economic Development Act of 1965, as amended, which requires that each of the commissions authorized under the Act shall:

Notes:

a/Established under the Public Works and Economic Development Act of 1965, the Ozarks Regional Commission is a Federal-State partnership concerned with planning and fostering orderly economic growth of member States. By statute, the Commission is required to develop long-range comprehensive plans to serve as guidelines for program and project funding. That is, all projects selected and funded under technical assistance and supplemental grant programs must be in support of a Regional Economic Development Action Plan.

b/The Secretary of Commerce is charged with providing coordination and liaison between the Federal Government and the Commission, which includes giving policy guidance to the Federal Cochairman (see c/ and d/). The Commission's appropriation requests are submitted to the Congress by the Secretary.

c/The Commerce Secretary's functions with respect to ORC (and other regional commissions) are carried out through the Office of Regional Development.

d/The Commission has a Federal Cochairman (headquartered in Washington, D.C.) appointed by the President and confirmed by the Senate.

e/Commission membership is composed of a Federal Cochairman and the Governors of the respective States, one of whom serves as State Cochairman. All substantive decisions (such as approval of a regional development plan or implementing investment programs) made by the Commission require the presence of a quorum of the State members and the affirmative vote of the Federal Cochairman and a majority of the State members.

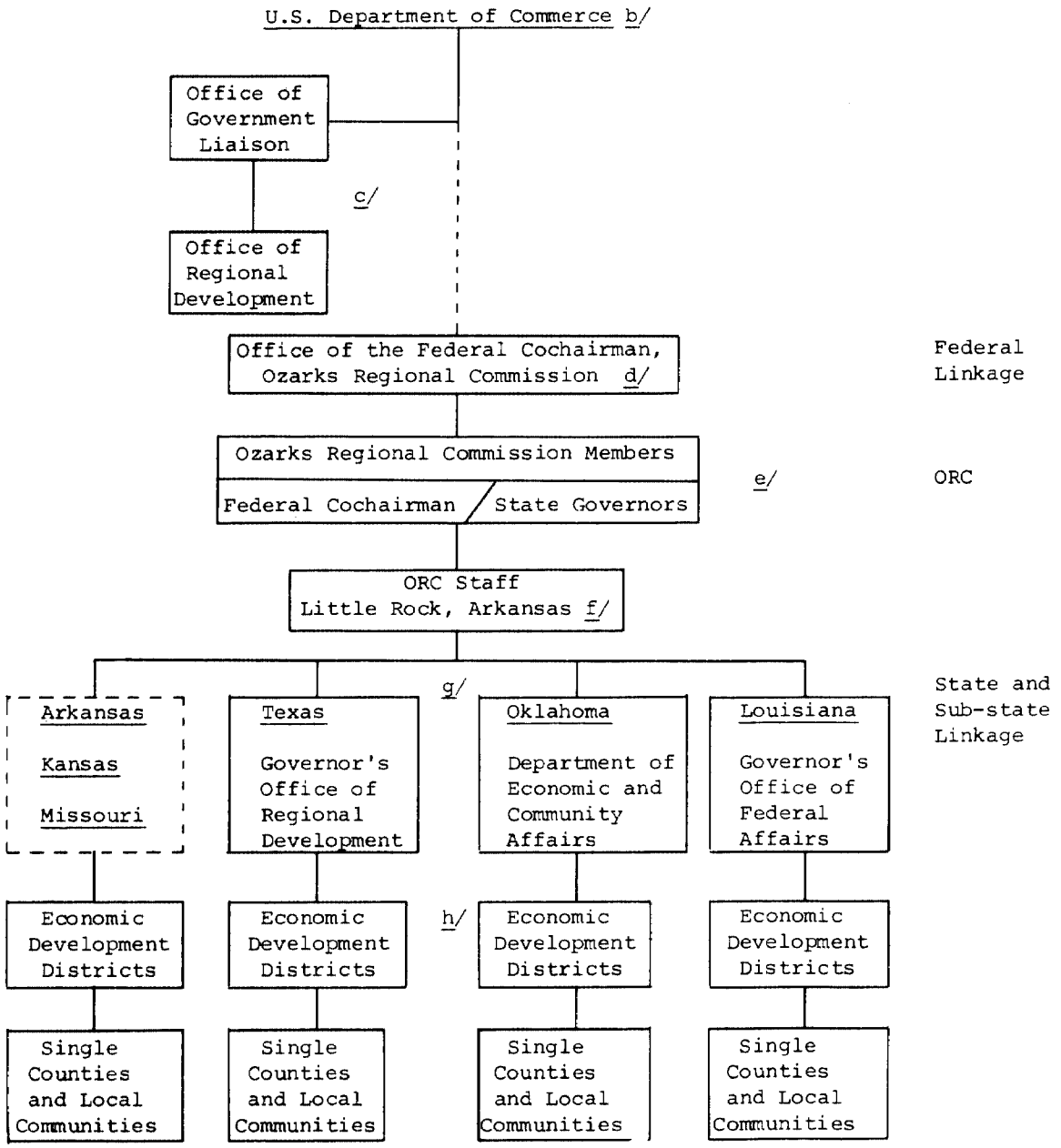
f/The Commission is assisted by a staff which is funded jointly by the member States and the Federal Government. The Staff Director manages the ORC's activities within policy guidance provided by the State and Federal Cochairmen.

g/Member States are Arkansas, Kansas, Missouri, Oklahoma, Texas, and Louisiana. The agencies shown here house the Commission's staff liaisons for the respective State. For example, Louisiana's ORC office is part of the Governor's Office of Federal Affairs and serves as staff for the Governor in his role as a Commissioner for the ORC.

h/These are generally the same Economic Development Districts designated by EDA (see fig. 12, g/).

Figure 14

ORC Organization for Economic Development Policy and Planning a/



as ORC Commissioners, have project approval authority.

--Moreover, once a project is completed, the Governors decide the extent to which the project's recommendations are implemented in their respective State.

--In short, any decision about what needs to be done in a particular State, whether it is long-range planning for fiscal and economic base diversification or any other issue, depends upon the Governor's list of priorities.

--Generally, any plans to diversify the fiscal and economic bases of the States relative to the oil and gas industry would have to recognize State differences; each State has peculiar diversification problems.

--In this vein, the Commission, which is a Federal-State partnership, is chartered to work with the States in the region, both individually and collectively. On the other hand, other Federal agencies' mandate, such as that of EDA and HUD, is not so much to work with the States but to simply carry out Federal programs in the States. So, in this perspective, the ORC is probably the one Federal-related entity best able to stimulate interest and action from the States.

This last thought about the Commission's special partnership with the States was also iterated by the Special Assistant to the Federal cochairman. This ORC representative added that long-range fiscal and economic base diversification planning relative to the oil and gas industry was probably an issue which the Commission should have thought of on its own--especially since such planning is definitely in line with the Commission's recent and ongoing energy projects, such as the Regional Energy Alternatives Study. Additionally, the special assistant said that, if priorities were rearranged, the Commission's present budget was adequate to sponsor the planning; however, he noted that any decision on such a project would rest with the Governors.

Comparatively, as the preceding sections show, the other two Federal agencies' (EDA and HUD) preliminary reactions to the Southwest oil and gas issue varied widely from ORC's. Generally, EDA and HUD representatives emphasized that their agencies' programs concentrated on real, immediate concerns; thus, they saw no need to address possible long-range fiscal and economic base problems in the Southwest

states to alleviate the impact of the gas shortage by achieving a balanced and orderly transition to alternative fuels for both industry and utilities. * * * there are many policy options at the State or regional levels which can help to alleviate or avoid future energy problems." 1/

Another technical assistance project mentioned by ORC's Energy Program Officer was an energy information system for Kansas, a pilot program which, if successful, could be used in other States. The computerized system is to be capable of evaluating the economic impacts of energy policy options. As stated in the draft report, "The availability of reliable energy information is essential to understanding the dimensions of our energy problems and developing appropriate solutions." 2/

Finally, the program officer mentioned that the Commission considered sponsoring a project to assess emerging careers in energy but it was not funded this year. Essentially, this project would have determined the extent that training directed toward solar and other energy sources should be included in vocational/technical curricula. The thrust of the proposal was that orderly transition to alternative energy sources will require appropriate educational facilities.

Other than sponsoring technical assistance projects such as these three, said the Commission's Executive Director, it is difficult for ORC to factor oil and gas resources into the region's Economic Development Action Plan. However, one way to do this would be to foster technical assistance projects designed to develop new energy resources. Similarly, he added, any Commission influence regarding the States' fiscal and economic dependency on the oil and gas industry would be through projects or studies to detail the various scenarios or options open to the States. The Staff Director's additional comments may be paraphrased as follows:

--Any proposed project or study must first have the Governors' interest and concurrence. The Governors,

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1/Ozarks Regional Commission, Regional Energy Alternatives Study - Oklahoma Summary, August 1977, p. 1.

2/Development Planning and Research Associates, Inc., Kansas Energy Profiles, Manhattan, Kansas, December 1979, p. ii. (Draft final report--subject to format revision only.)

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

The southwestern States' public and private sectors are heavily dependent on the oil and gas industry--an industry which is currently healthy, stimulated by expanding demand and rising energy prices. But the current activity in these industries cannot persist indefinitely; the nonrenewable resource base will inevitably diminish. These potentially troublesome trends should be addressed by Federal, State, and sub-State planning processes.

Generally, the various, existing planning assistance programs are partnerships among the Federal, State, and local governments. Although the lower governmental levels often decide the course of planning and development efforts (a bottom-up approach), the Federal Government nonetheless retains essential coordinative and redistributive roles. Too, the Federal Government frequently provides much of the funding for planning processes. Through oversight of applicable Federal agencies' operations, the Congress can help assure that potentially severe economic dislocations in the Southwest's basic industry are anticipated in time to take mitigative actions and thus preclude the need for huge Federal aid expenditures in what could become a distressed area.

A major function of any planning activity is to anticipate future developments that should be considered in current decisions and policies. The Federal Government has a strong interest in encouraging such forward planning. This is attested to by various examples, including major corporations, such as Chrysler, major cities, such as New York, and major regions, such as New England (recall its mid-20th century decline as a leading textiles manufacturing area).

To a large extent, a region's long-term fiscal and economic vitality and resiliency depend upon diversification. Appropriate means exist for encouraging diversification through planning decisions and policies. The complexities and difficulties involved do not negate the need. Our basic message is that the several, existing Federal planning assistance programs should include a focus on potential fiscal and economic base dislocations in the Southwest stemming from declining petroleum production and reserves levels.

CONCLUSIONS

As the preceding chapters show, the State budgets and economies of Texas, Oklahoma, and Louisiana rely heavily on the oil and gas industry. Thus, the region's fiscal and

stemming from the region's heavy reliance on the oil and gas industry. However, whereas EDA headquarters probably would not object to regional office initiatives, HUD headquarters seems reluctant to delegate such discretionary authority to area offices.

Other aspects of Federal planning programs can be similarly assessed--procedure controls substance. EDA's regional strategy for the Southwest is a case in point. Largely, the strategy functions only as a funds-distribution mechanism because State and sub-state proposals are rarely evaluated in relation to identified, regional issues. The reasons for this are several but perhaps may be expressed simply as "it is the American way." That is, in this country, any kind of central economic development planning traditionally has been viewed as being anathema to the private enterprise system and a representative democracy.

In turn, the concept of regional economic development policies--planning for multi-State areas--has been slow to develop. One development, though, has been creation of regional planning bodies, such as the Ozarks Regional Commission, where the Federal cochairman deals with the pertinent State governors as an equal and any policy decision is subject to veto at either the Federal or the State level.

It must be recognized that, even though the Federal Government is the arbiter of national interests (which includes multi-State or regional issues), effective program implementation depends more on a cooperative coalition, with "grass roots" input, than on explicit authority. One means to improve the quality of local input might be to enlist the support of research centers in the various regions. These centers might serve as channels for disseminating information on methods to local planners and the centers could also provide the needed research to support extensive regional planning efforts.

The existing, Federal planning programs discussed here recognize and, indeed, are built around the "grass roots" concept, perhaps to the extent of being a fault at times. Still, however, as discussed in chapter 6, there is nothing incompatible between a bottom-up approach to planning and the Federal Government's being more proactive in assuring that important regional issues are addressed. This principle is reflected in the following recommendations.

RECOMMENDATIONS TO THE SECRETARY OF COMMERCE

We recommend that the Secretary of Commerce have EDA use its programmatic elements to help assure that applicable Federal, State, and substate planning processes include a focus on the Southwest's oil and gas issue. EDA has several complementary programmatic options which could be helpful. Concerning options available to the Southwestern regional office, we believe that the office's regional strategy should

economic outlook is very dependent on continued oil and gas availability. Resource assessment can be a very inexact endeavor; estimates vary widely because technological breakthroughs are not predictable, much geophysical information remains to be learned, and much depends on the economic or pricing situation. Moreover, it is difficult to determine the extent to which energy-led economic growth promotes expansion in the other sectors, such as manufacturing and service industries, and creates new, internal factors or cumulative advantages for self-sustaining regional growth. Nonetheless, the region's oil and gas reserves and production have been declining since the early 1970s, and prospects for reversing this trend are not optimistic.

Heavy reliance on depleting, nonreplenishable resources should be continuously reassessed. The data and analyses presented in this report indicate such a need. In recent years, the Southwest region has become more specialized, as measured by increased employment shares in oil and gas industries relative to other sectors of the economy, despite declining oil and gas reserves and production. Yet, despite substantial oil and gas price increases, the trend in reserves and production has not turned around.

So, the facts strongly suggest that long-range planning is needed. However, as discussed in chapter 5, the States generally have done little planning. The limited interest which does exist relates almost singularly to public revenues. Concern for potential private sector ramifications is virtually nonexistent, perhaps reflective of the thought that "business will take care of itself."

However, given relatively high wages and petroleum derivatives' use in numerous end products, the ripple or multiplier effects throughout the economy make the oil and gas industry a leader in generating the Southwest region's economic growth. The leading position of the oil and gas industry in the Southwest's economy underscores the need for long-range planning. The Federal Government, as discussed in chapter 6, provides planning assistance through various agencies and programs--for example, EDA's 302(a) program and HUD's 701 program. But, generally these programs are geared to developing a planning capacity within each State's executive branch, particularly within the Governor's office. The intent is that procedure (i.e., capacity building) will stimulate substantive planning--comprehensive policy formulation regarding specific, important issues, both short-run and long-run. In this perspective, then, the substantive impact or contribution of these Federal programs is only as good as the States' planning processes.

Further, even though HUD has no regional strategy, the 701 program's State and substate grantees in Texas, Oklahoma, and Louisiana are, in many instances, also recipients of EDA and ORC assistance. In this regard, we recommend that HUD's area offices be cognizant and supportive of the other Federal agencies' issue-oriented efforts.

RECOMMENDATIONS TO THE CONGRESS

We recommend that the Congress consider the following oversight options to assure that the Southwest's oil and gas issue is addressed.

--The preceding sections made several recommendations concerning the regional strategies and/or planning assistance programs of EDA, HUD, and ORC. Through the annual authorizations and appropriations processes, the Congress can monitor the Federal agencies' progress in meeting the recommendations.

--There is much in common among the planning objectives of EDA, HUD, and ORC. This suggests the possibility of composite, coordinated planning documents. To facilitate oversight, as well as to promote greater efficiency and effectiveness of planning and development efforts, the Congress could require the applicable Federal agencies to follow a common regional strategy or action plan.

MATTERS FOR CONGRESSIONAL CONSIDERATION

The Southwest's long-term, energy-related issues are of concern nationally because the southwestern States provide the majority of the Nation's oil and gas production. This national aspect contributes to political considerations increasingly permeating all aspects of energy. For example, even the dichotomy between energy-producing and energy-consuming States, in terms of severance tax revenues, is becoming a national issue which may demand congressional attention.

In its policymaking role, the Congress should be aware that broad, national economic-energy policies may produce inequitable effects among the various regions because of regional differences in industry and natural resources concentration. Cartel-established, world oil prices and incremental decontrol of domestic oil and gas prices exacerbate regional differences in energy endowments and needs.

be just that--an issue-oriented strategy, with specific goals and objectives to address identified issues. The strategy for the Southwest should recognize the oil and gas issue; and the regional office can take positive actions--particularly in reviewing applications for 301(b) and 302(a) planning assistance funds--to assure that the issue is (1) considered by State government grantees in Texas, Oklahoma, and Louisiana; and (2) included in applicable sub-State areas' Overall Economic Development Programs.

Moreover, we think that the EDA southwestern regional office's planning and operating needs--especially in preparing, monitoring, and updating an issue-oriented economic development strategy--should be supported by the agency's research division. For instance, the division can identify or undertake specific research programs or projects, such as developing a multi-state data base and monitoring system regarding oil and gas resource depletion and the related fiscal and economic base impacts, to provide an early warning capability so that officials of government at all levels can anticipate better and plan their responses.

If long-range planning, which includes issue-oriented research and strategy development, is to be truly useful, it must reflect the policy needs and concerns of the States. That is, the value of planning efforts will depend largely on central State policy involvement--the Governor's lists of priorities. We recommend that EDA's efforts be coordinated with those of the Ozarks Regional Commission. Ideally, EDA's Southwestern Regional Strategy, which seeks input from State and substate grantees, and ORC's Regional Action Plan, which is approved by the Federal cochairman and the States' Governors, should be mutually reinforcing.

RECOMMENDATIONS TO THE SECRETARY OF HOUSING AND URBAN DEVELOPMENT

Unlike EDA and ORC, HUD does not formulate multi-State development strategies. The 701 program, for example, is managed by area offices in each State and pursues broad national goals. We believe, however, that the area offices and the 701 program, with their direct influence on grantees' Overall Program Designs, can be helpful in addressing regional concerns, such as the Southwest oil and gas issue. Therefore, we recommend that the 701 program's administrator, the Assistant Secretary for Community Planning and Development, direct area offices in Texas, Oklahoma, and Louisiana to consider this issue in reviewing 701 applications and overall program designs.

Prior to the Act's passage, the regional growth policy process was being considered by applicable congressional committees and Federal agencies. For example, at the Department of Commerce's request, the Old West Regional Action Planning Commission has undertaken a prototype program to implement such a policy process. A year into its program, the Commission reports some positive results and views the program's continuation as highest priority, especially given that one of the process' primary strengths is its ability to achieve regional objectives within existing budgetary levels.

AGENCY COMMENTS

In gathering information for this report, we interviewed several Federal and State agency officials (see app. VII). Each agency was sent a draft copy of the report and given the opportunity to make comments (see app. VIII). In general, their comments were favorable with many praising the study, while others were very careful to define or clarify the position of their agency vis a vis the report's message. A few, however, felt that we did not prove the need for long-term planning. We continue to believe this report does document such a need.

Even though national policies traditionally have had inequitable effects among the various regions, the less-advantaged or less-developed regions have been slow to use political power to influence national policies and priorities. This is perhaps caused by a number of factors, including the traditional reliance on the free market system, the prevailing attitudes of local-regional independence, and the relative cultural similarity among all regions. One result is that the Federal Government, in formulating national policies, has not been fully sensitive to disparities among the various regions' economies.

Although the United States has no national policies specifically intended to affect the regional distribution of economic activities, the current transitional era has witnessed the birth of a slew of regional, political coalitions. Moreover, the concept of balanced regional economic development has become a topic of congressional interest. It may well be that energy, as the "new economic development wildcard," 1/ will necessitate the Congress increasing its efforts to assure that national economic policies consider and reflect regional concerns and differences.

In this regard, the Housing and Community Economic Development Act of 1980 provides a basis for creating a functioning, national partnership to establish and achieve growth policy and economic development goals. One purpose of the proposed Act is to improve Federal agencies' abilities to consider specific regional differences, perspectives, and needs.

To accomplish this purpose, the Act incorporates and extends President Carter's concept of a "regional growth policy process" designed, in the words of a January 1979 Presidential memorandum, to enhance "the ability of States and localities to shape Federal policies in behalf of regional concerns * * *." 2/ That is, under the envisioned policy process, State and regional plans would guide not only the Title V regional commissions but also all Federal agency activities relating to regional growth and development.

1/Shirley P. Burggraf, "Energy: The New Economic Development Wildcard," January 1978--a paper prepared for the White House Conference on National Balanced Growth and Economic Development, under a grant from EDA.

2/As reported in Leonard U. Wilson, Council of State Governments, "Integrating Development Planning and Programming," May 1980, a paper prepared for the Office of Regional Development, U.S. Department of Commerce.

Chapter 5: To determine whether the States are doing any planning to diversify their revenue sources and economic bases, we interviewed numerous State officials. The extent of fiscal planning is presented as each State's interest in such planning (based on discussions with representatives from each State's budget office, tax commission, or comptroller) and as potential alternative revenue sources (including a comparative analysis of the States' fiscal capacity and tax effort, as measured by the Advisory Commission on Intergovernmental Relations' representative tax system).

The economic base diversification section is based on visits (which included interviewing key officials and reviewing planning documents and issue papers) to each of the States' various agencies responsible for economic policy and functional planning (see figs. 9, 10, and 11). Also, we contacted academic (University of Texas, Oklahoma University, and Louisiana State University) and nonprofit, corporate research groups in each State (Texas Research League; Oklahoma's Kerr Foundation, Inc.; and Public Affairs Research Council of Louisiana, Inc.) and reviewed general State-planning literature, particularly that sponsored by the Council of State Governments.

Chapter 6: To determine whether the Federal Government is encouraging long-range planning for regional fiscal and economic base diversification, we focused on the major agencies having broad, planning-assistance responsibilities--EDA, ORC, and HUD. We interviewed headquarters and regional officials and reviewed the various planning programs' legislation and implementing guidelines and obtained an overview of the Southwest's activity in each program, including the role played by State and substate grantees.

As the preceding overview suggests, this report generally may be characterized as a synthesis of existing ideas and data rather than one which makes methodological innovations. It is even possible, for instance, to synthesize the substance of the report's message from the writings of leading economists. The following excerpts serve as cases in point:

> "Regional growth typically has been promoted by the ability of a region to produce goods or services demanded by the national economy and to export them at a competitive advantage with respect to other regions."

* * * * *

> "An especially important instance of the regional effects of changes in national requirements is

APPENDIX I

SCOPE AND METHODOLOGY OF REVIEW

The scope of this report varied according to the subject matter of each chapter. Each chapter contains fairly explicit details and references to the data sources and methodologies used. A brief overview of chapters 2 through 6 follows:

Chapter 2: The importance of direct mineral wealth (severance taxes, rents, and royalties) is analyzed for the period 1960-78, using data from the U.S. Bureau of the Census' State Government Finances (see app. II); regional and State mineral wealth is compared to national averages. The section on revenue earmarking was developed based on discussions with budget officials in Texas, Oklahoma, and Louisiana and review of the States' budgets and other documents. Similarly, the outlook section draws upon interviews with State budget officials and upon review of applicable literature.

Chapter 3: Discussion of the oil and gas industry's importance within the region is based on standard, regional economic analytical techniques, such as coefficients of specialization and shift-share analyses. These techniques primarily use employment data (and payrolls, to a lesser extent) from the U.S. Bureau of the Census' County Business Patterns for 1962, 1967, 1972, and 1977 (see app. III and IV).

Chapter 4: The basic method used to develop high and low case projections of oil and gas production for 1980-90 is a form of trend extrapolation used by the U.S. Bureau of Mines (i.e., past relationships are assumed to continue in the future). In each State, certain historical relationships between production and reserves, between drilling and finding rates, and between drilling and size of discovered reserves are applied to future circumstances. The projected production figures are based on the American Petroleum Institute's production, reserves, and additions to reserves data for 1970-78 and the American Association of Petroleum Geologists' drilling statistics (see app. V).

To check the reasonableness of the projected production figures, estimates of the size of the undiscovered, recoverable reserves of oil and gas in the three States were made based on U.S. Geological Survey data. To provide an additional indicator of reasonableness and further perspective, other projections were made using linear regression and simple percentage extension of past oil and gas production growth or decline rates.

other forms of energy, but they do so with a disproportionately high percentage of their [fiscal and] economic structure linked to petrochemicals and other energy-based industries." (Underscoring supplied.) 1/

However, due largely to rising energy prices, the Southwest region is currently (and increasingly) prospering, a situation perhaps best hypothesized by the dean of regional economists, William Miernyk:

"* * * the era of cheap energy is over. It is likely that the long-run demand for energy will increase more rapidly than supply for the remainder of this century; if so, energy prices will rise more rapidly than the general price level. One consequence of this trend would be a shift of real income from energy-consuming to energy-producing States.

"* * * much of the windfall income generated by rising energy prices will remain in the net energy-producing areas in the form of higher wages, higher rents, and particularly in higher State and local taxes. Also, as energy prices continue to rise, there will be an incentive to invest in new basic energy facilities in the energy-producing States." 2/

But current prosperity, in turn, may mask the need for transition planning:

"Regions, like people, want a doctor only when they are sick. When a region is enjoying full or high and rising employment, there is no great disposition to examine its situation and prospects in detail and search for ways to gild its robust health. National attention is directed only to those regions that are in trouble * * *. We assume, in other words, that in healthy regions the workings of the market economy under existing constraints are relatively satisfactory." 3/

1/W.W. Rostow, Getting from Here to There, (New York: McGraw-Hill, Inc., 1978), pages 78 and 185.

2/William H. Miernyk, "Rising Energy Prices and Regional Economic Development", in William H. Miernyk, Frank Giarratani, and Charles F. Socher, Regional Impacts of Rising Energy Prices, (Cambridge: Ballinger Publishing Company, 1978), pages 80-81.

3/Edgar M. Hoover, An Introduction to Regional Economics, (New York: Alfred A. Knopf, Inc., 1971), p. 261.

provided by the case of petroleum and natural gas in the Southwest in recent decades. * * * The happy coincidence of these mineral fuels with rich deposits of salt and sulfur provided a resource base for a rapidly expanding chemical industry. Thus, petroleum and gas extraction and refining, responding to a huge and growing national demand, served to change the economic conditions of production throughout the entire Southwest."

* * * * *

"* * * there are two characteristics of minerals that deserve special attention: first, minerals are nonrenewable resources, so that the depletion phenomenon becomes important in assessing the relative advantage conveyed by them; second, there is an unusually high degree of substitutability among mineral products * * *."

"* * *The role of petroleum and natural gas deserves a special comment. * * * These mineral fuels are strongly conditioned by the discovery-depletion cycle, so that areas narrowly specialized in the production of these mineral fuels may well find these products to have substantial disadvantages for growth, if the depletion of reserves takes place at a greater rate than the augmentation of reserves by new discovery." 1/

The following excerpts from Getting from Here to There by Walt Rostow, a former Presidential adviser, continue the synthesis:

"* * * the era of energy derived from hydrocarbons is drawing towards a close."

* * * * *

"* * * the oil and gas reserves from conventional sources are almost certain to run down over the next generation in Louisiana, Oklahoma, and Texas. Like the nation as a whole, they face a transition to * * *

1/Harvey S. Perloff and Lowdon Wingo, Jr., "Natural Resource Endowment and Regional Economic Growth," in Joseph J. Spengler, editor, Natural Resources and Economic Growth, (Washington, D.C.: Resources for the Future, Inc., 1961), pp. 199, 196, and 202.

clause, the Supreme Court has tried to strike a balance between two interests: (a) the national interest in preventing States from establishing taxation patterns that unfairly discriminate against or are unduly burdensome upon interstate commerce, and (b) the host State's interest in compelling interstate commerce to "pay its own way."

In short, while State power to tax natural resources has not been preempted by Federal law, the commerce clause prohibits States from taxing products that are in interstate commerce and from imposing taxes which have a substantial effect on interstate commerce. Under these legal parameters, all three southwestern States tax oil and gas produced within their respective borders at varying rates.

SEVERANCE TAX RATES VARY AMONG THE STATES

The Texas, Oklahoma, and Louisiana legislatures have often opted for increases in severance tax rates when seeking additional State revenue. Texas experienced some rate changing during the earlier years of its severance tax. The Kennedy Gross Receipts Law of 1905 set the tax at 1.0 percent on the gross value of crude oil production and 2 percent on the gross receipts of pipeline companies and wholesalers. In 1907 the tax rate on crude oil production was lowered to 0.5 percent, then raised to 1.5 percent in 1919 and 2.0 percent in 1923. Since 1923 the rate has risen only three times: in 1936, in 1941, and in 1951 to the current rate of 4.6 percent. Severance taxes on natural gas production were not imposed in Texas until 1931 because natural gas production was viewed as relatively unimportant up until the early 1930s.

Among the three States, Oklahoma has had the least frequent tax rate changes. Oklahoma enacted a gross value severance tax of 3 percent on both oil and gas in 1916. The rate was raised in 1935 to 5 percent, and again in 1971 to 7 percent. There have been several changes in the petroleum excise tax, but the current rate established in 1976, 0.00085 percent of gross value, is relatively low compared to the severance tax. In 1978 a "conservation excise tax" was imposed in the amount of 7 cents per 1,000 cubic feet of natural and/or casinghead gas, less 7 percent of gross value of each thousand cubic feet.

In contrast to Texas and Oklahoma, Louisiana has made frequent changes in both the rate and the base. The State has experienced a number of swings between a tax based on quantity severed and a tax based on gross value. The original tax, passed in 1910 on both oil and gas, used quantity

SEVERANCE TAXES: A BRIEF SYNOPSIS OF PUBLIC POLICY AND CONSTITUTIONAL PERSPECTIVES

Most States with nonrenewable natural resources impose a severance tax on either the value or quantity of resources extracted. Severance taxes have been collected in Texas, Oklahoma, and Louisiana during most of this century. The Texas legislature first enacted an oil severance, called the Kennedy Gross Receipts Law, in 1905. Louisiana, although authorized to do so by the Constitution of 1898, did not impose severance taxes until 1910. Oklahoma followed soon after, enacting a gross value severance tax of 3 percent on both oil and natural gas in 1916. These long-established taxes have been subjected to various public policy and constitutional arguments.

The public policy arguments for imposing severance taxes are numerous. One of the earliest arguments was that the extracted resource belonged to the public as part of each State's heritage; thus, the public should benefit from the States' natural resources. Another argument favoring severance taxation was that it provided a disincentive for rapid exploitation by increasing the cost of extraction. It was also argued that the severance tax base could be exported to residents outside the State; that is, producers could shift the tax or increased extraction cost forward to consumers throughout the Nation. 1/ For these reasons, and the more practical ones of ease of collection and the ability to generate a substantial revenue, the severance tax has become a permanent fixture in the budgets of Texas, Oklahoma, and Louisiana.

The constitutional permissibility of such severance taxes is well established. States have a good deal of freedom in taxing the production and processing of natural resources, although the Federal Constitution's commerce clause does pose certain limitations. Generally, a State may tax oil and gas produced within its borders until the minerals enter the "stream of interstate commerce," i.e., the point at which production and processing cease and transmission in interstate commerce begins. In interpreting the commerce

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1/Note that the tax shifting argument is somewhat contradictory to the extraction disincentive argument. Tax shifting depends on the price elasticities of demand and supply. The more inelastic the demand (indicating an absence of substitutes), the more forward shifting by producers.

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Table 26

Severance Tax Rates in 1979

	Texas	Oklahoma	Louisiana
OIL	4.6% of market value if value exceeds $1 per 42 gallon barrel, otherwise 4.6 cents per barrel. Plus 3/16 of 1 cent per barrel.	7.0% of market value plus 0.085 of 1% excise tax on the value of each barrel of petroleum oil.	12.5% of market value on high producing wells 6.25% of market value for wells producing less than 25 barrels per day. 3.125% of market value for stripper wells producing less than 10 barrels per day.
GAS	7.5% of market value with a minimum of 121/1500 of 1 cent for 1,000 cubic feet.	7.0% of market value plus 0.085 of 1% excise tax of the gross value of natural and/or casinghead gas. Plus a conservation excise tax of 7 cents per 1,000 cubic feet less 7.0% of gross value of each MCF.	7 cents per 1,000 cubic feet (slightly lower rates for less capable wells) (first use tax of 7 cents per 1,000 cubic feet currently being questioned on legal grounds.)

Source: 1979 State Tax Guide, All States, Commerce Clearing House, Inc., Chicago, 1979.

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as the base. Between 1910 and 1928 there were several switches of the tax base. After 1928, the State seemed to settle on an oil and gas tax base of quantity, but continued to make rate increases whenever necessary, suggesting a degree of dependency on oil and gas revenue. The most recent increase in tax rates occurred in 1973 when the legislature again switched the tax base on oil from volume to gross value, with a rate of 12.5 percent for the most productive wells and lower rates (6.250 and 3.125) for less capable wells. The current tax rate on natural gas, also set in 1973, is 7 cents per 1,000 cubic feet (MCF).

Table 26 summarizes the current severance tax rates in Texas, Oklahoma, and Louisiana. While all three States use the gross value tax base on oil, Louisiana taxes at a rate almost 8 percentage points higher than Texas. Texas and Oklahoma use the same tax base for natural gas as for oil, and tax natural gas at about the same rate, but Louisiana taxes natural gas on a volume basis, which leads to diminished revenues when production decreases.

Table 28

Rents and Royalties as a Percent of Non-Tax (Own-Source) Revenue
(Thousands of Dollars)

Year	Texas			Oklahoma			Louisiana		
	Nontax (own-source) revenue	Rent and royalty revenue	Percent	Nontax (own-source) revenue	Rent and royalty revenue	Percent	Nontax (own-source) revenue	Rent and royalty revenue	Percent
1960	$ 150751	$ 49012	32.5	$ 52157	$ 4228	8.1	$111999	$ 74539	67.2
1961	165786	52900	32.5	53943	4373	8.1	128040	85982	67.2
1962	175217	50483	28.8	62490	5674	9.1	125278	80180	64.0
1963	192823	53411	27.7	69768	4950	7.1	152107	104471	68.7
1964	220422	59352	26.9	81261	5162	6.4	164025	107478	65.5
1965	308762	126215	40.9	89351	4141	4.6	174230	115062	66.0
1966	304993	94767	31.1	106091	5714	5.4	222495	155888	70.1
1967	311544	55600	17.8	124783	5754	4.6	208740	123075	60.0
1968	356564	64496	18.1	153662	5964	3.9	250344	156100	62.4
1969	417935	64303	15.4	165853	7154	4.3	268234	152083	56.7
1970	475553	64764	13.6	188115	5629	3.0	289801	154989	53.5
1971	514778	65911	12.8	193565	6586	3.4	304795	160497	52.7
1972	533280	65236	12.2	206170	7218	3.5	336680	165024	49.0
1973	658579	77132	11.7	222867	6557	2.9	349769	148805	42.5
1974	814077	148546	18.2	261631	9646	3.7	437152	197464	45.2
1975	899678	171099	19.0	259720	13120	5.1	391890	164963	42.1
1976	1088223	222768	20.5	315213	13933	4.4	608432	286923	47.2
1977	1257571	318186	25.3	364810	18290	5.0	516964	220514	42.7
1978	1394321	373089	26.8	393417	25928	6.6	634685	286293	45.1

Source: Various issues of U.S. Bureau of the Census, State Government Finances.

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Table 27

Severance Tax as a Percent of Total Tax Revenues
(Thousands of Dollars)

Year	Texas			Oklahoma			Louisiana		
	Total tax revenue	Severance tax revenue	Percent	Total tax revenue	Severance tax revenue	Percent	Total tax revenue	Severance tax revenue	Percent
1960	$ 777863	$182000	23.4	$275379	$ 32969	12.0	$ 452705	$137173	30.3
1961	806867	184493	22.9	285150	33969	11.9	462811	147747	31.9
1962	991501	187254	18.9	307881	34463	11.2	485272	150791	31.1
1963	1051584	191934	18.3	321917	35628	11.1	509262	164268	32.3
1964	1122553	196360	17.5	332257	37963	11.4	542627	173313	31.9
1965	1187247	202285	17.0	357571	38483	10.8	581272	179085	30.8
1966	1267084	210762	16.6	388705	39921	10.3	658571	206276	31.3
1967	1335847	224664	16.8	401030	45459	11.3	690439	215336	31.2
1968	1437971	243601	16.9	427502	45857	10.7	740679	239429	32.3
1969	1710686	244725	14.3	472562	48222	10.2	776704	241503	31.1
1970	1924788	273213	14.2	502121	50539	10.1	838792	251019	29.9
1971	2188318	307924	14.1	540918	51280	9.5	988715	256600	26.0
1972	2571960	311979	12.1	645460	73342	11.4	1105116	244456	22.1
1973	2818943	339757	12.1	694715	71456	10.3	1165677	267651	23.0
1974	3287923	525990	16.0	777522	96980	12.5	1319521	390346	29.6
1975	3636623	666876	18.3	883735	128096	14.5	1528692	548510	35.9
1976	4214273	800693	19.0	1000218	151316	15.1	1655576	558495	33.7
1977	4748947	907281	19.1	1139000	191351	16.8	1714616	495498	28.9
1978	5389980	959686	17.8	1315468	230368	17.5	1980212	476829	24.1

Source: Various issues of U.S. Bureau of the Census, State Government Finances.

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METHODOLOGY USED TO MEASURE REGIONAL ECONOMIC IMPORTANCE OF PETROLEUM AND RELATED INDUSTRIES

In measuring the regional economic importance of petroleum and related industries, chapter 3 uses employment, and to a lesser degree, payroll data, because these data are based on area residency; residents spend their wages, to a large extent, on local purchases. Since those who own "* * * oil and gas wells do not necessarily live in the States in which energy is produced, there will continue to be substantial geographic dispersion of profits." 1/ Thus, profit data was not used in this analysis.

Chapter 3 primarily uses employment and payroll data from the Bureau of the Census' County Business Patterns for the years 1962, 1967, 1972, and 1977. 2/ These data are estimated from a sample of employers in each industry, and the data are periodically adjusted by social insurance statistics, primarily State unemployment insurance data. Employment is for mid-March (or week including March 12) payroll. Taxable first quarter payrolls are used for all except the last period, which uses total first quarter payrolls. The Bureau of the Census notes that, for the first quarter period, total payrolls are within 1 percent of taxable payrolls. These data are subject to disclosure regulations (i.e., data are not given if disclosure would adversely affect an organization's operations). Therefore, data are not available for all categories in all locations. Data withheld because of disclosure regulations necessitated the use of other data sources in parts of chapter 3's section on intraregional industry concentration, and determined the choice of industrial categories used in other sections. For example, unavailability of consistent data precluded the use of subsections of chemicals and allied products (SIC 28). Except for the section on intraregional industry concentration, all sections in

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1/William H. Miernyk, "Rising Energy Prices and Regional Economic Development" in William H. Miernyk, Frank Giarratoni, and Charles F. Socher, eds., Regional Impact of Rising Energy Prices, (Cambridge, Mass.: Ballinger Publishing Company, a subsidiary of J.B. Lippincott Company, 1978), pp. 80-81.

2/See County Business Patterns 1977 for a full description of data and changes which have occurred over time.

Table 29

Severance Taxes, Rents, and Royalties as a Percent of Own-Source General Revenue
(Thousands of Dollars)

Year	Texas			Oklahoma			Louisiana		
	Own-source general revenue	Direct mineral revenue	Percent	Own-source general revenue	Direct mineral revenue	Percent	Own-source general revenue	Direct mineral revenue	Percent
1960	$ 928616	$ 231012	24.9	$ 327536	$ 37197	11.4	$ 563704	$211712	37.6
1961	972653	238393	24.5	339093	38342	11.3	590851	233729	39.6
1962	1166718	237737	20.4	370371	40137	10.8	610550	230971	37.8
1963	1244407	245345	19.7	391685	40578	10.4	661369	268739	40.6
1964	1342975	255712	19.0	413518	43125	10.4	706652	280791	39.7
1965	1496009	328500	22.0	446922	42624	9.5	755502	294147	38.9
1966	1572077	305529	19.4	494796	45635	9.2	881066	362164	41.1
1967	1647391	280264	17.0	525813	51213	9.7	899179	338411	37.6
1968	1794535	308097	17.2	581164	51821	8.9	991023	395529	39.9
1969	2128621	309028	14.5	638415	55376	8.7	1044938	393586	37.7
1970	2400341	337977	14.1	690236	56168	8.1	1128593	406008	36.0
1971	2703096	373835	13.8	734483	57866	7.7	1293510	417097	32.2
1972	3105240	377215	12.1	851630	80560	9.5	1441796	409480	28.4
1973	3477522	416889	12.0	917582	78013	8.5	1515446	416456	27.5
1974	4102000	674536	16.4	1039153	106626	10.3	1756673	587810	33.5
1975	4536301	837975	18.5	1143455	141216	12.3	1920582	713473	37.1
1976	5302496	1023461	19.3	1315431	165249	12.6	2264008	845418	37.3
1977	6006518	1225467	20.4	1503810	209641	13.9	2231580	716012	32.1
1978	6784301	1332775	19.6	1708885	256296	15.0	2614897	763122	29.2

Source: Various issues of U.S. Bureau of the Census, State Government Finances.

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Table 30

Scope of "Petroleum and Related Industries"

SIC	Industry	Description
131	Crude petroleum and natural gas	*
132	Natural gas liquids	*
1381	Drilling oil and gas wells	*
1382	Oil and gas exploration services	*
1389	Oil and gas field services not elsewhere classified	*
28	Chemicals and allied products	Manufacture of (1) basic chemicals such as acids, alkalies, and organic chemicals; (2) chemical products for use in further manufacturing such as fibers and pigments; and (3) finished chemical products such as drugs, cosmetics, paints, and fertilizers.
291	Petroleum refining	Production of gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, and other products from crude petroleum and its fractional products.
3533	Oilfield machinery	Manufacture of machinery and equipment for use in oil- or gasfields or for drilling water wells including drilling rigs, drilling and other tools, bits, derricks, etc.
492	Gas production and distribution	Manufacture and/or distribution of liquefied petroleum products and transmission and/or distribution of natural gas (includes storage and natural gas pipe lines).

*See figure on the next page.

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chapter 3 exclusively use Bureau of the Census data for the industries shown in table 30. This table, and figure 15, define the scope of "petroleum and related industries" as used throughout chapter 3.

APPENDIX IV

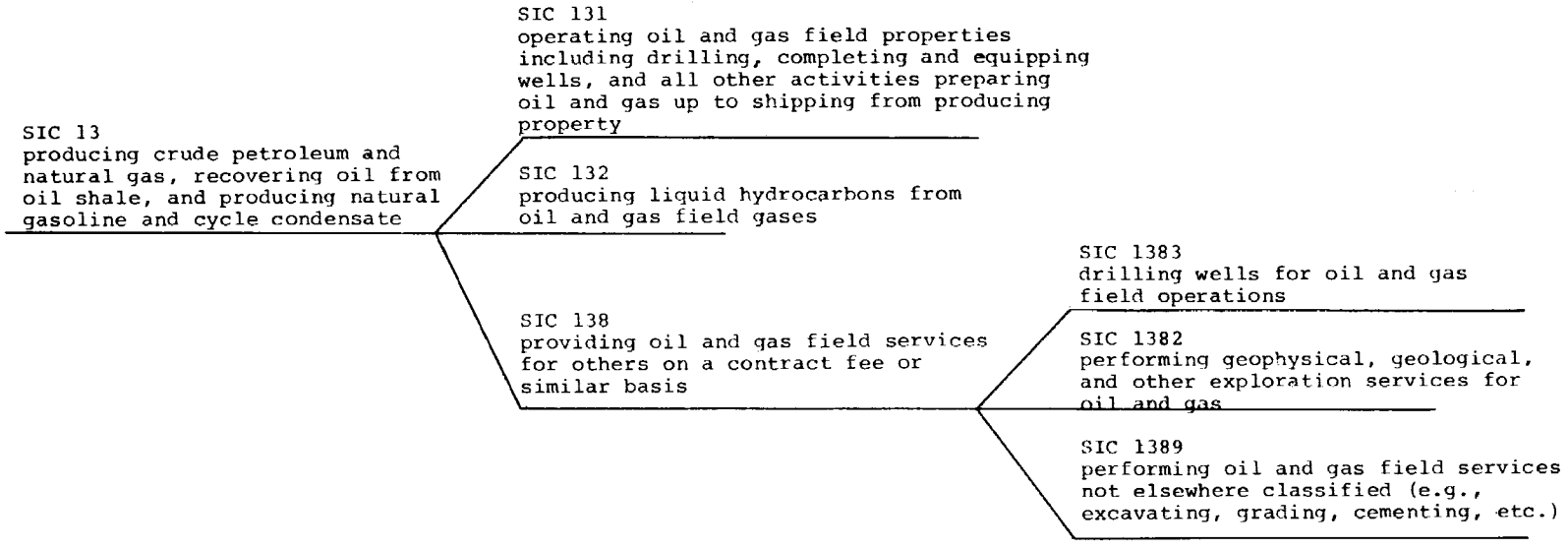
SHIFT-SHARE ANALYSIS TABLES FOR VARIOUS PERIODS

This appendix contains computerized tables on shift-share analysis for both employment and payrolls by industry and in aggregate for each State and the region for 1962-67, 1967-72, 1972-77, and 1962-72. Shift-share analysis is explained in chapter 3.

The shift-share method, primarily a descriptive model rather than a cause-and-effect structural model, actually pinpoints areas of industrial expansion and contraction relative to national trends. A survey article by Harry W. Richardson ("The State of Regional Economics" in International Regional Science Review, vol. 3, Fall 1978, pp. 18-20) provides some background material relating to uses and purposes of shift-share analysis, as well as some caveats regarding its potential misuses.

Figure 15

Schema of Standard Industrial Classification (SIC) 13 Oil and Gas Extraction



Source: Statistical Policy Division, Office of Management and Budget, Executive Office of the President, Standard Industrial Classification Manual 1972 (Washington, D.C.: Government Printing Office, 1972).

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Table 32: Shift-Share Analysis Employment 1967-1972

	SIC	Industry	1967 employment	Rates of change: All industries National	Rates of change: Petroleum and related industries National	Rates of change: Petroleum and related industries State/Region	Shift-share components: National	Shift-share components: Industrial mix	Shift-share components: Competitive	Shift-share components: All	1972 employment
Texas	131	Crude petroleum and natural gas	36404	0.1007	-0.1752	-0.2297	3667	-10045	-1984	-8362	28042
	132	Natural gas liquids	4545	0.1007	-0.2344	-0.0717	458	-1523	739	-326	4219
	1381	Drilling oil and gas wells	16354	0.1007	-0.0282	-0.1000	1647	-2109	-1174	-1635	14719
	1382	Oil and gas exploration services	2692	0.1007	0.6569	1.2682	271	1497	1646	3414	6106
	1389	Oil- and gasfield services NEC*	22122	0.1007	0.0227	0.0131	2228	-1726	-214	289	22411
	28	Chemicals and allied products	51515	0.1007	-0.0199	0.0497	5189	-6213	3585	2561	54076
	291	Petroleum refining	31180	0.1007	-0.0305	0.0804	3141	-4092	3458	2506	33686
	3533	Oilfield machinery	20898	0.1007	0.0454	-0.0285	2105	-1157	-1543	-595	20303
	492	Gas production and distribution	17918	0.1007	0.0176	0.0434	1805	-1489	461	777	18695
	Total		203628	0.1007	-0.0230	-0.0067	20511	-25204	3323	-1371	202257
Okla.	131	Crude petroleum and natural gas	11034	0.1007	-0.1752	-0.2267	1111	-3045	-568	-2501	8533
	132	Natural gas liquids	1203	0.1007	-0.2344	-0.5071	121	-403	-328	-610	593
	1381	Drilling oil and gas wells	3933	0.1007	-0.0282	-0.1307	396	-507	-403	-514	3419
	1382	Oil and gas exploration services	717	0.1007	0.6569	0.3808	72	399	-198	273	990
	1389	Oil- and gasfield services NEC*	6552	0.1007	0.0227	-0.2215	660	-511	-1600	-1451	5101
	28	Chemicals and allied products	1754	0.1007	-0.0199	-0.1956	177	-212	-308	-343	1411
	291	Petroleum refining	4375	0.1007	-0.0305	-0.0313	441	-574	-3	-137	4238
	3533	Oilfield machinery	3968	0.1007	0.0454	-0.0171	400	-220	-248	-68	3900
	492	Gas production and distribution	3706	0.1007	0.0176	-0.0815	373	-308	-367	-302	3404
	Total		37242	0.1007	-0.0230	-0.1518	3751	-4610	-4795	-5653	31589
La.	131	Crude petroleum and natural gas	15763	0.1007	-0.1752	-0.0537	1588	-4350	1915	-847	14916
	132	Natural gas liquids	2131	0.1007	-0.2344	-0.5434	215	-714	-659	-1158	973
	1381	Drilling oil and gas wells	10113	0.1007	-0.0282	-0.0477	1019	-1304	-197	-482	9631
	1382	Oil and gas exploration services	1624	0.1007	0.6569	-0.2401	164	903	-1457	-390	1234
	1389	Oil- and gasfield services NEC*	10736	0.1007	0.0227	0.2388	1081	-837	2320	2564	13300
	28	Chemicals and allied products	19583	0.1007	-0.0199	0.1364	1973	-2362	3060	2671	22254
	291	Petroleum refining	8535	0.1007	-0.0305	0.0835	860	-1120	974	713	9248
	3533	Oilfield machinery	1017	0.1007	0.0454	0.5801	102	-56	544	590	1607
	492	Gas production and distribution	6324	0.1007	0.0176	-0.1377	637	-526	-982	-871	5453
	Total		75826	0.1007	-0.0230	0.0367	7638	-9385	4533	2785	78611
Region	131	Crude petroleum and natural gas	63201	0.1007	-0.1752	-0.1853	6366	-17439	-637	-11710	51491
	132	Natural gas liquids	7879	0.1007	-0.2344	-0.2658	794	-2640	-247	-2094	5785
	1381	Drilling oil and gas wells	30400	0.1007	-0.0282	-0.0865	3062	-3920	-1773	-2631	27769
	1382	Oil and gas exploration services	5033	0.1007	0.6569	0.6551	507	2799	-9	3297	8330
	1389	Oil- and gasfield services NEC*	39410	0.1007	0.0227	0.0356	3970	-3074	506	1402	40812
	28	Chemicals and allied products	72852	0.1007	-0.0199	0.0671	7338	-8786	6337	4889	77741
	291	Petroleum refining	44090	0.1007	-0.0305	0.0699	4441	-5787	4428	3082	47172
	3533	Oilfield machinery	25883	0.1007	0.0454	-0.0028	2607	-1433	-1248	-73	25810
	492	Gas production and distribution	27948	0.1007	0.0176	-0.0142	2815	-2323	-888	-396	27552
	Total		316696	0.1007	-0.0230	-0.0134	31900	-39199	3066	-4234	312462

*Not elsewhere classified

Source: Developed by GAO staff using data from Bureau of the Census, U.S. Department of Commerce, County Business Patterns 1967, CBP-67-1, CBP-67-20, CBP-67-38, and CBP-67-45, County Business Patterns 1972, CBP-72-1, CBP-72-20, CBP-72-38, and CBP-72-45, Washington, D.C.: Government Printing Office, 1968 and 1973.

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Table 31: Shift-Share Analysis Employment 1962-1967

	SIC	Industry	1962 employment	Rates of change: All industries National	Rates of change: Petroleum and related industries National	Rates of change: Petroleum and related industries State/Region	Shift-share components: National	Shift-share components: Industrial mix	Shift-share components: Competitive	Shift-share components: All	1967 employment
Texas	131	Crude petroleum and natural gas	46421	0.2113	-0.1958	-0.2158	9809	-18899	-927	-10017	36404
	132	Natural gas liquids	5949	0.2113	-0.2550	-0.2360	1257	-2774	113	-1404	4545
	1381	Drilling oil and gas wells	19152	0.2113	-0.1050	-0.1461	4047	-6058	-787	-2798	16354
	1382	Oil and gas exploration services	3826	0.2113	-0.0507	-0.2964	808	-1002	-940	-1134	2692
	1389	Oil- and gasfield services NEC*	22960	0.2113	0.0646	-0.0365	4852	-3368	-2321	-838	22122
	28	Chemicals and allied products	43047	0.2113	0.1231	0.1967	9096	-3798	3170	8468	51515
	291	Petroleum refining	36626	0.2113	-0.1738	-0.1487	7739	-14105	919	-5446	31180
	3533	Oilfield machinery	18525	0.2113	0.1082	0.1281	3915	-1911	370	2373	20898
	492	Gas production and distribution	18404	0.2113	0.0207	-0.0264	3889	-3509	-866	-486	17918
	Total		214910	0.2113	0.0361	-0.0525	45413	-37648	-19046	-11282	203628
Okla.	131	Crude petroleum and natural gas	16383	0.2113	-0.1958	-0.3265	3462	-6670	-2141	-5349	11034
	132	Natural gas liquids	2513	0.2113	-0.2550	-0.5213	531	-1172	-669	-1310	1203
	1381	Drilling oil and gas wells	5609	0.2113	-0.1050	-0.2988	1185	-1774	-1087	-1676	3933
	1382	Oil and gas exploration services	1301	0.2113	-0.0507	-0.4489	275	-341	-518	584	717
	1389	Oil- and gasfield services NEC*	6238	0.2113	0.0646	0.0503	1318	-915	-89	314	6552
	28	Chemicals and allied products	1699	0.2113	0.1231	0.0324	359	-150	-154	55	1754
	291	Petroleum refining	6562	0.2113	-0.1738	-0.3333	1387	-2527	-1047	-2187	4375
	3533	Oilfield machinery	4110	0.2113	0.1082	-0.0345	868	-424	-586	-142	3968
	492	Gas production and distribution	3723	0.2113	0.0207	-0.0046	787	-710	-94	-17	3706
	Total		48138	0.2113	0.0361	-0.2263	10172	-8433	-12635	-10896	37242
La.	131	Crude petroleum and natural gas	15220	0.2113	-0.1958	0.0357	3216	-6196	3523	543	15763
	132	Natural gas liquids	2397	0.2113	-0.2550	-0.1110	507	-1118	345	-266	2131
	1381	Drilling oil and gas wells	8200	0.2113	-0.1050	0.2333	1733	-2594	2774	1913	10113
	1382	Oil and gas exploration services	829	0.2113	-0.0507	0.9590	175	-217	837	795	1624
	1389	Oil- and gasfield services NEC*	7792	0.2113	0.0646	0.3778	1647	-1143	2441	2944	10736
	28	Chemicals and allied products	18834	0.2113	0.1231	0.0398	3980	-1662	-1569	749	19583
	291	Petroleum refining	9780	0.2113	-0.1738	-0.1273	2067	-3766	455	-1245	8535
	3533	Oilfield machinery	737	0.2113	0.1082	0.3799	156	-76	200	280	1017
	492	Gas production and distribution	6472	0.2113	0.0207	-0.0229	1368	-1234	-282	-148	6324
	Total		70261	0.2113	0.0361	0.0792	14847	-12308	3027	5565	75826
Region	131	Crude petroleum and natural gas	78024	0.2113	-0.1958	-0.1900	16487	-31766	455	-14823	63201
	132	Natural gas liquids	10859	0.2113	-0.2550	-0.2744	2295	-5064	-211	-2980	7879
	1381	Drilling oil and gas wells	32961	0.2113	-0.1050	-0.0777	6965	-10426	900	-2561	30400
	1382	Oil and gas exploration services	5956	0.2113	-0.0507	-0.1550	1259	-1560	-621	-923	5033
	1389	Oil- and gasfield services NEC*	36990	0.2113	0.0646	0.0654	7816	-5427	30	2420	39410
	28	Chemicals and allied products	63580	0.2113	0.1231	0.1458	13435	-5610	1447	9272	72852
	291	Petroleum refining	52968	0.2113	-0.1738	-0.1676	11193	-20398	328	-8878	44090
	3533	Oilfield machinery	23372	0.2113	0.1082	0.1074	4939	-2411	-17	2511	25883
	492	Gas production and distribution	28599	0.2113	0.0207	-0.0228	6043	-5452	-1242	-651	27948
	Total		333309	0.2113	0.0361	-0.0498	70431	-58389	-28655	-16613	316696

*Not elsewhere classified

Source: Developed by GAO staff using data from Bureau of the Census, U.S. Department of Commerce, County Business Pattern 1962, Parts 1, 8A, and 8B, and County Business Patterns 1967, CBP-67-1, CBP-67-20, CBP-67-38, and CBP-67-45, Washington, D.C.: Government Printing Office, 1963 and 1968.

APPENDIX IV

Table 34: Shift-Share Analysis Employment 1962-1972

	SIC	Industry	1962 employment	Rates of change: All industries National	Rates of change: Petroleum and related industries National	Rates of change: Petroleum and related industries State/Region	Shift-share components: National	Shift-share components: Industrial mix	Shift-share components: Competitive	Shift-share components: All	1972 employment
Texas	131	Crude petroleum and natural gas	46421	0.3333	-0.3367	-0.3959	15473	-31104	-2748	-18379	28042
	132	Natural gas liquids	5949	0.3333	-0.4296	-0.2908	1983	-4539	826	-1730	4219
	1381	Drilling oil and gas wells	19152	0.3333	-0.1302	-0.2315	6384	-8878	-1938	-4433	14719
	1382	Oil and gas exploration services	3826	0.3333	0.5730	0.5959	1275	917	88	2280	6106
	1389	Oil- and gasfield services NEC*	22960	0.3333	0.0888	-0.0239	7653	-5614	-2588	-549	22411
	28	Chemicals and allied products	43047	0.3333	0.1007	0.2562	14348	-10012	6692	11029	54076
	291	Petroleum refining	36626	0.3333	-0.1990	-0.0803	12208	-19497	4349	-2940	33686
	3533	Oilfield machinery	18525	0.3333	0.1584	0.0960	6175	-3240	-1157	1778	20303
	492	Gas production and distribution	18404	0.3333	0.0386	0.0158	6134	-5423	-420	291	18695
	Total		214910	0.3333	0.0122	-0.0589	71634	-69002	-15285	-12653	202257
Okla.	131	Crude petroleum and natural gas	16383	0.3333	-0.3367	-0.4792	5461	-10977	-2334	-7850	8533
	132	Natural gas liquids	2513	0.3333	-0.4296	-0.7640	838	-1917	-840	-1920	593
	1381	Drilling oil and gas wells	5609	0.3333	-0.1302	-0.3904	1870	-2600	-1459	-2190	3419
	1382	Oil and gas exploration services	1301	0.3333	-0.5730	-0.2390	434	312	-1056	-311	990
	1389	Oil- and gasfield services NEC*	6238	0.3333	0.0888	-0.1823	2079	-1525	-1691	-1137	5101
	28	Chemicals and allied products	1699	0.3333	0.1007	-0.1695	566	-395	-459	-288	1411
	291	Petroleum refining	6562	0.3333	-0.1990	-0.3542	2187	-3493	-1018	-2324	4238
	3533	Oilfield machinery	4110	0.3333	0.1584	-0.0511	1370	-719	-861	-210	3900
	492	Gas production and distribution	3723	0.3333	0.0386	-0.0857	1241	-1097	-463	-319	3404
	Total		48138	0.3333	0.0122	-0.3438	16045	-15456	-17139	-16549	31589
La.	131	Crude petroleum and natural gas	15220	0.3333	-0.3367	-0.0200	5073	-10198	4821	-304	14916
	132	Natural gas liquids	2397	0.3333	-0.4296	-0.5941	799	-1829	-394	-1424	973
	1381	Drilling oil and gas wells	8200	0.3333	-0.1302	0.1745	2733	-3801	2499	1431	9631
	1382	Oil and gas exploration services	829	0.3333	0.5730	0.4885	276	199	-70	405	1234
	1389	Oil- and gasfield services NEC*	7792	0.3333	0.0888	0.7069	2597	-1905	4816	5508	13300
	28	Chemicals and allied products	18834	0.3333	0.1007	0.1816	6278	-4380	1523	3420	22254
	291	Petroleum refining	9780	0.3333	-0.1990	-0.0544	3260	-5206	1414	-532	9248
	3533	Oilfield machinery	737	0.3333	0.1584	1.1805	246	-129	753	870	1607
	492	Gas production and distribution	6472	0.3333	0.0386	-0.1574	2157	-1907	-1269	-1019	5453
	Total		70261	0.3333	0.0122	0.1188	23419	-22559	7490	8350	78611
Region	131	Crude petroleum and natural gas	78024	0.3333	-0.3367	-0.3401	26007	-52279	-261	-26533	51491
	132	Natural gas liquids	10859	0.3333	-0.4296	-0.4673	3620	-8285	-409	-5074	5785
	1381	Drilling oil and gas wells	32961	0.3333	-0.1302	-0.1575	10987	-15280	-899	-5192	27769
	1382	Oil and gas exploration services	5956	0.3333	0.5730	0.3986	1985	1427	-1039	2374	8330
	1389	Oil- and gasfield services NEC*	36990	0.3333	0.0888	0.1033	12329	-9045	537	3822	40812
	28	Chemicals and allied products	63580	0.3333	0.1007	0.2227	21192	-14787	7756	14161	77741
	291	Petroleum refining	52968	0.3333	-0.1990	-0.1094	17655	-28197	4746	-5796	47172
	3533	Oilfield machinery	23372	0.3333	0.1584	0.1043	7790	-4087	-1265	2438	25810
	492	Gas production and distribution	28599	0.3333	0.0386	-0.0366	9533	-8427	-2152	-1047	27552
	Total		333309	0.3333	0.0122	-0.0625	111098	-107017	-24929	-20847	312462

*Not elsewhere classified

Source: Developed by GAO staff using data from Bureau of the Census, U.S. Department of Commerce, County Business Patterns 1962, Parts 1, 8A, and 8B, and County Business Patterns 1972, CBP-72-1, CBP-72-20, CBP-72-38, and CBP-72-45, Washington, D.C.: Government Printing Office, 1963 and 1973.

APPENDIX IV

Table 33: Shift-Share Analysis Employment 1972-1977

	SIC	Industry	1972 employment	Rates of change: All industries National	Rates of change: Petroleum and related industries National	Rates of change: Petroleum and related industries State/Region	Shift-share components: National	Shift-share components: Industrial mix	Shift-share components: Competitive	Shift-share components: All	1977 employment
Texas	131	Crude petroleum and natural gas	28042	0.1200	0.2384	0.3165	3364	3321	2189	8874	36916
	132	Natural gas liquids	4219	0.1200	0.4173	0.1685	506	1255	-1050	711	4930
	1381	Drilling oil and gas wells	14719	0.1200	0.6422	0.6795	1766	7687	549	10002	24721
	1382	Oil and gas exploration services	6106	0.1200	0.6098	0.4302	732	2991	-1097	2627	8733
	1389	Oil- and gasfield services NEC*	22411	0.1200	0.9070	0.9948	2688	17639	1966	22294	44705
	28	Chemicals and allied products	54076	0.1200	0.0449	0.3246	6487	-4058	15125	17554	71630
	291	Petroleum refining	33686	0.1200	-0.0375	-0.0528	4041	-5303	-516	-1778	31908
	3533	Oilfield machinery	20303	0.1200	0.6152	0.8953	2436	10055	5686	18177	38480
	492	Gas production and distribution	18695	0.1200	-0.1550	0.0492	2243	-5140	3817	920	19615
	Total		202257	0.1200	0.1089	0.3925	24263	-2233	57351	79381	281638
Okla.	131	Crude petroleum and natural gas	8533	0.1200	0.2384	0.1573	1024	1011	-692	1342	9875
	132	Natural gas liquids	593	0.1200	0.4173	0.7960	71	176	225	472	1065
	1381	Drilling oil and gas wells	3419	0.1200	0.6422	1.0439	410	1786	1373	3569	6988
	1382	Oil and gas exploration services	990	0.1200	0.6098	0.3212	119	485	-286	318	1308
	1389	Oil- and gasfield services NEC*	5101	0.1200	0.9070	1.4576	612	4015	2808	7435	12536
	28	Chemicals and allied products	1411	0.1200	0.0449	0.4848	169	-106	621	684	2095
	291	Petroleum refining	4238	0.1200	-0.0375	-0.0757	508	-667	-162	-321	3917
	3533	Oilfield machinery	3900	0.1200	0.6152	0.6000	468	1932	-59	2340	6240
	492	Gas production and distribution	3404	0.1200	-0.1550	0.4313	408	-936	1996	1468	4872
	Total		31589	0.1200	0.1089	0.5479	3789	-349	13866	17307	48896
La.	131	Crude petroleum and natural gas	14916	0.1200	0.2384	0.0849	1789	1767	-2290	1266	16182
	132	Natural gas liquids	973	0.1200	0.4173	0.5498	117	289	129	535	1508
	1381	Drilling oil and gas wells	9631	0.1200	0.6422	0.5313	1155	5030	-1068	5117	14748
	1382	Oil and gas exploration services	1234	0.1200	0.6098	1.9417	148	605	1643	2396	3630
	1389	Oil- and gasfield services NEC*	13300	0.1200	0.9070	0.5859	1595	10468	-4272	7792	21092
	28	Chemicals and allied products	22254	0.1200	0.0449	0.3568	2670	-1670	6941	7941	30195
	291	Petroleum refining	9248	0.1200	-0.0375	-0.0857	1109	-1456	-447	-793	8455
	3533	Oilfield machinery	1607	0.1200	0.6152	0.1605	193	796	-731	258	1865
	492	Gas production and distribution	5453	0.1200	-0.1550	-0.3569	654	-1499	-1101	-1946	3507
	Total		78611	0.1200	0.1089	0.2871	9430	-868	14009	22571	101182
Region	131	Crude petroleum and natural gas	51491	0.1200	0.2384	0.2230	6177	6098	-793	11482	62973
	132	Natural gas liquids	5785	0.1200	0.4173	0.2970	694	1720	-696	1718	7503
	1381	Drilling oil and gas wells	27769	0.1200	0.6422	0.6730	3331	14503	854	18688	46457
	1382	Oil and gas exploration services	8330	0.1200	0.6098	0.6412	999	4081	261	5341	13671
	1389	Oil- and gasfield services NEC*	40812	0.1200	0.9070	0.9194	4896	32122	503	37521	78333
	28	Chemicals and allied products	77741	0.1200	0.0449	0.3367	9326	-5833	22686	26179	103920
	291	Petroleum refining	47172	0.1200	-0.0375	-0.0613	5659	-7426	-1125	-2892	44280
	3533	Oilfield machinery	25810	0.1200	0.6152	0.8049	3096	12783	4896	20775	46585
	492	Gas production and distribution	27552	0.1200	-0.1550	0.0160	3305	-7575	4712	442	27994
	Total		312462	0.1200	0.1089	0.3817	37483	-3450	85220	119254	431716

*Not elsewhere classified

Source: Developed by GAO staff using data from Bureau of the Census, U.S. Department of Commerce, County Business Pattern 1972, CBP-72-1, CBP-72-20, CBP-72-38, and CBP-72-45, and County Business Patterns 1977, CBP-77-1, CBP-77-20, CBP-77-38, and CBP-77-45, Washington, D.C.: Government Printing Office, 1973 and 1979.

APPENDIX IV

Table 36: Shift-Share Analysis First Quarter Payrolls 1967-1972

	SIC	Industry	1967 first quarter payrolls ($1,000)	Rates of change: All industries National	Rates of change: Petroleum and related industries National	Rates of change: Petroleum and related industries State/Region	Shift-share components: National	Shift-share components: Industrial mix	Shift-share components: Competitive	Shift-share components: All	1972 first quarter payrolls ($1,000)
Texas	131	Crude petroleum and natural gas	71922	0.4611	0.1335	0.0234	33160	-23556	-7922	1682	73604
	132	Natural gas liquids	9215	0.4611	0.0853	0.2909	4249	-3463	1895	2681	11896
	1381	Drilling oil and gas wells	26543	0.4611	0.2642	0.2434	12238	-5225	-553	6460	33003
	1382	Oil and gas exploration services	4338	0.4611	1.3299	2.1660	2000	3769	3627	9396	13734
	1389	Oil- and gasfield services NEC*	31546	0.4611	0.3280	0.3324	14544	-4199	139	10485	42031
	28	Chemicals and allied products	109990	0.4611	0.3417	0.4335	50712	-13129	10103	47686	157676
	291	Petroleum refining	68069	0.4611	0.3340	0.4878	31384	-8648	10465	33201	101270
	3533	Oilfield machinery	36902	0.4611	0.3775	0.2778	17014	-3084	-3678	10252	47154
	492	Gas production and distribution	30245	0.4611	0.4300	0.4338	13945	-938	112	13119	43364
	Total		388770	0.4611	0.3349	0.3472	179245	-49062	4779	134962	523732
Okla.	131	Crude petroleum and natural gas	19022	0.4611	0.1335	0.0269	8770	-6230	-2028	512	19534
	132	Natural gas liquids	2442	0.4611	0.0853	-0.3272	1126	-918	-1007	-799	1643
	1381	Drilling oil and gas wells	5535	0.4611	0.2642	0.3057	2552	-1090	230	1692	7227
	1382	Oil and gas exploration services	1190	0.4611	1.3299	1.1546	549	1034	-209	1374	2564
	1389	Oil- and gasfield services NEC*	9362	0.4611	0.3280	0.0366	4316	-1246	-2727	343	9705
	28	Chemicals and allied products	2858	0.4611	0.3417	0.0738	1318	-341	-766	211	3069
	291	Petroleum refining	8500	0.4611	0.3340	0.3941	3919	-1080	511	3350	11850
	3533	Oilfield machinery	6559	0.4611	0.3775	0.2790	3024	-548	-646	1830	8389
	492	Gas production and distribution	5704	0.4611	0.4300	0.2474	2630	-177	-1042	1411	7115
	Total		61172	0.4611	0.3349	0.1622	28204	-7720	-10560	9924	71096
La.	131	Crude petroleum and natural gas	33611	0.4611	0.1335	0.3073	15497	-11008	5841	10329	43940
	132	Natural gas liquids	4238	0.4611	0.0853	-0.3464	1954	-1593	-1829	-1468	2770
	1381	Drilling oil and gas wells	19893	0.4611	0.2642	0.1363	9172	-3916	-2545	2711	22604
	1382	Oil and gas exploration services	2494	0.4611	1.3299	-0.1877	1150	2167	-3785	-468	2026
	1389	Oil- and gasfield services NEC*	17258	0.4611	0.3280	0.5916	7957	-2297	4550	10210	27468
	28	Chemicals and allied products	42635	0.4611	0.3417	0.6266	19657	-5089	12148	26716	69351
	291	Petroleum refining	20840	0.4611	0.3340	0.3964	9608	-2648	1299	8260	29100
	3533	Oilfield machinery	1931	0.4611	0.3775	0.7473	890	-161	714	1443	3374
	492	Gas production and distribution	11243	0.4611	0.4300	0.1272	5184	-349	-3405	1430	12673
	Total		154143	0.4611	0.3349	0.3838	71069	-19453	7547	59163	213306
Region	131	Crude petroleum and natural gas	124555	0.4611	0.1335	0.1005	57427	-40795	-4109	12523	137078
	132	Natural gas liquids	15895	0.4611	0.0853	0.0260	7328	-5973	-941	414	16309
	1381	Drilling oil and gas wells	51971	0.4611	0.2642	0.2090	23962	-10230	-2868	10863	62834
	1382	Oil and gas exploration services	8022	0.4611	1.3299	1.2842	3699	6970	-366	10302	18324
	1389	Oil- and gasfield services NEC*	58166	0.4611	0.3280	0.3617	26818	-7742	1962	21038	79204
	28	Chemicals and allied products	155483	0.4611	0.3417	0.4799	71686	-18559	21485	74613	230096
	291	Petroleum refining	97409	0.4611	0.3340	0.4600	44911	-12375	12275	44811	142220
	3533	Oilfield machinery	45392	0.4611	0.3775	0.2980	20928	-3793	-3610	13525	58917
	492	Gas production and distribution	47192	0.4611	0.4300	0.3382	21758	-1463	-4335	15960	63152
	Total		604085	0.4611	0.3349	0.3378	278517	-76235	1767	204049	808134

*Not elsewhere classified

Source: Developed by GAO staff using data from Bureau of the Census, U.S. Department of Commerce, County Business Patterns 1967, CBP-67-1, CBP-67-20, CBP-67-38, and CBP-67-45, County Business Patterns 1972, CBP-72-1, CBP-72-20, CBP-72-38, and CBP-72-45, Washington, D.C.: Government Printing Office, 1968 and 1973.

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Table 35: Shift-Share Analysis First Quarter Payrolls 1962-1967

	SIC	Industry	1962 first quarter payrolls ($1,000)	Rates of change: All industries National	Rates of change: Petroleum and related industries National	Rates of change: Petroleum and related industries State/Region	Shift-share components: National	Shift-share components: Industrial mix	Shift-share components: Competitive	Shift-share components: All	1967 first quarter payrolls ($1,000)
Texas	131	Crude petroleum and natural gas	77386	0.4349	-0.0463	-0.0706	33655	-37236	-1883	-5464	71922
	132	Natural gas liquids	10245	0.4349	-0.1329	-0.1005	4456	-5817	331	-1030	9215
	1381	Drilling oil and gas wells	26792	0.4349	0.0880	-0.0093	11652	-9295	-2606	-249	26543
	1382	Oil and gas exploration services	5207	0.4349	0.1257	-0.1669	2265	-1610	-1523	-869	4338
	1389	Oil- and gasfield services NEC*	28416	0.4349	0.2872	0.1101	12358	-4198	-5030	3130	31546
	28	Chemicals and allied products	78092	0.4349	0.3094	0.4085	33962	-9797	7733	31898	109990
	291	Petroleum refining	68073	0.4349	-0.0252	-0.0001	29605	-31318	1709	-4	68069
	3533	Oilfield machinery	28273	0.4349	0.2817	0.3052	12296	-4332	665	8629	36902
	492	Gas production and distribution	25770	0.4349	0.2335	0.1737	11207	-5190	-1542	4475	30245
	Total		348254	0.4349	0.2156	0.1163	151455	-76378	-34561	40516	388770
Okla.	131	Crude petroleum and natural gas	24165	0.4349	-0.0463	-0.2128	10509	-11628	-4025	-5143	19022
	132	Natural gas liquids	4510	0.4349	-0.1329	-0.4585	1961	-2561	-1469	-2068	2442
	1381	Drilling oil and gas wells	7296	0.4349	0.0880	-0.2414	3173	-2531	-2403	-1761	5535
	1382	Oil and gas exploration services	1601	0.4349	0.1257	-0.2567	696	-495	-612	-411	1190
	1389	Oil- and gasfield services NEC*	7138	0.4349	0.2872	0.3116	3104	-1055	174	2224	9362
	28	Chemicals and allied products	2856	0.4349	0.3094	0.0007	1242	-358	-882	2	2858
	291	Petroleum refining	10233	0.4349	-0.0252	-0.1694	4450	-4708	-1475	-1733	8500
	3533	Oilfield machinery	5958	0.4349	0.2817	0.1009	2591	-913	-1077	601	6559
	492	Gas production and distribution	4545	0.4349	0.2335	0.2550	1977	-915	98	1159	5704
	Total		68302	0.4349	0.2156	-0.1044	29704	-14980	-21855	-7130	61172
La.	131	Crude petroleum and natural gas	27347	0.4349	-0.0463	0.2291	11893	-13159	7529	6264	33611
	132	Natural gas liquids	4029	0.4349	-0.1329	0.0519	1752	-2288	744	209	4238
	1381	Drilling oil and gas wells	12675	0.4349	0.0880	0.5695	5512	-4397	6103	7218	19893
	1382	Oil and gas exploration services	1178	0.4349	0.1257	1.1171	512	-364	1168	1316	2494
	1389	Oil- and gasfield services NEC*	9911	0.4349	0.2872	0.7413	4310	-1464	4501	7347	17258
	28	Chemicals and allied products	32858	0.4349	0.3094	0.2976	14290	-4122	-391	9777	42635
	291	Petroleum refining	21552	0.4349	-0.0252	-0.0330	9373	-9915	-170	-712	20840
	3533	Oilfield machinery	1107	0.4349	0.2817	0.7444	481	-170	512	824	1931
	492	Gas production and distribution	9809	0.4349	0.2335	0.1462	4266	-1976	-856	1434	11243
	Total		120466	0.4349	0.2156	0.2796	52390	-26420	7707	33677	154143
Region	131	Crude petroleum and natural gas	128898	0.4349	-0.0463	-0.0337	56057	-62022	1622	-4343	124555
	132	Natural gas liquids	18784	0.4349	-0.1329	-0.1538	8169	-10665	-393	-2889	15895
	1381	Drilling oil and gas wells	46763	0.4349	0.0880	0.1114	20337	-16224	1094	5208	51971
	1382	Oil and gas exploration services	7986	0.4349	0.1257	0.0045	3473	-2469	-968	36	8022
	1389	Oil- and gasfield services NEC*	45465	0.4349	0.2872	0.2794	19773	-6717	-355	12701	58166
	28	Chemicals and allied products	113806	0.4349	0.3094	0.3662	49494	-14277	6460	41677	155483
	291	Petroleum refining	99858	0.4349	-0.0252	-0.0245	43428	-45941	64	-2449	97409
	3533	Oilfield machinery	35338	0.4349	0.2817	0.2845	15368	-5414	100	10054	45392
	492	Gas production and distribution	40124	0.4349	0.2335	0.1762	17450	-8081	-2301	7068	47192
	Total		537022	0.4349	0.2156	0.1249	233549	-117778	-48709	67063	604085

*Not elsewhere classified

Source: Developed by GAO staff using data from Bureau of the Census, U.S. Department of Commerce, County Business Patterns 1962, Parts 1, 8A, and 8B, and County Business Patterns 1967, CBP-67-1, CBP-67-20, CBP-67-38, and CBP-67-45, Washington, D.C.: Government Printing Office, 1963 and 1968.

APPENDIX IV

Table 38: Shift-Share Analysis First Quarter Payrolls 1962-1972

	SIC	Industry	1962 first quarter payrolls ($1,000)	Rates of change: All industries National	Rates of change: Petroleum and related industries National	Rates of change: Petroleum and related industries State/Region	Shift-share components: National	Shift-share components: Industrial mix	Shift-share components: Competitive	Shift-share components: All	1972 first quarter payrolls ($1,000)
Texas	131	Crude petroleum and natural gas	77386	1.0965	0.0811	-0.0489	84851	-78577	-10056	-3782	73604
	132	Natural gas liquids	10245	1.0965	-0.0589	0.1612	11233	-11837	2255	1651	11896
	1381	Drilling oil and gas wells	26792	1.0965	0.3754	0.2318	29376	-19318	-3847	6211	33003
	1382	Oil and gas exploration services	5207	1.0965	1.6219	1.6376	5709	2736	82	8527	13734
	1389	Oil- and gasfield services NEC*	28416	1.0965	0.7093	0.4791	31157	-11002	-6540	13615	42031
	28	Chemicals and allied products	78092	1.0965	0.7569	1.0191	85625	-26519	20478	79584	157676
	291	Petroleum refining	68073	1.0965	0.3022	0.4877	74640	-54065	12622	33197	101270
	3533	Oilfield machinery	28273	1.0965	0.7655	0.6678	31000	-9357	-2762	18881	47154
	492	Gas production and distribution	25770	1.0965	0.7640	0.6827	28256	-8569	-2093	17594	43364
	Total		348254	1.0965	0.6226	0.5039	381848	-165016	-41355	175478	523732
Okla.	131	Crude petroleum and natural gas	24165	1.0965	0.0811	-0.1916	26496	-24537	-6590	-4631	19534
	132	Natural gas liquids	4510	1.0965	-0.0589	-0.6357	4945	-5211	-2601	-2867	1643
	1381	Drilling oil and gas wells	7296	1.0965	0.3754	-0.0095	8000	-5261	-2808	-69	7227
	1382	Oil and gas exploration services	1601	1.0965	1.6219	0.6015	1755	841	-1634	963	2564
	1389	Oil- and gasfield services NEC*	7138	1.0965	0.7093	0.3596	7827	-2764	-2496	2567	9705
	28	Chemicals and allied products	2856	1.0965	0.7569	0.0746	3132	-970	-1949	213	3069
	291	Petroleum refining	10233	1.0965	0.3022	0.1580	11220	-8127	-1476	1617	11850
	3533	Oilfield machinery	5958	1.0965	0.7655	0.4080	6533	-1972	-2130	2431	8389
	492	Gas production and distribution	4545	1.0965	-0.7640	0.5655	4983	-1511	-902	2570	7115
	Total		68302	1.0965	0.6226	0.0409	74891	-32364	-39733	2794	71096
La.	131	Crude petroleum and natural gas	27347	1.0965	0.0811	0.6068	29985	-27768	14376	16593	43940
	132	Natural gas liquids	4029	1.0965	-0.0589	-0.3125	4418	-4655	-1022	-1259	2770
	1381	Drilling oil and gas wells	12675	1.0965	0.3754	0.7834	13898	-9139	5171	9929	22604
	1382	Oil and gas exploration services	1178	1.0965	1.6219	0.7199	1292	619	-1063	848	2026
	1389	Oil- and gasfield services NEC*	9911	1.0965	0.7093	1.7715	10867	-3837	10527	17557	27468
	28	Chemicals and allied products	32858	1.0965	0.7569	1.1106	36028	-11158	11624	36493	69351
	291	Petroleum refining	21552	1.0965	0.3022	0.3502	23631	-17117	1034	7548	29100
	3533	Oilfield machinery	1107	1.0965	0.7655	2.0479	1214	-366	1420	2267	3374
	492	Gas production and distribution	9809	1.0965	0.7640	0.2920	10755	-3262	-4630	2864	12673
	Total		120466	1.0965	0.6226	0.7707	132087	-57081	17834	92840	213306
Region	131	Crude petroleum and natural gas	128898	1.0965	0.0811	0.0635	141332	-130882	-2270	8180	137078
	132	Natural gas liquids	18784	1.0965	-0.0589	-0.1318	20596	-21703	-1368	-2475	16309
	1381	Drilling oil and gas wells	46763	1.0965	0.3754	0.3437	51274	-33718	-1485	16071	62834
	1382	Oil and gas exploration services	7986	1.0965	1.6219	1.2945	8756	4196	-2615	10338	18324
	1389	Oil- and gasfield services NEC*	45465	1.0965	0.7093	0.7421	49851	-17603	1491	33739	79204
	28	Chemicals and allied products	113806	1.0965	0.7569	1.0218	124784	-38647	30153	116290	230096
	291	Petroleum refining	99858	1.0965	0.3022	0.4242	109491	-79310	12181	42362	142220
	3533	Oilfield machinery	35338	1.0965	0.7655	0.6672	38747	-11695	-3472	23579	58917
	492	Gas production and distribution	40124	1.0965	0.7640	0.5739	43995	-13341	-7625	23028	63152
	Total		537022	1.0965	0.6226	0.5048	588826	-254461	-63253	271112	808134

*Not elsewhere classified

Source: Developed by GAO staff using data from Bureau of the Census, U.S. Department of Commerce, County Business Patterns 1962, Parts 1, 8A, and 8B, and County Business Patterns 1972, CBP-72-1, CBP-72-20, CBP-72-38, and CBP-72-45, Washington, D.C.: Government Printing Office, 1963 and 1973.

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Table 37: Shift-Share Analysis First Quarter Payrolls 1972-1977

	SIC	Industry	1972 first quarter payrolls ($1,000)	Rates of change: All industries National	Rates of change: Petroleum and related industries National	Rates of change: Petroleum and related industries State/Region	Shift-share components: National	Shift-share components: Industrial mix	Shift-share components: Competitive	Shift-share components: All	1977 first quarter payrolls ($1,000)
Texas	131	Crude petroleum and natural gas	73604	0.5789	0.9879	1.1175	42613	30103	9536	82252	155856
	132	Natural gas liquids	11896	0.5789	1.3180	0.9448	6887	8791	-4440	11239	23135
	1381	Drilling oil and gas wells	33003	0.5789	1.7547	1.7634	19107	38802	290	58199	91202
	1382	Oil and gas exploration services	13734	0.5789	1.4668	1.1480	7951	12194	-4378	15767	29501
	1389	Oil- and gasfield services NEC*	42031	0.5789	2.4315	2.3670	24334	77864	-2710	99487	141518
	28	Chemicals and allied products	157676	0.5789	0.5266	0.9745	91285	-8261	70630	153655	311331
	291	Petroleum refining	101270	0.5789	0.5445	0.5074	58630	-3493	-3748	51389	152659
	3533	Oilfield machinery	47154	0.5789	1.5007	1.9648	27299	43466	21884	92650	139804
	492	Gas production and distribution	43364	0.5789	0.2403	0.6162	25105	-14683	16297	26719	70083
	Total		523732	0.5789	0.6619	1.1291	303211	43434	244711	591357	1115088
Okla.	131	Crude petroleum and natural gas	19534	0.5789	0.9879	0.9400	11309	7989	-936	18362	37896
	132	Natural gas liquids	1643	0.5789	1.3180	1.7967	951	1214	787	2952	4595
	1381	Drilling oil and gas wells	7227	0.5789	1.7547	2.6380	4184	8497	6384	19065	26292
	1382	Oil and gas exploration services	2564	0.5789	1.4668	0.7601	1484	2276	-1812	1949	4513
	1389	Oil- and gasfield services NEC*	9705	0.5789	2.4315	3.4436	5619	17979	9823	33420	43125
	28	Chemicals and allied products	3069	0.5789	0.5266	1.1320	1777	-161	1858	3474	6543
	291	Petroleum refining	11850	0.5789	0.5445	0.4742	6860	-409	-833	5619	17469
	3533	Oilfield machinery	8389	0.5789	1.5007	1.3035	4857	7733	-1655	10935	19324
	492	Gas production and distribution	7115	0.5789	0.2403	1.1165	4119	-2409	6234	7944	15059
	Total		71096	0.5789	0.6619	1.4589	41161	5896	56663	103720	174816
La.	131	Crude petroleum and natural gas	43940	0.5789	0.9879	0.6661	25439	17971	-14140	29270	73210
	132	Natural gas liquids	2770	0.5789	1.3180	1.4134	1604	2047	264	3915	6685
	1381	Drilling oil and gas wells	22604	0.5789	1.7547	1.5793	13086	26576	-3964	35698	58302
	1382	Oil and gas exploration services	2026	0.5789	1.4668	5.0755	1173	1799	7311	10283	12309
	1389	Oil- and gasfield services NEC*	27468	0.5789	2.4315	2.6500	15902	50885	6001	72789	100257
	28	Chemicals and allied products	69351	0.5789	0.5266	1.0259	40150	-3633	34630	71147	140498
	291	Petroleum refining	29100	0.5789	0.5445	0.4581	16847	-1004	-2514	13330	42430
	3533	Oilfield machinery	3374	0.5789	1.5007	0.8480	1953	3110	-2202	2861	6235
	492	Gas production and distribution	12673	0.5789	0.2403	-0.0460	7337	-4291	-3629	-583	12090
	Total		213306	0.5789	0.6619	1.1191	123492	17690	97528	238710	452016
Region	131	Crude petroleum and natural gas	137078	0.5789	0.9879	0.9475	79360	56063	-5539	129884	266962
	132	Natural gas liquids	16309	0.5789	1.3180	1.1102	9442	12053	-3389	18106	34415
	1381	Drilling oil and gas wells	62834	0.5789	1.7547	1.3203	36377	73875	-27290	82962	145796
	1382	Oil and gas exploration services	18324	0.5789	1.4668	1.5280	10609	16269	1121	27999	46323
	1389	Oil- and gasfield services NEC*	79204	0.5789	2.4315	2.5970	45855	146728	13114	205696	284900
	28	Chemicals and allied products	230096	0.5789	0.5266	0.9921	133213	-12055	107118	228276	458372
	291	Petroleum refining	142220	0.5789	0.5445	0.4946	82337	-4905	-7094	70338	212558
	3533	Oilfield machinery	58917	0.5789	1.5007	1.8067	34110	54309	18027	106446	165363
	492	Gas production and distribution	63152	0.5789	0.2403	0.5396	36561	-21383	18902	34080	97232
	Total		808134	0.5789	0.6619	1.1555	467864	67021	398903	933787	1741920

*Not elsewhere classified

Source: Developed by GAO staff using data from Bureau of the Census, U.S. Department of Commerce, County Business Patterns 1972, CBP-72-1, CBP-72-20, CBP-72-38 and CBP-72-45, County Business Patterns 1977, CBP-77-1, CBP-77-20, CBP-77-38, and CBP-77-45, Washington, D.C.: Government Printing Office, 1973 and 1979.

APPENDIX IV

this appendix, "proven reserves" will refer to both oil and gas, unless noted otherwise.

Additions to proven reserves through discovery depend on drilling levels and finding rates. Finding rates are defined as the rate of reserves found per foot drilled and are derived for each State by dividing additions to proven reserves by the total drilling (successful and unsuccessful). 1/

Historical or actual additions to proven reserves are taken from the American Petroleum Institute's annual reports of Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the U.S. and Canada. The drilling figures used are from the American Association of Petroleum Geologists' yearly reports on "North American Drilling Activity" in AAPG Bulletins. The data used is restricted to the 1970-1978 period, which was the most current data available at the time of chapter 4's preparation. Moreover, oil and gas industries apparently are going through significant changes in the way they do business. By using the most recent decade's data, chapter 4's projections hopefully reflect some of these changes.

PROCESS STEPS

Overall, the methodology has five general phases for each of the three States and is displayed as a flowchart in figure 16: (1) identifying the historical data; (2) calculating historical performance of certain key variables pertaining to oil and gas exploration, discovery, and production; (3) projecting the key variables; (4) applying the projections to ascertain total additions to proven reserves; and (5) ascertaining the projected changes to proven reserves.

Phase 1 - Identification of historical data

Step A: Historical oil and gas drilling footage was identified, including both successful and unsuccessful attempts. The annual drilling levels included all the major exploratory and developmental drilling categories.

Step B: The annual additions to proven reserves by new discoveries and extensions were identified. This fact gives an indication of the magnitude of changes to reserves brought about by drilling.

1/The finding rate for associated gas was derived from the level of oil production by using gas-to-oil ratios.

APPENDIX V

METHODOLOGY USED TO PROJECT CRUDE OIL AND NATURAL GAS PRODUCTION 1980-90

The basic class of methods used in chapter 4 to project crude oil and natural gas production for the three States is trend extrapolation. The methods, with a few modifications, closely follow those used in a 1974 Bureau of Mines publication. 1/

The projection methodology used in chapter 4 obviously does not consider demand. In simply projecting trends without considering price increases and their effects on the economic motivation for drilling, secondary recovery, etc., the methodology is perhaps open to question, particularly from economists. Chapter 4 implicitly assumes that domestically produced oil and gas will continue to be in great demand, especially given increasing uneasiness concerning actual and potential disruptions in imported sources. Consequently, the methodology concentrates on physical trends, such as drilling levels and finding rates, which determine production levels.

Chapter 4's objective in projecting possible oil and gas production levels is to provide a perspective on the future roles of nonrenewable resources in the budgets and economies of Texas, Oklahoma, and Louisiana. Since oil and gas production is heavily laced with uncertainties, both physical and governmental, the chapter gives a range of futures, within "optimistic" and "pessimistic" limits. The methods used assume finite quantities of crude oil and natural gas which producers can find.

The key part of the methodology was to project changes to proven reserves of oil and gas. There are three main flows which affect proven reserves: (1) additions to reserves resulting from the discovery of new reserves or extensions of older reserves; (2) revisions (upward or downward) to known reserves caused by additional field knowledge or, in the case of oil production, by improved recovery techniques; and (3) production of oil and/or gas. Throughout

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1/T.M. Garland, M. Carrales, Jr., and J.S. Conway, Bureau of Mines, U.S. Department of the Interior, Assessment of U.S. Petroleum Supply with Varying Drilling Efforts, I.C. 8634, 1974.

APPENDIX V

Step L: Reserves added through drilling were found by multiplying projected drilling footage (step H) by projected finding rates (step I).

Step M: In turn, the projected reserves additions that result from drilling (step L) were multiplied by the projected revision factors (step J) to give projected changes to proven reserves from revisions. (Revisions may result in upward or downward adjustments to proven reserves.)

Step N: Reserves additions by drilling (step L) and reserves additions through revisions (step M) were added to give total additions to reserves.

Phase 5 - Projected changes to proven reserves

The final phase of the methodology was to project production levels under various conditions and expected proven reserves levels.

Steps O, P, Q, and R: Note that O minus P, plus Q, equals R. The first year's projected production (step P) was calculated by multiplying the production-to-reserves ratio (step K) and reserves at the beginning of the year (step O). The cycle is repeated as shown in figure 16, with year-end reserves (step R) becoming the next year's beginning reserves (step O).

Steps S and T: Associated gas-to-oil ratios (step S) were calculated based on the past relationship between associated gas production and oil production. Then these ratios were used, with the oil production levels developed in step P, to project associated gas production (P times S equals T). Associated gas production depends on the level of oil production. Consequently, if the "best" case results in a high level of oil production, similar results are expected for associated gas production. Non-associated gas was projected separately using steps A through R.

Step C: Annual changes to proven reserves by revisions (for both oil and nonassociated natural gas) were determined for each of the three States.

Step D: Annual oil and gas production levels and proven reserves were identified.

Phase 2 - Calculation of historical performance of key variables

Once the historical data base was established, certain key variables were calculated to indicate how the oil and gas industry has performed over the years.

Step E: The finding rates are the amount of new reserves additions per foot of drilling. They are average figures (step B divided by step A), based on the level of drilling (successful and unsuccessful) and the amount of reserves added during the year. The finding rates, in conjunction with drilling levels, are used later to determine additions to proven reserves (see steps H, I, and L).

Step F: The revision factor is the ratio of revisions to additions (step C divided by step B).

Step G: The production-to-reserves ratios are calculated from the historical data identified in step D. The ratios are used later to determine the level of production which can be expected from a given level of proven reserves.

Phase 3 - Projection of key variables

In this phase, oil and gas drilling footage is projected and so are the key variables calculated in phase 2.

Steps H, I, J, and K: Drilling footage, finding rates, revision factors, and production-to-reserves ratios were projected using analytical judgment as described in table 39.

Phase 4 - Application of the projections to ascertain total additions to proven reserves

The projection made in phase 3 were used to ascertain total additions to proven reserves through drilling (discovery) and through revisions.

Table 39

Description of Projection Parameters Used in Figure 16 (Steps H, I, J, and K)

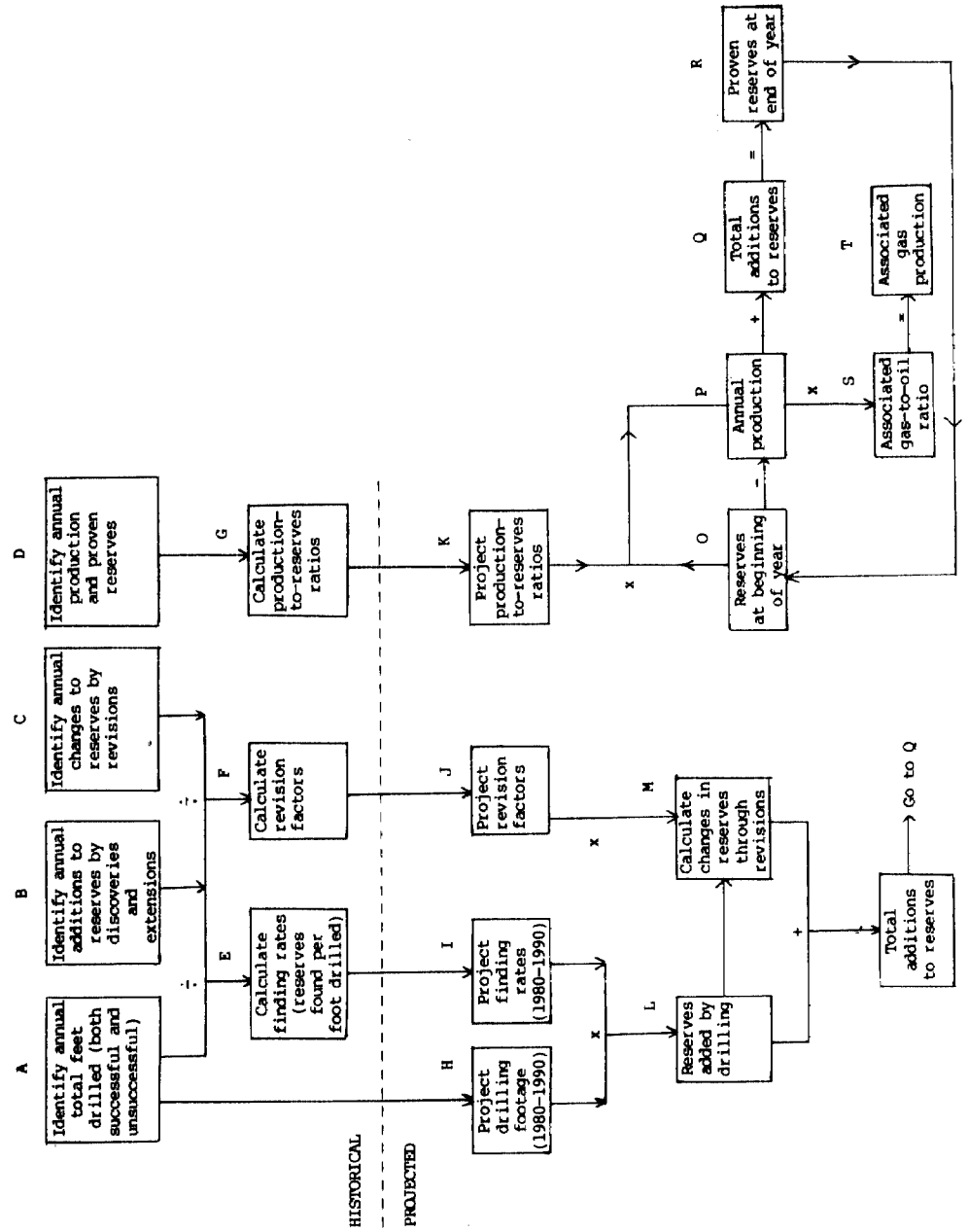
Major elements used in the projection methodology	Crude oil			Natural gas		
	"Best" case	"Worst" case	"Mean" case	"Best" case	"Worst" case	"Mean" case
Drilling footage: (a/)						
linear regression extension of the State's 1970-1978 trend	Tx,Ok			Tx,Ok,La		
the State's 1978 drilling rate assumed as a constant throughout 1980-1990	La	Tx,Ok			Tx,Ok,La	
the State's drilling assumed to drop 4% a year during 1980-1985 and 2% annually during 1986-1990		La				
the State's drilling rate assumed to grow 4% a year during 1980-1985 and 2% a year during 1986-1990			Tx,Ok			Tx,Ok
the State's drilling rate assumed to drop 2% a year during 1980-1985 and then remain constant through 1990			La			
the State's drilling rate assumed to grow 2% a year during 1980-1985 and 1% a year during 1986-1990						La
Finding rates: (b/)						
average of the State's 3 best years during 1970-1978	Tx,Ok,La			Tx,Ok,La		
average of the State's 3 worst years during 1970-1978		Tx,Ok,La			Tx,Ok,La	
average of the State's 1970-1978 ratios			Tx,Ok,La			Tx,Ok,La
Revision factors: (c/)						
average of the State's 1970-1978 revisions	Tx,Ok,La		Tx,Ok,La	Tx,Ok,La		Tx,Ok,La
average of the State's 1976-1978 revisions		Tx,Ok,La			Tx,Ok,La	
Production-to-reserves ratios: (d/)						
average of the State's 1976-1978 ratios	Tx,Ok,La	Tx,Ok,La	Tx,Ok,La	Tx,Ok,La	Tx,Ok,La	Tx,Ok,La

Notes: (See next page.)

APPENDIX V

Figure 16

Flowchart of Methodology Used to Project Crude Oil and Natural Gas Production for 1980-90



drilling was assumed to drop 4 percent per year during 1980-85 and 2 percent annually during 1986-90. These drilling levels were judgmentally arrived at, based on the belief that the decline in drilling in Louisiana has been following an "S" curve--i.e., the trend shows a sharp decline, followed by a more gradual decline, and then levels off. However, if drilling drops off at the rate established in the 1970s, the results for Louisiana would obviously be significantly less oil production than the "worst" case projection. Likewise, the "mean" case drilling projections assume an "S" curve upward in Texas and Oklahoma drilling; Louisiana, however, is assumed to have a more moderate drop in drilling in the "mean" case.

b/ Finding rates are an important part of the methodology. These rates, as mentioned previously, are calculated for each State by dividing total additions through discovery by the total drilling effort.

The trend in nonassociated gas finding rates is strongly downward. (See table 15.) Linear regression calculation shows downward sloping lines with a high negative correlation coefficient (between -0.85 and -0.94), indicating a strong trend. However, if the trend is carried to its conclusion, gas finding rates for the three States become strongly negative by 1990, which is clearly not appropriate (i.e., it is not likely that for every foot drilled gas will be injected back into the ground). Given such a strong negative trend, the "worst" case, with its use of the average of only the lowest 3 years' finding rates, is conservative or not as pessimistic as it probably should be.

Oil finding rates for Texas and Oklahoma show the same pattern as the gas finding rates--that is, negatively sloping lines and strong correlation coefficient. Here again, use of figures averaged over only 3 years, gives the "best" and "worst" scenarios a conservative bias, especially if drilling rates continue to climb. (It is assumed that increased drilling will drive down finding rates as nonrenewable resources are depleted over time.)

In Louisiana, the trend in oil finding rates is not as clear as in Texas and Oklahoma. Louisiana has a downward sloping line, but the correlation coefficient is only -0.41. This may be the result of decreasing and selective drilling,

Notes:

a/The historical drilling figures, as mentioned earlier, are taken from the American Association of Petroleum Geologists' surveys of drilling in North America. However, since the Association presents only three categories ("oil producers," "gas producers," and "dry holes"), it was necessary to allocate "dry holes" between oil and gas drilling. This was done by multiplying the ratio of "oil producers" to "total producers" times the total "dry holes." Use of the ratio is, in effect, saying that finding oil is no more difficult than finding nonassociated gas.

To obtain the total drilling figure, each individual drilling category was allocated between oil and gas, and then the gas drilling by category was summed; likewise, the oil drilling by category was also summed. The drilling categories used by the American Association of Petroleum Geologists include new field exploratory drilling, new pool exploratory drilling, deep exploratory drilling, shallower-pool exploratory drilling, extension (outpost) exploratory drilling, and development drilling.

Linear regression was used in the "best" case to project drilling levels for both oil and gas; the following are the coefficient estimates where Y = output and X = year:

	Equations	R-square
Texas Oil	Y = 23.562X - 1427.59	0.77
Texas Gas	Y = 34.213X - 2298.57	0.96
Oklahoma Oil	Y = 95.193X - 6105.94	0.69
Oklahoma Gas	Y = 11.081X - 762.39	0.88
Louisiana Gas	Y = 60.672X - 3166.78	0.64

The equation for Louisiana oil was excluded because resultant projections showed total drilling being only 327,000 feet in 1990. This drop in oil drilling, while reflecting the 1970 to 1978 trend, is probably too drastic. Thus, for the "best" case, it was assumed that the drilling effort in Louisiana would not continue to drop as fast during the 1980s. However, since no evidence of logical growth rates for Louisiana exists, for the "worst" case

the absence of strong trends, chapter 4's "optimistic" and "pessimistic" projections use increasing and decreasing revision factors, respectively, for oil and gas.

d/The end product of the methodology is to ascertain future levels of production from proven reserves. Production levels are calculated based on historical production-to-proven reserves ratios.

The crude oil production-to-proven reserves ratio has been rising for Texas and Louisiana--that is, a larger percentage of the States' reserves are being produced. In the case of Texas, the ratio went from .0957 in 1970 to .1271 in 1978, as the State's producers strived to maintain production in the face of falling additions to proven reserves. The change was not as dramatic in Louisiana, where the ratio went from .1594 in 1970 to .1712 in 1978. Oklahoma, on the other hand, had a decline in the ratio of production to proven reserves during the 1970-78 period, falling from .1610 to .1360. Oklahoma's lowest ratio was in 1976, although the ratio has started back up in 1977 and 1978.

In short, only Texas exhibited a clear trend. Because of this, and to simplify the analysis, the production-to-reserves ratio is held constant in all chapter 4's projections. The ratio used is the average of each State's last 3 years' production-to-reserves ratios. The average is used to capture the latest changes. Initial efforts had, however, used a linear regression projection of the 1970-78 data; but a problem arose in deciding how high the ratios could rise. In the absence of some clearly defined, internal dynamic or knowledge of the driving force, using constant ratios may be the most acceptable course. If Texas' ratio continues to change in the same pattern, the State's oil production would of course be higher at the expense of faster depletion of proven reserves. Likewise, if Oklahoma's production-to-reserves ratio continues to decline, production would be lower than projected.

i.e., lower risk taking or picking only the best areas for drilling. It would require reversing an 8-year trend to assume oil drilling rates would start to increase during the 1980s and finding rates to drop more consistently. Even though the "optimistic" and "pessimistic" cases for Louisiana use averages of the best and worst finding rates, respectively, this approach is largely arbitrary in the absence of a strong trend.

c/Revision factors (total revisions divided by total additions) were calculated for each of the three States for each year 1970 through 1978, as shown below:

Table 40

Crude Oil and Nonassociated Natural Gas Revision Factors 1970-78

	Crude oil			Nonassociated natural gas		
Year	Texas	Oklahoma	Louisiana	Texas	Oklahoma	Louisiana
1970	7.8774	1.565	.6856	-.4653	-.0517	.3097
1971	6.241	3.025	.8842	.0851	-1.0255	-.2322
1972	2.144	.7201	.4166	.5569	-.4087	.0845
1973	4.908	7.764	.3085	-2.2282	-.2347	-.0007
1974	2.956	3.074	.3143	-.5192	-.0616	-.1174
1975	.980	1.946	-.4887	-.8761	-.1835	.4687
1976	.916	1.0996	-.0720	-.0229	-.2805	.0816
1977	1.964	.8235	-.2560	.0609	-.1756	.3984
1978	1.129	.6731	.6395	-1.0644	-.1840	1.0083

Source: Developed by GAO staff using data from American Petroleum Institute publications.

The revision factors for nonassociated natural gas show no clearly defined trend, whereas the oil revision factors generally appear to be dropping. Here again though, in

modeling efforts. The Governor's Energy Advisory Council coordinated various modeling efforts that resulted in developing a comprehensive model called the Texas Energy-Economic Forecasting Model (TEFM). Forecasts of this model, however, depend upon the Chase Econometrics INFORUM model, which provides national estimates of industry growth rates.

The TEFM model produces aggregate estimates for 48 industrial sectors, along with the residential, government, investment, saving, import, and export sectors. Figure 17 illustrates general relationships of the model. Annual simulations are calculated for several standard economic indicators, including employment, personal income, taxes, and gross State product. These simulations are based on data from a recent input-output model, and data from each year's simulation becomes input for simulations in subsequent years. Thus a small error in a previous year could result in a growing bias as the model simulates the future.

To minimize the chance of error caused by factors beyond the model's control, TEFM produces three scenarios: "business as usual," "maximum Government control," and "free market." The effects of these three scenarios on the model's output are illustrated in the model's projected annual decline in Texas energy supply. With business as usual, the energy supply is projected to decline 2.5 percent annually; with maximum Government control, annual decline is 3.8 percent; decline is slowest under a free market, at 0.9 percent a year. The model also has projected that jobs and personal income in 1990 will be highest under a free market, and that household energy bills will be substantially lower than under maximum Government control.

Texas State revenues are forecasted primarily by the Comptroller of Public Accounts. 1/ Before 1975, revenue estimates were based on simple linear regressions or extrapolations. Since 1975, Texas has attempted to improve its forecasting capabilities by developing the Texas Revenue Estimating Model (TREM).

1/The Texas Constitution requires that any appropriations bill passed by the legislature be "certified" by the Comptroller before going to the Governor for approval or veto. Under the State's "pay-as-you-go" provisions, the Comptroller must certify that the proposed appropriations are available in the applicable funds. To carry out effectively his certification responsibilities, the Comptroller's office must periodically make revenue estimates or forecasts.

APPENDIX VI

COMPUTER MODELING EFFORTS FOR FISCAL AND ECONOMIC PLANNING IN TEXAS, OKLAHOMA, AND LOUISIANA

Data collection and analysis using computer models is becoming an increasingly important part of planning processes. Researchers in Texas, Oklahoma, and Louisiana have developed models to forecast State revenues and economic activity, but these models have been developed piecemeal and they generally need better maintenance before they can aid long-term planners. 1/ Also, many State officials view model building with skepticism. They wonder whether the costs of model building are justified, especially when the models are technically complex and difficult to use.

Since energy is so important to the Southwest's economy, most of the region's computer-assisted, fiscal planning studies overlap with energy policy studies. Texas appears to be ahead of the other two States, partly because during 1972 and 1973, the Governor's Energy Advisory Council supported the creation of the Texas input-output model.

In Oklahoma, projecting revenue through computer modeling seems to be in its infancy. For instance, in May 1979, the Oklahoma Senate passed a bill requiring the Oklahoma Tax Commission to make periodic appraisals of the various energy-related taxes and to develop econometric models to predict revenue shortfalls.

Louisiana has a State Planning Office, but it serves primarily as a centralized data center. Several universities in Louisiana, however, have done research connected with fiscal planning.

TEXAS STATE AGENCIES INTERESTED IN USING MODELS IN THE PLANNING PROCESS

In Texas, both the Governor's Energy Advisory Council and the Comptroller of Public Accounts have participated in

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1/For a more detailed discussion of current modeling efforts in various State governments, see James A. Richardson and W. Patton Culbertson, Jr., "A Final Report on Energy/Resources Policy Evaluation System-Conceptual Definitions," submitted to the Louisiana Department of Natural Resources, 1978.

TREM is actually a series of models used to estimate growth in the bases of the major State taxes. One estimating equation is used for each tax, with income, prices, employment, and seasonal correction factors used to derive the tax revenue estimate. Seasonal correction factors are needed because estimates are based on quarterly rather than annual data. Although the model provides quarterly estimates, using this data set restricts the choice of independent variables since many economic variables are collected only on an annual basis. As long as basic structural changes do not occur, the model will produce reasonably accurate forecasts.

MODELING EFFORTS IN OKLAHOMA

In Oklahoma, the foundation is being laid for a computer-assisted effort by the State's Department of Energy through the support of research to construct a forecasting model based on input-output analysis. 1/ The model builders believe that having a reliable model to assess the effects of various economic policies is essential for planning. Consequently, a free market model and a regulated market model were developed. However, these models were constructed using 1967 market elasticities and these data must be updated before the models can be used for policy simulation.

In addition to the State Department of Energy's effort, the Oklahoma Senate recently passed a bill requiring the Oklahoma Tax Commission to develop econometric models, build a data base, and gather any other needed information concerning possible shortfalls in tax revenue.

MODELS FOR SHORT-TERM PLANNING DEVELOPED FOR LOUISIANA

In Louisiana, the Governor has a Council of Economic Advisors that has made State revenue projections at his request. Also, economists at Louisiana State University have developed various short-run regional models. They believe that these modeling efforts can be extended so the legislature can analyze the fiscal and economic effects of various energy policies.

The Louisiana legislature has been receiving revenue forecasts for a number of years. In the early 1970s, several different groups from both the executive and legislative branches, as well as universities, provided revenue

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1/Liew, C.D., and Liew, C.J., "Oklahoma Energy Assessment and Forecasting: An Application of the Variable Input-Output Model," May 1979.

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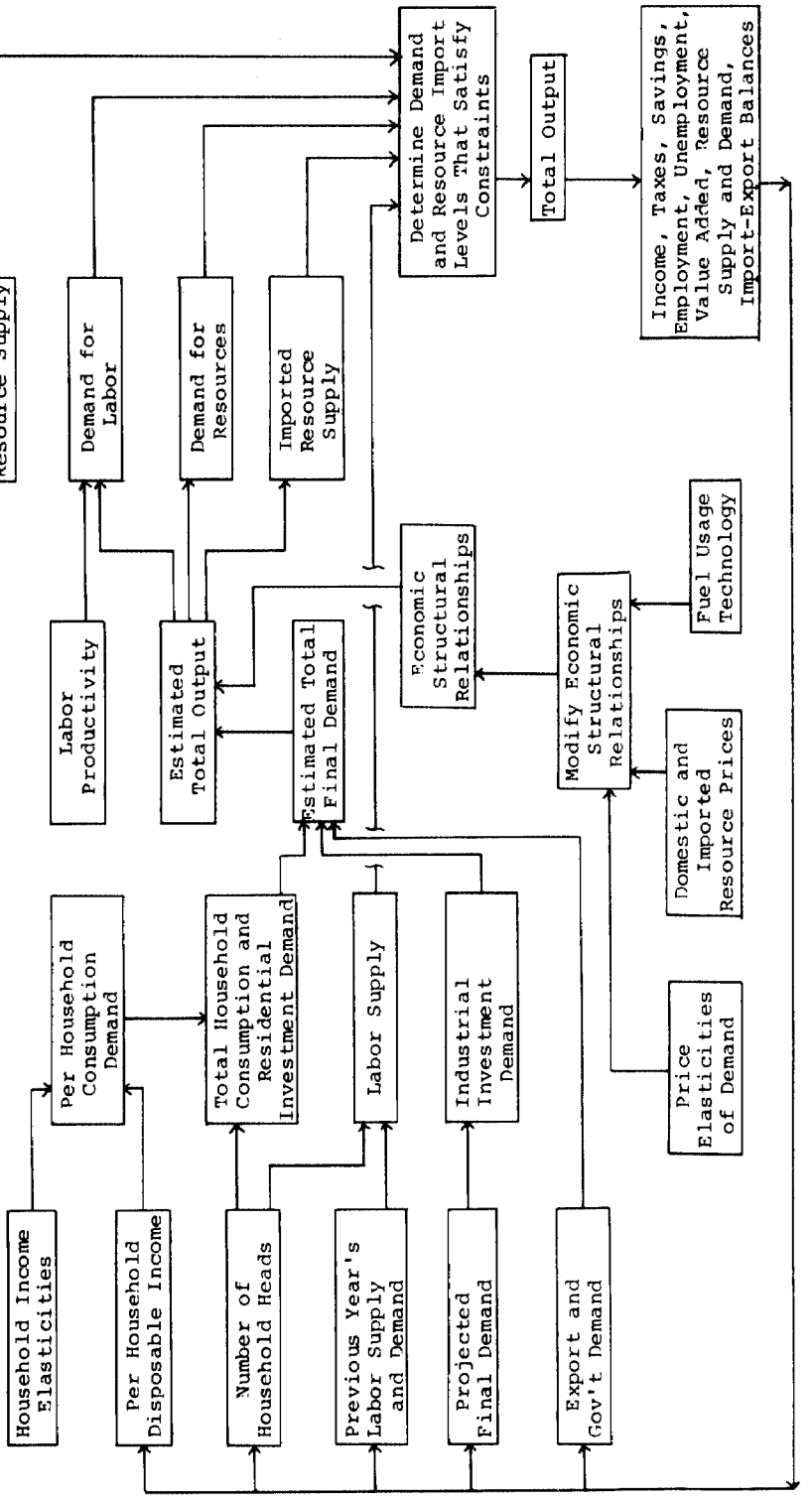
Figure 17

Diagram of TEFM Model Relationships



Source: Milton L. Holloway, "Texas Economic Modeling Capability with Special Reference to Energy," Governor's Energy Advisory Council, April 1977 (#77-04-05).

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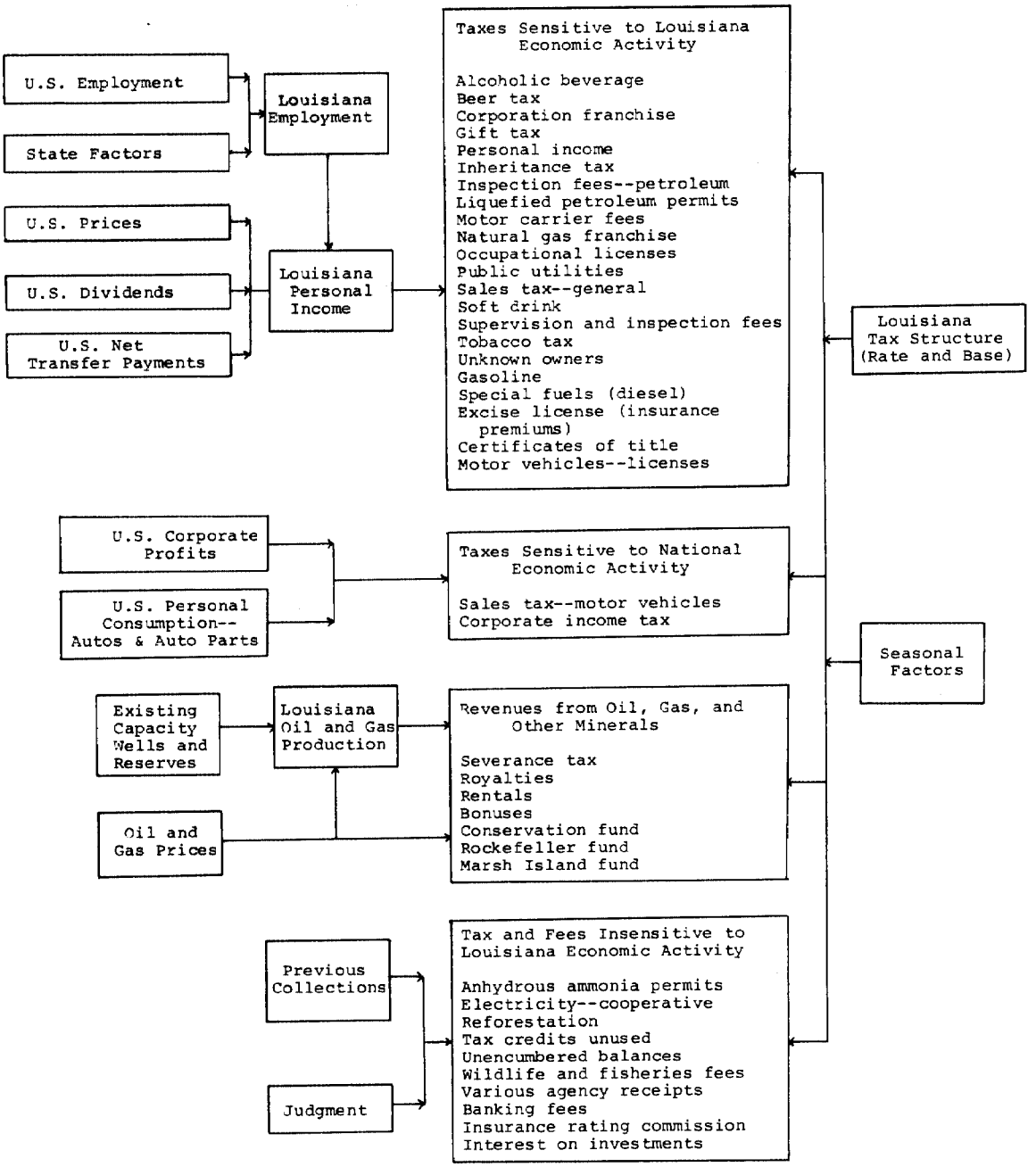
Figure 18

Louisiana Revenue Projection Model



Source: James A. Richardson and Loren C. Scott, "Projecting State Revenues in Louisiana with an Econometric Model," State and Local Government Review, 10 (September 1978).

estimates. Then, in 1976, the State's legislative fiscal office reduced the number of separate estimates by requiring concensus estimates from various groups. Projections from an econometric model, called the Louisiana Revenue Projection Model, were provided by the Division of Research at Louisiana State University. This model includes a series of quarterly tax equations that use personal income as the major determinant. Personal income, in turn, is determined by national economic conditions so the State model is linked to Wharton's U.S. Quarterly Forecasting Model.

The tax equations in Louisiana's model are similar to the Texas model; however, the Louisiana Revenue Projection Model includes a variable to capture tax rate or base changes and its adjustment for seasonality is more detailed than TREM. 1/ Louisiana's quarterly model suffers from the same deficiencies as Texas' model, but there is a trade-off between annual forecasts with a richer array of explanatory power and the more timely quarterly forecasts with a reduced ability to capture the effects of sudden structured changes. Figure 18 flowcharts the logic of the Louisiana model's tax equations.

The predictive power of the Louisiana Revenue Projection Model is quite strong for short periods of time; but, for longer periods, the probability of error increases since forecasts of explanatory variables become less and less accurate. Thus, the Louisiana model builders believe that their model can output acceptable projections in a 12- to 24-month range, which should be sufficient time for short-term planning. Use of the model for long-term planning is more risky, particularly during times of much volatility in oil and gas revenues and many uncertainties regarding policy decisions.

Another effort, which focused primarily on energy aspects of Louisiana's economy, employed an input-output model to analyze various strategies for State development. 2/

1/Adjustments are made for changes in the slope of the function from quarter to quarter as well as parallel shifts in the function. For more detail, see James A. Richardson and Loren C. Scott, "Projecting State Revenues in Louisiana with an Econometric Model," State and Local Government Review, 10 (September 1978), pp. 92-99.

2/Lentz, P.A., and Vanlandingham, H.W., "The Impact of Energy on the Regional Economy of Louisiana", in Hamilton and Linge (eds.), Spatial Analysis, Industry, and Industrial Environment, (Chichester: John Wiley and Sons), 1979.

AGENCY COMMENTS AND OUR EVALUATION

In gathering information for this report, we interviewed several Federal and State agency officials, and officials from various research institutions in these States. Each agency or institution was sent a draft of the report and given the opportunity to make comments. 1/ Some of the agencies and institutions responded in writing, while others gave an oral response.

The following agencies and research institutions sent written responses:

U.S. Department of Commerce
U.S. Department of Housing and Urban Development
The Ozarks Regional Commission
Texas Energy and Natural Resources Advisory Council 2/
Oklahoma Tax Commission
Oklahoma Geological Survey
Louisiana Department of Commerce
Louisiana Department of Natural Resources
Louisiana State Planning Office
The University of Texas at Austin, Bureau of Business Research
The University of Texas at Dallas, Southwest Center for Economic and Community Development

The following agencies and research institutions gave oral responses:

U.S. Department of Energy
Advisory Commission on Intergovernmental Relations
Oklahoma Department of Energy
Oklahoma Department of Economic and Community Affairs
Oklahoma Department of Industrial Development
Louisiana State Budget Office
Louisiana Department of Urban and Community Affairs
Louisiana Geological Survey
The Kerr Foundation, Economic Studies Division
Louisiana State University, Division of Research, College of Business Administration

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1/The written responses from Federal agencies and a selection of State agencies (one from each State) are in app. VIII. The title and page numbers in these letters refer to the title and page numbers of the draft copy.

2/This agency coordinated the responses from several Texas State agencies.

APPENDIX VI

These researchers argued that neglect and obsolescence have been hallmarks of Louisiana's social and economic infrastructure, i.e., in the past, there was little need to give much thought to the State's future while severance tax revenues appeared guaranteed. They proposed various long-term development strategies, then used an input-output model to estimate multipliers under each scenario. The first development alternative followed economic base theory and emphasized industrial growth for export purposes; the second concentrated on the processing of local raw materials; and, the third proposed an urban-oriented strategy by concentrating on activities in the tertiary sectors. From an energy-conservation viewpoint, a combination of the second and third strategies produced the best results. Energy efficiency was maintained, while development potential was not thwarted. The authors concluded that with careful planning by both public and private managers, Louisiana can survive a crisis of fossil fuel depletion. The authors have shown how an input-output model can be used to aid in the planning process; but, because 1963 data was used to generate the multipliers, the quantitative results have limited use for current planning. One of the major tasks in the planning process is obtaining current information. An analytical model using inaccurate or outdated information cannot produce reliable results for planning purposes.

MODELS FOR LONG-TERM PLANNING NOT YET DEVELOPED

Although modeling efforts have shown how policy makers could use the model's results in the planning process, costly problems of gathering current data and maintaining the model must be overcome before long-term planners could use these models with any degree of confidence. In terms of short-run fiscal planning, however, many State legislatures now use revenue forecasts provided by various economic models.

STATE OF TEXAS COMMENTS AND OUR EVALUATION

The Texas Energy and Natural Resources Advisory Council (TENRAC) thought the section on the earmarking of severance tax revenues was overstated, but comparison of Texas with other States reveals that the Texas educational system is highly dependent on oil and gas revenues. TENRAC agreed that State, regional, and industrial concerns need to be reflected in long-term energy policy.

STATE OF OKLAHOMA COMMENTS AND OUR EVALUATION

The Oklahoma Tax Commission thought that the private sector analysis in the report was basically sound. However, they stressed the uncertainty involved in predicting just when the oil and gas might run out. We agree that this problem of uncertainty is an important issue, but think that some long-term planning is needed to be better prepared for the eventual decline in nonrenewable oil and gas resources. The Commission also suggested that we obtain comments from other State officials more involved with the policy issues of the report. As previously mentioned, we did receive both written and oral comments from other State officials. Many of their comments have been incorporated into the final report.

STATE OF LOUISIANA COMMENTS AND OUR EVALUATION

Louisiana's Department of Natural Resources said that the report needed considerably more work to establish as a fact the need for long-term planning. We feel, however, that such a need for the Southwest region can be definitely established only in retrospect. The main focus of the report is to plan now to minimize the unwanted effects of economic dislocations.

Our data sources and methodology are criticized by this agency. However, the data used in the trend extrapolation is appropriately documented. Other less reliable data sources are used only as a sensitivity test to the trend extrapolations. The methodology was developed at the Bureau of Mines and is an accepted and objective procedure. It does, however, have limitations--one being that future price changes are not explicitly considered in the methodology.

Some Louisiana officials felt that we were one-sided in describing their role or lack of role in the long-term planning. In some cases, they presented additional evidence to

The responses fall into two basic categories--substantive and editorial. We have incorporated most of the editorial suggestions into the final report, along with suggestions to improve or qualify our discussion in several chapters of the report. Only our evaluation of the written responses from Federal agencies and a selection of State agencies will be treated in this appendix.

DEPARTMENT OF COMMERCE COMMENTS AND OUR EVALUATION

Through the Secretary's office, we received a response from the Economic Development Administration (EDA) and the Regional Commission's Washington office. The Ozarks Regional Commission also responded with comments that were primarily editorial. These comments were incorporated into the body of the report.

The Economic Development Administration, however, disagreed with the report's implication that EDA is not doing enough to prepare for the depletion of oil and gas in the region. They believe that the issue is not a pressing one and prefer to devote resources to higher priority needs. However, the basic message of the report is that not enough is being done in terms of long-range planning. Without long-term planning, today's potential dislocations will become tomorrow's short-term crises that receive quick and sometimes counterproductive Federal Government responses. A strategy that devotes some resources to anticipating problems and developing a menu of options has a greater likelihood of success, than one that continuously reacts to short-term demands.

The Regional Commissions agreed with GAO that Federal development efforts should be coordinated and mutually reinforcing. Because of their nature, regional commissions have the necessary flexibility to address energy dependence issues that overlap State boundaries, and they could devote some of their resources to the work of coordination.

HUD COMMENTS

The Department of Housing and Urban Development (HUD), had no major disagreements with the report; however, they noted that resource constraints pose problems in meeting some of our concerns. Most of HUD's comments dealt with points of clarification, which, if appropriate, have been incorporated into the text of the final report.

APPENDIX VIII

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Economic Development
Washington, D.C. 20230

Mr. Henry Eschwege
Director, Community and Economic
Development Division
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Eschwege:

We have reviewed the subject draft report as you requested. When the report is published in final, it should be useful to many Federal and state officials concerned with the long-range planning for the Southwest. EDA does deal with "big picture" issues such as oil and gas depletion at both the national and regional policy level. As the study indicates, much can be done now to plan for the eventuality of oil and gas depletion and diversification.

The Economic Development Administration (EDA) does not agree with the criticisms contained in the draft report which appear to imply we are at fault for not doing far more to plan for this problem. The Southwest is today experiencing a boom as a result of its oil and gas income. In many instances, this wealth is at the expense of other sections of the country. As the draft report indicates, America's oil and gas depletion/ diversification problems in Southwest are long-range problems. The issue addressed by this study may well be resolved quite normally with minimum Federal government involvement. On the other hand, the nation has many other economic development problems facing it today, both within the oil and gas industries and in other segments of the economy. Many of these problems are so acute that they must be considered now. EDA continues to believe that it will accomplish more by devoting the bulk of its limited resources to these more pressing needs, rather than overemphasizing the issue of the draft report.

This does not mean that the Agency does not plan to focus on the issue. We believe that there are roles for different levels of government and government organization to play in addressing this issue. Certainly there should be a national strategy. Such a strategy should be developed in consultation with the States and with careful consideration of how oil and gas production affect the economies of particular States. This process would encourage impacted States to think strategically and formulate their own plans for adjusting to changes in the oil and gas industry.

EDA has long recognized energy as a crucial element in economic development. Funding goals have been set for projects which address energy problems; policy papers on energy issues have

substantiate their claims and the report was revised to reflect this new information.

Some Louisiana officials agreed with the message of the report that long-range planning is needed. One said that he had been telling the State legislature for years that the oil and gas revenues would not last forever. Another agency felt the report was "right on the mark." However, there was disagreement over who should be doing the long-range planning. Many officials in Louisiana, as well as the other two States, were skeptical of Federal Government efforts, largely due to the unwanted effects of past energy and regulatory policies. An official of Louisiana's State Planning Office aptly articulated this concern:

> "Our third concern involves responsibility for resolving the issue of the three States' fiscal and economic dependence on diminishing, nonrenewable oil and gas resources. Basically, this issue contains our problems which we have lived with and thus become most familiar with over the past 50 to 100 years. The State of Louisiana therefore believes that the States should be afforded a rightful opportunity to resolve this issue first within and among themselves. We believe your report should emphasize more greatly such a role, and hope you would refer to our above planning efforts as indicative of the States' ability to fulfill that role. Certainly the Federal Government has a responsibility for insuring that regions contribute to a healthy national economy. However, we firmly believe that initial Federal actions, without consultation with the States, stand a good chance of being either uninformed, insensitive, or even politically discriminatory."

along with those more local in nature. We assist local/regional/State officials in preparing these plans, review their plans once they are completed, and approve projects based on these plans for which there is great need and potential impact.

The Agency does not see the need to stress oil and gas depletion/diversification in its Southwest 301(b) local (district) program. However, beginning in FY 1981, EDA will encourage those funded under its 302(a) state program in the Southwest to address this issue. We believe that these documents will address the problems and opportunities detailed by the draft report. (There is an error in the draft report which the Agency would like corrected. The statement on page 6.8 which was attributed to the "Region VI (Southwest) Coordinator" should be changed to "the Washington 302(a) Program Specialist for the Southwestern Regional Office." As such, the indirect quotes attributed to this individual should be restricted to the 302(a) program. We do not believe that statements from this official should be used as a rebuttal to those made by officials interviewed in the Southwestern Regional Office.)

3. The EDA Southwestern Regional Office's planning and operating needs -- especially in preparing, monitoring, and updating an issue-oriented economic development strategy -- should be supported by the Agency's Research Division.

The Research Division does try to focus on priority problems critical for the long-term development of a number of cummunities or large geographic areas. For example, EDA is conducting a $6 million study which was mandated by the 1976 Water Resources Development Act. This effort, called the High Plains - Ogallala Aquifer Study, has been designed to examine the needs for the states of Colorado, Kansas, New Mexico, Oklahoma, Texas, and Nebraska.

However, resources for this Division are limited and there are numerous demands on it to fund projects addressing pressing national and regional issues. We do not believe that the issues raised by the draft report are of a priority to warrant expenditures of the Research Division's funds at this time.

We appreciate the opportunity to comment on this report and look forward to reading it when it is prepared in final.

Sincerely,

Robert T. Hall
Assistant Secretary
for Economic Development

been developed and disseminated. An FY 81-82 planning program goal for EDA is to better incorporate energy considerations into local plans.

Our response to the specific "Suggestions to the Secretary of Commerce" which begins on page 7.6 of the draft report follows.

The report suggests that the Economic Development Administration use its programmatic elements to help assure that applicable Federal-State-sub-State planning processes include a focus on the Southwest's oil and gas depletion issues.

1. The report suggests that EDA's regional strategy should be just that -- an issue-oriented strategy, with specific goals and objectives to address identified issues such as oil and gas depletion.

EDA and HUD deal primarily in grass roots planning. EDA works at the local and multi-county district level to assist localities in developing and implementing economic development plans. These localities and the medium-sized businesses EDA works with are appropriately concerned with their community and its very tangible and often short-term needs (e.g., water and sewer systems) and opportunities (e.g., a particular business that is interested in locating in the area). They can and do develop and build long-range strategies for diversification and stabilization of their economies.

The purpose of EDA's regional strategy is not to develop the region, but a strategy for EDA investment in support of local development within the region. Issues such as oil and gas depletion are relevant as problems to be responded to by states and localities in their efforts to increase job-creating investment, but it is not EDA's role to mandate actions to respond to a single problem.

Structurally, the Agency's regional strategy documents are funding action plans which set forth criteria for ranking and selecting projects. These criteria are based on economic analyses of regional trends and local plans. They do not reproduce the extensive regional economic analyses that are available in other Agency planning sources which are discussed below.

2. The Agency strategy should recognize the oil and gas issue; and, the Regional Office should take positive actions -- particularly in reviewing applications for 301(b) and 302(a) planning assistance funds -- to assure that the issue is considered and included in sub-State areas' Overall Economic Development Programs.

EDA's legislative mandate clearly directs a "bottoms-up" planning system. As such, EDA does not dictate specific problems to be addressed by a region. General information on national problems/opportunities is available from many sources to the region. Planning documents by local and State institutions often incorporate these problems/opportunities

APPENDIX VIII

6.17 The second paragraph observes that "HUD . . . would not consider having the agency's southwestern Area Offices include a focus on the oil and gas issue." We believe the oil and gas issues defined in the draft report to be of major importance and significance. The issue is not whether HUD would consider focusing on these issues, but how oil and gas related planning impacts upon HUD's 701 National Policy Objectives. The 701 Program was recently reoriented toward the achievement of the following three National Policy Objectives, as expressed by the President in his March 27, 1978 Urban Policy Statement to the Congress:

1. Conservation and improvement of existing communities;

2. Expansion of housing and employment opportunities and choice for the poor, minorities and disadvantaged;

3. Promotion of orderly and efficient growth and development.

Applicants have discretion in selecting work activities, as long as the activity clearly relates to these objectives. Unrelated activities are not eligible for 701 funding. Over a three year period applicants must undertake activities which further the achievement of all three National Policy Objectives. Within this context, 701 funds may be allocated for oil and gas related planning work. It is HUD's policy not to mandate how these objectives are to be achieved by grantees.

6.17 The final point paraphrased on this page does not clearly distinguish between a comprehensive plan and an Overall Program Design (OPD). We request that this be corrected to note that an OPD is a work program to be followed by grantees utilizing 701 funds, while the comprehensive plan is the end-product of the process.

6.20 The draft cites our publication Rapid Growth From Energy Projects as an example of HUD 701 sponsorship of work related to "specific types of planning." This is not wholly accurate. Planning for coping with decline and/or growth resulting from rapid growth related to energy development is an eligible 701 activity. This publication is an example of an aid created by HUD to assist planners and citizens who are not knowledgeable in a new, specialized field. HUD has provided this type of assistance in many areas of planning need, and could also do so for oil and gas. Unfortunately, current 701 funding levels do not permit us to allocate funds for this purpose at the present time.

APPENDIX VIII

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C. 20410

August 14, 1980

OFFICE OF THE ASSISTANT SECRETARY
FOR COMMUNITY PLANNING AND DEVELOPMENT

IN REPLY REFER TO:

Mr. Henry Eschwege
Director, Community and Economic
Development Division
U. S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Eschwege:

Thank you for your letter of July 9, 1980 to Secretary Landrieu and copies of the draft report entitled "The Southwest's Fiscal and Economic Dependence on Diminishing, Non-renewable Oil and Gas Resources: Long-range Planning is Needed," (PAD-80-82, July 9, 1980). Your report highlights an area of concern to HUD and the Administration, and we welcome the opportunity to relate HUD programs to this sector of national need.

Before discussing specific recommendations and observations in more detail, we want to clarify certain points raised throughout the draft report. In a number of sections there appears to be a tendency to confuse comprehensive with more specialized planning (such as economic planning). We wish to emphasize that HUD's 701 Comprehensive Planning Program (as noted on page 6.16) is indeed "the most flexible of Federal planning programs." As such, 701 grantees can undertake economic development and other types of planning, should they choose to do so. Economic development is, however, only one aspect of comprehensive planning.

The report also continually emphasizes data collection needs. As a result of Congressional criticism, we have reoriented the 701 Program to emphasize results-oriented planning, utilizing available or previously assembled and updated data to the greatest extent possible. Too little funding is available to support or justify major new data acquisition efforts, as opposed to actionable planning needs.

GAO OBSERVATIONS

This section of the draft report includes a description of the 701 Program, accompanied by charts, data and paraphrased quotes from the Acting Deputy Director of HUD's Office of Planning and Program Coordination, and GAO observations on the Program and HUD policies. We will identify certain paraphrased quotes, issues and policies by draft report page number and clarify our position on each.

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4

SUGGESTIONS TO THE CONGRESS

7.10 In this section the draft recommends the Congress take several actions, some of which apply to the 701 Program. The second of two oversight options noted on page 7.10 suggests that "the Congress should require the applicable Federal agencies to follow a common regional strategy or action plan." Two new bills (S. 2719 and H.R. 7262) including revisions to the 701 Program have just passed the Senate and House. Sections of both bills require that certain national strategies and objectives must be followed by 701 grantees. Other sections encourage coordination and cooperation among Federal, areawide, State and other agencies in administration of the 701 Program, and in allocation of Federal funds as a result of planning products produced through the Program. We have worked with the Economic Development Administration to insure consistency of regional strategies tied in with EDA's Title V funding, and will continue to do so. We will raise the issue of 701 and EDA related planning centered about oil and gas, and pursue the problem of funding and support if the States choose to add oil and gas to their present 701 activities.

In the previous paragraph we also noted that a close cooperative relationship exists between HUD and other Federal agencies through the Federal Regional Councils, and through close, staff contacts. 701 regulations also require clearances and coordination with other Federal agencies, as previously mentioned.

In the case of 701, the draft report recommendation that planning coordination be "required" is already met through both S. 2719 and H.R. 7262. We request that the report be revised to reflect the bills, and/or the Conference Report and final bill, if signed before publication of the report.

CONCLUSION

We welcome the opportunity to comment on the draft report, and acknowledge the importance of the oil and gas issue to the Southwest. We agree that additional planning is very much needed on this issue, and we will encourage our 701 Program grantees to consider it. However, limited 701 resources preclude extensive budget supplements to grantees who may wish to include it. Reprogramming of commited or available funds may therefore be necessary if grantees decide to include oil and gas planning in their on-going work programs.

Sincerely yours,

Robert C. Embry, Jr.
Assistant Secretary

APPENDIX VIII

6.21 The final point paraphrased on page 6.21 states that "the Congress is likely to find laughable any suggestion that long-range planning is needed for the Southwest." We do not consider it possible that Congress would find such a suggestion "laughable." The issue is one of great importance. The paraphrase, however, is out-of-context. The Acting Deputy Director's reference was to the fact that Congress has pressured HUD to insure an action-oriented 701 program. Such a program, as defined by Congress, is oriented to shorter-term rather than long-term planning. His observation was that Congress probably would not accept a 701 program oriented towards results which may be 15-20 years in the future. They probably would look with greater favor on a shorter-term approach through 701 to Southwestern oil and gas issues, rather than a long-term projection. The paraphrase should be corrected to reflect this more accurately.

SUGGESTIONS TO THE SECRETARY OF HOUSING AND URBAN DEVELOPMENT

7.8 The draft recommends that HUD "direct Area Offices [in the Southwest] to consider [the oil and gas issue] in reviewing 701 applications and Overall Program Designs." We will ask our Area Offices to discuss this important planning issue with the States concerned and to review the impact on 701 National Policy Objectives. In your draft you also refer to broad regional development strategies on oil and gas issues. The States concerned would be able to address such issues either singly or cooperatively where there is a clear impact on 701 National Policy Objectives. In such cases, we will strongly encourage States to focus on oil and gas related issues, both intrastate and regionally.

The draft also recommends that HUD's Area Offices be cognizant and supportive of other Federal agencies' issue oriented efforts. Through the Federal Regional Councils, and through normal inter-agency coordination, we maintain a constant awareness of key issues of importance to other agencies. In addition, the A-95 review process often highlights problems of interagency concern. Our Regional and Area Office staff are in regular communication with their other Federal counterparts, and grantees must inform us of related Federal programs which play a role in their 701 plans. When issues of importance to other agencies fit within 701 objectives, grantees are able to structure their proposals to include such issues. With reference to this recommendation, 701 regulations require clearances and coordination with such other Federal agencies as the Departments of Energy, Commerce (Coastal Zone Management, Economic Development Administration, and other organizational units), Transportation (highways, airports, railways, and other units), the Environmental Protection Agency, and so forth. Grantees are required to provide evidence of clearance and/or coordination, and our Field Staff are instructed to carefully assess all interagency aspects of 701 proposals in light of major related Federal agency policy issues.

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The GAO study recommends that the Federal Government take a stronger role in Southwest regional planning for diversification in the context of energy depletions in this three-state region. The Report makes a number of suggestions pertinent to EDA and HUD planning. It further suggests that "EDA's efforts be coordinated with those of the Ozarks Regional Commission (hopefully, with Texas as either a member or participant). Ideally, EDA's Southwestern Regional Strategy, which seeks input from State and sub-State grantees, and ORC's Regional Action Plan, which is approved by the Federal Cochairman and the States' Governors, should be mutually reinforcing."

We believe this is a sound suggestion. Although the Regional Commissions are not operating agencies of the Commerce Department, the Secretary is, nevertheless, charged with giving policy guidance to the Federal Cochairmen of the Commissions. The Federal Cochairmen are on record supporting the Secretary's and Administration's initiatives that have significant regional impacts. Commissions have the flexibility to respond to national concerns with regional overtones and they have indicated their willingness to consider national priorities in their regional planning and programming.

More specifically, there is every reason to think that coordination and mutual program support between EDA, HUD, and the Ozarks Regional Commission could very well develop a long-range regional planning strategy for the energy dependence issue. That Commission has already devoted resources to the energy dependence problem through the six-state region. It is possible that the Ozarks Federal Cochairman, Mrs. Patsy Ann Danner, would be willing to argue for increased attention by the Commission to the energy dependence issue, perhaps even taking a lead position in the formulation of the three-state strategy. Other resources of the Secretary's Office of Regional Development might also be made available to assist in some of the coordinating work, as, for example, in the accessing of Federal statistics and data keyed to the three-state subregion, or facilitating possible interchanges between Ozarks and the neighboring Southwest Border Regional Commission which shares part of Texas with Ozarks, or providing staff planning skills, if appropriate, to the development of the subregional energy strategy, or facilitating interagency coordination with HUD based on long-continuing relationships developed between Commerce and HUD for regional commission plan reviews.

If coordinated in this way, such a planning strategy might well accommodate many of the GAO recommendations, particularly those related to the commitment of planning funds, the support of related research, the support for energy-directed data and information systems, and the interstate institutionalization of these activities.

Sincerely,

Frances E. Phipps
Special Assistant
to the Secretary for
Regional Development

APPENDIX VIII

UNITED STATES DEPARTMENT OF COMMERCE
Office of the Secretary
Washington, D.C. 20230

August 20, 1980

Mr. Henry Eschwege
Director, Community and Economic
Development Division
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Eschwege:

Thank you for the opportunity to review GAO's draft report, "The Southwest's Fiscal and Economic Dependence on Diminishing, Nonrenewable Oil and Gas Resources: Long-range Planning is Needed."

This study by GAO is a thorough, workmanlike, and generally balanced examination of what the southwest oil and gas producing states (Louisiana, Oklahoma, and Texas) are doing in respect to planning for the time of diminished fiscal and economic resources hinged on depletable energy supplies.

The study first examines prevailing evidence showing likely futures for oil and gas production and supplies and existing economic dependencies on those energy sources. It then inquires into what the states and Federal Government are doing to plan for the diversification of the southwestern economies once the fossil energy sources run out. Various Federal planning assistance programs (EDA, HUD, and the Ozarks Regional Commission) are examined. For the more traditional development agencies, like EDA and HUD, the findings are that planning assistance goes to the lower levels (states, multicounty districts, counties, and communities); planning at these levels generally attends short-term project and program demands. In the case of the Ozarks Regional Commission, by contrast, the planning horizon is much longer and, indeed, the Commission's existing long-range plan does address issues of energy dependence, depletion, and adjustment. The matter of economic diversification in the three specific states was not in the Ozarks plan, however, since the Ozarks Region now encompasses all of five adjacent states (Arkansas, Kansas, Louisiana, Missouri, Oklahoma) and 206 counties in Texas.

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Mr. Charles Vehorn
Washington, D.C.

August 11, 1980
Page 2

In reference to the last paragraph on page 6.27, a reference should be made that the most effective way to factor the influence of oil and natural gas into the Region's Economic Development Plan is to foster technical assistance projects designed to develop new energy resources. Special emphasis is placed on the conception of projects which are readily implemented.

I would appreciate the inclusion of these references in the sections dealing with the Ozarks Regional Commission.

Very truly yours,

Frank J. Lien III
Executive Director

FJI:jmh

APPENDIX VIII

THE OZARKS REGIONAL COMMISSION
1100 No. University, Suite 109 Evergreen Place
Little Rock, Arkansas 72207 (501) 378-5905

Frank J. Iuen III
Executive Director

August 11, 1980

Mr. Charles Vehorn
Program Analysis Division
General Accounting Office
Room 5014
441 "G" Street, N.W.
Washington, D.C. 20548

Re: Comments/"The Southwest's Fiscal and Economic Dependence on Diminishing, Nonrenewable Oil and Gas Resources: Long-range Planning is Needed"

Dear Mr. Vehorn:

It has been brought to my attention by the program staff, that the last paragraph on page 6.21 would better describe the actions of the Commission if the text indicated a reference to the ORC Energy Alternatives Study. The reference might include the study as the logical extension and follow-on of the Regional Action Plan in the area of Energy Resources Development, both renewable and nonrenewable. Furthermore, the Energy Alternatives Study does stress the region's economic base characteristics, and describes and illustrates the long-range planning ethic.

The Kansas study as mentioned is complete and available for distribution. This material provides a very comprehensive package which has the following uses.

- short term planning
- emergency preparedness/action
- long term planning
- policy analysis
- projections of future energy supply and demand
- assessment of current or near term energy supply/ demand situations
- analysis of effectiveness of weatherization and other conservation programs
- answering "what if" type questions which have implications for policy

The next logical step from this state system would be an extension to the regional level.

The report's comment that "heavy reliance on petroleum revenues should be continuously reassessed," (p. 2.1) is well known by State officials, and planning activities are ongoing to examine the situation. The potential for synthetic fuels is being studied, as are near-term strategies such as infill drilling (see p. 4.22 for comments in the report on the DeGolyer and MacNaughton report on waterflooding potential).

Two.

The report contains a good summary and compilation of data for the three energy-producing Southwestern states. It will be of considerable use to energy department staff members in the states. Some discrepancies in the data should be corrected, however. See, e.g., the statement on p. 4.15 that "the Windfall Profits Act will be in effect until either $227.3 billion is collected or January 1991, whichever is sooner." The word "sooner" should be replaced with "later".

Three.

There is some editorial comment in the report that should be deleted. For example, the statement "Redistributing a State's tax revenues would perhaps be inflammatory to the point of engendering highly emotional secessionary rhetoric" (p. 2.26) is inappropriate. I would suggest that the text be edited to delete comments of this kind.

Four.

The material on pp. 5.12-14 is misleading. The implication is that the Legislatures of the Southwestern states are prone to increase severance tax rates: "Understandably, then, when a need for additional revenue is indicated, the first impulse of southwestern legislators is to revise or expand severance taxes or seek alternative energy-based taxes." (pp. 5.13-14) In Texas, severance taxes on lignite and uranium have been proposed, but they have not been passed. Furthermore, the severance tax rate on crude oil in Texas has remained constant at 4.6% since 1951, a fact that is pointed out in the report on p. 9.4. The Texas Legislature assesses the need for additional taxes, and as revenues from the oil and natural gas severance taxes begin to decrease in the next few years, new tax bills will be introduced.

The State's reliance on severance taxes is overstated in chapter 2, in which the "earmarking" process is emphasized. See pp. 2.16 and 2.22, especially. Education in Texas is financed in part through earmarking of severance tax revenues. However, an equal amount is provided through general revenues, and as severance tax collections change, the amount of general revenue funding for education changes in accordance.

The Texas Legislature does not haphazardly increase the severance tax rates whenever there is a need for additional state funding. The Legislature acknowledges that "traditional taxes could easily be used more extenseively to finance public services," (p. 5.12), and also understands that new taxes could be authorized. However, tax structures tend to be rigid once in place (note the national problem with financing of the social security system), and the Legislature has chosen to take a more reasoned approach to tax policy.

APPENDIX VIII

TEXAS ENERGY AND NATURAL RESOURCES ADVISORY COUNCIL
411 WEST 13TH STREET, AUSTIN, TEXAS 78701

8 August 1980

Mr. Morton A. Myers, Director
Program Analysis Division
United States General Accounting Office
Washington, DC 20548

Dear Mr. Myers:

Thank you for providing the State of Texas with the opportunity of reviewing the report entitled "The Southwest's Fiscal and Economic Dependence on Diminishing, Nonrenewable Oil and Gas Resources: Long Range Planning is Needed." My staff and I have reviewed the report, and have consulted with other agencies of the State. I am pleased to submit these comments for your consideration.

One.

As you note, the Governor has created the Texas 2000 Project to assess the resources and needs of the State through the end of the century. However, several State agencies, in particular the Texas Energy and Natural Resources Advisory Council (TENRAC), are engaged in a process of studying the needs and resources of the State. TENRAC administers the Energy Development Fund, through which research projects are funded to investigate the potential of alternative energy supplies for Texas and for the Nation. In addition, the Texas Energy Policy Project (TEPP) has been set up to (a) monitor energy policy developments, (b) create a decision-making process in which government leaders, technical experts, and citizen and industry groups interact to formulate energy policy for the State, and (c) develop an energy modeling capability, including econometric or process models of key energy sectors and associated nonenergy sectors.

The Texas Energy-Economic Forecasting Model (TEFM), which is mentioned on p. 12.2 of the report, is a key element in the evaluative process, but other models are utilized as well, including national macroeconomic models, state and regional models, and industry models of the oil, natural gas, refining, petrochemicals, agriculture, coal, transportation, and other industries. The State of Texas is using these models, the advice of experts, and the knowledge of interested citizens to support decision makers in planning for future needs.

APPENDIX VIII

OKLAHOMA TAX COMMISSION
STATE OF OKLAHOMA
2501 LINCOLN BLVD.
OKLAHOMA CITY, OKLAHOMA 73194

JAMES E. WALKER, Chairman
JOHN L. GARRETT, Vice-Chairman
J. L. MERRILL, Sec'y-Member

September 4, 1980

Mr. Morton A. Myers, Director
Program Analysis Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Myers:

This letter is in reply to the draft copy of your proposed report entitled The Southwest's Fiscal and Economic Dependence on Diminishing, Nonrenewable Oil and Gas Resources: Long-Range Planning is Needed. The Oklahoma Tax Commission feels that your analysis of the private sector importance of the oil and gas industry in Oklahoma is basically sound. The State of Oklahoma does indeed have a significant portion of the nation's oil and gas industry activity. The Commission also agrees that the State of Oklahoma derives significant tax revenue from this industry. Obviously, there "eventually" will be the need for Oklahoma to deal with the problem of diminishing oil and gas resources and revenues from these resources. An obviously important question seems to involve a better definition of "eventually".

The above comments are regarding the quantitative analysis found in your report. However, a large part of your report deals with policy questions. The Oklahoma Tax Commission is an administrative body. Our function is to administer the prescribed tax laws. The Commission does not make policy. More appropriate sources for comments on the policy implications of your report would be the Governor's Office, DECA, or key members of the Oklahoma Legislature.

Sincerely,

James E. Walker

JAMES E. WALKER, CHAIRMAN
OKLAHOMA TAX COMMISSION

JEW/ks
cc: Governor George Nigh

APPENDIX VIII

Five.

Centralized planning is a viable complement to the working of the market system. Planning is not "anathema" to the market system, as stated on p. 7.5, but it must be remembered that the price signals of the market, if unimpeded by government controls, serve the economy better as planning tools than do official government plans. Planning should be focused on broad issues. Markets should be relied upon to allocate the goods and resources, since government planners can never have sufficient information on which to base detailed planning decisions.

The State of Texas is studying the effects of national energy policies on the various regions of the country, and based upon the findings will develop long range planning requirements. In part these actions are being undertaken because of a lack of concern at the national level with the interregional impacts of national energy policy. Beginning with the Project Independence Report and continuing to the latest National Energy Plan, national policy has been related to the total impacts of energy policy. In some instances a given policy will have small national effects--however, it may have very serious effects on some of the regions of the country.

I support your efforts to expand the scope of Federal policy to include consideration of state, regional, and industry concerns over energy policy. It is a long-neglected area in national energy policy.

Six.

There is an error in the chart (Figure V-5, p. 5.43) that illustrates the planning agencies in Texas. TENRAC is not in the Office of the Governor. The agency was created by statute, to replace the Texas Energy Advisory Council and to incorporate other functions. It is co-chaired by the Governor and Lieutenant Governor, and includes the State officials whose responsibility includes energy policy, and citizen members. In addition to other responsibilities, TENRAC is charged with maintaining an energy data base and modeling system, reviewing the annual reports of the Department of Energy, and recommending energy policy for the State.

Conclusion.

The report provides useful tables and charts, giving data for the States of Oklahoma, Louisiana, and Texas. These data will be used by energy policy analysts in Texas.

The importance and changing importance of severance tax collections to the State treasury are well known, and many organizations, including TENRAC, the Office of the Comptroller of Public Accounts, the Texas Industrial Commission, the Bureau of Business Research at the University of Texas at Austin, the Texas 2000 Project, and the Texas Research League, have been studying this issue. We expect to recommend to the Governor and the Legislature new energy policy initiatives in a timely manner.

Sincerely,

James W. Lamb, Jr. for MLH

Milton L. Holloway
Executive Director

APPENDIX VIII

FRANK A. ASHBY, JR.
SECRETARY

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RESEARCH AND DEVELOPMENT

T.C. LANDRUM
DIRECTOR

July 29, 1980

MEMORANDUM

TO: Mr. Frank A. Ashby, Jr., Secretary

FROM: Dr. John H. Ristroph JR

SUBJECT: Technical Review of GAO Report

The draft copy of the GAO report entitled "The Southwest's Fiscal and Economic Dependence on Diminishing, Nonrenewable Oil and Gas Resources: Long-Range Planning Is Needed" documents the dependence of the Southwest (defined to be Texas, Oklahoma, and Louisiana) upon oil and gas, both in the public and private sectors. It is stated on page 1.7 that "by encouraging long-term planning, the Federal Government can help avert problems in the Southwest resulting from diminishing, nonrenewable oil and gas resources." This statement fairly well summarizes the report and hence bears close scrutiny. Although it is quite possible that the statement is correct, the report nonetheless fails to establish it as fact. There are three observations in this regard.

The first observation concerns the regional dependency on oil and gas. The demographic evidence presented in the report clearly indicates a dependence, but it fails to document the claim that problems will arise. In fact, a reference cited in the report contains data which indicates that further analysis is needed before it may be asserted that problems will occur as a result of this dependency. For example, the plots on the next page of unemployment and income levels for Louisiana do not appear to indicate a strong correlation with the dependency of Louisiana's economy upon oil and gas as measured either by the fractions of the workforce employed in oil and gas related industries or by the coefficient of specialization used in the report.

The second observation deals with the projection of production declines. It is ironic that the authors state on page 12.11 that "an analytical model using inaccurate or outdated information cannot produce reliable results for planning purposes"

P.O. BOX 44156 . BATON ROUGE, LOUISIANA 70804 . PHONE 504 / 342-4594

APPENDIX VIII

DAVID C. TREEN
GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

FRANK A. ASHBY, JR.
SECRETARY

July 31, 1980

Mr. Morton A. Myers, Director
Program Analysis Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Myers:

A draft copy of the proposed report, "The Southwest's Fiscal and Economic Dependence on Diminishing, Nonrenewable Oil and Gas Resources: Long-Range Planning is Needed" (minus pages 6.26 and 6.28) has been reviewed by the Louisiana Department of Natural Resources. It seems that the report recognizes some potentially important issues; however, considerable more work is needed to factually support its conclusions.

Page 5.29 of the draft states, in part, that Louisiana does not fear using coal. Although we do not fear using coal, we are greatly concerned and feel very strongly that Louisiana should not be forced to switch to coal at significant financial expense while others are allowed the liberty to continue using gas, much of which would, in all likelihood, come from Louisiana. Otherwise, we will be in effect importing their pollution problems and exporting one of the cleanest energy sources.

The attached memorandum contains a detailed critique which your staff may find useful in improving the report.

Sincerely,

Frank A. Ashby, Jr.

FAAjr/gc

P.O. BOX 44396 . BATON ROUGE, LA. 70804 . PHONE 342-4500
NATURAL RESOURCES BUILDING

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Year	Ratio of Louisianian Income to National Income[1]	Fraction of Louisianian Workforce Unemployed[2]	Fraction of Louisianian Workforce Employed in Petroleum Related Industries[3]	Coefficient of Specialization (Louisiana vs. National)[4]
1962	0.749	0.064	0.1201	8.96
1963	0.762	0.054		
1964	0.763	0.046		
1965	0.766	0.049		
1966	0.782	0.043		
1967	0.799	0.046	0.0977	7.16
1968	0.800	0.048		
1969	0.776	0.051		
1970	0.779	0.067		
1971	0.786	0.074		
1972	0.788	0.077	0.0922	6.90
1973	0.785	0.068		
1974	0.812	0.071		
1975	0.831	0.074		
1976		0.068		
1977			0.0972	7.43

Sources:

1. Calculated from data in Statistical Abstract of Louisiana, eds. J. R. Bobo and H. S. Segal, University of New Orleans, 1977, page 202.
2. Ibid, page 227.
3. "The Southwest's Fiscal and Economic Dependence on Diminishing, Non-Renewable Oil and Gas Resources: Long Range Planning Is Needed," draft copy, GAO, 1980, page 3.22.
4. Ibid, page 3.32.

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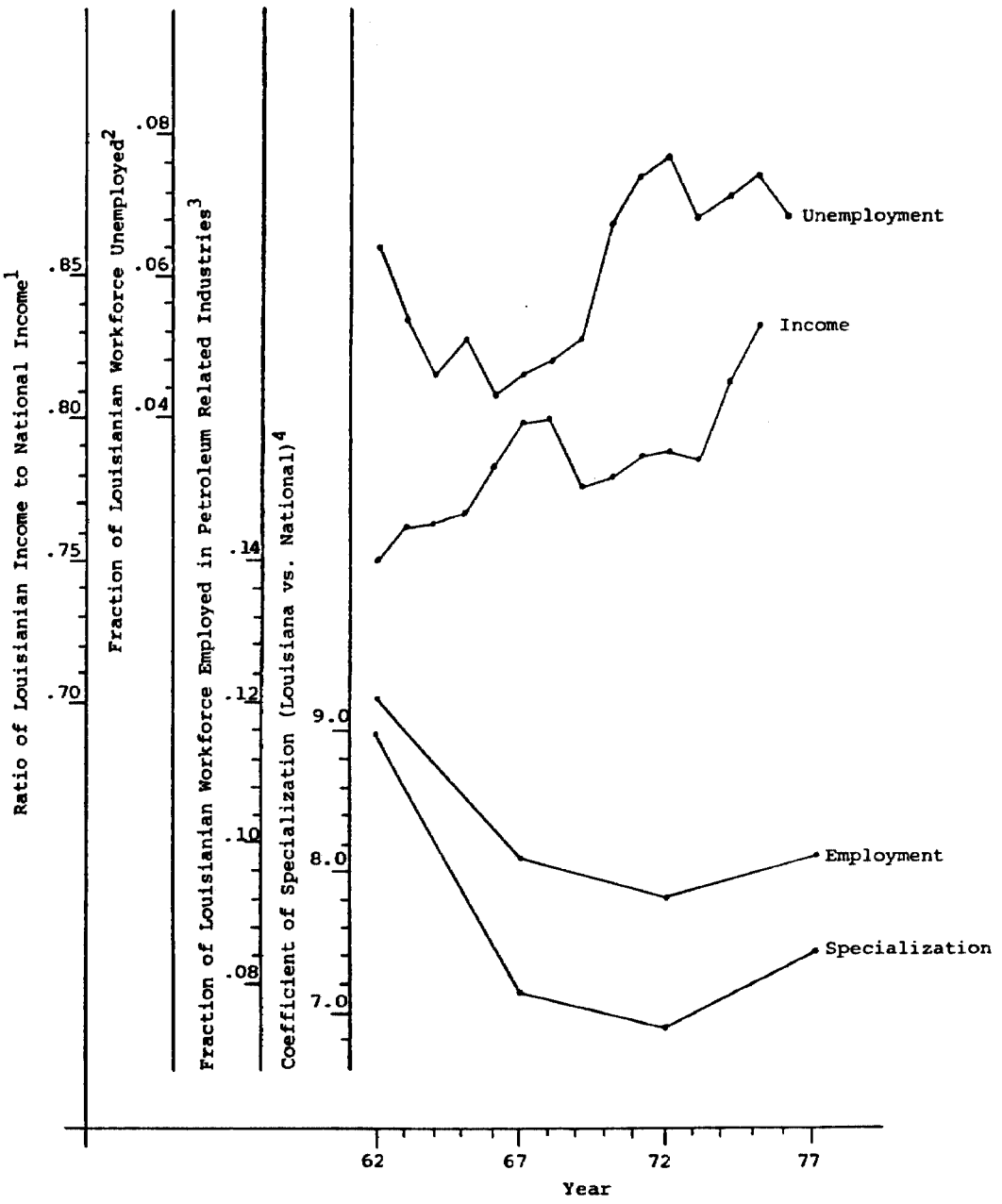

Sources:

1. Calculated from data in Statistical Abstract of Louisiana, eds. J. R. Bobo and H. S. Segal, University of New Orleans, 1977, page 202.
2. Ibid, page 227.
3. "The Southwest's Fiscal and Economic Dependence on Diminishing, Non-Renewable Oil and Gas Resources: Long Range Planning Is Needed," draft copy, GAO, 1980, page 3.22.
4. Ibid, page 3.32.

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after doing precisely that. The historical data used in making the projections for Louisiana includes the federal offshore. Another example is the use of data such as the drilling rates cited on page 4.29. An examination of the cited literature reveals that certain rates were accepted based on hearsay rather than properly documented information. Further, it is unclear why drilling rates are cited in the body of the text when it does not appear that they are used in the methodology described in Appendix IV.

The projection mechanism itself drastically needs review by a competent modeler. There are problems of incorrect specifications of functional forms, ill defined procedures, and unknown statistics. Also the impact of economics upon future production is ignored. The end product is a set of basically subjective projections disguised as a product of analysis.

The final observation deals with the ability of the federal government to help avert problems. Past efforts, notably DOE's tampering with projections of natural gas production volumes, do not lend credence to this assertion. There is a lack of empirical evidence to indicate that federal economic initiatives will be successful.

In summary, the report raises interesting and potentially important issues which are inadequately treated. However, the recognition of these issues is worthwhile. State level programs may be appropriate for further analysis. The report discusses federal funding procedures for such studies.

JHR/edb

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