OCS Study
MMS 2001-020

Coastal Marine Institute

Lafourche Parish and Port Fourchon, Louisiana: Effects of the Outer Continental Shelf Petroleum Industry on the Economy and Public Services, Part 2

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

Cooperative Agreement
Coastal Marine Institute
Louisiana State University

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Petroleum Mining on the Outer Continental Shelf, Gulf of Mexico: Impact on the Economy of and Public Service Provision in Lafourche, Parish, Louisiana, Part 2

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April 2002

Prepared under MMS Contract
1435-01-96-CT-30660-19945
by
Department of Agricultural Economics and Agribusiness
and
Coastal Fisheries Institute
Louisiana State University
Baton Rouge, Louisiana 70801

Published by

U.S. Department of the Interior
Minerals Management Service

Gulf of Mexico OCS Region

Cooperative Agreement
Coastal Marine Institute
Louisiana State University

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CITATION

Suggested citation:

Hughes, D.W., J.M. Fannin, W. Keithly, W. Olatubi, and J. Guo. 2001. Lafourche Parish and Port Fourchon, Louisiana: Effects of the Outer Continental Shelf Petroleum Industry on the Economy and Public Services, Part 2. Prepared by the Louisiana State University, Coastal Marine Institute. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2001-020. 51 pp.

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EXECUTIVE SUMMARY

Published analysis indicates that oil production from the Gulf of Mexico will increase in the range of 35 to 70 percent between 1998 and 2002 (7-10 percent per year). Production from deepwater fields will soon account for up to 64 percent of total Gulf of Mexico oil (compared to 26 percent in 1997). This increase in deepwater activity will require considerably more land based services than is currently available. Limitations on such facilities could place restrictions on future deepwater activities.

Port Fourchon's strategic location provides it with a competitive advantage as a supply base for oil-and-gas related activities in the Central Gulf of Mexico. These activities are diverse, ranging from supply boats used to service oil and gas rigs to the maintenance and repair of mobile drilling rigs. Currently, more than 600 offshore platforms are located within a 40-mile radius of Port Fourchon and the Port is likely to play an increasingly important role as development in the Outer Continental Shelf (OCS) progresses.

Further development of OCS activity and Port Fourchon is expected to markedly effect Lafourche Parish. Rapid increases in parish employment, which began in 1995, have continued in 1998 (2,184 new jobs) and have been concentrated in water transportation and shipbuilding.

Community Impact Models (CIM) quantify the linkages among economic activity in local communities and the demand for and ability to support local government services. A CIM developed for Louisiana is used to evaluate the impact of the OCS petroleum industry on the economy and local government finances of Lafourche Parish. An input-output model represents the local economy. This model used data collected prior to January 2000.

The OCS petroleum industry has and will continue to have a significant impact on the Lafourche Parish economy according to model results. Based on published estimates of OCS activity from 1995 through 2002, the industry is predicted to be directly and indirectly responsible for the addition of 6,349 jobs and $603 million in total output. But U.S. Census estimates indicate that the Lafourche Parish population has continued to experience slow growth through 1997. Dramatic declines in parish unemployment levels (starting in 1995) indicate that many new jobs have gone to the unemployed and to workers commuting into the parish. However, population levels should ultimately begin to show strong growth. For example, model results predict an increase in population of 4.2 percent from 88,263 in 1997 to 91,977 in 2002.

Model results also indicate increases in various revenue and expenditure categories due to the OCS petroleum industry. Total, inflation-adjusted, revenues paid to local governments are expected to increase by $20 million (11.2 percent) in 2002 from the 1995 level. Model results also indicate marked

increases in expenditures ($9.6 million) by 2002 thus implying that ongoing activity in the Gulf of Mexico should not strain the ability of local governments to deliver publicly provided services. However, this result is tempered because certain costs incurred by local governments due to the OCS petroleum industry, such as a major expansion in the water system, are not accounted for in model results. Such costs are an addition to costs increases predicted by the model. Hence, the ability of local governments to meet increases in cost due to the expansion of the OCS petroleum industry could be problematic. Further, a detailed study shows that State Highway 1 (LA 1) is receiving significant damage as a result of OCS activity. Because it is not a local responsibility, the cost of maintaining and upgrading the road is also not accounted for in model results.

Finally, the historical development of the OCS petroleum industry and the resulting impacts on economic and population levels in Lafourche Parish has been boom and bust. Increases in population and economic activity could and in some cases are already requiring substantial new investment in local infrastructure. If activity in the OCS petroleum industry should decrease rapidly in the future, local governments may incur the costs of infrastructure development without obtaining the levels of revenue needed to meet such costs.

I. INTRODUCTION

In the summer of 1996, the Executive Director of the Greater Lafourche Port Authority (responsible for the operation of Port Fourchon) wrote the Regional Director of the Minerals Management Service, Gulf of Mexico Region, calling his attention to the growing truck traffic on Louisiana State Highway 1 (LA 1) due to the increasing oil related activities on the Outer Continental Shelf (OCS) in the Gulf of Mexico. The increase in truck traffic raised the concern that the road is and will continue to be detrimentally affected. Hence, the ability of the road to handle increasing levels of truck traffic is questionable.

This report grew out of that concern. The report provides a brief history of OCS activities in Gulf waters, describes the current expansion in exploration, development and production activities on the OCS, and examines the prospect for future activities. Resulting growth in the Lafourche Parish economy is examined both from long run and more recent perspectives. The increasing activities of the OCS oil and gas industry have strongly affected the Lafourche Parish economy and Port Fourchon is an important locus for these effects. This report describes the Port and its environs, focusing on issues related to activities on the OCS.

Typically, rapid economic growth places stresses on a wide range of publicly provided services from schools, to police and fire protection, to welfare agencies, to provision of roads and utilities. The effects of the growth in the OCS petroleum industry on a range of public services in Lafourche Parish are discussed. In some cases, the offshore petroleum industry places unique stresses on public services. These are also described and discussed. (In particular, a detailed analysis of the impact of OCS petroleum industry activity on LA 1 issue is provided in the companion document, "An Analysis of LA Highway 1 in Relation to Expanding Oil and Gas Activity in the Central Gulf of Mexico" (Guo et al., 2000).

A major portion of the research presented herein involved the development of a regional economic model for Lafourche Parish and Port Fourchon. Accordingly, regional modeling in general, the regional model developed for this study, and the results from that model are extensively discussed. Also provided are discussions of the parish, the port, and oil and gas activity in the Gulf of Mexico.

II. GULF OF MEXICO PETROLEUM ACTIVITIES

A. Introduction

The Gulf of Mexico, almost completely surrounded by the United States, Mexico, and Cuba, is an oval sea encompassing some 3.9 million square kilometers. With approximately four thousand oil and gas platforms along the shelf and slope regions, the Gulf of Mexico is the most intensely developed region of the world on the basis of offshore oil and gas production and accounts for 90 percent of all oil and gas production in offshore waters of the United States (Louisiana Mid-Continent Oil and Gas

Association, 1996).[1] Between 1954 and 1993, oil and gas activities generated more than $90 billion to the U.S. Treasury in the form of lease bonuses and royalties (American Petroleum Institute, 1998).

B. A Brief History of Oil and Gas Activities

While offshore oil and gas development dates back about a century ago to Santa Barbara, California, 1933 is considered the benchmark year for activities in the Gulf of Mexico. It was in this year that the first attempt to drill in the offshore waters of the Gulf of Mexico was made and the first successful producing well became active four years later in 1937. This well, about a mile offshore, was drilled in 13 feet of water. In 1947, Kerr-McGee Oil Company completed the first well completely beyond sight of land. This well, which produced 600 barrels of oil per day, established the pattern of supporting offshore wells from onshore bases (Weber et al., 1990). Following a legal dispute between the federal government and the states involving ownership of the offshore seabed adjacent to the states coasts, the federal government, in 1954, conducted its first sale of offshore drilling rights.[2] Since that initial sale, more than 100 thousand tracts totaling more than 500 million acres have been offered for lease and more than 40 million acres have been taken for lease[3] (Weber et al., 1990).

Through time, the industry became more experienced and developed wells in ever greater depths. By the mid-1950's, wells fifty miles away from land were in operation (Weber et al., 1990). As of January 2000, 3,971 active oil and gas platforms were operating in the Gulf of Mexico OCS (Minerals Management Service, 2000). Exploration and drilling activities associated with these wells require substantial land based infrastructure to ensure continued operation. This land based infrastructure -- including oil field equipment dealers, air transport, marine equipment and transportation services, and contract labor and engineering services, to name just a few -- is located largely in Louisiana and Texas and contributes significantly to the economies of local coastal communities.

Until recently, the vast majority of oil and gas production from the Gulf of Mexico OCS was shallow water based (defined as taken from depths of less than 1,000 feet). As recently as the late

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[1] The U.S. domestic production of oil equaled almost 2.4 billion barrels in 1995 while the production of gas equaled 18,902 billion cubic fee. Production of oil from the Gulf of Mexico Outer Continental Shelf (OCS), defined, with some exceptions, as the area of oceans beyond the state boundaries out to 200 miles offshore, in 1995 (357 million barrels) represented 15 percent of the nation's 2.4 billion barrels produced while production of gas from the Gulf of Mexico OCS (5,015 billion cubic feet) represented more than a quarter of the nation's total domestic supply.

[2] This legal dispute emanated from a 1945 declaration by President Truman that the United States maintained ownership of natural resources of the seabed beyond the coastal states three nautical mile jurisdiction.

[3] This figure may be somewhat inflated because some tracts may have been returned and reissued at a subsequent date.

1980's, most of the conventional fields were mature and moving toward production decline (the Gulf of Mexico was being referred to as the "Dead Sea"). This observation was discredited during the 1990's, however, as a result of several factors including significant deepwater discoveries, new exploration and extraction technologies, and deepwater royalty relief (Cranswick and Regg, 1997).

C. An Era of Cautious Optimism

The rejuvenation of oil and gas activities in the Gulf of Mexico OCS is generally credited to three factors according to production analysts at Minerals Management Service (Cranswick and Regg, 1997). First, there have been significant discoveries in the deepwater shelf of the Gulf of Mexico in recent years. In 1997, for example, eleven new deepwater discoveries were announced. Second, new and improved technologies have been developed and implemented in recent years, which have permitted the extension of the conventional fields and increased discoveries on fields in deeper waters. Third, the passage of Public Law 104-58, Title III, the OCS Deepwater Royalty Relief Act (signed on November 25, 1995) appears to have provided a stimulus to deepwater bidding and leasing activities. For example, before the passage of the OCS Deepwater Royalty Relief Act in 1994, 49 bids were submitted on Gulf of Mexico tracts in excess of 800 meters. After enactment of the Act, the number of bids had increased to 722 in 1996 and to more than 1,100 in 1997 and as of April 2000, there were 3,670 leases in water depths of 1000 feet or greater (Baud et al., 2000). As a result, economic conditions have been favorable in recent years (Cranswick and Regg, 1997) although output prices have followed an erratic pattern of declines and increases from 1997 through 2000. Particularly pronounced growth since the early 1990's has been in deepwater activities (in excess of 1,000 feet of water) and there is cautious optimism that these offshore activities will continue, and likely expand, well into the next century. To assess oil and gas activities in the Gulf of Mexico, recent trends are first presented. Then, attention is turned to analysis of future activities based on available forecasts and other relevant information.

D. Oil Production

Production of oil from the Gulf of Mexico OCS for the 1985-97 period is illustrated in Figure 1. Overall, annual production ranged from a low of 275 million barrels in 1990 to a high of 412 million barrels in 1997. Examination of the data suggests two distinct trends during this 13 year period. The first, from 1985 to 1990, is one of a sharp decline in total production. Overall, total production during this period fell by about 20 percent. This decline is generally associated with the declining price of the products during this period. The second trend, evident from 1990 through 1997, is one of increasing total production. During this period, production of
oil from the Gulf of Mexico (OCS) grew by 50 percent with the last four years exhibiting particularly pronounced production increases (Minerals Management Service, 1999).

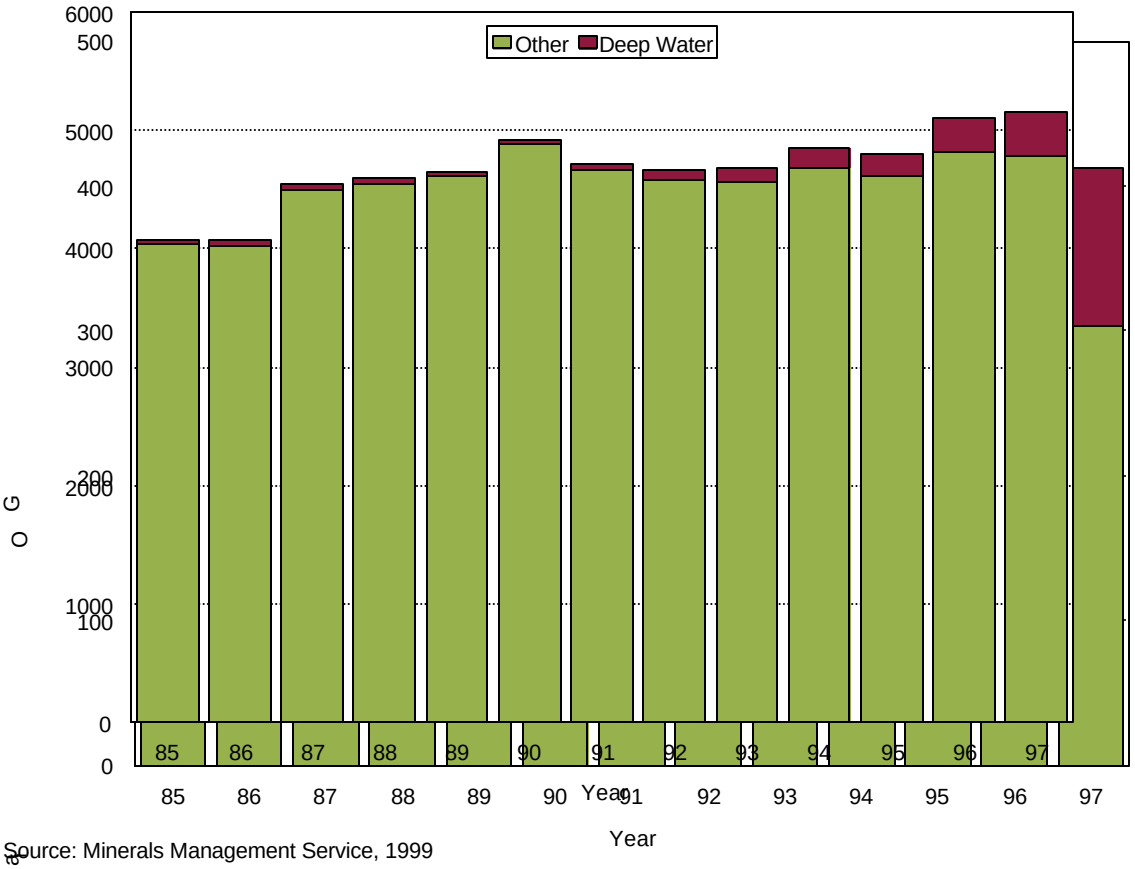
The increasing production since 1990 is primarily the result of expanding deepwater activities (defined here as production in more than 1,000 feet of water). Deepwater production of oil from the Gulf of Mexico equaled 12 million barrels in 1990. By 1997, deepwater production had increased more than ninefold to 108.5 million barrels (Figure 1). Overall, the share of Gulf of Mexico OCS oil

production represented by deepwater activities was 26.3 percent in 1997 as compared to 4.4 percent in 1990 (Minerals Management Service, 1999).

E. Gas Production

Natural gas production from the Gulf of Mexico (OCS) is given in Figure 2 for the 1985-97 period. Total production, as indicated, increased from 4.1×10^9 mcf in 1985 to 5.2×10^9 mcf in 1997, an increase of 26.4 percent. Production of natural gas from deepwater activities increased from 3.1×10^7 mcf in 1990 to 3.8×10^8 in 1997, an over tenfold increase. Overall, the share of the Gulf of Mexico OCS production derived from deepwater activities increased from less than 1 percent in 1990 to 7.4 percent in 1997 (Minerals Management Service, 1999). Predicting future Gulf of Mexico oil and gas activities is, at best, imprecise with the level of imprecision increasing in relation to the length of the forecast period.[4] Having given this cautionary note, some forecasts and indications of future activities are contained herein.

[4] In one recent economic study, for example, Walls (1994) predicted that Gulf of Mexico oil production would decline from about 277 million barrels in 1989 to about 160 million barrels by the year 2000. Similarly, production of gas was predicted to fall from 4275 bcf to 3160 bcf. Walls under-predict activity because her predicted oil and gas wellhead prices were well below current prices and because the technological development supporting current expansion in deepwater activities was not foreseen.



Source: Minerals Management Service, 1999

Source: Minerals Management Service, 1999

Figure 1. Offshore Oil Production, 1985-1997.

Figure 2. Offshore Gas Production, 1985-1997.

F. Future Activities

Analysis conducted by MMS (Melancon and Roby, 1998) indicates that oil production from the Gulf of Mexico will increase in the range of 35 percent to 70 percent between 1998 and 2002, or at a rate of 7 percent to 10 percent per year (Table 1).

Depending on assumptions used in the analysis, production of gas will either rise by as much as 15 percent or decline by 6 percent. Melancon and Roby suggest that production from deepwater fields will account for 56 percent to 64 percent of the total Gulf of Mexico oil production by the year-end 2000 (compared to 17 percent as of 1996) and from 23 percent to 30 percent of the gas supply (compared to 6 percent as of 1996). This increase in deepwater activity will, of course, require considerable land based services and Melancon and Roby recognize that limitations of land based service facilities could place restrictions on future deepwater activities.

Table 1

Projected Daily Oil and Gas Production in the Gulf of Mexico, 1998-2002.
Rate Projections - GOM

	1998	1999	2000	2001	2002
Low Oil MBOPD* (Decline Used)	1,226	1,493	1,592	1,606	1,976
High Oil MBOPD* (No Decline used)	1,347	1,667	1,816	1,874	1,976
Low Gas Bcfd** (Decline Used)	13.27	13.43	13.39	12.83	12.43
High Gas Bcfd** (No Decline Used)	15.26	16.30	17.07	17.25	17.54

* Oil in MBOPD includes condensate.
** Gas in BCFPD includes associated or casinghead gas
Source: Melancon and Roby, 1998.

Several indicators suggest considerable current and near-term future expansion of deepwater oil and gas activities in the Gulf of Mexico. Drilling permit applications (approved by the Minerals Management Service) increased from 39 in 1992 to 126 in 1996. Rigs drilling in federal shallow and deepwater for the period followed a similar trend, increasing from three in 1992 to 19 in 1996 (monthly average). Similarly, for federal shallow and deepwater, the total number of fields in production equaled 16 in 1996 compared to only six in 1992 while the total number of fields with proven reserves increased from 15 in 1992 to 25 as of June 1996 (Melancon and Roby, 1998).

Baud et al. (2000) suggest that more recent information supports continued and even accelerated interest in deepwater activities in the Gulf of Mexico. They report, for instance, that an additional 11 deepwater discoveries were announced in 1998. Furthermore, the 1997 lease sales in the Central and Western Planning Areas of the Gulf of Mexico received set records in terms of the number of bids received, tracts bid on, and the number of tracts leased in deepwater. The average number of rigs drilling for oil and natural gas in the deepwater of the Gulf of Mexico increased from 18 in 1996 to 26 in 1997. Finally, Baud et al. (2000) report that deepwater oil production surpassed shallow-water production in late 1999. The steady increase in deepwater gas production has offset the recent declines in shallow-water gas production.

While past activities do not necessarily reflect future activities, the information provided above suggests significant future activities in the deepwater of the Gulf of Mexico, *ceteris paribus*. Much of the ongoing and anticipated future activities are concentrated in the Central Planning area and most are easily accessible from the Port Fourchon area. This study presents an analysis of the impact of ongoing deepwater oil and gas activities on Port Fourchon and the Lafourche Parish area and evaluates potential impacts associated with expanding activities.

III. DEVELOPMENT OF PORT FOURCHON

A. Introduction

Port Fourchon, located in Southeast Louisiana near the mouth of Bayou Lafourche in southern Lafourche Parish, is the only major Louisiana port located directly on the Gulf of Mexico (see Figure 3). The Port covers 3.6 thousand acres and extends approximately three miles along the east side of Bayou Lafourche from its junction with Belle Pass and Pass Fourchon to the Flotation Canal (U.S. Army Corp of Engineers and Greater Lafourche Port Commission, 1994).

LA 1 is the only road providing surface access to Port Fourchon from the rest of the state. From where it dead-ends in Grand Isle, LA 1 runs north past Port Fourchon through Leeville, Golden Meadow, Galliano, Larose, Lockport, and almost to Raceland before it connects to U.S. 90. U.S. 90, in turn, runs east to New Orleans and west through Houma and New Iberia to Lafayette. At Lafayette and in the New Orleans area, U.S. 90 connects with U.S. Interstate 10 (I-10), part of the interstate highway system. The technical term for the connection from U.S. 90 to the Port is "intermodal." Unlike commerce moving on U.S. I-10 or U.S. 90, which moves through the area and can go to other places and states, commerce going to Port Fourchon has to stop there and be loaded on a boat - another "mode" of transportation - to continue its journey (U.S. Army Corp of Engineers and Greater Lafourche Port Commission, 1994).

Port Fourchon's waterway connections are of primary importance to its functions as a port. It is connected to the Gulf of Mexico by a navigation canal dredged through Bayou Lafourche and Belle Pass to the Gulf. Currently, the canal is 20 feet deep, approximately four miles long, and has a jetty at the mouth. While this canal is of primary importance to the Port's business, the port is also connected by a canal dredged in Bayou Lafourche north to Lockport. At Larose, this canal bisects the southern arm of the Intercoastal Waterway, giving Port Fourchon access to this waterborne traffic (U.S. Army Corp of Engineers and Greater Lafourche Port Commission, 1994).

Federally constructed projects provide access on Bayou Lafourche from Lockport, Louisiana, to the Gulf of Mexico. Channels are maintained by the Federal Government with the exception of the reach (section) extending from Port Fourchon to the Gulf. This section is maintained by the Greater Lafourche Port Commission (U.S. Army Corp of Engineers and Greater Lafourche Port Commission, 1994).

Port Fourchon is, first and foremost, a land based support terminal for the offshore oil and gas industry in the Central Gulf of Mexico. As stated in a 1994 U.S. Army Corps of Engineers report (p.19) "the economic viability of Port Fourchon is directly related to the exploration and production activities of the offshore oil and gas industries operating in the Federal waters of the Gulf of Mexico." The Port also provides logistical support for several other types of economic activities (U.S. Army Corp of Engineers and Greater Lafourche Port Commission, 1994). These activities - including the Louisiana Offshore Oil Port, waterborne commerce, and commercial fishing- are briefly examined below. Then, a more detailed examination of the offshore oil and gas based services housed out of Port Fourchon is provided.

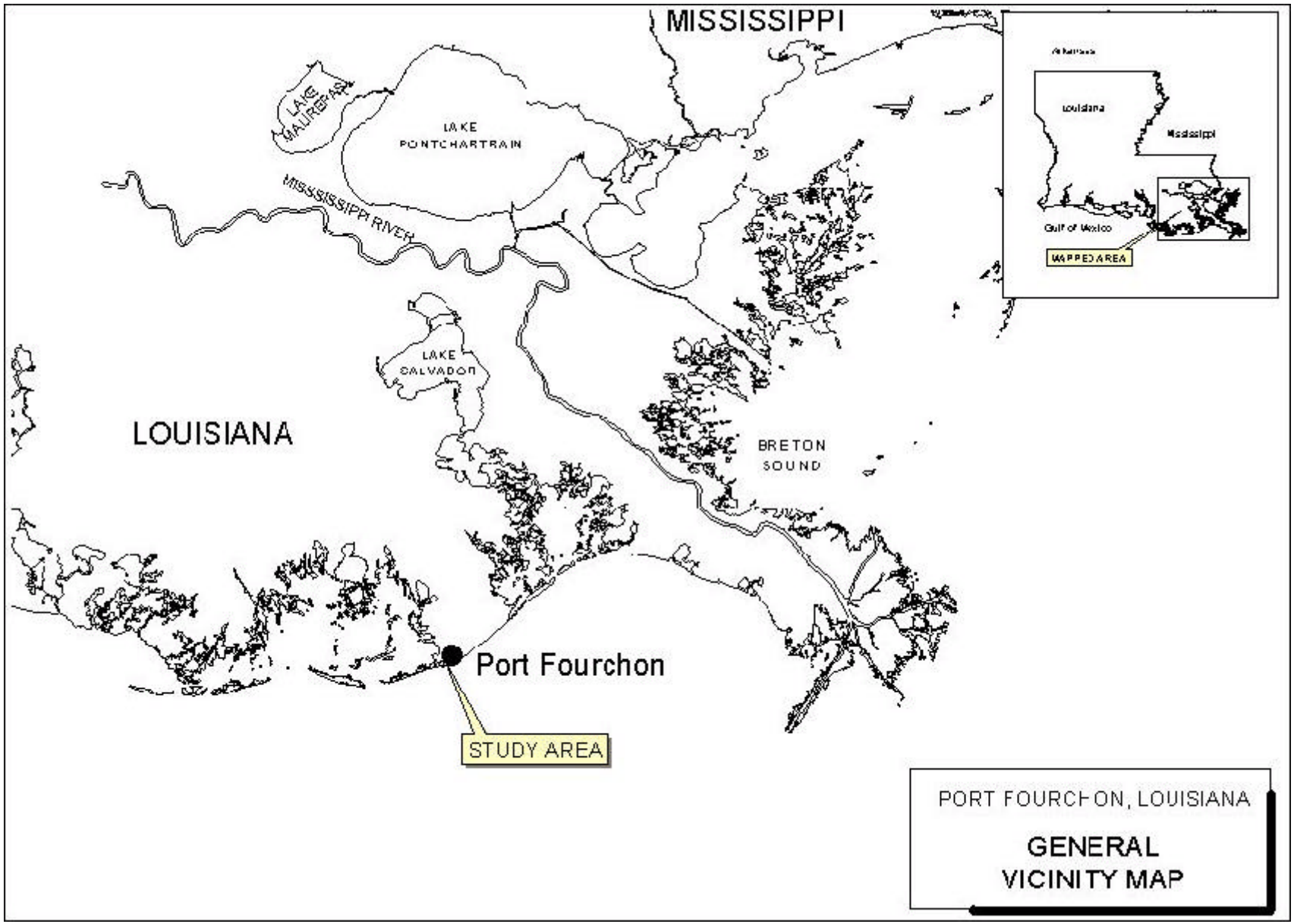


Figure 3. Port Fourchon and Surrounding Area

B. Non-OCS Petroleum-Based Economic Activities

1. Louisiana Offshore Oil Port: The Louisiana Offshore Oil Port (LOOP) is located approximately 21 miles south-southwest of Port Fourchon. The port, which became operational in May of 1981, is the only deepwater port operating under U.S. license. The port was built to facilitate the unloading of imported crude oil from oceangoing tankers. LOOP is a monobuoy facility that supports tankers up to 700 thousand deadweight tons. Crude oil is offloaded and pumped to underground storage areas in the Galliano Salt Dome, located on the east side of Bayou Lafourche near Golden Meadow, Louisiana. From there, the crude can be piped to storage areas and refineries throughout Louisiana, Texas, and the Midwest. Connection to five pipelines gives LOOP access to more than 30 percent of the nation's refinery capacity (U.S. Army Corp of Engineers and Greater Lafourche Port Commission, 1994). LOOP was developed to handle up to 1.2 million barrels of crude oil per day. In 1995, LOOP handled approximately 685 thousand barrels of oil per day, or more than 250 million barrels per year. LOOP handles 10 percent of all crude oil imports entering the United States (Louisiana Dept. of Transportation and Development, 1998).

2. Waterborne Commerce: Given its prime location, near the Gulf of Mexico mouth of Bayou Lafourche, Port Fourchon supports considerable internal waterborne commerce. As discussed in a 1994 U.S. Corps of Engineers feasibility study, Bayou Lafourche is navigable from upstream to the northern end of the Federal navigation project in Lockport, Louisiana, to the Gulf of Mexico. This waterway links the communities of Raceland, Lockport, Larose, Golden Meadow, and Leeville to the Gulf Intracoastal Waterway. The Gulf Intracoastal Waterway intersects Bayou Lafourche at Larose (Gulf Intracoastal Waterway mile 35) (U.S. Army Corp of Engineers and Greater Lafourche Port Commission, 1997).

Waterborne commerce on Bayou Lafourche averaged approximately 1.15 million tons annually during 1987-90. With the recent increase in OCS activity in the Central Gulf of Mexico, the significance of Bayou Lafourche in the movement of cargo in support of OCS activities has also increased. Between 1990 and 1992, for example, freight traffic along Bayou Lafourche advanced from approximately 1.2 million tons to 2.0 million tons, or by 70 percent. By 1994, reported freight traffic had advanced to more than 3.1 million tons and advanced again to 4.2 million tons in 1996. Overall, 1996 freight traffic exceeded the 1990 traffic by 250 percent (U.S. Army Corp of Engineers and Greater Lafourche Port Commission, 1994).

3. Commercial Fishing Activities: Commercial fishing has long been an important way of making a living for residents of the Golden Meadow-Leeville-Port Fourchon area. Before the full development of Alaska's fisheries, Louisiana generally ranked either first or second (after Massachusetts) when evaluated on the basis of commercial landings.

The area surrounding Port Fourchon lies in the heart of Louisiana's commercial seafood industry. Because of the shallow drafts of the fishing boats and the traditional residence patterns of the fishing families, commercial vessels tend to tie up along the banks of Bayou Lafourche. The ex-vessel (dock) value of commercial marine products landed in Lafourche Parish in 1997 equaled $27.7 million,

or approximately 8 percent of the state's $330.6 million reported harvest (Louisiana State University Agricultural Center, 1998). Much of the product landed in the parish is delivered fresh to the New Orleans market or shipped elsewhere for processing or fresh consumption.

Port Fourchon, at one time, represented an important unloading facility for the shrimp fleet operating out of Lafourche Parish. The best information on commercial fishing vessel traffic at the Port is dated and comes from a special census of port traffic conducted by the Greater Lafourche Port Commission during the month extending from July 15 to August 15 in 1988. During this month, which tends to be near the peak of the offshore shrimp season, 79 commercial vessels with drafts of 12 feet or greater made 330 round trips out of the Port. This is approximately one trip per week per vessel which reflects the common practice among Louisiana's commercial fishermen (U.S. Army Corps of Engineers and Greater Lafourche Port Commission, 1994). Given the sharp reduction in the deflated dockside price of shrimp since the Port Commission survey and the concurrent reduction in fleet size, the 1988 figures are likely to be significantly higher than current activities.

C. Oil- and Gas-Based Economic Activities

Port Fourchon's strategic location provides it with a competitive advantage as a supply base for oil and gas related activities in the Central Gulf of Mexico. These activities are diverse, ranging from the use of supply boats and tugboats to service oil and gas rigs to the maintenance and repair required for mobile drilling rigs. As of 1998, more than 600 offshore platforms are located within a 40-mile radius of Port Fourchon (Falgout, 1999) and the Port is likely to play an increasingly important role as development in the OCS progresses.

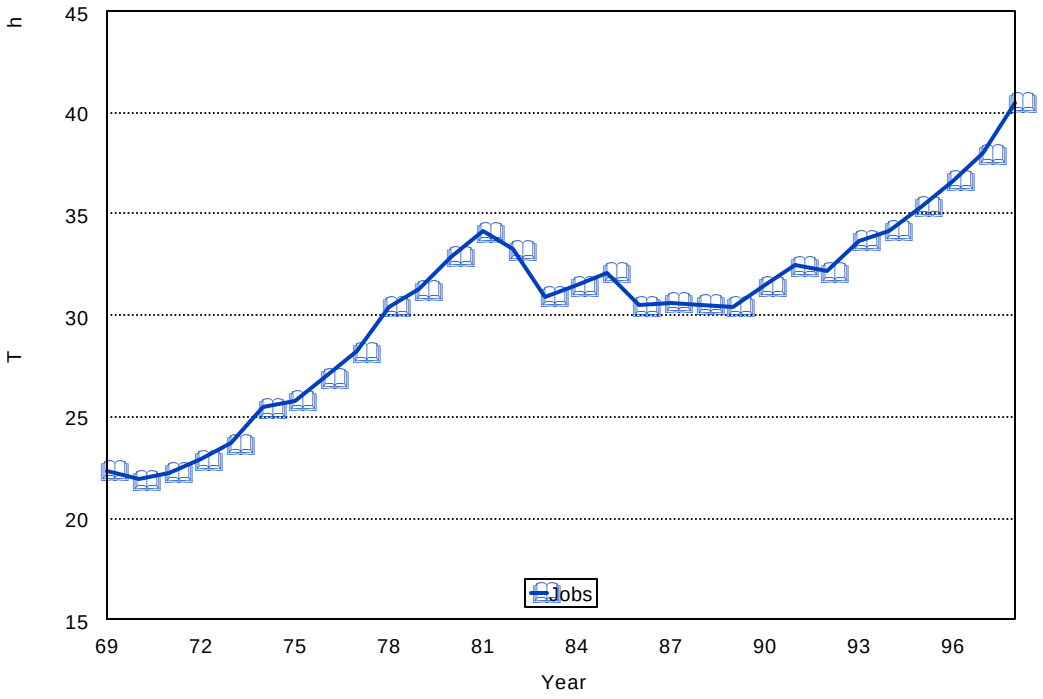
An examination of the types of waterborne cargo transported along Bayou Lafourche helps establish the importance of Port Fourchon to the offshore oil and gas sector. Specifically, 35 percent of the 4.2 million freight tons moved along Bayou Lafourche in 1996 constituted machinery (not electrical), classified under SIC code 7110 (U.S. Army Corp of Engineers, 1997). While statistics do not indicate the end use for this machinery, most of it is used in OCS related activities (Falgout 1997). Petroleum and petroleum products represented an additional 27 percent of the total freight tonnage. Finally, inedible crude materials (such as limestone, gravel, and marine shells) accounted for about 16 percent of the 1996 freight traffic in terms of tonnage.

The OCS oil industry has numerous links with a variety of onshore and offshore industries. These industries range in nature from restaurants that provide food and catering to offshore workers, shipbuilders that fabricate drill ships and oil well service vessels, air transportation and water transportation firms, as well as petroleum extraction companies. Estimating the relationship between growth in OCS petroleum activity and growth in these industries was a major part of the research effort presented in this document. Accordingly, a detailed discussion of these industries is presented in the section concerning model application.

IV. CHANGES IN PARISH SOCIOECONOMIC ACTIVITY

A. Employment Changes

The total number of jobs in Lafourche Parish has increased rapidly in recent years. While other factors, such as a healthy national economy, contributed to this increase, a sizeable portion is due to activity in the deepwater offshore oil industry. From 1977 to 1998, employment in Lafourche Parish grew at an annual rate of 1.6 percent (Louisiana Dept. of Labor, No Date). However, the growth rate does not reflect the cyclical nature of the parish economy (due in part to the cyclical nature of the petroleum industry). Total jobs in the parish increased from 28,235 in 1977 to 34,119 in 1981 (a 20.8 percent increase over a five-year period) (Figure 4).



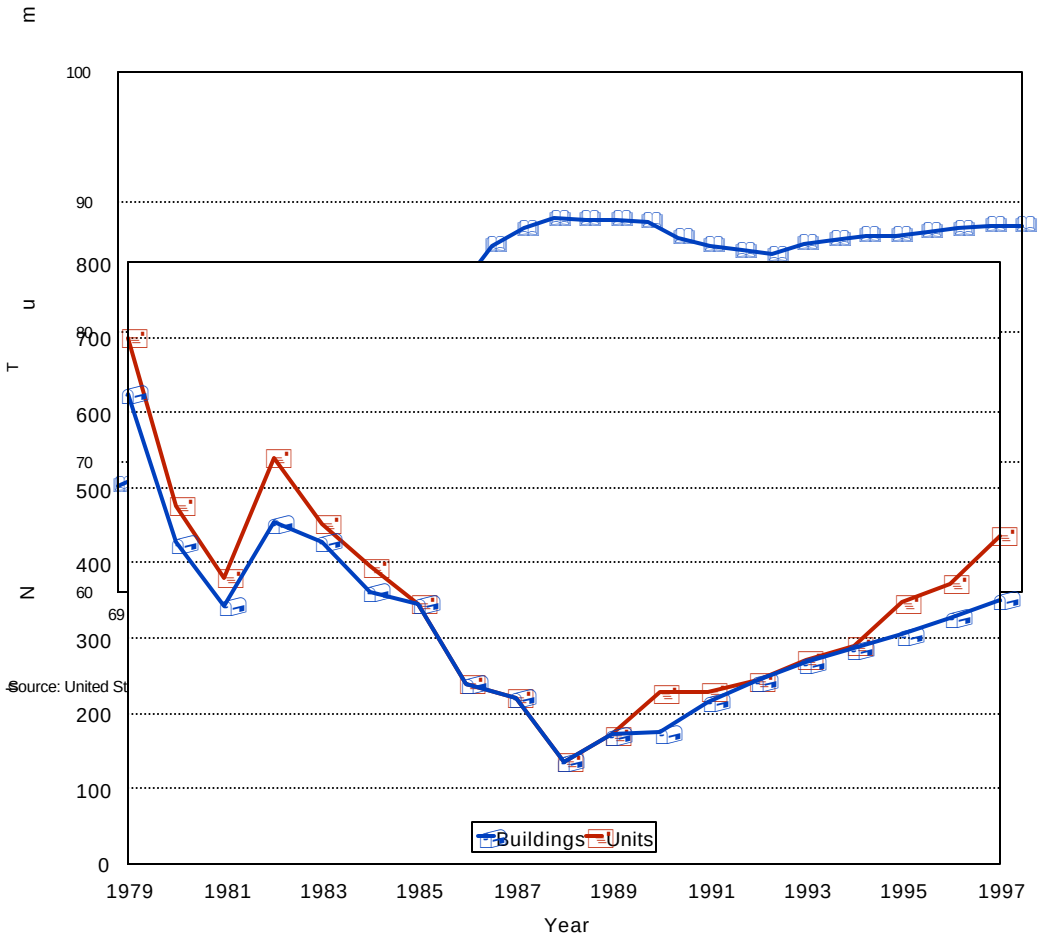
Source: United States Department of Commerce, Louisiana Department of Commerce

Figure 4. Employment in Lafourche Parish, 1969-1997.

In the years preceding 1986, employment dropped in 1983 (to 30,934 jobs) but increased in 1985 (32,130 total jobs). At that point, employment dropped by more than 5 percent in 1986 (as a net of 1,644 jobs were lost) and remained stagnant until 1990. Growth in employment then resumed at a slow pace. Rapid increases in employment began in 1995 and are estimated to have continued into 1998. Parish employment increased from 35,357 jobs in 1995 to 36,664 jobs in 1996 (an increase of 1,307 jobs or 3.7 percent). With the exception of 1993, this increase was the largest absolute increase in employment in Lafourche Parish since 1980. Employment estimates showed a similar level of growth (1,326 jobs) from 1996 to 1997. Estimates through March of 1998 have shown even stronger increases in employment. Based on this data (provided by the Louisiana Department of Economic Development, 1998), Parish employment is expected to increase by 2,505 jobs (6.6 percent) to a total of 40,496 in 1998. These increases in employment are consistent with increases in employment experienced from 1977 to 1978
(7.7 percent or 2,184 new jobs) during the 1970s oil boom. Recent increases in employment in Lafourche Parish have been concentrated in the water transportation and shipbuilding sectors.

B. Population Changes

Published estimates through the middle of 1997 (Louisiana Dept. of Economic Development, 1998) did not indicate marked increases in population as a result of the recent and dramatic increase in deep and shallow water petroleum activity in the Gulf of Mexico. Published Lafourche Parish population estimates provided in Figure 5 indicate slow growth. Population in the parish grew at an annual rate of 0.36 percent from 1990 through 1997 as
compared to an annual population growth rate for the entire state of 0.44 percent during the same period. However, as discussed later, there are indications that marked increases in population growth may be starting to occur.



Source: U.S. Bureau of Census, Construction Statistics Division

Figure 5. Population in Lafourche Parish, 1969-1997.

C. Residential Construction Changes

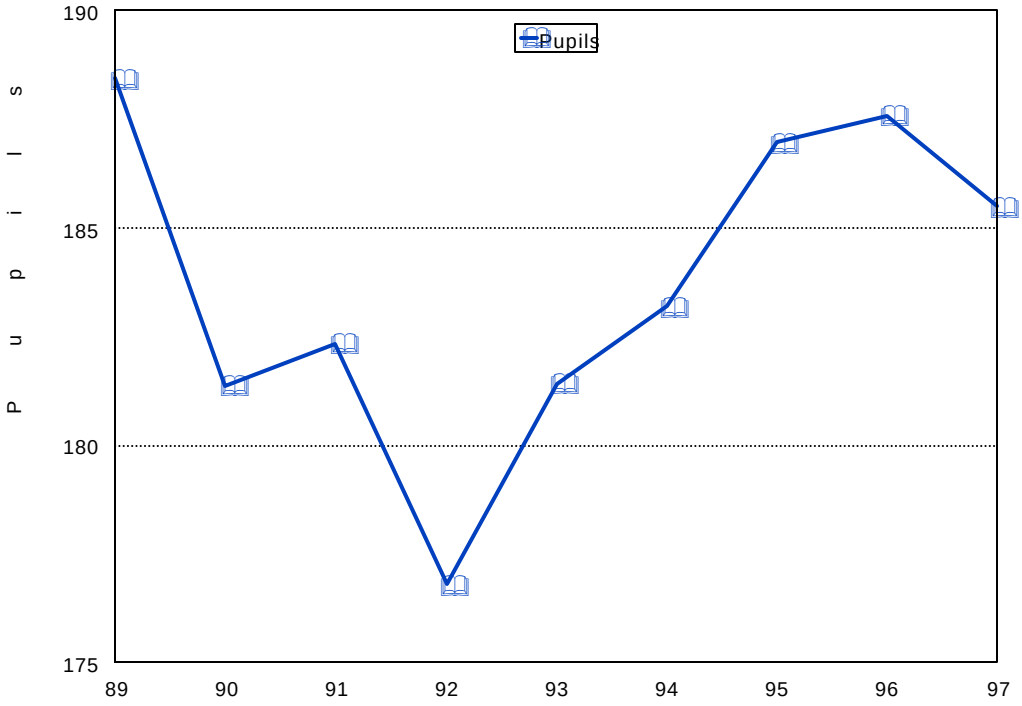
As indicated in Figure 6, residential construction in Lafourche Parish has consistently grown from a low of 136 buildings and 136 units (multi-unit residential buildings include apartment complexes, duplexes, and similar buildings) in 1988 to 358 buildings and 427 units in 1997 (U.S. Bureau of the Census, 1998). From 1988 through 1997, residential construction grew at an annual rate of 11.15 percent in terms of buildings and at an annual rate of 13.82 percent in terms of units. The number of building units constructed in 1997 either equaled or exceeded 1985 levels. However, residential construction is still less than the levels seen in the late 1970s and early 1980s (the last sustained oil boom).

Figure 6. Residential Construction in Lafourche Parish, 1969-1997.

The increase in Gulf of Mexico petroleum and exploration activity and resulting growth in Port Fourchon has undoubtedly contributed to the increase in residential construction in recent years. Residential construction, especially in terms of units, has shown continued strong growth from 1995 through 1997. However, the recent increase in residential construction (buildings and units) has not deviated from the longer term 1988 through 1997 growth trend. Accordingly, trends in residential construction provide evidence that recent increases in employment have not translated into marked increases in local population as of 1997.

D. School Enrollment Changes

Parish school enrollment exhibited modest increases from 1990 through 1997 (Figure 7). In percentage terms, the increase in school enrollment was consistent with estimated changes in population. During the 1987-97 period, a low of 17,679 students were enrolled in public and private primary and secondary education in Lafourche Parish in 1992. Enrollment had increased to 18,759 students by 1996, before declining slightly in 1997 (Louisiana Dept. of Education, 1997a).



Source: Louisiana Department of Education

Figure 7. Public and Private K-12 School Enrollment in Lafourche Parish, 1989-1997.

V. THE LOUISIANA COMMUNITY IMPACT MODEL

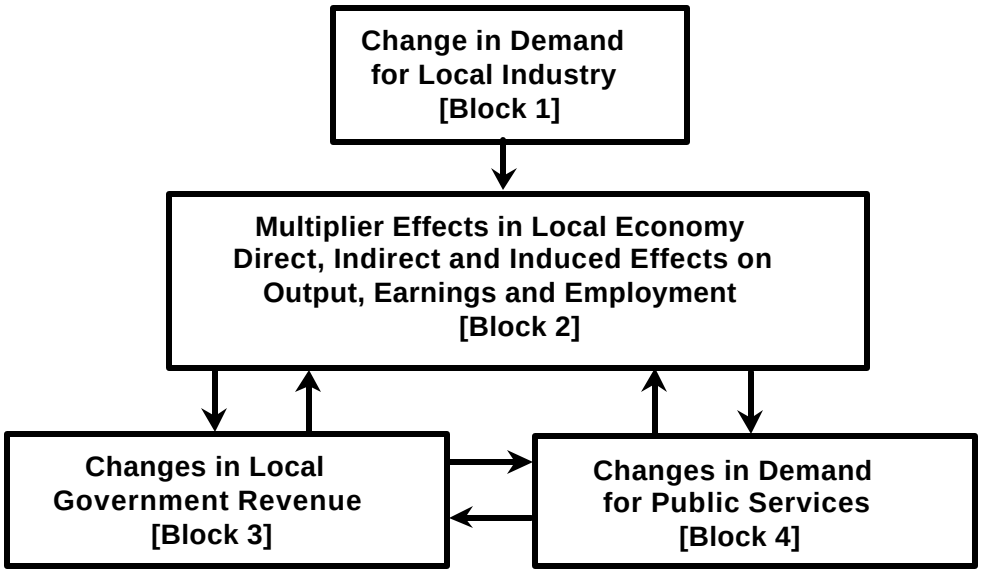
A. Introduction

In recent years, policy analysis tools called community impact models (Johnson 1991, 1996) have been developed to provide policy leaders a way to measure the potential impact of policy decisions on designated areas. Community Impact Models (CIM) are a further development from earlier efforts where models of the local economy have been joined to demographic models of the community (Jones et al., 1988).

CIMs quantify the linkages among the three major components (economy, government revenue, government service provision) of the community economics local government system (Figure 8).[5] When a change in demand for an industry basic to the local economy occurs, initial economy activity develops (Block 1, Figure 8). The interdependency of local industries and spending behavior of local residents

[5] A detailed discussion of the CIM model for Louisiana (LCIM) is provided in Appendix A.

leads to multiplier effects in the local economy (Block 2, Figure 8). An increase in external demand for the output of the local industry causes that industry to increase its purchases from other local firms and from local labor. These purchases are dollars injected in the local economy that in turn drive additional spending. For example, if shipbuilding grows in Lafourche Parish because of increased OCS petroleum



activity, then

Figure 8. Overview of the Louisiana Community Impact Model

shipbuilders will purchase additional output from local fabricators. The local fabricators will in turn make purchases of their own. Hence, the re-spending of money interjected by particular types of activity leads to growth in jobs and income in the entire economy. For this study, any Lafourche Parish industry directly tied to OCS oil and gas activity belongs to the basic set of industries (Block 1, Figure 8). A major research challenge, therefore, is ascertaining the change in economic activity for industries such as water transportation and shipbuilding, directly due to growth in OCS activity.

Multiplier effects from the local economy simultaneously result in increases in local government revenue and in demand for local public services ((Block 3 and Block 4, Figure 8). Changes in local government revenues are primarily due to changes in various forms of local taxes (usually property and sales) and user fees as the economy grows or declines. Intergovernment transfers from state and federal government to local government entities are another source of local government revenue. Such transfer payments also tend to change in step with local economic activity.[6]

[6] For example, as local per capita income grows in Louisiana and many other states, the per student level of payments from state to local government supporting K-12 education declines.

Similarly, the demand placed on services provided by local government grows as the local economy grows (Block 4, Figure 8). Changes in local government expenditures occur in a variety of categories, such as roads and schools. As the economy grows, for example, population would ultimately grow meaning that schools and roads would become more congested. Spending by local government would increase as a result. In the CIM, the backward linkages that occur as a result of government spending also leads to additional multiplier effects within the local economy. That is, spending by local government to alleviate pressure on publicly provided services, such as increased spending on education, will also interject dollars into the local economy. As local government revenues increase, local governments may have some additional discretionary spending, which can be used to provide new or improved public services.

In this study, a community economic model developed for Louisiana (LCIM, Louisiana Community Impact Model) is used to evaluate the impact of the OCS industry on the economy and local government finances of Lafourche Parish. In LCIM, an input-output model and a labor market model together represent the local economy (Block 2 in Figure 8). A fiscal module represents both the generation of local government revenue (Block 3 in Figure 8) and the changes in demand for locally provided public services (Block 4 in Figure 8). The process originates with estimates of the impact of OCS activity on Lafourche parish industry that directly support such activity (Block 1, Figure 8).

B. Input-Output and Labor Market Models

Input-output (I-O) analysis allows us to look at the flows of products between different industries of an economy in a formalized framework. As such, I-O analysis is especially useful in looking at (1) the structure of a local economy and (2) secondary effects that may spin off from an initial change in economic activity. An I-O model serves as a framework for collecting, categorizing and analyzing data that concerns the overall structure of a given regional economy (Schaffer, 1989). Thus, the model serves as a way to link micro decision making at the firm level to economic events at the regional macro level (Powell et al., 1990). The economy is represented with general categories, such as interindustry product flows and value-added payments. Relationships between different economic agents are identified within each major category, such as the level of intermediate product flows between specific industries. By identifying interrelationships between households and firms and by indicating the presence or absence of interindustry linkages, I-O models can make an important contribution to the policy making process (Giarratani, 1990).

"Regional input-output studies attempt to quantify the impacts on the sectors located in a particular region that are caused by new final demands for products made in the region" (Miller and Blair, 1985, p. 46). Economic multipliers (estimates of the total change in the regional economy resulting from an exogenous shock to the economy) are derived by tracing the ripple effect of a given exogenous change in demand for regionally produced goods and services (Richardson, 1972). Policy relevant questions concerning the total effect of a demand-side shock to a regional economy, such as or the growth or decline of an already established industry (California Commission on State Finance, 1988) can, therefore, be addressed.

Accordingly, an I-O model is an appropriate tool for examining the impact of growth in OCS petroleum activity on the economy of Lafourche Parish, especially in regards to growth in Port Fourchon. The IMPLAN (Impact Planning) modeling system (U.S. Forest Service 1996) will be used to compute the I-O model used in this study. IMPLAN is considered a ready-made modeling system. This modeling system relies on secondary data, such as employment, combined with the assumption that the regional economy is very similar in structure to the national economy (Hughes and Guedry 1993). Because this assumption is often tenuous, ready-made I-O models should be evaluated and altered in light of other data sources and knowledge concerning the local economy.

Regional I-O models have been conjoined with models that represent the regional labor market in various ways for a number of years (Miller and Blair, 1985). For this study, a conjoined model is appropriate because jobs generated in the local economy often go to in-commuters or the previously unemployed. Not accounting for these possibilities could lead to overestimation of both local population and resident income growth. Hence, a labor market module (a set of econometric equations) is also used to represent the local economy. This component of the LCIM model allocated demand for labor by firms in the local economy between in-commuters, unemployed local workers, and in-migrants.[7] This component of the model also provides population estimates as the local economy grows or declines.[8]

C. Fiscal Module of LCIM

The fiscal model receives input from the conjoined I-O and labor market module. That is, changes in population and earnings from the I-O and labor market model are "drivers" in the fiscal module. For example, tax yields from retail sales are a function of population and income growth. This growth is determined by results from the I-O and labor market module.

Sixteen equations are included in the Louisiana fiscal module. Six of these equations are in the revenue generating part of the module. Two equations measure revenue capacity--assessed value and retail sales. Four direct revenue equations are included--severance tax revenue, state transfer revenue, federal transfer revenue (for both schools and other functions), and other tax revenue.

Ten expenditure equations are estimated in the fiscal model. These equations attempt to explain changes in spending for school, road, general, administration and other, law enforcement, waste disposal, hospital, levee and drainage, fire, parks and recreation, and utility expenditures. Hospital expenditures include own hospital expenditures, other hospital expenditures, and health care expenditures. Waste disposal expenditures include solid waste expenditures and sewer expenditures.

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[7] Changes in the labor force are result in growth in and out commuting. Changes in commuting are netted from local jobs to estimate local jobs going to local workers. These local workers may be previous unemployed or nonparticipants in the labor market or new residents.

[8] The labor market module and the I-O model also interact in accounting for household spending induced effect impacts. That is, changes in jobs lead to changes in population and household earnings. These in turn lead to household spending and additional induced effect impacts.

Law enforcement expenditures include expenditures for judicial, police, and corrections. General, administration, and other expenditures include financial administration, general services/buildings, library, public welfare, general debt interest, insurance trust, and liquor store expenditures. Changes in local government expenditures are indirectly driven by changes in population and earnings from the I-O and labor market module. For example, changes in population and earnings drive changes in property tax yields, which in term drive changes in spending in K-12 education by local government.

D. Sectors With Direct OCS Oil Industry Links[9]

As previously stated, the modeling process sketched in Figure 7 starts with estimating the strength of linkages between Lafourche Parish industries and OCS petroleum activity. To estimate the impact of the OCS oil industry on the Lafourche Parish economy, changes in levels of economic activity in all sectors of the Lafourche Parish economy directly affected by the OCS oil industry had to be estimated. Estimates through 1997 and in some cases 1998 were based on a combination of regression analyses using employment data (Louisiana Department of Economic Development), telephone conversations with firms with facilities at Port Fourchon, and data found in Melancon and Roby concerning OCS Oil Industry activity. Least squares regression analysis was used to aid in our predictions concerning the direct impact of OCS oil industry activity on employment in the water transportation, ship building, and mining industries in the parish. That is, the regression analysis was used to confirm our observations based on other published sources and on the conversations with firms in the three industries located at Port Fourchon. Estimates after 1997 were based on the assumptions that estimated relationship between the OCS oil industry and the sector in question would remain unchanged and of conservative growth in future OCS oil industry activity (4.0 percent per year). Future growth rates are based on the most recent published projects of Gulf of Mexico OCS petroleum activity (Melancon and Roby, February 1998) at the time this research was conducted including the slowdown in OCS petroleum activity due to sharp declines in crude oil prices in the summer of 1998 (Baton Rouge Advocate,
August 1, 1998). Growth rates and resulting economic impacts are projected through the year 2002.

Direct major changes in employment and economic activity were estimated for construction, catering, water transportation, petroleum extraction, shipbuilding, and air transportation. Relatively small changes in employment and economic activity were estimated for providers of oil field waste disposal, oil worker medical testing services, and equipment rental.

Other parish industries, such as oil spill clean up firms, diving companies, oil field equipment manufacturers, and fabricated metal product manufacturers, were also evaluated for changes in employment due to growth in the offshore oil industry. No growth in employment or output was found for these industries in Lafourche Parish in relation to growth in the OCS oil industry. Likewise, firms classified as construction companies are often directly responsible for the construction of deepwater, offshore oil rigs. These companies usually fall into SIC category 1629, Heavy Construction NEC. However, data indicated no growth in this sector in Lafourche Parish in relation to OCS oil industry

[9] A sector is either a single industry or an aggregate of industries in the I-O model.

activity, although, in other parts of the state, the sector is expanding in relation to the level of OCS activities.

E. Petroleum-Related Businesses Operating at Port Fourchon

The expansion in port facilities is attributable to the growth of the offshore oil and gas industry. More than 100 businesses are operating at Port Fourchon as of May of 1999 (Falgout, 1999). The vast majority of these companies are either directly or indirectly involved in supporting OCS activity, including deepwater activity. Major commodities shipped through the port include steel pipe, various oil field fluids, barite, limestone, and fuel. Further, the port is the major point of departure for offshore oil workers, virtually all by helicopter (Louisiana Dept. of Economic Development, 1998). As shown in Table 2, these companies fall into a number of major categories.

Table 2

Companies Operating out of Port Fourchon that Support OCS Petroleum Activity

Firm	Firm Type
MINING FIRMS:	
Oryx Energy co.	Oil Company
Greenhill Petroleum Corp.	Oil Company
Agip Petroleum Co. Inc.	Oil Company
Kinlaw	Oil Company (Major)
Phillips Petroleum Co.	Oil Company (Major)
Marathon Oil Co.	Oil Company (Major)
Arnoco	Oil Company (Major)
Kerr McGee Corp.	Oil Company (Major)
Shell Offshore	Oil Company (Major)
Pool Company	Drilling Company
Rowan Petroleum	Drilling Company
Diamond Offshore Turnkey	Drilling Company
M I Drilling Fluids	Oil Field Fluids
Anchor Drilling Fluids	Oil Field Fluids
Chemrich	Oil Field Fluids
Francis Drilling Fluids	Oil Field Fluids
Ambar	Oil Field Fluids
Baker Hughes Inteq	Oil Field Fluids
Dowell Schlumberger	Oil Field Fluids
OSCA	Oil Field Fluids
SBM Operators	Oil Field Fluids
Bariod Drilling Fluids	Oil Field Fluids
Subsea International	Pipeline Laying Company
Offshore Pipeline, Inc.	Pipeline Laying Company
Shell Pipeline Corp.	Pipeline Laying Company
OTHER OIL FIELD SERVICES:	
Walsh Environmental, Inc.	Computers and environmental testing services
American Oilfield Divers	Divers
Buckner Rental	Equipment Rentals
C-Port/Stone	Fuel Supply
L & L Oil Dock #16	Fuel Supply
Tetra Oil & Gas Services	Oil Field Services
Land Treatment Systems, Inc.	Oil Field Waste Treatment
Newpark Environmental #1	Oil Field Waste Treatment

Cenac Environmental Services	Oil Spill Response Firm
Hughes Tool Co.	Oil Tool Company
B.J. Services	Oil Tool Company
Halliburton Services	Oilfield Cement
Chervon Pipeline Company	Transmission Pipeline

Table 2

Continued

TRANSPORTATION:	
Brown & Root (East Main Yard)	Intermodal Terminal
Gulf Star Oilfield Services, Inc.	Intermodal Terminal
Ocean Marine Operators	Intermodal Terminal
Martin Fuel Dock	Intermodal Terminal
C-Port	Intermodal Terminal
Offshore Logistics, Inc.	Helicopter Transportation Company
Era Aviation	Helicopter Transportation Company
PHI Helicopters	Helicopter Transportation Company
Airlogistics	Helicopter Transportation Company
Evergreen Helicopters, Inc.	Helicopter Transportation Company
Packard Trucking	Trucking
Ace Transportation	Trucking
Gulf South Systems	Tanks for Truck Transportation of Oil Field Fluids
Bollinger Fourchon, L.L.C.	Shipyard
MISCELLANEOUS SERVICES:	
Lafarge Coporation	Construction Cement
R & C Supply & Lumber Co., Inc.	Hardware Store
Danos & Curole	Labor Contractor (Stevedores)
Lafouche Services, Inc.	Medical Testing, Job Drug Testing
Kajun Sportsman	Truck Stops Restaurant

Source: Unpublished Records, Greater Lafourche Port Commission, 1998.

1. Petroleum Production Firms: Nine petroleum production companies maintain operations at Port Fourchon including major oil producers, such as Phillips Petroleum, and smaller, less well know firms, such as Greenhill Petroleum Corporation (Table 2). Based on discussion with local firms and observation by the Port Director, oil producers have a relatively small number of employees located at the Port (dispatchers and a petroleum engineer). These individuals are responsible for dispatching equipment and other materials to offshore rigs through either inland barge to ship or truck to ship (intermodal) transportation facilities at the Port (Falgout, 1997). They are also responsible for dispatching personnel to and from offshore rigs.

Nineteen other firms at the Port fall into the SIC Code 13 Oil and Gas Extraction (Mining) Category (Table 2). These companies provide a variety of oil field production support facilities. Ten firms provide various drilling fluids, such as drilling muds (Falgout, 1997). Drilling fluid company employees at Port Fourchon are responsible for overseeing the intermodal transfer of drilling fluids, fuel, and water to offshore rigs. The employees also provide a variety of special services as needed. At least three independent drilling companies also operate out of Port Fourchon as do several oilfield pipeline laying companies, some of which are subsidiaries of major petroleum producers.

Based on telephone conversations with all of the firms located at the port, 29 companies identified as belonging to SIC 13 (Petroleum Mining) employed an estimated total of 533 people. More than 80 percent of all current employment was credited to OCS activity. Of the 14 companies that responded to our inquires in early June 1998, an average increase in employment of 7.2 percent was indicated in the near future due to increased activity in the deepwater OCS. Regression analysis provided in Table 3 show mining employment in Lafourche Parish as positively and significantly related to the number of deep water production plans filed with MMS.

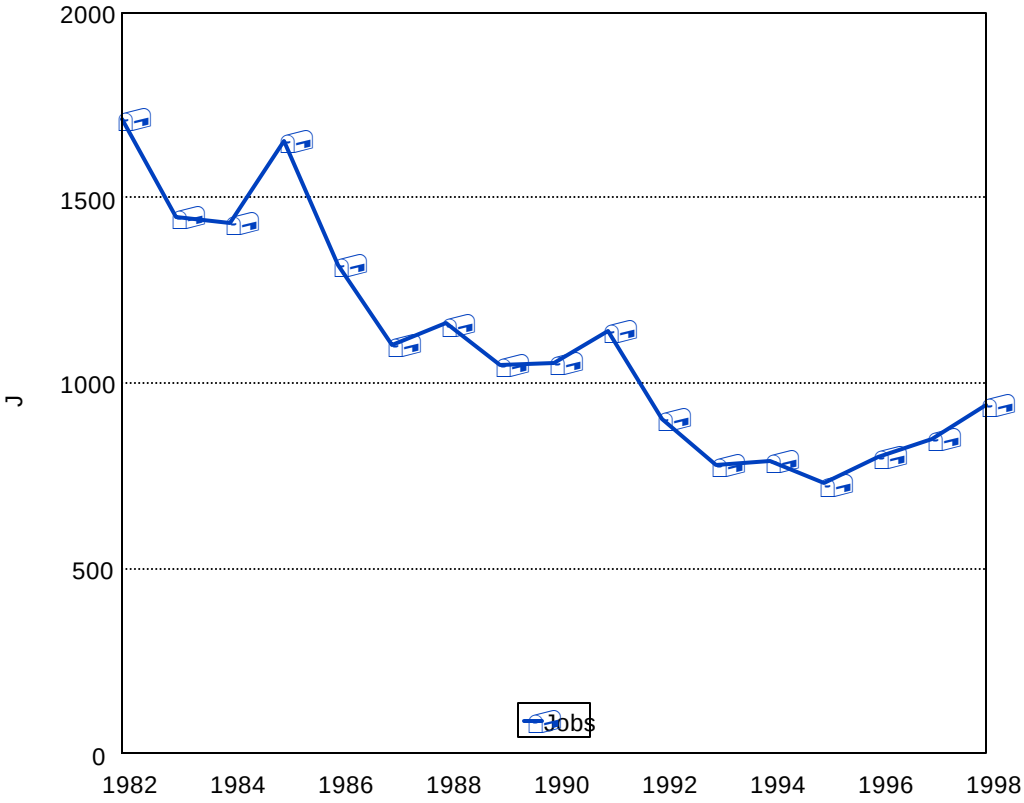
Table 3

Ordinary Least Squares (Regression) Analysis Results Indicating Employment in Lafourche Parish Water Transportation, Ship Building, and Mining Industries as a Function of Deep Water Outer Continental Shelf Oil Industry Activity.

Independent Variable	-------- ---------- Regression Equation----------		
	Water Transportation	Ship Building	Mining
Constant	1850.5*	724.55*	901.8*
Exploration Wells	1.3850	Na	Na
Deep Water Production Plans	15.629***	Na	3.1402***
Deep Water Production	Na	.007996*	Na
Number of Observations	7	13	7
R-Square	0.9435	0.6757	0.6828
Adjusted R-Square	0.9135	0.6462	0.6194

Note:
Values in the table are beta values.
*Significant at the " = .001 probability level
**Significant at the " =.01 probability level.
***Significant at the " = .05 probability level.
**** Significant at the " =.10 probability level.
Na means that the equation in question does not contain that particular independent variable.
Results for ship building are based on annual data for deep water production and parish employment; results for water transportation and mining are based on quarterly data (1995-1st quarter 1998) for exploration wells, deep water production plans, and parish employment. Data for the various measures of OCS production and exploration came from Melancon and Roby (1998). Employment data came from the Louisiana Department of Economic Development (1998).

The regression analysis indicated that one additional plan would be expected to result in a slight increase (3.1 percent) in mining jobs in Lafourche parish. Our projected increase in jobs (7.2 percent) was also



consistent with a slight increase in petroleum extraction employment credited to Lafourche Parish beginning in 1995 (Figure 9).

2. Other Oilfield Support Firms: A variety of firms at Port Fourchon fall into the other oilfield support services category (Table 2). Analysis of telephone conversations with such firms indicates that they have a small number of employees at the port. Still, the various services that they provide are important. Such firms also belong in a variety of different SIC categories. Two oilfield waste treatment firms are present at the Port as is one oil spill response company. At least

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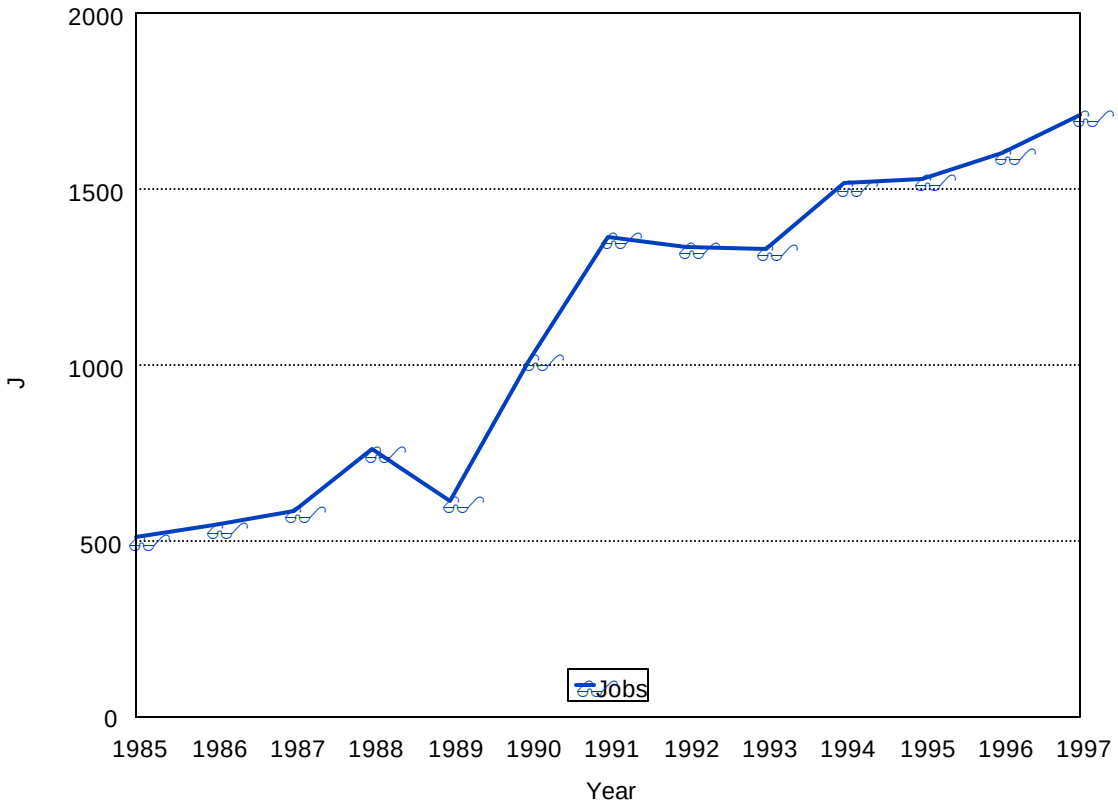
Figure 9. Petroleum Mining Employment in Lafourche Parish, 1982-1998.

one company provides diving services to the offshore petroleum industry. Several companies provide fuel supplies while at least one company provided medical testing facilities for workers. Several major oil tool manufacturers, such as Hughes Tools, have employees at the port. Providers of oil field cement, used to plug-up dry wells and for other purposes, are also present.



Source: U.S. Dept of Commerce, Louisiana Department of Labor

Based on telephone conversations with firms, small increases in employment in oil field waste treatment, medical, and equipment rental sectors of the economy were assumed for the period of analysis (1995 through 2002). No growth in employment was assumed for firms that deal with oil field spills or for diving companies.

3. Shipbuilding: Shipbuilding is an activity in Louisiana that has historically had strong ties to the offshore oil and natural gas production industry. Three types of drilling rigs (jack up, semi-submersible, and drill ship) are used for exploratory wells in offshore waters (Minerals Management Service, November 1997). Drill ships are ship shaped vessels usually used for such a purpose in water depths of more than 750 meters. These vessels are usually constructed by shipbuilding firms (Minerals Management Service, November 1997). In fact, shipbuilding throughout the Gulf Coast states has undergone a dramatic revitalization, in large part due to renewed activity in the OCS.

Figure 10. Shipbuilding Employment in Lafourche Parish, 1987-1997.

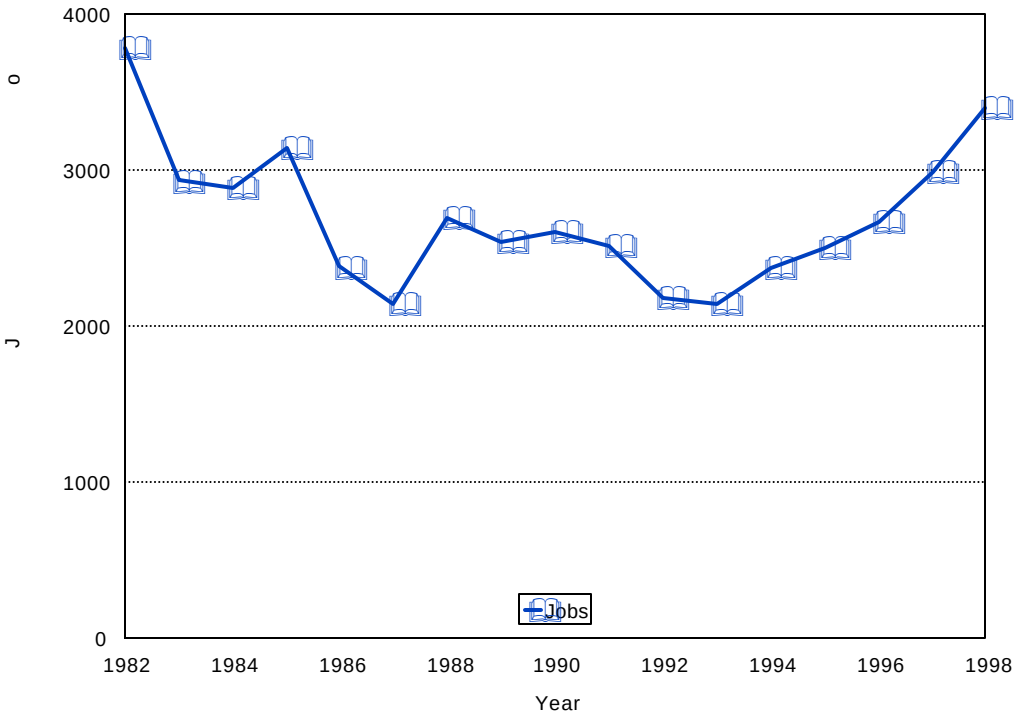
Employment in shipbuilding has grown in Lafourche Parish to the point where it is the major parish manufacturing sector (Figure 10). Major shipbuilders in the parish include Bollinger Shipyards, with three facilities (at Larose, Lockport, and Port Fourchon), North American Shipyards, and Allied Shipyards, among others (Louisiana Dept. of Economic Development). Seven shipbuilding firms have facilities located in the vicinity of Port Fourchon. Certain facilities, such as the Bollinger facility at Port Fourchon, provide vessel repair services. Other facilities, such as the Bollinger yard in Lockport, are being used to construct ships, some up to 200 feet in length (Bollinger Shipyards Inc, 2000).

Shipbuilding in the parish is positively and highly significantly related to deep water production levels based on the regression analysis provided in Table 3. That is, deepwater OSC activity has been responsible for a significant share of the employment growth in shipbuilding. Based on the R-square regression value reported for the shipbuilding employment equation reported in Table 3, deepwater OCS activity has been responsible for 65 percent of the employment growth in shipbuilding from 1985-1997. This percentage is comparable to the statement by industry officials that 75 percent of shipbuilding employment in Louisiana is tied to
OCS petroleum production activity (Minerals Management Service, November 1997).

Regression results indicated that a 10 percent increase in OCS deepwater activity would be expected to lead to a 7 percent increase (120 more jobs from 1997 levels) in shipbuilding employment in Lafourche Parish.

4. Water Transportation: Firms falling in the SIC category of Water Transportation (SIC 44) have experienced the largest levels of growth in Lafourche Parish due to deepwater OCS activity (Figure 11). Employment in the sector has increased rapidly since 1995 with a net gain of 167 jobs in 1996, an additional 323 jobs in 1997, and over 400 new additional jobs in the first quarter of 1998 (Louisiana Department of Labor, 1998). The sector has been, and continues to be, one of the largest sources of employment in the parish. It was directly responsible for 6.7 percent of all employment in Lafourche Parish (with 2,176 jobs) in 1992. By the first quarter of 1998, the percent of parish employment directly attributable to water transportation increased to 3,394 jobs, or 8.4 percent of total employment in the parish. Regression analysis based on quarterly employment data from 1995 through the first quarter of 1998 showed that water

Figure 11. Water Transportation Employment in Lafourche Parish, 2-1998.



Source: Louisiana Department of Labor

transportation in Lafourche Parish was a function of OCS exploration wells and deep water production plans (Table 3). That is, the regression analysis indicates that the increase in employment in the sector since 1995 has been attributable to growth in deep water oil industry exploration and production activity.

Major water transportation firms at Port Fourchon are often also classified as intermodal terminal transportation companies. That is, usually using cranes, they either offload equipment and other material from inland barges or trucks to ocean going vessels for transport to offshore rigs or offload materials

from such vessels that have been picked up from offshore rigs. Such firms include Edison Chouest, which operates the recently constructed C-Port facility designed to service its own supply vessels. Hence, such companies provide crane loading, fuel delivery, and other services. Some companies provide such services to subleases; for example, Brown and Root operates crane services as a sublease from Martin Terminal (Falgout, 1997). Five companies were identified as operators of intermodal terminal facilities at Port Fourchon (Table 2).

A variety of other services are provided by other companies classified as water transportation firms. At least five companies in the area provide barge lines while six companies provide barge fleets (Louisiana Dept. of Economic Development, 1998). Liquid bulk items, such as water, fuel, oil field waste, and oil field fluids, are generally moved by inland barge either into or out of Port Fourchon (Falgout, 1997). More than forty firms in the Port Fourchon region were identified as providing tugboat services for barges and other shipping activity (Louisiana Dept. of Economic Development, 1998).

5. Motor Freight (Trucking) Companies: Five firms that all specialize in providing motor freight or trucking services to the petroleum industry have dispatchers at Port Fourchon. All of these companies have headquarters and major dispatch centers elsewhere in places such as Morgan City and Lafayette. However, a review of the dispatch records for several companies indicated that a few drivers reside in Lafourche Parish. Trucking companies are responsible for the transportation of less bulky items, (liquid bulk items are delivered to the port by inland barge if possible) (Falgout, 1997). Trucking companies transport most of the pipe, other equipment, groceries and other worker supplies that move through Port Fourchon to offshore rigs. While the five firms are undoubtedly the most important providers of motor freight services to Port Fourchon, other trucking firms, such as SAIA, also make a significant number of deliveries to the port. Because the only alternative mode of transportation is inland barges, trucking companies provide a vital link to Port Fourchon. As discussed in more detail in the companion document, "An Analysis of LA Highway 1 in Relation to Expanding Oil and Gas Activity in the Central Gulf of Mexico" (Guo et al., 2000), the dramatic recent increase in truck traffic to Port Fourchon has strained the quality of services provided by LA 1, the only road leading directly to Port Fourchon.

6. Air Transportation (Helicopter Companies): Five companies were identified as providing helicopter transportation services to offshore facilities from Port Fourchon (Table 2). These firms all specialize in providing oil industry air transportation support services, often throughout the Gulf Coast. The companies usually belong to either SIC Code Classification 4512 (Air Transportation Scheduled), SIC 4522 (Air Transportation Nonscheduled), or SIC 7359 (Miscellaneous Equipment Rental and Leasing, NEC). Such firms ferry workers and other as needed to and from offshore oil rigs. An estimated 6,000 workers annually move through Port Fourchon by helicopter to offshore rigs. These workers work on rigs for two weeks and then have two weeks off (Falgout, 1997).

Three helicopter companies at Port Fourchon responded to our inquiries in the Spring of 1998. Assuming the three companies are representative of all five helicopter companies at the port, helicopter transportation firms employed a total of 222 workers at Port Fourchon. Of the three companies responding to our inquiries, an increase of 31.8 percent in employment in the

near future was expected because of increased deepwater OCS activity. Based on company inquiries and unpublished state employment for Lafourche Parish through 1997, more modest increases in employment and output were assumed for the sector.

F. LCIM Model Results

Results from the LCIM are provided in terms of the input-output module, labor force module, and fiscal impacts module. Model results are used to assess the impact of the OCS petroleum industry on the Lafourche Parish economy. To properly evaluate the impact of OCS activity, one should account for economic growth that would have occurred in the parish without it. Such a baseline estimate is the change in the local economy and fiscal sector that would have occurred without the recent and projected growth in OCS petroleum activity.

It is assumed that the economy of Lafourche Parish would have grown at an annual rate of 1.0 percent from 1995-1998 and at 0.5 percent from 1999-2002 without the development of the OCS petroleum industry. These growth rates were based on discussions with local government and business leaders and examination of population and employment trends. Employment data for major employers oriented toward outside markets and with no connection to the OCS oil industry were especially scrutinized. Employment data for other industries important to the Lafourche Parish economy, such as sugar mills and farm machinery manufacturing, indicated little or no growth. Overall population growth also indicated a slow growing economy without any growth in the OCS oil industry.

G. Results From the Input-Output Module

As previously discussed, direct growth in employment and output was estimated for numerous parts of the Lafourche Parish economy due to OCS petroleum activity. IMPLAN sectors experiencing direct growth included Petroleum Extraction, Nonresidential Construction, Ship Building and Repair, Water Transportation, Air Transportation, Eating and Drinking Establishments, and Services. All other sectors provided in Table 4 and Table 5 experienced purely indirect and induced impacts in jobs and output.[10]

The OCS petroleum industry has and will continue to have a significant impact on the Lafourche Parish economy according to model results. The industry was responsible for estimated direct and indirect employment impacts of 531 jobs in 1995, 864 jobs in 1996, 1,270 jobs in 1997 (Table 4). Employment impacts are predicted to peak at 1,424 jobs in 1998. Lower impacts in 1999 through 2002 are a result of conservative estimates (made based on volatile oil prices) concerning future growth in OCS

[10] Because Port Fourchon has a low population base, most indirect and induced effects would occur elsewhere in the Parish. In terms of direct growth, increases in water transportation and air transportation would be for firms located at the port. Some growth in petroleum extraction, nonresidential construction, ship building and repair, eating and drinking establishments, and services industries would be in facilities located at Port Fourchon. The percent of growth at the port would vary between industries.

petroleum activity. Growth in output showed a similar pattern as output growth peaked at $147 million (1995 constant dollars) in 1998 (Table 5). It is

Table 4

Direct, Indirect, and Induced Changes in Employment due to OCS Petroleum Industry Activity in Lafourche Parish, 1995-2002

IMPLAN SECTOR		1995	1996	1997	1998	1999	2000	2001	2002
1	Agriculture	4.2	6.8	10.1	11.2	4.7	4.8	4.9	5.0
28	Mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	Petroleum Mining	41.4	88.3	33.1	39.6	7.6	7.7	7.7	8.0
48	Construction	0.8	1.4	2.0	2.3	0.7	0.7	0.7	0.8
49	Nonresidential Construction	29.9	74.3	124.2	183.1	123.7	123.6	123.7	123.9
58	Manufacturing	6.3	11.1	17.3	18.6	7.5	7.6	7.8	8.0
392	Ship Building	16.5	73.7	107.8	37.4	37.7	39.7	41.8	43.8
433	Transport and Utilities	15.5	23.6	38.0	43.9	12.7	13.1	13.5	14.0
436	Water Transportation	132.8	166.5	322.3	400.9	82.1	85.5	89.0	93.6
437	Air Transportation	0.0	7.0	7.3	2.6	2.1	2.1	2.1	2.1
447	Trade	51.4	89.1	135.0	149.5	58.1	59.4	60.7	62.2
454	Eating and Drinking	82.3	93.1	105.2	108.9	81.8	82.2	82.6	83.1
456	Finance and Real Estate	22.9	37.0	54.1	61.4	19.2	19.8	20.3	21.0
463	Services	112.1	168.2	276.1	322.8	95.7	98.4	101.1	104.6
510	Government	15.0	23.7	37.0	42.2	13.4	13.8	14.2	14.6
	Total	531.1	863.8	1,269.5	1,424.4	547.0	558.5	570.1	584.7

Source: Louisiana Community Impact Model(LCIM), Input-Output Module, IMPLAN.
Note: direct changes in employment are in petroleum mining, ship building, water transportation, air transportation, nonresidential construction, eating and drinking establishments, and services. Changes in agriculture, manufacturing, and transport and utilities are primarily indirect effects while changes in construction, finance and real estate, services, and government are primarily induced effect changes.

important to note that impacts are assumed to be additions to growth in previous years. Hence, over the entire eight-year period, employment impacts are estimated at 6,349 jobs while total changes in output are estimated to be $603 million.

Estimated direct employment impacts due to the OCS petroleum industry in Lafourche Parish were 289 jobs in 1995 (54.4 percent of 531 total jobs), 476 jobs in 1996 (37.5 percent of 864 total jobs), 732 jobs in 1998 (57.6 percent of 1,270 total jobs), and 330 jobs in 2001 (57.9 percent of 570 total jobs) (Table 4). Accordingly, an "average" job in industries with direct links to OCS petroleum production lead to 1.837 total jobs (531 total jobs divided by 289) in the parish in 1995 (or 0.837

additional jobs for one direct job). Likewise, in 1998, 1.735 total jobs and in 2001 1.727 total jobs were generated by an average OCS petroleum related job. Among sectors with purely indirect and induced impacts, finance and real estate and trade experienced relatively large job impacts. Fairly large job impacts in services (323 jobs in 1998) were primarily due to the indirect and induced effects of the OCS petroleum industry on Lafourche Parish.

Table 5

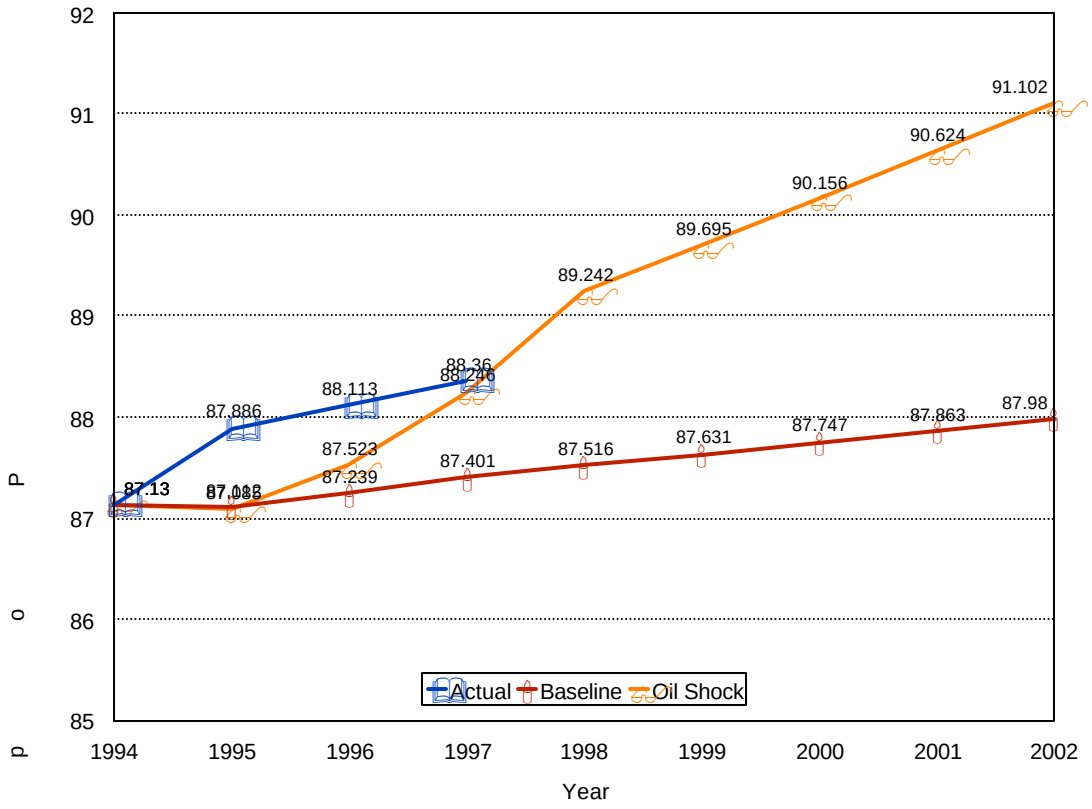
Direct, Indirect, and Induced Changes in Output due to
OCS Petroleum Industry Activity in Lafourche Parish, 1995-2002

	IMPLAN SECTOR	1995	1996	1997	1998	1999	2000	2001	2002
1	Agriculture	118,010	191,305	281,665	313,913	131,567	134,028	136,490	139,573
28	Mining	371	623	1,016	1,219	478	487	496	506
38	Petroleum Mining	5,953,370	12,689,510	4,751,326	5,689,134	1,094,849	1,101,419	1,107,990	1,150,442
48	Construction	74,165	119,850	175,614	199,282	62,381	64,108	65,836	68,072
49	Nonresidential Construction	1,930,960	4,806,941	8,033,479	11,843,560	7,995,308	8,000,572	8,005,836	8,012,560
58	Manufacturing	1,196,732	2,105,997	3,271,762	3,532,117	1,416,582	1,448,684	1,480,786	1,520,004
392	Ship Building	1,346,230	5,999,970	8,779,054	3,045,815	3,073,855	3,239,215	3,404,575	3,570,718
433	Other Transport and Utilities	2,546,139	3,894,207	6,259,432	7,225,241	2,098,405	2,161,164	2,223,923	2,305,280
436	Water Transportation	25,644,802	32,131,138	62,210,520	77,364,184	15,842,864	16,511,623	17,180,382	18,072,058
437	Air Transportation	44,876	1,066,688	1,122,347	403,138	321,053	322,268	323,484	324,996
447	Trade	2,729,803	4,730,583	7,164,705	7,935,991	3,083,769	3,151,656	3,219,542	3,304,033
454	Eating and Drinking	2,466,967	2,792,038	3,156,510	3,262,391	2,454,132	2,465,374	2,476,617	2,490,778
456	Finance and Real Estate	3,359,889	5,430,565	7,952,549	9,023,963	2,824,318	2,902,541	2,980,764	3,082,023
463	Services	5,533,917	8,306,355	13,632,294	15,941,126	4,723,668	4,857,169	4,990,671	5,163,155
510	Government	427,785	677,955	1,057,866	1,205,357	383,335	393,718	404,101	417,432
	Total	**53,374,016**	**84,943,725**	**127,850,139**	**146,986,431**	**45,506,564**	**46,754,026**	**48,001,493**	**49,621,630**

Source: Louisiana Community Impact Model(LCIM), Input-Output Module, IMPLAN.
*All Values in 1995 dollars.
Note: direct changes in employment are in petroleum mining, ship building, water transportation, air transportation, nonresidential construction, eating and drinking establishments, and services. Changes in agriculture, manufacturing, and transport and utilities are primarily indirect effects while changes in construction, finance and real estate, services, and government are primarily induced effect changes.

1. Changes in Parish Population: Model predictions from the LCIM model indicate growth in population due to the effects of the OCS petroleum industry (Figure 12). Population estimates made by the U.S. Census Bureau through 1997 indicate that the Lafourche Parish population has continued to experience slow growth despite the growth in the OCS petroleum industry. For example, the U.S. Census Bureau estimated the population at 87,391 in 1994 and 88,360 in 1997 (Louisiana Dept. of Economic Development, 1998) (an increase of only 1.1 percent over four years). As previously discussed, public and private school enrollment data in the parish confirmed the slow growth in population as did discussions with local government officials. Dramatic declines in the level of unemployment in the Parish (starting in 1995) indicate that much of the job increase in the local economy has gone to the previously unemployed and to workers commuting into the parish.

As of June 1998, unemployment was at very low levels (roughly 2.2 percent of the current labor force) (Louisiana Dept. of Economic Development, 1998). According to the results from equation 2 in



Source: Louisiana Department of Economic Development, Louisiana Community Impact Model

the labor force model, as unemployment reaches such low levels, population levels should begin to show strong growth (Figure 12). For example, model results predict an increase in population of 4.2 percent (3,714) from 88,263 in 1997 to 91,977 in 2002. Increases in residential water main hookups (Barrios, 1998) of 2 percent from 1997 to 1998 provide additional evidence of very recent population growth not yet reflected in published population estimates.

Figure 12. Actual versus Predicted Population Change, Lafourche Parish, 1994-2002.

2. Local Government Revenue and Expenditure Impacts: The fiscal component of the LCIM model was used to estimate the effects of the OCS petroleum industry on the ability of local government to deliver publicly provided goods and services. Growth in a local economy will inevitable place additional pressures on and hence increase the cost of providing services such as roads and schools. At the same time, growth should also increase local government revenues such as property and sales taxes. As previously discussed, net changes in local government spending and revenue in Lafourche Parish due to the OCS petroleum industry are evaluated in comparison to the baseline change in economic activity.

2.a Changes in local government expenditures: Results from the fiscal module of the LCIM model indicate increases in the various expenditure categories due to the OCS petroleum industry (Table

6). Results are based on direct, indirect, and induced increases in economic activity (in particular population) due to the OCS petroleum industry. Total expenditures by local government were projected to increase by $5.325 million (1995 constant dollars) in 1998 from 1995 levels (a 3.6 percent increase) and by $9.551 million in 2002 from 1995 levels (a 6.4 percent increase). The school system was the largest government expenditure item as it was responsible for 45.4 percent of all local government spending in 1995 and 45.0 percent in 2002. By 2002,
expenditures on the public school system are predicted to increase to $71.152 million from $67.803 million in 1995 (a $3.349 million increase equal to 4.9%).

Expenditures on local public schools had the largest absolute increases from 1995 to 2002 among the ten expenditure categories accounted for in the model. Other categories with large absolute increases in spending from 1995 to 2002 included health care ($1.722 million), law enforcement ($1.300 million), and general administration ($1.259 million). In relative (percentage) terms, general administration (17.4 percent) had the largest increase from 1995 to 2002 among the ten expenditure categories accounted for in the model followed by law enforcement (12.6 percent) and waste disposal (12.0 percent).

Table 6

Predicted Changes in Local Government Expenditures for Lafourche Parish Under OCS Oil Industry Development, 1995-2002

ITEM	1995	1996	1997	1998	1999	2000	2001	2002
Schools	67,803,374	68,215,394	68,834,204	69,647,711	70,015,649	70,388,676	70,767,048	71,152,432
Roads	5,893,196	5,871,521	5,849,560	5,892,238	5,912,727	5,934,347	5,957,215	5,981,546
General Administration	7,216,990	7,423,809	7,700,174	7,971,014	8,094,095	8,219,118	8,346,123	8,475,637
Law Enforcement	10,327,916	10,520,355	10,790,402	11,082,011	11,214,867	11,350,025	11,487,535	11,627,975
Waste Disposal	6,636,528	6,759,949	6,929,256	7,104,291	7,183,865	7,264,709	7,346,850	7,430,627
Healthcare	37,325,518	37,513,344	37,823,329	38,249,931	38,444,177	38,641,691	38,842,526	39,047,506
Levees and Drainage	2,176,751	2,187,705	2,205,782	2,230,661	2,241,989	2,253,508	2,265,220	2,277,174
Fire Protection	1,148,909	1,154,690	1,164,232	1,177,363	1,183,342	1,189,421	1,195,603	1,201,913
Parks	1,900,503	1,910,067	1,925,850	1,947,571	1,957,462	1,967,519	1,977,744	1,988,181
Utilities	8,225,803	8,334,764	8,493,892	8,678,092	8,762,101	8,847,619	8,934,678	9,023,646
TOTAL	**148,655,488**	**149,891,598**	**151,716,681**	**153,980,884**	**155,010,274**	**156,056,632**	**157,120,543**	**158,206,637**

*All Values in 1995 dollars.
Source: Louisiana Community Impact Model(LCIM).

2.b Changes in local government revenues: Results from the fiscal module of the LCIM model indicate increases in the various revenue categories due to the OCS petroleum industry (Table 7). Like the expenditure estimates, results are based on direct, indirect, and induced increases in economic activity (in particular population) due to the OCS petroleum industry. Total revenues received by local government were projected to increase by $11.874 million (1995 constant dollars) in 1998 from 1995 levels (a 6.6 percent increase) and by $20.028 million in 2002 from 1995 levels (a 11.2 percent increase).

Table 7

Predicted Changes in Local Government Revenues for Lafourche Parish Under OCS Oil Industry Development, 1995-2002

ITEM	1995	1996	1997	1998	1999	2000	2001	2002
Total Sales Tax Revenue	16,974,524	17,626,203	18,495,386	19,345,254	19,731,298	20,123,338	20,521,508	20,927,461
Net Advoloreum Tax Revenue	23,329,084	23,908,271	24,688,196	25,464,974	25,818,014	26,176,643	26,540,977	26,912,526
Total Severance Tax	500,835	500,835	500,835	500,835	500,835	500,835	500,835	500,835
Total State Transfer(Transport)	724,546	728,192	734,209	742,490	746,261	750,095	753,994	757,973
Total State Transfer(School)	41,649,257	41,618,296	41,661,868	41,351,387	41,212,202	41,212,202	41,212,202	41,212,202
Total Federal Transfer	9,931,268	9,981,243	10,063,722	10,177,229	10,228,912	10,281,465	10,334,901	10,389,441
Other tax Revenue	70,648,088	71,694,496	73,143,662	74,670,369	75,363,507	76,067,129	76,781,429	77,509,328
Other State Transfer	12,793,013	13,730,581	14,958,177	16,110,699	16,634,069	17,165,487	17,705,139	18,255,268
Total Federal Transfer(Other)	2,469,727	2,482,155	2,502,666	2,530,893	2,543,745	2,556,814	2,570,103	2,583,666
TOTAL	**179,020,342**	**182,270,273**	**186,748,721**	**190,894,130**	**192,778,843**	**194,834,008**	**196,921,088**	**199,048,699**

*All Values in 1995 dollars.

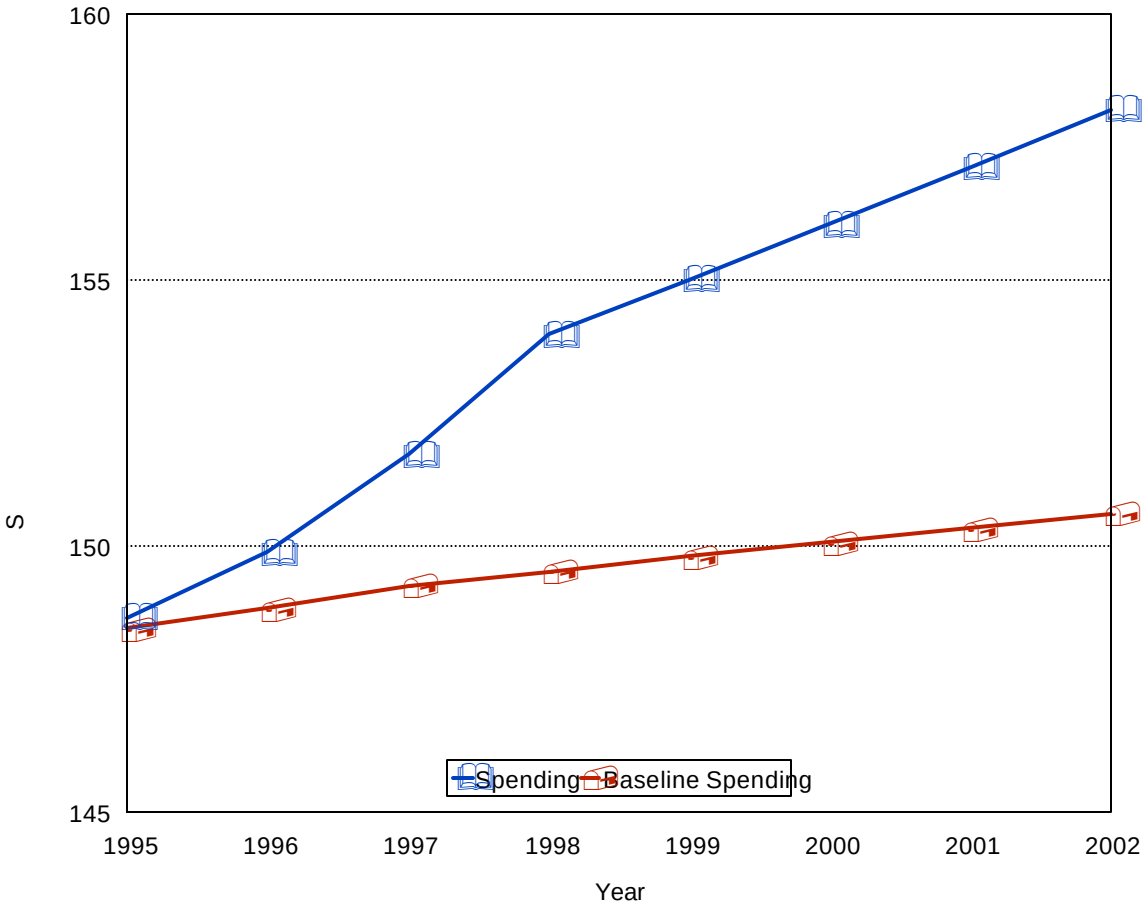
Source: Louisiana Community Impact Model(LCIM).

2.c Net costs to local government: Model results in Figures 13 through 15 indicate a marked increase in both expenditures ($9.551 million by 2002) and revenues ($20.028 million by 2002) due to the effect of to the OCS petroleum industry. As expected, changes in both variables are much larger than under the baseline scenario. Further, under the OCS scenario, the effect of increased population causes revenues to increase more rapidly than expenditures (Figure 15).[11] Hence, model results imply that ongoing activity in the Gulf of Mexico should not place additional strains on the ability of local governments to deliver publicly provided services. However, this result should be tempered by the fact that certain costs –– such as construction of new infrastructure -- being incurred by local governments due

[11] Local government entities in Louisiana can not have budget surpluses or deficits over the long run. Hence, assuming that model results are correct, either government spending must increase or tax levels decrease to provide a balance budget for all forms of local government in Lafourche Parish.

to the OCS petroleum industry are not accounted for in model results.[12] Such costs should be seen as an addition to costs increases predicted by the model.

[12] It is also possible that a lag may occur between immediate service needs and a government revenues (such as growth in property taxes) that do not occur immediately. However, given their reliance on sales taxes as a revenue source, this is probably not a problem for Lafourche Parish Governments.



Source: Louisiana Community Impact Model (LCIM)

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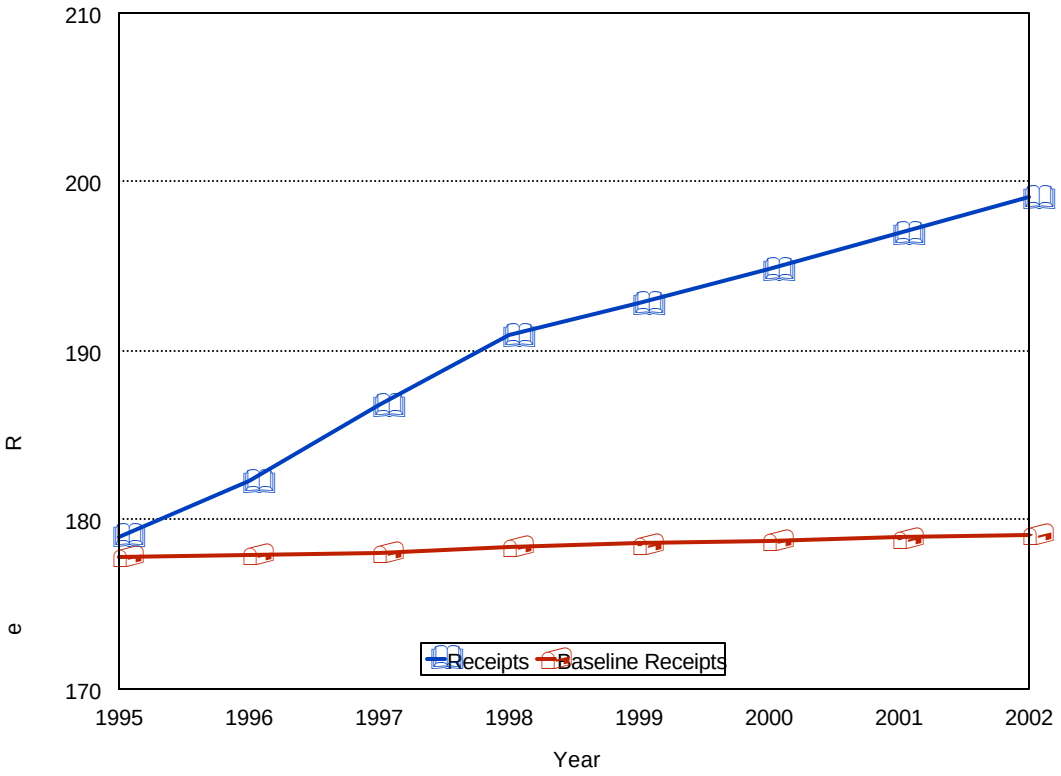
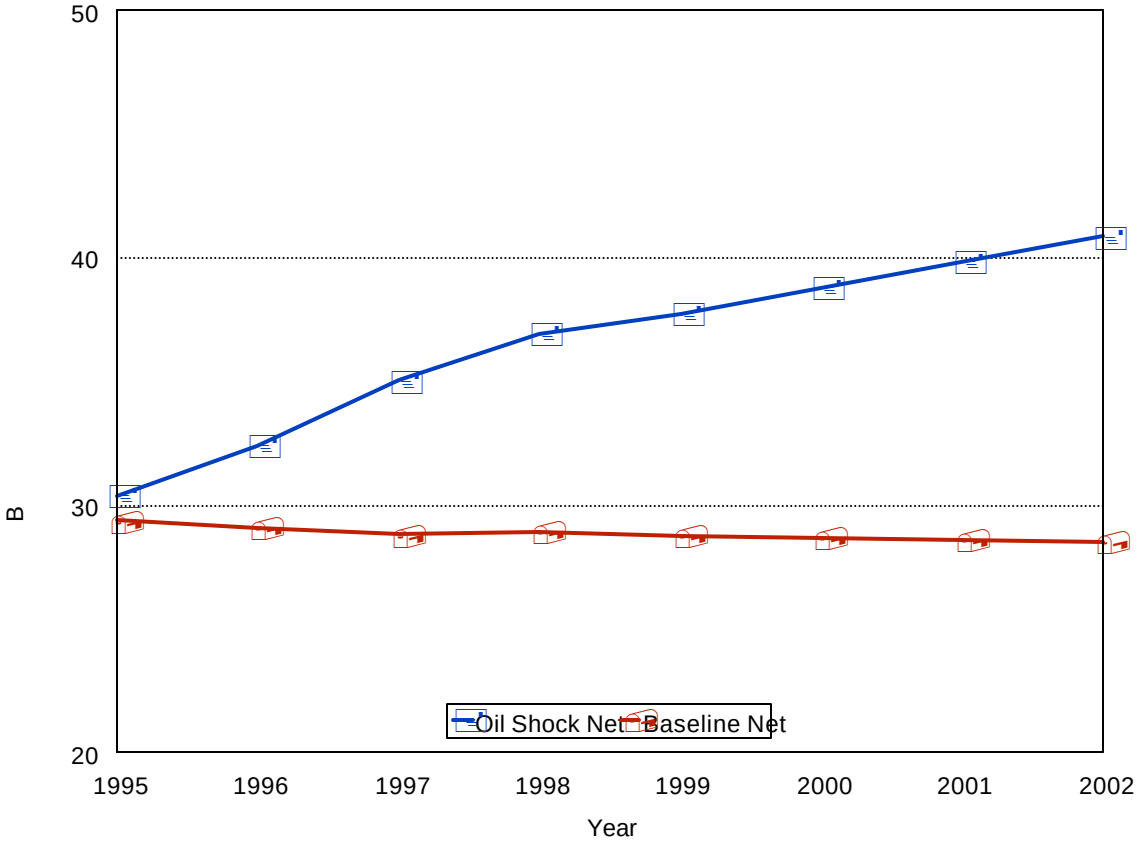
Figure 13. Estimated Local Lafourche Parish Government Spending under Baseline and Oil Shock Scenarios, 1995-2002.



Source: Louisiana Community Impact Model (LCIM)

Figure 14. Estimated Local Lafourche Parish Government Revenue under Baseline and Oil Shock Scenarios, 1995-2002.



Source. Louisiana Community Impact Model (LCIM)

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Figure 15. Estimated Local Lafourche Parish Government Revenues Less Costs under Baseline and Oil Shock Scenarios, 1995-2002.

H. Additional Pressures on Publicly Provided Services

Certain publicly provided services are tied to the unique needs of the offshore oil industry. Schools, city water, and roads have been especially impacted by certain aspects of growth unique to the offshore oil industry, especially in Lafourche Parish. By and large, these additional pressures were not accounted for in the previously discussed LCIM model results. Hence, efforts were made to assess the impact of OCS industry growth on the quality, quantity, and additional expense of providing such services.

1. City Water: The provision of clean water has become a critical local need for the offshore oil industry based out of Port Fourchon. According to Dirk Barrios, supervisor of Lafourche Parish Water District #1 at Lockport, between 1.2 million and 1.5 million gallons of water per day is being delivered to Port Fourchon. However, firms at the port indicate a minimum need of 4.0 million gallons per day. Firms have even brought water in barges into Port Fourchon in some cases, although the water is still provided by parish government. Water usage has increased dramatically because of use in drilling muds and in washing down equipment and infrastructure at the Port and offshore. As noted earlier, employment in shipbuilding has increased dramatically in the recent past. Shipbuilders in the parish, such as Bollinger, also use large amounts of water in their operations. Also, residential demand for city water services has increased recently.

A $10 million bond is in place to pay for increasing the capacity of the water district plant and the ability to deliver water to the Port Fourchon area. An 18-inch pipe to the port has been installed, two new storage tanks have been built at the Port, and booster pump improvements have also been made. These improvements were finished in the summer of 1999. The ability to deliver water to the area increased by 1.0 million gallons per day as a result. The capacity of the water plant also increased from 8 million to 12 million gallons per day. Two construction projects in the winter of 1998 and 1999 also led to necessary improvements in filtering and pumping capacity (both needed to support the long-run increase in capacity). The 12 million gallons per day production goal was obtained by the end of the summer of 2000. The improvements are being supported by a $10 million bond and by water usage charges in the Port Fourchon area. Sale tax revenues from throughout the parish (with the exception of the cities of Thibodaux and Lockport) are being used to payoff the bond.

2. Roads: The quality of roads in Lafourche Parish, especially LA 1, has become an important concern for local government officials. Because it is a state road, local government is not responsible for any new construction on LA 1 or for its upkeep and maintenance. Still, the serviceability of the road is of vital importance to local residents and to the OCS offshore petroleum industry based out of Port Fourchon. The companion study "An Analysis of LA Highway 1 in Relation to Expanding Oil and Gas Activity in the Central Gulf of Mexico" (Guo et al., 2000), has indicated that the large growth in truck traffic to Port Fourchon due to OCS petroleum activity was significantly affecting the quality of the road. At the very least, current and projected growth in truck traffic was expected to increase the need to repave and upgrade the road in a number of respects.

3. Additional Costs to Local School System: The local school system is also bearing additional costs due to the OCS petroleum industry, some of which are not accounted for in model results. In migration of foreign national workers has resulted in additional demand for locally provided educational services in the form of English as a second language class and expansion of vocational education programs (Minerals Management Service, 1997). Changes in school expenditures due to population growth are accounted for in LCIM model results reported in this study. However, certain increased expenditures, such as English as second language classes, are extraordinary costs that are not accounted for in model results. Hence, increases in expenditures by the local school system due to such extra activities are an additional cost for local government.

VI. SUMMARY AND CONCLUSIONS

The OCS petroleum industry is causing substantial levels of growth at Port Fourchon and in the Lafourche Parish economy in general. Model results are based on the assumption that the level of activity for the OCS petroleum industry will increase at an annual rate of 4 percent. These assumptions may or may not be correct given changes in key factors, such as crude oil prices. However, this growth is predicted to continue at least through the year 2002. As a result, increases in economic activity and population growth through the year 2002 are predicted to be substantial.

Model results also included estimates of resulting changes in revenues paid to and expenditures made by local government in Lafourche Parish. Model results indicated that the expanding OCS petroleum industry will lead to marked increases in both expenditures by and revenues to local government. By themselves, results imply that local government should be able to continue to meet increases in expenditures caused by that activity. In comparison to baseline growth, increases in revenues increased at a more rapid rate than did increases in expenditures. However, additional costs, such as English as a second language classes in the school system, may not always be reflected in model results. Hence, in the final analysis, the ability of parish government to meet increases in costs due to the expansion of the OCS petroleum industry could be problematic.

Finally, the history of the development of the OCS petroleum industry and the resulting impacts on economic activity and population levels in Lafourche Parish has been boom and bust. Projected increases in population and economic activity could and in some categories are already requiring substantial new investment in local infrastructure. If activity in the OCS petroleum industry should decrease rapidly in the future, local government may incur the costs of infrastructure development without obtaining the levels of revenue needed to meet such costs.

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APPENDIX A

Input-Output Module of LCIM

The I-O model was altered in several different ways to improve the accuracy of results. Original employment and output estimates for petroleum industries were changed in light of published and unpublished employment data for Lafourche Parish (U.S. Dept. of Commerce, 1998; Louisiana Dept. of Labor, 1998). IMPLAN provides information on trade for 528 commodities. Estimates of shipments in and out of the parish for eleven commodities were changed in view of economic theory and knowledge of the regional economy.[13] Finally, the model of the Lafourche Parish economy was aggregated based on standard procedures and using the IMPLAN software to 15 sectors (aggregate industries) for ease of analysis and for presenting model results.[14] Industry detail was retained for sectors with strong ties to the OCS petroleum industry, such as shipbuilding.

Besides the I-O module, the CIM contains a labor market module and a fiscal module. The labor market module examines labor demand and supply, and the fiscal module measures effects of labor markets and general economic activity on taxing ability and public service provisions (Ma et al., 1996).

Empirical Specification of the Labor Force Module

The labor force module serves to direct output from shocks in the input-output model into changes in government revenue and expenditures in the fiscal module. Both the place of residence and

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[13] The commodities for which the regional purchase coefficients (rpcs) were changed are listed as follows: Hay and Pasture, Natural Gas & Crude Petroleum, Natural Gas Liquids, Sugar, Confectionery Products, Concrete Block and Brick, Concrete Product, N.E.C., Ready-mixed Concrete, Business Associations, Labor and Civic Organizations, and U.S. Postal Service.

[14] Following standard practice, individual industries can be aggregated into a single industry group by summing rows and columns in the I-O flows table. For example, for agriculture in this study is a compilation of data for 27 individual agricultural industries in the original IMPLAN database.

place of work of the population are important to distinguish in the labor force module. Thus similar to Johnson (1991, 1996) and Swenson (1996), the Louisiana model empirically specifies seven equations for these variables, including external labor force and external employment index equations, which were calculated using gravity models.

Gravity models have been used extensively to model interactions between regions where distance has been an important factor in determining the costs and the benefit of the interaction (Isard et al.). For example, individuals are much less likely to commute 20 miles to a job than 10 miles. The opportunity costs of commuting can be seen as increasing at an exponential rate. Hence, driving the 20 miles might be seen as four times (rather than twice) as costly by the worker than the 10 mile trip. The level of interaction between the regions is also governed by the size (mass) of the variable in question. That is, the bigger the set of available workers in a given region, the greater the number of workers that may commute to jobs in another region. In this way, a gravity model can be used to produce an index that reflects the interaction between a particular region and all other regions in a given set. That is, assuming we had three regions in our gravity model, then the gravity index for region one would be the size (such as size of work force) in region two divided by the squared distance between region one and two plus the size in region three divided by the squared distance between region one and region three.

$$External\ \ Employment\ \ Index_j = \sum_{i=1}^{n} External\ \ Employment_i / Distance_i^2$$

In the labor market module, gravity equations are used to estimate external labor force and external employment indices. The former is an independent variable in the in-commuting earnings equation while the latter is an independent variables in the out-commuting earnings equation. Formally, we can write the two gravity equations as

$$External\ \ Labor\ \ Force\ \ Index_j = \sum_{i=1}^{n} External\ \ Labor\ \ Force_i / Distance_i^2 \qquad (1)$$

(2)

where: i ...j; and where, for the ith observation, the contribution to the labor force (employment) index for j is the size of the work force for i (job base) divided by the straight line distance between the geographic centers of i and j. The external labor force index and the external employment index are calculated for all 64 Louisiana parishes. The external labor force and external employment variables are defined to include all 64 Louisiana parishes plus any out of state county with at least 100 commuters to the jth Louisiana parish in 1990 (U.S. Bureau of the Census, 1991).

For the other five equations in the Labor market model, we have population (as a function of the level of employment and the level of unemployment), in-commuter earnings (as a function of place of work employment and external labor force index), and out-commuter earnings (as a function of labor force and external employment index), or

Population = f (Employment, Unemployment) (3)

In-commuter Earnings = f (Place of Work Employment, External Labor Force Index) (4)

Out-commuter Earnings = f (Labor Force, External Employment Index) (5)

In-Commuters = In-Commuter Earnings / Average Parish In-Commuter Earnings (6)

Out-Commuters = Out-Commuter Earnings / Average Parish Out-Commuter Earnings (7)

where: in-commuter earnings is total pay (employee compensation plus proprietary income) to individuals working but not living in the parish; place of work employment is the number of jobs in the parish; labor force is the level of employed plus unemployed residents in the parish; and

parish in-commuting and out-commuting average earnings are calculated based on 1990 Census data (total in-commuting earnings divided by the total number of in-commuters and total out-commuting earnings divided by the total number of out-commuters).

Estimates of population, place of work employment, and unemployment were obtained from publications by the Louisiana Department of Labor and the Louisiana Department of Economic Development. (Estimates for 24 years of data (Louisiana Dept. of Economic Development, 1998) for Lafourche Parish were used in estimating the relationships in equation 1). Estimates of in-commuter earnings and out-commuter earnings came from the Census Bureau, Journey to Work data set for 1990. In addition, equations 6 and 7 are used to convert commuter earnings into estimates of the actual number of in-commuters and out-commuters, based on average commuter earnings derived from the Journey to Work data set. The estimated labor force module is provided in Appendix A Table 1.

The labor force variable serves as the "link" between the input-output module and the fiscal module. That is, a final demand shock from the input-output module will lead to a change in the labor force. The change in labor force will lead to changes in population, in-commuter earnings, and out-commuter earnings. Changes in earnings are also used to derive changes in household spending (induced effects) in the input-output model after accounting for leakages out of the local economy (to in-commuters), interjections from out-commuters and spending leakages in the form of income taxes, savings, and purchases from elsewhere.[15] The round of induced effects spending occurs into the

[15] That is, changes in earnings by local residents equals the change in earnings estimated with the I-O, minus the estimated change in in-commuter earnings (from the labor market model) plus the estimated changes in out-commuter earnings (from the labor market module). Tax and

estimated total change in employment is very small (less than one job). Thus, the I-O model and labor market model are operated interactively, as results from the I-O feed into the labor market module and the resulting changes in variables from the labor market module feed back into the I-O model, until the changes in variables approach zero.

Changes in variables in the fiscal component of the model are also based on changes in variables from the combined I-O and labor market model. That is, changes in population, in-commuter earnings, and out-commuter earnings are independent variables in the fiscal component of the model. Thus, the community impact model works in a block recursive fashion.

Previous research (Deller and Shields, 1996), a likelihood ratio test (Greene, 1997), and economic theory were used to determine the functional forms for equations (2) – (4) in the labor force module. It was determined that in-commuter earnings and out-commuter earnings would be estimated using a Cobb-Douglas functional form, whereas population would be estimated using a linear functional form.

Empirical Specification of the Fiscal Module

To estimate the changes in local government revenues and expenditures, the theoretical derivation of the fiscal module must be empirically specified. The empirical specification used in this module closely follows the fiscal modules of Johnson (1991, 1996) and Deller and Shields (1996). The structural equations identifying public service demand and supply are not observed. Rather, the equilibrium levels of public goods are what is observed in the local economy. Thus, by estimating a set of reduced form equations, changes can be followed in the provision and production of publicly provided goods and services even when the parameters for the structural equations are unidentifiable (Stallmann et al., 1998).

Previous research provides a starting point for estimating the public good expenditure equations. Fiscal modules developed by Johnson (1991, 1996), Deller and Shields (1996), and Swenson (1996) were used as starting points for empirical specification of the Louisiana fiscal module. However, as Johnson (1997) explains, the underlying structure surrounding the production and delivery of publicly provided goods and services varies from state to state, and thus empirical specification will differ.

Sixteen equations are included in the Louisiana fiscal module. The primary forms of local taxes in Louisiana are real estate property (based on assessed value) and retail sales taxes. Two equations measure revenue capacity--assessed property value and retail sales (Appendix A Table 2). Four direct revenue equations are included--severance tax revenue, state transfer revenue, federal transfer revenue (for both schools and other functions), and other tax revenue. Severance tax revenue includes all tax

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spending leakages are removed from the change in earnings to local residents to arrive at an estimate of the change in disposal earnings (incomes) to local residents. The change in local economic activity (one round of the induced effect) is then calculated by assuming that the pattern of expenditures (including purchase of local goods versus purchase versus goods produced elsewhere) given for medium income households in the IMPLAN model holds true.

revenue collected from the extraction of oil, natural gas, other minerals, and timber and pulpwood. Federal transfer payments include Medicare, Medicaid, and school lunch program payments. State transfer revenue consists of public school transfers from the state minimum foundation program, local public road transfers from the parish transportation trust fund, and all other state transfer revenue. Other tax revenue includes revenue generated from license taxes, general charges, hospital charges, special assessments, interest earnings, fines and forfeitures, and miscellaneous general revenues (Appendix A Table 3).

Ten expenditure equations are estimated in the fiscal model (Appendix A Table 4). These equations attempt to explain changes in spending for school, road, general, administration and other, law enforcement, waste disposal, utility, hospital, levee and drainage, fire, and parks and recreation expenditures. Hospital expenditures also include other health care expenditures. Waste disposal expenditures include solid waste expenditures and sewer expenditures. Law enforcement expenditures include expenditures for judicial, police, and corrections. General, administration, and other expenditures include financial administration, general services/buildings, library, public welfare, general debt interest, insurance trust, and liquor store expenditures.[16]

One year of data for assessed value, retail sales, and severance tax revenue came from the Statistical Abstract of Louisiana (1997). Estimates of other tax revenue, federal transfer revenue, and other state transfer revenue came from the 1992 Census of Governments (U.S. Bureau of the Census 1992). State school transfer revenue was derived from the Louisiana Department of Education minimum foundation formula (Louisiana Department of Education 1997b) whereas federal school transfer revenue came for the Louisiana Department of Education Annual Financial and Statistical Report (Louisiana Department of Education 1997a). Parish transportation trust fund revenue was derived from the formula given in the Louisiana Revised Statues (1997).

All expenditure estimates except for school and levees and drainage came from the 1992 Census of Governments (U.S. Bureau of the Census, 1992). Expenditures for an individual parish were calculated as the sum of expenditures from the parish governing body and all municipalities within the parish. This aggregation was necessary because different public goods and services are produced by different government entities. School revenues and expenditures came from the Louisiana Department of Education Annual Financial and Statistical Report (Louisiana Dept. of Education, 1997b). Expenditures on levees and drainage were assumed to equal revenues explicitly collected for such activity. Revenues often do not equal expenditures in a given year, but it is assumed that on the average, a local government will be in fiscal balance; that is, no long-term surpluses or deficits will exist.

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[16] Equations were estimated for per capita variable values, such as per capita spending on schools. For four spending categories (hospitals, levee and drainage, fire, and parks and recreation), no relationship was found between changes in local population and earnings and per capita spending. Hence, expenditures were assumed to increase at a constant rate with population, and a regression approach was not used.

Again, previous research, economic theory, and a likelihood ratio test were used to test for functional form. A Cobb-Douglas functional form was used to estimate the school expenditure equation whereas a linear functional form was used for the other five regression-based expenditure equations. The Cobb-Douglas functional form used is based on the assumption that the average (per capita) cost of supplying publicly provided goods and services increases at a decreasing rate as population increases (i.e., economies of scale exist).

Table A1

Estimation Results from the Labor Force Module of the Louisiana Community Impact Model

---------- Dependent Variable----------			
Independent Variable	Population	In-Commuter Earnings	Out-Commuter Earnings
Labor Force	Na	Na	0.973**
Place of Work Employment	0.618**	1.094**	Na
	(3.28)	(18.03)	
Place of Work Unemployment	0.907**	Na	Na
	(3.44)		
External Labor Force Index	Na	0.002**	Na
		(3.27)	
External Employment Index	Na	Na	0.00229**
			(15.88)
Constant	272.84	6.780**	1.324*
	(1.31)	(11.49)	(2.41)
R-Square	0.45	0.82	0.81
Condition Index	2.21	N/A	N/A
Heteroskedasticity Tests:			
B-P-G Test	4.49	N/A	N/A
Harvey Test	6.047*	N/A	N/A
Glejser Test	5.184*	N/A	N/A

** - Significant at " =.01 * - Significant at " =.10

Note: T-Statistics are in Parenthesis.

Population equation estimated with first difference for all variables to correct for autocorrelation. In-commuter and out-commuter equations were transformed to account for heteroskedacity. Na means the equation in question does not contain that independent variable. N/A means the test does not apply.

Table A2

Least Square Results of Assessed Value and Retail Sales from the Louisiana Community Impact Model

---------- Dependent Variable---------		
Independent Variable	Assessed Value	Retail Sales
Arable Land Density	115,280*	-41,180
	(1.87)	(-1.63)
In-commuter Earnings	Na	-0.15473**
		(-3.62)
Out-commuter Earnings	0.10223**	0.36299**
	(11.02)	(7.76)
Resident-Employed Earnings	0.29459**	0.78686**
	(44.80)	(34.96)
Constant	44,032,000**	-14,743,000**
	(5.54)	(-10.01)
R-Square	0.93	0.98

** - Significant at " = .01 * - Significant at " = .10

Note: T-Statistics are in Parenthesis. Both equations were transformed to account for heteroskedacity. Na means the equation in question does not contain that independent variable.

Table A3

Estimation Results of Per Capita Other Tax Revenue and Per Capita Other State Transfer Revenue
from the Louisiana Community Impact Model

	---------- Dependent Variable----------	
Independent Variable	Per Capita Other Tax Revenue	Per Capita Other State Transfer Revenue
Per Capita Assessed Value	0.918** (10.84)	0.017** (5.98)
Per Capita Retail Sales	0.615** (12.55)	0.051 (1.35)
Arable Land Density	-0.038 (-0.75)	Na
Constant	-6.658** (-4.70)	-18.837 (-0.83)
R-Square	0.24	0.39
Heteroskedasticity Tests		
B-P-G	N/A	2.942
Harvey	N/A	9.970**
Glejser	N/A	11.503**

** - Significant at " = .01 * - Significant at " = .10
Note: T-Statistics are in Parenthesis.
The per capita other tax revenue equation was transformed to account for heteroskedacity. Na means the equation in question does not contain that independent variable. N/A means the test does not apply.

Table A4

Per Capita Expenditure Equations from the Louisiana Community Impact Model

	----------Dependent Variable----------					
Independent Variable	School	Road	General, Administration, and Other	Law Enforcement	Waste Disposal	Utilities
Per Capita Assessed Value	0.24873** (5.21)	0.01505** (3.51)	0.03083* (2.22)	0.02272** (3.43)	0.01718** (3.19)	0.00995 (1.49)
Per Capita Retail Sales		-0.00891* (-2.09)			-0.00033 (-0.05)	
Arable Land Density	0.03000 (1.35)	0.13854* (2.56)		0.11456* (1.70)		0.09681 (1.15)
Per Capita Public School Registration	0.87287** (4.43)					
Pupil to Teacher Ratio	-0.65749** (-2.93)					
Per Capita Local Road Miles		823.28000 (1.32)				
Per Capita All Other Expenditures			0.11446* (2.053)			
Non-Wetland Acres				-0.00001 (-0.23)		
Percent Urban					120.27000* (2.55)	
Public Electricity Dummy						113.83000** (3.95)
Public Gas Dummy						9.95460 (0.35)
Public Transportation Dummy						64.35600 (1.51)
Constant	7.92** (8.91)	49.24 (1.44)	-9.89 (-0.15)	53.27 (1.45)	-22.15 (-0.61)	22.39 (0.63)
R-Square	0.4605	0.1957	0.2083	0.1828	0.2621	0.2381
Standard Error	0.16352	80.761	243.86	124.64	100.85	127.11
White' Test	15.12	13.68	2.82	1.38	3.17	20.36

LM Test for Contemporaneous Covariance of the System of Equations = 118.95**
** - Significant at " = .01 * - Significant at " = .10
Note: T-Statistics are in Parenthesis.

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.