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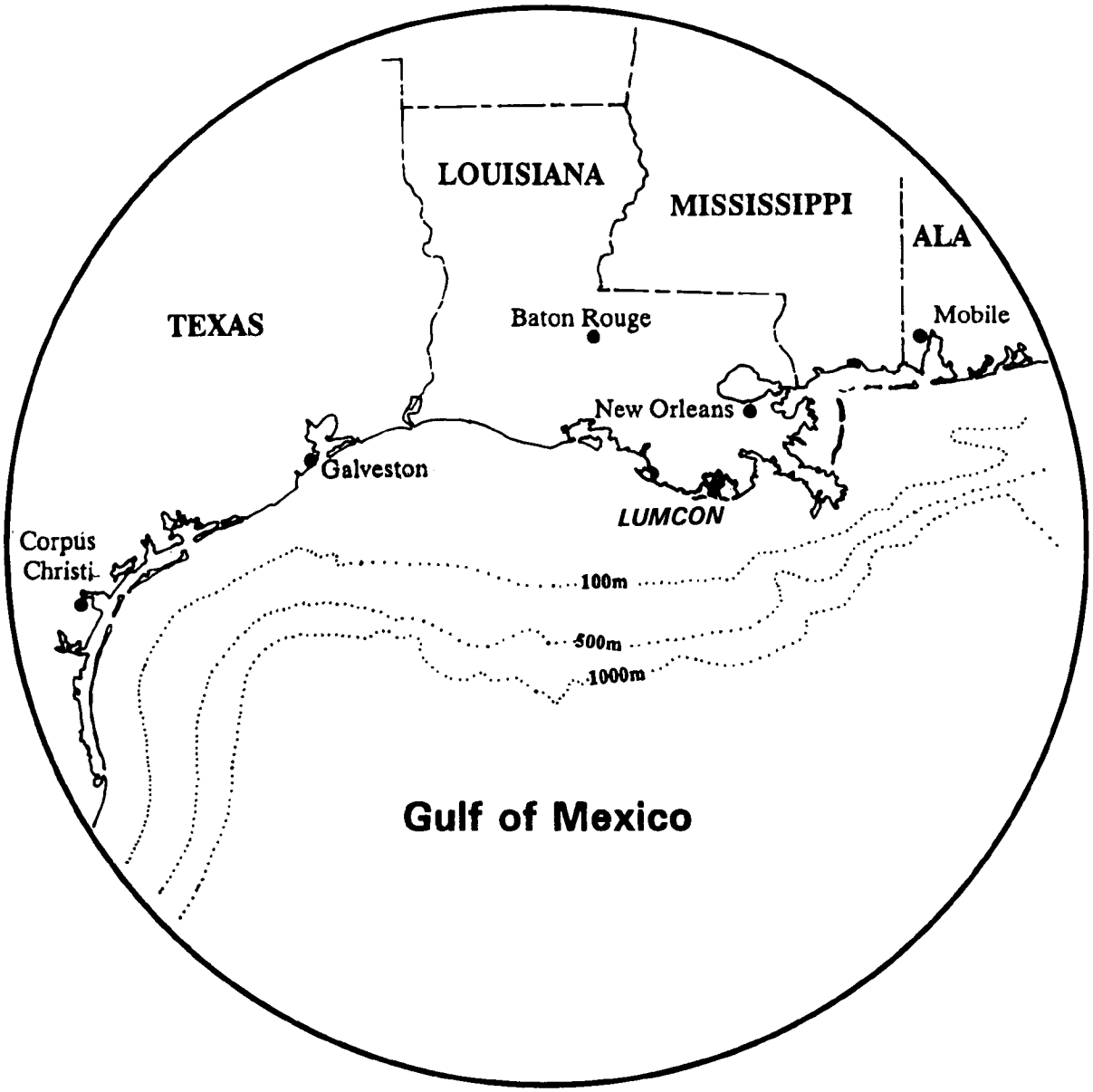
Social and Economic Impacts of Petroleum "Boom and Bust" Cycles



MMS U.S. Department of the Interior
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Louisiana Universities Marine Consortium

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Social and Economic Impacts of Petroleum "Boom and Bust" Cycles

Continuation of a Project within
"Impact of Offshore Oil Exploration and Production
on the Social Institutions of Coastal Louisiana"
(OCS Study MMS 93-0007)

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June 1994

Prepared under MMS Contract
14-35-0001-30470
by
Louisiana Universities Marine Consortium
150 Riverside Mall, Room 107
Baton Rouge, Louisiana 70801

Published by

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

Cooperative Agreement
University Research Initiative
Louisiana Universities Marine Consortium

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CITATION

Suggested citation:

Seydlitz, R. and S. Laska. 1993. Social and Economic Impacts of Petroleum "Boom and Bust" Cycles. Prepared by the Environmental Social Science Research Institute, University of New Orleans. OCS Study MMS 94-0016. U.S. Dept. of the Interior, Minerals Mgmt. Service, Gulf of Mexico OCS Regional Office. New Orleans, La. 131 pp.

ABSTRACT

Resource extraction activities are primary activities and, as such, have social and economic impacts on communities involved in these activities. The exploration for and production of petroleum reserves from the Gulf of Mexico are examples of resource extraction activities. Yet, the effects of these operations on the communities surrounding the Gulf of Mexico are largely unknown due to limited research in this region.

The research in this report focuses on the social and economic impacts of petroleum production in the Gulf of Mexico on communities in Louisiana. Specifically, the study examines the effect of petroleum production on social problems, educational attainment and strain, and community economic health in parishes in Louisiana. The parishes studied vary in their degree and type of involvement in petroleum production, i.e., direct extraction activities or indirectly related activities such as refining, metal fabrication and wholesaling.

The findings suggest that petroleum production in the Gulf of Mexico affects social problems, educational attainment, educational strain, and community economic health. In addition, the influence depends on both the degree of involvement (highly or minimally involved) and type of involvement (extraction or related activities). Overall, the results imply that community economic health and basic level educational attainment temporarily improve while social problems and educational strain temporarily worsen due to increases in petroleum activity, especially in the highly involved and extraction parishes.

Mitigation recommendations include data collection, impact monitoring, sharing of information about potential impacts with community residents, counseling and treatment programs, and the expansion of government assistance and programs that help citizens cope with impacts.

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ACKNOWLEDGMENTS

The authors want to thank the many individuals who assisted in locating, collecting, cleaning and analyzing the data:

Social Problems. Sallye Hampton, graduate student in the Department of Sociology, University of New Orleans; Kimberly Muse, senior in General Studies, University of New Orleans; John Rodi and Mike Melancon of Minerals Management Service for information about the petroleum industry; Gordon J. Mills III of the Office of Information Services, Louisiana Department of Public Safety and Corrections for compiling the data on juvenile commitments for us; Mary Lynn Murret of the Judicial Administration Office, Louisiana Supreme Court for giving us the data on the criminal court cases; and Vincent Maruggi of the Division of Business and Economic Research, College of Business Administration, University of New Orleans for helping us acquire the population data. We also acknowledge the assistance of the following people in our search for the juvenile commitment data: George Lamy of the Office of Information Services, Louisiana Department of Public Safety and Corrections; George White and Terry Klare of the Louisiana Department of Public Safety and Corrections; Alyce Lappin of the Louisiana Commission of Law Enforcement and Administration of Justice; Ernest Thomas, Detention Home Supervisor, Department of Juvenile Services, Parish of Jefferson; and Dr. Cecile Guin.

Education. Sallye Hampton, graduate student in the Department of Sociology, University of New Orleans; Kimberly Muse, senior in General Studies, University of New Orleans; John Rodi and Mike Melancon of Minerals Management Service for giving us the information on the petroleum industry; and David Miller of the American Petroleum Institute and Larry Wall of the Louisiana Mid-Continent Oil and Gas Association for giving us information about requirements of workers on offshore platforms.

Community Economic Health. Sallye Hampton, graduate student in the Department of Sociology, University of New Orleans; Kimberly Muse, senior in General Studies, University of New Orleans; John Rodi and Mike Melancon of Minerals Management Service for information concerning the petroleum industry; Patty Lopez of the Louisiana Department of Employment and Training for giving us the employment data; Vincent Maruggi of the Division of Business and Economic Research, College of Business Administration, University of New Orleans for assistance in acquiring the data from the Bureau of Economic Analysis; and Francis Conner of the Louisiana Department of Revenue and Taxation for giving us some of the sales taxes data.

CHAPTER 1

EXECUTIVE SUMMARY

The State of Louisiana is unique in its long-term and massive involvement in the exploration and extraction of natural resources from beneath the seabed of the Gulf of Mexico. In Louisiana, a distinctive intertwining of coastal environment, culture in the coastal region, and approach by State government to natural resource extraction occurred and facilitated the early, rapid, and immense development of petroleum production off the coast. The massive involvement in petroleum operations that has spanned almost five decades has led to a greater local dependence on petroleum production than is seen anywhere else in the world. This dependence is compounded by the fact that the fate of the local industry is largely controlled by forces beyond the influence of Louisiana residents, namely the magnitude of the world petroleum industry, the power of multinational petroleum companies and the power of other oil-producing countries. Decisions are made by petroleum companies based on the world market for its products that result in changes in local communities.

Companies may decide to begin or increase petroleum extraction in a particular area. These companies recruit employees to work in these areas in extractive operations. One method of recruiting employees and obtaining employees with the best skills needed by the company is to offer higher wages than do other employment positions in the community. These higher wages and job opportunities may attract not only long-time residents, but also people from other communities. Also, because the local residents may not have the required skills to obtain employment in the industry, workers are recruited from outside the community. Therefore, people migrate into the community. The combination of higher incomes and inmigration lead to other changes in the community such as social disruption, a higher cost of living, increased housing costs, and changes in people's perceptions of the community. Ultimately, these factors may lead to increased social problems, changes in educational attainment of people in the community, differences in the ability to provide educational services, and changes in community economic health. This rapid development of extraction in combination with rapid population growth creates a situation that deserves to be studied in depth. Some of the important questions that need to be addressed are:

1. How do resource extraction activities affect communities' social, educational and economic conditions?

2. To what extent do potential impacts depend on a) the amount of involvement of the communities in resource extraction, and b) whether communities are involved primarily in the extraction of oil and gas or in related industries such as refining, wholesaling and metal fabrication, i.e., the construction of the physical infrastructure for the extraction activities?

3. Are the potential impacts mostly positive, mostly negative or a mixture?

4. If the research examining these three empirical questions demonstrates evidence of negative impacts, what are some of the ways these impacts can be mitigated?

HISTORY OF THE STUDY

The current research is an extension of a portion "Impact of Offshore Petroleum Exploration and Production on the Social Institutions of Coastal Louisiana" (Shirley Laska et al., MMS 93-0007, prepared under MMS contract 14-35-0001-30470). The original sub-study of which this is an extension examined the impact of increases and fluctuations in OCS production on social problems, long-term human capital, and community economic health in highly and minimally involved parishes. The initial research resulted in one publication (Seydlitz et al. 1993) and three presentations at professional meetings - one from the original study itself and two from projects related to it.

Despite the productivity of the original funding, more research on the effect of the price of oil and number of wells on these three impacts was needed. First, the original study could not include data on the decline because these have become available only recently. Thus, the social problems and education series could be extended to span the period from approximately 1957 through 1990 for those variables used in the original study. The economic series could be increased to cover the time from approximately 1969 to 1990 for the variables used in the initial study. Moreover, the census data for 1990 became available; therefore, it was possible to complete the boom to bust and preboom to bust comparisons with these data in the current project.

Second, additional indicators for social problems, education, and economic health were collected, thus doubling the number of indicators for each of these impacts. Third, more detailed comparisons of the impact of petroleum production on social problems, education and economic health not possible in the first phase of the study were conducted by type of involvement as well as degree of involvement.

METHODOLOGY

The research effort was organized to examine the impact of petroleum activity on social problems, education, and economic health of communities involved in petroleum production taking into account the degree and type of involvement of the parish. Because data were not available for smaller units, counties (called parishes in Louisiana) were used as the operationalization for community. A total of twenty-four parishes were examined. To account for degree of involvement, twelve parishes highly involved in the petroleum industry and eleven minimally involved parishes were examined. Some of the highly involved parishes were highly involved in mining activities and some were highly involved in related activities, such as refining, fabrication and wholesaling. Thus, to account for type of involvement, five parishes highly involved in extraction (four from the original group plus one other parish)

and five parishes highly involved in related activities (all from the original group) were studied.

To determine the degree of involvement of the parishes, an involvement score was assigned to the parishes and was the average of the parishes' ranks on two criteria. The first was the percentage of people working in the parish employed in oil and gas extraction, manufacturing and wholesale trade in 1975, 1981, and 1984 (U.S. Bureau of the Census 1978, 1983b, 1986). The percentages of workers for each of the three years were ranked and an average of the three rankings was computed. The second criterion was the percentage of total income of the parish residents that came from wages and salaries from oil and gas activities in 1984, the only year for which the data were available (Centaur Associates 1986). The original data on which the ranks were based is shown in table 1.1.

To determine which parishes were highest in extraction activities, an involvement score was computed which was the average of the parishes' rankings on two factors. The first was the percentage of people working in the parish employed in petroleum and gas extraction in 1975, 1981, and 1984 (U.S. Bureau of the Census 1978, 1983b, and 1986). The percentages of workers for each of the years were ranked and an average rank was calculated. The second factor was the percentage of total income of the parish residents that came from petroleum and gas extraction activities in 1984 (Centaur Associates 1986). The original data that was ranked is shown in table 1.2.

To determine which parishes were highest in related activities, an involvement score was calculated that was the average of the parishes' rankings on two criteria. The first was the percentage of people working in petroleum and gas related manufacturing and wholesale trade in 1975, 1981, and 1984 (U.S. Bureau of the Census 1978, 1983b, 1986). For each year, the percentages of workers were ranked and an average rank was figured. The second criterion was the percentage of total income of the residents that came from gas processing, oil refining and contract supply work in 1984 (Centaur Associates 1986). The original data is given in table 1.3.

Petroleum and gas activities are not distributed in a manner that would guarantee that a parish would be involved only in extraction or solely in related activities. However, the average ranks across the two criteria (percentage of workers and percentage of residents' income) did result in two discrete groups with one exception. Plaquemines parish was among the highest ranked parishes on both types of involvement; therefore, it was omitted from both categories. When the data in tables 1.2 and 1.3 are examined, it is important to remember it is not the absolute value of these data that determine the type of involvement of the parish, it is the relative value of these data; in other words, the rankings.

The data were statistics collected from various State and Federal government agencies. Some of these statistics were obtained from published documents; others were compiled by the agencies at our request. Three main statistical techniques were used to analyze the data to address specific questions about the impact of petroleum production on social problems,

Table 1.1. Percentage of Workers in and Parish Residents' Income from Petroleum and Gas Activities

	Percentage of Workers			Percentage of Income
	1975	1981	1984	
A. Highly Involved				
Acadia	12.6	8.6	6.0	5.1
Calcasieu	11.8	9.1	9.0	4.5
Cameron	59.6	24.1	14.0	21.1
Iberia	16.1	6.1	6.0	3.1
Lafayette	7.5	16.9	15.5	2.4
Plaquemines	32.8	25.7	15.2	18.9
St. Bernard	10.0	8.3	8.6	7.7
St. Charles	11.9	13.4	16.0	10.1
St. James	13.8	8.9	18.4	13.9
St. Mary	13.5	9.6	6.5	7.5
Terrebonne	26.5	17.9	16.7	2.6
Vermilion	23.1	28.2	13.7	7.3
B. Minimally Involved				
Allen	0.0	1.6	0.0	0.6
Ascension	1.3	1.3	3.0	0.4
Avoyelles	0.0	0.0	1.0	0.7
Beauregard	1.5	2.0	1.0	0.5
Caldwell	0.0	15.4	0.0	0.4
DeSoto	5.0	7.7	2.0	0.1
Grant	0.0	0.0	0.0	0.7
Madison	3.3	0.0	0.0	0.1
West Carroll	0.0	0.6	0.0	0.2
West Feliciana	1.0	8.4	2.6	0.1
Winn	1.5	4.8	1.9	0.6

Table 1.2. Percentage of Workers in and Parish Residents' Income from Oil and Gas Mining Activities

	Percentage of Workers			Percentage of Income
	1975	1981	1984	
A. Extraction Parishes				
Cameron	59.6	24.1	14.4	7.0
Lafayette	7.3	16.5	14.6	2.4
LaFourche	6.4	8.2	4.9	3.5
St. Mary	12.7	9.0	5.6	4.6
Vermilion	21.7	26.2	12.5	3.4

Table 1.3. Percentage of Workers in and Parish Residents' Income from Oil and Gas Related Activities

	Percentage of Workers			Percentage of Income
	1975	1981	1984	
A. Related Activities Parishes				
Acadia[a]	1.9	2.7	1.2	7.5
Calcasieu	10.3	7.3	7.4	3.7
St. Bernard	8.8	6.0	7.4	6.8
St. Charles	10.0	12.2	15.2	6.9
St. James	9.4	7.7	15.1	13.7

a. The low percentage of workers in oil and gas related manufacturing and wholesale trade combined with the high percentage of income from gas processing, oil refining, and contract supply work indicates that Acadia's involvement in related activities is specialized. However, the average rank of the two criteria - percentage of workers and percentage of income - for Acadia is one of the highest. Therefore, Acadia met the criteria for inclusion as a related activities parish.

education and economics. These techniques were analysis of variance (ANOVA), time series regression, and t-tests for the difference between means. Percentage changes were used to complete preboom to boom, boom to bust, and preboom to bust comparisons for the decennial data presented in the chapter concerning community economic health (chapter 4).

FINDINGS[1]

Presentation of the findings will be organized according to the questions posed earlier in this document.[2] For each question, answers will be presented along with suggestions for future research.

1. How do resource extraction activities affect communities' social, educational and economic conditions?

The results indicated that rapid increases in petroleum industry activity increased social problems, particularly suicides and homicides. Further analyses suggested that there was a cycle of social problems, other than the obvious boom/bust cycle. The findings showed that increases in petroleum activity were associated with increases in social problems within one year of the increase in activity. In addition, the results demonstrated that increases in petroleum activity were associated with decreases in social problems in the second, third and fourth year after the increase in activity.

The outcome of the analyses also showed that greater petroleum industry activity was associated with higher percentages of students completing high school, lower percentages of high school graduates enrolling in college, and greater strain in providing educational services - higher education expenditures and a larger number of pupils.

The analyses comparing preboom, boom, transition to bust, and bust levels of economic variables displayed some evidence of an economic gain in involved parishes when petroleum activity was rapidly increasing (boom), but the results also showed that there were serious economic problems when petroleum activity was rapidly decreasing or had attained a low level following a period of greater activity (bust). Although the direct effect of increases in petroleum industry activity was an improvement in community economic health, this economic gain was transitory. The improved economic health was within one year of an increase in petroleum activity and was followed by decreases in economic health in the second, third and fourth years after an increase in activity.

Additional studies specifying different types of resource extraction experiences would benefit the understanding of particular experiences such as OCS activity. Such studies should examine more closely: differences depending on the resource extracted (e.g., renewable or non-renewable), the geographical isolation of the community that is host to the extraction industry, and the location of the resource extracted (e.g., onshore or offshore) (Freudenburg 1992). Also, it is important to develop baseline data on resource extraction activities and to

analyze the involvement experiences of involved communities over the entire duration of the extraction activities. It is very difficult to discern long-term impacts of resource extraction without knowing how the community was faring before resource extraction operations were considered. It is necessary to begin to develop the baseline data even before extraction projects are publicly discussed because some prior research suggests that impacts start in anticipation of an energy development project, rather than merely when the actual activity takes place.

Although Minerals Management Service is interested primarily in the effect of offshore petroleum and gas extraction, this extraction is a type of resource extraction. Inasmuch as various types of resource extraction have characteristics in common, the impacts of offshore petroleum extraction would be expected to be similar to those from other specific resource extraction. In fact, the results of this study are similar to those of other resource extraction and energy development projects. Also, if other resources besides petroleum and gas are extracted from Federal OCS waters in the future, such as marine minerals, the impacts of such extraction would be of interest to Minerals Management Service and would be predicted to be comparable to those of petroleum and other resource extraction.

2. To what extent do potential impacts depend on a) the amount of involvement of the communities in resource extraction and related activities, and b) whether communities are involved primarily in the extraction of oil and gas or in related industries such as refining, wholesaling and metal fabrication, i.e., the construction of the physical infrastructure for the extraction activities?

There was no evidence that the impact of petroleum industry activity on social problems differs by either degree or type of involvement. In contrast, the impact on education and economic health did depend on both degree and type of involvement. The effect was stronger, clearer and more consistent in the highly involved and extraction parishes rather than in the minimally involved or related activities parishes.

More studies that compare impacts by degree and type of involvement are required since these factors are rarely controlled in investigations reported in the energy development/ resource extraction literature.

3. Are the potential impacts mostly positive, mostly negative or a mixture?

The preponderance of the evidence, but not all of it, suggested the following. First, the impact on social problems was negative. Second, the impact on education was a combination of positive and negative effects. Third, the impact on community economic health was positive, but only immediately after increases in activity. The results also showed serious economic problems during the bust, especially in the highly involved and extraction parishes.

The effects of petroleum activity on social problems were not clear, consistent or strong. Nevertheless, the results implied that there was a negative impact on social problems. Social

problems tended to increase when petroleum activity increased, but this negative impact was transitory.

The impact on education was a mixture of positive and negative effects. A positive effect on educational attainment was the increase in high school completion when the petroleum industry was more active. On the other hand, the percentage of high school graduates enrolling in institutions of higher learning decreased when activity increased. There was also a negative effect of increases in activity on educational strain - expenditures and the number of pupils tended to increase. However, this effect was short-term; expenditures and the number of pupils tended to decrease after initial increases which paralleled increases in petroleum activity.

The influence of petroleum production on economic health was initially positive. Average income, inmigration, and sales taxes tended to increase within one year of increases in petroleum activity, while unemployment and transfer payments decreased during this time. However, in the second, third and fourth years after increases in activity, these relationships reversed. Thus, the positive effect on economic health was temporary.

Further research with diverse methodologies is needed to determine if the transitory nature of the impacts reported in this study is common to other communities involved in OCS activity. Before the results of this study are used to suggest that mitigation is not needed because the impacts are transitory, it is necessary to see if the results can be replicated in other communities involved in petroleum production and in other resource extraction contexts.

4. If the research examining these three empirical questions demonstrates evidence of negative impacts, what are some of the ways these impacts can be mitigated?

Strategies that may mitigate the negative effects on social problems involve programs that have proven effective in reducing suicide, controlling anger, and decreasing substance abuse in other contexts. These programs include suicide prevention programs and hotlines, employment counseling, anger management training, mental health counseling, and substance abuse prevention and treatment for both newcomers and long-time residents.

The negative impact on enhancement level educational attainment may be reduced by actions of employers designed to encourage employees to seek additional education. Policies that might prove useful include flexible hours for employees enrolled in college, credits toward promotions given for completing college courses, and presentations to high school students concerning employment opportunities and working conditions with and without a college education. Discussions with the public and the media concerning the inevitability of the bust and the problems that occur if the community overspecializes in resource extraction activities may also be useful in encouraging citizens to obtain additional education. The negative effect of petroleum activity on educational strain might be mitigated by creating accounts of money from sales and severance taxes collected and from companies to be used for educational expenditures.

The results concerning economic health suggest that a diversified economy, even a diversified involvement in the extractive industry, helps reduce the negative effects. One method of ensuring a more diversified involvement in the extractive industry is to require companies that are extracting the resource to site plants that process the material in a way that adds value to the material in the community from which the resource is extracted. Another method of mitigating some of the negative impact on community economic health may be to set aside money from federal lease sales, sales and severance taxes collected, and the companies involved in extraction for job training and employment counseling of long-time residents and newcomers. Such money could also be used to mitigate the increase in transfer payments that occurs when unemployment increases, partly due to the number of inmigrants attempting to find employment in a community undergoing extractive energy development.

The outcome of this study also demonstrates the need for federal and state government agencies to monitor the effects of energy development/resource extraction projects. Further, true baseline figures for any social and economic impact variable for Louisiana cannot be obtained, even at the parish level, due to the long involvement of Louisiana in the offshore petroleum industry, discussed earlier. Moreover, annual data at the parish level are rare. When it is expected that a region of the country will be host to an energy development/ resource extraction project, attention should be paid immediately to collecting baseline data to adequately measure the impacts of that project.

Knowledge concerning impact mitigation would be greatly increased by studying mitigation programs currently operating, such as the one in Santa Barbara (Powers 1991), and developing such programs for communities becoming involved in resource extraction. These monitoring and mitigation programs should begin when the extraction project is first considered to ensure that impacts in anticipation of development are monitored (Brown et al. 1989; Freudenburg and Gramling 1992; Gramling and Freudenburg 1992). Further, these programs should be designed in ways that enable scientific program evaluation of the mitigation program operations and their ability to mitigate the impacts targeted for mitigation. It should not be assumed that the mitigation program is working simply because it exists; these programs need to be scientifically evaluated. This evaluation research should also examine the possibility that impacts that are not monitored and mitigated are occurring. Results of program evaluations that demonstrate that impacts other than those being monitored also occurred would show that the monitoring and mitigating program was inadequate and would be useful in designing improved programs to monitor and mitigate impacts.

ENDNOTES

1. A wide variety of variables measuring social problems, educational attainment and strain, and community economic health are used in this study. The idea is to examine several indicators and, if all indicators demonstrate the same pattern, greater confidence can be placed in the results. The reader can have greater confidence in the findings and the implication that the patterns are due to OCS activities when data for Louisiana are compared with data for the nation - suicide and homicide rates, average per capita income, and per capita transfer payments. Unfortunately, it was not possible to obtain comparable data for the nation for all of the variables used in this study. Thus, confidence in the findings for the rest of the variables depends on the quality of the data and the validity of the measurement. Therefore, the second confidence consists of findings from the following variables: educational expenditures, average number of pupils, unemployment data, and sales taxes collected. The third confidence tier consists of results from high school completion rates, percentage of high school graduates enrolling in institutions of higher learning, and criminal court cases filed. The results for one variable are particularly unreliable, as the reader is warned later in the report, the juvenile commitments. The series is incomplete. Although this variable is included in two tables, it is not discussed in the text.

2. It was not possible to separate the impacts of onshore from offshore petroleum activities. Changes in onshore petroleum extraction will be related to the price of oil as will changes in offshore petroleum extraction. Also, differences in onshore petroleum extraction may be related to fluctuations in the number of developmental wells off the coast of Louisiana. To the extent that this relationship exists, the results reported for the effect of differences in the number of wells in OCS waters off the coast of Louisiana on changes in social problems, education and economics will reflect changes in onshore petroleum extraction as well as offshore extraction. While it is important to distinguish the impacts of onshore extraction from those of offshore extraction which is regulated by MMS, this separation was not possible in this study and will be improbable in future research as well.

CHAPTER 2

THE IMPACT OF DEVELOPMENT ON SOCIAL PROBLEMS

Rapid social change is more often than not accompanied by social disorder, though there are differences of opinion regarding the exact relationship between the two. Industrial booms are one type of social change that is likely to exacerbate local social problems (Brookshire and D'Arge 1980; Brown et al. 1989; Dixon 1978; England and Albrecht 1984; Erickson and Jensen 1977; Finsterbusch 1982; Freudenburg 1981, 1984, 1986; Freudenburg and Jones 1991; Gramling and Brabant 1986; Krannich et al. 1989; Moen 1981). An increasingly frequent industrial boom affecting a growing number of American communities is rapid growth energy development. Among the problems associated with a quick influx of primary and secondary services that follow development of energy extraction industries are diminution in quality of community life, loss of civic participation and social integration, and crime (Brookshire and D'Arge 1980; Brown et al. 1989; Dixon 1978; England and Albrecht 1984; Erickson and Jensen 1977; Finsterbusch 1982; Freudenburg 1981, 1984, 1986; Freudenburg and Jones 1991; Gramling and Brabant 1986; Krannich et al. 1989; Moen 1981).

Most studies of energy development focus on the western United States. Relatively little is known about the social and economic impacts of rapid development offshore petroleum extraction in the eastern United States, particularly in the Gulf of Mexico. Louisiana's involvement in the offshore petroleum industry presents an excellent opportunity to examine the effects of this boom-creating process on local communities.

First, the development of the oil and gas industry in Louisiana is decades long and massive in scope. More than 90 percent of the petroleum extracted from the outer continental shelf (OCS) is from the Gulf of Mexico, primarily in waters off the coast of Louisiana (Gramling 1992); and the only deep water port in the United States is off the coast of Louisiana (Gale and Albright 1993). The extraction of petroleum in the waters near Louisiana was a culmination of a gradual extension of land-based drilling. In the 1920's and 1930's, drilling technology was adapted for the marshes along the coast of Louisiana and, in the subsequent decade, it was altered for OCS extraction. In fact, the first exploratory drilling in the Gulf took place in 1946 just six miles from the Louisiana coast. This early extraction near Louisiana was stimulated by the creation in 1936 of the State Mineral Board, which was authorized to lease the waters off the Louisiana shore, and by the first OCS lease sale in 1954 (Gramling 1992). By 1960, petroleum drilling was well underway and activity dramatically increased after the 1973-1974 Arab oil embargo. Extraction activity remained high until 1986, the year in which the price of crude oil dropped by about half of its previous value. Second, OCS extraction in the Gulf of Mexico is likely to continue as long as there are reserves of oil and gas that are economically feasible to obtain. The Western and Central Gulf is one of the few regions of the OCS that is not currently under a moratorium against new extraction operations.

Conceptualizing the relationships between community social problems and rapid energy development in Louisiana's Gulf coast region suggests two dichotomous variables: the degree of community involvement in the extraction process, that is, high or minimal involvement; and the type of community involvement in the extraction process, that is, primary involvement in the extraction process itself or secondary involvement in related activities, such as wholesale trade or refining. Guided by the distinctions between degree and type of community involvement in rapid energy extraction development, this paper asks the following three questions: 1. Do changes in petroleum extraction activity affect the type and intensity of local social problems?; 2. Does the relationship between petroleum extraction activity and social problems differ by degree or type of community involvement in these activities?; 3. Does the intensity of social problems differ by degree or type of community involvement?

In the next section we will discuss theories that explain why energy development would be expected to have an impact on social problems.

THEORIES OF THE EFFECTS OF RAPID INDUSTRIAL GROWTH

According to the boomtown literature, increases in development activities lead to rapid inmigration and growth which, in turn, affect social problems. Two theories of social deviance are commonly used in the boomtown literature - social disorganization and economic inequality - to explain the relationship among rapid growth, economics and social problems. Social disorganization refers to breakdowns in social networks in communities that lessen the ability of the community to control the behavior of its members through informal social control (Bursik 1988). This theory is particularly appropriate for examining social problems in rapidly growing energy development communities because the major factors in boom communities - rapid growth and inmigration - are causal variables leading to disorganization and social problems in this theory. The social disruption hypothesis, derived from social disorganization theory and often used in the boomtown literature, has two components: 1) disruptions occur and 2) the disruptions are due to rapid population growth (Brown et al. 1989). Economic inequality means that some people have more material goods and greater income and wealth. Economic inequality theory is relevant in explaining the relationship between rapid development and social problems because it suggests that structural inequalities, particularly economic ones, contribute to social problems. Some research concerning development shows that increased economic inequality occurs in boomtown communities because not all residents benefit from the increased industrial activity (Brabant 1991; Little and Lovejoy 1979; Molotch 1976; Seyfrit 1986; Summers and Clemente 1976).

Social Disorganization Theory

According to social disorganization theory, rapid industrial growth and its related processes of rapid urbanization and inmigration combine to reduce primary group

controls on individuals. This theory proposes that massive inmigration increases population density which elevates nervousness and suspicion and generates anonymity and competition for resources (Krahn et al. 1986; Tönnies 1983). Increases in structural density - the number of households sharing spaces such as hallways and stairwells - reduce knowledge and concern for neighbors, guardianship of property, and surveillance; contribute to poorer social relationships and poorer child care; increase the independence of individuals; and impede informal social control (Galle et al. 1972; Gove et al. 1979; Sampson 1983, 1985; Simmel 1971; Tönnies 1983; Wirth 1938).

Moreover, social relationships become more superficial, impersonal and transitory, and this reduction in interpersonal controls is related to an increase in crime (Bailey 1984; Krahn et al. 1986; Sampson and Groves 1989). However, rapid population growth only increases crime if it reduces density of acquaintanceship - the proportion of people in a community who are acquaintances (Freudenburg and Jones 1991). When this density is high, people recognize each other, know who does and does not belong in a particular house, and are able to report perpetrators' names to the police. When density of acquaintanceship decreases, people feel less safe, and informal social controls are reduced (Krannich et al. 1989).

In social disorganization theory, rapid industrialization, urbanization and inmigration also lead to a breakdown in social networks by reducing homogeneity in a population. Reduced homogeneity disrupts the continuity of cultural traditions and informal support systems, increases uncertainty and perceptions of threat, and generates culture conflict and crime (Albrecht 1982; Bursik 1988; Krannich et al. 1989; Shaw and McKay 1942; Wirth 1938). According to Krahn et al. (1986), decreased cultural homogeneity is related to increases in crime partly because the dominant culture proscribes behaviors valued by minority culture members and partly due to the frustration of lower status people who perceive that their opportunities to advance are blocked by people different from themselves. Based on social disorganization theory, it is expected that greater activity in petroleum industry activity will be associated with greater social disorganization and more social problems in communities involved in the industry if there is a concomitant increase in inmigration.

There is debate concerning the applicability of social disorganization theory to boomtowns. Both Albrecht (1982) and Wilkinson et al. (1982) contend that the stereotypes of boomtowns are inaccurate. The former points out that disruption of social ties occurs primarily during the rapid industrial growth and is not permanent while the latter hold that the portrayal of Western rural towns as stable communities having informal ties among people based on common tradition and symbiotic interdependency does not fit reality. Both cite studies that suggest that these towns experienced recurring conflicts and cycles of in and outmigration and that ties among people were not close due to the strong individualism of the residents. In contrast to Albrecht's findings, Brown et al. (1989) report that the disruptive impacts of development began before rapid population growth started and continued after growth

had ended. They suggest that the anticipatory disruptive effects could be due to psychological anticipation of disruptions or conflicts over issues related to development.

Not only has the applicability of the stereotype for Western energy communities been challenged, but its use in describing Louisiana communities involved in petroleum extraction has also been debated (Gramling and Brabant 1986). According to Albrecht (1982), classic boomtowns have the following characteristics: they experience very rapid growth and change, they are geographically isolated which reduces commuting and requires workers to move into the communities, and their populations were larger around 1910 and 1920 than they were in 1970. As researchers familiar with Louisiana petroleum extracting communities have pointed out, the classic boomtown traits may not fit these communities because the structure of offshore drilling allows long-distance commuting (Forsyth and Gauthier 1991; Gramling 1989; Gramling and Brabant 1986) and the population growth occurred over several decades (Gramling and Brabant 1986; Gramling 1984a). On the other hand, Brabant (1991) suggests that these Louisiana communities had some of the attributes of boomtowns, including rapid population growth and a sudden, unexpected bust.

Economic Inequality Theory

Criminologists have also contended that violent crime is related to economic characteristics of communities. Absolute economic deprivation and relative economic deprivation are two theories often used to explain this relationship, the latter being more common. According to relative deprivation theory, economic inequality means that some people are economically deprived relative to others, they perceive that they are deprived, and view this situation as unjust (Davis 1959). The theory further argues that this perception may generate hostility and stimulate aggression toward other people resulting in violent crime (Bailey 1984; Coser 1963; Messner and Tardiff 1986). Economic inequality is particularly likely to lead to crime when combined with universal material success goals and an egalitarian culture (Messner 1983; Stack 1984). The theory also suggests that the frustration and anger generated by perceived deprivation may lead to responses other than crime, such as substance abuse, rebellion or political crime, or attempts to use socially prescribed means to seek societal change (Stack 1984). Moreover, the aggression can be directed inward (Bailey 1984; Coser 1963) and may result in suicide (Henry and Short 1954).

Research demonstrates that economic conditions, particularly economic inequality and absolute deprivation, are related to crime. Diverse measures of income inequality in a population are significantly positively related to crimes against persons and homicides (Blau and Blau 1982; Braithwaite 1979; Braithwaite and Braithwaite 1980; Carroll and Jackson 1983; Hansmann and Quigley 1982; Krahn et al. 1986; Krohn 1976; McDonald 1976; Messner 1980, 1982; Peterson and Bailey 1988) and property crimes (Carroll and Jackson 1983; Jacobs 1981). In contrast, some researchers report no relationship between a common measure of income inequality (GINI coefficient) and

violent or property crimes including homicide (Bailey 1984; Messner 1983; Messner and Tardiff 1986; Patterson 1991; Stack 1984). Absolute economic deprivation, measured as the proportion of the population below the poverty level or some percentage of the poverty level, is significantly positively related to homicide and other violent crimes (Bailey 1984; Messner 1983; Messner and Tardiff 1986; Patterson 1991).

Although the general economic conditions of boomtowns suggest economic gains for the residents, not all citizens are able to partake in the community's good fortune. Poverty rises in both the boom and the bust (Brabant 1991), the disparity in income increases during the boom (Brabant 1991), unemployment rates increase (Molotch 1976), and people lacking the necessary skills to obtain jobs in the growing industry do not benefit from the industry development (Little and Lovejoy 1979; Summers and Clemente 1976).

Based on the theories presented, we propose the following scenario. Increases in petroleum extraction will create additional jobs, will raise the incomes of some residents, and will increase the cost of living, especially in communities (operationalized as parishes) highly involved in the petroleum industry. Some of these residents will be unable to participate in the parish's newfound wealth and will feel deprived, which will result in feelings of frustration and anger that, in turn, will lead to increased rates of social problems. Thus, both the levels of social problems and the relationship between petroleum industry activity and social problems will depend on the degree of involvement of the parish in petroleum extraction activities. Some research suggests that parishes that are more involved in energy development undergo greater social change (Brabant 1984; Gramling 1984b, c and d; Manuel 1984a and b).

H1: During periods of high petroleum industry activity, social problems (suicides, homicides, criminal court cases, juvenile commitments) will be higher, especially in highly involved parishes, as opposed to periods of low activity.

H2: Year-to-year changes in the amount of petroleum industry activity are positively related to annual differences in social problems, especially in highly involved parishes.

H3: Parishes that are highly involved in petroleum industry activities will have higher levels of social problems than those that are minimally involved.

The effect of involvement in petroleum extraction may also differ by type of involvement. Type of involvement has been reported to affect the relationship between petroleum industry activity and employment (Gramling 1984c; Gramling and Freudenburg 1990). Due to the scarcity of previous studies concerning differences by type of involvement, it is difficult to predict which group of parishes may experience greater social problems due to involvement

in petroleum development. Parishes that are highly involved in related activities may undergo more differences in social problems because workers involved in this kind of employment are more likely to relocate themselves and their families near their place of employment than are employees who work on the oil rigs. Parishes that are highly involved in extraction include many people who work on the rigs and, as mentioned previously, their work schedules allow them to commute long distances. Hence, they would not have to move their families into highly involved parishes. On the other hand, extraction employment may be more sensitive to changes in the price of oil or in consumption and production levels than is employment in refining, fabrication and wholesaling, thus extraction parishes may experience more impacts than parishes highly involved in related activities, including social problems.

DATA

The data were obtained annually from diverse federal and state government sources. The dependent variables, indicators of social problems, were suicide and homicide rates (Department of Health and Human Resources 1956-1986; U.S. Department of Health, Education, and Welfare 1961, 1989-1992), criminal court cases filed (Judicial Council of the Supreme Court of Louisiana 1963-1991), and rates of commitments of adolescent offenders to secure facilities.[1] Homicides and suicides were selected because homicide is the most often examined crime and homicides and suicides are the most extreme and officially well-documented measures of outwardly- and inwardly-directed anger. Criminal court cases filed were included as a measure of a broader range of crime, and juvenile commitments to secure facilities were examined because the literature presented earlier consistently shows a negative effect of boomtowns on adolescents. In addition, the data on the first four variables were available annually at the county (called parish in Louisiana) level from 1956 or 1957 through 1989 for suicides and homicides and from 1967 through 1990 for criminal court cases filed[2]. Juvenile commitments were obtainable only for a few years, 1971 through 1975, 1980 through 1982, and 1988 through 1990. We attempted to acquire annual, parish-level data for other possible indicators (e.g., alcohol consumption, mental hospital admissions, divorces, and data for other crimes), but these data were unavailable or, as in the case of divorces, incomplete and invalid.

The dependent variables were created and analyzed separately for the four groups of parishes, highly involved, minimally involved, extraction, and related activities. (The four groups of parishes enable comparisons by degree and type of involvement and will be explained below.) Rates for suicides, homicides, and juvenile commitments were calculated by summing the number of each of these events per year for the parishes in the group, dividing by the sum of the populations of the parishes[3], and multiplying by one hundred thousand. Criminal court cases filed were created similarly, except that the quotient was multiplied by one thousand instead of one hundred thousand.[4]

Two variables were used as indicators of petroleum extraction activity - the average price per barrel in constant dollars (Hall 1992; U.S. Bureau of the Census 1956-1991) and the number

of developmental wells off the coast of Louisiana (U.S. Department of the Interior 1992). The price of petroleum was examined since it is a good indicator of petroleum industry activity.[5] The number of developmental wells off the coast of Louisiana was chosen since developmental drilling is a labor intensive stage in petroleum extraction and affects the number of jobs available in the offshore petroleum industry. Both variables were used because the chain between petroleum industry activity and social and economic impacts is poorly understood.

Degree of involvement was accounted for by comparing the results for two groups of parishes - those highly involved and those minimally involved in the petroleum industry. An involvement score was assigned to each parish and was the average of each parish's rank on two criteria. The first was the percentage of people working in the parish employed in oil and gas extraction, manufacturing and wholesale trade in 1975, 1981 and 1984 (U.S. Bureau of the Census 1978, 1983b, 1986). The second was the percentage of total income of the parish residents that came from wages and salaries from oil and gas activities in 1984, the only year for which the data were available (Centaur Associates 1986) (see table 1.1). The utilization of these two indicators enabled designation of the parish's involvement by both place of employment and place of residence impact. The twelve parishes with the highest average ranks were the highly involved parishes while the twelve with the lowest average ranks were the minimally involved parishes. Twelve were chosen because there was a relatively large difference between the twelfth and thirteenth parishes in rank at both the high and low extremes of involvement. However, one minimally involved parish, Vernon, was subsequently omitted because a military base in the parish caused the population to be very unstable.[6]

Type of involvement was accounted for by comparing the results for two additional groups of parishes - those highly involved in extraction and those highly involved in related activities. The extraction parishes were those with the highest average ranks based on the percentage of people working in the parish employed in petroleum and gas extraction in 1975, 1981, and 1984 (U.S. Bureau of the Census 1978, 1983b, and 1986) and the percentage of total income of the parish residents that came from employment in petroleum and gas extraction activities in 1984 (Centaur Associates 1986) (see table 1.2). The related activities parishes were those with the highest average ranks based on the percentage of people working in petroleum and gas related manufacturing and wholesale trade in 1975, 1981, and 1984 (U.S. Bureau of the Census 1978, 1983b, 1986) and the percentage of total income of the residents that came from such activities in 1984 (Centaur Associates 1986) (see table 1.3). The six parishes with the highest average ranks on extraction activities were considered highly involved in extraction, while the six with the highest average rank on related activities were designated as highly involved in related activities. The six extraction and six related activities parishes had much higher average ranks than did the other parishes. Since Plaquemines Parish was highly ranked on both types of involvement, it was omitted.[7]

Many cross-sectional studies of the effect of economics on crime include various control variables such as population, population growth, population density, the GINI coefficient,

percentage of young people or young males, percentage unemployed, percentage of people living in poverty, percentage black, and the percentage of people divorced (Bailey 1984; Carroll and Jackson 1983; Devine et al. 1988; Hansmann and Quigley 1982; Krahn et al. 1986; Jacobs 1981; Messner 1982, 1983; Messner and Tardiff 1986; Spector 1975; Stack 1984). Percentage of young people or young males, percentage of people living in poverty, percentage black, population prior to 1969, unemployment rates before 1970, and the data necessary to calculate a measure of income inequality were not available annually at the parish level.

METHODS AND RESULTS

Effects of Levels of Activity on Social Problems

The test of the first hypothesis, that social problems - suicide rates, homicide rates, criminal court cases and juvenile commitments - will be higher when the level of petroleum extraction activities is higher, was completed using one-way analysis of variance (ANOVA) to compare the means on the dependent variables for periods when activity levels were higher with times when there was less activity. To determine the periods of greater and lesser activity, the series for the number of wells and the price of oil were examined.

It originally appeared that there would be four levels of the number of wells: 1) low and slowly increasing numbers from 190 to 363 (1956-1963), 2) higher and mainly decreasing numbers between 455 and 638 (1964-1975), 3) the highest numbers of wells ranging from 521 to 665 (1976-1985), and 4) low and stable numbers ranging between 309 and 402 (1986-1990). However, the ranges of the numbers in these two periods overlapped and a one-way analysis of variance showed that the middle two periods were not significantly different from each other. Therefore, there were only three periods of numbers of wells: 1) low and slowly increasing numbers ranging from 190 to 363 with a mean of 274.5 (1956-1963), 2) higher numbers ranging from 455 to 665 with a mean of 573.91 (1964-1985) and 3) low numbers ranging from 309 to 402 with a mean of 353.5 (1986-1990). An analysis of variance confirmed that the middle period had significantly higher numbers of wells than the other two times ($R^2 = .843$, $p < .001$). These three periods do not correspond with the years most people would consider to be the preboom phase (the period before the most intense energy development activity), the boom phase (the period of the most intense energy development activity) or the bust phase (the period following the most intense energy development activity). Therefore, use of this grouping of years would not allow the results of this study to be compared with those of previous research. Also, a number of events occurred in the oil industry, including the embargo, during the middle period and these events would be missed by considering these three times to be the preboom, boom and bust. Thus, this grouping of years to correspond with the three levels of the numbers of wells was not used to determine when greater or lesser activity occurred.

An examination of the price of oil demonstrated that both the level and stability of oil prices needed to be taken into account. There were four periods of price when stability as well as level was considered: 1) low, stable prices from $8.11 to $11.00 between 1956 and 1973, 2) rapidly increasing prices from $13.67 to $34.95 between 1974 and 1981, 3) rapidly decreasing prices from $29.55 to $22.39 between 1982 and 1985 and 4) low, stable prices between $10.63 and $15.33 from 1986 through 1990. An analysis of variance demonstrated that these were distinct periods. The middle two periods had significantly higher means ($18.54 for the increasing period, $25.79 for the decreasing period) than the first period ($9.24) while the mean for the decreasing period was significantly higher than that for the increasing period and the mean for the last period ($12.64) was significantly less than that for the decreasing period ($R^2 = .700$, $p < .001$). This analysis was similar to a comparison of the preboom (period in which some energy development activity is occurring but before such activity has reached its highest levels), boom (period of the highest levels of activity), transition to bust (period of high levels but rapidly falling levels of activity), and bust (period after the highest levels of activity). These were the four periods used to determine when the industry was more or less active for the analyses of variance.

Degree of Involvement. The means for suicide and per capita criminal court cases filed in both groups of parishes and homicide rates in the highly involved parishes suggest that rapid increases in petroleum industry activity are disruptive of the social controls that inhibit social problems (see table 2.1).[8] The means for suicide rates and criminal court cases in both groups of parishes and homicide rates in the highly involved parishes were significantly higher in the two middle periods than in the first period. In addition, the means in the two middle periods were higher than those in the last period for suicide rates and homicide rates in the highly involved parishes. The means for the last period were also significantly higher than those for the preboom for suicide rates and criminal court cases in both groups of parishes.

Suicide rates in both groups of parishes differed from the national trend. First, suicide rates in both groups of parishes rose faster between the preboom and the boom than did these rates in the nation as a whole. Second, suicide rates in the highly involved parishes peaked in the third period, not during the last period. Third, the increase in suicide rates from the preboom to the bust was greater in the highly and minimally involved parishes than in the nation.

Homicide rates in the highly involved parishes were similar to those of the nation in that these rates increased between the first and second periods, decreased between the second and third periods, and were stable between the third and fourth periods. In contrast, the means in the highly involved parishes differed from the national trend because the increase between the preboom and boom was greater in the highly involved parishes and the decrease between the boom and the bust was larger in the highly involved parishes.

In summary, the comparison of homicide and suicide rates in the highly involved parishes and the nation shows that these rates are higher in the second period - the time of the rapid increase in oil prices - than would be expected based on the national trend. This fast increase

in these rates in the highly involved parishes between the first two periods can easily be seen in that these parishes had much lower rates in the preboom than did the nation, while these parishes had higher homicide rates and their suicide rates approached those of the nation during the rapid increase in oil prices. Also, these rates in the highly involved parishes declined faster between the boom and bust; the homicide rates were slightly lower than those of the nation and the suicide rates were below those of the nation. The data support the prediction that rapid social change, particularly rapid economic growth, is disruptive.

Type of Involvement. The means during the middle two periods were significantly higher than those for the first period for suicide rates and criminal court cases in both groups of parishes (see Table 2.2). The means for homicide rates in both groups of parishes were significantly higher than those for the first period only during the increasing period. The means for social problems again suggest that rapid increases in petroleum industry activity are disruptive. Suicide rates in both groups of parishes and criminal court cases filed in the related activities parishes were significantly higher in the bust than in the preboom.

Suicide rates in both groups of parishes differed from the national trend. First, in both groups of parishes, the increase in the means of these rates was greater between the preboom and the increasing period than was the increase in the means for the nation as a whole. Second, the means of these rates peaked in the third period, not the fourth. Third, there was greater variability in the means in the two groups of parishes than in the nation. Fourth, the increase in suicide rates from the preboom to the bust was greater in the two groups of parishes than in the nation.

Homicide rates in the two groups of parishes differed from those in the nation in the following ways. First, there was a greater increase between the first two periods than in the nation. The mean of homicide rates in the extraction parishes was lower than that for the nation in the preboom, but was almost equal to that for the nation during the increasing period. The mean for the related activities parishes was close to that for the nation in the preboom, but it was much higher than that for the nation during the increasing period. Second, the means for homicide rates in both groups of parishes dropped faster between the increasing and decreasing periods than did that for the nation. Third, the increase in homicide rates in the extraction parishes between the preboom and the bust was greater than that for the nation. Again, the means for homicide and suicide rates demonstrate that the rates are higher when oil industry activity is rapidly increasing than would be expected based on the national trend. Thus, the means again support the idea that rapid social change, particularly rapid industrial growth, is disruptive. However, an analysis of variance only begins to examine the effect of changes in industry activity on social problems. This effect will be examined more directly using time series regression.

Table 2.1. Means of Social Problems by Activity and Degree of Involvement

Stability of Price	Low (1956-1973)	Increasing (1974-1981)	Decreasing (1982-1985)	Low (1986-1990)	F	R^2
H. Suicide Rates	7.02	11.99[a]	13.99[a]	11.88[a]	41.70***	.807
M. Suicide Rates	7.59	10.39[a]	11.70[a]	13.68[a]	15.67***	.610
H. Homicide Rates	5.82	10.13[a]	8.96[a]	8.80	11.31***	.539
M. Homicide Rates	9.79	11.52	11.79	8.13	1.96	.168
H. Juvenile Commit.	33.49	30.04	37.89	63.73	3.73	.615
M. Juvenile Commit.	46.67	40.75	29.63	98.33[abc]	12.45**	.842
H. Criminal Cases	64.63	91.16[a]	111.18[a]	96.85[a]	16.28***	.720
M. Criminal Cases	53.75	97.43[a]	125.45[a]	102.56[a]	18.37***	.744
U.S. Suicide Rates	10.93	12.43[a]	12.25[a]	12.63[a]	23.11***	.705
U.S. Homicide Rates	6.24	9.89[a]	8.73[a]	8.90	12.89***	.571

Note: H indicates highly involved parishes, M stands for minimally involved parishes.
* $p<.05$ ** $p<.01$ *** $p<.001$
[a] This mean is significantly different from that for the first low period.
[b] This mean is significantly different from that for the increasing period.
[c] This mean is significantly different from that for the decreasing period.

Table 2.2. Means of Social Problems by Activity and Type of Involvement

Stability of Price	Low (1956-1973)	Increasing (1974-1981)	Decreasing (1982-1985)	Low (1986-1990)	F	R^2
E. Suicide Rates	7.57	11.72[a]	12.83[a]	11.74[a]	16.38***	.621
R. Suicide Rates	6.91	12.99[a]	14.64[a]	12.90[a]	22.22***	.690
E. Homicide Rates	4.87	9.69[a]	8.24	8.25	11.14***	.535
R. Homicide Rates	6.34	10.52[a]	7.67	8.03	6.37**	.397
E. Juvenile Commit.	30.97	28.62	35.03	88.45[b]	6.18*	.726
R. Juvenile Commit.	27.86	26.73	25.85	36.61	1.53	.396
E. Criminal Cases	59.66	84.57[a]	111.63[ab]	81.88[c]	11.84***	.651
R. Criminal Cases	72.99	101.07[a]	120.70[a]	115.98[a]	13.14***	.675
U.S. Suicide Rates	10.93	12.43[a]	12.25[a]	12.63[a]	23.11***	.705
U.S. Homicide Rates	6.24	9.89[a]	8.73[a]	8.90	12.89***	.571

Note: E stands for extraction parishes, R indicates related activities parishes.
* $p<.05$ ** $p<.01$ *** $p<.001$
[a] This mean is significantly different from that for the first low period.
[b] This mean is significantly different from that for the increasing period.
[c] This mean is significantly different from that for the decreasing.

Effects of Differences in Activity on Changes in Social Problems

The second hypothesis states that differences in petroleum extraction activity are related to changes in social problems. To test this hypothesis, time series regression was used. The first differences of suicide rates, homicide rates and per capita criminal court cases filed were regressed on the first differences of price and the number of wells. (Juvenile commitments could not be used in this analysis due to the number of years for which the data was unobtainable.) Since the effects of changes in petroleum activity on social problems may not be immediate, lags of the independent variables were included in the models. Therefore, five equations were calculated initially for each dependent variable. First, the dependent variable (first differences of each variable) was regressed on the two independent variables (first differences of price and wells). Then, the first lags of the independent variables were added. Next, the second lags were included. Fourth, the third lags were added and, finally, the fourth lags were included. Based on the results of these five initial equations, particular lags or the first differences of the independent variables were omitted from the equation. Various models were tested until the best fitting model was obtained. The best fitting model was the one in which the terms were significantly related to the dependent variable, the Durbin-Watson statistic and the ARIMA analysis of the residuals demonstrated that the errors were not significantly correlated, the adjusted R^2 was the highest, and the press statistic and the sum of the squared residuals were among the lowest, if not the lowest. The final models are shown in tables 2.3 and 2.4 and are summarized in tables 2.5 and 2.6.

Degree of Involvement. The results in the highly involved parishes do not unequivocally support the hypothesis. Although criminal court cases filed and suicide rates increased as anticipated, criminal court cases later decreased and homicide rates declined four years after an increase in petroleum industry activity. The findings in the minimally involved parishes did not conform to the expectations of the hypothesis. Criminal court cases initially increased as predicted, but they later decreased. Moreover, suicide rates initially had an inverse relationship with increases in activity, but subsequently the direction of the relationship reversed. Finally, the impact of changes in activity on social problems was not greater in the highly involved parishes as was hypothesized. Although three of the four possible relationships were significant in the highly involved parishes and only two were in the minimally involved ones, there was no difference in the proportion of the variance in social problems explained by changes in petroleum industry activity.

Type of Involvement. Although the initial results in the extraction parishes appeared to support the hypothesis in that criminal court cases and suicide rates increased, these effects were transitory. Later, criminal court cases and suicide rates decreased and homicide rates declined four years after an increase in activity. The findings in the related activities parishes were similar. Criminal court cases and suicides rose initially, but decreased later. Moreover, the impact on social problems in the extraction parishes was not greater than that in the related activities parishes. Although all possible relationships were significant in the extraction parishes and only two were in the related activities parishes, the proportion of variance in social problems explained by differences in the price of oil and/or the number of wells did not differ by type of involvement. The range in the extraction parishes was from .188 to .443 while the range in the related activities parishes was from .267 to .353.

Table 2.3. Regression Results for the Effect of Changes in Petroleum Industry Activity on Social Problems by Degree of Involvement[a]

A. Highly Involved Parishes

Homicide Rates	B	beta
L4 D1 Price	-0.211*	-.419*
Constant	0.270	
Adjusted R^2	.145*	
Durbin-Watson	2.534	
First Order Autocorr.	-.271	

Criminal Court Cases	B	beta
D1 Price	1.551***	.586***
L2 D1 Wells	-0.069*	-.403*
Constant	0.704	
Adjusted R^2	.510***	
Durbin-Watson	2.437	
First Order Autocorr.	-.232	

Suicide Rates	B	beta
L3 D1 Price	0.233**	.436*
L1 D1 Suicide	-0.719***	-.722***
Constant	0.259	
Adjusted R^2	.508***	
Durbin-Watson	2.206	
First Order Autocorr.	-.121	
R^2 due to Price	.138	

B. Minimally Involved Parishes

Criminal Court Cases	B	beta
D1 Price	1.779***	.535***
D1 Wells	0.065*	.303*
L1 D1 Price	.023*	.305*
L2 D1 Price	-1.225**	-.364**
Constant	3.801	
Adjusted R^2	.692***	
Durbin-Watson	2.235	
First Order Autocorr.	-.132	

Suicide Rates	B	beta
D1 Price	-0.241*	-.317*
L2 D1 Price	0.264*	.341*
L1 D1 Suicide	-0.477**	-.522**
Constant	0.245	
Adjusted R^2	.395***	
Durbin-Watson	2.448	
First Order Autocorr.	-.249	
R^2 due to Price	.168	

[a] D1 stands for first differences, L1 is the lag of the first differences, L2 indicates the second lag, L3 is the third lag and L4 means the fourth lag.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 2.4. Regression Results for the Effect of Changes in Petroleum Industry Activity on Social Problems by Type of Involvement[a]

A. Extraction Parishes

Homicide Rates	B	beta
L4 D1 Price	-.0319*	-.466*
Constant	0.271	
Adjusted R^2	.188*	
Durbin-Watson	2.523	
First Order Autocorr.	-.292	

Criminal Court Cases	B	beta
D1 Price	1.640**	.580**
L2 D1 Wells	-0.062*	-.341*
Constant	-0.395	
Adjusted R^2	.443**	
Durbin-Watson	2.450	
First Order Autocorr.	-.230	

Suicide Rates	B	beta
L2 D1 Wells	0.011*	.317*
L4 D1 Wells	-0.016**	-.449**
L1 D1 Suicide	-0.544***	-.540***
Constant	0.439	
Adjusted R^2	.497***	
Durbin-Watson	2.159	
First Order Autocorr.	-.158	

B. Related Activities Parishes

Criminal Court Cases	B	beta
D1 Price	2.038**	.558**
L3 D1 Wells	-0.079*	-.367*
Constant	2.289	
Adjusted R^2	.353**	
Durbin-Watson	1.972	
First Order Autocorr.	.014	

Suicide Rates	B	beta
L3 D1 Price	0.489***	.522***
L4 D1 Price	-0.317*	-.274*
L4 D1 Wells	0.014*	.264*
L1 D1 Suicide	-0.617***	-.600***
Constant	0.244	
Adjusted R^2	.628***	
Durbin-Watson	1.895	
First Order Autocorr.	.027	
R^2 due to Price and Wells	.267	

[a] D1 stands for first differences, L1 is the lag of the first differences, L2 indicates the second lag, L3 is the third lag and L4 means the fourth lag.

[b] $p < .07$ The addition of this term into the model increased the adjusted R^2 by .078.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 2.5. Summary of Changes in Social Problems by Degree of Involvement

Impact Variable	Oil Activity Increases	One Year Later	Two Years Later	Three Years Later	Four Years Later
A. Highly Involved Parishes					
homicides					decrease
criminal cases	increase		decrease		
suicides				increase	
B. Minimally Involved Parishes					
criminal cases	increase	increase	decrease		
suicides	decrease		increase		

Table 2.6. Summary of Changes in Social Problems by Type of Involvement

Impact Variable	Oil Activity Increases	One Year Later	Two Years Later	Three Years Later	Four Years Later
A. Extraction Parishes					
homicides					decrease
criminal cases	increase		decrease		
suicides			increase		decrease
B. Related Activities Parishes					
criminal cases	increase			decrease	
suicides				increase	decrease after price, increase after wells

The outcome by both degree and type of involvement suggested that the factors involved in the cycle of disruptions and reequilibriations may affect various types of social problems differently. Criminal court cases always increased within one year of an increase in activity and declined two or three years later. In contrast, suicide rates tended to increase later, in the second or third years after an increase in petroleum activity, and to decrease much later, in the fourth year, if at all. Homicide rates had yet another pattern - they tended to decrease in the fourth year after an increase in industry activity.

Effects of Degree and Type Involvement on Social Problems

The analysis just presented examines the effect of differences in price and wells on changes in social problems. However, it does not statistically compare the levels of the social problems variables by degree and type of involvement. To address the third hypothesis and third question, whether degree and type of involvement impact social problems, the five dependent variables were calculated for each parish, not for groups of parishes as was presented earlier. Then, the differences in the means of the dependent variables for the groups of parishes - highly involved versus minimally involved, extraction versus related activities - were examined with t-tests.

Degree of Involvement. Degree of involvement has no effect on the levels of social problems (see Appendix A). Homicide rates were significantly different in only 4 of 33 years - 1958, 1968, 1977 and 1985. In all four years, the rates were lower in the highly involved parishes. Also, criminal court cases filed only significantly differed in two years, 1967 and 1968, and were higher in the highly involved parishes in both years. Moreover, suicide rates were significantly lower in the highly involved parishes in only one year, 1959. Further, rates of juvenile commitments to secure facilities significantly differed in only two years, 1980 and 1988. In both years, the rates were lower in the highly involved parishes.

Type of Involvement. Type of involvement also had no impact on the levels of social problems (see Appendix B). Homicide rates, criminal court cases filed and suicide rates never significantly differed. Rates of juveniles committed were significantly higher in the extraction parishes in just two years, 1989 and 1990.

DISCUSSION

The analysis of variance results suggest that rapid increases in petroleum industry activity are disruptive of the social controls that inhibit social problems. Further, although there may be some recovery in the rates of social problems during the bust, the rates did not return to their preboom levels. The increases in suicide and homicide rates between the preboom and the bust were greater than those in the nation. The findings from the regression analyses imply that there may be a cycle, other than the obvious boom/bust one, of disruptions and reequilibriations. Often the outcomes of the analyses demonstrated increases in the social problems variables followed by decreases later; however, the changes in the particular social

problems seem to occur at different times after increases in petroleum activity. The outcome of the tests of the differences by degree and type of involvement in the annual means of social problems showed that these two factors do not affect the levels of social problems.

Answers to the Three Questions

Changes in petroleum industry activity do seem to be related to social problems. However, the relationship is not clear, consistent, nor strong. Thus, the answer to the first question, do differences in petroleum industry activity affect social problems, is a tentative yes. The answer to the second question is no, the relationship between social problems and petroleum activity does not appear to differ by either degree or type of involvement. Moreover, the answer to the third question is no. The annual levels of social problems rarely significantly differed by either degree or type of involvement.

Theoretical Implications

Social disorganization theory suggests that rapid industrial growth leads to social problems. This idea was supported by the analysis of variance results by the finding that the mean rates of social problems were greater in the increasing period than during the preboom, especially for suicides, homicides and criminal court cases filed. However, the analysis of variance results imply that the theory should be modified. First, they suggest that the theory should be modified to take into account that rapid decreases in industrial activity are also associated with higher levels of social problems, particularly suicides and criminal court cases. Second, these results imply necessary modifications because low and stable levels of industrial activity may be disruptive when these occur after a period of high activity, in other words, in a bust context.

The regression outcome also suggests the need to alter social disorganization theory. The results of the regression analyses showed that the hypothesized disruption that occurs with rapid industrial growth and that leads to social problems may not be long-term; social problems tended to increase shortly after an increase in activity and to decrease later. This result supports Albrecht's (1982) finding that the disruption of social ties occurs primarily during rapid growth and is not permanent, but is contrary to the finding of Brown et al. (1989) that disruptive impacts of development began before rapid population growth started and continued after it had ended. Further, studies of the effect of rapid industrial growth on social problems are necessary to determine if the impact is long-term or transitory, if rapid decreases in industrial activity are as disruptive and result in as high a level of social problems as do rapid increases, and if a bust situation is also disruptive and leads to elevated levels of social problems.

The results fit the expectations derived from relative economic deprivation theory; however, the higher rates of social problems during periods of greater industrial activity also conform

to the expectations of the attraction of social isolates or "riff-raff" thesis (Wilkinson et al. 1982). The riff-raff thesis proposes that greater industrial activity and the possibility of employment attract young, unattached males and transients to the community. These newcomers are social isolates in the new community and thus at greater risk for diverse social problems. However, evidence concerning this thesis is contradictory.

In support of the riff-raff thesis, Milkman et al. (1980) reported that young males were the largest portion of the newcomers in boomtowns and that they have a greater risk of substance abuse. In opposition to the thesis, Massey and Lewis (1979) showed that newcomers were not riff-raff or social isolates and Freudenburg (1986) found no support for the idea that the increase in social problems in a boomtown in Colorado was due to newcomers or riff-raff. The question of who is more vulnerable to social problems - long-time residents (which supports relative deprivation) or newcomers (which supports the riff-raff thesis) - cannot be answered with aggregate data and must be answered to determine the applicability of relative deprivation theory as an explanation of social problems in boomtowns.[9]

Policy Implications

Because the results concerning the relationship between petroleum industry activity and social problems were not clear, consistent or strong, it is difficult to suggest possible mitigation strategies. However, obvious means to reduce social problems utilized in other contexts may reduce social problems in communities undergoing rapid changes in industrial activity and growth. These strategies include suicide prevention programs, employment counseling, anger management training, mental health counseling, and substance abuse prevention and treatment for both newcomers and long-time residents.

Contributions to the Literature

The findings are consistent with theories and prior research. The outcome supports theories such as social disorganization and relative deprivation that suggest that rapid industrial growth leads to social problems. The results also bolster those of other studies that show that rapid industrial growth is conducive to increases in social problems. Second, the results suggest that the effects of petroleum extraction on social problems are not limited to the parishes that are highly involved in this activity. There were significant relationships in the minimally involved parishes and the patterns of suicide and homicide rates in these parishes differed from those of the nation. This finding has important implications for monitoring and mitigation programs as this result implies that such programs should include communities near that which is the host to the resource extraction activity. For example, the Santa Barbara monitoring and mitigation program discussed previously should be examining the surrounding communities to determine if they are also affected and to take steps to reduce the impacts.

Third, the outcome of this study goes beyond the results of prior studies in that the findings suggest that the increase in social problems due to increases in industrial activity may be transitory. In this manner, the results support the findings of Albrecht (1982) that social disruption is temporary and not those of Brown et al. (1989) that disruptions occur over a longer period of time beginning before rapid population growth and continuing after such growth had ceased.

In summary, the findings of this study suggest the need for improvement in the methods used to analyze social and economic impacts of economic development projects. Such research should include communities uninvolved or minimally involved in the development, many studies in this literature do not include these communities (see Seydlitz et al. 1993). Also, investigators interested in the impacts of economic development, especially resource extraction, need to be more careful about the measurement of the phases of the extraction activities (see Seydlitz et al. 1993). In addition, there is a need for longitudinal studies that investigate the possibility of differential impacts due to the type of resource extracted (e.g., renewable or non-renewable), the geographical isolation of the community that is host to the extraction industry, and the location of the extracted resource (e.g., onshore or offshore) (Freudenburg 1992).

ENDNOTES

1. The data concerning juvenile commitments were compiled for us by Gordon J. Mills III, Office of Information Services, Department of Public Safety and Corrections, 504 Mayflower Street - Bldg. 3, P.O. Box 94304 - Capitol Station, Baton Rouge, Louisiana 70804-9304. We received the data in late July, 1992.

2. The data were actually available beginning in 1963, but the numbers for 1963 through 1966 were very unstable and missing for some parishes. Further, the reports for 1976 were completely different from those for the other years and had numbers vastly disparate from those for surrounding years. Thus, when this variable was created for the four groups of parishes, 1963 through 1966 were omitted and 1976 was linearly interpolated for the regression analysis.

3. The population data were obtained in two different ways. The data for 1969 through 1990 came from the U.S. Department of Commerce (1992). Comparable data from this agency prior to 1969 were not available. Also, obtainable data from state sources did not include migration; therefore, the numbers were quite disparate from the actual census figures for the years just prior to 1960 and 1970. Estimates for the years before 1969 were made using linear interpolation to get initial values for the years between the censuses of 1950, 1960 and 1970. Then the parish estimates for all 64 parishes were summed and divided into the state population figures to create an adjustment factor. The adjustment factor was then multiplied to the linear interpolated estimate for each parish. Don Starsinic of the Population Division of the U.S. Bureau of the Census suggested this technique.

4. Some parishes had to be omitted from the creation of the variables due to missing data. Cameron and Plaquemines were omitted from the highly involved parishes and Cameron was omitted from the extraction parishes when juvenile commitment rates were calculated. Acadia was omitted from the highly involved parishes and the related activities parishes while Ascension was deleted from the minimally involved parishes in the creation of the criminal court cases series due to the instability of the numbers in these parishes.

5. Personal communication with Mr. Mike Melancon of the U.S. Department of the Interior, Minerals Management Service, Summer 1992.

6. The highly involved parishes were: Acadia, Calcasieu, Cameron, Iberia, Lafayette, Plaquemines, St. Bernard, St. Charles, St. James, St. Mary, Terrebonne and Vermilion. The minimally involved parishes were: Allen, Ascension, Avoyelles, Beauregard, Caldwell, DeSoto, Grant, Madison, West Carroll, West Feliciana and Winn.

7. The extraction parishes were: Cameron, Lafayette, LaFourche, St. Mary and Vermilion. The related activities parishes were: Acadia, Calcasieu, St. Bernard, St. Charles and St. James.

8. The means for juvenile commitments to secure facilities must be interpreted with caution because the data were available for only three years in the first period, four years in the second, one year in the third, and three years in the last period.

9. Data on the percentage of males, net migration of young males, percentage of mobile housing units, and number of people per household did not lend credence to the idea that between 1950 and 1980 large numbers of young, unattached males and transients migrated into the highly involved parishes.

CHAPTER 3

THE IMPACT OF DEVELOPMENT ON EDUCATION

Researchers in several disciplines are examining the effect of energy development on communities, primarily in the Western United States. These studies demonstrate relationships between boom period development and local changes in crime, mental health, employment and wages, the ability to provide basic services, and indicators of community satisfaction. One area of community change in relationship to energy development that remains understudied is its effects on educational attainment (Freudenburg 1992). The few studies examining this issue suggest energy development is likely to result in desirable and undesirable changes in local educational culture. Positive changes include lower per pupil expenses and a higher level of educational attainment during times of greater energy development activities (Brabant 1984). Negative impacts discussed in the literature are overfilled schools, strain, and increased costs in providing adequate education (Gramling and Brabant 1986; Gramling and Freudenburg 1990; Murray and Weber 1982).

The effects of energy development projects on local education are likely to prove important for the stability and growth of communities. For example, the educational attainment of the residents of a region has a strong impact on future development opportunities. If people forego college to accept high paying jobs in the energy development or resource extraction industry, the community runs the risk of skill overadaptation (Freudenburg 1992; Freudenburg and Gramling 1992; Gramling and Freudenburg 1992) and becomes less attractive to industries that require advanced education, such as information and knowledge manufacturing. According to Appelbaum and Albin (1990, p. 32), information and knowledge manufacturing is a classification in the industrial sector that "...includes electronic computing equipment; office and accounting machines; radio, TV, and communication equipment; professional and photographic equipment; scientific and controlling instruments; and printing, publishing, and allied industries." Studies also document a strong relationship between educational attainment and civic participation, an important factor in the stability of local communities (Warren 1971).

This study is designed to address important questions in the complicated relationship between energy development and educational attainment in the petroleum industry region of the Louisiana Gulf. Louisiana and its involvement in offshore petroleum extraction provides an excellent opportunity to examine the effect of resource extraction on education for several reasons. First, the development has been massive and has taken place over decades. The Gulf of Mexico is the primary site of offshore petroleum extraction in the world (Gramling 1992). More than 90 percent of the world's petroleum that comes from the outer continental shelf is from the Gulf of Mexico, primarily off the coast of Louisiana. There are 3,800 production platforms in the waters off the coast of Louisiana and Texas. Second, the only deep water port in the coastal waters of the United States is off the coast of Louisiana (Gale and Albright 1993). Third, the Western and Central Gulf is one of the few parts of the coast with access

to the OCS that is not currently under a moratorium against further OCS development (Goll 1993). The purpose of this study is to examine the effects of petroleum industry involvement on education in several Louisiana parishes (counties). Three questions are addressed: Do changes in the activity level of petroleum extraction affect educational attainment and strain? Is the relationship between petroleum industry activity and education affected by **degree** and/or **type** of involvement of the community in the industry? And, does degree or type of involvement affect the level of educational attainment or strain?

The study examines changes in education across the different phases of petroleum industry activity in the Gulf - the preboom (the period before the most intense level of activity), the boom or development (the period of the highest level of activity), and the decline (the period in which petroleum extraction has decreased). Analyses that cover all three phases of energy development projects are necessary to more fully understand the impacts of energy development and to show the need for monitoring and mitigation programs during all phases of such activities.

The study also accounts for the mediating effects of degree and type of involvement in the petroleum industry on education. The literature suggests that the impact of energy development projects on communities depends on how involved the community is in the project. Some studies of the coastal region of Louisiana report that parishes with the most intense petroleum involvement and OCS activity are more affected than are other parishes (Brabant 1984; Gramling 1984b, c, and d; Manuel 1984a and b). The impact of type of involvement has largely been ignored. However, type of involvement has been found to affect changes in employment (Gramling 1984c; Gramling and Freudenburg 1990).

A short discussion of educational attainment and strain and their relationships to level of industry activity and type and degree of community involvement results in the development of three specific hypotheses. Next, the data sources are described followed by a discussion of the methods and findings. In conclusion, the theoretical and policy implications of these data are addressed and several links are made between this study and the literature on social and economic impacts of petroleum extraction.

EDUCATIONAL ATTAINMENT AND STRAIN

Educational Attainment

The decision by an individual to increase his or her education depends on a rational comparison of the costs and benefits of additional education (Becker 1975; Mincer 1974). This analysis of costs and benefits depends on the perceived costs, the individual's access to financial support for his or her education, expected benefits, and the job market.

Additional education, particularly college, is expensive. There are direct costs - tuition, fees, books, supplies, transportation, lodging, etc. - and indirect costs - forgone earnings due to

postponing entry into the labor force, the reduction in the number of years between obtaining full time employment and retirement, and forgone leisure (Becker 1975; Kalleberg and Sørensen 1979; Mincer 1974; Parsons 1974). The individual's perception of the costs of additional education can be affected by the individual's access to financial support for education. The costs of education, particularly college, increase over time as the less expensive sources of money (e.g., gifts from parents, relatives, friends, foundations, and the government) are exhausted and the individual is forced to use more expensive sources of money (e.g., commercial loans). Also, the faster the person attempts to obtain the additional education, the more the costs of the education increase, since the less expensive sources of funds are exhausted more rapidly. For example, the part-time student more slowly acquires additional education and is more able to rely on his or her own resources to finance his or her schooling. If the decision to continue schooling is rational, additional education will not be sought unless it is expected to increase income later.

Perceived benefits of education affect the decision to continue schooling, but the reward is uncertain. Research shows that the payoff for education depends on factors related to the education itself - e.g., years of schooling, quality of the school, credentials obtained - as well as factors related to employment - the organizational rank and establishment size (Sakamoto and Chen 1991; Spilerman and Lunde 1991; Stolzenberg 1978). Moreover, the anticipated benefit in additional income decreases as the years of schooling increase and eventually there are diminishing returns (Becker 1975). Further, the presumed reward can be affected by the individual's ability to use the additional education. For example, completion of high school has been demonstrated to be influenced by family structure and school-related parenting practices (Astone and McLanahan 1991). An individual is more likely to choose to continue schooling when the perceived benefits are higher and the costs are lower.

Further, the job market affects the decision to seek additional education. Large expenditures such as college are more difficult to afford than smaller expenditures like short-term migration. When higher paying jobs are available simply by moving, people are more likely to migrate than to advance their education (Becker 1975). In summary, an individual is more likely to seek additional education when the costs - direct and indirect - are lower or the direct costs can be paid using less expensive resources, the perceived benefits are higher and the job market is such that higher-paying jobs are not available simply by migrating.

Changes in petroleum industry activity affect job market conditions and will alter the rational cost/benefit analysis and the availability of money to pay for schooling in contradictory ways. When the industry is more active, it employs more people and more highly paid jobs become available without additional education (Freudenburg 1992). The availability of these employment opportunities reduces the perceived benefit and increases the indirect costs of education, especially that of forgone earnings due to postponing entry into the labor force, which results in a shift in the cost/benefit analysis and decreases the likelihood that the individual will continue schooling when the industry is more active. Further, since college is more expensive than migration, people will move to obtain these jobs and forego additional education. However, married women are less likely than married men to relocate to obtain

better jobs (e.g., Markham and Pleck 1986), especially if they believe in traditional gender roles (Bielby and Bielby 1992). Thus, based on perceived benefits, costs, and market conditions, people should be less likely to pursue additional education when the petroleum industry is more active.

In contrast, less expensive sources of financial support for additional schooling should be more available when the petroleum extraction activities are at higher levels. If parents are able to obtain higher paying positions, they will have more money to support their children's education. Moreover, communities may have more resources to support education and may give scholarships, less expensive loans, and engage in similar programs that will make continued schooling more attractive. Thus, if less expensive sources of financial support for additional education are more available when the petroleum industry is more active, continued schooling, especially college, will be more attractive.

Despite the greater availability of financial support for education, we anticipate that investments in education will decline when the petroleum industry is more active due to the reduced benefits and increased indirect costs of education at this time. Based on the above discussion, high school completion rates and college enrollments should decrease. However, the rational choices explained above probably only reduce enrollment in college and may actually increase high school completion for two reasons. First, parents with employment in the oil industry would have the money to be able to encourage adolescents to complete high school and research has shown that parents with greater economic resources and security have higher long-term educational aspirations for their children (see Astone and McLanahan 1991). Second, although there was no specific requirement that all employees on offshore platforms have high school degrees, especially during the oil boom[1], there were strong incentives to obtain this credential. Major oil companies such as Exxon did require their workers on the platforms to have high school degrees, but many employees on an offshore platform work for one of a number of subcontractors hired by the oil company and these subcontractors did not require high school diplomas.[2] Therefore, a large number of employment opportunities on platforms had no such requirement, but employees could earn more and could advance with increasing degrees. Also, high schools in some communities such as Morgan City in St. Mary Parish, a highly involved parish, offered curricula tailored for oil industry employment.[3] Thus, although many jobs did not require a high school degree, there were strong incentives to complete high school and opportunities in high school to learn skills that would increase the graduates' chances of obtaining employment in the oil industry. Therefore, high school completion rates would be expected to increase when the oil industry is more active.

Strain in Providing Educational Services

It is difficult to predict the effect of increased petroleum extraction activities on the ability of the community to provide educational services. There are conflicting results in the literature concerning the effect of resource extraction on the cost of education and the size of the student population. Brabant (1984) found lower per pupil expenses during the boom, but

others have reported overfilled schools, strain and increased costs in providing adequate education (Gramling and Brabant 1986; Gramling and Freudenburg 1990; Murray and Weber 1982).

Further, the literature concerning the economic health of a community undergoing rapid development, particularly resource extraction, is contradictory. Some research shows improvement in economic conditions and increases in total employment and average per capita income (Antonov 1988; Bunker 1984; Dixon 1978; England and Albrecht 1984; Finsterbusch 1982; Harris et al. 1986; Leistritz et al. 1982; Manuel 1984b; McNicoll 1984). In contrast, other literature suggests that these communities experience negative economic impacts: inflationary prices, increases in poverty and unemployment, and higher costs and strain in providing basic services (Brabant 1991; Brookshire and D'Arge 1980; England and Albrecht 1984; Gramling and Brabant 1986; Gramling and Freudenburg 1990; Harris et al. 1986; Massey 1980; Moen 1981; Molotch 1976; Murray and Weber 1982).

Two conflicting hypotheses could be derived from this literature. First, there is less strain in providing educational services during rapid development. This would be the case if communities do experience improved economic conditions without a drastic growth in the student population. Second, there is greater strain in supporting education during rapid development. This would occur if communities undergo worsened economic conditions and are encountering dramatic growth in the student body.

Degree and Type of Involvement

Degree of involvement of the community (operationalized as parish in this study) in petroleum extraction will affect the impact of levels of petroleum activities on educational attainment and strain. Those parishes more involved in the petroleum industry are expected to experience greater changes in educational attainment and strain due to variations in the amount of activity in the petroleum industry because they are more involved in the industry.

The effect of involvement in petroleum extraction may also differ by type of involvement in extractive industries - highly involved in the extraction activities themselves (mining and transportation) or highly involved in activities related to the extraction (processing of the raw material, wholesale trade, manufacturing equipment). Due to the lack of previous studies concerning differences by type of involvement, it is difficult to predict which group of parishes may experience greater educational impacts from involvement in petroleum extraction. Parishes that are highly involved in related activities may undergo more differences in educational attainment and strain because workers involved in this kind of employment are more likely to relocate near their place of employment and to bring their families to the new parish than are employees who work in extraction on the oil rigs. Parishes that are highly involved in extraction include many people who work on the oil rigs and their work schedules would allow them to commute long distances (Forsyth and Gauthier 1991; Gramling 1989; Gramling and Brabant 1986), thus they would not have to move their families into these parishes.

On the other hand, extraction employment may be more sensitive to changes in the price of oil or in consumption and production levels than is employment in refining, fabrication and wholesaling, thus extraction parishes may experience more impacts than those highly involved in related activities, including educational impacts. Moreover, extraction parishes are involved in petroleum production primarily in one way, mining, while related activities parishes have a more diversified involvement in petroleum production. Extraction communities in general, not just those involved in offshore petroleum, are often admonished to develop a diversified economy to avoid reliance on just one industry as their economic base to protect themselves from downturns in extraction of the resource (Freudenburg 1992). Further, the importing of oil may protect the related activities communities against the downturns in domestic extraction since this oil may need refining and will need to be sold and transported to communities not involved in petroleum extraction activities (Trench 1993). In fact, the Energy Information Administration forecasts suggest that the Gulf Coast refining capabilities will be required to supply the projected demand for light oil products in the Southeastern Atlantic region of the United States (Trench 1993). Therefore, due to the more diversified involvement in petroleum extraction and the ability to profit from the importing of oil, related activities communities may be less affected than are extraction communities by the upturns and downturns in petroleum extraction.

Hence, the hypotheses to be tested are:

H1: During periods of high petroleum industry activity, basic level educational attainment (high school completion) and educational strain (expenditures and number of pupils) will be higher and enhancement level educational attainment (enrolling in college) will be lower, especially in the highly involved and extraction parishes, as opposed to periods of low activity.

H2: Differences in petroleum industry activity are positively related to differences in basic educational attainment and educational strain and inversely related to changes in enhancement level educational attainment, especially in the highly involved and extraction parishes.

H3: Parishes that are highly involved in petroleum industry activities will have higher levels of basic educational attainment and educational strain and lower levels of enhancement level educational attainment than those that are minimally involved. Also, extraction parishes will have higher levels of basic educational attainment and strain and lower levels of enhancement level educational attainment than will the related activities parishes, especially when the industry is more active.

DATA

The data primarily came from one federal agency, Minerals Management Service, and one state agency, the Louisiana Department of Education. The dependent variables were

measures of educational attainment (percent of students completing high school and percent of high school graduates enrolling in institutions of higher education) and educational strain (per pupil and per capita educational expenditures and the number of pupils) (Louisiana Department of Education 1952-1991). The dependent variables were created for the four groups of parishes - highly involved, minimally involved, extraction and related activities - not individual parishes. True high school completion rates and college enrollments were not available.[4] The proxy for high school completion was calculated by summing the number of graduates in the parishes in the group, dividing by the number of ninth graders four years earlier and multiplying the quotient by 100. This calculation is a revision of the estimation procedure employed by the Louisiana Department of Education to calculate dropout rates. Thus, students counted as not completing high school include not only dropouts and students who have been expelled or in some cases indefinitely suspended, but also students whose families have moved out of the group of parishes (the calculation used will include students who complete high school in another parish in the group of parishes) and students who complete high school in less than four years or more than four years. Unfortunately, the Louisiana Department of Education only recently started reporting dropouts, expulsions, and suspensions. The approximation for enrolling in college was figured by adding the number of students from the parishes that enrolled in such institutions, dividing by the sum of the students who graduated from high school in the previous winter, spring and summer and multiplying by 100.[5] This estimation is an extension of the manner in which the Louisiana Department of Education calculates the percentage of students going on to college.

The only educational expenditures reported for the entire period of interest were instructional (regular, special and adult/continuing education programs) and support (pupil support, instructional staff, administration, business and central services) expenditures, thus only these expenditures were used in calculating total educational expenditures. Per pupil expenditures was calculated by summing the expenditures for the parishes in the group, dividing by the sum of the number of students in grades kindergarten through 12, then dividing by the consumer price index to control for inflation. Per capita expenditures was calculated by summing the expenditures for the parishes in the group, dividing by the sum of the populations of the parishes and dividing the quotient by the consumer price index.[6] The number of pupils was figured by adding the number of students in grades kindergarten through 12 for the parishes and dividing by the number of parishes to obtain an average number of pupils for the group of parishes. Since reporting of many school-related issues - such as number of pupils, number of graduates, percentage of graduates enrolling in institutions of higher learning - by private schools was voluntary, only the information for public schools was used.[7] These variables were calculated for each year from 1956 through 1990.

Two variables were used as indicators of petroleum extraction activity - the average price per barrel in constant dollars (Hall 1992; U.S. Bureau of the Census 1956-1991) and the number of developmental wells off the coast of Louisiana (U.S. Department of the Interior 1992). The price of petroleum was examined since it is a good indicator of petroleum industry activity.[8] The number of developmental wells off the coast of Louisiana was chosen since

developmental drilling is a labor intensive stage in petroleum extraction and affects the number of jobs available in the offshore petroleum industry. Both variables were used because the chain between petroleum industry activity and social and economic impacts is poorly understood.

Degree of involvement was accounted for by comparing the results for two groups of parishes - those highly involved and those minimally involved in the petroleum industry. An involvement score was assigned to each parish and was the average of each parish's rank on two criteria. The first was the percentage of people working in the parish employed in oil and gas extraction, oil and gas manufacturing and oil and gas wholesale trade in 1975, 1981 and 1984 (U.S. Bureau of the Census 1978, 1983b, 1986). The second was the percentage of total income of the parish residents that came from wages and salaries from oil and gas activities in 1984, the only year for which the data were available (Centaur Associates 1986) (see table 1.1). The utilization of these two indicators enabled designation of the parish's involvement by both place of employment and place of residence impact. The twelve parishes with the highest average ranks were the highly involved parishes while the twelve with the lowest average ranks were the minimally involved parishes. Twelve were chosen because there was a relatively large difference between the twelfth and thirteenth parishes in rank at both the high and low extremes of involvement. However, one minimally involved parish, Vernon, was subsequently omitted because a military base in the parish caused the population to be very unstable.[9]

Type of involvement was accounted for by comparing the results for two additional groups of parishes - those highly involved in extraction and those highly involved in related activities. The extraction parishes were those with the highest average ranks based on the percentage of people working in the parish employed in petroleum and gas extraction in 1975, 1981, and 1984 (U.S. Bureau of the Census 1978, 1983b, and 1986) and the percentage of total income of the parish residents that came from employment in petroleum and gas extraction activities in 1984 (Centaur Associates 1986) (see table 1.2). The related activities parishes were those with the highest average ranks based on the percentage of people working in petroleum and gas related manufacturing and wholesale trade in 1975, 1981, and 1984 (U.S. Bureau of the Census 1978, 1983b, 1986) and the percentage of total income of the residents that came from such activities in 1984 (Centaur Associates 1986) (see table 1.3). The six parishes with the highest average ranks on extraction activities were considered highly involved in extraction while the six with the highest average rank on related activities were designated as highly involved in related activities. The six extraction and six related activities parishes had much higher average ranks than did the other parishes. Since Plaquemines Parish was highly ranked on both types of involvement, it was omitted.[10]

METHODS AND RESULTS

Effects of Levels of Activity on Education

The test of the first hypothesis, that enrollment in college will be lower while high school completion, per pupil expenditures, and average number of students will be higher when the level of petroleum extraction activities is higher, was completed using one-way analysis of variance (ANOVA) to compare the means on the dependent variables for periods when activity levels were higher with times when there was less activity. To determine the periods of greater and lesser activity, the series for the number of wells and the price of petroleum were examined.

It originally appeared that there would be four levels of the number of wells: 1) low and slowly increasing numbers from 190 to 363 (1956-1963), 2) higher and mainly decreasing numbers between 455 and 638 (1964-1975), 3) the highest numbers of wells ranging from 521 to 665 (1976-1985), and 4) low and stable numbers ranging between 309 and 402 (1986-1990). However, the ranges of the numbers in the two middle periods overlapped and a one-way analysis of variance showed that these two periods were not significantly different from each other. Therefore, there were only three periods of numbers of wells: 1) low and slowly increasing numbers ranging from 190 to 363 with a mean of 274.5 (1956-1963), 2) higher numbers ranging from 455 to 665 with a mean of 573.91 (1964-1985) and 3) low numbers ranging from 309 to 402 with a mean of 353.5 (1986-1990). An analysis of variance confirmed that the middle period had significantly higher numbers of wells than the other two times ($R^2 = .843$, $p < .001$). These three periods do not correspond with the years most people would consider to be the preboom, the boom or the bust; therefore, use of these three periods would preclude comparing the results of this study with those of prior research. Also, a number of events occurred in the petroleum industry, including the embargo, during the middle period and these events would be missed by considering these three times to be the preboom, boom and bust. Thus, this grouping of years to correspond with the three levels of the numbers of wells was not used to determine when greater or lesser activity occurred for the analyses of variance.

An examination of the price of petroleum demonstrated that both the level and stability of oil prices needed to be taken into account. There were four periods of price when stability as well as level was considered: 1) low, stable prices from $8.11 to $11.00 between 1956 and 1973, 2) rapidly increasing prices from $13.67 to $34.95 between 1974 and 1981, 3) rapidly decreasing prices from $29.55 to $22.39 between 1982 and 1985 and 4) low, stable prices between $10.63 and $15.33 from 1986 through 1990. An analysis of variance demonstrated that these were distinct periods. The middle two periods had significantly higher means ($18.54 for the increasing period, $25.79 for the decreasing period) than the first period ($9.24) while the mean for the decreasing period was significantly higher than that for the increasing period and the mean for the last period ($12.64) was significantly less than that for the decreasing period ($R^2 = .700$, $p < .001$). This analysis was similar to a comparison of the preboom, boom, transition to bust, and bust. These were the four periods used to

determine when the industry was more or less active since there were both higher prices and a greater number of wells during the two middle periods than during the first or last periods.

If the hypothesis is correct, there should be a significant difference between the mean for the first low period, preboom, and the increasing period, boom. Also, for the mean for the increasing period should be the lowest for the percentage of graduates entering college and the highest for the other education variables. Further, the means for the decreasing and second low periods, the transition and bust, respectively, should be similar to those for the preboom or, in the case of entering college, higher than the preboom and, in the case of the other variables, lower than the preboom. The mean levels of the education variables during these four periods are shown in tables 3.1 and 3.2.

Degree of Involvement. The data support the hypothesis (see table 3.1). The means of high school completion and the average number of pupils in the highly involved parishes and the means of entering college in both groups of parishes did conform to the expected pattern. The means of high school completion and average number of pupils in the increasing period in the highly involved parishes was significantly higher than that for the first low period, but not significantly higher than that in the last period. In the minimally involved parishes only, there was a significant increase in the percentage of high school graduates entering college from the first period to the last (37.98 to 46.35, a 22 percent increase). The increase from 42.73 in the first group of years to 47.63 in the final group of years (an 11 percent increase) in the highly involved parishes was not statistically significant and could have occurred by chance alone. Because this significant increase occurred only in the minimally involved parishes (not in the highly involved or even the extraction and related parishes as will be discussed below), it is probably due to trends not related to petroleum industry involvement. The means for the expenditure variables did not fit the anticipated pattern; the means for the later two periods were significantly greater than those for the first period for both groups of parishes and the means of per pupil expenditures for the increasing period were not the highest for either group of parishes.

Thus, there is evidence that basic level educational attainment is greater when petroleum industry activity is higher, especially in the highly involved parishes, and that enhancement level educational attainment is lower when petroleum industry activity is greater in both groups of parishes. In addition, with the exception of the average number of pupils in the highly involved parishes, there is no evidence of strain in providing educational services in either group of parishes. Overall, the means conform to the expected patterns more often in the highly involved parishes (completing high school, entering college, and average number of pupils) than in the minimally involved parishes (entering college), as hypothesized.

Type of Involvement. The pattern of means for some of the variables support the hypothesis (see table 3.2). The means of the percentage of students completing high school in the related activities parishes and the means of entering college and the average number of pupils in the extraction parishes conformed to the expected pattern. Again there is a slight, but not statistically significant increase in entering college between the first and fourth

periods, a 4 percent increase in the extraction parishes and a 13 percent increase in the related activities parishes. Because these increases were not statistically significant, they could have occurred by chance alone. As occurred for the highly and minimally involved parishes, the means of the expenditure variables did not fit the expectation; the means for the later two periods were significantly greater than those for the preboom in both groups of parishes.

Therefore, the evidence suggests that educational attainment is affected as expected - higher high school completion when petroleum industry activity is greater and lower college enrolling when activity is higher. In contrast, except for the average number of pupils in the extraction parishes, there is no evidence of strain in providing educational services. In addition, the means conformed to the expected pattern slightly more often for the extraction parishes (entering college, average number of pupils) than the related activities parishes (completing high school), as anticipated. However, an analysis of variance only begins to examine the effect of changes in industry activity levels on educational variables. This effect will be examined more directly using time series regression.

Effects of Differences in Activity on Changes in Education

The second hypothesis states that differences in petroleum extraction activity are positively related to changes in basic level educational attainment and educational strain and inversely related to enhancement level educational attainment, especially in the highly involved parishes. To test this hypothesis, time series regression was used. The first differences of high school completion, percentage of high school graduates enrolling in institutions of high learning, per pupil and per capita expenditures and average number of pupils were regressed on the first differences of price and the number of wells. Since the effects of changes in petroleum activity on educational attainment and strain may not be immediate, lags of the independent variables were included in the models. Therefore, five equations were calculated initially for each dependent variable.

First, the dependent variable (first differences of each education variable) was regressed on the two independent variables (first differences of price and wells). Then, the first lags of the independent variables were added. Next, the second lags were included. Fourth, the third lags were added and, finally, the fourth lags were included. Based on the results of these five initial equations, particular lags or the first differences of the independent variables were omitted from the equation. Various models were tested until the best fitting model was obtained. The best fitting model was the one in which the terms were significantly related to the dependent variable, the Durbin-Watson statistic and the ARIMA analysis of the residuals demonstrated that the errors were not significantly correlated, the adjusted R^2 was the highest, and the press statistic and the sum of the squared residuals were among the lowest, if not the lowest. The final models are shown in tables 3.3 and 3.4 and summarized in tables 3.5 and 3.6.

Table 3.1. Means of Educational Attainment and Strain by Activity and Degree of Involvement

Stability of Price	Low (1956-1973)	Increasing (1974-1981)	Decreasing (1982-1985)	Low (1986-1990)	F	R^2
Educational Attainment						
H. High School	62.12	66.27[a]	62.98	62.43	3.20*	.231
M. High School	62.89	66.34	62.10	59.93[b]	5.47**	.339
H. Enter College	42.73	35.66[a]	41.47	47.63[b]	12.86***	.555
M. Enter College	37.98	33.51[a]	40.89[b]	46.35[ab]	20.28***	.662
Educational Strain						
H. Per Pupil Expenditure	1191.81	2337.75[a]	2603.71[a]	2525.38[a]	53.93***	.839
M. Per Pupil Expenditure	1333.06	2289.73[a]	2415.25[a]	2429.07[a]	36.45***	.779
H. Per Capita Expenditure	288.18	529.37[a]	497.00[a]	482.11[a]	20.78***	.668
M. Per Capita Expenditure	354.19	559.06[a]	536.72[a]	521.95[a]	17.81***	.633
H. Pupils	12151.99	14562.70[a]	13631.65	13362.07	3.49*	.246
M. Pupils	5183.49	5374.49	5312.77	5075.98[b]	4.58**	.300

Note: H indicates highly involved parishes and M stands for minimally involved parishes.
* $p<.05$ ** $p<.01$ *** $p<.001$
[a] This mean is significantly different from that for the first low period.
[b] This mean is significantly different from that for the increasing period.

Table 3.2. Means of Educational Attainment and Strain by Activity and Type of Involvement

Stability of Price	Low (1956-1973)	Increasing (1974-1981)	Decreasing (1982-1985) (	Low 1986-1990)	F	R^2
Educational Attainment						
E. High School	64.11	66.68	62.73	63.85	1.53	.126
R. High School	62.36	68.30[a]	64.57	63.09	3.98*	.272
E. Enter College	44.16	36.71[a]	38.01	46.10[b]	8.98***	.465
R. Enter College	42.21	36.92	42.87	48.51[b]	6.91**	.401
Educational Strain						
E. Per Pupil Expenditure	1224.74	2274.72[a]	2645.78[a]	2438.56[a]	46.05***	.817
R. Per Pupil Expenditure	1198.45	2408.69[a]	2584.28[a]	2596.58[a]	54.28***	.840
E. Per Capita Expenditure	292.83	503.69[a]	485.43[a]	449.25[a]	16.32***	.612
R. Per Capita Expenditure	284.63	540.31[a]	482.68[a]	482.40[a]	17.57***	.630
E. Pupils	12147.42	15053.95[a]	14141.90	13845.12	4.49**	.296
R. Pupils	12835.60	14905.50	13519.75	13262.96	2.02	.159

Note: E stands for extraction parishes, R indicates related activities parishes.
* $p<.05$ ** $p<.01$ *** $p<.001$
[a] This mean is significantly different from that for the first low period.
[b] This mean is significantly different from that for the increasing period.

Degree of Involvement. The results for many of the variables in the highly involved parishes support the hypothesis (see tables 3.3 and 3.5). As expected, the percentage of ninth graders completing high school, per capita expenditures, and per pupil expenditures were positively related to changes in oil industry activity. However, these relationships were more complex than predicted. High school completion did not increase immediately, changes in high school completion were significantly related to differences in oil industry activity three years previously. Moreover, although per pupil expenditures increased when activity increased, these expenditures decreased three years after an increase in activity. Further, the relationship between industry activity and the percentage of high school graduates enrolling in college was difficult to interpret. This particular regression model suggested that when industry activity increased, the percentage increased, followed by a decrease the first year after the increase in activity, then another increase and yet another decrease in the percentage the third year after the increase in activity. Caution should be exercised in interpreting this particular regression model. Although there were no significant outliers to account for this model and the addition of the lag of the dependent variable was not significant and the results were the same when second differences were used, it is unlikely that there is this much instability in the relationship between industry activity and the percentage of high school graduates enrolling in institutions of higher learning. In summary, the findings suggest that basic level educational attainment and strain increase either as or after oil activity increases, although per pupil expenditures, but not per capita ones, decrease three years after an increase in activity.

Only two of the five relationships tested in the minimally involved parishes were significant, but they support the hypothesis. As predicted, high school completion increased when petroleum industry activity increased. Also, as expected, the average number of pupils was positively related to petroleum industry activity. One, two, and three years after an increase in petroleum activity, the average number of pupils increased. Thus, the findings demonstrate that increases in activity are associated with increases in basic level educational attainment. However, since only one of the three measures of strain was significantly related to oil industry activity, it cannot be concluded that the minimally involved parishes experienced greater strain in providing education services due to increases in petroleum industry activity. The findings further support the hypothesis by demonstrating that changes in oil industry activity have a greater effect on educational attainment and strain in the highly involved parishes. Of the five relationships tested for each group of parishes, four were significant in the highly involved parishes while only two were significant in the minimally involved parishes.

Table 3.3. Regression Results for the Effect of Changes in Petroleum Industry Activity on Educational Attainment and Strain by Degree of Involvement[a]

A. Educational Attainment - Highly Involved Parishes

High School Completion	B	beta	Percentage Going to College[b]	B	beta
L3 D1 Wells	.010*	.350*	D1 Wells	.017*	.416*
			L1 D1 Wells	-.020**	-.470**
			L2 D1 Wells	.019**	.485**
			L3 D1 Wells	-.013*	-.341*
Constant	.037		Constant	.373	
Adjusted R^2	.093*		Adjusted R^2	.302**	
Durbin-Watson	2.194		Durbin-Watson	1.370	
First Order Autocorr.	-.111		First Order Autocorr.	.312	

B. Educational Attainment - Minimally Involved Parishes

High School Completion	B	beta
D1 Wells	.015**	.438**
L1 D1 High School	-.517**	-.511**
Constant	-.054	
Adjusted R^2	.311**	
Durbin-Watson	2.057	
First Order Autocorr.	-.040	
R^2 due to Wells	.166	

C. Educational Strain - Highly Involved Parishes

Per Pupil Expenditures	B	beta	Per Capita Expenditures	B	beta
D1 Price	16.972*	.433*	D1 Price	3.321*	.356*
L3 D1 Price	-12.488[c]	-.311[c]			
Constant	58.102		Constant	10.527	
Adjusted R^2	.256*		Adjusted R^2	.100*	
Durbin-Watson	2.673		Durbin-Watson	2.147	
First Order Autocorr.	-.340		First Order Autocorr.	-.076	

D. Educational Strain - Minimally Involved Parishes

Average Number of Pupils	B	beta
L1 D1 Wells	.323*	.322*
L2 D1 Price	7.137*	.384*
L3 D1 Wells	.322*	.359*
Constant	-.798	
Adjusted R^2	.292**	
Durbin-Watson	1.601	
First Order Autocorr.	.169	

[a] D1 stands for first differences, L1 is the lag of the first differences, L2 indicates the second lag, L3 is the third lag and L4 means the fourth lag.

[b] When second differences were used, the results were the same. Also, when the lag of the first differences of the dependent variable was added to the equation, it was not significant.

[c] $p < .06$ This variable adds .069 to the adjusted R^2.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 3.4. Regression Results for the Effect of Changes in Petroleum Industry Activity on Educational Attainment and Strain by Type of Involvement[a]

A. Educational Attainment - Extraction Parishes

High School Completion	B	beta
D1 Wells	.012*	.350*
L1 D1 High School	-.295[b]	-.318[b]
Constant	.052	
Adjusted R^2	.135*	
Durbin-Watson	2.072	
First Order Autocorr.	-.046	
R^2 due to Wells	.096	

Percentage Going to College	B	beta
D1 Price	-.331*	-.349*
L3 D1 Price	-.348*	-.358*
Constant	.283	
Adjusted R^2	.176*	
Durbin-Watson	2.065	
First Order Autocorr.	-.034	

B. Educational Strain - Extraction Parishes

Per Pupil Expenditures	B	beta
D1 Price	14.676**	.370***
L1 D1 Price	19.489***	.488***
L3 D1 Price	-16.505**	-.407**
Constant	53.791	
Adjusted R^2	.596***	
Durbin-Watson	2.437	
First Order Autocorr.	-.236	

Per Capita Expenditures	B	beta
D1 Price	2.597*	.302*
L1 D1 Price	3.360*	.388*
L2 D1 Price	-2.617*	-.300*
L3 D1 Price	-3.309*	-.375*
Constant	9.498	
Adjusted R^2	.464***	
Durbin-Watson	1.936	
First Order Autocorr.	.018	

Average Number of Pupils	B	beta
L2 D1 Price	-20.293*	-.219*
L1 D1 Pupils	.859***	.870***
Constant	9.519	
Adjusted R^2	.770***	
Durbin-Watson	1.823	
First Order Autocorr.	.078	
R^2 due to Price	.042	

C. Educational Strain - Related Activities Parishes

Per Pupil Expenditures	B	beta
D1 Price	20.575**	.459**
L1 D1 Expends.	-.301[c]	-.301[c]
Constant	75.649	
Adjusted R^2	.223**	
Durbin-Watson	2.348	
First Order Autocorr.	-.174	
R^2 due to Price	.190	

[a] D1 stands for first differences, L1 is the lag of the first differences, L2 indicates the second lag, L3 is the third lag and L4 means the fourth lag.

[b] $p < .07$ When this variable was omitted, the first differences of wells were not significantly related to the percentage completing high school and the errors were not random.

[c] $p < .07$ When this variable was omitted, the autocorrelation was significant.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 3.5. Summary of Changes in Educational Attainment and Strain by Degree of Involvement

Impact Variable	Oil Activity Increases	One Year Later	Two Years Later	Three Years Later
A. Highly Involved Parishes				
high school completion				increases
going to college	increases	decreases	increases	decreases
per pupil expenditures	increase			decrease
per capita expenditures	increase			
B. Minimally Involved Parishes				
high school completion	increases			
average number of pupils		increases	increases	increases

Table 3.6. Summary of Changes in Educational Attainment and Strain by Type of Involvement

Impact Variable	Oil Activity Increases	One Year Later	Two Years Later	Three Years Later
A. Extraction Parishes				
high school completion	increases			
going to college	decreases			decreases
per pupil expenditures	increase	increase		decrease
per capita expenditures	increase	increase	decrease	decrease
average number of pupils			decreases	
B. Related Activities Parishes				
per pupil expenditures	increase			

Type of Involvement. The results for the extraction parishes support portions of the hypothesis (see tables 3.4 and 3.6). As predicted, changes in high school completion, per pupil expenditures, and per capita expenditures were positively related to differences in industry activity while changes in enrolling in college were inversely related to differences in activity. Yet, the results for educational strain must be qualified. Although per pupil and per capita expenditures increased as activity increased and they increased the year after increases in activity, these two variables decreased in the later years. Per pupil expenditures decreased the third year after increases in activity and per capita expenditures declined the second and third years following increases in activity. Moreover, the average number of pupils decreased the second year subsequent to increases in activity. In summary, in the extraction parishes, basic level educational attainment increased and enhancement level educational attainment decreased due to increases in petroleum industry activity and educational strain initially increased when activity increased, but later strain decreased.
Only one of the five relationships between petroleum industry activity and educational attainment and strain examined in the related activities parishes was significant (see table 3.4 and table 3.6). As anticipated, per pupil expenditures increased as activity increased. However, it cannot be concluded that increased petroleum activity increases educational strain in the related activities parishes because only one of the three measures of educational strain was related to oil industry activity.

The results further demonstrated that petroleum industry activity has a greater effect on educational attainment and strain in the extraction parishes than in the related activities parishes, as predicted. All five relationships were significant in the extraction parishes, but only one of the five was significant in the related activities parishes.

The findings for both degree and type of involvement show the importance of examining different measures of industry activity. The outcome demonstrated that educational attainment was mainly affected by changes in the number of wells, while educational strain was primarily related to changes in the price of oil. Of the five significant relationships for educational attainment, four involved the number of wells and one was with the price of oil. Of the seven significant associations for educational strain, six included only the price of oil and one involved both the price of oil and the number of wells. It is possible that these two indicators tap different aspects of petroleum industry activity and thus affect different dimensions of educational impacts. This issue will be discussed later.

Effects of Degree and Type of Involvement on Education

The analyses just presented examined the effect of differences in price and wells on changes in education and suggested that the impact of changes in petroleum industry activity on educational attainment and strain do depend on the degree and type of involvement of the parish in the industry. However, the previous analyses do not statistically compare the levels of the education variables by degree and type of involvement. To address the third hypothesis and third question, whether degree and type of involvement influence educational attainment and strain, the five dependent variables were calculated for each parish, not for groups of

parishes as was presented earlier, and the differences by degree and type of involvement in the means of the dependent variables were examined with t-tests.

Degree of Involvement. The results show that educational attainment does not differ by degree of involvement (see Appendix C). The means of high school completion for the highly and minimally involved parishes were significantly different in only two of 36 years - 1982 and 1987. However, these two years are the first years after major changes in activity. The first year, 1982, is the year after the highest price of petroleum and the second year, 1987, is the year subsequent to the crash in both the price of petroleum and the number of wells. Similarly, the means of going to college were significant in only two years - 1968 and 1970. These two years were not related to major changes in either the price of oil or the number of wells.

Educational strain does differ by degree of involvement. Although the more common measure of educational expenditures, per pupil expenditures, significantly differed in only one year, 1981, per capita expenditures were significantly lower in the highly involved parishes for 10 of the 35 years - 1957 through 1965 and 1967. These were years before the petroleum industry reached its peak of activity. The results for these two expenditure variables suggest that in the earliest years of the series, per pupil expenditures in the two groups of parishes were the same, but these expenditures were a greater burden for the people in the minimally involved parishes. This advantage for people in the highly involved parishes was lost, for whatever reason, when the petroleum industry became more active. Further, there were significantly more pupils in the highly involved parishes from 1956 through 1990. However, it should be noted that these are larger parishes than are the minimally involved ones, thus this result was expected.

Type of Involvement. Neither educational attainment nor strain varies by type of involvement (Appendix D). The means of high school completion never significantly differed while the means of the percentage of students going to college were significantly lower for the extraction parishes in only two of the 35 years - 1963 and 1990. Further, the differences in means by type of involvement for educational expenditures and the average number of pupils were never significant.

DISCUSSION

In summary, the results demonstrate that greater petroleum industry activity is associated with higher percentages of students completing high school, lower percentages of high school graduates enrolling in college, and greater strain, primarily in the highly involved and extraction parishes. The outcome further showed that the annual levels of educational attainment of the residents in the parishes do not differ by either degree or type of involvement in petroleum production. There was some difference in educational strain by degree of involvement in the years prior to the height of petroleum industry activity, but type of involvement did not affect educational strain.

Therefore, the results of this study support the hypothesis that changes in the level of petroleum industry activity do affect education. Moreover, the findings demonstrate that the relationship between petroleum industry activity and educational impacts does depend on both degree and type of involvement. Petroleum activity has a greater effect on education in the highly involved parishes than in the minimally involved ones and also in the extraction parishes rather than the related activities parishes. The results show further that the levels of educational attainment or strain themselves do not differ by degree or type of involvement, although the association between these levels and petroleum activity do differ by both degree and type of involvement.

Theoretical Implications

This study supports the proposition that investment in education is based on a rational assessment of the costs and benefits of additional educational attainment. The high school graduates in the parishes were less likely to invest in a college education when the petroleum industry was more active and presumably more highly paid jobs are available without a college education. The graduates were also more likely to seek a college education when the industry was less active and there were fewer highly paid employment opportunities available without additional education. Conversely, the results showed that students were more likely to complete a basic education when the industry was more active and less likely to do so when the industry was less active. It was not possible to discern from our data if the reason for this association was that petroleum industry employment required a high school degree, especially in the late 1970's and the early 1980's when the industry was most active, or that parents were able to obtain these better jobs and this financial security of the parents raised their educational aspirations for their offspring.

In one sense, the findings concerning educational strain were consistent with the previous literature in that they were contradictory. The analysis of variance results gave little evidence of strain in providing educational services, except for the increase in the average number of pupils when petroleum activity was rapidly increasing. Expenditures largely increased across the four periods, although the greatest increase was between the preboom and the period of rapid increases in activity. It is possible that expenditures tended to increase over time due to federal, state, and local mandates concerning basic educational requirements, including such costly expenditures such as improved access for physically challenged students. The increase over time was not due to inflation since the effect of this factor was removed in the creation of the expenditure variables.

The regression results suggest that a possible reason for the contradictory outcomes of the previous studies could be when the change is expected to occur and how the research analyzed the data to find changes. The regression analyses frequently displayed the pattern of increased strain within the first year of an increase in petroleum activity followed in the subsequent two years by reductions in strain. This result suggests that there is a cycle of strain within the obvious boom/bust cycle in which increases in activity disrupt the provision of educational services in a manner that initially increases strain, but the strain is reduced in

the following two years. (Possible reasons for this cycle will be discussed in chapter 5 in which the results concerning all the impacts will be put together and a scenario of impacts will be presented.)

Policy Implications

The outcome of the study implies that there is a need to monitor and mitigate the impacts of energy extraction economic development on educational attainment. A mitigation strategy to encourage high school graduates to invest in college when the industry is very active is necessary as is a policy to stimulate high school students to complete high school when the industry is less active. Both mitigation activities would reduce overspecialization of the community in the energy extraction industry, which would enable the community to take advantage of or even create future economic development opportunities when the extractive industry is less active or has ceased operations entirely.

High school graduates could be encouraged to continue their education when the industry is active if employers would allow employees to work flexible hours or even part-time so employees could obtain additional education. Employers could also offer credits toward promotions for completing college courses. In as much as possible, these incentives should be offered not only to managerial employees, but also to workers in manual labor positions. Employers could have meetings with employees, community leaders (informal as well as formal leaders), and the media to discuss the inevitability of the bust and the need for individuals and communities to develop other educational skills to attract new economic development opportunities to protect the community against the economic problems associated with the decline in the extractive industry. Presentations could be made at the high schools showing students the possible jobs available with different levels of education, including information about working conditions, type of work and salary ranges. Such information may entice some high school graduates to continue their education despite the availability of positions that do not require additional education.

Although the data demonstrated that high school completion increases when industry activity increases, incentives by employers could further elevate high school completion rates. For example, employers could require a high school degree as a prerequisite for jobs and job training. Employers could visit high schools in the communities and discuss the employment opportunities available if students obtain their high school degree. In fact, employers could present material on the wide range of possible employment and show students the potential salary ranges and working conditions of positions available with and without the high school degree. If no attractive jobs are available without the high school degree and some are available with this degree, at least some students should be encouraged to complete high school.

Educational strain may be dependent on another factor affected by industry activity - migration. It may be possible to set aside some money from federal lease sales, the industry,

and the community (e.g., income from sales taxes) to the offset additional demands for educational services that initially occur with increases in activity.

Contributions to the Literature

The contributions of this study to the literature on social and economic impacts of petroleum extraction come from the following. First, this study examined an impact that has rarely been investigated - education. There are far more studies on other issues such as crime, community satisfaction, and community economic health than there are on educational impacts. Second, the results suggest that the effects of petroleum extraction are not limited to the parishes that are highly involved in this activity. There were a few significant relationships in the minimally involved parishes such as the increase in high school completion and the average number of pupils with and subsequent to increases in petroleum activity. This finding has important implications for monitoring and mitigation programs as this result implies that such programs should include communities near that which is the host to the resource extraction activity. For example, the Santa Barbara monitoring and mitigation program discussed previously should be examining the surrounding communities to determine if they are also affected and to take steps to reduce the impacts. Third, the results suggest that highly involved communities are not affected equally. Those communities that have a more diversified involvement in energy extraction may experience fewer impacts than those that are primarily involved only in extraction activities.

Fourth, the importance of examining different measures of activity was demonstrated by the results. The findings showed that determination of the major phases of extraction development can differ depending on the measure of activity levels as displayed by the analysis of variance outcomes for price and wells. Further, the effect on education varied by the measure of activity. Overall, price affected educational strain and the number of wells influenced educational attainment. This finding may have occurred because price and the number of wells may tap different aspects of activity.

In summary, the findings of this study suggest the need for improvement in the methods used to analyze social and economic impacts of economic development projects. Such research should include communities uninvolved or minimally involved in the development, many studies in this literature do not include these communities (see Seydlitz et al. 1993). Also, investigators interested in the impacts of economic development, especially resource extraction, need to be more careful about the measurement of the phases of the extraction activities (see Seydlitz et al. 1993). In addition, there is a need for longitudinal studies that investigate the possibility of differential impacts due to the type of resource extracted (e.g., renewable or non-renewable), the geographical isolation of the community that is host to the extraction industry, and the location of the extracted resource (e.g., onshore or offshore) (Freudenburg 1992).

ENDNOTES

1. Personal conversations with Mr. David Miller at the American Petroleum Institute and with Mr. Larry Wall at the Louisiana Mid-Continent Oil and Gas Association, January 10, 1994.

2. Personal conversation with Mr. Larry Wall at the Louisiana Mid-Continent Oil and Gas Association, January 10, 1994.

3. Personal conversation with Mr. Larry Wall at the Louisiana Mid-Continent Oil and Gas Association, January 10, 1994.

4. Actual numbers of students dropping out of high school are not available prior to the 1978/1979 school year.

5. Two highly involved parishes had to be omitted from the calculations for this variable due to missing data for several years for Iberia and due to suspicious data in the late 1980's for Vermilion. Vermilion also had to be omitted from the extraction parishes due to the data problems. Further, some of the data was clearly erroneous and one was corrected by the Louisiana Department of Education. Since the department could not afford to correct the other 16 numbers, linear interpolation was used to estimate these numbers. Changing fewer than .77 percent (three variables for 40 parishes - including some not examined in this study - for 35 years) of the numbers to reduce errors should not cause problems. There was no pattern in these 16 data points.

6. The population data came from two sources. The populations for 1969 through 1990 were obtained from the U.S. Department of Commerce (1992). However, this agency did not have comparable data prior to 1969. State sources of population data were unusable because the numbers did not include migration and were quite disparate from the census figures for years immediately prior to census years. Estimates for the years prior to 1969 were made using the procedure described below, which was suggested by Don Starsinic of the Population Division of the U.S. Bureau of the Census. Initial estimates of the population figures between the census years of 1950, 1960 and 1970 were created using linear interpolation for each of the 64 parishes. Then these estimates were summed and divided into the state population numbers for each year to create an adjustment factor. Finally, the adjustment factor was multiplied to the linear interpolated estimate for each parish.

7. With the exception of a few parishes, the percentage of schools that were private schools in each parish in academic years 1960/1961, 1970/1971, 1980/1981 and 1990/1991 was small. Caution is advised in examining these percentages since the total numbers of schools were small, usually less than 30, in many parishes. The highest percentages were in 1960/1961 and the lowest in 1990/1991 for most parishes. There were 12 highly involved parishes and nine of these had percentages between 0 and 15 in 1960/1961 (the exceptions were Lafayette with 54 percent, Plaquemines with 50 percent and Acadia with 31 percent). In 1990/1991, the percentages of private schools in the highly involved parishes ranged from

0 to 27 percent. Four of the 5 extraction parishes had percentages between 0 and 14 in 1960/1961 (the exception was Lafayette). In 1990/1991, the range for all 5 extraction parishes was from 0 to 27 percent. Three of the 5 related activities parishes had percentages between 13 and 19 (the exceptions were Acadia with 31 percent and Calcasieu with 7 percent) in 1960/1961. In 1990/1991, the range for the 5 parishes was from 8 to 26 percent. Most of the 11 minimally involved parishes had no private schools in 1960/1961 and 1990/1991 (8 parishes). In 1960/1961, the range for the 11 parishes was from 0 to 34 percent (the nonzero percentages were 9 percent in Allen, 30 percent in Ascension and 34 percent in Avoyelles). The range in 1990/1991 was 0 to 32 percent (the nonzero percentages were 14 percent in both Ascension and Madison and 32 percent in Avoyelles). Since private schools do not have to report information about students and expenditures and the percentages of private schools were small for most of the parishes and tended to decline from 1960/1961 to 1990/1991, it is unlikely that using only the public schools resulted in a distorted view of students and expenditures.

8. Personal communication with Mike Melancon of the U.S. Department of the Interior, Minerals Management Service, Summer 1992.

9. The highly involved parishes were: Acadia, Calcasieu, Cameron, Iberia, Lafayette, Plaquemines, St. Bernard, St. Charles, St. James, St. Mary, Terrebonne and Vermilion. The minimally involved parishes were: Allen, Ascension, Avoyelles, Beauregard, Caldwell, DeSoto, Grant, Madison, West Carroll, West Feliciana and Winn.

10. The extraction parishes were: Cameron, Lafayette, LaFourche, St. Mary and Vermilion. The related activities parishes were: Acadia, Calcasieu, St. Bernard, St. Charles and St. James.

CHAPTER 4

THE IMPACT OF DEVELOPMENT ON COMMUNITY ECONOMIC HEALTH

INTRODUCTION

The effects of energy development on community economic health are contradictory. Some researchers report reductions during the boom in the demands for welfare and food stamps (Brabant 1991; Dixon 1978) and increases in income and economic conditions (Bunker 1984; Dixon 1978; England and Albrecht 1984; Finsterbusch 1982; Harris et al. 1986; Manuel 1984b; McNicoll 1984). Other studies demonstrate increases in employment and declines in unemployment particularly in the construction phase of development (Antonov 1988; Harris et al. 1986; Leistritz et al. 1982; McNicoll 1984), although locals who are not skilled or are not willing to undergo job training to obtain the energy-related jobs do not benefit from the improved economic conditions (Little and Lovejoy 1979; Lovejoy 1983; Seyfrit 1986; Summers and Clemente 1976).

In contrast, negative economic impacts reported include inflationary prices and an increased cost of living (Harris et al. 1986; Massey 1980; Moen 1981) as well as housing shortages and higher housing costs (Antonov 1988; Harris et al. 1986). Other studies show increases in poverty and income disparity during the height of energy extraction activity (Brabant 1991), elevated unemployment rates (Molotch 1976) even when there is a high level of extraction activity (Freudenburg 1992) and economic problems before the extracted material is exhausted (Freudenburg 1992). Other negative effects displayed in prior studies are strain and increased costs in providing necessary services (Brookshire and D'Arge 1980; England and Albrecht 1984; Gramling and Brabant 1986; Gramling and Freudenburg 1990; Murray and Weber 1982) and economic addiction to extraction (Freudenburg 1992). In addition, economic conditions in the community hosting the development may not improve because of the diffusion of the impact due to commuting workers (Summers and Clemente 1976).

Such contradictory findings suggest a need for systematic inquiry into the idea that communities undergoing economic development experience varying gains with different types of economic growth. Proposed here is a first step in establishing a comparative data base: a study of the local economic changes that occurred in the Gulf coast region of Louisiana in response to extensive offshore extractive activities.

The Louisiana Gulf coast region is an opportune location to examine the relationships between industrial boom and community economics. It is timely because very little is currently known about the economic impacts of energy extraction from offshore petroleum mining. Indeed, the effects of offshore petroleum extraction on local economies is largely unknown. There are, in fact, comparatively few studies of impacts of whatever types stemming from offshore petroleum development, particularly in the Gulf of Mexico (notable exceptions include Brabant 1984, 1991; Gramling 1984a, b, c and d; Gramling and Brabant

1986; Gramling and Freudenburg 1990; Manuel 1984a and b). Furthermore, effects studies of offshore petroleum extraction in the Gulf of Mexico are important because the Gulf is the main site of known American petroleum reserves and the Western and Central Gulf is one of the few coastal areas of the United States not included in the moratoria (Goll 1993). Finally, the offshore extraction industry on Louisiana's Gulf coast is sufficiently mature to permit reliable studies of its various effects.

Hence, the development of the offshore petroleum industry in Louisiana provides an excellent opportunity to study the effect of this industry on community economic health because the development has taken place over decades and has been massive. Greater than 90 percent of the world's petroleum that comes from the outer continental shelf (OCS) is from the Gulf of Mexico, particularly off the Louisiana coast (Gramling 1992). Further, the only deep water port off the coast of the United States is in the waters off the shore of Louisiana (Gale and Albright 1993). Extraction in the Gulf of Mexico off the coast of Louisiana began decades ago. The first exploratory drilling occurred in 1946 six miles off the Louisiana coast. This early development was facilitated by the creation of the State Mineral Board in 1936, which was given the authority to lease the waters near the Louisiana shore, and by the first federal OCS lease sale in 1954 (Gramling 1992). Petroleum drilling was well underway by 1960 and increased drastically after the 1973/1974 Arab oil embargo. Activity remained high until 1986 when the price of crude oil dropped by about half of its 1985 value.

A CONCEPTUAL MATRIX

The effect of a particular energy development project, including offshore petroleum extraction, on community economic health may depend on several factors peculiar to the particular project: the level, rate and direction of change in extraction activities; the year to year fluctuations in extraction; and the degree (high or low) and type (extraction or related activities such as refining, wholesaling, fabrication, and transportation) of involvement of the community in petroleum mining.

The effect of extraction activities on community economic health can be analyzed in different ways depending on how the amount of and changes in activity are operationalized. One operationalization is to determine when the industry is more or less active, as is done in preboom to boom, boom to bust, and preboom to bust comparisons of economic variables. However, these comparisons should account not only for the level of activity, but also the rate and direction of change in the amount of activity. When the level of activity is higher or rapidly increasing, community economic health should be better than when the activity is lower or rapidly decreasing. Thus, the appropriate comparisons might have more than three periods. For example, there could be a preboom (low and stable activity), a boom (high or rapidly increasing activity), a transition to the bust (rapidly decreasing activity), and the bust (low and stable activity, if any). Another means of operationalizing the amount of and changes in activity is to examine the effect of the changes in activity from one year to the next. Then, year to year changes in the economic variables could be regressed on year to

year changes in the amount of extraction activity to determine the direct effect of changes in activity on economic variables.

Yet, regardless of how activity is operationalized, it is important to take into account the degree and type of involvement of the community in the extraction operations. Some research suggests that communities that are more involved in energy development undergo greater social change (Brabant 1984; Gramling 1984b, c and d; Manuel 1984a and b). Moreover, type of involvement has been reported to affect the relationship between petroleum industry activity and employment (Gramling 1984c; Gramling and Freudenburg 1990).

Due to the lack of studies concerning the effect of type of involvement on impacts of offshore petroleum industry activity, it is difficult to anticipate how this factor will influence the relationship between industry activity and community economic health. Communities (operationalized as parishes) that are highly involved in related activities may undergo greater changes in economic factors because workers involved in this kind of employment are more likely to relocate near their place of employment and to bring their families than are employees who work in extraction on the oil rigs. Parishes that are highly involved in extraction activities themselves include many people who work on the oil rigs and their work schedules would allow them to commute long distances, thus they would not have to move their families into these parishes.

On the other hand, extraction employment may be more sensitive to changes in the price of oil or in consumption and production levels than is employment in refining, transportation, fabrication and wholesaling, thus extraction parishes may experience more economic impacts than those highly involved in related activities. Moreover, extraction parishes are involved in petroleum production primarily in one way, mining, while related activities parishes have a more diversified involvement in petroleum production. Communities involved in any manner in extraction activities, not just those involved in offshore petroleum, are often admonished to develop a diversified economy to avoid reliance on just one industry as their economic base to protect themselves from downturns in extraction of the resource (Freudenburg 1992). Thus, parishes that have a more diversified involvement in extraction have a more diversified economy that may provide some protection against the inevitable decline in the extractive endeavor. Further, the importing of oil may protect the related activities parishes against the downturns in domestic extraction since this oil may need refining and will need to be sold and transported (Trench 1993). In fact, the Energy Information Administration forecasts suggest that the Gulf Coast refining capabilities will be required to supply the projected demand for light oil products in the Southeastern Atlantic region of the United States (Trench 1993). Therefore, related activities parishes may be less affected than are extraction parishes by the upturns and downturns in petroleum extraction due to their more diversified involvement in petroleum production and their ability to profit from the importing of petroleum. It was possible to identify 12 highly involved parishes, 12 minimally involved parishes, 6 parishes highly involved in extraction and 6 parishes highly involved in related activities (explained below).

Based on the above literature, three questions are asked. First, is parish economic health affected by the amount of or changes in petroleum industry activity? Second, does the relationship between petroleum industry activity and community economic health differ by degree or type of involvement? Third, does the level of community economic health depend on degree or type of involvement? The following hypotheses will be tested.

H1: During periods of high petroleum industry activity, economic health will be improved (higher income, sales taxes collected, and net migration and lower transfer payments and unemployment), especially in highly involved parishes and in extraction parishes, as opposed to periods of low activity.

H2: Differences in petroleum industry activity are positively related to differences in income, sales taxes collected, and net migration and inversely related to changes in transfer payments and unemployment, particularly in the highly involved parishes and in the extraction parishes.

H3: Parishes that are highly involved in petroleum industry activities will have higher levels of income, sales taxes collected, and net migration and lower levels of transfer payments and unemployment than those that are minimally involved. Additionally, extraction parishes will have higher levels of income, sales taxes collected, and net migration and lower levels of transfer payments and unemployment than related activities parishes, primarily during periods when petroleum extraction was more active.

DATA

The data were obtained annually from a variety of federal and state government agencies. The indicators of community economic health, the dependent variable, were: 1) per capita transfer payments which included maintenance and unemployment payments in constant dollars (U.S. Department of Commerce 1992), 2) average per capita income of the parish residents in constant dollars (U.S. Department of Commerce 1992), 3) net migration (Department of Health and Human Resources 1969-1986, U.S. Department of Commerce 1992; U.S. Department of Health, Education, and Welfare 1989-1990), 4) per capita sales taxes collected in constant dollars (Louisiana Department of Revenue and Taxation 1956-1991), 5) unemployment rates and 6) per capita unemployment[1]. The dependent variables were created and analyzed separately for the four groups of parishes: highly and minimally involved, extraction and related activities. (The four groups of parishes allow for comparisons by degree and type of involvement and will be explained below.)

Two variables were used as indicators of petroleum extraction activity - the average price per barrel in 1983 dollars (Hall 1992; U.S. Bureau of the Census 1956-1991) and the number of developmental wells off the coast of Louisiana (U.S. Department of the Interior 1992). The price of petroleum was examined since it is a good indicator of petroleum industry activity.[2] The number of developmental wells off the coast of Louisiana was chosen because developmental drilling is a labor intensive stage in petroleum extraction and affects the number of jobs available in the offshore petroleum industry. Both variables were used because the causal chain between petroleum industry activity and social and economic impacts is poorly understood.

Degree of involvement was accounted for by comparing the results for two groups of parishes - those highly involved and those minimally involved in the petroleum industry. An involvement score was assigned to each parish and was the average of each parish's rank on two criteria. The first was the percentage of people working in the parish employed in oil and gas extraction, oil and gas manufacturing and oil and gas wholesale trade in 1975, 1981 and 1984 (U.S. Bureau of the Census 1978, 1983b, 1986). The second was the percentage of total income of the parish residents that came from wages and salaries from oil and gas activities in 1984, the only year for which the data were available (Centaur Associates 1986) (see table 1.1). The utilization of these two indicators enabled designation of the parish's involvement by both place of employment and place of residence impact. The twelve parishes with the highest average ranks were the highly involved parishes while the twelve with the lowest average ranks were the minimally involved parishes. Twelve were chosen because there was a relatively large difference between the twelfth and thirteenth parishes in rank at both the high and low extremes of involvement. However, one minimally involved parish, Vernon, was subsequently omitted because a military base in the parish caused the population to be very unstable.[3]

Type of involvement was accounted for by comparing the results for two additional groups of parishes - those highly involved in extraction and those highly involved in related activities. The extraction parishes were those with the highest average ranks based on the percentage of people working in the parish employed in petroleum and gas extraction in 1975, 1981, and 1984 (U.S. Bureau of the Census 1978, 1983b, and 1986) and the percentage of total income of the parish residents that came from employment in petroleum and gas extraction activities in 1984 (Centaur Associates 1986) (see table 1.2). The related activities parishes were those with the highest average ranks based on the percentage of people working in petroleum and gas related manufacturing and wholesale trade in 1975, 1981, and 1984 (U.S. Bureau of the Census 1978, 1983b, 1986) and the percentage of total income of the residents that came from such activities in 1984 (Centaur Associates 1986) (see table 1.3). The six parishes with the highest average ranks on extraction activities were considered highly involved in extraction while the six with the highest average rank on related activities were designated as highly involved in related activities. The six extraction and six related activities parishes had much higher average ranks than did the other parishes. Since Plaquemines Parish was highly ranked on both types of involvement, it was omitted.[4]

METHODS AND RESULTS

Effects of Levels of Activity on Economic Health

The first hypothesis stated that income, sales taxes collected, and inmigration will be higher while transfer payments, unemployment rates and per capita unemployment will be lower when petroleum extraction activity is higher than during periods when this activity is lower, particularly in the highly involved and extraction parishes. The test of this hypothesis was completed using one-way analysis of variance (ANOVA) to compare the means on the dependent variables for periods when activity levels were higher with times when there was less activity. To determine the periods of greater and lesser activity, the series for the number of wells and the price of oil were examined.

It originally appeared that there would be four levels of the number of wells: 1) low and slowly increasing numbers from 190 to 363 (1956-1963), 2) higher and mainly decreasing numbers between 455 and 638 (1964-1975), 3) the highest numbers of wells ranging from 521 to 665 (1976-1985), and 4) low and stable numbers ranging between 309 and 402 (1986-1990). However, the ranges of the numbers in these two periods overlapped and a one-way analysis of variance showed that the middle two periods were not significantly different from each other. Therefore, there were only three periods of numbers of wells: 1) low and slowly increasing numbers ranging from 190 to 363 with a mean of 274.5 (1956-1963), 2) higher numbers ranging from 455 to 665 with a mean of 573.91 (1964-1985) and 3) low numbers ranging from 309 to 402 with a mean of 353.5 (1986-1990). An analysis of variance confirmed that the middle period had significantly higher numbers of wells than the other two times ($R^2 = .843$, $p < .001$). These three periods do not correspond with the years most people would consider to be the preboom, the boom and the bust and would not enable comparisons of results of this study with those of prior studies. Also, a number of events occurred in the oil industry, including the embargo, during the middle period and these events would be missed by considering these three times to be the preboom, boom and bust. Thus, this grouping of years to correspond with the three levels of the numbers of wells was not used to determine when greater or lesser activity occurred for the analyses of variance.

An examination of the price of oil demonstrated that both the level and stability of oil prices needed to be taken into account. There were four periods of price when stability as well as level was considered: 1) low, stable prices from $8.11 to $11.00 between 1956 and 1973, 2) rapidly increasing prices from $13.67 to $34.95 between 1974 and 1981, 3) rapidly decreasing prices from $29.55 to $22.39 between 1982 and 1985 and 4) low, stable prices between $10.63 and $15.33 from 1986 through 1990. An analysis of variance demonstrated that these were distinct periods. The middle two periods had significantly higher means ($18.54 for the increasing period, $25.79 for the decreasing period) than the first period ($9.24) while the mean for the decreasing period was significantly higher than that for the increasing period and the mean for the last period ($12.64) was significantly less than that for the decreasing period ($R^2 = .700$, $p < .001$). This analysis was similar to a comparison

of the preboom, boom, transition to bust, and bust. These were the four periods used to determine when the industry was more or less active for the analyses of variance.

If the hypothesis is correct, there should be a significant difference between the mean for the first low period, preboom, and the increasing period, boom. Also, the mean for the increasing period should be the lowest for unemployment rates, per capita unemployment, and transfer payments and the highest for income, inmigration, and sales taxes collected. Further, the means for the decreasing and second low periods, the transition to the bust and the bust, respectively, should be similar to those for the preboom or, in the cases of unemployment rates, per capita unemployment, and transfer payments, higher than the preboom and, in the cases of income, inmigration, and sales taxes collected lower than the preboom. The mean levels of the economic variables during these four periods are shown in tables 4.1 and 4.2.

Degree of Involvement. None of the patterns of means conformed to the expected pattern (see table 4.1). Some of the results support the popular belief that parishes involved in resource extraction experience economic gain when the extractive industry is highly active or rapidly increasing in activity. On the other hand, the results also suggest that there is an adverse effect on the poor and unemployed when activity in the industry is rapidly decreasing or has attained a low level after having been highly active.

The means for average income for the minimally involved parishes more closely approximate those of the nation. In both the minimally involved parishes and the nation, average income increased across the four periods. In fact, the percentage increases from the first to last period for the minimally involved parishes and the nation were similar: 26 percent for the minimally involved parishes and 28 percent for the nation. These increases were statistically significant. The means in the highly involved parishes differ from the national trend and the means for the minimally involved parishes in three ways. First, the increase between the first two periods was over $1,000 larger, a possible advantage of oil industry involvement. Second, average income decreased between the last two periods in the highly involved parishes, possibly an effect of the bust. Third, the increase in the means of income between the preboom and bust in the highly involved parishes was about $685 less than that for the nation as a whole, but it was also statistically significant. The percentage increase (31 percent) between the preboom and the bust was higher in the highly involved parishes than in the nation and the minimally involved parishes, primarily due to the percentage increase in the related activities parishes as will be discussed below.

The means for transfer payments in both groups of parishes differ from those of the nation. In the two groups of parishes, the highest transfer payments were in the third period which was a time of high but rapidly decreasing annual prices of oil, not the second period. The means for the highly involved parishes differed from those for the nation and the minimally involved parishes in that the means in the highly involved parishes were highest in the last two periods, not the middle two periods. Further, the increase in the means of transfer

payments between the preboom and bust in the highly involved parishes ($95.77) was more than double that for the nation ($41.91).

Overall, the results show that the minimally involved parishes were not as adversely affected by the decrease and bust in industry activity as were the highly involved parishes. Further, as hypothesized, for most of the variables (income, unemployment rates, per capita unemployment, and transfer payments), the relationship between the level of industry activity and economic health was stronger in the highly involved parishes than in the minimally involved parishes.

Type of Involvement. Again, the means did not conform to the expectation for any variable (see table 4.2). Some of the results support the idea that parishes highly involved in extraction itself or activities related to the extraction experience an improvement in economic health when activity in the petroleum industry is increasing; however, there is evidence of the adverse impact on the poor and unemployed when the activity level is decreasing or is low and stable after having been high.

The results also suggest that the related activities parishes, which by definition have a more diversified involvement in petroleum activity, fared better economically during the bust than did the extraction parishes, despite the stronger association between level of activity and the economic variables in the related activities parishes. This recovery is demonstrated by the following. First, there is a lesser decline in mean income between the later two periods in the related activities parishes that causes these parishes to have a higher mean income during this period although their mean income was lower during the two middle periods. Second, the percentage increase between the preboom and the bust in income was greater in the related activities parishes (34 percent) than in the extraction parishes (30 percent), the nation (28 percent) and the minimally involved parishes (26 percent). Third, there was a decrease in the means of unemployment rates, per capita unemployment and transfer payments between the decreasing and bust periods in the related activities parishes instead of an increase as occurred in the extraction parishes. Fourth, there was an absence of significance between the means of net migration in the last two periods in the related activities parishes. Finally, there was an increase in sales taxes between the decreasing and last period in the related activities parishes instead of the decrease in sales taxes that occurred in the extraction parishes.

The means for both income and transfer payments in both groups of parishes differed from the national trend. In the two groups of parishes, the means for income rose more between the first two periods than those for the nation, again a possible advantage of the oil industry involvement. Also, the means for income in the two groups of parishes decreased between the third and fourth periods, instead of increasing, a possible reflection of the bust in the oil industry. Further, the increase in the means of income from the preboom to the bust in the extraction parishes was $843 lower than that in the nation and the increase in the related activities parishes was $450 lower than that in the nation. For the two groups of parishes, the means for transfer payments were higher in the last two periods (during the decrease and bust in oil prices) instead of the two middle periods as occurred in the nation. Moreover, the

increase in the means for transfer payments from the preboom to the bust in the extraction parishes ($107.96) was more than double that of the nation ($41.91), while the increase in the related activities parishes ($58.72) was only somewhat larger than that for the nation. However, an analysis of variance only begins to examine the effect of changes in industry activity on economic variables. This effect will be examined more directly using time series regression.

Effects of Differences in Activity on Changes in Economics

The second hypothesis states that differences in petroleum extraction activity are related to changes in economic health. To test this hypothesis, time series regression was used. The first differences of average per capita income, unemployment rates, per capita unemployment, transfer payments, net migration and sales taxes collected were regressed on the first differences of price and the number of wells. Since the effects of changes in petroleum activity may not be immediate, lags of the independent variables were included in the models. Initially, five equations were calculated for each dependent variable. First, the dependent variable (first differences of each variable) was regressed on the two independent variables (first differences of price and wells). Then, the first lags of the independent variables were added. Next, the second lags were included. Fourth, the third lags were added and, finally, the fourth lags were included. Based on the results of these five initial equations, particular lags or the first differences of the independent variables were omitted from the equation. Various models were tested until the best fitting model was obtained. The best fitting model was the one in which the terms were significantly related to the dependent variable, the Durbin-Watson statistic and the ARIMA analysis of the residuals demonstrated that the errors were not significantly correlated, the adjusted R^2 was the highest, and the press statistic and the sum of the squared residuals were among the lowest, if not the lowest. The final models are shown in tables 4.3 and 4.4 and summarized in tables 4.5 and 4.6.

Degree of Involvement. The results for the highly involved parishes supported the hypothesis, but only within the first year of an increase in oil industry activity (see tables 4.3 and 4.5). Within one year of an increase in activity, income, sales taxes collected, and inmigration increased, as predicted, while transfer payments and unemployment decreased, as anticipated. However, all of these relationships reversed in the second and third years after an increase in petroleum activity. Income and sales taxes collected decreased, outmigration occurred, and transfer payments and unemployment increased. The findings demonstrated that the benefit in economic health due to an increase in petroleum industry activity was transitory. This outcome suggested that there is a cycle of impacts on community economic health in which the parish experiences improved economic health shortly after an increase in activity followed by a reversal in economic health in the second and third year after an increase in activity.

The hypothesis was somewhat supported by the findings for the minimally involved parishes. As expected, income increased and unemployment decreased due to increases in petroleum activity. Again this improvement in economic health was transitory because unemployment increased one year after the increase in activity and sales taxes decreased three years after the increase in activity.

Table 4.1. Means of Economic Health by Petroleum Industry Activity and Degree of Involvement

Stability of Price	Low (1956-1973)	Increasing (1974-1981)	Decreasing (1982-1985)	Low (1986-1990)	F	R^2
H. Average Income	7657.08	10052.90[a]	10643.16[a]	10051.04[a]	19.13***	.761
M. Average Income	6287.76	7636.37[a]	7759.18[a]	7913.95[a]	17.10***	.740
H. Unemploy. Rates	6.62	6.06	11.85[ab]	10.55[b]	7.88**	.568
M. Unemploy. Rates	9.49	9.34	13.93[ab]	12.08	6.18**	.508
H. Per Capita Unemploy.	23.43	25.76	56.71[ab]	51.83[ab]	12.85***	.694
M. Per Capita Unemploy.	30.18	33.65	57.43[ab]	52.89[ab]	10.99***	.660
H. Transfer Payments	166.81	193.14	293.58[ab]	262.58[a]	9.26***	.607
M. Transfer Payments	315.87	336.68	374.46	323.33	3.42*	.363
H. Net Migration	1713.25	4635.38	-2261.50	-16453.00[abc]	10.26***	.672
M. Net Migration	-492.50	2201.13	-298.25	-3792.33[b]	10.58***	.679
H. Sales Taxes	97.44	134.77[a]	144.98[a]	142.46[a]	19.07***	.656
M. Sales Taxes	46.11	60.42[a]	59.90	79.30[abc]	19.47***	.661
U.S. Average Income	10851.12	11935.24[a]	12424.59[a]	13930.20[abc]	38.48***	.865
U.S. Transfer Payments	187.91	272.67[a]	258.10[a]	229.82	7.07**	.541

Note: H indicates highly involved parishes, M stands for minimally involved parishes.

* $p<.05$ ** $p<.01$ *** $p<.001$

[a] This mean is significantly different from that for the first low period.

[b] This mean is significantly different from that for the increasing period.

[c] This mean is significantly different from that for the decreasing period.

Table 4.2. Means of Economic Health by Petroleum Industry Activity and Type of Involvement

Stability of Price	Low (1956-1973)	Increasing (1974-1981)	Decreasing (1982-1985)	Low (1986-1990)	F	R^2
E. Average Income	7521.16	10144.08[a]	10700.18[a]	9756.70[a]	18.05***	.750
R. Average Income	7774.34	9887.70[a]	10523.91[a]	10403.28[a]	23.27***	.795
E. Unemploy. Rates	5.14	4.98	10.19[b]	10.37[b]	7.24**	.547
R. Unemploy. Rates	8.31	7.59	13.61[ab]	10.40	10.50***	.636
E. Per Capita Unemploy.	18.45	22.40	53.74[ab]	55.30[ab]	12.05***	.680
R. Per Capita Unemploy.	29.24	30.73	60.39[ab]	48.67[ab]	16.63***	.746
E. Transfer Payments	149.06	167.78	249.86[a]	257.02[ab]	8.10**	.575
R. Transfer Payments	188.85	217.37	327.30[ab]	247.57[c]	11.12***	.650
E. Net Migration	1468.50	3308.00	-255.50	-8853.33[abc]	10.18***	.671
R. Net Migration	903.25	1679.75	-2028.00	-5029.67[ab]	9.24**	.649
E. Sales Taxes	103.81	150.90[a]	168.73[a]	154.52[a]	17.68***	.639
R. Sales Taxes	82.16	104.40[a]	105.73[a]	120.50[a]	18.97***	.655
U.S. Average Income	10851.12	11935.24[a]	12424.59[a]	13930.20[abc]	38.48***	.865
U.S. Transfer Payments	187.91	272.67[a]	258.10[a]	229.82	7.07**	.541

Note: E stands for extraction parishes, R indicates related activities parishes.

* $p<.05$ ** $p<.01$ *** $p<.001$

[a] This mean is significantly different from that for the first low period.

[b] This mean is significantly different from that for the increasing period.

[c] This mean is significantly different from that for the decreasing.

Table 4.3. Regression Results for the Effect of Changes in Petroleum Industry Activity on Community Economic Health by Degree of Involvement[a]

A. Highly Involved Parishes

Average Income	B	beta
D1 Price	24.348[b]	.325[b]
L1 D1 Wells	2.340**	.453**
L2 D1 Price	-36.613**	-.482**
L1 D1 Income	0.493*	.488*
Constant	110.287	
Adjusted R^2	.628***	
Durbin-Watson	2.395	
First Order Autocorr.	-.200	
R^2 due to Price and Wells	.383	

Transfer Payments	B	beta
D1 Price	-4.371*	-.336*
L2 D1 Price	8.827***	.671***
Constant	4.916	
Adjusted R^2	.509***	
Durbin-Watson	2.548	
First Order Autocorr.	-.304	

Unemployment Rates	B	beta
D1 Wells	-0.014**	-.480**
L2 D1 Price	.304***	.677***
Constant	-.221	
Adjusted R^2	.527***	
Durbin-Watson	2.069	
First Order Autocorr.	-.043	

Per Capita Unemployment	B	beta
D1 Wells	-0.064**	-.461**
L2 D1 Price	1.487***	.721***
Constant	-.521	
Adjusted R^2	.544***	
Durbin-Watson	2.159	
First Order Autocorr.	-.080	

Net Migration	B	beta
L1 D1 Price	789.580**	.587**
L3 D1 Price	-900.301**	-.533**
Constant	-378.354	
Adjusted R^2	.648***	
Durbin-Watson	2.153	
First Order Autocorr.	-.101	

Sales Taxes Collected	B	beta
L1 D1 Wells	0.067[c]	.325[c]
L3 D1 Price	-1.887**	-.490**
Constant	1.956	
Adjusted R^2	.240**	
Durbin-Watson	1.804	
First Order Autocorr.	.083	

Table 4.3. Regression Results for the Effect of Changes in Petroleum Industry Activity on Community Economic Health by Degree of Involvement (Continued)

B. Minimally Involved Parishes

Average Income

	B	beta
D1 Wells	1.939[d]	.397[d]
Constant	141.785	
Adjusted R^2	.113[d]	
Durbin-Watson	2.350	
First Order Autocorr.	-.184	

Unemployment Rates

	B	beta
D1 Wells	-0.014**	-.540**
L1 D1 Price	.263***	.700***
L1 D1 Unemploy.		.412*.397*
Constant	-.226	
Adjusted R^2	.608***	
Durbin-Watson	1.938	
First Order Autocorr.	-.007	
R^2 due to Price and Wells[e]		

Per Capita Unemployment

	B	beta
D1 Wells	-0.045*	-.418
L1 D1 Price	0.969**	.617**
L1 D1 Unemploy.	0.453*	.432*
Constant	-0.789	
Adjusted R^2	.516**	
Durbin-Watson	2.245	
First Order Autocorr.	-.125	
R^2 due to Price and Wells	.408	

Sales Taxes Collected

	B	beta
L3 D1 Price	-1.343***	-.641***
L4 D1 Price	1.029**	.489**
L4 D1 Wells	-0.034*	-.326*
Constant	2.039	
Adjusted R^2	.396**	
Durbin-Watson	1.693	
First Order Autocorr.	.134	

[a] D1 stands for first differences, L1 is the first lag, L2 is the second lag, L3 indicates the third lag, and L4 means the fourth lag.

[b] $p = .0503$

[c] $p = .0538$ This term added .08 to the adjusted R^2.

[d] $p < .08$ This model was reported because it is contradictory to the hypothesis.

[e] The adjusted R^2 for the lag of the dependent variable by itself was .000; the adjusted R^2 for price and wells without the lag of the dependent variable was .4642.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 4.4. Regression Results for the Effect of Changes in Petroleum Industry Activity on Community Economic Health by Type of Involvement[a]

A. Extraction Parishes

Average Income

	B	beta
D1 Price	33.247*	.359*
L1 D1 Wells	3.253***	.510***
L2 D1 Price	-52.223***	-.557***
L1 D1 Income	0.515**	.510**
Constant	111.108	
Adjusted R^2	.737***	
Durbin-Watson	2.012	
First Order Autocorr.	-.008	
R^2 due to Price and Wells	.532	

Transfer Payments

	B	beta
L2 D1 Price	8.512**	.619**
Constant	3.603	
Adjusted R^2	.351**	
Durbin-Watson	2.590	
First Order Autocorr.	-.308	

Unemployment Rates

	B	beta
L2 D1 Price	0.291**	.558**
Constant	0.016	
Adjusted R^2	.275**	
Durbin-Watson	1.534	
First Order Autocorr.	.231	

Per Capita Unemployment

	B	beta
L2 D1 Price	1.501**	.589**
Constant	0.337	
Adjusted R^2	.310**	
Durbin-Watson	1.624	
First Order Autocorr.	.174	

Net Migration

	B	beta
L1 D1 Price	475.976***	.605***
L3 D1 Price	-494.388**	-.501**
Constant	-312.087	
Adjusted R^2	.633***	
Durbin-Watson	2.522	
First Order Autocorr.	-.287	

Sales Taxes Collected

	B	beta
L1 D1 Price	1.918*	.395*
L1 D1 Wells	0.073	.276[b]
L3 D1 Price	-2.941***	-.596***
L3 D1 Wells	0.080*	.330*
Constant	1.887	
Adjusted R^2	.445***	
Durbin-Watson	1.638	
First Order Autocorr.	.172	

Table 4.4. Regression Results for the Effect of Changes in Petroleum Industry Activity on Community Economic Health by Type of Involvement (Continued)

B. Related Activities Parishes

Average Income	B	beta	Transfer Payments	B	beta
L1 D1 Wells	1.873*	.456*	L2 D1 Price	7.993***	.699***
Constant	180.318		Constant	2.364	
Adjusted R^2	.166*		Adjusted R^2	.461***	
Durbin-Watson	1.375[c]		Durbin-Watson	2.710[d]	
First Order Autocorr.	.273		First Order Autocorr.	-.395	

Unemployment Rates	B	beta	Per Capita Unemployment	B	beta
L2 D1 Price	0.185*	.514*	L2 D1 Price	0.860*	.556*
Constant	-0.038		Constant	0.063	
Adjusted R^2	.225*		Adjusted R^2	.271*	
Durbin-Watson	1.808		Durbin-Watson	1.710	
First Order Autocorr.	.076		First Order Autocorr.	.122	

[a] D1 stands for first differences, L1 is the first lag, L2 is the second lag, L3 indicates the third lag, and L4 means the fourth lag.

[b] $p < .08$ This term added .052 to the adjusted R^2. When this term was omitted, the third lag of wells was not significant ($p < .08$). When both wells terms were omitted, the errors were not random although the Durbin-Watson statistic was 1.759.

[c] The lag of the dependent variable was not significant by itself or with the wells term.

[d] The lag of the dependent variable was not significant by itself or with the price term.

* $p < .05$

** $p < .01$

*** $p < .001$

Table 4.5. Summary of Changes in Community Economic Health by Degree of Involvement

Impact Variable	Oil Activity Increases	One Year Later	Two Years Later	Three Years Later	Four Years Later
A. Highly Involved Parishes					
income	increases	increases	decreases		
transfer payments	decrease		increase		
unemployment rates	decrease		increase		
per capita unemployment	decreases		increases		
inmigration		increases			
outmigration				decreases	
sales taxes	increase		decrease		
B. Minimally Involved Parishes					
income ($p < .08$)	increase				
unemployment rates	decrease	increase			
per capita unemployment	decreases	increases			
sales taxes				decreases	increase after price, decrease after wells

Table 4.6. Summary of Changes in Community Economic Health by Type of Involvement

Impact Variable	Oil Activity Increases	One Year Later	Two Years Later	Three Years Later	Four Years Later
A. Extraction Parishes					
income	increases	increases	decreases		
transfer payments			increase		
unemployment rates			increase		
per capita unemployment			increases		
inmigration		increases			
outmigration				increases	
sales taxes	increase			decrease after price, increase after wells	
B. Related Activities Parishes					
income		increases			
transfer payments			increase		
unemployment rates			increase		
per capita unemployment			increases		

The outcome also fit the expectation in hypothesis 2 that the impact of changes in petroleum activity would be greater in the highly involved parishes than in the minimally involved ones. All six economic variables were significantly related to changes in petroleum activity in the highly involved parishes, but only three were significant (at the .05 level) in the minimally involved ones. Further, the proportion of variance in the economic variables explained by changes in activity tended to be greater in the highly involved parishes. In the highly involved parishes, four of the six significant relationships had adjusted R^2s for the effect of price and/or wells that were greater than .5, while, in the minimally involved parishes, all of the relationships had adjusted R^2s due to price and/or wells that were less than .5.

Type of Involvement. The hypothesis was largely supported by the results in the extraction parishes (see tables 4.4 and 4.6). Within the first year of an increase in petroleum activity, income, inmigration and sales taxes increased as expected. However, the direction of these relationships reversed in the second and third years after an increase in activity; income decreased, outmigration occurred, plus there was an increase in transfer payments and unemployment. These findings again suggest that there is a cycle of economic impacts consisting of initial improvements in community economic health followed by declining economic health.

The outcome for the related activities parishes tended not to conform to the expectations of the hypothesis. Although income increased the first year after an elevation in petroleum activity, transfer payments and unemployment did not decrease when activity rose. Instead, transfer payments and unemployment increased the second year after a rise in activity.

The results concerning the effect of petroleum activity on economic health fit the predictions of the hypothesis in one more way - the impact on community economic health was greater in the extraction parishes than in the related activities parishes. All six of the possible relationships were significant in the extraction parishes while only four were significant in the related activities parishes. In addition, five of the six relationships in the extraction parishes had adjusted R^2s for the effect of price and/or wells that were greater than .3 while three of the four in the related activities parishes were less than .3.

Effects of Degree and Type of Involvement on Economic Health

The analyses just presented examined the effect of differences in price and wells on changes in economic health. However, time series regression does not statistically compare the levels of the economic variables by degree and type of involvement. To address the third question and third hypothesis, whether degree and type of involvement impact economics, the six dependent variables were calculated for each parish, not for groups of parishes as was presented earlier. Then, the differences in the means of the dependent variables for the groups of parishes - highly involved versus minimally involved, extraction versus related activities - were examined with t-tests.

Degree of Involvement. Degree of involvement did affect economic health; highly involved parishes were better off economically, especially when the petroleum industry was doing well. Average per capita income was significantly greater in the highly involved parishes every year and the differences between the means of income tended to be greater when the industry was more active, the late 1970s and early 1980s (see Appendix E). Also, per capita transfer payments were significantly lower in the highly involved parishes for 18 of the 22 years. The four years in which transfer payments were not significantly lower in the highly involved parishes were years following downturns in the industry. The first two years, 1983 and 1984, are the second and third years after the price of oil started rapidly falling after its peak in 1981. The second two years, 1986 and 1987, are the year of the crash in the price of oil and the number of wells and the year following the dramatic decrease, respectively.

Moreover, unemployment rates were significantly lower in the highly involved parishes for 16 years, 1970 through 1982 plus 1989 and 1990. The period in which the unemployment rates were not significantly lower was the time of rapid decreases in the price of oil (1983 through 1985), the crash in the price of oil and number of wells (1986), and two years following the crash (1987 and 1988). The data suggest that when the industry restabilized after the drop in price and wells, the unemployment rates in the highly involved parishes declined and became significantly less than those in the minimally involved parishes. Further, per capita unemployment was significantly less in the highly involved parishes during years in which the industry was more active. These years were: 1) 1970 through 1972 which was a time when the number of wells was relatively high, although the price of oil was not; 2) 1975 and 1976, a time of petroleum industry readjustments after the oil embargo when the price of oil was setting new high records annually and the number of wells increased dramatically (between 1975 and 1976 wells increased by over 100); 3) 1980 and 1981 which were the last two years of the annual rapid increases in the price of oil; and 4) 1990 which was a local maximum for price and wells (price was about $2 to $3 higher and wells were about 50 higher than any other year during the bust).

Net migration rarely significantly differed by degree of involvement. However, the four years during which migration out of the highly involved parishes was significantly greater than that out of the minimally involved parishes were related to problems in the petroleum industry. The first year, 1984, followed three successive annual large decreases in the price of oil. The other three years, 1986 through 1988, are the year of the crash in price and wells and the two succeeding years. Sales taxes collected also demonstrated significant differences by degree of involvement. This source of revenue was significantly greater in the highly involved parishes from 1957 through 1988. Thus, the results show that highly involved parishes are better off economically, especially when the oil industry is more active.

Type of Involvement. Type of involvement had very little effect on economic health. Average per capita income never significantly differed and transfer payments significantly differed in only three of the 22 years (Appendix F). However, these three years, 1980 through 1982, were the peak in the price of oil. In these three years, transfer payments were

significantly lower in the extraction parishes, suggesting that the extremely high prices of oil stimulated extraction of petroleum, but not refining and wholesaling.

Unemployment rates were significantly lower in the extraction parishes for 9 of the 22 years. These years - 1971 and 1972, 1974 through 1980 and 1982 - were years of greater industry activity; in fact, 1974 is the first year of an increase in the price of oil due to the embargo. The following years, 1975 through 1980, were years of higher prices and, in the late 1970's, years of rapidly increasing prices. The last year, 1982, was the beginning of the rapid decline in price, but the value this year was one of the four largest. The t value for 1981, which was the year of the peak in the price of oil, was not statistically significant at the .05 level, but approached significance. Per capita unemployment significantly differed by type of involvement in only two years, 1971 and 1975. In both years, unemployment was lower in the extraction parishes. Net migration never significantly differed by type of involvement. Sales taxes collected were significantly higher in the extraction parishes during only two of 34 years, 1963 and 1964. In both years, this source of revenue was greater in the extraction parishes. Thus, type of involvement has very little association with economic health. However, extraction parishes do have one economic advantage, lower unemployment, but only when the petroleum industry is very active.

Decennial Economic Data

Since there were so few variables concerning economic health that were available annually, decennial census data were used to supplement the annual data. The following data were used: population, percent of vacant dwellings, percent of owner-occupied dwellings, percent unemployed, median family income, median housing value, median rent, rent as a percentage of monthly income, and housing value as a percentage of annual income (U.S. Bureau of the Census 1952, 1953, 1961, 1962, 1972, 1973, 1982, 1983a, 1991, 1992). The population for each group of parishes was the sum of the populations of the parishes in the group. The two dwelling unit variables were created by summing the numbers of each type of unit for the parishes in the group, then dividing by the sum of the total number of units and multiplying the quotient by 100. To calculate the percentage unemployed, the percentage was multiplied by the population for each parish in the group, then these figures were summed for the group of parishes and divided by the sum of the populations. For variables that were medians, a two stage process was used. First, an adjustment factor was created by dividing each parish's population by the sum of the populations for the parishes in the group. Then, the adjustment factor for each parish was multiplied by the parish's value on the variable (the value was a median), the resulting numbers for the parishes in the group were summed and the sum was divided by the consumer price index. Rent as a percentage of income was calculated by dividing the median family income for each parish by 12 to obtain monthly income, dividing this figure into the median rent, multiplying the result by the proportion of the group's population that was in that parish, summing these figures for the parishes in the group and finally multiplying by 100. Housing value as a percentage of income was estimated by dividing median housing value by median family income for each parish, multiplying the quotient by the proportion of the group's population in the parish, summing these figures for the parishes in the group and multiplying the figure by 100.

Percentage changes for the three phases of oil industry activity - preboom, boom and bust - were calculated to analyze these data. Table 4.7 shows the values for each variable for 1950 (before much oil industry activity in the Gulf), 1960, 1970, 1980 (the boom), and 1990 (the bust) plus the percentage changes for the three phases.

The results show that oil industry activity dramatically increased from the preboom (1950, four years after the first exploratory drilling on the outer continental shelf) to the boom (1980) and decreased from the boom to the bust (1990, four years after the plunge in the price of oil and the number of wells). Activity in 1990 was still greater than that in 1950, which is shown especially by the number of wells.

Degree of Involvement. Degree of involvement affects the impact of changes in oil industry activity on parishes. Rapid inmigration occurred in the highly involved parishes. Population increased faster in the highly involved parishes; in fact, these parishes gained people between 1980 and 1990 while the minimally involved parishes lost people during the 1980's. Between the preboom and the boom, the minimally involved parishes experienced an increase in vacant dwellings, while the percentages of vacant dwellings in the highly involved parishes were almost identical for 1980 and 1990. Between the preboom and the bust, vacant dwellings increased in both groups of parishes and both groups of parishes had more vacant housing in 1990 than in 1950. Owner occupied housing was very similar in the two groups of parishes and the increase between the preboom and boom in owner occupied housing was comparable. Both groups of parishes experienced a decrease in owner occupied housing between the boom and bust; yet, there were more owner occupied dwellings in 1990 than in 1950 in both groups of parishes.

Unemployment and median family income clearly demonstrate the cycle of activity in oil extraction. Unemployment decreased from the preboom to the boom in the highly involved parishes and increased in the minimally involved parishes. However, between the boom and the bust, unemployment increased more rapidly in the highly involved parishes. Overall, the highly involved parishes fared better in unemployment than did the minimally involved parishes because the percentages of unemployed people were always lower in the highly involved parishes and the increase in unemployment from 1960 to 1990 was less in these parishes. Since the median family income in 1950 was so much lower in the minimally involved parishes than in the highly involved ones, the percentage changes are deceptive. People in the highly involved parishes were relatively advantaged in income compared to those in the minimally involved parishes when the oil industry was more active. The median family income in 1950 was approximately $3,000 greater in the highly involved parishes. The disparity in median family income was greater in 1960, 1970 and 1980 (around $6,000 higher in the highly involved parishes than in the minimally involved ones). However, the relative advantage in income was lost during the bust since the difference in median family income returned to approximately $3,000. For both groups of parishes, the means for median family income were greater in the bust than in the preboom and the difference in the means from the preboom to bust was similar for the two groups of parishes ($11,655.75 for the minimally involved parishes and $11,870.72 for the highly involved parishes).

Table 4.7. Economic Changes by Degree and Type of Involvement

	Preboom 1950	1960	1970	Boom 1980	Bust 1990	Preboom to Boom	Boom to Bust	Preboom to Bust
A. Oil Industry Activity								
Price of Oil[a]	10.66	9.73	8.20	26.20	15.33	145.78	-41.49	43.81
Wells	25	269	615	567	402	2168.00	-29.10	1508.00
B. Degree of Involvement								
M.Population	206850	210223	220146	264070	255104	27.66	-3.40	23.33
H.Population	410859	571406	678396	802759	826980	95.39	3.02	101.28
M.VacantDwell	7.66	10.44	10.15	11.37	14.06	48.43	23.66	83.55
H.VacantDwell	7.09	8.46	6.61	7.20	10.52	1.55	46.11	48.38
M.OwnerOccupy	53.16	58.68	64.02	68.01	65.67	27.93	-3.44	23.53
H.OwnerOccupy	54.73	60.77	65.29	65.99	63.13	20.57	-4.33	15.35
M.%Unemployed[b]		7.44	6.75	8.34	11.25	12.10	34.89	51.21
H.%Unemployed[b]		6.57	4.95	4.98	9.00	-24.20	80.72	36.99
M.MdIncome[a]	5931.44	9330.06	14642.86	18366.84	17587.19	209.65	-4.24	196.51
H.MdIncome[a]	8940.54	15581.03	20402.55	24759.52	20811.26	176.94	-15.95	132.77
M.HouseValue[a]	11969.78	21040.12	22689.44	35816.98	33426.13	199.23	-6.68	179.25
H.HouseValue[a]	17488.11	33875.01	35622.86	54632.47	42253.05	212.40	-22.66	141.61
M.Rent[a]	55.54	111.51	98.78	93.78	124.31	68.85	32.55	123.82
H.Rent[a]	91.64	179.55	149.46	195.84	176.77	113.71	-9.74	92.90
M.Rent%Income	11.21	14.43	8.05	6.04	8.45	-46.12	39.90	-24.62
H.Rent%Income	12.22	13.86	8.72	9.39	10.18	-23.16	8.41	-16.69
M.House%Income	208.33	233.95	156.02	195.29	190.62	-6.26	-2.39	-8.50
H.House%Income	196.23	217.27	173.87	219.68	203.52	11.95	-7.36	3.72

Table 4.7. Economic Changes by Degree and Type of Involvement (Continued)

C. Type of Involvement								
E.Population	178973	234634	290674	354547	368023	98.10	3.80	105.63
R.Population	176469	267180	297992	346501	353963	96.35	2.15	100.58
E.VacantDwell	8.00	7.93	6.98	7.35	11.24	-8.13	52.93	40.50
R.VacantDwell	6.59	9.21	6.53	6.57	9.14	-0.30	39.12	38.69
E.OwnerOccupy	53.75	60.28	63.93	64.41	60.49	19.83	-6.09	12.54
R.OwnerOccupy	56.70	62.29	67.68	68.53	66.46	20.86	-3.02	17.21
E.%Unemployed[b]		5.49	4.53	4.37	8.61	-20.40	97.03	56.83
R.%Unemployed[b]		7.34	5.52	5.71	8.92	-22.21	56.22	21.53
E.MdIncome[a]	7953.71	14532.69	19714.24	24676.29	20404.26	210.25	-17.31	156.54
R.MdIncome[a]	9945.78	16201.63	21006.93	24843.06	21660.81	149.78	-12.81	117.79
E.HouseValue[a]	16516.45	31339.21	36547.70	57994.25	42168.63	251.13	-27.29	155.31
R.HouseValue[a]	18426.91	35115.93	33458.52	50802.15	42715.35	175.70	-15.92	131.81
E.Rent[a]	83.10	178.98	146.85	199.64	164.70	140.24	-17.50	98.19
R.Rent[a]	101.75	177.16	150.46	188.06	182.47	84.83	-2.97	79.33
E.Rent%Income	12.52	14.70	8.89	9.60	9.69	-23.32	0.94	-22.60
R.Rent%Income	12.05	13.21	8.51	8.97	10.04	-25.56	11.93	-16.68
E.House%Income	207.47	215.14	184.67	233.07	206.80	12.34	-11.27	-0.32
R.House%Income	183.32	215.92	157.82	204.24	197.87	11.41	-3.12	7.94

Note: M. stands for minimally involved parishes, H. indicates highly involved parishes, E. means extraction parishes and R. stands for related activities parishes.

[a] Constant dollars, adjusted for inflation.

[b] The Census Bureau data do not give the percentage of people unemployed for 1950 and estimates using the number of people employed and the number of people of working ages were not always consistent with the percentages for the other four decades; therefore 1950 has been omitted. 1960 is used for the preboom for this variable.

Although the highly involved parishes experienced the advantages of less unemployment and greater median family incomes, they also underwent higher housing costs. Again the discrepancy in the 1950 figures causes the percentage changes to be deceptive. First, housing costs were always greater in the highly involved parishes. Second, between the preboom and the boom, housing costs rose faster in the highly involved parishes. In 1950, the difference in the median value of a house was around $6,000 while this disparity was around $19,000 in 1980 and the difference in the median rent was about $36 in 1950 and approximately $102 in 1980. However, housing costs decreased faster in the highly involved parishes between the boom and bust. Between 1980 and 1990, the difference in the median value of a house decreased from around $19,000 to about $9,000 and the disparity in median rent declined from approximately $102 to about $52. Homeowners were better off in the highly involved parishes since their homes increased in value faster than homes in the minimally involved ones, but renters and home buyers were worse off in the highly involved parishes due to the faster increase in housing costs.

An additional factor must be considered in examining housing costs - income. Income was greater in the highly involved parishes during the time when housing costs were greater; therefore, it is necessary to examine rent and the value of a house as a percentage of income. Renters and home buyers fared better in the minimally involved parishes while homeowners were better off in the highly involved parishes. Rent as a percentage of income decreased faster in the minimally involved parishes between the preboom and the boom, and, despite a faster increase in rent as a percentage of income between the boom and the bust, the overall decrease in rent as a percentage of income was greater in the minimally involved parishes. The median value of a house increased in the highly involved parishes and decreased in the minimally involved ones between the preboom and the bust, and, in spite of a faster decline in the value of a house between the boom and the bust, the median value of a house increased in the highly involved parishes during the period under study and declined in the minimally involved parishes.

Type of Involvement. Type of involvement has very little influence on the impact of changes in oil industry activity on parishes. Table 4.7 demonstrates that the values of the variables and the percentage changes for extraction and related activities parishes are very similar. First, the populations for the two groups of parishes are almost identical as are the percentage changes. Both groups of parishes almost doubled in population between the preboom and boom and did double between the preboom and bust. The phase of the oil industry development had a somewhat greater effect on the percentage of vacant housing in the extraction parishes than the related activities parishes. The disparity by type of involvement in the percentage of vacant housing was greater when the oil industry was less active due to the decrease in vacant housing in the extraction parishes during the boom. Although the percentage changes in vacant housing between the preboom and bust were similar by type of involvement, vacant housing decreased faster in the extraction parishes between the preboom and boom and increased faster between the boom and the bust. The percentages of owner occupied housing were very similar by type of involvement for all five decades, thus the percentage changes were also comparable.

The bust in the oil industry had a stronger negative effect on unemployment in the extraction parishes, as was demonstrated earlier by the ANOVA results, while the boom decreased the percentage of unemployed people in the related activities parishes. Although the extraction parishes had a lower percentage of unemployed people every decade, the percentages were more similar for 1990 than for any other decade. Also, the increase in unemployment from the boom to the bust was greater for the extraction parishes. The boom had a stronger positive effect on median family income in the extraction parishes. In 1950, families in the extraction parishes earned about $2,000 less than those in the related activities parishes, but, in 1980, the difference was less than $200. However, the bust was associated with a decrease in median family income in both parishes, which was faster in the extraction parishes, and the discrepancy in income increased to over $1,200. The means for both groups of parishes were greater in the bust than in the preboom - the mean for the extraction parishes in 1990 was $12,450.55 higher than that in 1950 while the mean for the related activities parishes in 1990 was $11,715.03 higher.

The boom in the oil industry increased housing costs faster in the extraction parishes. The value of a house in the extraction parishes was almost $2,000 less than in the related activities parishes in 1950, but, in 1980, the value of a house was over $7,000 greater in the extraction parishes. However, the gain in the value of a house in the extraction parishes during the boom was lost during the bust and the 1990 values were very similar by type of involvement. Similarly, in the extraction parishes, the cost of rent increased faster between the preboom and boom and decreased faster between the boom and bust. Rent was almost $20 cheaper in the extraction parishes in 1950, but it was $11 more in these parishes in 1980. In addition, rent was almost $18 cheaper in the extraction parishes in 1990. Again, the changes in income must be taken into account when examining housing costs. Rent as a percentage of income was very similar by type of involvement in 1950, 1960, 1970 and 1980 and the percentage changes between the preboom and boom were comparable. However, rent as a percentage of income increased faster between the boom and bust in the related activities parishes and was higher in these parishes in 1990 although it had always been higher in the extraction parishes in the previous decennial years. The value of a house as a percentage of income was higher in the extraction parishes for all five decades, but the increase between the preboom and boom in this variable was very similar for both groups of parishes. The value of a house as a percentage of income decreased faster in the extraction parishes between the boom and bust and was similar to its 1950 value. However, the figures for this variable were not very stable across the five decades.

Government Revenues and Expenditures

We were also interested in how changes in oil industry activity affect parish government revenues and expenditures, but such data were difficult to locate. Annual data on government revenues and expenditures, other than sales taxes collected, could not be found and the decennial census data did not include this information. Hence, we used the data concerning state and local governments published every five years by the U.S. Bureau of the Census (1964, 1969, 1974, 1979, 1984 and 1990) to examine how oil industry activity is related to

government revenues and expenditures. We examined total revenue, revenue from the state, total expenditures, transportation and highway expenditures, public safety (police and fire) expenditures and sewage and sanitation expenditures. Each variable was created by summing the amounts for the parishes in the group, dividing by the sum of the populations of the parishes in the group, multiplying by 1000 (to convert the data from thousands of dollars into dollars), and dividing by the consumer price index.[5] Thus, the variables are per capita dollar amounts in 1983 dollars. We compared the means of these variables for the preboom (1962 - the first year for which the data were available - 1967 and 1972) with the means for the boom (1977 and 1982) and the values for the bust (1987, the most recent year for which the data were available) for each of the four groups of parishes using one-way analysis of variance. The results are shown in Table 4.8.

Very few differences across the three periods were statistically significant, despite the strong relationships, due to the small number of data points. The data demonstrated that oil industry activity was greater during the boom than the preboom and bust for both price and the number of wells. In contrast, only two per capita revenue and expenditure variables displayed this pattern of a greater value during the boom than the preboom or bust - revenue from the state for all four groups of parishes and transportation and highway expenditures in the highly involved and related activities parishes. The other revenue and expenditure variables increased across the three periods. For most of these variables, the increase from the preboom to the boom was greater than the increase from the boom to the bust. The exceptions were revenue from the state in all groups of parishes, transportation and highway expenditures in the highly involved and related activities parishes, public safety and sewage and sanitation expenditures in the extraction parishes. The larger increase from the preboom to the boom would be anticipated based on the years of data for the three periods. The years for which the data were available for the preboom span a 10 year period (1962 through 1972) while the years for which the data were obtainable for the boom cover a 5 year period (1977 through 1982) and the data for the bust represent only 1 year (1987). Therefore, if revenues and expenditures were increasing at the same rate for the entire period, a larger increase between the means of the preboom and boom years than between the mean of the boom years and the value for the year for the bust would be expected.

Therefore the data support neither the strain hypothesis of expenditures - that communities undergoing a boom in their major industry experience strain in attempting to provide necessary services - nor the gain hypothesis of revenues and expenditures - that communities undergoing a boom have higher per capita revenues and lower per capita expenditures because they increase people without a commensurate increase in demand for services.

Table 4.8. Mean Per Capita Parish Government Revenue and Expenditures by Degree and Type of Involvement

	Preboom	Boom	Bust	F	R^2
A. Oil Industry Activity					
Price of Oil	8.82	21.85	13.56	2.55	.630
Wells	484.33	638.00	353.00	3.15	.677
B. Degree of Involvement					
M. Total Revenue	610.82	998.70	1138.29	6.31[a]	.808
H. Total Revenue	697.74	1289.45	1592.77	7.90[a]	.840
M. Revenue from State	369.13	482.45	409.33	3.81	.717
H. Revenue from State	298.62	430.72	363.83	3.12	.675
M. Total Expend.	638.82	962.91	1148.35	6.38[a]	.810
H. Total Expend.	751.80	1241.45	1555.62	6.71[a]	.817
M. Transportation	46.76	68.36	74.46	8.48[a]	.850
H. Transportation	59.08	88.17	87.66	3.27	.686
M. Public Safety	31.34	50.95[b]	69.25[b]	43.25**	.966
H. Public Safety	45.46	75.12	92.88	8.35[a]	.848
M. Sewage/Sanitation	10.50	16.28	22.71	5.21	.776
H. Sewage/Sanitation	25.93	55.19[b]	80.76[bc]	56.64**	.974
C. Type of Involvement					
E. Total Revenue	678.69	1285.59	1792.81	7.43[a]	.832
R. Total Revenue	675.83	1183.77	1294.86	9.09[a]	.858
E. Revenue from State	298.69	406.51	339.51	1.75	.539
R. Revenue from State	286.16	399.55	348.98	3.41	.695
E. Total Expend.	754.42	1267.18	1763.42	4.15	.735
R. Total Expend.	735.90	1142.71	1235.50	10.14*	.871
E. Transportation	60.48	99.24	103.69	2.91	.660
R. Transportation	55.32	78.01[b]	72.45	16.52*	.917
E. Public Safety	43.21	63.84	86.29	5.55[a]	.787
R. Public Safety	42.17	77.36	95.27	12.43*	.892
E. Sewage/Sanitation	28.89	44.96	72.88	3.40	.694
R. Sewage/Sanitation	23.04	53.41	69.90	4.56	.753

Note: M. stands for minimally involved parishes, H. for highly involved parishes, E. for extraction parishes and R. for related activities parishes. Dollar amounts are in 1983 dollars.

* $p < .05$

** $p < .01$

[a] $p < .10$

[b] This mean is significantly different from that for the preboom.

[c] This mean is significantly different from that for the boom.

DISCUSSION

Only some of the results support the common sense notion that communities experience improved economic health when their major industry is more active. The analysis of variance showed some evidence in support of an economic gain when petroleum activity was rapidly increasing (income, unemployment rates and net migration, but not transfer payments and per capita unemployment); however, this analysis did show that there are serious economic problems when petroleum activity was rapidly decreasing or had attained a low level after having been highly active (income, unemployment rates, per capita unemployment, transfer payments and net migration). The means for income were greater in the bust than in the preboom, but the percentage increases for three groups of parishes - minimally involved, highly involved, and extraction - were similar to that for the nation as a whole. However, the percentage increase for the related activities parishes was greater than those for the other groups of parishes and for the nation. The regression results supported the idea that there may not be much improvement in economic health when the industry is doing well. Although the indicators of economic health displayed improvement - higher incomes, sales taxes collected and inmigration and lower transfer payments and unemployment - these findings also demonstrated that this improvement was transitory. Community economic health increased within one year of an increase in petroleum activity; conversely, community economic health decreased the second, third and fourth years after a rise in industry activity.

The t-tests do not take into account changes in industry activity - they only examine the effect of degree or type of involvement on the measures of economic health. Therefore, differences in the means by degree or type of involvement could be due to disparities in factors between the groups of parishes. With this in mind, the findings did show that the highly involved parishes had better levels on the economic variables than did the minimally involved parishes, especially in years where the petroleum industry was known to be more active. On the other hand, there was no difference in the levels of the economic indicators by type of involvement.

The decennial data support many of the prior studies and common sense notions about the economic viability of communities in the three major phases of economic development - the preboom, boom and bust. Between the preboom and the boom, the highly involved, extraction, and related activities parishes, experienced rapid population increases, a shortage of vacant housing, a reduction in unemployment and increases in income and housing costs. All of these changes reversed between the boom and the bust in these three groups of parishes. The populations almost ceased to grow, there were increases in vacant dwellings and unemployment and decreases in income and housing costs.

The outcome of this study also showed that government revenues and expenditures were largely unaffected by the boom/bust cycle; therefore, neither the strain hypothesis of expenditures nor the gain hypothesis of revenues and expenditures were supported. Revenue received from the state was higher in the boom than during the preboom and bust in all four parish groups while expenditures on transportation and highways were also their largest in

the boom in the highly involved and related activities parishes. Both of these results are easily understandable. When the petroleum industry is more active, the state has more money to disperse among the parishes. Further, highly involved and related activities parishes, but not extraction parishes, have a greater need for highways and transportation facilities to move the oil. The extraction parishes mainly need to transport workers to the rigs, which is primarily accomplished using helicopters, and to move oil to shore, which is largely done through the pipelines. Neither of these require many workers or parish government expenditures. In contrast, the related activities parishes must transport the crude and refined oil to their appropriate destinations, which may involve trucks and this type of transportation requires roads.

Answers to the Three Questions

The answer to the first question is yes; changes in petroleum industry activity do affect community economic health. There were overall increases in the means for income in all four groups of parishes and the nation and these changes in the minimally involved, highly involved and extraction parishes were similar to those for the nation. The preboom to bust percentage change in the mean for income was greater in the related activities parishes than in the nation, although the actual dollar amount of change was less than that in the nation.

However, the actual effect is not straightforward. The findings indicate that the improved economic health is transitory. These improvements can be lost as early as the second or third year after an increase in petroleum activity and will be lost during the bust, if not sooner. Further, the results more clearly showed the economic problems of the bust than any economic gain during a period of rapid increases in activity in the industry.

Similarly, the answer to the second question is yes; the effect of petroleum industry activity on community economic health does depend on the degree and type of involvement. There were more significant relationships between activity and economic health in the highly involved and extraction parishes than in the minimally involved and related activities ones. Moreover, the detrimental impact of decreases in petroleum activity was clearer in the highly involved and extraction parishes.

Yes, the level of economic health does differ by degree of involvement; however, it does not vary by type of involvement. The highly involved parishes tended to have better levels on the economic indicators than did the minimally involved ones, especially in years when the petroleum industry was known to be more active. In contrast, the levels on the economic variables were rarely significantly different in the extraction and related activities parishes.

Theoretical Implications

The results suggest that communities highly involved in offshore petroleum production, particularly those involved primarily in extraction, do not permanently experience greater economic health due to increases in petroleum industry activity and whatever improvement in

economic health is gained due to an increase in activity is lost shortly thereafter. The highly involved and extraction parishes experience an economic roller coaster ride of short term improvements succeeded by declines in economic health. Moreover, whatever improvements are gained during the boom are lost during the bust. The outcome demonstrates the need for communities to have a more diversified economy. The related activities parishes fared better during the bust and did not experience as many of the improvements and reversals as did the extraction parishes.

The findings are also useful for explaining the contradictory results of previous studies - the results depend on when the researcher examines the economic variables to look for impacts and the analytical technique utilized. If we had only compared the levels of the economic variables across degree of involvement, we would have concluded that involvement in the petroleum industry was economically beneficial for communities. In contrast, when the effect of changes in petroleum activity on community economic health was examined more directly - using analysis of variance or time series regression - the results indicated that greater involvement has few economic gains for communities and these gains may be transitory. On the other hand, the results of the analyses of the decennial data do fit the common expectation of economic gains during the boom and economic problems in the bust. Moreover, the outcome of this study further demonstrates the need to analyze the relationship between energy extraction activity and economic conditions using a technique that allows for a reversal in the direction of the associations at a later time. Especially in the highly involved and extraction parishes, initial economic gains were succeeded by a reversal of these relationships. The improvements mainly occurred within one year of an increase in oil activity and were followed by reversals in the second, third and fourth years after a rise in activity.

Policy Implications

The findings demonstrate the need for a diversified economy. Economic improvement, even when the extraction industry is doing well, is likely but not assured: economic problems when the industry is doing poorly are highly probable. The economic decline due to the downturn in the industry can be mitigated somewhat if the community has a more diversified economy. In fact, even a more diversified involvement in the extraction - such as producing products from the extracted resource, constructing equipment needed for extraction, transporting the raw material and its products, wholesaling the raw material and products - may be economically beneficial, particularly when the industry is less active. On the other hand, it is possible that the economic survival of the related activities parishes was due to the importation of oil from other countries. If this is the case, then the economic survival of these communities would not be generalizable to other communities involved in activities related to extraction where importation of the raw resource is not possible.

If a community is undergoing rapid economic development through resource extraction and the extracted material could be obtained from other regions when it is not available in the host community, then it may be possible to ensure a more diversified involvement in the

extractive industry. The creation of a more diversified involvement could be accomplished by requiring companies that are extracting the resource to site plants that process the material in a way that adds to the value of the material in the community from which the resource is extracted. These plants cannot be those that do low level processing that adds little to the value of the resource, such as cutting lumber to make it easier to transport. To mitigate some of the negative impacts, the plants must be those that truly add to the value of the material that was extracted, such as refining petroleum for use as gasoline and heating fuel.

Another possible method of mitigating some of the negative impact on community economic health may be to set aside money from federal lease sales, sales taxes collected and the companies involved in extraction for job training and employment counseling of long-time residents and newcomers. However, some prior research shows that long-time residents are unwilling to undergo job training to obtain employment at power generating stations (Little and Lovejoy 1979; Lovejoy 1983). Such money could also be used to mitigate the increase in transfer payments that occurs when unemployment increases, partly due to the number of inmigrants attempting to find employment in a community undergoing extractive energy development.

It might also be possible to reduce the economic roller coaster of improved economic health succeeded by decreasing economic health by regulating the speed with which the extractive industry is allowed to develop. In the context of offshore petroleum extraction, this could be accomplished by monitoring economic impacts and adjusting the number of tracts leased and number of wells allowed to control the economic changes. Unfortunately, this strategy may have the effect of increasing the anticipated duration of extractive endeavors in the community and elongating the period of prosperity associated with the extraction which may result in a greater risk of overspecialization to the extractive industry (Freudenburg and Gramling 1992).

The outcome of this study also demonstrates the need for federal and state government agencies to monitor the effects of energy development projects. It was not possible to collect the economic data, except sales taxes, prior to 1969. Further, true baseline figures for any social and economic impact variable for Louisiana cannot be obtained, even at the parish level, due to the long involvement of Louisiana in the offshore petroleum industry, discussed earlier. Moreover, annual data at the parish level are rare. Bankruptcy data at the parish level are only available beginning in 1986, retail sales data by parish is obtainable only in the late 1950's, and data concerning collection of various taxes (corporate income, corporate franchise, individual income, severance, tobacco and liquors-alcohol) are only available at the state level. When it is expected that a region of the country will be host to an energy development project, attention should be paid to collecting baseline data to adequately measure the impacts of that project.

Contributions to the Literature

The first contribution of this study to the literature concerning the effect of energy development on economic health of communities is that some of the findings replicated those of prior studies. The decennial results of this study do support the findings of previous studies that used percentage changes between one time representing the preboom and another representing the boom. Second, the findings suggest that the effects of petroleum extraction are not limited to the communities that are highly involved in this activity. There were a few significant relationships in the minimally involved parishes. This outcome has important implications for monitoring and mitigation programs as this result implies that such programs should include communities near that which is the host to the resource extraction activity. For example, the Santa Barbara monitoring and mitigation program discussed previously should be examining the surrounding communities to determine if they are also affected and to take steps to reduce the impacts. Third, the results suggest that highly involved communities are not affected equally. Those communities that have a more diversified involvement in energy extraction may experience fewer impacts than those that are primarily involved in just extraction activities. Thus, future studies of social and economic impacts of extractive industries should account for the type of involvement of the community in the extractive industry.

In summary, the findings of this study suggest the need for improvement in the methods used to analyze social and economic impacts of economic development projects. Such research should include communities uninvolved or minimally involved in the development, many studies in this literature do not include these communities (see Seydlitz et al. 1993). Also, investigators interested in the impacts of economic development, especially resource extraction, need to be more careful about the measurement of the phases of the extraction activities (see Seydlitz et al. 1993). In addition, there is a need for longitudinal studies that investigate the possibility of differential impacts due to the type of resource extracted (e.g., renewable or non-renewable), the geographical isolation of the community that is host to the extraction industry, and the location of the extracted resource (e.g., onshore or offshore) (Freudenburg 1992).

The effect of development of extractive industries on community economic health may differ by the type of resource extracted - non-renewable or renewable (Freudenburg 1992). Although it is possible to exhaust a renewable resource by extracting it too quickly, it is certain that a non-renewable resource will be exhausted and the industry will leave the region resulting in the need for the community to develop another industrial base. Developing another industry can be difficult since extractive economies develop infrastructures that are difficult, if not impossible, to use for some other endeavor (Bunker 1984). Also, skill overspecialization may have occurred; thus, the people of the region may lack the knowledge necessary to attract and to provide workers for a new industry (Bunker 1984; Freudenburg 1992; Freudenburg and Gramling 1992; Gramling and Freudenburg 1992). Therefore, in studies of the effect of economic development on communities' economic health, it is

necessary to distinguish the type of development - productive or extractive - and the type of resource extracted - renewable or non-renewable.

It is also possible that the effects of extractive economic development may depend on the resource extracted and where it is extracted from - onshore or offshore. Offshore petroleum extraction has some characteristics in common with other extractive energy development, such as that in the western United States, onshore petroleum extraction, and coal mining, and some differences from onshore energy development. The similarities include the cyclical nature of the extraction, the creation of new local jobs, and the attraction of inmigrants who hope to obtain the new jobs. In contrast, offshore petroleum extraction differs from the western energy development in that not all new employment opportunities are located near the source of the oil because the construction of offshore rigs can occur at any coastal site in the world and work schedules on oil rigs allow long-distance commuting (Forsyth and Gauthier 1991; Gramling 1989; Gramling and Brabant 1986).

The possible differences between offshore petroleum extraction and other energy extraction are further demonstrated by the debate concerning the applicability of the classic boomtown model, which was developed for the western energy extraction, to Louisiana communities involved in the petroleum industry. Classic boomtowns have the following characteristics: they undergo extremely rapid growth and change, they are geographically isolated which requires workers to move into the community, and their populations were larger earlier in the century - around 1910 and 1920 - than in 1970 (Albrecht 1982). In contrast to the classic boomtown, population growth in Louisiana communities involved in the offshore petroleum industry occurred over several decades (Gramling 1984a; Gramling and Brabant 1986) and the shifts on offshore rigs allow long-distance commuting. On the other hand, some researchers argue that Louisiana communities have many of the characteristics and stresses of classic boomtowns (Brabant 1991; Gramling 1992). Thus, there is a need to examine the impacts of offshore petroleum extraction.

Very little of the literature concerning the economic impacts of energy extraction comes from studies of the economic impacts of offshore petroleum extraction; therefore, the effect of offshore petroleum extraction on community economic health largely is unknown. In fact, there is a paucity of studies of any impacts at all of offshore petroleum development, especially in the Gulf of Mexico (notable exceptions include Brabant 1984, 1991; Gramling 1984a, b, c and d; Gramling and Brabant 1986; Gramling and Freudenburg 1990; Manuel 1984a and b). Studies of the effect of offshore petroleum extraction in the Gulf of Mexico are important because the Gulf is the main site of known American petroleum reserves and the Western and Central Gulf is one of the few coastal areas of the United States not included in the moratoria (Goll 1993).

ENDNOTES

1. The employment data were compiled for us in the summer of 1992 by Patty Lopez of the Louisiana Department of Employment and Training, Research and Statistics Unit, Room 202, Box 94094, Baton Rouge, Louisiana 70804-9094.

2. Personal communication with Mike Melancon of the U.S. Department of the Interior, Minerals Management Service, Summer 1992.

3. The highly involved parishes were: Acadia, Calcasieu, Cameron, Iberia, Lafayette, Plaquemines, St. Bernard, St. Charles, St. James, St. Mary, Terrebonne and Vermilion. The minimally involved parishes were: Allen, Ascension, Avoyelles, Beauregard, Caldwell, DeSoto, Grant, Madison, West Carroll, West Feliciana and Winn.

4. The extraction parishes were: Cameron, Lafayette, LaFourche, St. Mary and Vermilion. The related activities parishes were: Acadia, Calcasieu, St. Bernard, St. Charles and St. James.

5. Some parishes were omitted from the analyses for some of the variables due to missing values or extreme outliers. Plaquemines was omitted from the highly involved parishes for transportation expenditures because its 1982 value was a high outlier. Caldwell and West Feliciana were omitted from the minimally involved parishes for sewage and sanitation expenditures because the data were missing for 1972. Ascension and Avoyelles were omitted from the minimally involved parishes for sewage and sanitation expenditures because their values were very high outliers in 1982 and 1987, respectively.

CHAPTER 5

CONCLUSION

In the previous chapters, results regarding the effect of offshore petroleum extraction activity in the Gulf of Mexico on social problems, education, and community economic health of communities (operationalized as parishes) in Louisiana were presented. The findings were given separately for four groups of parishes. The parishes varied by degree of involvement (highly or minimally involved) and type of involvement (extraction activities or activities related to extraction - e.g., refining, fabrication, and wholesale trade) in offshore petroleum extraction. Petroleum industry activity was measured by the price of oil and the number of developmental wells in OCS waters off the coast of Louisiana. Multiple variables were used to indicate social problems, education, and community economic health. In this chapter, the following questions will be addressed: Can the effect occur? What is the effect? What is its likelihood of happening? Can the effect be mitigated?

CAN THE EFFECT OCCUR?

In this section, information will be presented to determine if the effect can occur. This question will be addressed by determining if there is any evidence that resource extraction or energy development has affected a particular dimension of impact. The focus will be on whether or not there is an effect, not whether the effect is positive or negative, which will be discussed in the next section. Although diverse effects, including some not examined in this study, potentially can occur, this presentation will focus on the dimensions of social and economic impacts investigated in this study - social problems, education and community economic health. The answers will be based on the results of this study and prior research reviewed in the preceding chapters. For each dimension of impact, the results from the current study will be discussed first. The findings from previous investigations will be presented second.

Social Problems

Social problems in response to resource extraction, including offshore petroleum mining can and do occur. The outcome of this study demonstrated that the rates of social problems were higher when petroleum industry activity was rapidly changing, both increasing and decreasing. These rates remained higher even during the years after the crash in the price of oil, although the rates for the years after 1985 tended not to be the highest of the four periods. Moreover, this study found significant associations of petroleum industry activity with criminal court cases and suicides in all four parish groups. Also, there was a significant effect on homicide rates in the highly involved and extraction parish groups.

Prior research concerning the effect of resource extraction and energy development on social problems also reports significant associations between resource extraction activities and crime (Brookshire and D'Arge 1980; Dixon 1978; Finsterbusch 1982; Freudenburg and Jones 1991; Gramling and Brabant 1986; Krannich et al. 1989). Previous studies have examined a broader range of potential social problems than was possible in the current investigation. These explorations have reported impacts on community satisfaction (Finsterbusch 1982; Freudenburg 1981, 1984, 1986; Moen 1981), juvenile delinquency (Erickson and Jensen 1977), residents' well-being and social disruption (Brown et al. 1989; Dixon 1978; England and Albrecht 1984). Future research concerning extraction activities should include more measures of social problems tapping more diverse dimensions of social problems, such as violent crime, property crime, community satisfaction, residents' stress, residents' recognition of and familiarity with their neighbors and residents' social networks.

Education

There are very few studies that examine the impact of resource extraction or energy development on education. However, the available evidence suggests that resource extraction and energy development can affect educational variables. Based on the results from the present study, it can be concluded that resource extraction activities affect educational attainment. Both basic level (high school completion) and enhancement level (enrolling in college) educational attainment were significantly related to the level of petroleum industry activity. Further, changes in basic level educational attainment were significantly related to differences in petroleum activities in three of the four parish groups (highly involved, minimally involved, and extraction parishes) while changes in enhancement level educational attainment were associated with differences in petroleum industry activity in two groups (highly involved and extraction parishes). Very little prior research has been conducted concerning the effect of resource extraction activities on educational attainment. However, this research does suggest that there is an impact. Brabant (1984) found a relationship between educational attainment and resource extraction.

The current study demonstrated that educational strain - the ability of communities to provide educational services as indicated by the cost of education and the number of pupils - may be related to resource extraction, particularly in parishes highly involved in the petroleum industry or involved primarily in the extraction operations themselves.

There are few previous studies, but some studies find overfilled schools, strain, and increased costs in providing adequate education (Gramling and Brabant 1986; Gramling and Freudenburg 1990; Murray and Weber 1982).

Community Economic Health

Both the current study and prior research shows that community economic health definitely is related to resource extraction operations. The present study found that the mean levels of the economic variables varied by the level and direction of change in petroleum industry activity.

Further, changes in unemployment rates and per capita unemployment were significantly related to differences in the price of oil or the number of developmental wells, in all four parish groups. Moreover, changes in average per capita income, transfer payments, and sales taxes were significantly associated with differences in the price of oil or number of wells in three of the four parish groups. In addition, there were changes in population, housing and housing costs, unemployment and income demonstrated in the preboom to the boom, the boom to the bust, and the preboom to the bust comparisons.

Prior research also demonstrates that economic conditions are related to resource extraction operations. Extraction activities have been shown to affect: demands for welfare and food stamps (Brabant 1991; Dixon 1978), income and the economic condition of the residents (Bunker 1984; Dixon 1978; England and Albrecht 1984; Finsterbusch 1982; Harris et al. 1986; Manuel 1984b; McNicoll 1984), and employment and unemployment rates (Antonov 1988; Gramling and Freudenburg 1990; Harris et al. 1986; Leistritz et al. 1982; Molotch 1976; McNicoll 1984). Other economic conditions affected by resource extraction endeavors are: retail prices and the cost of living (Harris et al. 1986; Massey 1980; Moen 1981), amount of housing available and cost of housing (Antonov 1988; Harris et al. 1986), poverty and income disparity (Brabant 1991), and provision of basic services (Brookshire and D'Arge 1980; England and Albrecht 1984; Gramling and Brabant 1986; Gramling and Freudenburg 1990; Murray and Weber 1982).

In summary, the preponderance of the evidence from prior literature and the present study demonstrates that resource extraction activities, including offshore petroleum extraction, affect social problems, education, and community economic health. In the next section, the nature of the effects themselves (positive or adverse) will be examined.

WHAT IS THE EFFECT?

The previous section focused on the question: do resource extraction activities affect social problems, education, and community economic health? It was demonstrated that resource extraction, including offshore petroleum development, does affect social problems, education, and community economic health. Given that there is evidence that these effects can occur, it is important to examine what the effects are. This section will address this issue.

This is a more difficult question to answer because it requires an examination of the direction of the relationship - is the impact of resource extraction activities on social problems, education, and economics positive or adverse. It is not sufficient to show only that an effect has occurred; the nature of the effect must be discerned. The problem that occurs when the direction of the relationship is considered is that research results are inconsistent. Although there are not enough studies reported in the resource extraction/energy development literature to warrant an intensive review, a summary of the literature will be essential in the future. In this suggested review, results would be reported by the analytical method used (e.g., percentage changes, analysis of variance, regression, interviews, surveys), the type of

resource extracted (e.g., renewable or non-renewable), the geographical isolation of the host community (e.g, rural, urban, or in between), and the site of the material extracted (e.g., onshore or offshore). It is possible that research results within combinations of these categories (e.g., percentages changes for a non-renewable resource in a rural area where the material is onshore) are consistent, although findings are not for resource extraction as a whole. If this consistency within combinations of categories were found, then researchers would know the relevant dimensions of resource extraction activities that differentially affect impacts and they would know what impacts to expect based on the combination of categories of a proposed resource extraction project.

Social Problems

Based on the current study, social problems are the most difficult category of impact to answer the question concerning the nature of the effect. The reason for this difficulty is that the results were not consistent nor strong. Thus, the answer given is tentative. The findings suggested that social problems were greater when petroleum industry activity was rapidly increasing or decreasing. The outcome also implied that the mean rates of social problems during the decline or bust were slightly lower than during periods of rapid change, but not as low as they were during the preboom.

The results of the present study further indicated that, regardless of the degree and type of involvement of the parish, criminal court cases increase with or immediately following an increase in the price of oil or the number of wells. In addition, the findings showed that criminal court cases decreased in the second or third year after an increase in petroleum activity. Again regardless of the degree or type of involvement, suicide rates rose in the second or third year after an increase in activity; moreover, for two parish groups, the rates declined in the fourth year after an increase in activity. In the highly involved and extraction parishes, homicides rates decreased in the fourth year after an increase in price or wells. What is not shown in the results, is that the regression models for homicide rates often had a nonsignificant increase in the rates either when activity increased or the first year after an increase. Thus, these results suggest that crime rises with or shortly after an increase in resource extraction activity and that crime declines between two and four years after an increase in activity. However, suicide rates seem to be a different dimension of social problem in that they tend to rise in the second or third year after an increase in activity and may decline in the fourth year after an increase in activity. The difference may be due to the type of anger involved in crime and suicide. Crime, especially homicide, is a display of outwardly directed anger while suicide tends to be associated with inwardly directed anger. Possible reasons why this occurs will be discussed below.

Prior research consistently shows that inmigrants, adolescents and women are adversely affected by resource extraction activities. Recent migrants and adolescents are less satisfied with the community (Finsterbusch 1982; Freudenburg 1981, 1984, 1986). Women have trouble coping with some of the conditions of rapidly growing communities (Moen 1981). Some studies report that resource extraction activities are associated with an increase in

crime and fear of crime (Brookshire and D'Arge 1980; Dixon 1978; Finsterbusch 1982; Freudenburg and Jones 1991; Gramling and Brabant 1986; Krannich et al. 1989). On the other hand, two studies suggest that the increase in crime is not due to extraction activities (Brookshire and D'Arge 1980; Wilkinson et al. 1984). Some prior research suggests that resource extraction activities are related to lower community satisfaction and social disruption (Brown et al. 1989; Dixon 1978; England and Albrecht 1984) while others find no decrease in community satisfaction (Finsterbusch 1982; Freudenburg 1981).

In summary, the results of prior research support the conclusion that newcomers, adolescents and women are negatively affected by resource extraction activities. In contrast, the findings of the present research and prior studies suggest that more research on crime, community satisfaction of long-time adult residents and social networks is needed. This research must control for possible confounding factors before a conclusion concerning the effect of resource extraction on crime, community satisfaction of long-time adult residents and social networks can be reached. Currently the preponderance of the evidence from the current study and previous investigations support the idea that crime rates increase, community satisfaction decreases, social networks are disrupted and suicide rates increase, possibly as a result of lowered satisfaction and disrupted networks.

Education

Relying on both prior research and the present investigation, it can be concluded that the effect of resource extraction, including offshore petroleum, is a mixture of positive and adverse effects. The effect of offshore petroleum extraction on basic level educational attainment is positive. The current study showed that basic level educational attainment was higher when petroleum industry activities were rapidly increasing, especially in the highly involved parishes. In addition, this level of educational attainment increased with or after increases in petroleum activities in three of the four parish groups - highly involved, minimally involved and extraction parishes. In contrast, enhancement level educational attainment was lower when petroleum industry activities were rapidly increasing, especially in the highly involved parishes. Further, increases in petroleum activities were associated with decreases in enrolling in college in the extraction parishes.

One previous study that examined educational attainment also reported a positive effect of petroleum extraction. Brabant (1984) reported that educational attainment increased during periods of greater energy development activities. These results from both the present study and the one previous examination support the conclusion that basic level educational attainment increases due to increases in resource extraction while enhancement level educational attainment decreases due to increases in extraction operations.

Based on the research available, including the present study as well as prior research, educational strain is higher when resource extraction is more active. The current examination demonstrated that, although school expenditures tended to increase across the four periods, the average number of pupils were higher during the period of increasing petroleum activity.

In addition, increases in petroleum activity were associated with initial increases in expenditures followed by later decreases in expenditures in the highly involved and extraction parishes. There are few previous studies, but those available report overfilled schools, strain, and increased costs in providing adequate education (Gramling and Brabant 1986; Gramling and Freudenburg 1990; Murray and Weber 1982).

In summary, the effect of resource extraction, including offshore petroleum development, on educational attainment is a mixture of positive and negative effects. Although basic level educational attainment increases due to greater extraction activities, enhancement level educational attainment decreases. The impact of resource extraction on educational strain is negative, according to the available literature. However, this negative effect may occur only immediately following increases in extraction activities.

Community Economic Health

Overall, both the present study and previous research suggest that the effect of resource extraction on economics is a mixture of positive and adverse impacts. The results of the current investigation support the idea that community economic health decreases when resource extraction activities decline, particularly in the highly involved and extraction parishes. Transfer payments and unemployment were higher after the crash in the price of oil. Also, although transfer payments and unemployment initially decreased with increases in petroleum industry activity in the highly and minimally involved, they increased in the first or second year after an increase in activity in all four groups of parishes. Income rose with or shortly after increases in activity in the highly involved, extraction and related activities parishes; however, it decreased in the second year after increases in activity in the highly involved and extraction parishes. Further, in the highly involved and extraction parishes, inmigration increased in the first year after an increase in activity and outmigration rose in the third year after an increase in activity. The preboom to boom, boom to bust, and preboom to bust comparisons demonstrated that the highly involved, extraction, and related activities parishes experienced greater economic health during the boom than during the preboom or bust.

Prior research suggests that communities involved in resource extraction experience both positive and negative changes in their economic profile. Although income increases and the demand for welfare and food stamps decrease (Brabant 1991; Bunker 1984; Dixon 1978; England and Albrecht 1984; Finsterbusch 1982; Harris et al. 1986; Manuel 1984b; McNicoll 1984), costs of living and housing increase as do poverty and the disparity in income (Antonov 1988; Brabant 1991; Harris et al. 1986; Massey 1980; Moen 1981). In addition, some studies report increases in employment and decreases in unemployment (Antonov 1988; Harris et al. 1986; Leistritz et al. 1982; McNicoll 1984), while others find increases in unemployment rates (Freudenburg 1992; Molotch 1976).

In summary, the results of the current study and prior research support the following conclusions. Social problems increase with resource extraction activities. This conclusion is

tentative and more research employing designs that enable controlling for confounding factors is necessary. Basic level educational attainment rises while enhancement level educational attainment falls due to resource extraction. Resource extraction also appears to be associated with increases in educational strain, but there is not much research in this area. There is no consistent evidence of a gain in community economic health during the boom phase of resource extraction. Some research and analytical techniques support the idea of improved economic conditions during this period while others do not. Studies examining community economic health consistently find that the inevitable decline in resource extraction is associated with serious economic problems.

WHAT IS THE LIKELIHOOD OF THE EFFECT'S OCCURRENCE?

Based on the present study and prior research discussed above, effects of resource extraction on social problems, educational attainment, educational strain, and community economic health are highly probable. Although the existence of an effect of resource extraction on some of the indicators of social problems is somewhat debatable, the main uncertainty is the direction of the effect for some variables used as measures of these impacts.

CAN THE EFFECT BE MITIGATED?

It may be possible to mitigate the impacts of resource extraction on social problems, community economic health, and educational attainment and strain as discussed in the previous chapters. The policy implications presented in the earlier chapters are reiterated below. Then, there will be a discussion of another means of potentially accomplishing the same goal.

Social Problems

The results concerning the relationship between petroleum industry activity and social problems were not clear, consistent or strong; hence, it is difficult to suggest possible mitigation strategies. However, it may be possible to use programs that have reduced similar problems in other contexts. These strategies include suicide prevention programs, employment counseling, anger management training, mental health counseling, and substance abuse prevention and treatment for both newcomers and long-time residents.

Education

The outcome of the study implies that there is a need to monitor and mitigate the impacts of energy extraction on educational attainment. A mitigation strategy to encourage high school graduates to invest in college when the industry is very active is necessary as is a policy to stimulate high school students to complete high school when the industry is less active. Both mitigation activities would reduce overspecialization of the community in the energy extraction industry, which would enable the community to take advantage of or even create

future economic development opportunities when the extractive industry is less active or has ceased operations entirely.

High school graduates could be encouraged to continue their education when the industry is active if employers would allow employees to work flexible hours or even part-time so employees could obtain additional education. Employers could also offer credits toward promotions for completing college courses. As much as possible, these incentives should be offered not only to managerial employees, but also to workers in manual labor positions. Employers could have meetings with employees, community leaders (informal as well as formal leaders), and the media to discuss the inevitability of the bust and the need for individuals and communities to develop other skills to attract new economic development opportunities to protect the community against the economic problems associated with the decline in the extractive industry. Presentations could be made at the high schools showing students the possible jobs available with different levels of education, including information about working conditions, type of work and salary ranges. Such information may entice some high school graduates to continue their education despite the availability of positions that do not require additional education.

Although the data demonstrated that high school completion increases when industry activity increases, incentives by employers could further elevate high school completion rates. For example, employers could require a high school degree as a prerequisite for more jobs and job training, especially for lucrative resource extraction employment. Employers could visit high schools in the communities and discuss the employment opportunities available if students obtain their high school degree. In fact, employers could present material on the wide range of possible employment and show students the potential salary ranges and working conditions of positions available with and without the high school degree. If no attractive jobs are available without the high school degree and some are available with this degree, at least some students should be encouraged to complete high school.

Educational strain may be dependent on another factor affected by industry activity - migration. It may be possible to set aside some money from the industry, the state (e.g., severance taxes), the community (e.g., unexpected additional income from sales and property taxes), and the federal government (e.g., money from lease sales) to the offset additional demands for educational services that initially occur with increases in activity. Because the benefits of resource extraction, including offshore petroleum extraction, are national while the impacts are local, it is logical for the federal government to set aside some of the money to mitigate impacts in both the highly involved communities and affected communities surrounding those that are highly involved.

Community Economic Health

The findings demonstrate the need for a diversified economy. Economic improvement, even when the extraction industry is doing well, is not assured, but economic problems when the industry is doing poorly are highly probable. The economic decline due to the downturn in

the industry can be mitigated somewhat if the community has a more diversified economy. In fact, even a more diversified involvement in the extraction - such as producing products from the extracted resource, constructing equipment needed for extraction activities, transporting the raw material and its products, wholesaling the raw material and products - may be economically beneficial, particularly when the industry is less active. On the other hand, it is possible that the economic survival of the related activities parishes demonstrated in chapter 4 was due to the importation of oil from other countries. If this is the case, then the economic survival of these communities would not be generalizable to other communities involved in activities related to extraction where importation of the raw resource is not possible.

If a community is undergoing rapid economic development through resource extraction and the extracted material could be obtained from other regions when it is not available in the host community, then it may be possible to ensure a more diversified involvement in the extractive industry. The creation of a more diversified involvement could be accomplished by requiring companies that are extracting the resource to site plants that process the material in a way that adds to the value of the material in the community from which the resource is extracted. These plants cannot be those that do low level processing that adds little to the value of the resource, such as cutting lumber to make it easier to transport. To mitigate some of the negative impacts, the plants must be those that truly add to the value of the material that was extracted, such as refining petroleum for use as gasoline and heating fuel as well as producing industrial chemicals and consumer use plastic items from the petroleum.

Another possible method of mitigating some of the negative impact on community economic health may be to set aside money from sales taxes collected by the community, severance taxes collected by the state, lease sale proceeds collected by the federal government, and the profits earned by the companies involved in extraction for job training and employment counseling of long-time residents and newcomers. However, some prior research shows that long-time residents are unwilling to undergo job training to obtain employment at power generating stations (Little and Lovejoy 1979; Lovejoy 1983). Such money could also be used to mitigate the increase in transfer payments that occurs when unemployment increases, partly due to the number of inmigrants attempting to find employment in a community undergoing extractive energy development.

It might also be possible to reduce the economic roller coaster of improved economic health succeeded by decreasing economic health by regulating the speed with which the extractive industry is allowed to develop. In the context of offshore petroleum extraction, this could be accomplished by monitoring economic impacts and adjusting the number of tracts leased and number of wells allowed to control the economic changes. Unfortunately, this strategy may have the effect of increasing the anticipated duration of extractive endeavors in the community and elongating the period of prosperity associated with the extraction which may result in a greater risk of overspecialization to the extractive industry (Freudenburg and Gramling 1992).

MONITORING THE IMPACTS

The results of this study suggest the need for monitoring programs for all resource extraction projects. One benefit of monitoring the impacts is that monitoring will add to the literature available concerning the effects of resource extraction/energy development. These programs would add to the literature because they require collection and analyses of data. The results when published would facilitate a sorting of the evidence concerning impacts by the type of resource extraction project. This sorting of results by type of project would enable an intensive review of the literature that accounts for the methodology of the study, the type of resource extracted, the geographical isolation of the host community and the site of extraction.

Monitoring should begin when the project is first considered and should continue throughout the duration of the extraction operations. Impacts may begin as soon as the project is discussed publicly (Brown et al. 1989; Freudenburg and Gramling 1992; Gramling and Freudenburg 1992). Monitoring programs should examine not only the host community, but also the surrounding communities based on the results of the current study. The present study demonstrated that the minimally involved parishes did experience some impacts. Also, such programs should take into account the type of involvement of the community in the resource extraction. The current study showed that the impacts may differ by this factor.

Some monitoring may be accomplished by using data already collected by federal and state government agencies. All of the data used in this study came from such agencies. Yet, monitoring programs cannot totally rely on data collected by other governmental agencies. For example, it was not possible to collect the economic data, except sales taxes, prior to 1969. Further, true baseline figures for any social and economic impact variable for Louisiana cannot be obtained, even at the parish level, due to the long involvement of Louisiana in the offshore petroleum industry, discussed earlier. Moreover, annual data at the parish level are rare. Bankruptcy data at the parish level are only available beginning in 1986, retail sales data by parish is obtainable only in the late 1950's, and data concerning collection of various taxes (corporate income, corporate franchise, individual income, severance, tobacco and liquors-alcohol) are only available at the state level. The openings and closings of businesses and banks would be a useful indicator of economic health, if available.

Other measures of educational attainment are needed. These might include high school suspensions, expulsions and drop out rates. Although most of these data are now being reported for the parishes in Louisiana, they were not reported early enough in the history of oil industry development to be used in this study.

Further, better data are needed to monitor social problems. Criminal court cases were only a rough approximation of the desired data, but they were the best data available that was comparable across the years examined. Data for the following indicators of social problems are necessary: juvenile delinquency, mental hospital admissions of adults, mental hospital

admissions of adolescents, and divorce statistics. Monitoring programs should contact agencies that collect some data, such as the data employed in the present study, to ensure that the data are being collected and that the program will have access to such information. It may be necessary to obtain access to court records, police records, hospital records, and other such agencies records since information is lost when larger agencies gather it voluntarily. When it is expected that a region of the country will be host to a resource extraction/energy development project, attention should be paid to collecting baseline data to adequately measure the impacts of that project.

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APPENDIX A

MEANS OF SOCIAL PROBLEMS BY DEGREE OF INVOLVEMENT

	Homicide Rates			Criminal Court Cases		
Year	Highly Involved Parishes	Minimally Involved Parishes	t	Highly Involved Parishes	Minimally Involved Parishes	t
1956						
1957	3.85	7.99	-2.07			
1958	3.18	9.10	-2.35			
1959	5.45	4.90	0.23			
1960	3.81	9.31	-2.12			
1961	3.71	7.66	-1.31			
1962	1.64	6.56	-1.88			
1963	4.86	8.15	-1.25			
1964	5.78	9.11	-1.51			
1965	6.31	9.13	-0.82			
1966	4.84	6.98	-0.94			
1967	6.67	8.70	-0.66	60.60	30.05	3.19*
1968	5.33	14.17	-2.87	60.56	35.03	2.32*
1969	4.77	12.21	-1.77	86.45	57.40	1.04
1970	4.96	15.04	-2.18	94.40	67.52	0.86
1971	7.73	10.06	-0.87	77.26	71.25	0.26
1972	7.32	14.38	-1.41	66.02	73.37	-0.45
1973	9.47	10.67	-0.33	77.64	70.70	0.44
1974	7.94	9.75	-0.82	78.49	76.97	0.08
1975	8.60	8.55	0.02	91.19	86.90	0.28
1976	7.86	12.42	-1.41			
1977	6.97	19.03	-2.64*	111.17	100.92	0.41
1978	11.36	8.78	0.89	102.69	102.26	0.01
1979	9.94	7.54	0.83	113.73	96.91	0.66
1980	10.48	13.38	-1.13	158.62	115.78	0.88
1981	10.23	13.48	-1.02	182.90	151.69	0.53
1982	11.08	10.34	0.33	182.07	143.67	0.67
1983	11.31	13.51	-0.64	146.82	130.92	0.47
1984	7.98	9.21	-0.56	153.28	136.48	0.47
1985	5.31	11.98	-2.25*	157.56	137.45	0.51
1986	9.23	9.06	0.06	114.12	100.60	0.48
1987	8.67	6.67	0.80	125.93	94.54	1.09
1988	8.63	5.94	0.96	150.56	116.54	0.75
1989	8.48	8.65	-0.07	141.89	117.07	0.56
1990				142.33	129.94	0.33

Appendix A. Means of Social Problems by Degree of Involvement (continued)

	Suicide Rates			Juvenile Commitments		
Year	Highly Involved Parishes	Minimally Involved Parishes	t	Highly Involved Parishes	Minimally Involved Parishes	t
1956	6.16	5.86	0.15			
1957	6.45	3.60	1.55			
1958	6.84	10.75	-1.07			
1959	3.58	8.85	-2.33*			
1960	6.56	8.61	-0.44			
1961	6.26	7.81	-0.58			
1962	5.11	6.07	-0.51			
1963	6.59	5.40	0.52			
1964	6.14	4.82	0.52			
1965	5.65	9.39	-1.43			
1966	6.10	5.60	0.27			
1967	5.64	9.26	-1.34			
1968	6.29	10.17	-1.49			
1969	7.74	9.65	-1.03			
1970	6.08	6.87	-0.28			
1971	6.20	6.87	-0.26	30.45	40.02	-0.80
1972	8.66	8.95	-0.12	33.24	55.66	-1.72
1973	10.72	6.37	1.66	33.76	46.38	-1.17
1974	10.56	10.17	0.19	35.86	45.01	-0.73
1975	10.26	7.20	0.93	24.34	31.79	-0.79
1976	9.82	10.85	-0.35			
1977	12.33	7.73	1.45			
1978	11.38	10.24	0.31			
1979	15.16	11.82	0.73			
1980	10.59	8.13	1.15	23.78	43.32	-2.20*
1981	12.13	8.05	1.67	30.93	35.58	-0.40
1982	11.60	10.76	0.33	35.85	30.81	-0.42
1983	14.18	12.54	0.43			
1984	13.10	10.66	0.91			
1985	11.88	11.21	0.28			
1986	13.47	14.16	-0.26			
1987	12.10	12.01	0.04			
1988	11.18	12.67	-0.55	37.19	74.44	-2.65*
1989	8.96	14.59	-2.04	71.05	94.00	-1.18
1990				82.41	129.73	-2.00

* The difference between means by degree of involvement is significant at the .05 level.

APPENDIX B

MEANS OF SOCIAL PROBLEMS BY TYPE OF INVOLVEMENT

	Homicide Rates			Criminal Court Cases		
Year	Extraction Parishes	Related Activities Parishes	t	Extraction Parishes	Related Activities Parishes	t
1957	0.96	6.05	-2.16			
1958	2.14	1.98	0.10			
1959	3.30	6.18	-1.39			
1960	3.07	4.75	-0.73			
1961	1.61	2.26	-0.46			
1962	1.18	2.73	-1.21			
1963	1.59	7.39	-2.16			
1964	5.37	5.51	-0.06			
1965	5.94	7.51	-0.45			
1966	5.74	3.11	0.75			
1967	6.13	5.48	0.24	54.44	66.41	-0.54
1968	4.53	4.37	0.07	63.12	61.99	0.04
1969	2.64	7.48	-1.29	63.64	124.82	-0.79
1970	5.41	5.55	-0.05	67.70	135.16	-0.82
1971	6.01	10.23	-2.18	54.20	103.76	-0.86
1972	7.48	8.60	-0.24	56.43	71.94	-0.49
1973	5.68	12.91	-1.54	61.81	85.00	-0.75
1974	5.81	10.74	-1.92	59.25	104.53	-1.13
1975	8.41	10.25	-0.50	84.01	102.50	-0.66
1976	9.09	6.39	1.18			
1977	9.51	8.15	0.32	95.50	131.77	-0.63
1978	9.40	11.35	-0.46	88.55	113.02	-0.51
1979	6.89	11.61	-1.59	116.84	104.26	0.23
1980	11.59	8.49	0.96	195.27	131.13	0.53
1981	11.70	8.28	1.26	233.23	152.10	0.55
1982	10.39	8.78	0.47	220.97	163.38	0.41
1983	12.77	7.26	1.11	174.41	138.22	0.46
1984	9.18	6.94	0.84	164.94	143.55	0.26
1985	4.24	3.95	0.17	158.22	152.58	0.07
1986	12.05	5.70	1.19	116.87	116.98	0.00
1987	7.22	8.44	-0.57	112.80	149.98	-0.56
1988	8.33	7.39	0.32	123.13	183.52	-0.50
1989	8.63	7.42	0.65	108.99	186.10	-0.79
1990				117.90	183.98	-0.78

Appendix B. Means of Social Problems by Type of Involvement (continued)

	Suicide Rates			Juvenile Commitments		
Year	Extraction Parishes	Related Activities Parishes	t	Extraction Parishes	Related Activities Parishes	t
1956	7.73	4.70	0.97			
1957	5.82	6.47	-0.18			
1958	8.43	7.46	0.32			
1959	3.75	4.38	-0.28			
1960	7.72	4.63	1.05			
1961	5.54	7.70	-0.90			
1962	7.63	2.94	1.75			
1963	7.12	4.36	0.83			
1964	7.91	2.77	1.83			
1965	2.88	6.13	-1.38			
1966	6.99	4.60	1.01			
1967	7.52	6.23	0.32			
1968	9.03	5.11	1.32			
1969	5.42	9.18	-1.42			
1970	8.55	6.58	0.64			
1971	6.93	5.39	0.59	31.20	21.39	0.89
1972	9.65	9.30	0.21	33.12	29.58	0.86
1973	11.81	9.03	0.72	28.50	30.52	-0.18
1974	10.28	12.88	-1.24	24.60	32.62	-0.65
1975	9.35	12.61	-0.68	23.55	16.77	1.08
1976	8.09	10.59	-0.71			
1977	11.59	13.64	-0.54			
1978	18.66	7.29	2.35			
1979	19.10	11.71	0.76			
1980	7.72	11.86	-1.08	40.97	21.16	1.03
1981	13.35	11.02	0.61	33.74	24.57	0.62
1982	10.13	12.50	-0.99	36.13	21.80	1.20
1983	11.67	12.96	-0.28			
1984	14.90	15.53	-0.20			
1985	10.17	10.04	0.05			
1986	13.28	14.45	-0.34			
1987	12.54	12.15	0.08			
1988	10.55	13.09	-1.45	52.27	29.67	1.46
1989	10.04	8.21	0.44	108.33	36.47	3.50*
1990				118.10	49.47	3.59*

* The difference between means by type of involvement is significant at the .05 level.

APPENDIX C

MEANS OF EDUCATIONAL ATTAINMENT AND STRAIN BY DEGREE OF INVOLVEMENT

	Complete High School			Go to College		
Year	Highly Involved Parishes	Minimally Involved Parishes	t	Highly Involved Parishes	Minimally Involved Parishes	t
1956	61.71	57.20	1.30	35.00	35.48	-0.16
1957	59.71	58.62	0.35	35.23	32.78	0.66
1958	59.51	55.89	1.16	36.40	36.77	-0.12
1959	59.19	58.49	0.30	39.60	38.73	0.31
1960	60.82	59.15	0.71	39.26	38.77	0.15
1961	58.87	58.86	0.00	42.55	37.00	1.47
1962	58.05	59.31	-0.40	40.57	39.21	0.38
1963	56.85	59.26	-0.92	42.31	37.38	1.83
1964	62.88	63.20	-0.11	45.57	41.85	1.23
1965	64.62	65.62	-0.36	44.91	46.25	-0.37
1966	65.02	65.08	-0.03	42.60	41.43	0.46
1967	62.56	67.06	-1.24	44.03	41.45	0.61
1968	63.93	67.46	-0.94	46.10	37.93	2.84*
1969	63.89	65.99	-0.56	42.51	38.34	1.41
1970	64.07	66.99	-1.00	46.77	37.13	2.62*
1971	66.72	64.78	0.73	38.75	37.32	0.49
1972	67.45	64.64	1.03	37.63	36.39	0.49
1973	69.07	63.67	2.08	36.81	32.78	1.54
1974	65.60	68.29	-0.78	35.97	31.07	1.54
1975	66.21	66.72	-0.17	34.14	34.98	-0.23
1976	66.36	65.39	0.27	32.48	36.21	-1.12
1977	65.67	67.82	-0.98	31.92	37.11	-1.72
1978	64.50	62.95	0.48	34.76	32.79	0.53
1979	63.07	65.77	-1.07	33.28	35.05	-0.44
1980	63.90	61.71	0.77	33.76	35.11	-0.64
1981	65.74	64.17	0.47	36.09	33.93	0.73
1982	67.02	60.85	2.37*	37.06	37.11	-0.02
1983	61.16	60.03	0.47	40.58	43.99	-1.29
1984	63.36	62.25	0.39	42.68	44.00	-0.38
1985	62.09	59.94	0.76	42.61	42.41	0.05
1986	65.41	62.41	0.95	41.53	43.84	-1.13
1987	67.02	61.22	2.10*	43.33	44.82	-0.58
1988	63.25	57.19	2.06	44.92	47.55	-0.87
1989	62.24	61.20	0.23	49.62	47.25	0.75
1990	60.26	58.56	0.57	50.58	47.13	1.27
1991	59.44	56.83	0.88			

Appendix C. Means of Educational Attainment and Strain by Degree of Involvement (Continued)

	Per Pupil Expenditures			Per Capita Expenditures		
Year	Highly Involved Parishes	Minimally Involved Parishes	t	Highly Involved Parishes	Minimally Involved Parishes	t
1956	823.62	873.25	-0.72	180.41	229.13	- 2.06
1957	976.55	987.17	-0.09	204.23	259.19	-2.11*
1958	935.82	1011.52	-1.09	204.89	269.02	-3.14*
1959	942.35	1019.27	-0.97	210.73	269.28	-2.61*
1960	997.23	1096.24	-1.24	226.80	291.67	-2.77*
1961	1040.94	1147.70	-1.28	242.71	309.27	-2.74*
1962	1039.17	1127.63	-1.00	246.82	307.65	-2.41*
1963	1029.02	1119.32	-1.02	251.16	309.95	-2.30*
1964	1048.83	1149.63	-1.12	260.48	315.93	-2.09*
1965	1103.84	1207.34	-1.18	276.77	328.79	-2.13*
1966	1262.82	1272.34	-0.10	307.02	345.68	-1.69
1967	1270.94	1362.19	-1.31	323.28	371.73	-2.13*
1968	1550.55	1543.90	0.07	414.81	420.64	-0.16
1969	1481.22	1514.16	-0.40	382.86	411.35	-1.13
1970	1703.95	1816.78	-1.11	444.77	469.75	-0.79
1971	1839.90	1973.17	-1.36	479.58	518.17	-1.22
1972	1901.73	2023.80	-1.22	487.98	523.21	-1.15
1973	1877.58	2031.68	-1.81	477.30	529.01	-1.97
1974	2203.53	2161.62	0.26	564.17	558.38	0.12
1975	2263.28	2239.44	0.15	569.95	560.46	0.21
1976	2325.80	2403.89	-0.38	573.17	595.16	-0.36
1977	2451.94	2694.55	-1.08	583.43	638.69	-1.17
1978	2332.89	2247.71	0.54	533.87	529.12	0.12
1979	2472.94	2309.13	1.01	543.93	537.24	0.17
1980	2617.58	2384.16	1.42	554.85	533.07	0.57
1981	2910.66	2436.24	2.16*	601.03	539.44	1.23
1982	3010.77	2436.45	1.92	607.82	530.95	1.10
1983	2831.58	2397.44	1.43	561.49	526.27	0.50
1984	2860.23	2517.39	1.26	563.34	547.92	0.25
1985	2942.56	2545.52	1.70	568.63	550.47	0.36
1986	2827.56	2542.16	1.13	549.55	537.97	0.23
1987	2502.40	2286.48	1.04	488.02	482.80	0.12
1988	2639.27	2322.36	1.56	515.52	489.29	0.59
1989	2962.31	2534.81	1.81	577.58	530.79	0.99
1990	2947.58	2642.69	1.35	586.14	563.08	0.48

Appendix C. Means of Educational Attainment and Strain by Degree of Involvement (Continued)

	Average Number of Pupils		
Year	Highly Involved Parishes	Minimally Involved Parishes	t
1955	8092.92	4815.73	2.06
1956	8575.92	4873.18	2.19*
1957	9026.58	4949.36	2.20*
1958	9499.58	4988.09	2.30*
1959	9957.50	4950.09	2.44*
1960	10352.67	4976.91	2.56*
1961	10842.75	5051.82	2.66*
1962	11328.58	5154.73	2.72*
1963	11800.83	5225.18	2.90*
1964	12301.08	5257.73	3.03*
1965	12753.58	5278.91	3.09*
1966	13023.83	5345.27	2.96*
1967	13870.08	5393.91	2.95*
1968	14715.75	5442.09	2.93*
1969	14789.25	5403.27	2.87*
1970	14859.75	5268.00	3.00*
1971	15031.42	5387.45	3.01*
1972	15033.75	5365.55	3.02*
1973	15032.00	5359.00	3.05*
1974	15144.33	5411.09	3.06*
1975	15142.08	5407.55	3.04*
1976	14991.58	5414.18	3.00*
1977	14749.25	5398.55	2.97*
1978	14453.33	5389.55	2.92*
1979	14145.50	5403.91	2.87*
1980	13983.33	5296.55	2.88*
1981	13892.17	5274.55	2.87*
1982	13765.83	5289.55	2.85*
1983	13621.08	5354.55	2.82*
1984	13583.67	5336.73	2.81*
1985	13556.00	5270.27	2.79*
1986	13548.83	5198.73	2.81*
1987	13318.33	5172.73	2.81*
1988	13288.17	4999.36	2.85*
1989	13299.83	4979.82	2.79*
1990	13355.17	5029.27	2.83*

* The difference between means by degree of involvement is significant at the .05 level.

APPENDIX D

MEANS OF EDUCATIONAL ATTAINMENT AND STRAIN BY TYPE OF INVOLVEMENT

	Complete High School			Go to College		
Year	Extraction Parishes	Related Activities Parishes	t	Extraction Parishes	Related Activities Parishes	t
1956	64.38	61.09	0.52	34.49	34.40	0.03
1957	60.39	58.75	0.34	33.93	31.49	0.45
1958	59.39	56.88	0.52	39.87	34.09	1.52
1959	59.53	58.16	0.30	41.33	38.21	0.69
1960	58.91	61.16	-0.49	43.15	39.20	1.67
1961	62.04	59.38	0.51	45.16	36.70	1.85
1962	57.97	58.51	-0.18	41.69	37.62	0.80
1963	59.49	54.41	1.33	50.18	39.16	2.46*
1964	64.94	62.95	0.47	47.98	44.51	0.65
1965	64.98	65.59	-0.13	45.95	42.91	0.78
1966	67.10	64.79	0.66	45.18	41.09	1.35
1967	67.04	65.63	0.34	42.95	45.86	-0.50
1968	66.39	68.74	-0.63	46.37	47.89	-0.38
1969	68.11	67.67	0.23	44.49	45.56	-0.18
1970	69.98	66.14	0.90	45.48	48.23	-0.39
1971	65.81	68.35	-0.66	42.50	39.26	0.86
1972	70.44	65.57	1.04	40.46	38.06	0.62
1973	69.99	68.71	0.34	37.02	37.69	-0.13
1974	67.00	66.28	0.15	37.81	35.50	0.43
1975	69.62	68.06	0.43	37.58	34.45	0.61
1976	69.53	67.07	0.64	34.10	34.84	-0.15
1977	68.27	65.13	1.21	32.26	35.08	-0.69
1978	64.57	66.23	-0.33	35.88	36.31	-0.15
1979	65.33	65.63	-0.10	34.28	36.38	-0.34
1980	63.54	67.61	-0.88	35.44	33.50	0.69
1981	64.92	67.22	-0.52	33.98	37.98	-1.15
1982	65.73	69.77	-1.52	39.71	36.52	0.67
1983	62.68	62.23	0.12	38.99	40.82	-0.35
1984	64.43	63.46	0.19	38.50	44.84	-0.96
1985	62.53	59.70	0.64	34.74	44.66	-1.51
1986	64.59	64.61	0.00	39.83	42.45	-0.61
1987	65.52	65.91	-0.16	41.82	44.92	-0.77
1988	64.23	63.67	0.12	45.69	44.71	0.32
1989	63.84	63.15	0.11	47.12	52.78	-1.02
1990	65.45	60.35	0.95	46.12	54.69	-2.87*
1991	63.86	58.62	1.13			

Appendix D. Means of Educational Attainment and Strain by Type of Involvement (Continued)

	Per Pupil Expenditures			Per Capita Expenditures		
Year	Extraction Parishes	Related Activities Parishes	t	Extraction Parishes	Related Activities Parishes	t
1956	905.08	760.96	1.00	199.28	157.37	0.92
1957	1162.46	832.52	1.21	230.43	173.72	1.13
1958	1030.39	882.50	1.15	219.37	188.88	0.94
1959	1051.10	871.44	1.17	229.46	189.02	1.06
1960	1136.36	904.73	1.50	252.50	200.41	1.34
1961	1180.02	945.91	1.46	266.29	216.14	1.22
1962	1175.91	958.72	1.28	268.61	221.76	1.08
1963	1150.43	960.01	1.10	270.27	227.57	0.99
1964	1186.63	950.20	1.30	282.51	227.60	1.21
1965	1235.86	1027.24	1.28	294.97	250.83	1.08
1966	1306.08	1206.18	0.59	313.63	298.77	0.35
1967	1386.25	1220.23	1.10	344.49	319.49	0.61
1968	1573.84	1659.84	-0.40	403.25	466.13	-0.81
1969	1559.56	1483.15	0.43	410.04	397.59	0.24
1970	1826.82	1714.79	0.56	480.87	455.42	0.42
1971	1946.10	1832.55	0.57	497.97	495.10	0.05
1972	2011.16	1878.93	0.68	507.04	495.76	0.19
1973	1957.69	1867.11	0.51	492.51	486.02	0.12
1974	2239.24	2347.69	-0.33	565.87	608.04	-0.38
1975	2302.76	2360.42	-0.20	572.46	600.25	-0.28
1976	2261.78	2382.16	-0.41	549.72	585.90	-0.35
1977	2380.38	2579.01	-0.63	564.63	608.43	-0.44
1978	2346.61	2439.59	-0.32	536.35	550.96	-0.17
1979	2498.84	2536.60	-0.12	547.46	549.92	-0.14
1980	2698.29	2663.32	0.10	565.99	553.54	0.14
1981	2948.58	2996.17	-0.09	600.44	605.83	-0.04
1982	3413.64	2762.19	0.98	691.56	535.71	0.91
1983	3184.28	2663.29	0.76	637.14	503.15	0.77
1984	3053.59	2789.08	0.43	603.36	523.69	0.53
1985	2942.48	2801.57	0.29	572.91	523.34	0.41
1986	2795.70	2782.69	0.03	541.31	519.47	0.18
1987	2488.14	2536.18	-0.12	485.75	470.91	0.14
1988	2622.42	2612.31	0.02	518.72	488.76	0.28
1989	2930.71	2971.60	-0.09	577.55	558.72	0.16
1990	2926.45	2968.27	-0.09	588.86	572.42	0.14

Appendix D. Means of Educational Attainment and Strain by Type of Involvement (Continued)

	Average Number of Pupils		
Year	Extraction Parishes	Related Activities Parishes	t
1955	8044.60	8425.00	-0.10
1956	8438.20	8996.60	-0.14
1957	8749.20	9592.20	-0.19
1958	9214.20	10156.60	-0.20
1959	9720.80	10579.80	-0.18
1960	10143.80	10954.80	-0.16
1961	10537.80	11482.20	-0.18
1962	11002.00	11935.00	-0.17
1963	11647.00	12236.00	-0.11
1964	12183.80	12631.60	-0.08
1965	12605.20	13077.40	-0.08
1966	13145.00	13525.80	-0.06
1967	13904.60	14683.00	-0.12
1968	14663.80	15839.40	-0.16
1969	15155.20	15994.60	-0.11
1970	15405.40	15790.20	-0.05
1971	15340.60	16069.60	-0.10
1972	15412.80	15988.20	-0.08
1973	15487.00	15918.40	-0.06
1974	15505.20	15725.20	-0.03
1975	15531.60	15608.40	-0.01
1976	15361.60	15436.60	-0.01
1977	15275.40	15123.80	0.02
1978	14985.00	14780.20	0.03
1979	14710.60	14445.80	0.04
1980	14576.20	14172.80	0.06
1981	14486.00	13951.20	0.08
1982	14309.80	13691.00	0.09
1983	14120.40	13524.20	0.09
1984	14017.60	13428.80	0.09
1985	14119.80	13435.00	0.10
1986	14038.60	13400.80	0.09
1987	13710.20	13132.40	0.09
1988	13856.20	13124.40	0.11
1989	13784.80	13284.60	0.07
1990	13835.80	13372.60	0.07

* The difference between means by type of involvement is significant at the .05 level.

APPENDIX E

MEANS OF ECONOMIC HEALTH BY DEGREE OF INVOLVEMENT

	Average Per Capita Income			Transfer Payments		
Year	Highly Involved Parishes	Minimally Involved Parishes	t	Highly Involved Parishes	Minimally Involved Parishes	t
1969	7278.38	5603.91	4.70*	129.54	269.80	-6.23*
1970	7331.62	5946.34	4.68*	156.93	320.95	-4.75*
1971	7533.95	6212.79	4.43*	178.27	344.65	-4.43*
1972	7835.53	6504.78	4.52*	180.29	336.83	-5.77*
1973	8305.93	7170.97	4.50*	176.43	306.75	-5.73*
1974	8752.37	7203.39	6.25*	184.74	344.32	-5.47*
1975	8945.63	6793.00	6.61*	209.09	384.78	-5.67*
1976	9267.57	7653.30	3.66*	216.43	372.77	-5.16*
1977	9804.73	7739.87	5.06*	207.82	355.91	-5.70*
1978	10573.24	7969.46	5.54*	177.54	309.06	-5.05*
1979	10820.82	8038.07	5.75*	173.02	310.92	-4.87*
1980	10939.42	7704.88	6.30*	196.47	347.26	-4.60*
1981	11319.40	7989.00	6.34*	180.85	332.94	-5.05*
1982	11022.19	7644.37	6.45*	241.49	365.51	-3.87*
1983	10613.96	7691.77	5.41*	382.13	407.01	-0.65
1984	10506.90	7825.62	5.45*	286.40	356.12	-2.03
1985	10429.60	7874.96	5.10*	256.08	373.93	-2.67*
1986	10075.65	7741.29	4.47*	345.81	382.49	-0.99
1987	9638.57	7665.17	4.09*	289.52	330.86	-1.25
1988	9990.77	8057.79	3.91*	234.64	315.27	-2.52*
1989	10089.18	7886.66	4.42*	227.70	312.25	-2.58*
1990	10461.04	8218.82	4.32*	227.40	312.85	-2.54*

Appendix E. Means of Economic Health by Degree of Involvement (Continued)

	Unemployment Rates			Per Capita Unemployment		
Year	Highly Involved Parishes	Minimally Involved Parishes	t	Highly Involved Parishes	Minimally Involved Parishes	t
1970	5.78	10.43	-3.12*	20.08	31.45	-2.92*
1971	6.30	10.45	-3.10*	22.31	32.08	-2.66*
1972	7.08	10.35	-2.74*	24.37	31.89	-2.37*
1973	6.34	9.02	-2.27*	21.81	28.48	-1.93
1974	6.19	8.44	-2.34*	21.79	25.87	-1.53
1975	6.07	10.01	-3.17*	22.93	32.11	-2.52*
1976	5.52	8.82	-3.49*	21.45	29.06	-2.57*
1977	5.74	9.02	-3.03*	23.73	29.92	-1.79
1978	6.81	9.26	-2.62*	30.12	30.86	-0.25
1979	6.28	9.40	-3.71*	28.98	30.60	-0.64
1980	5.90	10.46	-3.71*	25.92	38.42	-2.83*
1981	7.27	13.01	-4.34*	32.39	49.98	-3.82*
1982	10.14	15.07	-3.21*	44.98	57.02	-1.99
1983	13.53	14.55	-0.69	60.71	57.28	-0.57
1984	11.85	12.11	-0.21	53.66	49.18	-0.85
1985	12.91	13.91	-0.75	58.50	57.67	-0.14
1986	16.38	16.71	-0.19	71.98	68.94	-0.42
1987	15.39	14.85	-0.34	65.67	60.90	-0.77
1988	12.43	14.14	-1.17	51.93	57.15	-0.93
1989	8.34	10.78	-2.27*	35.00	42.83	-1.97
1990	6.27	8.28	-2.54*	26.67	33.30	-2.17*
1991	7.32	10.45	-2.72*			

Appendix E. Means of Economic Health by Degree of Involvement (Continued)

	Sales Taxes Collected			Net Migration		
Year	Highly Involved Parishes	Minimally Involved Parishes	t	Highly Involved Parishes	Minimally Involved Parishes	t
1957	83.67	42.58	4.64*			
1958	83.85	44.40	3.97*			
1959	76.32	41.34	3.89*			
1960	79.74	41.59	4.18*			
1961	72.53	40.82	3.70*			
1962	76.79	44.70	3.48*			
1963	82.65	49.21	3.68*			
1964	88.60	52.07	3.64*			
1965	90.42	51.58	3.86*			
1966	80.47	36.51	4.45*			
1967	76.09	34.89	4.21*			
1968	73.19	35.38	3.47*			
1969	72.23	37.69	2.88*			
1970	72.98	38.66	2.62*	-73.00	-156.91	0.49
1971	97.34	46.01	3.38*	-19.92	105.91	-0.77
1972	106.33	52.17	3.37*	430.67	76.73	0.87
1972	100.74	52.60	3.02*	233.33	-204.82	1.37
1973	91.29	46.73	3.25*	-69.42	37.09	-0.34
1974	96.42	46.62	3.53*	284.33	343.91	-0.28
1976	101.40	49.12	3.50*	661.25	203.91	1.42
1977	105.19	48.90	3.68*	302.08	289.82	0.04
1978	117.12	57.98	2.98*	286.92	133.73	0.65
1979	126.09	59.33	3.14*	416.33	231.91	0.77
1980	125.51	52.73	3.32*	647.42	370.09	0.73
1981	134.34	55.76	3.31*	561.33	-9.64	1.86
1982	141.41	52.25	3.71*	961.50	49.00	2.04
1983	108.13	44.08	3.69*	-12.50	53.73	-0.21
1984	96.82	48.85	2.78*	-1102.25	-56.45	-3.57*
1985	124.38	59.99	3.10*	-600.58	-154.73	-1.85
1986	120.87	55.02	3.83*	-910.75	-129.91	-2.72*
1987	98.80	54.38	2.47*	-1876.17	-365.18	-2.98*
1988	112.06	61.32	2.56*	-1326.33	-539.18	-2.22*
1989	117.73	72.63	1.85			
1990	118.78	75.62	1.73			

* The difference between means by degree of involvement is significant at the .05 level.

APPENDIX F

MEANS OF ECONOMIC HEALTH BY TYPE OF INVOLVEMENT

	Average Per Capita Income			Transfer Payments		
Year	Extraction Parishes	Related Activities Parishes	t	Extraction Parishes	Related Activities Parishes	t
1969	7046.87	7556.95	-0.84	117.49	148.02	-1.22
1970	7198.45	7419.59	-0.43	140.01	190.48	-1.63
1971	7422.22	7656.79	-0.45	156.72	212.89	-1.73
1972	7738.28	7893.78	-0.31	158.80	206.06	-1.52
1973	8200.00	8344.59	-0.38	158.38	194.82	-1.32
1974	8744.02	8712.37	0.10	170.53	197.64	-0.78
1975	9027.88	8786.99	0.57	185.04	232.16	-1.48
1976	9210.54	9289.63	-0.11	196.06	235.40	-1.15
1977	9857.10	9823.76	0.05	183.68	236.01	-2.01
1978	10753.07	10339.57	0.50	155.14	201.05	-1.95
1979	11006.06	10581.27	0.51	148.48	193.12	-1.57
1980	11081.55	10622.33	0.52	156.41	233.19	-2.56*
1981	11472.39	10945.65	0.52	143.49	215.86	-2.66*
1982	11243.32	10637.72	0.62	196.99	288.35	-2.52*
1983	10599.60	10593.17	0.01	351.33	395.34	-0.81
1984	10507.60	10504.33	0.00	249.40	324.60	-1.88
1985	10450.19	10360.41	0.10	220.98	293.07	-1.69
1986	9824.45	10303.47	-0.53	351.71	325.86	0.43
1987	9265.67	10051.06	-0.90	288.19	276.01	0.23
1988	9696.20	10404.23	-0.81	219.45	238.95	-0.48
1989	9804.35	10449.68	-0.73	213.51	228.80	-0.37
1990	10192.81	10807.96	-0.64	210.43	228.80	-0.43

Appendix F. Means of Economic Health by Type of Involvement (Continued)

	Unemployment Rates			Per Capita Unemployment		
Year	Extraction Parishes	Related Activities Parishes	t	Extraction Parishes	Related Activities Parishes	t
1970	4.99	6.95	-1.84	17.90	23.42	-1.60
1971	5.25	7.80	-2.64*	18.82	27.20	-2.70*
1972	5.98	8.35	-2.54*	20.96	28.49	-2.07
1973	5.86	7.12	-1.60	20.57	24.10	-1.20
1974	5.28	7.50	-2.96*	19.38	25.09	-2.40
1975	4.88	7.76	-4.18*	19.40	28.06	-3.12*
1976	4.81	6.73	-2.52*	19.45	25.70	-1.98
1977	4.91	7.13	-2.43	21.04	29.02	-2.20
1978	6.26	7.74	-2.38*	28.67	33.30	-1.27
1979	5.79	7.17	-2.37*	27.55	31.86	-1.39
1980	5.00	7.13	-2.79*	23.01	30.88	-2.16
1981	5.93	9.18	-2.72	28.69	38.73	-2.31
1982	8.47	12.39	-2.57*	40.86	52.05	-1.94
1983	12.98	13.49	-0.31	60.47	60.09	0.06
1984	10.80	12.73	-1.49	51.00	58.11	-1.32
1985	11.69	14.37	-1.69	55.41	65.21	-1.43
1986	17.46	15.00	0.92	80.25	64.89	1.55
1987	16.13	14.22	0.82	71.06	61.66	1.32
1988	12.22	12.51	-0.18	53.20	53.04	0.03
1989	8.31	8.46	-0.17	36.29	36.09	0.07
1990	5.73	6.82	-1.77	25.13	29.88	-1.99
1991	6.76	7.97	-1.31			

Appendix F. Means of Economic Health by Type of Involvement (Continued)

	Sales Taxes Collected			Net Migration		
Year	Extraction Parishes	Related Activities Parishes	t	Extraction Parishes	Related Activities Parishes	t
1957	83.54	72.01	0.74			
1958	86.11	71.29	0.91			
1959	80.36	59.51	1.31			
1960	86.13	59.58	1.75			
1961	79.98	52.09	2.17			
1962	85.20	53.82	2.29			
1963	92.43	58.44	2.69*			
1964	99.46	60.07	2.75*			
1965	98.14	66.37	1.91			
1966	83.61	67.08	0.83			
1967	78.01	65.41	0.60			
1968	77.57	61.03	0.74			
1969	76.84	59.76	0.74			
1970	76.88	59.84	0.71	124.20	-73.80	0.52
1971	98.74	81.58	0.52	325.80	-331.00	2.14
1972	108.10	86.73	0.62	783.00	634.60	0.18
1973	104.50	86.77	0.51	-58.20	492.80	-0.84
1974	93.65	76.36	0.59	150.80	-204.00	0.50
1975	92.25	81.32	0.37	459.20	8.60	1.31
1976	97.00	84.93	0.40	975.40	556.40	0.64
1977	100.31	91.87	0.25	553.40	248.20	0.50
1978	119.49	91.10	0.75	377.00	267.00	0.24
1979	129.41	91.41	0.90	601.40	602.40	0.00
1980	133.32	86.08	1.11	900.60	980.20	0.10
1981	146.53	93.26	1.09	1275.00	228.80	1.47
1982	158.69	88.70	1.40	1345.00	268.80	1.05
1983	105.63	88.68	0.42	278.00	-195.40	0.67
1984	101.91	74.84	0.75	-1286.80	-939.20	-0.53
1985	132.21	95.84	0.79	-540.60	-756.60	0.35
1986	124.93	98.08	0.71	-909.40	-931.40	0.04
1987	100.61	76.35	0.64	-2543.00	-1119.40	-1.34
1988	103.41	106.41	-0.07	-1859.60	-967.00	-1.19
1989	110.71	107.43	0.08			
1990	115.87	106.37	0.20			

* The difference between means by type of involvement is significant at the .05 level.

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 **Royalty Management Program** 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.