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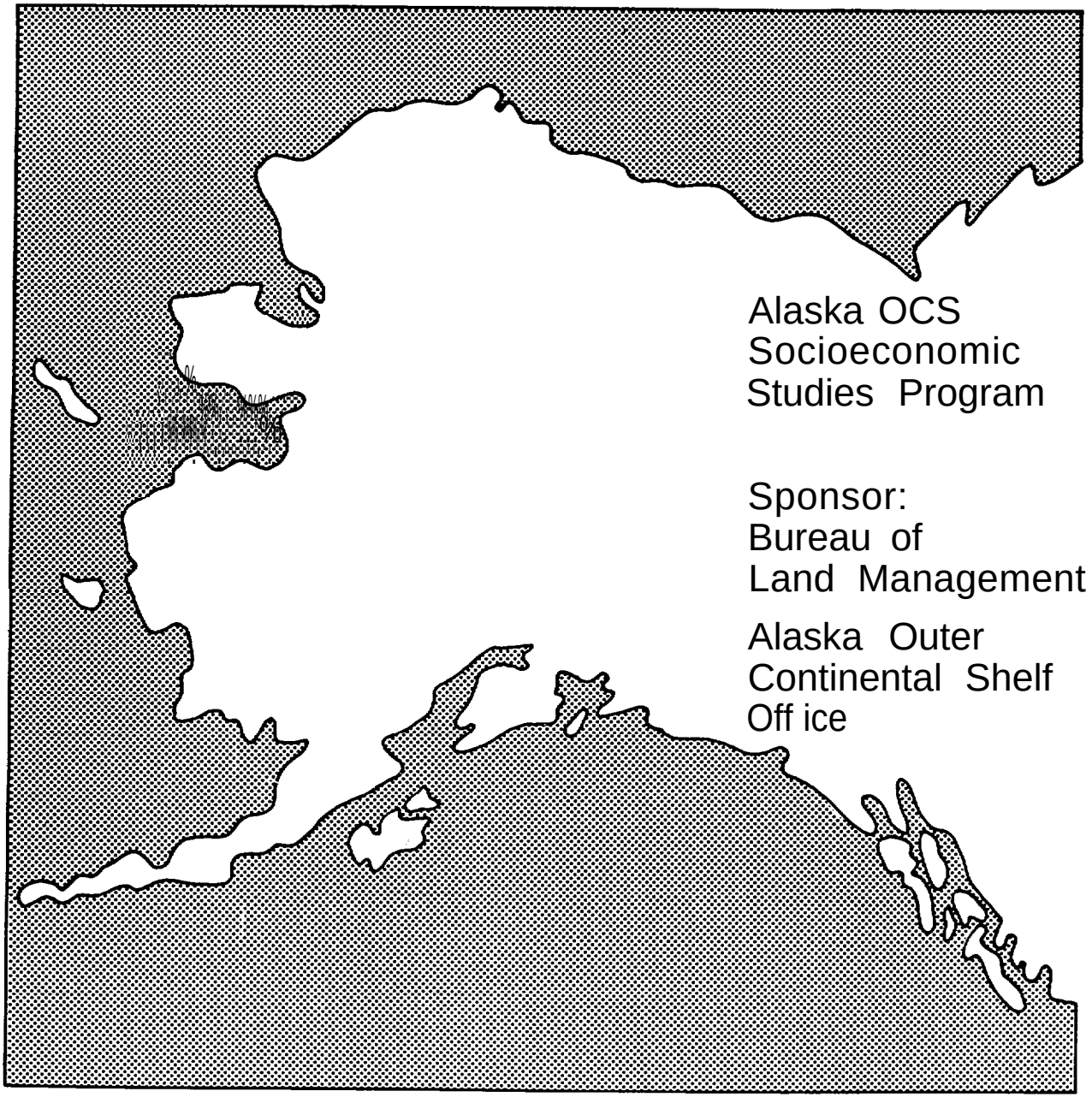

Alaska OCS
Socioeconomic
Studies Program

Sponsor:
Bureau of
Land Management

Alaska Outer
Continental Shelf
Off ice

Lower Cook Inlet
Petroleum Development Scenarios
Economic and Demographic Analysis

The United States Department of the Interior was designated by the Outer Continental Shelf (OCS) Lands Act of 1953 to carry out the majority of the Act's provisions for administering the mineral leasing and development of offshore areas of the United States under federal jurisdiction. Within the Department, the Bureau of Land Management (BLM) has the responsibility to meet requirements of the National Environmental Policy Act of 1969 (NEPA) as well as other legislation and regulations dealing with the effects of offshore development. In Alaska, unique cultural differences and climatic conditions create a need for developing additional socioeconomic and environmental information to improve OCS decision making at all governmental levels. In fulfillment of its federal responsibilities and with an awareness of these additional information needs, the BLM has initiated several investigative programs, one of which is the Alaska OCS Socioeconomic Studies Program (SESP).

The Alaska OCS Socioeconomic Studies Program is a multi-year research effort which attempts to predict and evaluate the effects of Alaska OCS Petroleum Development upon the physical, social, and economic environments within the state. The overall methodology is divided into three broad research components. The first component identifies an alternative set of assumptions regarding the location, the nature, and the timing of future petroleum events and related activities. In this component, the program takes into account the particular needs of the petroleum industry and projects the human, technological, economic, and environmental offshore and onshore development requirements of the regional petroleum industry.

The second component focuses on data gathering that identifies those quantifiable and qualifiable facts by which OCS-induced changes can be assessed. The critical community and regional components are identified and evaluated. Current endogenous and exogenous sources of change and functional organization among different sectors of community and regional life are analyzed. Susceptible community relationships, values, activities, and processes also are included.

The third research component focuses on an evaluation of the changes that could occur due to the potential oil and gas development. Impact evaluation concentrates on an analysis of the impacts at the statewide, regional, and local level.

In general, program products are sequentially arranged in accordance with BLM's proposed OCS lease sale schedule, so that information is timely to decisionmaking. Reports are available through the National Technical Information Service, and the BLM has a limited number of copies available through the Alaska OCS Office. Inquiries for information should be directed to: Program Coordinator (COAR), Socioeconomic Studies Program, Alaska OCS Office, P. O. Box 1159, Anchorage, Alaska 99510.

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ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM

LOWER COOK INLET PETROLEUM DEVELOPMENT SCENARIOS: ECONOMIC AND DEMOGRAPHIC ANALYSIS

PREPARED FOR

BUREAU OF LAND MANAGEMENT
ALASKA OUTER CONTINENTAL SHELF OFFICE

NOTICE

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ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM
LOWER COOK INLET PETROLEUM DEVELOPMENT
SCENARIOS: ECONOMIC AND DEMOGRAPHIC ANALYSIS

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I. INTRODUCTION

Background

Because of its high potential as a source of oil and gas, the U.S. Outer Continental Shelf (OCS) figures significantly in the future energy program of the United States, and Alaska is particularly important to the OCS program.

Alaska historically has played a small role in the U.S. energy supply. Through 1974, Alaska's oil output has accounted for only one percent of the total cumulative petroleum production in the United States (U.S. Geological Survey, 1975).

However, Alaska accounts for over one-fourth of the identified oil and gas reserves in the United States. An estimated one-third of all undiscovered recoverable domestic oil reserves are in the state, and it has been projected that by 1985 over 25 percent of total domestic crude oil production could be from Alaska (Federal Energy Administration, 1976).

Over 60 percent of the estimated undiscovered OCS reserves in the United States are in Alaska (U.S. Geological Survey, 1975). The development of Alaska's petroleum reserves is also important to the state economy. Changes produced by past petroleum development in the state have been major. The rapid changes in the Alaska economy associated with developments in Upper Cook Inlet and Prudhoe Bay created strains on the Alaskan

society and environment. At the same time, these developments generated the most prosperous economic period in the state's history as well as prospects of continued prosperity through the next decade.

The Purpose of the Study

This study is part of the Bureau of Land Management's Alaska OCS Socio-economic Studies Program. The objective of this program is to assess the potential impacts of proposed lease sales in the federal offshore areas of Alaska. The study of the impacts of OCS development in the Lower Cook Inlet is one of a series of studies describing lease sale impacts. Already completed is a study of the impact of the joint federal-state sale in the Beaufort Sea (ISER, 1978) and the sales in the Northern Gulf and Western Gulf (ISER, 1979); future studies will be conducted for lease sales in the Bering Sea-Norton Sound. The studies program is concerned with many aspects of OCS impact on many different levels. The major objective of this study is to examine only a portion of OCS impact, the statewide and regional economic and demographic impacts.

To achieve this objective, ISER will provide a series of economic and population forecasts through 2000 under several alternative scenarios for petroleum development in the Lower Cook Inlet. By contrasting these forecasts with a base case forecast, which does not include the proposed

development, it is possible to assess the major dimensions of the impacts of OCS development on population, employment, income, and the state's fiscal position.

Study Design

This study consists of three major parts: a baseline study of the economies of the state and its Gulf of Alaska region, a base case projection describing the future economy without Lower Cook development, and an examination of the impact of Lower Cook development. This section describes the relationship of each of these parts to the impact assessment and the methodology chosen to make the necessary projections.

EXAMINATION OF PAST ECONOMIC GROWTH

Examining the past growth of the Alaska economy and the economy of the Gulf of Alaska region provides an understanding of the way the economy works. This type of examination is implicit in the development of economic models. Making this analysis explicit will emphasize those aspects of economic growth which are important. The two aspects of the economy which will be emphasized in such a process are the important causes of growth and the economic relationships which transfer growth between sectors of the economy. An examination of the historical period will provide an indication of the types of response we can expect to OCS petroleum development. In addition, the historical growth and development of these economies provide a point of comparison for future economic growth, both OCS and non-OCS related.

THE BASE CASE

Petroleum development in the Lower Cook Inlet will affect both the structure and size of the Alaska economy. Changes in the economy which result from the development of the OCS resources (or its impacts) can be described as changes from the pattern of economic growth which would have occurred without OCS development. The non-OCS base case is developed to provide a reference point for the analysis of the impacts of OCS development. Comparing a projection of economic activity with OCS development to the base case will isolate the impacts of development.

THE ROLE OF SOCIOECONOMIC PROJECTIONS

Projections serve two important purposes--they serve as a means of determining future demands and needs for services, and they allow policy makers to test the alternative effects of various policies. They increase the information available to decision makers. Many present policy choices have important future implications which must be considered. For example, current policy decisions regarding Lower Cook OCS petroleum development will have their major effect in the middle of the next decade. By providing descriptions of the most probable future (or futures) socioeconomic projections serve as a framework for making policy choices.

METHODOLOGY

This section describes the methodology used to make the projections of Alaskan economic growth in both the base case and OCS development cases.

Two econometric models, statewide and regional, are used to make the projection. This section will describe the models used and their strengths and weaknesses.

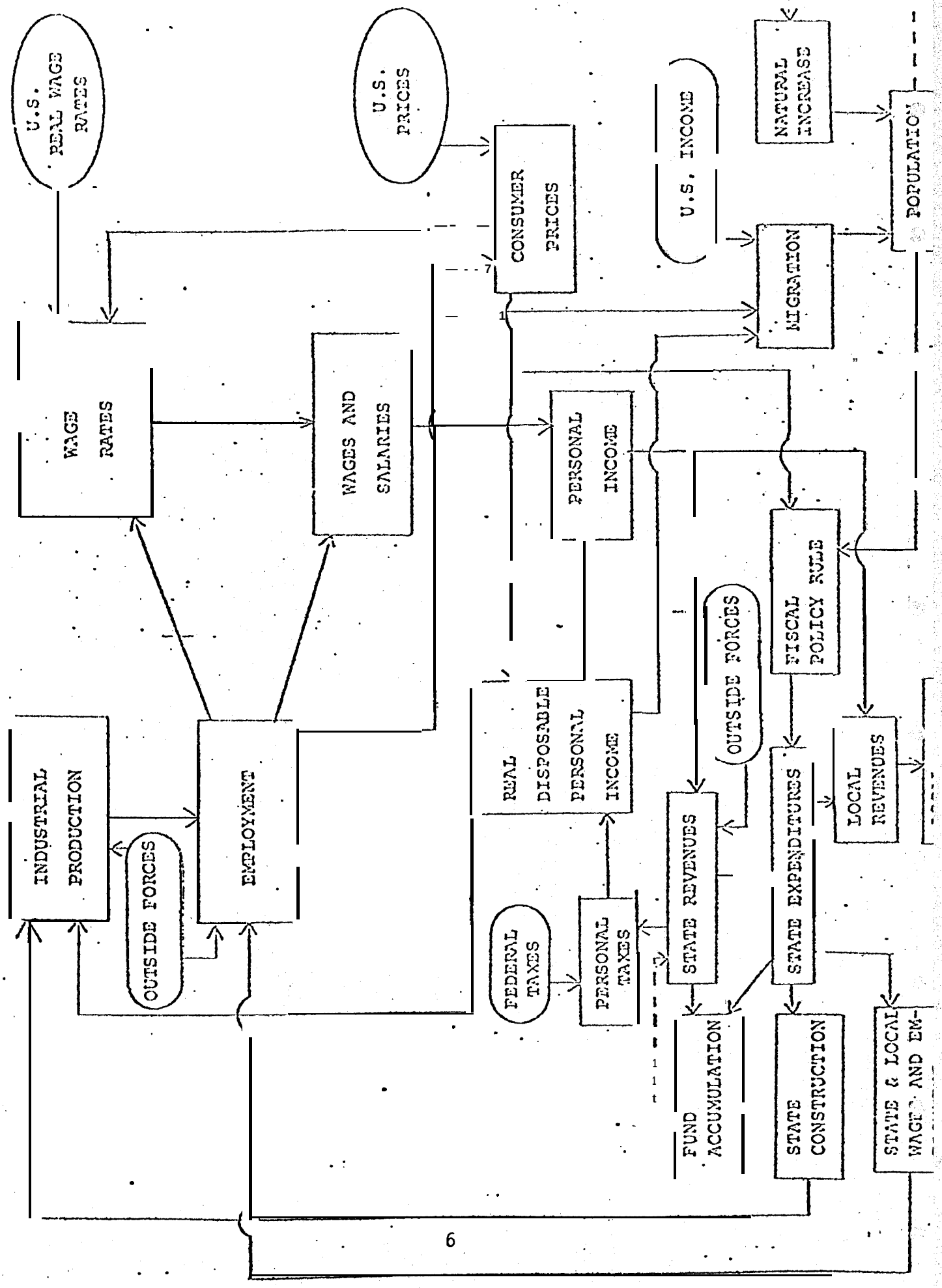
The Statewide Econometric Model

The basic model to be utilized in the analysis of the OCS development scenarios is the statewide econometric model of the Alaskan economy developed in the Man-in-the-Arctic Program (MAP) presently being conducted by the Institute of Social and Economic Research of the University of Alaska. There are three components of this model: an economic model, a fiscal model, and a demographic model. The basic structure of the model is shown in Figure 1.

The economic model is divided into exogenous or basic sectors and endogenous or nonbasic sectors. The level of output in the exogenous sectors is determined outside the state's economy. The primary reason for the nonbasic sector is to serve local Alaskan markets, so the level of output is determined within the Alaskan economy. The basic industries in the model are mining, agriculture-forestry-fisheries, manufacturing, federal government, and the exogenous component of construction. The nonbasic industries are transportation-communication-utilities, wholesale and retail trade, finance-insurance-real estate, services, and the remainder of construction.

FIGURE I

STRUCTURE OF THE BASIC MAP MODEL



In the model, industrial production determines the demand for labor and employment; employment is that level needed to produce the required output. Employment and the wage rate determine wages and salaries, the most important component of personal income. The Alaskan labor market is an open one with equilibrium achieved through migration of individuals.

Because of this, the most important determinant of Alaskan wage rates is U.S. wage rates; wages are also affected by rapid growth of employment in Alaska. An estimate of disposable personal income is made by adding an estimate of nonwage income to wages and salaries and adjusting this by deducting income taxes. The level of real disposable income is found by deflating disposable personal income by a relative price index; the major determinants of Alaskan prices are U.S. prices, the size of the economy, and the growth rate of the economy. Incomes determine the demand for local production; incomes and output are simultaneously determined.

Population is determined based upon a projection of each of its components--births, deaths, and migration. The model uses age-sex-race-specific survival rates and age-race-specific fertility rates to project births and deaths for the civilian population. Total civilian population is found by adding civilian net migration to the natural increase. Net migration is determined by the relative economic opportunities in Alaska. In the model, these are described by employment changes and the

Alaskan real per capita income relative to the real per capita income of the United States. An exogenous estimate of military population is added to determine total population.

The fiscal model, which provides important pieces of information for the economic model, also provides a framework for analyzing the effects of alternate fiscal policies. The fiscal model calculates personal tax payments in order to derive disposable personal income. The fiscal model, based on an assumed state spending rule, also calculates personnel expenditures, state government employment, and the amount spent on capital improvements which determines a portion of employment in the construction industry. All three' submodels are linked through their requirement for information produced by the other submodels.

The Regional Econometric Model

The regional model provides an allocation of employment, income, and population in the state to seven regions of the state. These regions are shown in Figure 2. The economic component is similar in each region to that of the state model. The major difference is that some regional economies are influenced by economic activity in other regions; the most notable of these is Anchorage. The demographic component of the regional model is much simpler than that component of the state model. Regional population is estimated as a function of employment. Regional population is estimated in two components--enclave and nonenclave population. A

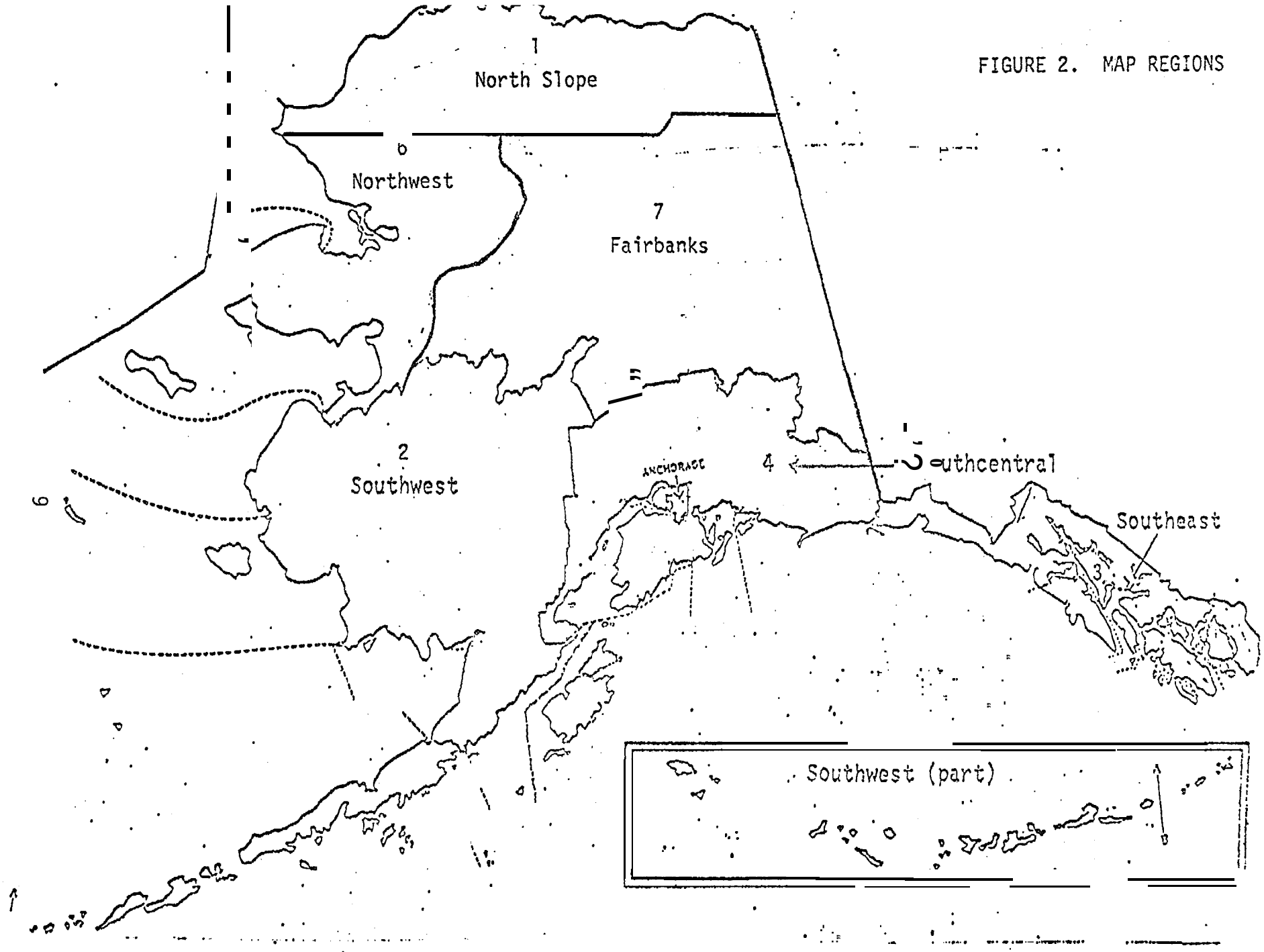


FIGURE 2. MAP REGIONS

weighted average of the nonenclave population to nonenclave employment ratio for the state and the lagged value in the region is multiplied by the nonenclave employment to estimate nonenclave population in the current year. The weights are based on the proportion of state population in the region. Enclave employment is added to nonenclave population to determine total regional population. Enclave employment includes the military and major construction projects such as the trans-Alaska pipeline. The regional model has no fiscal component and must accept an exogenous pattern of wage and salary payments to state and local government workers. Usually the pattern of wage and salary payments used is taken from a similar state model projection. Estimates of regional' employment, population, and income in the regional model are constrained to total to equivalent variables from the state model results.

STRENGTHS AND LIMITATIONS

The models used in this analysis have several strengths and weaknesses ' which must be considered when examining the reported results. The principal strength of these models is that they capture the essence of the Alaska growth process. Export base industries and government create growth directly through hiring and indirectly through the demand generated by their employees for locally produced goods and services. Incomes earned by these export base workers and the workers who supply the goods and services provide the base of the economy. Compared to two alternative forms, the economic base and input-output models, the econometric specification of this type is preferred, since it captures the dynamics of

industry growth. The economic base model is useful for projecting marginal changes but assumes that changes in the support sector are proportional to changes in basic sector employment. This misses both the feedback effect of the growth of the support sector incomes and the change in the responsiveness of the support industries over “time. While input-output models more precisely define the interindustry flows of purchases of goods and services, it represents the economy only at a particular point in time. The econometric approach can capture some of the changing relationships over time, and these are described by historic changes or incorporated by the modeler.

The limits on the econometric method define the limits on the acceptance of the resulting projections. No model is able to capture revolutionary changes which violate the assumptions upon which the model is built, unless, structural change has been foreseen and incorporated by the modeler. The limitations of the model increase the more the model is extended into the future and the more vocationally precise the model is expected to be. In other words, more confidence should be placed in the 1985 results than those for 1995, and statewide projections are more likely to be “correct” than regional results.

Another important limitation of this model is that the projections should be considered contingent. The accuracy of the projections depends on the continued relevance of the model’s historical structure and the accuracy of the assumptions about the level, timing, and dis-

tribution of the exogenous variables. One result of this centingency is that the projections may not necessarily agree with the actual levels of the projected variables for any given year. Projections are based on the average historical relationships between the projected variables and important exogenous variables. This leads to two reasons why projections in any year may differ from the actual levels of projected variables. First, estimates of the level of important exogenous variables may differ from the actual levels. Secondly, in any given year, the relation between projected and exogenous variables may differ from the historical average. Cyclical effects may cause yearly divergence from the general trend of economic growth. The relationships described by the model, while they may not predict actual levels in any particular year, describe the general trend of future Alaskan economic growth.

The final limitation of the results concerns the projection of the regional distribution of state growth. These results are merely allocations of the projected statewide totals to the regions. This should not be assumed to be a detailed analysis of the regional economies and should not replace such analysis.

The general approach to be pursued in the projections of the impacts of Lower Cook OCS development will be as follows: A set of scenarios will be developed which contain no Lower Cook OCS development. These scenarios will be run using the MAP model and will serve as points of comparison

for each alternate Lower Cook scenario. Each of the Lower Cook development scenarios will then be run. Each of these runs will then be compared to the appropriate base run to examine the impact of this hypothetical development on the major dimensions of the Alaskan economy.

The effect of alternative Lower Cook development scenarios will be examined. Part II describes the historical growth in Alaska and its Gulf of Alaska region. Part 111 presents the projection of economic activity in a base case which contains no offshore activity in the Lower Cook.

II. THE ALASKAN ECONOMY, 1965-1976

Introduction

The methodological framework used in this report is that of economic base theory. This theory explains regional growth and change as the result of growth and change in the state's exports (or exogenous demand). Industries whose inputs are primarily a function of export demand are classified as basic industries. The remaining industries are classified as nonbasic in that their output and employment levels are functionally related to the level of state income. Economic base models are tractable and have relatively modest data requirements. Their use in impact analysis is well-established.

The period 1965-1978 was chosen to provide a long-term look at the changes in the economy. The period contains three significant events: the major Upper Cook Inlet oil development, the Prudhoe Bay lease sale, and the construction of the trans-Alaska oil pipeline. The Prudhoe Bay lease sale in 1969 marked the beginning of Alaska as a major petroleum economy. Comparing the economy before and after this date will illustrate the effects of this change.

Table 1 describes the change in the level of three aggregate measures of economic activity: population, employment, and real personal income. These variables provide an overview of the state's economic growth during the period 1965 through 1978.

TABLE 1. GROWTH OF EMPLOYMENT, POPULATION, PER CAPITA AND PERSONAL INCOME, ALASKA 1965-1977

	Population	Employment	Real Personal Income[3] ($ 1967 Million)	Real Per Capita Income[4]
1965	265,192	70,530	910.8	3,435
1970	302,361	92,476	1,288.3	4,260
1971	"312,930	97,584	1,379.1	4,407
1972	324,281	104,243	1,465.1	4,518
1973	330,365	109,851	1 ,662.3	5,031
1974	351,159	28,178	1,819.4	5,180
1975	404,634	61,313	2,311.7	5,713
1976	413,289	71,714	2,551.2	6,172
1977	411,211	64,100	2,442.6	5,940
Compound Annual Growth Rate				
1965-1977	3.72	4.10	8.57	4.67
1970-1977	4.49	8.54	9.57	4.86

[1]All estimates State of Alaska Department of Labor, Research and Analysis Section, Population Estimates by Census Division, except 1970 which is April 1970 Census of Population.

[2]Alaska Department of Labor, Statistical Quarterly, various years.

[3]U.S. Department of Commerce. Bureau of Economic Analysis, Regional Economic Information System, July 1978 printout. (Deflated using Anchorage Consumer Price Index.)

[4]Real personal income divided by population.

Population and Demographic Change

Population grew at a compound annual growth rate of 3.7 percent from 1965 to 1976. From 1965 to 1970, population grew at a compound annual rate of 2.66 percent. The compound growth rate from 1970 to 1977 was 4.49 percent, a difference of 1.83 percentage points. Three-quarters of the period's total population growth occurred after 1970. The most rapid growth occurred during the Trans-Alaska Pipeline Service (TAPS) construction when the population increased by 15.2 percent between 1974 and 1975.

The size of the population is strongly influenced by levels of economic activity. Migration was a major component of Alaskan population change, especially after 1970. Net migration appeared to be very responsive to employment opportunities in the state. Table 2 details the growth in population from 1965 to 1977.

A small region experiencing rapid economic growth would be expected to experience net migration as a response to excess demand in local labor markets. This was the Alaskan experience. Migration accounted for 55 percent of the total change in population between 1970 and 1976, after which out-migration occurred. In 1975, it accounted for 89 percent of the increase in population.

Table 3 describes the age-sex distribution for the years 1970 and 1976. This comparison reveals two observable trends. First, the proportion of males in the population declined. Secondly, the working-age population

TABLE 2. POPULATION GROWTH, ALASKA
1965, 1970-1977

	Number of Births	Number of Deaths	Natural Increase	Estimated Net Migration	Population as of July 1	% Increase over Previous Year
1965	7,063	1,400	5,663	4,538	265,192	3.84
1970	7,560	1,431	6,129	1,672	302,361	2.66[1]
1971	7,312	1,455	5,857	4,712	312,930	3.50
1972	6,948	1,467	5,481	5,870	324,281	3.60
1973	6,611	1,464	5,147	937	330,365	1.88
1974	7,006	1,468	5,538	15,256	351,159	6.29
1975	7,470	1,522	5,948	47,527	404,634	15.23
1976	7,912	1,617	6,295	2,360	413,289	2.14
1977	8,378	1,606	6,772	- 8,850	411,211	- .50

[1] Average annual compound growth rate between 1965 and 1970.

SOURCE : Alaska Department of Labor and the Division of Economic Enterprise, Department of Commerce and Economic Development, as reported in The Alaskan Economy, Year-end Performance Report, 1977, except 1970 population from U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population.

TABLE 3. ALASKA POPULATION
AGE-SEX DISTRIBUTION
1970, 1976

	1970			1976		
	Males	Females	Total	Males	Females	Total
Age						
All ages	54.2	45.7		51.6	48.4	
0-13	16.5	15.7	32.2	14.1	13.2	27.3
14-19	5.7	5.2	10.9	6.6	6.0	12.6
20-29	12.4	8.7	21.1	11.2	10.4	21.6
30-39	7.7	6.5	14.2	7.8	7.8	15.6
40-54	8.1	6.6	14.7	7.7	7.2	14.9
55-64	2.5	2.0	4.5	3.1	2.6	5.7
64 +	1.3	1.0	2.3	1.1	1.2	2.3

SOURCES: U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population.

U.S. Department of Commerce, Bureau of the Census, 1976 Survey of Income and Education Microdata Tape.

(14-64) increased relative to the total population. In spite of the rapid post-1970 population growth, the age-sex distribution has remained relatively stable. Evidently, by 1976, the transitory employment components associated with the pipeline construction had essentially vanished, and the remainder was demographically "normal" with respect to their age-sex characteristics.

The dependency ratio (population/employment) fell from 3.76 in 1965 to 2.41 in 1976. As previously explained, the TAPS construction project and its isolated, enclave nature attracted workers but few dependents.

Employment

Total nonagricultural wage and salary employment grew by 132 percent from 1965 to 1977 (see Table 1). Again, the pre- and post-1970 rates show great disparity. From 1965 to 1970, employment increased at a 5.6 percent compound annual rate. After 1970, the compound annual rate was almost 8.6 percent, or about 52 percent higher than the pre-1970 rate. As a result, more than 77 percent of the total growth in employment occurred after 1970.

The relationship between growth in employment and growth in total population indicates that employment growth was accompanied by relatively few dependents. In 1973, the ratio of total population-to-employment was 3.01. Between 1973 and 1975, the marginal ratio or the ratio between the change in population to the change in employment was only 1.44, considerably less than one dependent per worker. As a result,

the overall ratio had declined to 2.51 by 1975; this ratio remained at this level through 1977.

The different rates of growth in population and employment were related to the peculiar nature of employment during the 1973-1975 period. The expansion of the mining sector and the trans-Alaska pipeline construction were characterized by enclave-type work camps. Their relative isolation and the harshness of camp life encouraged employment of a transitory work force. This work force embodied "atypical" dependent/worker relations. Overall, the aggregate indicators indicate a rapidly growing economy. The major growth in the period occurred after 1970.

BASIC SECTOR GROWTH

The growth of the export base was a major force determining the growth of the Alaskan economy during this period. This section will examine the growth of the various industries which make up the Alaskan basic sector. By examining the growth in each industry, we can see its relative importance to Alaska's economic growth.

In this section, we will determine the basic sector by definition. Those industries where the level of activity is affected primarily by external factors will be considered basic industries. Mining, agricul ture-forestry-fi sheries, manufacturing, federal government, and construction are basic industries. The demand for the products of both mining and agricul ture-forestry-fisheries is determined in national and international markets, not within the Alaskan economy. Manufacturing

is largely a part of these two industries since food processing and petrochemicals are its major components. The level of federal government activity in Alaska is determined by decisions made outside the state, Construction has both basic and nonbasic components; however, major changes in construction activity are determined by exogenous influences, for example, the construction of the trans-Alaska pipeline.

Table 4 presents data on the growth rates of employment and wages and salaries. The growth rate of wages and salaries differed considerably by sector over the historical period. By taking the ratio of growth rates of wages and salaries to employment by sector, one can derive a measure of relative income behavior over the period 1965-1976. Over the whole period, relative incomes increased more rapidly in the basic sector than in the support sector. The ratio of relative increase is 3.16 (this is the ratio of growth in wages and salaries to growth in employment in the basic sector divided by the same ratio in the support sector). All incomes were increasing, but the distribution of income resulting from the growth process was favoring the basic sector.

The growth in wages and salaries can differ from employment growth for three reasons.

First, the growth of wage rates can differ between industries. Secondly, the hours worked in different industries can differ. Finally, the composition of industrial employment growth may not be proportional.

TABLE4. ALASKA ECONOMIC GROWTH BY SECTOR
1965-1976

	Compound Annual Rates of Growth								
	1965 - 1976			1970 - 1976			1973 - 1975		
	(1) Employment	(2) Wages & Salaries	(2/1)	(3) Employment	(4) Wages & Salaries	(4/3)	(5) employment	(6) Wages & Salaries	(6/5)
Basic Sector[1]	2.9	16.7	5.76	4.7	23.6	5.02	13.8	54.2	3.93
Mining	12.5	23.1		4.9	16,3		37.8	68.8	
Construction	15.2	29.1		27.9	50.6		82.2	157.8	
Manufacturing	4.6	11.1		4.7	13.0		1.1	15.5	
Federal Civilian	.3	7.6		.8	8.0		3.5	12.7	
Federal Military	- 2.7	5.7		- 4.1	4.3		- 4.1	2.5	
Support Sector	10.2	18.6	1.82	12.3	24.1	1.96	23.7	52.5	2.22
Transportation-Comm.-Utilities	7.4	16.9		9.6	22,8		26.0	58.7	
Trade	9.7	16.4		10.2	19.3		19.7	38.9	
Finance-Insurance-Real Estate	11.2	18.5		14.8	24.4		18.1	30.3	
Services	12.6	24.3		16.0	30.9		28.5	68.1	
Other									
State Government	6.6	15.7	2.38	5.4	15.8	2.93	6.0	23.0	3.83
Local Government	10.1	18.8	1.86	11.1	21.7	1.95	11.9	20.5	1.72
Total Nonagricultural Wages and Salaries[2]	6.0	17.5	2.92	7.8	23.4	3.0	16.5	47.5	2.88

[1] 'Agricul ture-forestry-fisheries is left out of this table. During the period, changes in the coverage of fisheries employment distorts the real growth in this industry.

[2] Includes military wages and salaries from U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, July 1978 printout.

SOURCES: Alaska Department of Labor, Alaska Labor Force Estimates, Estimates of Total Population, various years.

Alaska Department of Commerce and Economic Development, The Alaska Economy: Year End 'Performance Report 1977.

Overall employment in the basic sector grew at a much slower rate than the remainder of the economy in all but the pipeline years, 1973-1975. Between 1965 and 1976, basic sector employment increased at an average annual rate of only 2.9 percent per year, compared to 6 percent for the entire economy and 10.2 percent for the support sector. After 1970, industrial growth rates were much closer--basic sector employment grew at a rate of 4.7 percent, compared to 7.8 percent for the entire economy.

The growth rates are much closer when wages and salaries are considered. Between 1965 and 1976, the wages and salaries earned in the basic sector grew only .8 of a percentage point less than the economy-wide average of 17.5 percent. After 1970, basic sector wages and salaries grew slightly faster than the economy as a whole.

The effect of pipeline construction on the growth of the economy can be seen in the period 1973 to 1975. Employment in the basic sector grew at 13.8 percent annually, while the economy grew at 16.5 percent. Wages and salaries increased more rapidly, increasing at a rate of 54.2 percent annually in the basic sector, compared to 47.5 percent for the economy as a whole.

Within the basic sector, the federal government was declining in importance relative to other industries. The military was declining in an absolute and relative,sense, and federal civilian employment was virtually' stable.

The most rapidly growing basic industry was construction. Employment grew at an average annual rate of more than 15 percent throughout the period; this was more than twice the growth rate of the economy. The obvious reason for this growth was the construction of the trans-Alaska pipeline which began in 1974. The most rapid increase came in the period between 1973 and 1975 when construction employment increased at a rate of 82.2 percent per year. The state estimated that in 1976 construction employment connected with the Alyeska project was approximately 15,000, or 50 percent of the total state construction employment (Alaska Department of Labor, 1977). Wages and salaries mirrored the growth in employment, increasing at an average annual rate of 50.6 percent after 1970.

Mining employment also increased at a rapid rate throughout the period; its average annual rate was 12.5 percent. Unlike construction, mining experienced cyclical growth. Mining employment increased between 1965 and 1970 to 3,000, then fell to 2,000 in 1973 before increasing to 4,000 in 1976.

The early growth in mining resulted from discovery, development, and production of oil and gas from the Kenai Peninsula and Cook Inlet fields. Oil was discovered in 1957 at the Swanson River; and production increased from one million barrels per month in 1966 to a peak in 1970 of 7.5 million barrels per month. Employment associated with these fields grew at an annual rate of approximately 40 percent in the late sixties, causing mining employment to triple between 1965 and 1969 in

the Cook Inlet Region (Anchorage, Kenai, Matanuska-Susitna, Seward) (Scott, 1978) . Mining employment dropped after this peak. During the 1970s, the development of the Prudhoe Bay fields resulted in the expansion of the mining industry. This development led to growth in both exploration and production employment and headquarters employment in Anchorage. The most rapid expansion of the mining industry came between 1973 and 1975 when both employment and wages and salaries increased at rates more than three times as great as the economy.

Manufacturing in Alaska has traditionally been associated with the fishing industry. Over the period, food manufacturing, because of its relation to the fishing industry, showed cyclical growth; employment fell between 1973 and 1974 and did not rise again until 1976. The fastest growing sector of manufacturing was "other" manufacturing which consists principally of petroleum refining, petrochemical, and printing and publishing. Between 1965 and 1976, employment in "other" manufacturing increased at an average annual rate of 6.5 percent, which meant that this sector was increasing its share of manufacturing employment.

Agricul ture-fisheries-forestry depend on the development of'the state's renewable natural resources, and independent estimates of employment in these industries suggest little growth. Forestry employs only about 22 people statewide; most of the logging employment is accounted for in lumber and wood products manufacturing (Scott, 1979). One indicator of agricultural activity is employment reported in a yearly agricultural survey. This survey reports a decline in total agricultural employment from 900 in 1965 to 750 in 1975 (USDA)..

The fishing industry has traditionally been important to Alaska. Based on estimates from Fish and Game fish ticket data, employment was estimated to have increased from about 4,340 in 1970 to about 5,720 in 1976. This is an annual growth rate of 1.3 percent (Rogers and Listowski, 1978). Table 5 shows some additional indicators of the growth of the fisheries industry. The catch and value statistics shown in this table illustrate the cyclical nature of the fishing industry. The real value of fisheries catch peaked in 1973 at $117,842,000 (in 1967 dollars). After this peak, real value fell until 1975, after which it began to grow again.

In summary, employment in the basic industries grew rapidly but not so rapidly as the total economy. The major growth in the basic sector was in mining and construction. The traditionally important fishing industry did not keep up with growth in other basic sectors. Federal government employment, while providing a stable base for the economy, actually declined.

The ratio of total-to-basic employment in Alaska has steadily increased from the early fifties (Goldsmith and Huskey, 1978B). This growth in the nonbasic or support sector of the Alaskan economy means that equivalent increases in basic employment will lead to greater growth. Table 6 illustrates the effect of structural change on growth. The last two columns show what growth would have been with the given basic sector growth and the maintenance of 1965 and 1970 total-to-basic ratios. In all cases, these ratios underestimate the economy's real growth.

TABLE 5. ALASKA FISHERIES ACTIVITY
1970-1977

	1970	1971	1972	1973	1974	1975	1976	1977
Catch (million lbs)	533.6	471.0	422.5	513.1	454.2	442.4	615.7	674.5
Value ($000)	97,497	85,585	92,431	142,353	144,809	129,402	240,858	350,889
Real Value ($000)	88,957	75,735	79,751	117,842	108,147	84,965	141,266	193,328
Real Value Per Pound	$0.17	$0.16	$0.13	$0.23	$0.24	$ 0.19	$0.23	$0.29

SOURCE: Alaska Department of Commerce and Economic Development, 1977.

TABLE 6. THE EFFECT OF STRUCTURAL CHANGE, ALASKA, 1965-1976

Year	Total Non-Agricultural Employment	Civilian Total Basic Employment	Ratio of Total/ Basic	Total Employment When Using 1965 Ratio	Total Employment When Using 1970 Ratio	Change in Total Employment/ Basic Employment (from previous year)
1965	70,530	31,393	2.25		82,879	
1970	92,476	35,028	2.64	78,697		
1971	97,584	35,447	2.75	79,638	93,582	12.19
1972	104,243	36,137	2.88	81,188	95,404	9.65
1973	109,851	35,849	3.06	80,541	94,643	-19.47
1974	128,178	45,698	2.80	102,668	120,645	1.86
1975	161,313	58,592	2.75	131,637	154,686	2.57
1976	171,714	63,732	2.69	143,185	168,256	2.02

Basic Employment includes: Mining, Contract Construction, Manufacturing, Agriculture-Forestry-Fisheries, Federal Government, and Military.

SOURCE : Alaska Department of Labor, Statistical Quarterly, various quarters (primarily third), 1966-1977.

An analysis of the marginal change of total employment to basic employment reveals that it has been declining since 1970. While employment in the support sector has continued to grow in response to employment activity in the basic sector, this growth has been at a decreasing rate. This decreasing growth rate began after 1972 when the marginal rate first fell below the seven-year average of the total-to-basic employment ratios.

Table 7 provides a detailed description of the structure of Alaska industry in 1965, 1970, and two pipeline years--1975 and 1976. The support industries as a group expanded. Trade and transportation-communication-utilities remained constant after 1970. The service industry grew significantly in this period, increasing from 10.7 percent to 16.1 percent of total employment. Business services increased from 1.97 percent to 5.04 percent and were the major component of service sector change. Finance-insurance-real estate also increased as a proportion of total employment.

POSSIBLE LONG-TERM TRENDS IN STRUCTURAL CHANGE

Since 1965, the support sector employment has exhibited relative growth. There are reasons to expect this trend to continue. The process of economic growth will expand local market opportunities for reasons already cited (import substitution, scale economies, etc.).

Tables 8 and 9 give some insight into the likely limits to the growth of the support sector. Table 8 compares the Alaskan distribution of

TABLE 7 DISTRIBUTION OF EMPLOYMENT, ALASKA
1965, 1970, 1975, and 1976

Industry	1965 % of Total Employment	1970 % of Total Employment	1975 % of Total Employment	1976 % of Total Employment
Total Wage and Salary Employment	100.00	100.00	100.00	100.00
Mining	1.54	3.24	2.35	2.31
Contract Construction	9.15	7.45	16.04	17.61
Manufacturing	8.90	8.48	5.98	6.02
Food	4.26	4:04	2.68	2.98
Logging Lumber and Pulp	3.27	2.98	2.09	1.89
Other Manufacturing	1.36	1.45	1.20	1.14
Transportation, Communication, and Public Utilities	10.30	9.85	10.21	9.18
Trucking and Warehousing	1.72	1.79	2.45	1.89
WaterTransportation	1.47	.90	.86	.78
Air Transportation	2.72	3.32	2.96	2.70
Other Transportation	.76	.95	1.13	1.08
Communications and Public Utilities	3.63	2.89	2.69	2.73
Trade	14.11	16.61	16.25	16.05
Wholesale	2.63	3.51	3.66	3.55
Retail	11.48	13.10	12.58	12.50
General Mdse. and Apparel	2.69	3.63-	2.55	2.48
Food Stores	1.65	1.85	1.62	1.74
Automotive & Service Stations	NA	1.81	1.77	1.68
Eating/Drinking Establishments	2.77	3.02	3.88	3.76
Other Retail	4.36	2.78	2.76	2.84
Finance, Insurance, and Real Estate	3.08	3.35	3.74	4.14
Services	10.65	12.37	15.58	16.11
Hotels, Hotels, and Lodges	1.46	1.57	1.96	1.87
Personal	.96	.92	.57	.54
Business	1.97	2.16	4.54	5.04
Medical	2.03	2.35	2.68	2.92
Other	4.22	5.37	5.83	5.75
Government	42.06	38.45	29.22	27.89
Federal	24.72	18.50	11.34	10.45
State	9.87	11.21	9.59	8.22
Local	7.47	8.73	8.30	9.21
Agriculture, Forestry, and Fisheries	.20	.21	.63	.70

SOURCE: Statistical Quarterly, Alaska Department of Labor, various issues.

Table 8. THE ECONOMIC STRUCTURE OF SMALL STATES

	Total Employment (thousands)	Percent in	Percent in Trade	Percent in Finance-Insurance-Real Estate	Percent in Transportation-Communication-Public Utilities	Percent in Government
Alaska	151.7	15.2	17.5	5.1	9.0	34.5
Wyoming	168.7	13.9	21.9	3.4	7.8	22.7
Vermont	179.5	23.4	20.7	4.0	4.7	18.2
North Dakota	227.8	19.3	29.0	4.5	6.1	26.8
South Dakota	227.0	21.1	27.5	4.4	5.4	24.9
Delaware	234.3	16.9	22.0	4.8	5.2	17.8
Montana	263.7	18.4	25.2	4.4	7.8	27.8
Idaho	305.5	17.5	25.1	5.3	6.0	21.8
Nevada	323.7	40.8	19.8	4.2	6.0	16.1
New Hampshire	348.1	18.3	21.5	4.9	3.6	16.1
Hawaii	362.2	24.0	25.4	6.9	7.8	24.2
Rhode Island	383.0	18.8	19.9	5.0	3.5	15.7
Maine	384.3	17.0	21.1	3.9	4.5	21.3
New Mexico	430.9	19.5	22.9	4.4	6.0	26.9
Utah	500.2	17.4	24.0	4.6	6.1	23.8
Nebraska	583.6	17.4	26.5	6.6	7.2	22.2
Virginia	549.2	15.8	22.0	3.6	6.6	20.9
Arkansas	714.5	14.0	21.0	4.2	5.4	19.0
Mississippi	778.1	14.3	19.0	3.9	4.7	21.2
Arizona	829.8	18.2	24.4	5.6	5.2	23.2
Kansas	878.5	17.5	23.8	4.9	6.6	20.9
Oregon	962.7	17.5	23.7	6.2	5.7	20.3
Oklahoma	1,001.6	16.6	23.4	5.0	6.0	22.4
Colorado	1,008.1	19.4	23.4	6.1	6.5	22.2
Washington	1,040.6	18.4	23.7	5.6	5.7	20.7
Average (excluding Alaska)		19.0	23.3	4.8	5.8	21.5
U.S. Average		18.8	22.1	5.1	5.5	15.9

Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, June 1970.

TABLE 9. ECONOMIC STRUCTURE OF SMALL STATES
1977

	Total Employment Support Industry[1] (Thousands)	Personal Income (Million $)	Support/ Personal Income	Regional Index of costs (U.S.=1)	Support Employment/ Regionally Deflated Personal Income
Alaska	71.100	4,311	16.5	1.42	23.4
Wyoming	79,100	3,073	25.7	.90	23.1
Vermont	94,700	2,814	33.7	1.02	34.4
North Dakota	136,600	4,044	33.8	.92	31.1
South Dakota	132,700	4,104	32.3	.92	29.7
Delaware	114.700	4,477	25.6	1.02	26.1
Montana	147,300	4,661	31.6	.90	28.4
Idaho	164,600	5,128	32.1	.90	28.9
Nevada	228,800	5,059	45.2	.99	44.7
New Hampshire	168,400	5,547	30.4	1.02	31.0
Hawaii	234,600	6,773	34.6	1.21	41.8
Rhode Island	181,000	6,332	28.6	1.02	29.2
Maine	178,300	6,221	28.7	1.02	29.3
New Mexico	227,400	6,970	32.6	.88	28.7
Utah	256,300	7,510	34.1	.98	33.4
Nebraska	336,500	10,491	32.1	.93	29.9
West Virginia	264,000	11,129	,23.7	.85	20.1
Arkansas	321,100	11,878	27.0	.89	24.0
Mississippi	331,800	12.019	27.0	.89	24.0
Arizona	446,600	14,943	29.9	.99	29.6
Kansas	464,700	19,802	23.5	.93	21.9
Oregon	511,500	16,651	30.7	.998	30.6
Oklahoma	510,400	17,839	28.6	.98	28.0
Colorada	558,900	18,752	29.8	.98	29.2
Washington	755,900	27,534	27.5	.998	27.4

[1]Support sector includes: Services, Trade, Finance-Insurance-Real Estate, and Transportation-Communication-Public Utilities.

SOURCES: U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, June 1978.

U.S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review, April 1978.

employment to the United States and other small and western states. only in finance-insurance-real estate and transportation does Alaska come close to the employment shares of other states. The shares of trade and services are well below those of other states, The government and transportation-communications-public utilities sectors are substantially above the U.S. average, reflecting both the uniqueness and the geographical extent of the Alaskan economy.

Table 9 further details the differences in structure among states and relates the differences to personal income. When personal income is adjusted to reflect cost differences among regions, the differences among the states converge. The ratio of support per one million dollars in personal income is close to 30.00 for all states, independent of size. Alaska's ratio is less than 40 percent of the average.

There are a number of reasons -ForAlaska's underrepresentation of the support sector. First, high costs increase the threshold size before economies of scale can be realized. Second, mining and petroleum-related construction occur in isolated, enclave environments that are largely self-supporting. This reduces demand for support sector services. Finally, the geographical extent of the state and its lack of economic integration (except through the state government sector) make it more profitable for some parts of western and southeast Alaska to exchange directly with the Lower 48 rather than to rely on the Alaska support sector.

Unemployment

Chronic high unemployment has been endemic to the Alaskan economy. Table 10 reveals that the rate has remained near 10 percent every year since 1970. This was substantially above the national average. Only in 1975 did the state rate fall below 10 percent, but the number of unemployed remained high.

The increased demand for skilled labor was largely met by in-migration. The increase in the labor force participation rate may also explain the high unemployment rate, but this reason must be viewed cautiously. The low dependency ratio associated with the migrants and the economic motivation for their migration would, in itself, raise the labor force participation rate. The increases in the labor force participation rates appear to coincide with the peak years of in-migration.

Another factor associated with chronic unemployment is the seasonality of employment. One measure of seasonality is defined by the ratio of the fourth quarter employment to the third quarter employment. The closer this index is to one, the less seasonal is the industry. Table 11 shows the seasonality of Alaska industries. Seasonality has decreased in importance throughout the historical period. In 1960, the overall seasonality index was .8313. In 1975, it was .9402; the increase in seasonality in 1976 was due to the pipeline construction employment in the summer of 1976.

TABLE 10. UNEMPLOYMENT, ALASKA AND UNITED STATES 1965-1976

	Alaska Total Unemployed	Alaska Unemployment Rate (%)	United States Unemployment Rate (%)	Alaska Labor Force Participation Rate (%)
1965	7,700	8.6	4.5	38.16
1970	9,700	9.0	4.9	39.94
1971	12,100	10.4	5.9	40.97
1972	12,900	10.5	5.6	41.27
1973	13,900	10.8	4.9	42.78
1974	14,900	10.0	5.6	46.00
1975	14,900	8.3	8.5	47.40
1976	21,000	10.5	7.7	52.65

SOURCES: Alaska Department of Labor, Labor Force Estimates, various years.

Alaska Department of Labor, Estimates of Total Resident Population.

TABLE 11. SEASONALITY OF EMPLOYMENT, ALASKA
1950, 1960, 1965, 1970, 1975, and 1976

	1950	1960	1965	1970	1975	1976
Mining	.6267	.7143	.7949	.8556	.9009	.9690
Construction	.7900	.5862	.6460	.7279	.8374	.6906
Manufacturing	.2440	.5137	.6531	.5457	.6886	.6714
Transportation, Communication, and Public Utilities	.8248	.9683	.9125	.8851	.9887	.8871
Trade	.9226	.9718	.9905	.9733	1.0048	.9120
Finance, Insurance, and Real Estate	1.0000	1.0000	.9706	.8942	1.0000	.9270
Services .	.9583	.9123	.9664	.9716	.9812	.9387
Government	.9632	.9815	.9617	.9810	1.0049	.9689
Total	.7505	.8313	.8718	.8800	.9402	.8733

Note: Figures for 1977 are not available.

SOURCE: State of Alaska, Alaska Labor Force Estimates, various years.

The decrease in seasonality since 1960 has been the result of a number of factors. Even though seasonal, incomes in petroleum-related construction and construction in general were high enough so that workers in these sectors could sustain their consumption all year-round. Consequently, the demand for support sector services was less variable than it might have been. The growth of deposits from $535.5 million in 1973 to $848.8 million in 1976 represents a 17 percent increase when converted to real terms. Savings of. this magnitude probably served to stabilize employment both by reducing demand during peaks and increasing it during slack periods. Finally, construction technology partially adapted to winter construction conditions.

Real Income Per Capita

The statistics in Table 1 reveal an impressive real growth rate in per capita income of 4.86 percent per year primarily as a result of increases in employment. If this "real" rate were to continue, per capita real income would double approximately every 14.6 years.

Table 12 displays the Consumer Price Index (CPI) for Anchorage over the historical period (a statewide index is unavailable).

A comparison of the Anchorage index to the United States index gives relative movement in price levels. Prior to 1974, the Anchorage CPI was increasing at a slower rate than the U.S. CPI. This indicates that the price differential between Alaska and the United States was falling. With the trans-Alaska pipeline construction boom, this trend was reversed.

TABLE 12. ANCHORAGE CONSUMER PRICE INDEX
(1967 = 100)

Year	Anchorage Index	% Change Over Previous Years	United States Index	% Change Over Previous Years
1965	94.2	--	94.5	--
1970	109.6	3.07[1]	116.3	4.23[1]
1971	112.9	3.01	121.3	4.30
1972	115.9	2.66	125.3	3.30
1973	120.8	4.23	133.1	6.23
1974	133.9	10.84	147.7	10.97
1975	152.3	13.74	161.2	9.14
1976	164.1	7.74	170.5	5.77
1977	175.0	6.64	181.5	6.45

[1] Average annual rate of price increase 1965-1970

SOURCE : U.S. Department of Labor, Bureau of Labor Statistics, Washington, D.C.

Prices rose relatively faster in Alaska after 1975. Bottlenecks resulted when the rapid increase in demand was met by a relatively fixed supply. Persons whose income grew at rates less than the CPI experienced declining real incomes.

The Growth of State Government

An important nonexport sector contributing to the growth of Alaska between 1965 and 1976 was the state government. First, state government experienced rapid growth in the early 1970s. Secondly, this growth was largely funded by revenues exogenous to the state's economy (i.e., the $968 million in lease bonus monies from the Prudhoe Bay lease sale).

The growth of state government expenditures, when derived from exogenous sources, can influence the level of economic activity through two channels. First, increased state expenditures will lead to increased employment in state government. Secondly, capital expenditures will increase employment in the construction industry. The behavior of state expenditures since 1970 provides some insight into the state government's role in the growth process.

Since statehood, total state expenditures increased at an average annual rate of 21 percent (Goldsmith, 1977). There are three distinct periods of expenditure growth: 1) prior to the 1969 Prudhoe Bay lease sale, 2) between 1970 and 1972 when the initial adjustment to these revenues occurred, and 3) after 1972. In examining expenditures in the period after the state received the lease bonus in 1969, Scott (1978)" found:

1. The constant dollar increase was 62 percent of the nominal dollar increase.
2. The rate of increase was more rapid between 1970 and 1972 than between 1972 and 1977.
3. Operating expenditures have grown more rapidly over the whole period, while capital expenditures grew more rapidly between 1970 and 1972. These suggest that each type of expenditure may be sensitive to different factors with "operating expenditures responding to increases in demand and capital expenditures responding more to available revenues.

An examination of Table 13 reveals that real per capita operating and capital expenditures increased between 1970 and 1972. Real per capita operating expenses increased at an average rate of 19.9 percent, while capital expenditures increased at a rate of 32.3 percent per year. After 1972, operating expenditures increased at a rate of 3.4 percent; and capital expenditures actually decreased at a rate of -6 percent.

Petroleum revenues and federal government transfers have historically provided the major portion of state revenues. In 1973, theses sources accounted for 62 percent of the state government's income (Kresge, 1977). These clearly represent exogenous sources of income and, as such, contribute to the growth process.

TABLE 13. STATE REAL PER CAPITA OPERATING AND CAPITAL EXPENDITURES' 1970-1977

(Constant 1967 Dollars)

Fiscal Year	Resident , Population	Operating Expenditures Per Capita	Capital Expenditures Per Capita	Total Expenditures Per Capita
1977	413,289	$1,224.88	$409.17	$1,634.05
1976	404,635	1,156.97	486.57	1,634.54
1975	351,159	1,199.92	548.54	1,748.46
1974	330,600	1,168.14	475,66	1,643.80
1973	324,800	1,108.15	497,07	1,605.22
1972	312,930	1,038.74	555.11	1,593.85
1971	302,36'1	990.64	374.77	1,365.41
1970	294,560	722.20	317.02	1,039.22
Compound Annual Growth Rate				
1970-1977	5.(M	7.8%	3.7%	6.7%
1972-1977	5.7%	3.4%	- 6.0%	0.5%
1970-1972	3.1%	19.9%	32. 3%	23. 8%

'State's estimate from Research and Analysis Section, Employment Security Division, Alaska Department of Labor-, State of Alaska Current Population Estimates by Census Divisions, July 1 (year). The population as of the beginning of the fiscal year was used.

The Economy Since 1977

A review of some events and characteristics of the Alaskan economy since 1976 provides some useful insights into the economy during the first half of the seventies. While post-1977 data for most of the baseline socioeconomic indicators are not available at this time, data for a number of other available aggregate indicators will be discussed.

At the state level, post-1976 data indicate that aggregate levels of economic activity have receded from their 1976 levels and reveal that statewide employment grew at a compound annual average rate of 4.10 percent between 1965 and 1977. For the period 1970 through 1977, the compound growth rate was 8.54 percent per year. This higher rate was a result of the 71,624 workers added to the workforce between 1970 and 1977, an increase of over 77 percent. Most of this growth (75.7 percent) actually occurred after 1973, reflecting the influence of the TAPS project. By 1977, however, the average statewide employment level was 7,164 below its 1976 level, an indication that the economy was entering a post-boom period.

Employment data recently published (Alaska Department of Commerce and Economic Development, 1979) provide further substantiation of this interpretation. The downward trend in state employment levels continues through 1978 with employment almost 6 percent below the 1976 level. In addition, preliminary data for 1979 suggest little change from 1978. Between 1977 and 1978, the statewide unemployment rate increased from 9.2 percent to 11.1 percent, lending further credence to the interpretation of an economic slowdown.

It is important to look beyond the total employment figures when evaluating recent economic conditions.. A closer examination of these 1978 and preliminary 1979 data reveals that employment has remained relatively stable or grown slightly in most sectors. Contract construction employment declined from a peak of 30,233 in 1976 to 12,240 in 1978, a decrease of 17,993 (Alaska Department of Commerce and Economic Development, 1979). The data also reveal, however, that total employment only declined by 10,155, so other sectors of the economy actually expanded by 7,838 employees.

Statewide income statistics are consistent with the employment data. Total nominal personal income increased from $4.187 billion in 1976 to $4.370 billion in 1978. Although this is a 4.37 percent increase, it is more than vitiated by the rate of inflation for the same period. As an indication of the general inflation rate the Anchorage CPI increased by 14.26 percent from 1976 to 1978. Thus, if the income growth is adjusted for inflation, the two-year performance represents a decline of over 9 percent in real terms.

During the 1976-1978 period, statewide per capita income increased from $10,254 to $10,851 in nominal terms (Alaska Department of Commerce and Economic Development, Division of Economic Enterprise, 1979). This 5.82 percent increase represents a significant decline in real terms.

The Anchorage economy serves as a locus for approximately 50 percent of the income and employment generated within the state. Data indicate

that the statewide slowdown in economic activity is being felt in Anchorage. In 1977, the average level of employment in Anchorage was 77,858. By 1978, Anchorage employment had declined to 74,888 (Alaska Department of Labor, 1979). Almost half of this decline was in the contract construction sector where employment fell from 7,795 in 1977 to 6,431 in 1978. Preliminary data for 1979 suggest a further decline in this sector (Alaska Department of Labor, 1979). During this same period, the Anchorage unemployment rate increased from 6.9 percent to 8.3 percent (Alaska Department of Commerce and Economic Development, 1979) .

Income statistics for Anchorage are consistent with the view that the area is experiencing a modest economic slowdown. Aggregate real personal income grew from $579.3 million in 1970 to $1,185 billion in 1977 (Table 18). The 1978 real personal income is $1.1607 billion (Alaska Department of Commerce and Economic Development, 1979). This represents a decline of 2.05 percent in real terms. Nominal per capita income in Anchorage increased from $11,430 in 1977 to $12,152 in 1978 (Alaska Department of Commerce and Economic Development, 1979). When these figures are deflated by the CPI, they become $6,528 and $6,481, respectively. While this is a decline in real terms, the decrease is generally smaller than that experienced elsewhere in the state.

The various subregions within the Southcentral region have generally experienced significantly different growth patterns from Anchorage in the period 1975 through 1978 (Yakutat is excluded from this discussion

since the Census district data include Skagway). Nominal per capita incomes increased in all of the Census districts except Valdez-Chitina-Whittier. In this one, district nominal per capita income declined by 54.79 percent. Among the other Census districts, Kodiak showed the greatest per capita increase--44.96 percent. However, only Kodiak and Cordova-McCarthy measured increases in nominal per capita income in excess of the Anchorage CPI (Kodiak, 44.96 percent; Cordova-McCarthy, 32.20 percent; Anchorage CPI, 23.05 percent) over the three-year period.

The Economies of the Gulf of Alaska Region, 1965-1976

OVERVIEW

The major impacts from OCS development in the Lower Cook Inlet are projected to occur in the Gulf of Alaska region. The Gulf of Alaska region is the most populous region of the state. It contains almost 60 percent of the state's population. Many of the events which have influenced the growth of the state occurred in the Gulf of Alaska region. The Cook Inlet oil and gas fields are located in that region, and the terminus of the trans-Alaska pipeline is also in the Gulf of Alaska region at Valdez. This region also contains one of the major fishing ports in the state at Kodiak. Anchorage, the state's major metropolitan center, is in the region. The region and its subregional economies experienced rapid growth between 1965 and 1970. The Gulf of Alaska region grew faster than the state and increased its share of state employment from 53.6 percent to 56.5 percent.

The Gulf of Alaska region contains two major subregions, Anchorage and Southcentral. The Anchorage region consists of the Anchorage Census Division. Southcentral includes six Census Divisions: Kenai, Seward, Matanuska-Susitna, Valdez-Chitina-Whittier, and Cordova-McCarthy. It also includes the Yakutat portion of the Skagway-Yakutat Division. (Figure 3 shows the Alaska Census Divisions.) The character of each of these subregions differs. Anchorage is the urban center of the state. The Southcentral region consists of a series of small, rural economies. This section will examine the growth of the Gulf of Alaska's two subregions during the 7965-1976 period.

ANCHORAGE

Overview

The development of Alaska as a major oil province with the Cook Inlet discovery and the subsequent Prudhoe Bay discovery played a major role in the development of Anchorage. The construction activity associated with the development of TAPS provided an additional stimulus to Anchorage that had important effects on the size and structure of the local economy. Population, employment, and income showed rapid growth from 1965, with the pace of growth increasing after 1973.

The data presented in Table 14 indicate that population growth in Anchorage was responsive to the growth in economic activity. From 1965 to 1976, population grew at a compound annual growth rate of 5.56 percent. Between 1974 and 1976, the population of Anchorage increased by an

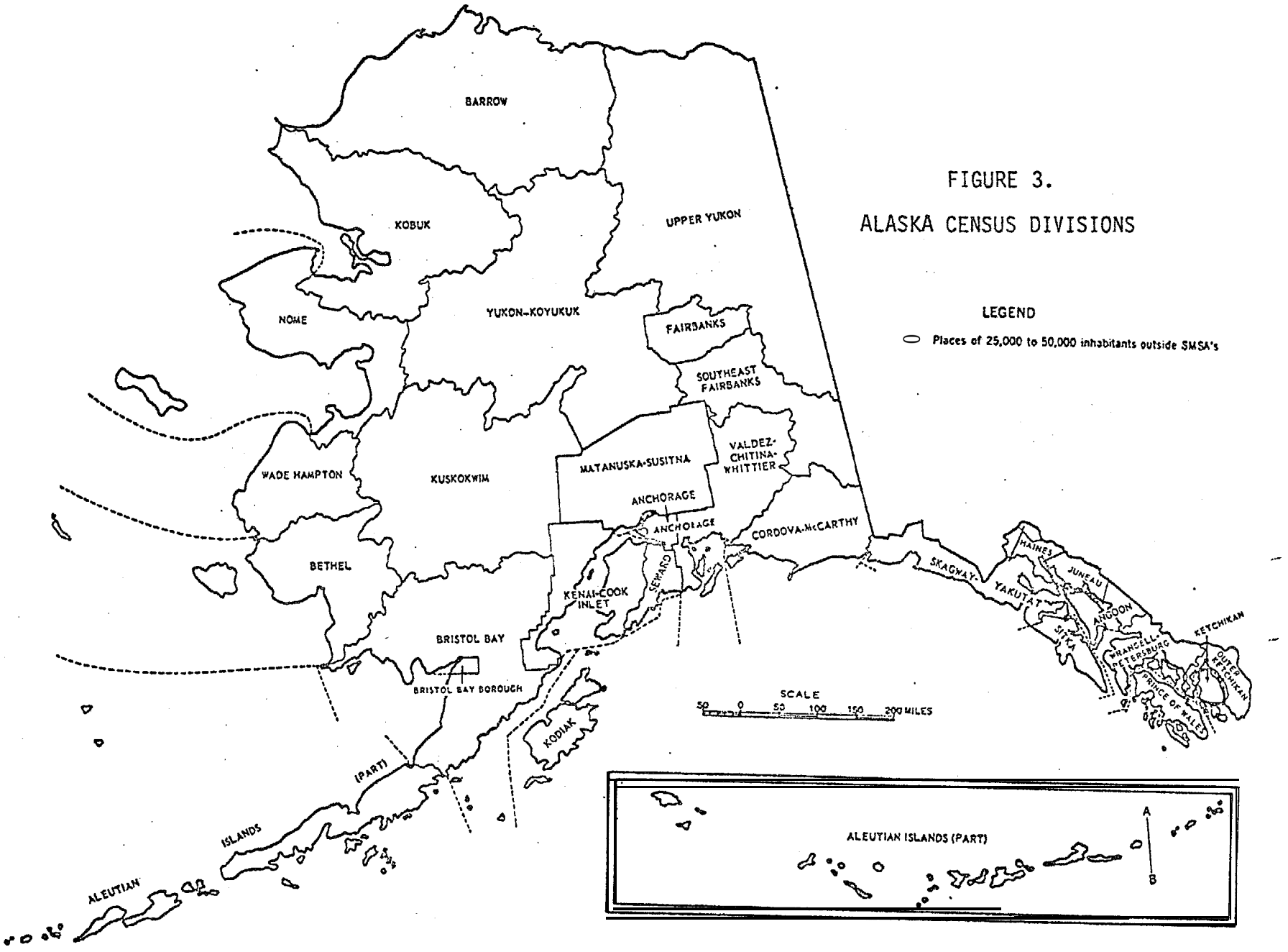


FIGURE 3.

ALASKA CENSUS DIVISIONS

LEGEND

○ Places of 25,000 to 50,000 inhabitants outside SMSA's

TABLE 14. POPULATION GROWTH, ANCHORAGE AND ALASKA, 1950-1977

	Anchorage Population	Alaska Population	Percent of State Population in Anchorage
1950	30,060	128,643	.23
1960	82,833	226,167	.37
1965	102,337	265,192	.39
1970	126,333	302,361	.42
1971	135,777	312,930	.43
1972	144,215	324,281	.44
1973	149,440	.330,365	.45
1974	153,112	351,159	.44
1975	177,817	404,634	.44
1976	185,179	413,289	.45
1977	195,826	411,211	.48
Compound Annual Growth Rate			
1965-1977	5.56	3.72	
1970-1977	6.46	4.49	
1973-1976	7.41	7.75	

SOURCE: Alaska Department of Labor.

estimated 32,067 persons. It is estimated that 27,681 persons, or 86 percent of the population change, was the result of in-migration. The dependency ratio (total population/labor force) fell from 3.01 to 2.53 between 1970 and 1976.

Anchorage employment increased from 30,678 in 1965 to 73,133 in 1976. Between the years 1973 and 1975, employment grew from 50,627 to 69,645, or an increase of 38 percent (State of Alaska, Department of Labor, 1979).

Other measures of economic activity and growth showed similar patterns of behavior. For example, freight tonnage passing through the port increased from approximately 2 million tons in 1973 to almost 2.8 million tons in 1975 (Municipality of Anchorage, 1979). The number of dwelling units authorized by the city increased from 1,035 in 1973 to 2,505, a 142 percent increase in two years.

Anchorage, the major metropolitan area in the state, has since 1970 contained more than 42 percent of the state's population (State of Alaska, Department of Labor, various years). Anchorage functions as the major administrative, distributive, and financial center for the state's private sector. This means that economic growth in Anchorage is affected by changes in the level of economic activity throughout the state. Major pipeline construction (TAPS) occurred hundreds of miles from Anchorage but profoundly affected the Anchorage economy.

Structural Characteristics and Economic Change 1965-1976

Trade, services, finance-insurance-real estate, and transportation also have substantial basic functions in the Anchorage economy since these sectors serve the rest of the state.

State government is also a basic sector from the city's viewpoint. Employment and expenditures by state government are determined by factors largely exogenous to Anchorage's economy. On the other hand, the manufacturing sector in Anchorage, bereft of food processing, is tailored to the local economy (supplying specialty products to the Anchorage stores) and is, therefore, nonbasic.

Table 15 presents the structural composition of Anchorage, Alaska, and the United States for the years 1965, 1970, 1975, and 1977.[1] Anchorage has a structure much closer to the United States than does the state. The trade and services sectors in Anchorage appear to have roughly the same relative importance as in the United States. Substantial differences still remain, however.

The diversification and growth of the Anchorage economy is further documented in Table 16. Several sectors demonstrate significant growth relative to the state. Manufacturing, services, and state government each grew relatively by over 30 percent between 1970 and 1978. Only

[1] The state statistics are somewhat misleading in that Anchorage is included and significantly affects the distribution of state employment.

TABLE 15. INDUSTRIAL COMPOSITION
VERTICAL DISTRIBUTION (PERCENT]
ANCHORAGE, ALASKA, AND UNITED STATES

	ANCHORAGE				ALASKA				UNITED STATES		
INDUSTRY	1965	1970	1975	1977	1965	1970	1975	1977	1970	1975	1977
Nonagricultural Wage and Salary	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.1	100.0	100.0	100.0
Mining	1.2	2.3	1.9	1.8	1.5	3.2	2.4	2.8	0.9	1.0	1.0
Construction	10.2	8.4	10.1	10.0	9.2	7.4	16.1	12.4	5.0	4.6	4.7
Manufacturing	2.6	2.4	2.3	2.3	8.9	8.4	6.0	6.3	27.3	23.8	23.8
Transportation	8.5	9.3	10.5	9.8	10.3	9.8	10.2	9.4	6.4	5.8	5.6
Trade	17.2	20.5	21.4	21.3	14.1	16.5	16.2	17.1	21.2	22.1	22.3
Wholesale	4.0	5.3	5.9	5.4	2.6	3.4	2.5	3.6	5.4	5.4	5.3
Retail	13.2	15.2	15.6	15.9	11.5	13.1	12.6	13.5	15.8	16.6	16.9
Finance-Insurance-Real Estate	4.2	4.7	5.2	6.0	3.1	3.3	3*7	4.7	5.2	5.5	5.5
Service and Misc.	12.3	15.4	19.5	21.7	10.7	13.2	16.2	16.6	16.4	18.2	18.7
Government	43.0	37.0	29.1	27.2	42.1	38.2	29.3	30.7	17.7	19.1	18.5
Federal	30.6	22.6	14.7	13.2	24.7	18.4	11.3	11.0	3.9	3.6	3.3
State	5.4	5.8	5.8	5.9	9.9	11.1"	9.6	8.7	13.9	15.5	15.2
Local	7.6	8.6	8.6	8.1	7.5	8.7	8.3	11.0			

SOURCE: Anchorage Annual Planning Information FY 1979, State of Alaska, Department of Labor, Research and Analysis Section.

TABLE 16. ANCHORAGE INDUSTRIAL COMPOSITION
PERCENT OF STATE

INDUSTRY	1970	1974	1975	1976	1977[1]	April 1978
Nonagricultural Wage and Salary	45.1	45.8	43.2	42.7	48.4	50.6
Mining	31.9	34.5	34.2	35.2	28.9	28.6
Construction	50.9	41.7	27.2	25.1	47.3	63.2
Manufacturing	13.1	14.4	16.4	15.8	16.5	18.0
Transportation	42.9	45.0	44.5	46.9	49.7	47.3
Trade	56.0	58.3	57.0	57.8	57.2	55.5
Wholesale	69.4	71.5	69.1	69.5	70.7	71.9
Retail	52.4	55.2	53.5	54.5	53.6	51.2
Finance-Insurance-Real Estate	63.9	64.3	60.3	60.0	63.6	63.5
Service and Misc.	52.5	52.9	52.0	53.9	60,7	70.0
Government	43.7	43.8	42.9	40.8	42.9	43.0
Federal	55.6	55.1	55.9	54.8	57.6	58.8
State	23.5	28.1	26.1	28.6	31.0	31.0
Local	44.6	51.3	44.6	35.6	37.7	38.0

[1] Preliminary estimate

SOURCE: Anchorage Annual Planning Information FY 1979, State of Alaska, Department of Labor, Research and Analysis Section.

mining and local government declined by a significant amount relative to the state.

Implicitly, all of the sectors where the employment shares are over 50 percent of the state can be viewed as having basic (or export) components. By this criteria, construction, trade, finance-insurance-real estate, and services were all basic sectors in 1978, exporting to the rest of the state. Note the dramatic decrease in the share of construction employment beginning in 1574 and continuing through 1976. This coincides with the peak years of TAPS construction.

Table 17 further documents the increased diversification accompanying Anchorage's economic growth.[2] The ratio of civilian basic to civilian total employment declined from .5683 to .4680 between 1965 and 1976, an increase in the ratio of total employment to total basic employment of 1.76 to 2.14.

Growth in Aggregate Economic Indicators

Table 18 reveals the growth in aggregate real income as well as real per capita income. Aggregate real income increased by over 200 percent in the twelve-year period; and per capita real income increased by 60.0 percent over the same period. The compound annual growth rates for several time periods are shown on the table. The table reveals that the peak pipeline years account for the greatest growth rates.

[2]One caution is necessary in interpreting the table. The manufacturing and agricul ture-forestry-fisheries sectors are probably locally oriented rather than export oriented.

TABLE 17. ANCHORAGE BASIC SECTOR GROWTH
1965, 1970, 1973, 1975. and 1976

Industry	1965	1970	1973	1975	1976
Agriculture, Forestry, and Fisheries	33	52	82	110	100
Mining	371	958	769	1,301	1,409
Contract Construction	3,127	3,514	4,178	7,054	7,587
Manufacturing	791	1,018	1,286	1,573	1,629
Transportation, Communication, and Public Utilities	- o -	- o -	- o -	230	697
Trade	1,195	1,642	2,239	3,611	4,195
Finance, Insurance, and Real Estate	350	573	825	1,010	1,229
Services	500	1.208	1,323	2,612	3,510
Federal Government	9,395	9,509	9,558	10,222	9,813
State Government	1,672	2,421	3,667	4,056	4,053
Total Civilian Basic Employment	17,434	20,895	23,927	31,779	34,222
Total Military Employment	15,190	12,884	14,049	12,642	12,179
Total Basic Employment	32,624	33,779	37,976	44,421	46,401
Total Basic/ Total Employment	.7113	.6155	.5872	.5398	.5440
Civilian Basic/Total Civilian Employment	.5683	.4975	.4726	.4563	.4680

SOURCE: Alaska Department of Labor, Statistical Quarterly, various issues.

TABLE 18. GROWTH IN PERSONAL INCOME
ANCHORAGE AND ALASKA, 1965-1977

(Millions of 1967 Dollars)

	Anchorage Personal Income	Per Capita	Alaska Personal Income	Per Capita	Percent of State Personal Income in Anchorage
1965	393.8	3,849	910.8	3,435	.43
1970	579.3	4,585	1,288.3	4,260	.45
1971	649.2	4,781	1,379.1	4,407	.47
1972	690.4	4,788	1,465.1	4,518	.47
1973	731.0	4,892	1,662.3	5,031	.44
1974	830.2	5,422	1,817.4	5,180	.46
1975	1,060.0	5,961	2,311.7	5,713	.46
1976	1,147.2	6,195	2,551.2	6,172	.45
1977	1,185.0	6,141	2,442.6	5,940	.49
Compound Annual Growth Rate					
1965-1977	9.62	3.97	8.57	4.67	
1970-1977	10.76	4.26	9.57	4.86	
1973-1975	19.03	9.12	17.81	9.12	

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, July 1979 printouts.

Alaska Department of Labor, Estimates of Total Resident Population.

Real personal income increased from $393.4 million (1967 dollars) in 1965 to over $1.1 billion in 1976 (U.S. Department of Commerce, 1978). This represents a real rate of growth of almost 10 percent annually. More dramatically, the annual growth rate surged to 19.03 percent during the peak of TAPS activity in 1973-1975. When these figures are converted to a real per capita basis, the growth rate is 4.04 percent per year from 1965 through 1976 with a high of 9.12 percent per year from 1973 to 1975 (U.S. Department of Commerce, 1978).

Table 19 indicates that employment in the Anchorage economy increased at a compound annual growth rate of 8.22 percent from 1965 to 1976, and at a compound annual rate of 9.68 percent from 1970 to 1976. Statewide, employment grew even more rapidly. As a result, the city's share of total state employment fell from 45 percent in 1970 to 43 percent in 1976.

Anchorage's unemployment rates remained high by U.S. standards, and absolute levels of unemployment increased in every year but 1975 (see Table 20). The six-year period (1970-1976) witnessed a 126 percent increase in the number of unemployed in the Anchorage labor market. The statewide unemployment/employment relationship was behaving in a similar manner falling below 10 percent in one year (1975) after 1970.

Both in-migration and changing labor force participation were important factors influencing Anchorage's unemployment. Between 1973 and 1974, Anchorage employment increased by a little more than 8,000 workers.

TABLE 19. EMPLOYMENT GROWTH, ANCHORAGE AND ALASKA, 1965-1977

	Anchorage Employment	Alaska Employment	Percent of State Employment in Anchorage
1965	30,678	70,530	.43
1970	41,995	92,476	.45
1971	45,452	97,584	.47
1972	48,252	104,243	.46
1973	50,627	109,351	.46
1974	58,713	128,178	.46
1975	69,645	161,313	.43
1976	73,113	171,714	.43
1977	77,858	164,071	.47
Compound Annual Growth Rate			
1965-1976	8.22	8.43	
1970-1976	9.68	10.87	

SOURCE: Alaska Department of Labor, Labor Force Estimates, various years.

TABLE 20. ANCHORAGE AND ALASKA UNEMPLOYMENT
1965, 1970-1976

	Anchorage Total Unemployment	Anchorage Unemployment Rate (%)	Anchorage Labor Force Participation Rate (%)	Alaska Unemployment Rate (%)	Alaska Labor Force Participation Rate (%)
1965	2,249	6.2	41.44	8.6	38.16
1970	3,267	6.7	43.21	9.0	39.94
1971	4,418	8.2	44.43	10.4	40.97
1972	5,140	8.9	44.68	10.5	41.27
1973	5,818	9.7	44.40	10.8	42.78
1974	5,980	8.6	49.66	10.0	46.00
1975	5,279	6.7	47.85	8.3	47.40
1976	7,372	6.9	50.56	10.5	52.65

SOURCE: Alaska Department of Labor, Alaska, Labor Force Estimates.

In-migration plus natural increase accounted for, at most, 3,672 of these workers. The remaining 55 percent, or 4,414 workers, must be the result of increased labor force participation. Inspection of Table 20 lends support to this conclusion.

The economic "boom" associated with the TAPS project undoubtedly encouraged increased labor force participation. Then, as the information about labor market conditions filtered to the Lower 48, the in-migration response was triggered. The response was dramatic. The data in Table 21 reveal an estimated net migration of 22,222 for 1975. But reported employment increased by only 10,932 (Table 19). Concurrently, the labor force participation rate fell to 47.85, and the unemployment rate declined.

A possible reconciliation of these data is achieved by assuming that a significant proportion of the in-migrants were employed elsewhere in the state even though they resided in Anchorage. During this period (1974-1975), statewide employment increased by 33,135, and Anchorage's share of total state employment fell from 46 to 43 percent (Table 19).

SOUTHCENTRAL ALASKA

Historically, the Southcentral region's economy has been based on the exploitation and development of natural resources. The fisheries of Southcentral are among the most important in the state, accounting for approximately half of the industry's statewide catch. The Upper Cook Inlet region was the site of the state's first major hydrocarbon development and remains the center of the state's petrochemical industry.

TABLE 21. ANCHORAGE POPULATION GROWTH
1965, 1970.1977

	Number of Births	Number of Deaths	Natural Increase	Estimated Net Migration	Population as of July 1	% increase over Previous Year
1965					102,337.	
1970	3,285	489	2,796		126,333	4.30[1]
1971	3,192	473	2,719	6,725	135,777	7.48
1972	3,119	490	2,629	5,809	144,215	6.21
1973	4,247	424	3,823	1,402	149,440	3.62
1974	3,123	481	2,642	1,030	153,112	2.46
1975	2,990	507	2,483	22,222	177,814	16.14
1976	3,472	519	2,953	4,412	185,179	4.14
1977	4,108	777	3,331	4,447	192,957	

[1] Percent average annual increase.

SOURCE: Alaska Department of Labor, Estimates of Total Resident Population and Estimates of Civilian Population.

Alaska Department of Health and Social Statistics, as reported by the Municipality of Anchorage.

During the time period under 'investigation, 1965-1976, an oil port was built at Valdez to serve as the terminus of the trans-Alaska pipeline. The construction of this facility and the pipeline leading to it were important factors in the growth of the Southcentral region during the mid-1970s.

Population

Population in the Southcentral region increased by over 28,000 between 1965 and 1976. Over half of this increase came after 1973 as a result of the construction of the trans-Alaska pipeline. Such rapid growth in a relatively small region indicates that migration was the major component of growth. Between 1973 and 1976, migration accounted for over 90 percent of the increase in population. Table 22 shows the components of population growth in Southcentral.

From 1973 through 1976, the historic relationships between population and employment seem inoperative, In 1965, the ratio of employment to population was 4.2, implying approximately 3.2 dependents per employee. If one analyzes the data from 1973 to 1976, a different pattern emerges. During that period, employment increased by 10,899 workers, but the population only expanded by 19,715 people. The marginal ratio of population-to-employment fell to 1.81, or less than one dependent per worker.

This departure from the traditional economic/demographic relationship can be partially explained by the sectors responsible for the rapid

TABLE 22. POPULATION GROWTH, SOUTHCENTRAL ALASKA, 1965, 1970-1977

	Number of Births	Number of Deaths	Natural Increase	Estimated Net Migration	Population as of July 1	% Increase over Previous Year-
1965					30,235	
1970	863[1]	215[1]	648[1]		37,540[2]	4.4[3]
1971	505	39	366	926	38,832	3.4
1972	505	38	367	-406	38,739	-0.2
1973	718	73	545	- 31	39,253	1.3
1974	768[4]	231[4]	537[4]	1,667	41,457	5.6
1975	634	244	390	9,828	51,675	24.6
1976	993	227	766	6,436	58,877	13.9
1977[5]						

[1] Data is from State of Alaska, Department of Health and Social Services, Office of Information Systems.

[2] Data is from April Census.

[3] Annual average increase from 1965 to 1970.

[4] Data is from 1974 Vital Statistics Provisional Figures, State of Alaska, Department of Health and Social Services, Health Information System Section.

[5] Figures for 1977 are not available.

growth: mining and construction. Employment in these sectors is more transient than employment in other sectors where there is greater likelihood of employees' taking up permanent residence. The employment rotation patterns and enclave nature of mining activity encourage a nonresident workforce, further reducing the demographic impact of mining development on a particular area. The TAPS construction project was imbued with all of the above characteristics; hence, it had minimal demographic impacts. Had 'historic relationships (pre-1973) held, there would have been 31,607a additional dependents [(10,899 x 3.9-10,899)] rather than 8,816.

Aggregate Measures of Economic Activity in Southcentral Alaska

Table 23 reveals the importance of the TAPS-related construction activity as an economic stimulus to the region. The pace of activity, as measured by income and employment, quickened after 1973. Between 1965 and 1976, total employment more than tripled. Over two-thirds of the measured change in employment occurred between 1973 and 1976. The growth in regional real income exhibited similar behavior, increasing by over 250 percent -From 1965 to 197(I, but 67 percent of this increase occurred in the last three years of the period.

Sources of Growth, 1965-1976. A major source of growth in the Southcentral region during this period was the expansion of the traditional. basic industries: mining, construction, and fisheries (including fish processing). The major mining development occurred early in the period with the development of the Kenai-Upper Cook Inlet fields. Petroleum

TABLE 23. GROWTH OF EMPLOYMENT, POPULATION, AND PERSONAL INCOME, SOUTHCENTRAL REGION 1965-1976

	Population	Employment	Real Personal Income 1$1967 Million)
1965	30,235	7,124	95.6
1970	37,809	9,582	143.5
1971	39,227	10,127	146.2
1972	39,148	10,735	149.2
1973	39,716	12,131	174.0
1974	41,986	13,645	197.5
1975	51,923	18,300	271.8
1976	59,431	23,030	336.0
Compound Annual Growth Rate			
1965-1976	6.34	11.26	12.11
1970-1976	7.83	15.74	15.23
Total Percent Change	96.56	223.22	251.50

SOURCES: All estimates State of Alaska Department of Labor, Research and Analysis Section, Population Estimates by Census Division, except 1970 which is Census of Population.

Alaska Department of Labor, Statistical Quarterly, various years.

U.S. Department of Commerce, Bureau of Economic Analysis, July 1978.

activity in the Kenai fields can be described in two periods. Field development occurred in the first period (between 1961 and 1968) which included the development of both onshore and offshore fields. During this phase, mining employment increased by over 600 percent. Major construction of petrochemical facilities also took place during this period. Three petrochemical plants and seven pipelines were completed between 1961 and 1968.

The second major phase was production. By 1970, all the major components of the petroleum Industry were in operation (Mathematical Sciences, Northwest, 1976). Since 1970, the industry has exhibited a cyclical pattern of employment, first declining, then increasing after 1973. Recent growth in the industry is related to increased exploratory and petrochemical activity (Kenai Borough, 1977).

Regional construction employment prior to 1970 was influenced importantly by petrochemical development in Kenai. Construction of five petrochemical facilities and seven pipelines increased Kenai's construction employment to a peak of 1,209 in 1968 (Mathematical Sciences, Northwest, 1976). By 1970, construction employment had decreased until its regional total was 583.

Table 24 reveals that construction employment was increasing throughout the period at an annual average rate of over 20 percent. The construction of TAPS and the transshipment facility at Valdez resulted in growth of construction employment at an annual average rate in excess of 131 percent between 1973 and 1975. The activity in Valdez alone accounted for

TABLE 24. EMPLOYMENT BY INDUSTRY
SOUTHCENTRAL ALASKA

Industry	Annual Average Percent Increase 1965 - 1976	1970 - 1976	1973 - 1975
Agriculture, Forestry, and Fisheries	38.44	37.87	5.16
Mining	8.27	1.37	18.59
Contract Construction	20.71	85.19	131.70
Manufacturing	9.53	11.90	.55
Food	6.30	8.65	.20
Transportation, Communication, and Public Utilities	9.51	2.09	32.62
Transportation	9.15	34.50	49.33"
Communications	22.71	19.69	2.86
Public Utilities	5.90	8.38	12.66
Trade	10.88	11.22	31.72
Wholesale	11.95	10.59	60.82
Retail	10.47	11.46	23.95
Finance, Insurance, and Real Estate	10.57	14.68	25.86
Services	12.12	16.72	21.56
Hotel	11.61	20.09	24.77
Personal	3.37	4.28	-1.01
Business	18.49	37.07	78.12
Medical	11.60	9.15	-6.89
Other	9.64	11.54	24.90
Government			
Federal	-3.80	-4.28	5.65
State and Local	8.49	7.50	6.33
Total	11.26	15.74	22.82

SOURCES: Estimated from Alaska Department of Labor, Research and Analysis Section worksheets.
Alaska State Housing Authority, Alaska, Yakutat, Comprehensive Development Plan, Anchorage 1971.
Alaska Consultants, Inc., Anchorage, Alaska, Yakutat, Comprehensive Development Plan, December 1976.

70 percent of regional construction employment in 1975 and 78 percent in 1976.

The other major basic industry in the Southcentral region is the fisheries industry. This industry is composed of fish harvesting and fish processing employment. The employment data must be interpreted with caution. Employment recorded in nonagricultural wage and salary employment excludes self-employed workers, traditionally a major component of fishery employment. The nexus between employment and income is also weaker than in other industries since catch and prices are subject to substantial annual variation.

The estimates of employment presented in Table 25 are based on catch and gear statistics for three regions: Prince William Sound, Cook Inlet, and Southwest. These regions include more than the Southcentral region but provide a rough estimate of industry behavior in the Southcentral region. Employment for the period averaged 2,107 workers with peak employment (2 ,388 in 1976) only 13.3 percent above and the low employment (1 ,853 in 1972) 12 percent less than the average figure. The real value of the catch appears to vary considerably from year-to-year, suggesting that the industry was characterized by wide fluctuations in income per worker. Since 1970, the catch has ranged from 233.8 million pounds (1972) to 363.6 million pounds (1973), and the real value from $32.47 million in 1971 to $63.5 million in 1977. Given relative prices for various species, the value of the catch is obviously affected by its composition as well as its volume. Some of the annual fluctuation in value illustrated in Table 25 is probably related to annual variations in catch composition.

TABLE 25. ESTIMATED FISH HARVESTING EMPLOYMENT AND VALUE OF CATCH

	1970	1971	1972	1973	1974	1975	1976	1977
Employment	2,193	2,052	1,853	2,235	1,998	2,031	2,388	--
Catch[2] (million lbs.)	269.3	256.6	233.8	362.6	254.5	256.8	245.4	215.6
Value[2] (thousand $)	40,681	36,658	44,773	73,496	65,912	60,971	93,668	115,377
Real Value (thousand $)	37,117	32,469	38,631	60,841	49,225	40,033	54,937	63,568

[1] Rogers and Listowski, 1978.

[2] Alaska Department of Commerce and Economic Development, 1977. Value is deflated by the Anchorage CPI.

The manufacturing sector of the Southcentral region is primarily composed of fish processing and petrochemicals. Since 1965, manufacturing employment has grown at an annual average rate of 9.5 percent (see Table 24). Although the manufacturing sector has experienced some cyclical instability associated with food processing (primarily due to variations in the fish harvest), the petrochemical component of the sector has given it relative stability.

The final basic sector is the federal government. Federal government employment actually fell from 975 in 1965 to 637 in 1976. The lowest point was in 1974 when employment was 595. Military employment in the region also followed the same pattern. Military employment in 1976 was 1,660 less than in 1965. The primary reason for this was the closure of the Kodiak Naval Station.

Table 26 summarizes the growth in the basic sector for the time period 1965-1976. Basic sector employment more than doubled from 1965 to 1976. The decline in federal government (military and nonmilitary) employment between 1965. and 1973 was offset by the growth in civilian basic sector employment. This offset was in the mining, manufacturing, and fisheries sectors and represents the occurrence of a modest degree of diversification in civilian sectoral employment over the 1965-73 time period.

The data for 1975 and 1976 show a very rapid growth in basic employment. Basic employment increased by 7,267 workers from 1973 to 1976. The growth in contract construction during this period is largely responsible

TABLE 26. BASIC SECTOR GROWTH, SOUTHCENTRAL ALASKA
1965, 1970, 1973, 1975, and 1976

Industry	1965	1970	1973	1975	1976
Agriculture, Forestry, and Fisheries	19	99	491	543	680
Mining	345	762	640	900	827
Contract Construction	880	583	681	3,656	6,978
Manufacturing	1,188	1,647	2,627	2,656	3,234
Federal Government	975	828	602	672	637
Total Civilian Basic Employment	3,407	3,919	5,041	8,427	12,356
Total Military Employment	2,651	2,110	1,039	747	991
Total Basic Employment	6,058	6,029	6,080	9,174	13,347
Total Basic/ Total Employment	.6197	.5157	.4617	.4817	.5556
Civilian Basic/Total Civilian Employment	.4782	.4090	.4155	.4605	.5365

SOURCES: Estimated from Alaska Department of Labor, Research and Analysis Section worksheets.

Alaska Department of Labor, Estimates of the Population.

Alaska State Housing Authority, Alaska, Yakutat, Comprehensive Development Plan, Anchorage, 1971.

Alaska Consultants, Inc., Yakutat, Comprehensive Development Plan, Anchorage, Alaska, 1971.

for the expansion in the basic sector. Construction employment grew by 6,297 workers, comprising almost 87 percent of the total employment growth in the basic sector.

Structural Change, 1955-1976

Tables 26 and 27 illustrate the effects on the Southcentral region of growth eminating from the construction industry. From 1965 to 1973, the basic-to-total employment ratio fell, implying an increased employment multiplier as the economy became more diversified. It is normally expected that, as a regional economy grows, import substitution and scale economies work to reduce (relatively) import leakages, and the basic-to-total employment ratio would reflect this structural change by declining. But, beginning with 1973, the ratio began to increase and increased rapidly in 1975 and 1976.

With the construction of TAPS, the support sector did not expand as rapidly as the basic sector. The enclave nature of pipeline employment meant that the support services were provided primarily within the enclave construction sector. This limited the necessary expansion of the support sector to accommodate pipeline employment and reversed the trend of the decrease in basic sector importance. This tendency was strengthened by the transient nature of employment in the construction and mining sectors. Thus, income earned in the Southcentral region was being spent elsewhere.

Table 27 illustrates the structure of the Southcentral economy. The non-TAPS trend can be seen by examining the change between 1965 and 1970.

TABLE 27. EMPLOYMENT DISTRIBUTION BY INDUSTRY
SOUTHCENTRAL ALASKA (ALASKA)
1965, 1970, AND 1976

Industry	Percent of Total Employment 1965	1970	1976
Agriculture, Forestry, and Fisheries	.27 (.20)	1.03 (.21)	2.95 (.70)
Mining	4.84 (1.54)	7.95 (3.24)	3.59 (2.31)
Contract Construction	12.35 (9.15)	6.08 (7.45)	30.30 (17.61)
Manufacturing	16.68 (8.90)	17.19 (8.48)	14.04 (6.02)
Food	15.24 (4.26)	13.49 (4.04)	9.24 (2.98)
Transportation, Communication, and Public Utilities	7.61 (10.30)	7.93 (9.85)	6.39 (9.18)
Transportation	5.24	5.44	4.24
Communication	.36	.89	1.07
Public Utilities	1.85	1.61	1.08
Trade	11.41 (14.11)	13.96 (16.61)	11.00 (16.05)
Wholesale	1.43 (2.63)	2.01 (3.51)	1.53 (3.66}
Retai 1	9.99 (11.48)	11.95 (13.10)	9.47 (12.58}
Finance, Insurance, and Real Estate	2.23 (3.08)	2.20 (3.35)	2.08 (4.14)
Services	10.36 (10.65)	10.72 (12.37)	11.28 (16.11)
Hotel	1.94	1.61	2.01
Personal	.35	.29	.16
Business	1.64	1.19	3.28
Medical	1.95	2.87	2.02
Other	4.48	4.76	3.81
Federal Government	13.69 (24.72)	8.64 (18.50)	2.77 (10.45)
State and Local Government	20.56 (17.34)	24.29 (19.94)	15.60 (17.43)

SOURCES: Estimated from Alaska Department of Labor, Research and Analysis Section worksheets. "
Alaska State Housing Authority, Yakutat Alaska, Comprehensive Development Plan, Anchorage 1971.
Alaska Consultants Inc., Anchorage, Alaska, Yakutat Comprehensive Development Plan, December 1976.

Between these periods, the support sectors either increased their share of employment or remained constant; the overall change was not so great as in the state or Anchorage. Only trade expanded its share significantly from 11.4 percent to 14 percent.

Unemployment

Unemployment rates remained high throughout the 1965-1976 period. The data presented in Table 28 indicate a peak unemployment rate of over 15 percent in 1972, falling to 12.42 percent in 1975 and rising to over 13.8 percent by 1976. Regional unemployment rates remained significantly higher than the statewide average throughout the period even though, as Table 24 indicated, the region experienced rapid economic growth.[3]

Personal Income

The income statistics in Table 23 probably overstate the income effect of development on the Southcentral region and the subregions within it. Because of the transient and enclave nature of the basic sectors (construction, mining), much of the income earned in the region accrued and was spent where the workers reside. In addition, the subregions are relatively small economies, and a substantial portion of income spent resulted in increased imports and reduced the regional response to increased demand.

[3]Employment grew at an annual average rate of 15.74 percent between 1970 and 1976.

TABLE 28. ALASKA AND SOUTHCENTRAL ALASKA UNEMPLOYMENT
1965, 1970-1976

	Southcentral Total Unemployment	Southcentral Unemployment Rate (%)	Southcentral Labor Force Participation Rate (%)	Alaska Unemployment Rate (%)	Alaska Labor Force Participation Rate (%)
1965	1,172	10.30	41.38	8.6	38.16
1970	1,835	13.44	38.24	9.0	39.94
1971	2,135	14.66	38.90	10.4	40.97
1972	2,257	15.03	39.17	10.5	41.27
1973	2,336	14.07	42.94	10.8	42.78
1974	2,744	14.80	45.09	10.0	46.00
1975	3,094	12.42	48.68	8.3	47.40
1976	4,502	13.83	54.78	10.5	52.65

SOURCES: Alaska Department of Labor, Labor Force Estimates, various years.

Alaska Department of Labor, Estimates of the Population.

Alaska State Housing Authority, Yakutat, Alaska Comprehensive Development Plan, Anchorage, 1971.

Alaska Consultants Inc., Anchorage, Alaska, Yakutat Comprehensive Development Plan, December 1976.

Table 29 provides statistics concerning income on a regional and statewide basis. The statistics reflect very rapid' growth on both a nominal and real basis. The region was clearly growing very rapidly throughout the 1970-to-1976 time period, especially after 1973 when TAPS-related influences dominated.

The per capita figures also show rapid growth in real income. If the 1973-to-1976 growth rates were sustained, per capita real incomes would double approximately every lightyears.

Summary

The Southcentral region's growth can be divided into two distinct phases. Prior to 1973, it was experiencing a stable growth pattern much the same as the state's. Beginning with the pipeline construction in 1973, the Southcentral economy experienced rapid growth. Its basic sector (mining, pipeline construction) expanded rapidly; and regional employment, income> and population correspondingly advanced. Structurally, the basic sector grew relative to the support sector of the economy. Much of this structural shift may prove to be temporary as the region's economy (absent of significant changes in the level of mining activity) reverts to its pre-TAPS growth path.

A DISAGGREGATED VIEW OF THE SOUTHCENTRAL REGION

The Southcentral region is a composit of a number of local economies, ranging in size from Yakutat (employment 241 in 1976) to Valdez (1976 employment of 7,818). In addition to differences in size and structure,

TABLE 29. GROWTH OF REAL PER CAPITA INCOME
SOUTHCENTRAL ALASKA
1965, 1970-1976

Year	Personal Income (Thousands $)	Real Personal Income (Thousands $)	Real Per Capita Personal Income ($)	State Real Per Capita Personal Income ($)
1965	90,128	95,677	3,164	3,435
1970	157,316	146,234	3,796	4,260
1971	165,099	143,536	3,728	4,407
1972	172,916	149,194	3,811	4,518
1973	210,235	174,036	4,382	5,031
1974	264,428	197,482	4,704	5,180
1975	414,045	271,861	5,236	5,701
1976	548,661	335,983	5,653	6,124
Compound Annual Growth Rate				
1965 - 7976	17.85	12.10	5.42	5.40
1970 - 1976	23.15	14.87	6.86	6.23
1973 - 1975	37.68	24.52	8.86	6.77

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System, July 1978 printouts.

Alaska Department of Labor, Labor Force Estimates, various years.

Alaska Consultants, Inc., City of Yakutat, Comprehensive Development Plan, December 1976,

U.S. Department of Labor, Bureau of Labor Statistics.

Alaska State Housing Authority, Alaska, Yakutat, Comprehensive Development Plan, Anchorage, 1971.

different factors influence their growth patterns. These local economies will first be discussed and then the question of regional integration will be addressed. Because of data limitations, the level of analysis will be the census division.

Table 30 provides a summary of economic and demographic information relating to the growth in the local economies. Growth in the region has been centered in three subregions: the Kenai Census Division, Matanuska-Susitna Census Division, and Valdez. But the growth occurred over different time periods. In the 1965-70 period, growth was centered in the Kenai region and was based on mining and petrochemical development. Employment in this region grew at an annual rate in excess of 15 percent.

After 1970, Valdez replaces Kenai as the fastest growing local economy in the region. Between 1970 and 1976, Valdez' employment grew by over 319 percent. Much of this growth was undoubtedly post-1973 and related to the construction of TAPS with its associated port facilities. The regional boom associated with TAPS radiated out and influenced the growth of all the local economies, with the possible exceptions of Kodiak and Yakutat.

Growth in the Matanuska-Susitna (Mat-Su) economy was TAPS-related but eminated from Anchorage. During the 1970-76 period, the Mat-Su economy was responding to population growth as it became a suburban center tied to Anchorage's economy. As a suburban center, the statistics on income

TABLE 30. AGGREGATE INDICATORS, SMALL ECONOMIES
1965, 1970, and 1976

	Population	Employment	Personal Income (Million $)	Per Capita Income (Dollars)
Cordova-McCarthy				
1965	1,991	604	7.5	3,767
1970	1,857	702	9.8	5,277
1976	2,353	1,041	17.7	7,522
Valdez-Chitina-Whittier				
1965	2,396	452	6.1	2,546
1970	3,098	831	9.7	3,131
1976	13,000	7,818	163.0	12,538
Matanuska-Susitna				
1965	6,125	1,083	13.4	2,188
1970	6,509	1,145	24.3	3,744
1976	14,010	2,269	108.9	7,773
Seward				
1965	2,213	620	5.7	2,576
1970	2,336	692	8.4	3,596
1976	3,395	1,136	25.9	7,629
Kenai				
1965	8,446	1,753	26.7	3,162
1970	14,250	3,576	57.2	4,014
1976	16,753	6,465	156.0	9,312
Kodiak				
1965	9,064	2,310	30.6	3,376
1970	9,409	2,469	45.0	4,783
1976	9,366	4,153	72.9	7,783
Yakutat				
1965	--	--	--	--
1970	350	193	3.0	8,571
1976	550	241	4.2	7,636

[1]Civilian nonagricultural wage and salary employment.

and employment are misleading. The majority of the employed population works in Anchorage, and Mat-Su has primarily a trade and services base. As a result, the dependency ratio during the 1965-76 period was high (5.66 in 1965 and 6.17 in 1976) and labor force participation rates appear low. In fact, the economy's economic base was geographically separate from the rest of the region.

The Southcentral Region as a Regional Economy

The preceding discussion, with its accompanying data, has given a rough indication of the size and diversity of the local economies The question remains as to whether or not the region can be treated as a regional economy for analytical and modeling purposes. One perspective by which areas can be classified as regions is based on functional integration. Areas may be functionally integrated in the sense that activities are tied to some central node or locus. This approach has been institutionalized by the Bureau of Census in their Standard Metropolitan Statistical Areas. This classification recognizes the economic relationship between the metropolitan area and the surrounding countryside. The radius of influence is obviously affected by many factors, among which the most important is transportation cost. Economies can be functionally integrated even though geographically separate if they are open and permit the exchange of goods and productive factors. The degree of integration reflects the importance of this exchange process.

The Southcentral region, relative to the rest of the state, has highly developed transportation links. Most larger communities in the region

are linked by roads and/or ferry and by a highly developed communications sys tern. There are numerous deepwater ports and commercial marine freight services. The communities of Kenai, Seward, Mat-Su, as well as Anchorage, are linked by the Seward, Sterling, and Glenn Highways. Valdez is linked through the Richardson Highway. Ferry service connects Cordova, Valdez, Kodiak, Seward, Whittier, Homer, and Seldovia. Van container service is available in Cordova, Valdez, Kodiak, and Seward (ISER, 1976).

The trade flows among these areas were previously described in a census of transportation conducted by the Institute of Social and Economic Research (ISER, 1976). Table 31 shows the distribution of intrastate freight from Southcentral points of origin. This is not a pure measure of trade flows since it includes transshipments of goods, but it does provide an indication of the trade links between the economies of the region. Freight and mail measure the flow of goods (final goods and material inputs) between communities. It is not a perfect measure of integration since it does not indicate the flow of labor and capital between communities. Of all the census divisions, Skagway-Yakutat is the least tied to the Southcentral region; only 30 percent of the freight leaving Skagway is shipped to other areas of Southcentral Alaska. For a number of the divisions--Valdez, Kodiak, Kenai, and Cordova--Anchorage is the destination for major portions of their flows; however, this relationship does not occur in reverse: less than 30 percent of Anchorage goods flow to other regions of Southcentral. The existing transportation links and the flows of freight show that the economies of Southcentral Alaska, when Anchorage is included, appear to exhibit a degree of functional integration.

TABLE 31. DISTRIBUTION OF INTRASTATE FLOW OF FREIGHT AND MAIL FROM SOUTHCENTRAL ORIGINS, 1973

(Percent of flows from Southcentral origins)

ORIGIN \ DESTINATION	Anchorage	Cordova	Kenai	Kodiak	Matanuska-Susitna	Seward	Skagway-Yakutat	Valdez-Chitina-Whittier	Total
Anchorage	5.84	.86	6.04	4.14	1.32	1.03	.07	2.63	21.93
Cordova	63.88	13.54	.38	7.17	.48	0	.65	1.17	87.27
Kenai	39.90	.62	15.50	2.64	.17	.15	.15	23.20	82.33
Kodiak	76.96	.02	11.87	6.73	0	.01	0	.26	95.85
Matanuska-Susitna	10.59	0	32.46	0	.50	25.91	0	5.71	75.17
Seward	12.36	.08	5.53	0	0	0	0	68.60	86.57
Skagway-Yakutat	.14	.02	28.80	0	o "	o	.67	0	29.63
Valdez-Chitina-Whittier	41.14	7.77	15.05	5.46	.73	7.97	2.93	.60	81.65

SOURCE: ISER., Census of Alaska Transportation, September 1976.

III. THE ALASKAN ECONOMY IN THE BASE CASE

This chapter presents a growth path for the Alaskan economy that excludes the proposed hydrocarbon development in the Lower Cook Inlet OCS.

Purpose of the Base Case

Petroleum development in the Lower Cook Inlet will affect both the size and structure of the Alaskan economy. These impacts can be described as a deviation from a pattern of growth that would have occurred in the absence of the Lower Cook development: the "base case." Comparing the divergence between the base case and the OCS impact case yields a measure of the impact of OCS development.

The base case scenario employed in this study is a consistent, plausible pattern of development; however, it should not be interpreted as forecasts of the likely future. The actual development likely to occur is subject to a considerable amount of uncertainty influenced by technological change, market prices, size of actual hydrocarbon discoveries, political vagaries, and many other uncertain events.

The base. case projection is generated to measure (estimate) the influence of OCS activities on the Alaskan economy. The base case satisfies a number of criteria including consistency, plausibility of assumptions, continuity with the economy's historical growth, and the overall structural stability of economic relations.

The Western Gulf scenarios project direct employment impacts of's lesser magnitude than the Northern Gulf scenarios. The high case scenario has a projected peak direct employment impact of 1,136 workers in 1989 with a sustained level of permanent employment of 976 for the remainder of the projection period. The mean scenario generates a peak employment of only 270 workers in 1984 and a permanent labor force of 86 workers. The low case projects exploration only with all activity ceasing after 1983.

Base Case Assumptions

Overall, the most important assumption underlying the base case is implicit: that the relationships identified in the recent past will continue to hold in the future. In other words, the major implicit assumption is structural stability throughout the projection period.

Utilization of the MAP model for projecting economic growth requires the development of a set of assumptions. In some cases, these assumptions take the form of specified relationships among variables. In other cases, they are a projected numerical series designed to reflect a particular sequence or level of activities. For the base case, these assumptions reflect levels of economic activity expected to occur independent of the proposed OCS development.

Four categories of assumptions circumscribe the base case. The first involves the level of employment in exogenous industries where employment levels are determined by factors outside of the Alaskan economy. These industries include manufacturing, agricul ture-forestry-fisheries,

federal government, mining, and a segment of the construction industry. Secondly, the state receives royalties, production taxes, property taxes, and corporate income taxes from the petroleum industry. The sales of this industry are almost totally exogenous; hence, the revenues to the state can be regarded as exogenously determined, given a tax structure. Thirdly, state government spending plays such a major role in the level of economic activity that a rule or assumption must be defined to project a state spending pattern. Finally, the state economy is influenced by U.S. economic variables such as the behavior of consumer prices, real per capita income, and the growth in wage compensation. Specific assumptions are made about each of these variables.

The uncertainties surrounding the future petroleum and world energy markets, as well as state economic decisions which influence economic growth, mean that any assumption about the appropriate base case scenarios is subject to criticism. An extensive development of a base case scenario which required considerable time and research would, because of these uncertainties, be subject to the same type of criticism. These uncertainties involve such major factors as the construction and timing of the ALCAN gasline and future state spending policy. Therefore, an extensive development of the base case scenario was not undertaken; instead, a reasonable set of assumptions was developed which emphasizes consistency and reasonableness of approach.

NON-OCS ASSUMPTIONS

Industry Assumptions

There are two sets of industry assumptions. The first relates to employment directly associated with special projects, primarily oil and gas development projects, Secondly, assumptions concerning the growth of the other major exogenous industries are needed (manufacturing, federal government, agriculture-forestry-fisheries). Special projects include petroleum projects, major construction projects, and the operations and maintenance of these projects. Petroleum activity is assumed to continue at Prudhoe Bay with further exploration and development of the Kuparak and Lisburne formations. Mining employment peaks in this region at 1,783 in 1980. The Upper Cook Inlet fields are the other major region of petroleum activity. Employment is assumed to increase from its present level until 1985 or 1990 as the oil fields are shut down. Gas production continues after 1990 but with a reduced work force. There is little other new mining activity in the state with other mining maintaining current levels throughout the projection period.

Major construction projects in the state during the projection period include the Trans-Alaska Pipeline Service (TAPS) and the ALCAN gasline. TAPS is completed in 1977, after which the line's capacity is assumed to be increased by the addition of four pump stations between 1979 and 1982. The ALCAN gasline is assumed to be built between 1981 and 1984 with peak employment of 4,800 in 1982. The only other special construction project in the state during the projection period is the construction of the

Pacific LNG plant between 1980 and 1983; this project employment peaks in 1982 with 1,300 employees.

TAPS is assumed to require 850 workers per year for long-term operations. ALCAN operations employment is assumed to be 96 commencing in 1985. The difference in pipeline employment can be explained by the inclusion of Valdez port employment as part of TAPS as well as the longer length of the TAPS within the state. Finally, operations employment for the Pacific LNG plant is 60 beginning in 1984.

The level of employment in federal government and agriculture-forestry-fisheries and output in manufacturing is set exogenously. Federal government employment is assumed to follow its general historical trend and remain constant at the 1976 level throughout the forecast period. The trend in the historical period reflected increases in civilian employment offsetting decreasing military employment. Employment in agriculture-forestry-fisheries is assumed to be dominated by increases in fisheries. Given favorable conditions, employment in Alaska fisheries has been projected to increase fourfold between 1975 and 2000. This would result from the establishment of an American trawl fishery which completely replaces foreign fishing off Alaska (ISER, 1979). The opposite extreme would be an assumption of no employment growth without bottomfish development. In this study, an average rate of growth of 3 percent per year is assumed. This is consistent with moderate replacement of the foreign fishery by Alaskans (Scott, 1979).

Output in manufacturing is assumed to increase at an average annual rate of 4 percent, which is consistent with both the historical trend and the assumed growth in the fisheries industry.

National Variables

As part of the U.S. economy, Alaska is influenced by the level of economic activity in the United States. Specific variables exert a significant effect on the Alaskan economy and assumptions about these variables must be included in the base case. These assumptions are based upon the long-term projections of the consumer price index by Data Resources, Inc. Assumed U.S. rates were those from DRI's TRENDCONG0678 forecast (DRI, 1978). This assumption assumes the continuation of long-term trends in important exogenous variables. The average annual rate over the period of the forecast was used as our assumption. The U S. consumer price index was assumed to grow at 5.5 percent per year. The U.S. real per capita disposable income, adjusted to reflect consistent tax assumptions, was assumed to grow at 2.2 percent per year. Finally, DRI does not provide a projection of U.S. weekly compensation. U.S. weekly compensation was assumed to increase at a rate of 6.8 percent per year, this chosen to be consistent with both the assumed growth in prices and real disposable income.

Petroleum Revenues

The petroleum revenues received by the state consist of royalties, production taxes, property taxes, and the corporate income tax. The major source of these revenues in the projection period is the Prudhoe

field. The revenues are determined by the assumed rate of production of oil and gas and its wellhead value. Prudhoe oil production is assumed to peak in 1985 at 641.5 million barrels, while gas production is assumed to maintain its peak production of 912 billion cubic feet per year once this is reached in 1987. The wellhead value of Prudhoe oil is determined by the following assumptions: constant real West Coast market price of $12 per barrel , constant real vessel and processing costs of $1.75 per barrel , and' a TAPS tariff of .$5.25 in 1978. The nominal TAPS tariff is assumed to remain constant until 1990 when increasing operating costs are assumed to dominate decreasing capital costs; after 1990, the real tariff is assumed to remain constant. The wellhead value of gas was assumed to equal $1.00 per MCF in 1978; this assumes the producers pay a $.45 per MCF processing cost. (These base case assumptions were selected prior to the passage of the 1978 Energy Bill which sets a ceiling of $1.68 per MCF on Prudhoe gas.) These wellhead values are only part of an array of many possible wellhead values. The range of wellhead values is a function of the uncertainty about the future levels of those factors influencing these values. Revenues are determined by existing state laws describing royalites, production taxes, property taxes, and corporate income taxes.

THE STATE EXPENDITURE RULE

The important role of state and local governments in the Alaskan economy requires that the treatment of governmental expenditures be a major component of the base case scenarios as well as the subsequent impact analysis. Over the projection period, the state government is assumed

to receive revenues from oil production far exceeding current levels of expenditures. The future level and composition of state government expenditures not only determine direct employment in the government sector but will influence all industries endogenously tied to the state economy.

Two important factors influence the framework in which state expenditure policy will be expressed. First, revenues to the state have increased substantially since the completion of the trans-Alaskan oil pipeline and will continue to do so into the future. These revenues will closely follow the pattern of production from Prudhoe Bay and possibly from other North Slope discoveries. Secondly, the establishment of the Permanent Fund places new constraints on the use of certain petroleum revenues. The Permanent Fund was adopted in 1976 as a constitutional amendment. It established that a minimum of 25 percent of all mineral lease rentals, royalties, royalty sale proceeds, federal mineral revenue sharing payments, and bonuses received by the state would be placed in the fund. This forced savings is only a portion of the revenues available to the state. Revenues accumulating in the General Fund will be greater than in the Permanent Fund for most of the period.

These changes in the structure of state spending limit the usefulness of past spending policies in determining the spending rules to be used. The rate of state expenditures, because it is a matter of policy choice to be made within a framework different from past experience, cannot be modeled simply from past experience. However, past experience can

provide a guide for developing the hypothetical spending rule used in the simulation. Scott, in his paper, "Behavioral Aspects of the State of Alaska's Operating Budget FY 1970-FY 1977," found two major factors responsible for the growth of state expenditures. First, real per capita state expenditures increased in response to real per capita income growth--a demand effect. Secondly, expenditures increased in relation to the available funds for state expenditures--a supply effect. The pattern between capital and operating expenditures differed.

Capital expenditures increased strongly in response to available fund growth, but the higher levels were not maintained. The higher levels of operating expenditures were maintained. Adjustments to available funds seemed to provide a new base for the growth of these expenditures.

Based on this analysis, the following pattern of state expenditures is assumed. Expenditures are assumed to increase in response to increases in personal income. The income elasticity of both capital and operating expenditures is less than one. The major difference is that the real level of state operating expenditures is assumed to be maintained, while the level of capital expenditures could fall.

The response to fund availability is composed of two parts. Expenditures respond to changes in the general fund balance. The response is weighted depending on the existing surplus; the weight equals the previous year's fund balance divided by general fund expenditures. In other words, the response to a change in the general fund is weighted by

the number of years of existing expenditures which could be financed by the general fund. The response of capital expenditures is greater than the operating expenditure response.

ALTERNATIVE OCS SCENARIOS

Four scenarios describing OCS activities prior to the Lower Cook Inlet lease sale are included in the base case. The four scenarios present potential low, moderate, and high development in the lease sale areas. These OCS scenarios are described in Tables 32, 33, 34, and 35. These tables present different levels of potential development in the Beaufort Sea, Gulf of Alaska, and the Lower Cook Inlet (1977 sale). These scenarios differ in timing and magnitude. The Lower Cook scenarios range from an exploration-only case to a high case with peak employment of almost 2,500. The timing differs significantly between the moderate and high scenarios with the moderate scenario reaching peak employment three years prior to the high scenario. The high Lower Cook scenario also contains the development of an LNG plant with 60 employees during its operation.

All three Beaufort scenarios contain production of oil and gas. In all cases, peak employment occurs in 1989; it ranges from 740 in the low scenario to 1,344 in the high scenario. Since the Beaufort sale is a joint state-federal lease sale, it also provides increased revenues to the state. These include bonus, royalty, severance tax, property tax, and corporate income tax revenues.

TABLE 32. LOWER COOK INLET EMPLOYMENT SCENARIOS

	Low[1]	Moderate[2]		High[1]		
	Mining	Mining	Construction	Mining	Construction	Manufacturing
1978	84	70	0	84	0	0
1979	126	321		126	0	0
1980	252	664	1:;	252	0	0
1981	210	804	108	486	213	0
1982	126	572	38	776	213	0
1983	84	523	0	1,285	543	0
1984	42	622	0	1,590	858	0
1985	42	604	0	1,548	317	0
1986	0	545	0	1,347	0	60
1987	0	411	0	1,139	0	60
1988	0	417	0	1,139	0	60
1989	0	417	0	1,139	0	60
1990	0	417	0	1,139	0	60
1991	0	417	0	1,139	0	60
1992	0	417	0	1,139	0	60
1993	0	417	0	1,139	0	60
1994	0	417	0	1,139	0	60
1995	0	417	0	1,139	0	60
1996	0	417	0	1,139	0	60
1997	0	417	0	1,139	0	60
1998	0	417	0	1,139	0	60
1999	0	417	0	1,139	0	60
2000	0	417	0	1,139	0	60

[1] Based on scenarios in Lower Cook Inlet, Final Environmental Impact Statement, 1976.

[2] Based on Lower Cook Inlet. scenario in Beaufort Sea Petroleum Development Scenarios. Economic and Demographic Impacts, Technical Report No. 18, Alaska OCS Socioeconomic Studies Program, 1978. Distribution between offshore/onshore and industry was based-on the distribution in the Lower Cook EIS.

TABLE 33. BEAUFORT SEA OCS EMPLOYMENT SCENARIOS

	Low		Moderate		High	
	Mining	Construction	Mining	Construction	Mining	Construction
1981	67	49			67	
1982	198	198	1;;	1:;	198	1::
1983	198	247	198	247	198	247
1984	232	247	232	247	232	247
1985	67	99	67	99	67	99
1986	70	281	112	304	70	403
1987	123	331	276	333	148	642
1988	228	395	479	466	321	810
1989	345	395	616	466	583	761
1990	387	132	595	155	710	254
1991	434	32	524	155	758	254
1992	388	66	503		748	127
1993	355	32	432	1 &	681	254
1994	333	32	535	155	647	254
1995	334	59	438	77 ,	616	127
1996	333	18	440	22	572	36
1997	332	0	417	0	551	0
1998	330	0	393	0	547	0
1999	327	0	393	0	548	0
2000	325	0	394	0	542	0

SOURCE: BLM-Alaska OCS Office.

TABLE 34. NORTHERN GULF OCS EMPLOYMENT SCENARIOS
(SEAR ADJUSTED)

	Low Scenario			Moderate Scenario			High Scenario		
	Construction		-Transportation	Construction	Mining	Transportation	Construction	Mining	Transportation
1981		38	9		45	17		53	26
1982		75	17		90	35			41
1983		83	26		90	35		1::	48
1984	38	75	17	38	83	26	38	53	26
1985	6	38	9	12	38	9	12	46	17
1986	80	59	46	86	90	0	92	3	8 9
1987	218	119	46	218	168	86	225	108	127
1988	181	225	46	181	320	86	181	192	127
1989		215	55		305	100		390	146
1990		196	59		315	107		397	156
1991		196	59		264	107		397	156
1992		215	59		277	42		334	117
1993		217	59		279	42		317	98
1994		217	59		281	42		396	98
1995		217	59		2$2	42		354	98
1996		217	59		282	42		354	98
1997		217	59		282	42		354	98
1998		217	59		282	42		354	98
1999		217	59		282	42		354	98
2000		217	59		282	42		354	98

SOURCE: BLM-Alaska OCS Office, 1979.

TABLE 35. WESTERN GULF OCS EMPLOYMENTSC ENARIOS
(SEAR ADJUSTED)

	Low Scenario		Moderate Scenario			High Scenario			
	Mining	Transportation	Construction	Mining	Transportation	Construction	Mining	Manufacturing	Transportation
1981	120	62		92	41	0	91		38
1982	120	62		93	41	0	171		82
1983	41	21		42	21	364	161		82
1984	0	0	260	10	0	587	345		260
1985	0	0	49	50	33	647	395		373
1986	0	0	32	118	29	315	313	50	276
1987	0	0		81	10	530	314	50	226
1988	0	0		80	22	205	634	50	200
1989	0	0		41	22	98	797	50	191
1990	0	0		39	22	54	880	50	185
1991	0	0		64	22	0	812	50	184
1992	0	0		64	22	0	729	50	191
1993	0	0		64	22	0	658	50	191
1994	0	0		64	22	0	685	50	191
1995	0	0		64	22	0	710	50	191
1996	0	0		64	22	0	735	50	191
1997	0	0		64	22	0	735	50	191
1998	0	0		64	22	0	735	50	191
1999	0	0		52	22	0	735	50	191
2000	0	0		0	0	0	735	50	191

SOURCE: Western Gulf of Alaska Statewide and Regional Population and Economic Systems Impact Analysis.

The Northern Gulf scenarios" generate direct resident employment ranging from 276 for long-run operations in the low scenario to 452 in the high. Given that this is a federal sale and the area is relatively remote, the economic effects of this sale on the base case are less than in the Beaufort and Lower Cook. The Mestern Gulf scenarios also provide economic effects which are less than either the Beaufort or the Lower Cook sale.

The Alaskan Economy: Moderate Base Case Growth .

The base case describes the pattern of Alaskan economic growth projected to occur in the absence of hydrocarbon development in the Lower Cook Inlet.

Table 36 presents statewide projections for three measures of aggregate economic activity: employment, real personal income, and population. Projected growth appears modest by recent historical standards. Employment is projected to grow at an annual rate of 2.1 percent over the 22-year period. Employment actually declines from 197,185 in 1978 to 193,510 in 1979, the nadir of the post-pipeline dip. After 1979, employment increases to 227,878 by 1983. This is a growth rate of approximately 4.2 percent. After 1983, employment growth slows to approximately 1.9 percent annually.

These growth rates are modest when compared to the years, 1965-1976. Over this period, employment grew at an annual average rate of approximately 8.4 percent. Even in the early years of the period, 1965-1970, employment increased at a 5.57 percent annual rate.

TABLE 36. AGGREGATE INDICATORS OF ECONOMIC GROWTH
ALASKA, 1978-2000

	Real Personal Income ($ 1977 Million)	Employment	Population
1978	3,592	197,185	404,436
1979	3,412	193,510	403,256
1980	3,926	196,419	407,511
1981	4,301	204,746	419,562
1982	5,000	218,508	440,274
1983	5,285	227,878	457,932
1984	5,016	227,330	462,438
1985	4,983	227,557	465,280
1986	5,151	229,760	469,501
1987	5,379	234,561	477,136
1988	5,647	241,309	487,542
1989	5,891	248,002	498,194
1990	6,091	253,644	507,570
1991	6,267	257,783	514,843
1992	6,465	261,698	521,645
1993	6,695	266,319	529,306
1994	6,941	271,437	537,641
1995	7,197	276,995	546,636
1996	7,502	283,627	557,134
1997	7,794	290,334	567,907
1998	8,110	297,495	579,924
1999	8,453	305,107	591,673
2000	8,810	313,030	604,521

SOURCE : MAP Model.

Projected population growth follows a pattern similar to employment, growing at an average annual rate of 1.84 percent. Population declines slightly between 1978 and 1979, falling from 404,436 to 403,256. It then rapidly recovers to 457,932 by 1983. This represents a gain of almost 13.6 percent. These rates of increase represent a substantial departure from the historical period (1965-1976) when population grew at an annual rate of 4.12 percent.

As Table 36 indicates, the growth in aggregate real income will be 4.16 percent annually. Again, some cyclical behavior is projected. Real income declines at a 5 percent rate from 1978 to 1979. Between 1980 and 1983, it grows at a 10.42 annual rate. After 1983, it grows at an average annual rate of about 3 percent. These rates compare to real income growth of 9.8 percent between 1965 and 1976 and over 15 percent per year during the pipeline years of 1973 to 1976.

Using the data in Table 36 as a basis, real per capita income (expressed in 1977 dollars) increases from $8,882 in 1978 to $14,574 by 2000. This 64 percent increase represents a growth rate of only 2.3 percent per year over the projection period. During the historical period, real per capita income grew at an average rate of 5.4 percent. At this rate, real per capita incomes would double approximately every 13.2 years.

Population Growth

Table 37 reveals the components of population change over the projection period. As in the historical period, the major component of short-run

TABLE 37. THE COMPONENTS OF POPULATION CHANGE
ALASKA, 1978-2000

	Net Migration	Natural Increase	Net Change
1978	- 5,000	7,394	2,394
1979	-13,289	7,088	-6,210
1980	- 2,203	6,431	4,228
1981	5,783	6,258	12,041
1982	14,314	6,400	20,714
1983	10,797	6,877	17,674
1984	- 2,669	7,186	4,517
1985	- 4,118	6,948	2,830
1986	- 2,482	6,688	4,206
1987	1,108	6,514	7,622
1988	3,900	6,498	10,398
1989	4,048	6,601	10,649
1990	2,663	6,711	9,374
1991	498	6,769	7,267
1992	48	6,748	6,796
1993	931	6,719	7,650
1994	1,592	6,734	8,326
1995	2,207	6,779	8,986
1996	3,637	6,852	10,489
1997	3,785	6,982	10,767
1998	4,396	7,115	11,511
1999	4,974	7,269	12,243
2000	5,400	7,442	12,842

SOURCE: MAP Model.

change is net migration. The migratory response to changing economic opportunities in the state is readily apparent. The post-TAPS employment contraction results in a net out-migration of 15,492 persons between 1978 and 1980. The ALCAN project reverses the trend and from 1981 to 1983, net migration is 30,894 persons. The post-ALCAN employment reductions lead to a net out-migration of 9,269 persons after 1983. The increase in in-migration from 1987 through 1989 is related to OCS activities in the Western and Northern Gulf of Alaska.

Employment Growth and Structural Change

Table 38 displays the annual changes in the level of employment. These changes are distributed among three sectors: basic, support, and state and local government. Fluctuations in employment levels in the basic sector in the period before 1985 are largely explained by changes in pipeline activity, the impacts induced by termination of TAPS, and construction of ALCAN. After 1985, much of the growth in the basic sector is related to growth in manufacturing (seafood processing) and the fisheries (bottomfish).

The support sector responds to changes in the level of basic sector employment as well as the real income growth. Income effects appear to dominate the later projection years. Between the years 1980 and 1982, the ratio is 1.5.[1] Between 1986 and 1987, 1,437 employees are added to

[1] This low ratio can be partially explained by the ALCAN construction's inflating basic sector employment, but the employment is largely of an enclave nature. This enclave basic employment reduces the income and expenditure effects that would induce greater support sector employment.

TABLE 38. CHANGES IN EMPLOYMENT BY SECTOR

	Support Sector	Basic Sector	State and Local Government	Total
1978	- 7,801	- 5,999	6,533	- 7,266
1979	- 4,450	756	-49	- 3,743
1980	949	3,175	- 1,215	2,909
1981	4,844	3,651	- 168	8,327
1982	8,022	6,053	- 313	13,762
1983	6,400	589	2,372	9,361
1984	659	- 3,903	2,629	- 615
1985	- 223	349	101	227
1986	994	1,794	- 585	2,203
1987	3,127	1,437	236	4,800
1988	4,109	1,968	672	6,749
1989	4,312	1,431	950	6,693
1990	3,870	929	843	5,642
1991	3,441	301	397	4,139
1992	3,073	882	- 40	3,879
1993	3,552	1,113	- 46	4,619
1994	3,813	1,228	24	5,065
1995	4,139	1,357	62	5,558
1996	4,645	1,932	58	6,635
1997	4,861	1,583	263	6,707
1998	5,153	1,789	218	7,160
1999	5,402	2,007	204	7,613
2000	5,721	1,942	260	7,923

SOURCE : MAP Model.

the basic sector, while the support sector added 3,127 workers. This means that 2.18 support workers found employment for every additional worker in the basic sector. Even if state and local government is added, the ratio of support to basic sector between the two years is 1.87. The same calculation (excluding state and local government) for the change in employment between 1992 and 1993 yields a ratio of 3.19.

The projection also has the basic sector's share of total employment gradually declining after 1984. This relative decline can be seen in Table 39. The basic sector's share of total employment declines from its 1982 peak to 38.1 percent in 2000. This is a 21 percent decline in the relative share of total employment allocated to the basic sector (46.2 /38.1 ≈ 1.21). Over the period, the basic sector grows at less than half the rate of the support sector.

One industry's growth merits special consideration. The construction industry has a major exogenous component associated with special construction projects such as pipelines, shore facilities, and liquifaction plants. Table 40 presents the derivation of that component. In so doing, it displays the impacts of special construction projects. Most of construction's cyclical behavior projected between 1980 and 2000 is related to special projects. Local construction shows very little change from one year to the next. Special project construction employment declines after TAPS is completed. Between 1980 and 1982, it adds 5,834 workers (almost a 30 percent increase in total employment). After 1983, special project construction declines throughout the projection period.

TABLE 39. STRUCTURE OF EMPLOYMENT
ALASKA, 1978-2000

	Support Sector Employment	Percent of Total Employment	Basic Sector[1] Employment	Percent of Total Employment
1978	71,168	36.1	86,775	44.0
1980	67,735	34'.5	90,206	46.2
1985	87,437	38.4	92,454	42.8
1990	103,849	'40.9	105,013	41.4
1995	121,921	44.0	109,894	39.7
2000	147,203	47.2	119,147	38.1
Average Annual Percent Change				
	3.37		1.45	

[1] Includes federal government.

SOURCE : MAP Model.

TABLE 40. CONSTRUCTION SECTOR
ALASKA, 1978-2000

	Total Construction	Local Construction	Exogenous Construction
1978	11,565	11,438	127
1979	11,685	11,380	305
1980	13,862	13,157	705
1981	16,450	13,807	2,643
1982	21,809	15,270	6,539
1983	21,831	16,374	5,457
1984	17,293	16,356	937
1985	17,236	16,949	287
1986	18,309	17,760	549
1987	18,907	18,229	678
1988	19,661	18,887	774
1989	19,981	19,427	554
1990	20,035	19,833	202
1991-	20,075	19,827	248
1992	20,181	20,055	126
1993	20,642	20,437	205
1994	21,093	20,887	206
1995	21,483	21,354	129
1996	22,397	22,124	273
1997	22,965	22,912	
1998	23,803	23,748	1::
1999	24,712	24,656	56
2000	25,662	25,604	58

SOURCE: MAP Model.

State Expenditures

The moderate base case as outlined in Table 41 essentially extrapolates the post-1972 behavior of state expenditures. Growth in real expenditures proceeds at a 6.6 percent rate until 1986 and then declines to 2.2 percent until the end of the projection period.[2] Real per capita expenditures grow at less than 2 percent per year.

The importance of the Prudhoe Bay revenues is underscored by the MAP projections of the total fund balance (Permanent plus General Fund). In constant dollars, the Fund grows from $744.04 million in 1977 to $4,965.38 million in 1988, the last peak year of Prudhoe Bay production. This represents a real rate of growth of almost 21 percent annually. Thereafter, the Fund grows to $5,547.2 million by 1991 and then declines to $2,811 .46 million by the year 2000. The post-1991 period represents an annual decline rate of about -7.3 percent.

Total revenue growth does not keep pace with the projected real growth in state expenditures (Table 41). This Fund projection should be interpreted with caution. It is the result of many assumptions concerning state spending behavior, oil prices, and rules constraining use of and additions to the Permanent Fund. At this time, long-run rules constraining the Permanent Fund must be regarded as extremely conjectural;

[2]This results from the decline in production at Prudhoe Bay. Oil revenues are so important to the state's fiscal position that the decline in Prudhoe production is only partially offset by general economic growth.

TABLE 41. STATE GOVERNMENT EXPENDITURES
MODERATE BASE CASE, ALASKA
1978-2000

	Total State Expenditures ($ Million)	Real Expenditures ($ 1977 Million)	Per Capita Expenditures ($ 1977)
1978	1,270.12	1,147	1,121
1979	1,371.84	1,221	1,146
1980	1,626.58	1,393	1,274
1981	1,756.73	1,429	1,272
1982	1,986.13	1,534	1,305
1983	2,304.70	1,691	1,394
1984	2,543.04	1,772	1,453
1985	2,759.60	1,826	1,487
1986	3,036.35	1,907	1,540
1987	3,301.34	1,970	1,568
1988	3,613.38	2,047	1,600
1989	3,936.02	2,118	1,627
1990	4,262.87	2,178	1,650
1991	4,524.18	2,195	1,645
1992	4,803.10	2,214	1,641
1993	5,119.25	2,240	1,641
1994	5,465.71	2,272	1,642
1995	5,826.12	2,300	1,640
1996	6,271.57	2,351	1,650
1997	6,768.68	2,410	1,665
1998	7,301.40	2,468	1,677
1999	7,870.26	2,527	1,687
2000	8,493.80	2,590	1,698
Average Annual Percent Change		3.7	

SOURCE : MAP Model.

hence, Fund behavior projected by the MAP model is only one among many possible outcomes within a given base case scenario.

The Anchorage Economy, 1978-2000

Table42 summarizes the growth in population and employment over the projection period. Employment grows at an annual rate of 2.5 percent, while population increases at an annual rate of 2.0 percent. Comparable rates over the historical period were 8.22 percent and 5.56 percent, respectively.

These growth rates are still in excess of those projected for the state (1 .73, 1.87) and represent a gradual shifting of state economic activity to the Anchorage area. This trend was apparent in the historical data and continues throughout the projection period. Table 43 reveals the result of this process. Anchorage's share of state employment increases from 45 percent in 1978 to 49 percent by 2000.

Table 43 also reveals that the support sector grows in relative importance over the projection period. This sector experiences a 22.7 percent relative increase from 1978 to 2000.

In part, this results from the fact that the support sector in Anchorage serves more than the Anchorage economy. Services, transportation, finance-insurance-real estate, and communications all have substantial basic components growing out of Anchorage's role as the major trade and

TABLE 42. AGGREGATE ECONOMIC INDICATORS
MODERATE BASE CASE, ANCHORAGE
1978-2000

	Population	Employment
1978	191,871	88,515
1979	186,555	86,656
1980	186,047	88,067
1981	190,653	91,905
1982	201,016	98,236
1983	210,524	103,861
1984	211,796	104,643
1985	212,656	104,914
1986	215,219	106,358
1987	219,367	108,992
1988	224,793	112,502
1989	230,401	116,086
1990	235,413	119,213
1991	240,336	121,892
1992	244,878	124,405
1993	249,792	127,239
1994	255,067	130,232
1995	260,682	133,631
1996	267,068	137,483
1997	273,659	141,416
1998	280,757	145,627
1999	288,230	150,067
2000	293,554	153,368

SOURCE : MAP Model.

TABLE 43. ECONOMIC AND DEMOGRAPHIC STRUCTURE
MODERATE BASE CASE, ANCHORAGE
1978-2000

	Support Sector Employment	Percent of Total Employment	Basic Sector Employment (incl. Fed. Govt.)	Percent of Total Employment	Employment/ Population	Population/ Employment	Anchorage Employment, State Employment
1978	50,627	57.2	37,888	42.8	.461	2.17	.449
198.0	49,766	56.5	38,301	43*4	.473	2.11	.448
1985	64,348	61.3	40,566	38.7	.494	2.02	.461
1990	76,509	64.2	42,704	35.8	.506	1.98	.470
1995	89,150	66.7	44,481	33.3	.513	1.95	.482
2000	107,636	70.2	45,732	29.8	.522	1.9′2	.490

SOURCE: MAP Model.

distribution center for the state. Thus, state growth translates to increased demands on Anchorage's "support sector."

The data in Table 43 reveal that family size declines and labor force participation rates increase over the projection period. This is the result of employment growth rates exceeding population growth rates. These changes subsume a host of economic and demographic factors operating not only on the Anchorage economy but on the United States as a whole since the mid-1960s.

Southcentral Growth and Development, 1978-2000

During the historical period, the Southcentral region experienced rapid growth rates in employment and population. The future baseline projects a more modest expansion of economic activity.

The figures in Table 44 indicate that employment is projected to grow at 2.1 percent annually over the entire 22-year period. Population is projected to increase at a 1.5 percent annual rate. The growth path is smooth, like that of employment.

The difference in growth rates between population and employment again implies that labor force participation rates and family size are gradually changing over the projection period. Table 45 confirms this inference.

TABLE 44. AGGREGATE ECONOMIC INDICATORS
MODERATE BASE CASE, SOUTHCENTRAL
1978-2000

	Population	Employment
1978	53,739	23,764
1979	54,701	23,761
1980	56,801	24,942
1981	59,116	26,547
1982	60,037	27,473
1983	60,200	27,358
1984	62,339	28,456
1985	62,398	28,438
1986	62,616	28,706
1987	63,326	29,320
1988	64,471	30,130
1989	65,616	30,880
1990	66,762	31,711
1991	66,117	31,605
1992	66,301	31,880
1993	66,924	32,388
1994	67,710	32,985
1995	68,525	33,606
1996	69,561	34,365
1997	70,559	35.,088
1998	71,642	35,858
1999	72,835	36,683
2000	74,596	37,822

SOURCE: MAP Model.

TABLE 45. ECONOMIC AND DEMOGRAPHIC STRUCTURE
MODERATE BASE CASE
SOUTHCENTRAL

	Support Sector Employment	Percent of Total Employment	Basic Sector Employment (incl. Fed. Govt.)	Percent of Total Employment	Employment/ Population	Population/ Employment	S. Central Employment/ State Employment
1978	12,106	50.9	11,658	49.1	.442	2.26	.121
980	12,078	48.4	12,864	51.6	.439	2.28	.127
985	14,489	50.9	13,949	49.1	.456	2.19	.125
990	16,401	51.7	15,310	48.3	.475	2.11	.125
1995	17,800	53.0	15,806	47.0	.490	2.04	.121
2000	20,736	54.8	17,086	45.2	.507	1.97	.121

SOURCE : MAP Model.

The fluctuation in Southcentral's regional share of state employment reflects the vicissitudes of state economic growth rather than regional fluctuations. Structurally, the region experiences less change than Anchorage with the support sector increasing its relative share of employment by about 7.7 percent over the whole period.

IV. LOWER COOK INLET OCS DEVELOPMENT SCENARIOS

Definition and Measurement.

This study is part of the Socioeconomic Studies Program of the Bureau of Land Management (BLM) Alaska Outer Continental Shelf (OCS). Dames and Moore (March 1979) provided a description of three petroleum development scenarios providing a reasonable range of technological, economic, and geographic options, such that both minimum and maximum development impacts can be discerned. These petroleum development scenarios are for the proposed Lower Cook Inlet and Shelikof Strait OCS Lease Sale No. 60, currently scheduled for Fall 1981. This would be the second-generation lease sale for the area, following the earlier Lower Cook Inlet Lease Sale No. CI which was held in October 1977.

The Dames and Moore study details three development scenarios: (1) a high-find scenario, (2) a medium-find scenario, and (3) an exploration-only or low scenario. These scenarios will affect the Alaska economy differently as a result of different direct employment levels associated with each scenario as well as by the generation of additional revenues (and the incurring of additional costs) by the state. The purpose of this report is to describe those differential impacts through use of the econometric model developed by ISER as part of the Man in the Arctic Program (MAP).[1]

[1] For a description of the MAP econometric model, see Appendix B.

The effect of direct OCS employment on the Alaska economy will depend upon the extent to which incomes earned in OCS employment are spent within the state of Alaska. Two factors limit this impact. First, the openness of Alaska's economy leads to relatively low multiplier effects and weak intraindustry linkages. Secondly, the international character of many offshore petroleum firms means that they have regular, experienced crews which are dispatched to jobs around the world (Dames and Moore, 1978). The international character of the crews may mean that when they are not working, they will reside outside of Alaska. Consequently, their employment will have less than a "normal" 'impact on Alaska's economy through indirect, consumer-linked effects. The direct employment impacts provided by Dames and Moore (Dames and Moore, 1979) were therefore adjusted to reflect the employment of Alaska residents, where an Alaska resident is defined as any employee of a petroleum firm who resides in Alaska and interacts with the economy for the duration of the Lower Cook Inlet Exploration and Development Program.[2]

Alternative Lower Cook Inlet Scenarios

EXPLORATION-ONLY SCENARIO

The exploration-only scenario assumes that noncommercial oil and/or gas resources are discovered in the Lower Cook Inlet and Shelikof Strait OCS areas. It assumes an initial high level of exploratory activity, but only

[2]The method used for making these adjustments is contained in the "Western Gulf of Alaska Statewide and Regional Population and Economic Systems Impact Analysis," (ISER, May 1979), pp. 172-175, inclusive.

small noncommercial hydrocarbon deposits are found. Exploration terminates in the third year after the lease sale with a total of nineteen wells drilled--eleven in the Shelikof Strait and eight in Lower Cook Inlet.

This scenario assumes that exploration commences in the first year after the lease sale, peaks in the second year, and terminates in the third year as a result of discouraging exploratory findings.

The principal exploration support base for Lower Cook Inlet is assumed to be Nikiski. Homer will serve as a terminal for air transportation of personnel, light supplies, and water. The Shelikof Strait exploration is also assumed to be supported by Nikiski facilities, although Seward and Kodiak become more viable alternatives as the distance from Nikiski increases.

Table 46 reports the direct employment requirements for the exploration-only scenario. It reports the total direct employment estimates by Dames and Moore (Dames and Moore, March 1979) as well as the adjusted employment estimates used in this analysis.[3] This scenario peaks in 1983 with total direct employment reaching 726. Given the international nature of the work force and the large number of exploratory workers who are expected to be nonresidents of Alaska, this implies the equivalent of 236 persons employed year-round and residing in Alaska. As shown in Table 46, almost

[3]The adjustments in the table are for the share of employment going to Alaska residents.

TABLE 46. DIRECT EMPLOYMENT REQUIREMENTS
EXPLORATION-ONLY SCENARIO
LOWER COOK, SALE 60

	CONSTRUCTION		MINING		TRANSPORTATION		HEADQUARTERS	TOTAL EMPLOYMENT	
	Total Direct Employment	Adjusted Employment*	Total Direct Employment	Adjusted Employment*	Total Direct Employment	Adjusted Employment*	Total Direct Employment	Total Direct Employment	Adjusted Employment*
1982	0	0	376	95	147	62	19	542	176
1983	0	0	503	127	196	82	27	726	236
1984	0	0	105	27	41	17	5	151	49
1985	0	0	0	0	0	0	0	0	0

*Adjusted to reflect the share of direct employment going to Alaska residents (SEAR).

70 percent of the total employment generated at the peak occurs among exploration workers, who are classified as part of the mining industry. Adjusted for Alaska residents, however, these workers constitute approximately 54 percent of the adjusted total employment during the peak year. Transportation workers are assumed to represent about 17 percent of the peak direct employment; but when adjusted for local residents, they make up an estimated 35 percent of the total peak work force. Finally, both the total direct employment and the adjusted employment estimates for headquarters workers (who are assumed to locate in Anchorage) are assumed to equal approximately 11 percent of peak employment.

MEDIUM-FIND SCENARIO

The medium-find scenario assumes a modest commercial discovery of 198 MMBL of oil in the Lower Cook area and 500 MMBl of oil in the Shelikof Strait area. It is assumed that a single oil field comprises the total resources of each area, with the Shelikof Strait field located in the Northern part of the state and connected through a short pipeline to a new terminal constructed on the west coast of Afognak Island. The Lower Cook Inlet field is assumed to be northwest of English Bay and connected through a short spur to a trunk pipeline that carries the oil from a field located in OCS Lease Sale No. CI. This pipeline makes a land fall on the Kenai Peninsula near Anchor Point and continues north to Nikiski where the crude is either shipped to the Lower 48 via tanker or used in Nikiski refineries.

Under this scenario, exploration commences in the first year after the lease sale, peaks in the third with a total of thirteen wells, and terminates

in the fourth year with a total of forty wells drilled. Field development commences in the fourth year, and the production platforms for both fields are installed in the sixth year-. Oil production from both fields begins in the eighth year after the lease sale and continues through the year 2000.

The medium-find scenario assumes that a crude terminal designed to process the estimated peak production of nearly 200,000 bpd completes crude stabilization, covers lpg, treats tanker ballast water, and provides storage for approximately two million barrels of crude on the west coast of Afognak Island. Due to distance from Upper Cook Inlet support facilities, a temporary construction base and permanent operation base are assumed to be constructed adjacent to the terminal site on Afognak Island. The Lower Cook Inlet field has its support provided through shore-side facilities at Nikiski and a forward support base in Homer which is used for ferrying workers and light supplies. Exploration activities in both Shelikof and the Lower Cook Inlet are supported by a main base at Nikiski and a forward base at Homer. Additional support may be provided by Kodiak.

Table 47 presents the direct employment requirements and adjusted (for the share of employment going to Alaska residents) employment requirements for the medium-find scenario. Exploration begins in 1982, peaks in 1984, and is completed by 1985. While the exploratory activities reach a peak of 509 workers in 1984, the international character of this work force causes it to be the equivalent of only 149 workers who are year-round Alaska residents. Between 1985 and 1'988, construction of facilities,

TABLE 47. DIRECT EMPLOYMENT REQUIREMENTS
MEDIUM-FIND SCENARIO
LOWER COOK, SALE 60

	CONSTRUCTION		MINING		TRANSPORTATION		HEADQUARTERS	TOTAL EMPLOYMENT	
	Total Direct Employment	Adjusted Employment*	Total Direct Employment	Adjusted Employment*	Total Direct Employment	Adjusted Employment*	Total Direct Employment	Total Direct Employment	Adjusted Employment*
1982	0	0	380	96	147	62	24	551	182
1983	0	0	457	119	196	82	32	685	233
1984	0	0	509	129	196	82	55	140	246
1985	198	104	254	67	98	43	16	. 566	230
1986	62	33	0	0	0		16	78	49
1987	572	92	61	61	150	12:	34	817	315
1988	565	166	451	177	87	74	51	1,154	468
1989	0	0	616	390	21	19	65	702	474
1990	0	0	749	435	56	55	67	872	557
1991	0	0	749	449	56	55	55	860	559
1992	0	0	336	298	56	55	53	445	406
1993	0	0	277	277	56	55	53	386	385
1994	0	0	353	353	56	55	53	462	461
1995	0	0	353	353	56	55	53	462	461
1996	0	0	353	353	56	55	53	462	461
1997	0	0	353	353	56	55	53	462	461
1998	0	0	353	353	56	55	53	462	461
1999	0	0	353	353	56	55	53	462	461
2000	0	0	353	353	56	55	53	462	461

'Adjusted to reflect the share of direct employment going to Alaska residents (SEAR).

including the terminal, are completed. The peak construction work force occurs in 1987 with 572 persons employed. Due to the changing composition of the construction work force, however, employment adjusted for year-round Alaska worker equivalents peaks in 1988 with adjusted construction employment reaching a level of 166 persons. Peak employment in the production of Lower Cook Inlet crude oil reaches 749 workers for both 1990 and 1991. When adjusted for Alaska residency, the economic impact of these workers is only about 60 percent of the numerical total, or 449 workers.

Transportation employment is assumed to peak with 196 workers (82 workers when adjusted for Alaska residency), to fall to zero in 1986, and then to rise to 150 workers (128 adjusted for Alaska residency) during the construction period. After 1990, transportation employment is assumed constant at 56 workers, with virtually all of these persons being full-time Alaska residents. It is interesting to note how the changing composition of transportation employment between the exploration and construction phases alters the ratio of total direct employment and employment adjusted for Alaska residency. During the exploration phase, the number of Alaska resident equivalent workers equals only 42 percent of the total direct employment. During the construction phase, it equals 85 percent, while it equals approximately 98 percent during the production phase of the field. The level of year-round resident worker equivalents will be much more stable than the pattern of total direct employment shown in the scenario, as well as the indirect, consumer-linked impacts of OCS exploration, development, and production which are dependent on the number of year-round-resident worker equivalents.

Headquarters employment is again assumed to take place in Anchorage and reaches a peak of 67 workers in 1990. As before, it is assumed that headquarters employment is entirely composed of full-time equivalent Alaska workers.

Overall, in the medium-find scenario, total direct employment rises to a level of 740 workers during the exploration phase (1984) and reaches a total peak of 1,154 workers during peak construction in 1980. The number of year-round resident worker equivalents, however, is much lower with an exploration peak of 246 workers in 1984 and a peak employment impact of 559 workers in 1991. From 1993 onward, it is assumed that over 99 percent of the total direct employment resulting from the Lower Cook Inlet and Shelikof Strait OCS Lease Sale No. 60 will be Alaska residents.

HIGH-FIND SCENARIO

The high-find scenario assumes significant commercial discoveries of 400 MMBBL of oil and 363 BCF of gas in the Lower Cook Inlet area, and 1,000 MMBL of oil and 1,000 BCF of gas are found in the Shelikof Strait.

The major portion of the oil and gas resources under this scenario are assumed to be discovered in the Shelikof Strait area west of Afognak Island, while the Lower Cook Inlet discoveries are made immediately to the north of Lease Sale CI. This scenario assumes that the fields in the Lower Cook Inlet do not share infrastructure (in particular pipeline) with sale CI fields but rather support their own pipeline. The scenario consequently assumes that a partial processing facility may

have to be constructed on shore. The development of Shelikof gas can only be justified, however, if it can share infrastructure (in particular pipeline) with other fields. Consequently, in this scenario, the gas from the Shelikof field is assumed to be piped to Lower Cook Inlet where it feeds into a trunk pipeline to the Lower Cook Inlet gas field.

This scenario assumes that exploration commences the first year after the lease sale, peaks in the second and fourth years (with 14 wells drilled each year), and terminates in the seventh year with a total of 57 wells drilled. Four commercial oil discoveries and two gas discoveries are made in the four-year period. Development of the field is assumed to commence in the fourth year following the decision to develop the first discovery. The first two production platforms are assumed to be installed in the sixth year and the last two, in the eighth year. Oil production for the Lower Cook Inlet commences in the eighth year after the lease sale, at the same time as oil production begins from the Shelikof Strait field. Gas production from both the Lower Cook Inlet and the Shelikof Strait fields starts in the fourth year.

The high-find scenario assumes that a major facility is constructed as a crude oil terminal on the west coast of Afognak Island. The terminal is designed to process an estimated production of nearly 400,000 bpd and to provide storage for crude. It is further assumed that there will be two loading jetties for tankers at the terminal. It is also assumed that there will be a forward service base supporting construction and operation of the Shelikof field, constructed adjacent to the Afognak

terminal, and that exploration in the Shelikof Strait is supported principally out of Nikiski with aerial support and light supply shipment provided by Homer. Field and terminal construction support bases are assumed to be located at Nikiski. The two Lower Cook Inlet oil fields assumed discovered north of OCS Lease Sale No. CI will share a pipeline to the Drift River terminal, although a partial processing/treatment facility may be required near the pipeline land fall at Harriet Point. The small Lower Cook Inlet gas field is connected onshore through a spur that links up with the onshore trunk line transporting gas from other Lower Cook Inlet and Shelikof fields to Nikiski.

The direct employment requirements and the adjusted employment equivalents for the high-find scenario are presented in Table 48.

Construction employment begins in 1986 under this scenario, reaching a peak of 1,465 workers in 1989. This only represents an employment of 351 resident equivalent workers (or 24 percent) due to a specialized and transient nature of the construction workers.

Mining employment has two phases, as before. The first phase involves oil exploration and reaches a peak of 677 workers in 1984. These workers, however, have the impact on the Alaskan economy of only 166 full-time equivalent workers--again, reflecting the specialization and transiency of the exploratory work force. With the beginning of production, employment begins to climb from its 1987 low of 61 workers to reach a peak level of 1,828 employees in 1991. It then declines somewhat and stabilizes in

TABLE 48. DIRECT EMPLOYMENT REQUIREMENTS
HIGH-FIND SCENARIO
LOWER COOK, SALE 60

	CONSTRUCTION		MINING		TRANSPORTATION		HEADQUARTERS	TOTAL EMPLOYMENT	
	Total Direct Employment	Adjusted Employment*	Total Direct Employment	Adjusted Employment*	Total Direct Employment	Adjusted Employment*	Total Direct Employment	Total Direct Employment	Adjusted Employment*
1982	0	0	378	96	147"	62	21	546	179
1983	0	0	632	160	245	103	37	914	300
1984	0	0	677	169	245	103	32	954	304
1985	0	0	632	166	245	108	37	914	311
1986	260	136	500	132	196	87	24	980	379
1987	533	72	61	61	150	128	24	768	285
1988	1,156	309	501	226	214	182	37	1,908	754
1989	1,465	351	994	898	281	251	77	2,817	1,577
1990	461	57	1,691	,224	201	196	134	2,487	,611
1991	0	0	1,828	,239	147	144	153	2,128	,536
1992	0	0	1,455	,103	168	165	141	1,774	,419
1993	0	0	1,072	963	168	165	135	1,381	,269
1994	0	0	941	923	168	165	133	1,244	,223
1995	0	0	936	936	168	165	133	1,237	,234
1996	0	0	974	974	168	165	133	1.275	1,252
1997	0	0	974	974	168	165	133	1 ,275	1 ,272
1998	0	0	913	913	154	151	133	1,200	1,197
1999	0	0	860	860	140	137	133	1,133	1,130
2000	0	0	825	825	138	135	133	1,096	1,093

*Adjusted to reflect the share of direct employment going to Alaska residents (SEAR).

the range of 825 to 975 workers through the year 2000. At the peak of production employment, the number of Alaska resident-worker equivalents equals about two-thirds of the total direct employment. By 1995, however, it is assumed that all of the direct employees are Alaska residents.

Transportation employment rises rapidly to hit an exploration peak of 245 workers in 1985; it then declines for several years before reaching its highest level of 281 workers in 1989. During the exploration phase, the number of resident-worker equivalents equals approximately 43 percent of the total direct employment. After 1990, however, it is assumed that virtually all (98 percent) of the total direct workers are Alaska residents. As was true under the other scenarios, it is assumed that headquarters employment is located in Anchorage and that all of these workers are year-round Alaska residents. Headquarters employment rises slowly through 1988, when it shows a sharp three-year increase to reach a peak of 153 workers. It declines slowly thereafter and stabilizes at 133 workers in 1995 to the year 2000.

Overall, total direct employment under the high-find scenario rises to a peak of 2,817 workers in 1989--the peak year for construction activity. Thereafter, it declines sharply over a four-year period to reach a level of 1,244 in 1994, after which it remains fairly stable (with a slight downward trend) in the range of 1,100 to 1,250 workers. In terms of resident-worker equivalents, the peak year is 1990 when 1,611 resident-worker equivalents are employed. At the peak, consequently, the impact worker population (defined as the number of resident-worker equivalents)

equals about 65 percent of the total direct employment; and over the entire period, it averaged just over 70 percent. From 1993 to the year 2000, however, the long-term stability of employment under the high-find scenario causes resident worker equivalents to equal better than 98 percent of the total direct employment.

V. THE PROBABLE IMPACT OF OCS DEVELOPMENT IN THE LOWER COOK INLET

This section describes the probable economic impact of OCS developments in the Lower Cook Inlet. Chapter III, above, described the expected growth of employment, population, and other economic variables in the state of Alaska, the Anchorage region, and the Southcentral region under the assumption that no OCS developments occur in the Lower Cook Inlet (Sale No. 60). This chapter projects the growth of the same economic variables under the assumption that there is OCS development. Each of the three development scenarios discussed in Chapter IV (the exploration-only, medium-find, and high-find scenarios) are analyzed.

All three scenarios assume that exploration occurs between 1982 and 1984. Under the medium-find scenario, construction is assumed to occur during the years 1985 through 1988, inclusive. Under the high-find scenario, construction occurs during the years 1986 through 1990, inclusive.

Primary emphasis in this chapter is placed upon the medium-find scenario since it represents the most probable case. However, the exploration-only scenario and the high-find scenario are also discussed, although in lesser detail, at the end of the chapter.

The growth scenarios analyzed in this chapter are similar to those contained in the Western Gulf of Alaska report (ISER, 1979). Production employment associated with the lease area is relatively small, averaging about 400 workers. In fact, total basic employment--including mining,

manufacturing, and transportation--peaks at less than 800 workers and averages only slightly over 500 workers per year during the twenty-year period, 1980 through 2000, inclusive. By way of comparison, total employment in Alaska is expected to increase by almost 120,000 workers over the same period of time.

Statewide Employment Impacts

Both the long-term and short-term employment impacts of the Lower Cook Inlet OCS development are insignificant for the state of Alaska. Table 49 reports the employment levels which are expected in Alaska under the assumption that the moderate-development scenario occurs. The second column of Table 49 shows the difference between the employment levels expected under this development scenario and those that would have occurred without it. The final column of the table presents the percent difference.

Throughout the forecast period, total employment (direct, indirect, and secondary) resulting from OCS development in Lower Cook Inlet never exceeds 2,500 persons. It hits a peak of 2.2 thousand in 1991, declines for three years, and then starts to grow slowly, reaching a year 2000 peak of 2.4 thousand. This is a statewide employment impact of less than one percent in any year during the forecast period.

Without OCS development in the Lower Cook Inlet, the average annual compound 'rate of growth in Alaska over the twenty-year period is 2.358 percent per year. With OCS development, the growth rate is

TABLE 49. LOWER COOK INLET, OCS EMPLOYMENT IMPACTS
STATE OF ALASKA
MODERATE DEVELOPMENT SCENARIO

	Employment Levels	Employment Changes	Percent @ W _ -
1980	196,419	0	0
1981	204,746	0	0
1982	218,824	316	0.1444
1983	228,459	581	0.25431
1984	228,052	722	0.31659
1985	228,316	759	0.33243
1986	230,304	544	0.2362
1987	235,444	883	0.37503
1988	242,739	1,430	0.58911
1989	249,867	1,865	0.74639
1990	255,783	2,139	0.83625
1991	260,005	2,222	0.85459
1992	263,687	1,989	0.7543
1993	268,134	1,815	0.6769
1994	273,362	1,925	0.70419
1995	279,039	2,044	0.73251
1996	285,746	2,119	0.74156
1997	292,520	2,186	0.74729
1998	299,751	2,256	0.75262
1999	307,431	2,325	0.75626
2000	315,424	2,394	0.75897

2.397 percent per year. The difference between OCS and non-OCS growth rates in total employment for the state of Alaska, consequently, is .039 percent per year over the twenty-year period.

The interaction of OCS-generated employment impacts with the rest of the state's economy is shown in Table 50. The table presents the level of total state employment, assuming the moderate Lower Cook Inlet development scenario and the changes in the level of employment from the baseline for the support sector, for the government sector, and for the basic sector. The support sector includes the transportation, communications, public utilities, wholesale and retail trade, finance, and service industries. Government employment includes state, local, and federal government. The basic sector includes mining, manufacturing, agriculture, forestry, fisheries, and construction industries.

As can be seen from the table, has" c employment averages around one-third of the total change in statewide employment. Government employment accounts for another 15 percent, while support employment regularly accounts for over half of the total change. The largest employment impacts of the Lower Cook Inlet OCS development on Alaska statewide employment, therefore, occur either (a) because of the need to provide services in support of the OCS-worker population or (b) because of income effects operating through the wages and salaries received by basic workers. It should be remembered, however, that the analysis takes place in terms of full-time equivalent workers--not in terms of actual workers employed. As discussed above (Chapter IV), this analysis takes as given the

TABLE 50. DISTRIBUTION OF OCS EMPLOYMENT IMPACTS
STATE OF ALASKA
MODERATE DEVELOPMENT SCENARIO

	Support Employment		Government Employment		Basic Employment	
	Level	Change	Level	Change	Level	Change
1980	67,735	0	80,899		47,785	0
1981	72,579		80,731		51,436	0
1982	80,735	13:	80,441	24	57,648	159
1983	87,287	286	82,866		58,306	219
1984	88,025	365	85,595	l;;	54,431	247
1985	87,837	400	85,672	86	54,806	273
1986	88,784	353	85,082	80	56,438	110
1987	92,059	501	85,329	90	58,056	292
1988	96,395	728	86,043	134	60,301	569
1989	100,895	916	87,121	261	61,850	688
1990	104,878	1,029	88,046	343	62,859	767
1991	108,375	1,084	88,459	359	63,172	779
1992	111,412	1,049	88,408	347	63,867	592
1993	114,863	947	88,330	314	64,942	554
1994	118,743	961	88,355	315	66,265	649
1995	122,965	1,045	88,437	335	67,637	664
1996	127,667	1,101	88,500	344	69,579	674
1997	132,576	1,148	88,770	351	71,174	686
1998	137,780	1,200	88,996	359	72,974	697
1999	143,233	1,251	89,206	365	74,993	709
2000	149,005	1,302	89,472	317	76,946	720

international character of the exploration and construction work forces usually employed by oil and gas development companies In interpreting the results, it should still be kept in mind that dec sions to hire a greater number of Alaskan workers (as opposed to the . nternational, traveling workers who are usually employed) could affect the forecast results.[1]

The growth caused by Lower Cook Inlet OCS development does not significantly change the structure of employment in the Alaskan economy. As is true in the base case, the support sector increases in importance throughout the projection period. The response of the support sector and government regularly accounts for more than half of the total employment gains in the economy. The smallness of the Lower Cook Inlet impacts, furthermore, precludes any major structural alteration in the manner in which the support sector responds to basic changes in employment and income.

Statewide Population Impacts

Population changes in Alaska primarily result from changes in employment opportunities. Increased employment customarily leads to an in-migration of workers. Some of these workers travel as individuals, and others bring their families. In either case, statewide population changes in a manner proportionate to the change in employment.

[1] This point is discussed in greater detail below in Chapter VI, Sensitivity Analysis.

Table 51 presents the population changes expected in the state of Alaska as a result of employment changes (both direct and indirect) generated by the Lower Cook Inlet's OCS development. As with employment, the net impact of OCS developments in the Lower Cook Inlet on Alaska's population is very small. By the year 2000, Alaska's population is expected to be greater than it would have been otherwise by approximately 5.1 thousand persons. This represents a net increase in the state's population of approximately 0.8 percent, vis-á-vis the baseline projection. Most of this population growth results from the increase in secondary employment.

Over the twenty-year forecast period, total net in-migration to the state of Alaska induced by Lower Cook Inlet's OCS developments equals approximately 3.8 thousand persons (an average annual net in-migration of less than 190 persons per year). Most migrants to the state of Alaska are younger and of child-bearing age. Once they migrate to the state, these persons are assumed to form families and have children at the same rate as other persons in their own age/sex grouping. Consequently, some of the in-migrants attracted to Alaska during the early 1980s will begin having children by the late 1980s and early 1990s. This produces an increase in the state's natural population increase and causes population to grow both by the number of in-migrants and by the increased number of children born to in-migrants after they have become Alaska residents.

In the case of the Lower Cook Inlet OCS developments, the approximately 3.8 thousand additional persons in-migrating to the state over the

TABLE 51. LOWER COOK INLET, OCS POPULATION IMPACTS
STATE OF ALASKA
MODERATE DEVELOPMENT SCENARIO

	Population Levels	Population Changes	Percent Change
1980	407.511	0	0
1981	419.562	0	0
1982	440.684	0.41	0. 09303
1983	458.741	0.81	0.17657
1984	463.506	1.068	0.23041
1985	466.467	1.187	0.25446
1986	470.497	0.996	0.21169
1987	478.644	1.508	0.31505
1988	489.921	2.38	0.48579
1989	501 .349	3.156	0.6295
1990	571.283	3.713	0.72621
1991	518.841	3.998	0.77056
1992	525.492	3.847	0.73207
1993	533.032	3.727	0.6992
1994	541.62	3.979	0.73464
1995	550.871	4.234	0.7686
1996	561.531	4.397	0.78303
1997	572.504	4.597	0 . 8 0 2 9 6
1998	584.204	4.781	0.81837
1999	596.637	4.964	0.83199
2000	609.668	5.148	0.84439

forecast period are expected to form families and cause an additional 1.4 thousand persons to be added to the state's total population through natural increase. Consequently, the total increase in population resulting from the Lower Cook Inlet's OCS development equals about 5.1 thousand persons by the year 2000--of which, just under three-quarters of the total will be added through migration and one-quarter through additions to the state's natural population increase.

During the early 1980s, when construction activity is high, the Lower Cook Inlet's OCS impacts do make a slight difference, by reversing the migration pattern for two years from a net out-migration to a net in-migration. Over the entire forecast period, nonetheless, the impacts on population are insignificant, causing Alaska's total population growth to change from an average annual compound rate of 1.99 percent to 2.03 percent, which is a change of 0.04 percent per year, compounded.

The major trends in the structure of Alaska's population observed in the base case also dominate the impact case. The ratio of total population-to-work force continues to fall as a result of increases in the labor force participation of the working-age population, particularly among younger females. Reinforcing this trend is the increase in the proportion of working-age persons in the population--a result of the aging of the "baby boom" observed to impact the schools in the 1960s and the labor market in the 1970s and thereafter.

Statewide Personal Income Impacts

As with the other economic indicators discussed, real income in the state of Alaska is only slightly affected by OCS developments in the Lower Cook Inlet. Real personal disposable income in the state grows to $2.8 billion by the year 2000, an increase of only $25 million (or 0.9 percent) greater than the base (non-OCS) case. This represents a change in the state's average annual compound rate of growth of real personal disposable income from 4.21 percent per year to 4.25 percent per year.[2]

Another measure of real income impacts of Lower Cook Inlet OCS developments is the state's change in real per capita personal income. The difference between this measure of income impacts and the real personal disposable income measure is twofold: (a) disposable income and personal income. differ by the amount of taxes--federal, state, and local--paid; and (b) the per capita measure divides the state's total personal income by its total population. Many economists consider the per capita measure a better indicator of economic welfare since it describes both the growth of income in the state and the amount of income available to each state resident. (See Table 52.)

Because the growth of real income induced by OCS impacts in the Lower Cook Inlet is matched by the growth of population, Alaska's statewide real per

[2]The MAP model used to generate these projections also assumes a long-term, twenty-year inflation rate of approximately 5 5 percent per year. Consequently, the average annual growth of Alaska s real personal disposable income in nominal dollar terms is expected to be approximately 9.25 percent per year with OCS impacts and 9.21 percent per year without OCS impacts.

TABLE 52. LOWER COOK INLET, OCS REAL INCOME IMPACTS
STATE OF ALASKA
MODERATE DEVELOPMENT SCENARIO

(Millions of Dollars)

	Real Personal Disposable Income			Real Per Capita Personal Income		
	Level	Change	% Change	Level	Change	% Change
1980	$1,227.41	$ 0	0	$3,590.62	$ 0	0
1981	1,342.86	0	0	3,829,.81	0	0
1982	1,560.70	2.905	0.18613	4,255.76	3.605	0.0847
1983	1,660.68	4.869	0.29319	4,363.72	5.324	0.122
1984	1,582.87	5.787	0.3656	4,119.78	6.074	0.14743
1985	1,570.39	7.746	0.49325	4,067.23	9.997	0.24579
1986	1,617.71	5.267	0.32558	4,162.66	5.055	0.12143
1987	1,692.76	9.148	0.54041	4,291.99	10.207	0..23781
1988	1,785.30	16.254	0.91043	4,434.88	20.328	0.45836
1989	1,867.26	18.088	0.96869	4,542.00	16.328	0.35948
1990	1,935.09	19.277	0.99618	4,626.51	13.609	0.29415
1991	1,994.50	20.348	0.0202	4,707.42	12.723	0.27027
1992	2,054.98	17.750	0.86375	4,799.55	7.07	0.1473
1993	2,127.33	16.687	0.78441	4,907.49	4.973	0.10133
1994	2,208.18	18.670	0.84549	5,025.00	6.676	0.13285
1995	2,292.48	20,068	0.87538	5,139.06	6.219	0.12101
7996	2,391.66	20.998	0.87796	5,271.55	5.66	0.10736
1997	2,489.14	22.146	0.8897	5,391.72	5.797	0.10751
1998	2,592.68	23.242	0.89644	5,516.00	5.094	0.09234
1999	2,706.43	24.364	0.90022	5,648.69	4.746	0.08401
2000	2,824.09	25.504	0.90308	5,781.32	4.363	0.07546

capita personal income is hardly affected over the forecast period. In the year 2000, the difference is slightly over $4 of real personal income per person in the population, which causes real per capita income to rise from $5,777 to $5,781. This represents a difference of less than one-tenth of one percent.

The greatest impact on state levels of real per capita personal income occurs during the late 1980s when OCS impacts account for a difference of slightly more than $20 of real personal income per capita in the state. This causes it to increase from $4,415 to $4,435, an increase of 0.5 percent. From the peak impact year of 1988, both the change in real per capita personal income and the percentage of change fall steadily through the remainder of the forecast period. Over the twenty-year forecast period, the average annual compound rate of change in real per capita personal income goes from 2.406 percent per year without OCS impacts to 2.410 percent per year with Lower Cook Inlet OCS impacts, a difference of .004 percent per year.

It should be remembered that after 1984 total OCS employment levels remain constant. Consequently, all increases in real per capita personal income result from assumed increases in productivity and real wages among workers in the state economy.

State Revenue and Expenditure Impacts

OCS development in the Lower Cook Inlet will affect Alaska's fiscal position in two ways: changes in state government expenditures and changes in state government revenues. In turn, the interaction between state revenues and expenditures will affect the state's current account surplus and, thereby, its fund balances.

Alaska will not receive substantial direct revenues from OCS activity in the Lower Cook Inlet. However, the increase in state levels of employment and income will generate additional state revenues. At the same time, the increase in the state's population levels will require additional services and result in additional state expenditures.

Table 53 presents the change in state government expenditures, the change in state government revenues, and the difference between them (the net cost to the State of Alaska of Lower Cook Inlet's OCS development].

In Table 53, the first column shows the change in state expenditures resulting from the increased demand for services produced by OCS developments in the Lower Cook Inlet. The second column shows the changes in state revenues, also resulting from Lower Cook Inlet OCS developments. The third column represents the difference between them--the net fiscal impact on the State of Alaska.

TABLE 53. LOWER COOK INLET, OCS FISCAL IMPACTS
STATE OF ALASKA
MODERATE DEVELOPMENT SCENARIO

(roil lions of nominal dollars)

	Change in State Expenditures	Change in State Revenues	Net Fiscal Impact	Real Net Fiscal Impact (1979 = 100.0)
1980	$ 0	$ 0	$ 0	
1981	0	0	0	
1982	2.504	0 .276	- 2.228	-$1.913
1983	4.541	1.272	- 3.269	- 2.688
1984	5.891	1.957	- 3.934	- 3.086
1985	6.828	2.393	- 4.435	- 3.301
1986	6.387	2.674	- 3.713	- 2.625
1987	10.671	2.392	- 8.279	- 5.570
1988	17.363	4.271	-13.092	- 8.396
1989	23.763	16.949	- 5.814	- 4.169
1990	29.023	18.734	-10.289	- 6.000
1991	32.383	19.805	-12.578	- 6.995
1992	32.719	20.340	-12.379	- 6.554
1993	34.016	19.227	-14.789	- 7.454
1994	38.828	18.809	-20.019	- 9.607
1995	43.328	20.027	-23.301	-10.651
1996	47.473	20.793	-26.680	-11.618
1997	52.668	21.277	-31.391	-13.028
1998	58.113	21.926	-36.187	-14.308
1999	63.906	22.406	-41.500	-15.634
2000	70.281	22.828	-47.451	-17.034

Table 53 shows that the Lower Cook Inlet's OCS development produces a negative fiscal impact on the state of Alaska beginning in 1982 at a level Of $2.2 million and increasing steadily to the year 2000, where the net fiscal impact is a negative $47.5 million. When measured against Alaska's projected total expenditures, these are small amounts. Even at the year 2000 level of a negative $70.3 million, this only represents an increase in total state government expenditures of about eight-tenths of one percent.

An alternative way to view the Lower Cook Inlet's OCS fiscal impacts is to estimate the costs of those impacts in terms of their drain on the state's ability to expend funds for goods or services. This is done in the fourth column of Table 53. The column presents the annual difference between state revenues and state expenditures resulting from OCS impacts in terms of constant value 1979 purchasing power dollars. The sum of this column equals approximately $150.6 million; and this amount represents the net fiscal cost to the state of Alaska of the Lower Cook Inlet's OCS impacts during the period 1980 through the year 2000, inclusive. It is an amount equal to approximately 11.0 percent of the state's 1979 total expenditures.

The adjustment for inflation overstates the costs to the state. Even in constant purchasing-power dollars, $17 million in the year 2000 is different from $17 million today. With no changes in purchasing power through time, there is still a preference for current value over future value. Discounting the real net fiscal impacts shown in the fourth column of Table 53 by an additional 4 percent per year, compounded to reflect the real time preference of the state, produces an estimated real current

cost of OCS impacts to the fiscal status of the state of Alaska. This amount equals approximately $88.6 million; or about 6.5 percent of the state's 1979 budget.

These costs to the state result from structure of state revenues and expenditures produced by the OCS development in the Lower Cook Inlet. The OCS development in the Lower Cook Inlet produces no substantial direct revenues for the state. The major sources of state revenues are those generated through state income taxes, business taxes, or the growth of the state fund revenues. Expenditures, on the other hand, increase with population growth. Assuming that the level of services currently provided by state government to Alaska residents is maintained at base case levels, the cost of providing services to the additional population is greater than the additional revenues collected as a result of their incomes and purchases within the state.

Two additional assumptions underlie this forecast. First, by holding the level of real per capita expenditures constant (under the assumption of constant levels of service), the forecast is probably overstating expenditures since it takes no account of economies of scale. That is, the costs of administering and operating a 100-person police force are not twice as high as those for a 50-person police force. On the other hand, the forecasted change in state revenues and expenditures is based on the estimated number of full-time equivalent workers. The income impact of a full-time equivalent worker is the same as that for four workers being employed three months each. However, the social dislocation produced

on communities by having four new residents per year is substantially greater than that of having one resident per year. To the degree that such social dislocations require additional expenditures for education, public safety, and other state-supported services, the forecast has a tendency to underestimate the increase in state expenditures and the real net fiscal impact.

Regional Impacts

THE ANCHORAGE REGION

Table 54 shows the impact on the Anchorage region of OCS developments in the Lower Cook Inlet. The table shows changes in population, employment, and real disposable personal income that will be produced. Population is expected to reach approximately 295,800 persons by the year 2000, an increase of approximately 2,300 persons over the projected baseline. This represents a population growth resulting from OCS impacts of less than one percent. Over the forecast period, 1980 through 2000, inclusive, OCS impacts contribute approximately 2 percent to the Anchorage region's total population growth.

The fourth column in Table 54 presents the OCS impacts expected to occur in the Anchorage region as a percentage of the total OCS impacts in the State of Alaska. It shows that the Anchorage region will account for 39 percent of the total population growth induced by Lower Cook Inlet OCS impacts in 1985. This percentage grows to approximately 44 percent by the year 2000.

TABLE 54. LOWER COOK INLET, OCS IMPACTS ON THE ANCHORAGE REGION MODERATE DEVELOPMENT SCENARIO

	Level	Change	Percent Change	Percent of Total State Change
Population				
1980	186,047	0	0.0	0.0
1985	213,119	463	0.2	39.0
1990	236,831	1,418	0.6	38.0
1995	262,482	1,800	0.7	42.5
2000	295,847	2,292	0.8	44.5
Employment				
1980	88,067	0	0.0	0.0
1985	105,193	278	0.3	36.6
1990	120,070	857	0.7	40.1
1995	134,496	865	0.6	42.3
2000	154,425	1,057	0.7	44.2
Real Disposable Personal Income[1]				
1980	$ 555.9	$ 0	0.0	0.0
1985	721.1	2.4	0.3	31.2
1990	888:3	6.4	0.7	33.2
1995	1,069.0	6.9	0.6	34.3
2000	1,325.0	9.2	0.7	36.1

[1] Millions of Constant Value Dollars

The reason for the growth of statewide impacts occurring in the Anchorage region is explained by the nature of those impacts. First, all of the headquarters employment related to the Lower Cook Inlet OCS developments is assumed to occur in the Anchorage region, and the population impacts produced by those employment changes are assumed to reside there. Second, most of the total population impacts occurring in the state of Alaska are induced through secondary and indirect employment impacts. Given the current structure of Alaska's economy (as embodied in the MAP econometric model), this directs a substantial share of all economic impacts in the state into the Anchorage region. Finally, the state expenditures required by increasing population also are heavily directed toward the Anchorage region. In consequence, the OCS impacts on the Anchorage region rise to slightly under half of the total statewide impacts by the year 2000 but still constitute only about 2 percent of the region's total growth. As such, these impacts should cause no significant population pressures, or problems, on the region.

The same general pattern observed for population also holds true for employment and real disposable personal income as shown in Table 54. Again, the Anchorage region accounts for approximately 44 percent of the total statewide employment impacts; but these impacts account for slightly more than 1.5 percent of the total employment growth expected to occur in the region over the forecast period. In the case of real disposable personal income, the Anchorage region will capture approximately one-third of the additional income generated in the state (in real terms). This represents approximately 1.2 percent of the total change in real disposable personal income which the region is expected to experience.

Overall, the Anchorage region is expected to capture substantial amounts of population, employment, and real disposable personal income produced in Alaska as a result of the Lower Cook Inlet's OCS developments. Despite a substantial location of these impacts in the region, however, the large size of the Anchorage region will allow it to accommodate to these impacts with little difficulty. In fact, these impacts only represent between 1 percent and 2 percent of the total change expected to occur in the region under the baseline forecast.

THE SOUTHCENTRAL REGION

Table 55 presents the expected impact of Lower Cook Inlet's OCS developments on the Southcentral region of Alaska. The top third of the table is expected population impacts; the middle third, expected employment impacts; and the bottom third, the Lower Cook Inlet OCS impacts on the Southcentral region's real disposable personal income.

By 1985, the region will experience an OCS-induced growth of population of approximately 600 persons; and throughout the 1990s, it will experience OCS population impacts of approximately 1,600 to 1,700 persons. This represents an increase of about 1 percent in the region's population in 1985 and between 2.2 percent and 2.6 percent through the 1990s. Induced population growth in excess of 2 percent in any given year are not excessive but do represent an important component of regional growth. In the case of the Southcentral region, the OCS-induced impacts over the forecast period, 1980 to 2000, inclusive, represent slightly under 9 percent of the total net increase in population expected to occur.

TABLE 55. LOWER COOK INLET, OCS IMPACTS ON THE SOUTHCENTRAL REGION MODERATE DEVELOPMENT SCENARIO

	Level	Change	Percent Change	Percent of Total State Change
Population				
1980	56,801	0	0.0	0.0
1985	62,999	602	1.0	50.7
1990	68,552	1,790	2.6	48.2
1995	70,135	1,610	2.3	38.0
2000	76,311	1,715	2.2	33.3
Employment				
1980	24,942	0	0.0	0.0
1985	28,794	356	1.2	46.9
1990	32,609	897	2.8	41.9
1995	34,393	787	2.3	38.5
2000	38,663	842	2.2	35.2
Real Disposable Personal Income[1]				
1980	$147.4	$ 0	0.0	0.0
1985	187.9	3.748	2.0	48.4
1990	238.8	9.816	4.1	50.9
1995	273.7	9.593	3.5	47.8
2000	337.8	11.372	3.4	44.6

[1] Millions of Constant Value Dollars

While these impacts are moderate when measured against regional totals, they represent a significant share of total OCS impacts occurring in the state of Alaska. During the early periods, when exploration and construction activities are substantial, the Southcentral region will probably experience about half of the total population growth seen in the state. After 1990, when an increasing part of the population impacts are produced by secondary and indirect OCS impacts, the Southcentral region's share of statewide impacts falls off to about one-third.

A similar pattern emerges with respect to employment. Net employment impacts rise from a 1985 level of approximately 360 workers to a year 2000 level of approximately 840 workers. This represents an increase in the region's total employment ranging between 2.2 and 2.8 percent through the 1990s. It also represents between 35 and 42 percent of the total employment impacts produced in the state of Alaska by Lower Cook Inlet OCS development. With respect to its significance for the region, the employment impacts generated by OCS represent slightly over 6 percent of the region's total employment growth during the forecast period.

The real disposable personal income impacts evidence a similar pattern. The region's real disposable personal income level is increased by approximately $3.7 million in 1985. This represents a 2 percent increase over the baseline regional income level, although it represents the occurring of approximately 48 percent of the total increase in real disposable personal income within Alaska as a result of Lower Cook Inlet OCS development. By the year 2000, OCS-induced impacts generate approximately

11.4 million additional dollars of real disposable personal income in the Southcentral region. This is an increase of approximately three-and-one-half percent over the income level that would have occurred if no OCS impacts had occurred. It also represents approximately 45 percent of all real disposable personal income impacts occurring statewide in Alaska. These income impacts represent approximately 6 percent of the total real disposable personal income growth expected to occur in the Southcentral region over the forecast period.

The overall picture that emerges for the Southcentral region is one of moderate impacts. Population, employment, and real disposable personal income will all be higher than they would have been by 2-to-3 percent; and OCS impacts will account for between 6 and 9 percent of the total growth expected in the region.

The region, however, is not homogeneous. Unlike the Anchorage region, it does not represent an integrated trading area or a single labor market. The impacts will not be evenly distributed throughout the region but will occur in the specific labor markets, housing markets, and trading areas associated with the communities at Nikiski, Homer, and Kodiak. These are all small communities. Taken together, they probably represent less than a quarter of the regional totals--implying that the magnitude of the impacts would be four times as great.

The MAP econometric model is not designed to analyze small area impacts, A comparison of the Anchorage and Southcentral impacts, however, shows

how the magnitude of impacts increase as their location shifts from more or less densely populated areas. For Anchorage, the impacts are not significant. In the Southcentral region, similar magnitudes produce moderate impacts. Given the nonhomogeneity of the region, there is a reasonable expectation that the specific small communities affected by OCS would experience significant impacts.

High Scenario Impacts

The high-find scenario, discussed above in Section IV, assumes significant commercial discoveries of oil and gas are found in both the Lower Cook Inlet and Shelikof Strait areas. As a result, this scenario generates peak direct employment at just under three times the level projected under the most probable (moderate-find) scenario. This section describes the differential impacts produced in the State of Alaska by the most probable level of development and the high-find level of development.

Table 56 presents the projected differential growth impacts of the high-find scenario in comparison to the most probable (moderate-find) impacts. These comparisons are made for population, employment, real per capita personal income, and state net fiscal impacts.[3] Column one of the table presents the moderate-find impacts, while the high-find scenario impacts are presented in column two. The difference between the high- and moderate-find scenario. impacts is presented in column three (in absolute terms) and column four (in percentage terms).

[3]State net fiscal impacts are the difference between state revenues and state expenditures.

TABLE 56. DIFFERENTIAL GROWTH IMPACTS OF LOWER COOK INLET OCS DEVELOPMENT
STATE OF ALASKA
HIGH-FIND SCENARIO

	Moderate-Find Impacts	High-Find Impacts	Difference	Difference as Percent of Moderate Impacts
Population				
1980	0	0	0	0
1985	1,187	1,502	315	26.5
1990	3,713	9,505	5,792	156.0
1995	4,234	11,208	6,974	164.7
2000	5,148	12,930	7,782	151.2
Employment				
1980	0	0	0	0
1985	759	968	209	27.5
1990	2,139	5,953	3,814	178.3
1995	2.044	5,558	3,514	171.9
2000	2,394	5,885	3,491	145.8
Real Per Capita Personal Income				
1980	$0	$0	$0	0
1985	9.99	7.11	- 2.89	- 28.9
1990	13.61	54.91	41.30	303.5
1995	6.22	18.55	12.32	198.2
2000	4.36	6.75	2.39	54.7
State Net Fiscal[1] (Revenues-Expenditures)				
1980	$0	$0	.$0	0
1985	- 4.435	- 5.637	- 1.202	27.1
1990	-10.289	-27.566	-17.277	167.9
1995	-23.301	-59.121	-35.820	153.7
2000	-47.453	-117.414	-69.961	147.4

[1] Millions of Nominal Dollars

State population impacts are approximately 25 percent higher under the high-find scenario than they are under the more probable moderate-find scenario in 1985. During the 1990s, the high-find scenario increases population by about two-and-one-half times the level that would occur under the more probable moderate-find scenario assumptions.

The high-find scenario's Lower Cook Inlet OCS impacts increase the state's population by approximately 2 percent over the level it would otherwise have been after 1990. In large part, these population gains are produced by the employment-induced in-migration associated with both the higher level of direct employment and the larger magnitude of the support sector's response.

The same general picture emerges with respect to employment. Particularly during the late 1980s and early 1990s, employment impacts in the state of Alaska under the high-find assumptions are almost two-and-three-quarters times higher than they are under the more probable moderate-find assumptions. By the year 2000, the difference has fallen to approximately two-and-one-half times. Employment under the high-find scenario assumptions averages approximately two percentage points higher than it would have been under the baseline assumptions of no OCS development from the late 1980s onward.

Real per capita personal income shows large increases as a result of the much higher level of direct employment assumed under the high-find scenario. In 1990 and 1995, the additional real per capita personal income generated

by the high-find scenario's assumptions are four times and three times as great, respectively, as they are under the more probable moderate-find assumptions. However, the real per capita personal income impacts of Lower Cook Inlet's OCS development are very small under all conditions. Even during the peak year of activity under the high-find scenario, the OCS impacts on real per capita personal income are only slightly above one percent of what they would have been under the baseline (non-OCS) assumptions.

The impact on the state's net fiscal condition (the difference between revenues and expenditures) is related to the population and real per capita income growth. It increases by approximately one-quarter in 1985 and fluctuates around two-and-one-half times the more probable moderate-find scenario's impacts during the late 1980s and 1990s. The figures reported in Table 56 are in nominal dollar values. The difference between the year 2000 net fiscal impacts is an increase in the size of the revenue-expenditure shortfall from $17 million to $25 million in 1979 purchasing power.

Overall, therefore, the assumptions underlying the high-find scenario increase the level of Lower Cook Inlet OCS developments on the Alaskan economy; increases in employment and population after 1990 go from less than one percent to approximately two percent when compared with the baseline (no OCS) forecasts. Particularly during the late 1980s and early 1990s, it appears that the high-find scenario produces low-to-moderate population and employment impacts compared to the more probable moderate-find scenario which produces no significant impacts.

The impacts on real per capita personal income and state net fiscal status are reasonably large but still" represent impacts of 1 percent or less, compared with baseline, non-OCS assumptions.

Exploration-Only Scenario Impacts

The exploration-only scenario assumes that no commercial oil or gas resources are discovered in the Lower Cook Inlet and Shelikof Strait OCS areas. It assumes that exploration begins in the first year after the lease sale, peaks in the second year, and terminates in the third year as a result of discouraging exploratory findings. Consequently, all of the direct employment impacts occur over a three-year period and are associated with exploration activity. Since the three years of exploration activity are 1982 through 1984, inclusive, there are no 1980 impacts. Furthermore, the impacts evidenced after ,1985 are residuals. That is, they reflect the impacts on the state's economy from persons who migrated to Alaska as a result of exploration activity and remained in the state as permanent residents. These impacts are given in Table 57.

By the middle of the 1980s, approximately three-quarters of the population and employment impacts have been eliminated from the Alaskan economy. From the late 1980s through the end of the forecast period, the impacts of Lower Cook Inlet OCS development under the exploration-only scenario are not significantly different from zero.

The real per capita personal income impacts of the exploration-only scenario disappear even more rapidly. By 1985, they have been reduced to zero and

TABLE 57. DIFFERENTIAL GROWTH IMPACTS OF LOWER COOK INLET OCS DEVELOPMENT
STATE OF ALASKA
EXPLORATION-ONLY SCENARIO

	Moderate-Find Impacts	Exploration-Only Impacts	Difference	Difference as Percent of Moderate Impacts
Population				
1980	0		o .	0
1985	1,187	31:	- 872	- 73.5
1990	3,713	140	-3,573	- 96.2
1995	4,234	118	-4,116	- 97.2
2000	5,148	146	-5,002	- 97.2
Employment				
1980	0		0	0
1985	759	15;	605	- 79.7
1990	2,139	24	-2,115	- 98.9
1995	2,044	17	-2,027	-99.2
2000	2,394	28	-2,366	- 98.5
Real Per Capita Personal Income				
1980	$ 0	$ 0	$ 0	0
1985	9.99	- .15	-10.14	-101.5
1990	13.61	- .65	-14.26	-104.8
1995	6.22	- .63	- 6.85	-110.1
2000	4.36	- .62	- 4.98	-114.1
State Net Fiscal[1] (Revenues-Expenditures)				
1980	$ 0	$ 0	$ 0	0
1985	- 4.435	- 2.161	2.274	- 51.3
1990	-10.289	- 4.387	5.902	- 57.4
1995	-23.301	- 6.512	16.789	- 72.1
2000	-47.453	-10.570	36.883	- 77.7

[1] 'Millions of Nominal Dollars

are not significantly different thereafter. The state net fiscal impacts persist over a longer period of time because the persons who migrated to Alaska and remained there continue to require services from the state. They represent a very small impact, however; and three-quarters of them have been eliminated by the year 2000.

Overall, therefore, the exploration-only scenario produces statewide population, employment, and real per capita personal income impacts that are not significantly different from zero except for the three years in which direct activity occurs. Even during these years, this scenario produces changes in the state's major economic indicators of less than one percent.

Summary and Conclusion

If OCS development occurs in the Lower Cook Inlet, its probable statewide impact will be negligible in terms of employment, population, and personal income. The changes that do occur are minor and generally represent less than a one percent alteration in the state's non-OCS development projections. There is a small impact on state revenue and expenditure patterns and a net cost to the state (in terms of a shortfall between revenues and expenditures produced by OCS impacts) of about six-and-one-half percent of the state's 1979 budget, calculated in real terms and discounted for the community's time preference.

If the high-find scenario should occur, however, the state would probably experience moderate impacts in employment, population, and personal income.

These impacts would be in the range of a two-to-five percent increase in the level of activity projected to occur without OCS developments.

The exploration-only scenario, on the other hand, has very small impacts (less than 1 percent per year), and these last for a very short period of time. Effectively, the exploration-only scenario produces no significant alteration in the state's overall growth path.

With respect to regional impacts, the Anchorage region experiences small changes in employment, population, and personal income, even though one-third to one-half of the total OCS impacts in the state are expected to occur there. Since the region represents an integrated economy, these impacts should not provide any strong pressures on the economy's ability to generate jobs, housing, and required services.

In the Southcentral region, moderate impacts are expected in the growth of population, employment, and personal income. However, this region is not homogeneous and does not have an integrated economy. The impacts will occur in specific communities, most of them quite small in size. Although the MAP econometric model does not have the capability of forecasting small area impacts, it appears probable that the small communities of Nikiski, Homer, and Kodiak would experience large economic impacts under the most probable OCS impact scenario. Under the high-find scenario, the impacts would probably be substantial. While the substantial impacts (particularly under the high-find scenario) are analytically discernible, they cannot be quantified and no estimates of their magnitude are currently available.

VI. SENSITIVITY ANALYSIS

This section examines the sensitivity of the forecasts with respect to certain key assumptions contained in the analysis. These assumptions fall into two categories: first, those which relate to the structure of the model; and second, those which relate to the input data used with the model. Essentially, the first set of assumptions relates to the state expenditure rule contained in the MAP econometric model. The second set of assumptions relates to the participation and seasonality of the OCS labor force. Each is discussed in turn.

State Expenditure Rule

The MAP econometric model contains an expenditure rule which specifies the essential features of state fiscal policy. The rule generally assumes that state real per capita expenditures grow at a rate proportional to the growth of real per capita income and available general fund balances. This general rule was developed from an analysis of historical state expenditure patterns (Scott, 1978). Alternative formulations of the basic expenditure rule have been tested, as has the implicit assumption that the state of Alaska will respond to OCS development impacts in the same manner that it has responded to population and employment growth in the past (Western Gulf of Alaska Statewide and Regional Population and Economic Systems Impact Analysis, Huskey and Nebesky, May 1, 1979). The specific assumptions used in the expenditure rule for this report are contained in Appendix %, “Base Case Assumptions.”

Of analytical importance for this report is the assumption that state capital expenditures as well as revenue expenditures will increase proportionately to the growth of the state's economy. This assumption applies equally to short-term and long-term changes. Consequently, state capital investments are assumed to be as great for population changes expected to last only one year as they are for long-term population growth. This is probably an unrealistic assumption. Short-term impacts such as those produced by OCS construction and exploration activity are usually provided exclusively through operating budgets. Additional policemen, firemen, school teachers, and agency employees will be added to deal with short-term impacts. Seldom, however, are new courthouses, schools, and other capital fat'ilities built unless there is a probability of their longer-term utilization.

In addition to the sensitivity of the forecast results to varying expenditure rules such as those discussed in the Western Gulf study, there would 'appear to be a tendency on the part of the MAP econometric model to systematically overestimate government expenditure responses to short-term impacts. Since the capital budget accounts for approximately twenty-five-to-thirty percent of the state's total annual expenditures during the forecast period, the expenditure forecasts could be overestimated by as much as fifteen-to-twenty percent during the peak years of construction and exploration activity.

Labor Force Participation and Seasonality

The analysis used in this report contains a procedure to reflect its resident/nonresident composition. A full description of this procedure is provided in the Western Gulf of Alaska report (Huskey and Nebesky, 1979). This procedure is known essentially as SEAR (Share of OCS Employment to Alaska Residents), and it has the following essential characteristics. For onshore OCS activity, the impact of approximately five exploration workers is assumed equal to that of one full-time Alaska resident. During the development phase, it takes two workers to have the same impact as a full-time Alaska resident; while during the production phase, all workers are assumed to be the same as full-time Alaska residents. The same relationships hold for offshore OCS activity, except that the impact of workers during the development stage is reduced from two-to-one to five-to-one.

During the peak employment years of OCS exploration and development, the SEAR adjustments significantly reduce the estimated direct employment impacts used as inputs to the MAP econometric model. Table 58 reports the results of using actual workers instead of SEAR workers for the impact analysis. The first column of Table 58 presents the Alaska non-OCS (baseline) forecast. The second column presents the most probable impacts used in the body of the report and contains SEAR-adjusted direct employment. The third column contains the most probable impacts when unadjusted employment is used. Columns 4 and 5 show the percent change from the baseline forecast produced by Lower Cook Inlet OCS impacts using SEAR-adjusted employment (column 4) and unadjusted employment (column 5).

TABLE 58. SENSITIVITY OF FORECASTS TO SEAR ADJUSTMENTS
STATE OF ALASKA

	Non-OCS Forecast	Most Probable Impacts (With SEAR)	Most Probable Impacts (Without SEAR)	Percent Change With SEAR [(2÷1) 100]	Percent Change Without SEAR [(3÷1) 100]	Without SEAR as Percent of With SEAR [(3÷2) 100]
Population						
1980	407.51	0.00	0.00	0.00	0.00	0.00
1985	465.28	1.19	3.36	0.26	0.72	282.35
1990	507.57	3.71	7.75	0.73	1.53	208.89
1995	546.64	4.23	6.02	0.77	1.10	142.32
2000	604.52	5.15	6.49	0.85	1.07	126.02
Employment						
1980	196.42	0.00	0.00	0.00	0.00	0.00
1985	227.56	0.76	2.09	0.33	0.92	275.00
1990	253.64	2.14	4.09	0.94	1.80	191.12
1995	276.99	2.04	2.34	0.74	0.84	114.71
2000	313.03	2.39	2.60	0.76	0.83	108.79
State Expenditures[2]						
1980	$1,626.58	$0.00	$0.00	0.00	0.00	0.00
1985	2,766.43	6.83	19.60	0s25	0.71	286.97
1990	4,291.89	29.02	62.97	0.68	1.47	216.99
1995	5,869.45	43.33	70.26	0.74	1.20	162.15
2000	8,564.09	70.28	101.57	0.82	1.19	144.52

[1] Thousands of persons (workers)

[2] Millions of nominal dollars

The final column of the table shows how much larger OCS impacts are when the non-SEAR-adjusted employment estimate is used.

The biggest difference between the SEAR and non-SEAR-adjusted impact estimates occurs during the peak years of exploration and development. Statewide population impacts in 1990 are approximately twice as large when total direct employment is used for the model as they are when SEAR-adjusted employment is used. The significance of the impacts as measured against the non-OCS forecast is also doubled, rising from 0.73 percent to 1.53 percent. Employment impacts are approximately twice as high in 1990 when the non-SEAR-adjusted employment estimates are used.

Overall, the use of SEAR adjustments reduces the magnitude of estimated Lower Cook Inlet OCS impacts by about one-half during the peak exploration and development years. Because the SEAR adjustments become less important through time and are identical with the direct employment estimates for the production years, the effect of using SEAR adjustments becomes less important as the forecast period gets longer. By the year 2000, they produce relatively small differences.

Statewide, even the unadjusted SEAR estimates are still small. They range in the order of 1.5-to-2.0 percent of the baseline conditions, compared with the SEAR-adjusted impacts which fall in the range of 0.7 to 0.9 percent during the peak exploration and development years. These are still small-to-moderate impacts on the statewide aggregate indicators. Assuming the Southcentral region maintains its same percentage of the state's total

OCS impacts implies increases in population and employment in excess of 5 percent and an increase in real disposable personal income of approximately 8 percent during the peak years of exploration and development. While the MAP econometric model does not provide estimates for small area Impacts, this could imply increases in employment and population in the affected communities of Nikiski, Homer, and Kodiak in the order of 20 percent during the peak years.

The second labor market adjustment tested for sensitivity was the use of annual average data for estimating impacts. The procedure for making this test was to apply the seasonal peak direct employment estimated by Dames & Moore (March 1979, page 119) and to use it in the MAP econometric model as if the seasonal peak were the annual average. The peak employment estimated impacts were then subtracted from the annual average estimated impacts as a measure of seasonality.[1]

The results of the seasonal adjustment process are reported in Table 59. Using 1990 as a reference year, it appears that peak seasonal impacts on employment and population could be in the range of two-and-one-half-to-three times those estimated from annual averages. Because the seasonal variations only occur during the exploration and development phases, the difference between the seasonally adjusted estimates and the annual

[1] This procedure probably overestimates seasonal impacts since the model incorporates secondary and indirect responses which would not occur for seasonal peaks. This is particularly true for capital budget expenditures and other related fiscal measures. For this reason, only seasonal adjustments to population and employment were made.

TABLE 59. SENSITIVITY OF FORECASTS TO SEASONAL ADJUSTMENTS
STATE OF ALASKA

	Non-OCS Forecast	Most Probable Impacts (Annual Average)	Most Probable Impacts (Seasonal Peak)	Percent Change With Annual Average [(2÷1) 100]	Peak as Percent of Average [(3÷2) 100]
Population					
1980	407.51	0.00	0.00	0.00	0.00
1985	465.28	1.19	4.16	0.26	349.58
1990	507.57	3.71	11.85	0.73	319.41
1995	546.64	4.23	7.90	0.77	186.76
2000	604.52	5.15	7.90	0.85	153.39
Employment					
1980	196.42	0.00	0.00	0.00	0.00
1985	227.56	0.76	2.63	0.33	346.05
1990	253.64	2.14	5.85	0.94	273.36
1995	276.99	2.04	2.62	0.74	128.43
2000	313.03	2.39	2.80	0.76	117.15

[1] Thousands of persons (workers)

averages becomes increasingly less important toward the end of the forecast period.

Since the state's total economy exhibits a large amount of seasonality, the seasonal peak impacts still remain a very small part of the state's total levels of employment and population in 1990. Assuming the South-central region continues to attract its share of total OCS impacts resulting from Lower Cook Inlet development, the analysis implies that the region's total population could increase by as many as 5,000 additional persons during the peak years of production and exploration, If all of these persons were to be located in the small communities primarily affected by Lower Cook Inlet OCS developments, the impacts would appear to be substantial.

VII. SUMMARY AND CONCLUSIONS

The probable impact of Outer Continental Shelf developments in the Lower Cook Inlet vary significantly with the area and period of time analyzed. The larger the area and the longer the period of time, the less significant. are the impacts. The smaller the area and the shorter the period of time, the more significant the impacts become.

For the state of Alaska as a whole, all of the impacts are very small in size--generally accounting for less than a change of one percent in the non-OCS baseline forecast. Even when using non-SEAR-adjusted total direct employment estimates and allowing for seasonal variations in employment, the impacts remain quite small. By extending the time period for estimating impacts and discounting future values to arrive at current value estimates, it appears that the net fiscal impact on the state of Alaska will be moderate, equaling between 6 and 7 percent of the state's 1979 budget. Some of this impact, however, appears to be produced by a tendency of the MAP econometric model to overestimate state expenditures in response to short-term changes in population and employment.

The smallest level of analysis for which the MAP econometric model produces estimates is the Southcentral region. Using non-SEAR-adjusted total direct employment estimates and estimating impacts at the seasonal peaks during the exploration and construction phases of development, OCS developments in the Lower Cook Inlet could produce impacts as great as 10,000 additional persons and 4,500 workers. This would mean increases in

population and employment in the range of 15 percent for the region. For the individual communities of Nikiski, Homer, and Kodiak where most of the direct OCS impacts will occur, the seasonal peaks occurring during the construction and exploration phases of the development would probably be large and significant.

APPENDIX A

Historical Growth, 1965-1976

TABLE Al. GROWTH IN EMPLOYMENT, ALASKA, 1965-1976

Industry	Average Monthly Employment 1965	1970	1971	1972	1973	1974	1975	1976
Mining	1,100	3, coo	2,400	2,100	2,000	3,000	3,800	4,000
Contract Construction	6,400	6,900	7,400	7,900	7,800	14,100	25,900	30,200
Manufacturing	6,300	7,800	7,800	8,100	9,400	9,600	9,600	10,300
Food Processing	3,000	3,700	3,600	3,800	4,600	4,300	4,300	5,100
Logging-Lumber and Pulp	2,300	2,800	2,800	2,800	3,200	3,600	3,400	3,200
Other Manufacturing	1,000	1,300	1,400	1,500	1,500	1,700	1,900	2,000
Transportation, Communication and Public Utilities	7,200	9,100	9,800	10,000	10,400	12,400	16,500	15,800
Trucking and Warehousing	1,200	1,700	1,500	1,6(?0	1,500	2,200	4,000	3,200
Water Transportation	1, 000	800	800	800	900	1, 000	1,400	1,300
Air Transportation	1,900	3,000	2,800	3,000	3,300	4,000	4,800	4,700
Other Transportation	500	900	1,000	1,000	1,100	1,300	1,800	1,900
Communications and Public Utilities	2,600	2,700	3,700	3,600	3,600	3,900	4,500	4,700
Trade	10,000	15,400	16,200	17,100	18,300	21,100	26, 2C0	27,500
Wholesale	1 ,900	3,200	3,200	3,300	3,400	4,000	5,500	6,100
Retail	8,100	12,200	12,900	13,'300	14',900	17,100	20,300	21 ,500
Finance, Insurance and Real Estate	2,200	3,100	3,200	3,700	4,300	4,900	6,000	7,100
Services	7,500	11,400	12,600	14,000	15,200	18,300	25,1(?0	27,700
Hotels, Hotels, etc.	1,000	1,400	1,600	1,800	1,909	2,500	3,200	3,200
Personal	700	800	900	900	900	800	900	900
Business	1,400	2,000	2,100	2,100	2,100	3,000	7,300	8,700
Medical	1 ,400	2,200	2,600	3,000	3,300	3,800	4,300	5,000
Other	3,000	5,000	5,400	6,200	7,000	8,200	9,400	9,900

TABLE A.1. (continued)

Industry	Average Monthly Employment							
	1965	?970	1971	1972	1973	1974	1975	1976
Government	29,000	35,600	38,000	40,500	41,600	43,800	47,200	47,200
Federal	17,400	17,100	17,300	17,200	17,100	18,000	18,300	17,900
State	7,000	10,300	11,700	13,300	13,800	14,200	15,500	14,100
Local	5,300	8,100	9,000	10,000	10,700	11,600	13,400	15,200
Agriculture, Forestry and Fisheries	100	800	900	900	1,0004	1,000	1,000	1,200
Total Civilian Non-Agricultural Wage and Salary Employment	70,500	93,100	98, 300	104,2CO	110,000	128,200	161,3(?5	171,100
Total Civilian Basic	31,300	35,600	35,800	36,200	37,300	45,700	58,600	63,600
Military	33,000	31,400	39,100	26,500	27,500	27,500	25,300	24,500
Total Basic	64,300	67,000	65,900	62,700	64,800	73,200	83,900	88,100
Total Support Sector	26,900	39,000	41,000	44,800	48,200	56,700	73,800	78,200
"Total Employment	114,000	129,900	133,900	136,500	143,200	161,500	190,200	203,200

Basic Employment Includes: Mining; Construction; Manufacturing; Federal Government; Agriculture, Forestry and Fisheries, and Military.

Support Sector Includes: Transportation, Communication and Public Utilities; Trade; Finance, Insurance and Real Estate; and the Services.

SOURCE : "Alaska Department of Labor, Alaska Labor Force Estimates, various years.
Alaska Department of Labor, Estimates of Total Resident Population and Estimates of Total Civilian Population'.

TABLE A.2. ANCHORAGE CIVILIAN EMPLOYMENT GROWTH, ALASKA, 1965-1976

Industry	1965	1970	1971	1972	1973	1974	1975	1976
Total	30,678	41,995	45,452	48,252	50,627	58,713	69,645	73,113
Agriculture, Forestry and Fisheries	33	52	63	76	82	100	110	100
Mining	371	958	916	806	769	1,036	1,301	1,409
Contract Construction	3,127	3,514	3,924	4,272	4,178	5,882	7,054	7,587
Manufacturing	791	1,018	1,117	1,215	1,286	1,379	1,571	1,629
Transportation, Communication and Public Utilities	2,618	3,907	4,591	4,522	4,625	5,383	7,343	7,409
Transportation	1,694	2,800	2,805	2,821	3,129	3,938	5,419	5,172
Air	773	1,482	1,455	1,629	1,835	2,123	2,610	2,668
Other	921	1,318	1,350	1,192	1,294	1,814	2,809	2,504
Communication	674	764	1,411	1,289	1,046	1,163	1,426	1,670
Public Utilities	250	343	374	411	451	483	499	568
Trade	5,280	8,617	9,334	9,948	10,663	12,298	14,928	15,958
Wholesale	1,226	2,220	2,292	2,423	2,475	2,860	4,077	4,240
Retail	4,053	6,397	7,042	7,525	8,188	9,438	10,852	11,718
Finance, Insurance and Real Estate	1,295	1,980	2,087	2,415	2,803	3,151	3,615	4,257
Services	3,767	6,403	7,027	7,725	8,319	10,119	13,465	15,450
Hotels	460	755	709	732	811	1,114	1,345	1,444
Personal	402	535	556	556	567	572	624	607
Business	789	1,188	1,194	1,120	1,190	1,680	3,795	4,914
Medical	681	1,200	1,480	1,759	1,993	2,283	2,286	2,657
Other	1,444	2,725	3,088	3,459	3,758	4,471	5,410	5,523
Federal Government	9,395	9,509	9,530	9,435	9,558	9,925	10,222	9,813
State Government	1,672	2,421	3,020	3,500	3,667	3,985	4,056	4,053
Local Government	2,329	3,615	3,845	4,349	4,677	5,257	5,979	5,413

SOURCE: Department of Labor, Statistical Quarterly, various issues.

TABLE A.3. EMPLOYMENT BY INDUSTRY, SOUTHCENTRAL ALASKA
1965, 1970-1976

Industry	1965	1970	1971	1972	1973	1974	1975	1976
Agriculture, Forestries and Fisheries	19	99	85	356	491	492	543	680
Mining	345	762	633	611	640	580	900	827
Contract Construction	880	583	895	768	681	1,239	3,656	6,978
Manufacturing	1,188"	1,647	1,627	1,818	2,627	2,522	2,656	3,234
Food	1,086	1,293	1,229	1,456	1,995	2,013	2,003	2,127
Transportation, Communication and Public Utilities	542	760	796	793	896	1,329	1,575	1,472
Transportation	373	521	502	442	497	708	1,106	977
Communications	26	85	132,	175	209	218	239	247
Public Utilities	132	154	153	176	189	03	231	248
Trade	813	1,338	1,319	1,383	1,460	1,611	2,327	2,533
Wholesale	102	153	.275	162	133	202	344	353
Retai 1	711	1,145	1,134	1,221	1,327	1,459	1 ,983	2,180
Finance, Insurance and Real Estate	159	211	204	220	239	308	377	420
Services	738	1,027	1,099	1,228	1,440	1,709	2,123	2,597
Hotel	138	154	230	297	300	427	467	462
Personal		28	29	39		40	49	35
Business	1?;	114	94	87	1;:	178	441	756
Medical	139	275	286	315	451	400	391	465
Other	319	456	460	490	5C0	664	780	878
Government								
Federal	975	828	742	626	602	595	572	637
State and Local	1,465	2,327	2,72S	2,932	3,056	3,180	3,455	3,592
Total	7,17.4	9,582	10,127	10,735	12,131	13,645	18,300	23,030

SOURCE: Estimated from Alaska Department of Labor, Research and Analysis Section Worksheets.
Alaska Stats Housing Authority, Alaska, Yakutat, Comprehensive Development Plan, Anchorage 1971.
Alaska Consultants, Inc., Anchorage, Alaska, Yakutat, Comprehensive Development Plan, December 1976.

Fig 1

APPENDIX B

Methods, Standards, and Assumptions to be Used in the Lower Cook Inlet (ICS Statewide and Regional Economic and Demographic Impact Analysis

This paper describes the methodology and assumptions to be used in analyzing the social and economic impacts of oil and gas developments in the Lower Cook Inlet. The major steps of this impact analysis are: (1} a historical baseline study of the economies of the state of Alaska and the Cook Inlet region, (2) development of base case (i.e., without Lower Cook Inlet oil and gas development) assumptions, (3) generation of base case projections, (4) generation of Lower Cook Inlet projections, and (5) a comparison of the impact projections with the baseline projections to analyze net impacts. This appendix will discuss the assumptions used in this analysis,

BaseCase Assumptions

A set of assumptions about the level of exogenous variables determines a development scenario; this section describes the assumptions in the non-OCS base case scenario. There are four major types of assumptions required for a scenario. First, there are assumptions about the growth of exogenously determined employment in both the petroleum and nonpetroleum sectors. Secondly, assumptions about exogenously determined petroleum revenues received by the state are needed. Thirdly, there are assumptions about national variables (see Chapter III, page 88). Finally, an assumption about the way the state spends its money is needed. Once these assumptions are set, the set of projections is determined by the model.

EMPLOYMENT ASSUMPTI ONS

Employment assumptions, include those associated with special projects and those associated with industry growth in manufacturing, agriculture-forestry-fisheries, and federal government.

Special Projects

Special projects include three basic types--petroleum projects, major construction projects, and operations of the major projects. Tables B.1 and B.2 show the project employment assumptions, The methods used to determine these levels are described below.

- Prudhoe Bay, Lisburne, and Kuparak mining employment was estimated from two sources of information. Employment scenarios were based on the scenarios described in the Alaska Department of Natural Resources, Alternatives for the Future: Petroleum Development Study, North Slope of Alaska (1977). The employment schedules were adjusted based on the estimated reserves, productivity, and the production schedules in Beaufort Sea Region Petroleum Development Scenarios (Technical Report No. 6, Alaska OCS Socioeconomic Studies Program, 1978).

- Northern Gulf OCS employment is an estimate of 1977 exploration employment. This was based on information in Monitoring Petroleum Activities in the Gulf of Alaska (Technical Report No. 17, Alaska OCS Socioeconomic Studies Program, 1978). Total employment associated with exploration was divided by the total wells drilled to obtain a man-years-per-well figure of approximately 90. Approximately 9.6 wells were drilled in 1977. Total exploration employment was adjusted by the percentage of Alaskan resident employment assumed in the report. There is no activity assumed after 1977.

- Upper Cook employment was an estimate of current employment made by the author. Employment was assumed to increase slightly between 1985 and 1990 as the oil fields are shut down. Gas production is assumed to continue after 1990.

TABLE B.1. MINING EMPLOYMENT

Year	Prudhoe,[1] Lisburne and Kuparak	N. Gulf[2] and Lower Cook OCS	Upper[3] Cook	Other[4] Mining
1977	1,586	271	575	2,082
1978	1,624	0	575	2,082
1979	1,585	0	575	2,082
1980	1,783	0	575	2,082
1981	1,402	0	575	2,082
1982	1,149	0	575	2,082
1983	897	0	575	2,082
1984	904	0	575	2,082
1985	987	0	575	2,082
1986	963	0	610	2,082
1987	985	0	645	2,082
1988	985	0	680	2,082
1989	1,009	0	715	2,082
1990	1,009	0	750	2,082
1991	1,020	0	300	2,082
1992	1,020	0	300	2,082
1993	940	0	300	2,082
1994	886	0	300	2,082
1995	886	0	300	2,082
1996	886	0	300	2,082
1997	886	0	300	2,082
1998	886	0	300	2,082
1999	886	0	300	2,082
2000	886	0	300	2,082

[1] Based on employment scenarios from Alternatives for the Future: Petroleum Development Study, North Slope of Alaska (Department of Natural Resources, 1977). Scenarios for 1 and 5 billion barrel reserves were adjusted to reflect reserves and production schedules of these fields.

[2] Exploration activity drilled 9.6 wells; assumed employment per well equaled 90 man-years from OCS Technical Report No. 17 (Dames and Moore, 1978).

[3] Estimate by the author based on current employment.

[4] Net employment in mining.

TABLE B.2. CONSTRUCTION EMPLOYMENT

Year	ECONX 1 TAPS	ECONX 1 ALCAN[3]	ECONX 1 Total	ECONX 2 Pacific[4] LNG
1977	5,300[1]	0	5,300	0
1978	0	0	0	0
1979	90[2]	0	90	0
1980	90	0	90	146
1981	90	1,425	1,515	844
1982	90	4,763	4,853	1,323
1983	0	4,663	4,663	420
1984	0	265	265	0
1985	0	0	0	0

[1] Based on estimate of TAPS construction employment by the Alaska State Labor Department.

[2] Assumed construction of four pump stations to increase capacity by 1982. Pump Station construction employment estimate from The Beaufort OCS Petroleum Development Scenarios, Dames and Moore, 1978.

[3] Northwest Energy Company manpower estimate, July 17, 1978.

[4] Based on letter to the Department of Natural Resources from S. California Gas, March 17, 1978, estimating peak construction employment of 1,500. Four-year construction period from E.I.S. for Pacific Alaska LNG Project, November 1974.

- Other mining was assumed to maintain its 1976 level, except in Anchorage and Fairbanks which were adjusted to an estimate of the 1977 mining employment.

Table B.2 shows special project construction employment.

- ECONX1 are highly paid construction workers associated with major projects, long hours, and extreme working conditions. Two projects are assumed in this category, the trans-Alaska pipeline and the ALCAN gasline. TAPS is completed in 1977. The 1977 employment is based on an actual estimate made by the Alaska Labor Department. After 1977 the line's capacity is assumed to be increased by the addition of four pump stations. Pump station construction employment estimates made in Technical Report No. 6 (Alaska OCS, 1978) were used to estimate employment. With completion of the TAPS construction in 1977, the line's capacity is assumed to be 1.2 million barrels per day. The capacity must be expanded to deliver the assumed base case North Slope production, which is 1.73 million barrels per day by 1983. Four additional pump stations were assumed to be needed to deliver this production. This was based on the ratio of capacity to pump stations (.15 million barrels per pump station) with eight pump stations. With this ratio, twelve pump stations would be needed to deliver 1.73 million barrels per day. These additions would also allow the line some additional capacity. The ALCAN gasline is assumed to be built between 1981 and 1984. The estimates are based on the most recent construction manpower estimates made by Northwest Energy Company in a letter to the state (July 1, 1978).

- ECONX2 employment is associated with special construction projects which are assumed to have regular employment schedules and be able to draw on local labor markets. One project of this type is assumed to be built, the Pacific LNG project. Pacific LNG is scheduled to begin construction in 1980 and operations in 1984 (Anchorage Daily News, September 23, 1978). The construction schedule is based on an estimated peak construction employment of 1,500 (letter from S. California Gas to Alaska Department of Natural Resources, May 17, 1978) and the four-year construction period from the 1974 E.I.S. for the Pacific LNG project.

Operations employment for these projects is transportation employment for the pipelines and manufacturing for the petrochemical projects. Alyeska estimated an operations employment of 300 for startup in 1977 and 850 per year for the long-term operations (Alaska Construction and Oil, October 1976). ALCAN operations employment is assumed to be 96 beginning in 1985. This estimate was, based on ALCAN's 1976 application to the Federal Power Commission. The difference in operations employment is accounted for because Trans-Alaska Pipeline Service (TAPS) has more pipeline in Alaska, the Valdez port employment is part of the TAPS employment, and TAPS has substantial Alaska headquarters employment. Operations employment for the Pacific LNG plant is 60 beginning in 1984.

Employment for these special projects is allocated to MAP Regions as follows:

1. Prudhoe, Lisburne, Kuparak employment to Region 1
2. Upper Cook N. Gulf OCS, Pacific LNG employment in Region 4
3. Other mining at its appropriate regional level
4. ALCAN and TAPS construction based on miles of pipe in region plus 300 TAPS headquarters in Anchorage in 1977
5. ALCAN operations is allocated by the miles of pipeline in each region
6. TAPS operations employment will be allocated as follows: 300 in Anchorage, 200 in Valdez, and the remainder based on the regional distribution of the pipeline.

Industry Growth

The level of employment in federal government and agriculture-forestry-fisheries is set exogenously. Federal government employment is assumed to follow its general historical trend and remain constant at the 1976 level throughout the forecast period. The trend in the historical period reflects increases in civilian employment offsetting decreasing military employment. The regional allocation will also remain constant. Employment in agriculture-forestry-fisheries will be assumed to increase at a rate of 3 percent per year. This reflects an assumption of little growth in agriculture and a modest increase in fisheries. The South-central Water Study estimated approximately a 5 percent annual increase with maximum fisheries development. Employment will be assumed to increase at this rate in each region.

Output in manufacturing must be determined exogenously. It is assumed to increase at an average annual rate of 4 percent which is consistent with both the historical trend and the assumed growth in the fisheries industry. Regional growth will be determined by the mix of industries with food manufacturing growing at the same rate as fisheries, 3 percent; lumber growing at 4 percent; paper growing at 2.5 percent; and other manufacturing bringing the growth rate into line with the overall 4 percent per year.

PETROLEUM REVENUE ASSUMPTIONS

Petroleum revenues to the state consist of royalties, production taxes, property taxes, and the corporate income tax. This section will examine the revenue assumptions chosen for the base case. Where it was possible

and did not conflict with other assumptions made in this study, we used revenue estimates made by the state; in other cases, revenues were estimated based on assumptions about the wellhead value and production.

COOK INLET REVENUES

Table 6.3 details the royalty and severance revenues from oil and gas production in Upper Cook Inlet. The overall assumption is that oil production would be over in 1995, while gas production will continue throughout the projection period. The specific assumptions are:

- Oil royalties and production tax are from a Legislative Affairs Agency memo of July 14, 1977. Revenues were estimated through 1985; after that a 15 percent decline was assumed in the value of oil produced. The average production of the well was assumed to decline below the taxable rate in 1989, and production was assumed to stop in 1995.
- Gas royalties and production tax are based on estimates of production through 1985 made by the Revenue Department in Revenue Journal, Vol. 1, No. 2, October 1976. Decline after 1985 was assumed by the author to be at a rate of 10 percent per year. The 1977 ratio of royalties and production taxes to production was assumed to hold throughout the projection period.

TABLE B.3. COOK INLET REVENUES[1]

Fiscal Year	Oil Royalties (Millions)	Oil Production Tax (Millions)	Gas Royalties (Millions)	Gas Production Tax (Millions)
1978	33.1	16.3	4.4	2.3
1979	31.3	14.4	5.4	2.8
1980	29.5	12.7	6.9	3.6
1981	27.9	10.9	8.3	4.4
1982	26.4	9.1	9.0	4.6
1983	24.6	7.3	9.1	4.7
1984	22.9	5.5	9.3	4.8
1985	21.2	3.7	9.4	4.9
1986	20.1	3.0	9.4	4.9
1987	19.1	2.0	9.4	4.9
1988	18.2	1.0	9.4	4.9
1989	17.3	0	8.5	4.4
1990	16.4	0	7.7	3.9
1991	0	0	6.9	3.5
1992	0	0	6.2	3.2
1993	0	0	5.6	2.9
1994	0	0	5.0	2.6
1995	0	0	4.5	2.3
1996	0	0	4.1	2.1
1997	0	0	3.7	1.9
1998	0	0	3.3	1.7
1999	0	0	3.0	1.5
2000	0	0	2.6	1.4

[1]Same as The Permanent Fund and the Alaskan Economy (Goldsmith, 1977) study except oil royalties which are the same until 1985, then decline at 15 percent to be eliminated in 1996.

PRUDHOE BAY REVENUES

Prudhoe Bay will produce the major petroleum revenues for the state in the projection period. To arrive at revenue estimates, estimates of production and the wellhead value are needed. These estimates are shown in Table B.4 and Table B.5.

- Production of oil was assumed to equal estimates made in Technical Report No. 6 (Alaska OCS Socioeconomic Studies Program, 1978).

- The wellhead value per barrel of oil was calculated based on discussion with BLM-OCS. These assumptions reflect those made with respect to N. Gulf oil.

  1. West Coast market price is $12/bbl. This reflects a $1.50 discount from a $13.50/bbl Gulf Coast price. The discount is for transport costs. The real market price stays constant.

  2. Vessel costs equal $1.00/bbl from Valdez to the West Coast and $.75/bbl processing costs. These costs remain constant in real terms.

  3. The TAPS tariff is $5.25 in 1978. The nominal tariff remains constant until 1990 when it is assumed the increased operating costs dominate the decreasing capital costs. After 1990, the tariff remains constant in real terms.

  This assumption reflects only one of a number which could be made concerning oil wellhead values.

- Production of gas at Prudhoe is assumed to increase following the Department of Revenue assumed production until 1987 when the peak production assumed by Dames and Moore (Beaufort OCS Petroleum Scenarios, 1978) is reached. This production level is assumed to remain throughout the period.

- The wellhead value of gas was calculated assuming the compromise energy bill is-adopted so that Prudhoe gas could sell at a wellhead value of $1.45 per MCF. This assumes the ability to roll this gas with other gas. It is assumed that producers pay $.45 processing costs for a net of $1.00 wellhead. A constant real price of gas is assumed.[1]

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[1] Base case was selected prior to final adoption of Federal Energy Act of 1978 which set a ceiling for Alaskan gas wellhead price.

TABLE B.4. PRUDHOE BAY OIL[1]

Fiscal Year	Production (Million Bbls)	Wellhead Price ($/Bbl)	Total Wellhead Value (Million$)	Royalties (Million$)	Production Tax (Million$)
1978	237.3	5.00	1186.5	148.3	124.6
1979	474.5	5.56	2638.2	329.8	277.0
1980	584.0	6.16	3597.4	449.7	377.7
1981	595.7	6.79	4044.8	505.6	424.7
1982	607.5	7.45	4525.9	565.7	475.2
1983	619.6	8.15	5049.7	631.2	530.2
1984	631.5	8.88	5607.7	701.0	588.8
1985	641.5	9.66	6196.9	774.6	650.7
1986	613.2	10.48	6426.3	803.3	674.8
1987	545.7	11.35	6193.7	774.2	650.3
1988	511.9	12.25	6270.8	783.9	658.4
1989	475.4	13.22	6284.8	785.6	659.9
1990	409.7	14.24	5834.1	729.3	561.5
1991	367.7	15.02	5522.9	690.4	531.6
1992	347.7	15.85	5511.0	688.9	530.4
1993	329.4	76.72	5507.6	688.5	530.1
1994	299.3	17.64	5279.7	660.0	508.2
1995	268.3	18.61	4993.1	624.1	480.6
1996	246.4	19.63	4836.8	604.6	465.5
1997	228.1	20.71	4724.0	590.5	454.7
1998	211.7	21.85	4625.6	578.2	445.2
1999	197.5	23.05	4552.4	569.1	438.2
2000	183.8	24.32	4470.0	558.8	430.2

[1] See text for explanation.

TABLE 6.5. PRUDHOE BAY GAS[1]

Fiscal Year	Production (Billion C. Ft)	Wellhead Price ($/MCF)	Wellhead Value (Million$)	Royalties (Million$)	Production Tax (Million$)
1978	3.9	1.00	3.9	.5	.4
1979	5.1	1.06	5.4	.7	.6
1980	5.9	1.11	6.5	.8	.7
1981	28	1.17	32.8	4.1	3.4
1982	43	1.24	53.3	6.7	5,6
1983	50	1.31	65.5	8.2	6.9
1984	780	1.38	1076.4	134.6	113.0
1985	830	1.45	1203.5	150.4	126.4
1986	870	1.53	1331.1	166.4	139.8
1987	912	1.62	1477.4	184.7	155.1
1988	912	1.71	1559.5	194.9	163.7
1989	912	1.80	1641.6	205.2	172.4
1990	912	1.90	1732.8	216.6	181.9
1991	912	2.01	1833.1	229.1	192.5
1992	912	2.12	1933.4	241.7	203.0
1993	912	2.23	2033.8	254.2	213.5
1994	912	2.36	2152.3	269.0	226.0
1995	912	2.48	2261.8	282.7	237.5
1996	912	2.62	2389.4	298.7	250.9
1997	912	2.77	2526.2	315.8	265.3
1998	912	2.92	2663.0	332.9	279.6
1999	912	3.08	2809.0	351.1	294.9
2000	912	3.25	2964.0	370.5	311.2

[1]See text for explanation.

Revenues from these are determined based upon state laws. Royalties are 12.5 percent of the wellhead value of oil and gas. The production tax in each case is a fraction of the nonroyalty value. This fraction depends upon the productivity of the average well in the field. The production tax on oil was assumed to equal 12 percent through 1989 when production declines and the rate falls to 11 percent. The production tax on gas is assumed to equal 12 percent throughout the projection period.

MISCELLANEOUS REVENUES

There are three important miscellaneous petroleum revenues: the property tax, the reserves taxes, and the corporate income tax. Table B.6 shows the assumed value of these taxes.

- The property tax taxes all petroleum-related property except oil refining and gas processing property and leases at a rate of twenty mills. We used the property tax revenue series estimated by the Department of Revenue in Alaska Oil and Gas Structure. This assumed construction of the TAPS and ALCAN lines.
- The reserves tax involves the repayment by the state of taxes paid by petroleum producers in 1976 and 1977. Credits of up to 50 percent of the production taxes are given until the $499 million collected is repaid. This tax affects only producers at Prudhoe.
- The Alaskan corporate income tax was changed in the last legislative session so that no state projection of this

TABLE B.6. OTHER REVENUES

Fiscal Year	Property Tax[1] (Million$)	Reserves Tax[2] (Million$)	ANCSA[3] (Million$)	Corporate Income Tax[4] (Million$)
1978	173.0	(83.3)	(23.8)	33.5
1979	185.0	(166.4)	(52.9)	127.8
1980	193.2	(204.8)	(72.1)	167.3
1981	226.7	(44.8)	(81 .6)	188.5
1982	251.8	0	(91.6)	212.8
1983	257.0	0	(102.3)	265.1
1984	261.4	0	(68.8)	348.9
1985	295.9	0	0	384.8
1986	281.1	0	0	405.1
1987	267.0	0	0	407.2
1988	253.7	0	0	421.6
1989	241.0	0	0	428.7
1990	229.0	0	0	421.4
1991	217.5	0	0	409.7
1992	206.6	0	0	416.5
1993	196.3	0	0	425.7
1994	186.5	0	0	418.8
1995	177.2	0	0	410.1
1996	168.3	0	0	410.7
1997	159.9	0	0	409.9
1998	151.9	0	0	411.0
1999	144.3	0	0	416.6
2000	137.1	0	0	418.5

[1] Based on estimates in Alaska Oil and Gas Tax Structure, Department of Revenue.

[2] 50 percent of Prudhoe production taxes.

[3] 2.0 percent of wellhead value at Prudhoe until $500 million is paid to the fund.

[4] Actual fiscal year 78 value; afterwards estimated as explained in the text.

revenue stream is available. The corporate income tax on petroleum is 9.4 percent of taxable petroleum income. Taxable income is gross income minus capital and operating costs and Alaskan taxes. The figure is not net of federal taxes. The tax was based on estimates of net income determined by the following procedure.

1. ALCAN and TAPS income was based on an assumption that these lines would be guaranteed a 20 percent after-tax return on their, equity by the rate structure. It was assumed that 15 percent of the capital cost of both projects was equity. The TAPS project was assumed to cost $10.5 billion and the Alaskan portion of the ALCAN line was assumed to cost $4.3 billion. The equity portion was depreciated in a straightline return on the remaining equity adjusted for an assumed 48 percent Federal tax rate.

2. Corporate taxable income for Prudhoe Bay gas and oil production was derived by estimating the components of revenues and costs. Revenues are derived above. The cost assumptions were derived from Technical Report No. 6 (Alaska OCS Socioeconomic Studies Program, 1978). The assumptions are shown below:

	Prudhoe Oil	Prudhoe Gas
Total Costs	$9.45 billion	$2.6 billion
Debt Proportion	25 %	25 %
Interest on Debt	9.0%	9.0%
Project Life	25 years	26 years
Total Throughput	10.5 billion bbls	26 billion MCF

Capital costs per barrel were found with this information. Per barrel costs were used to account for the flow of investment over the life of the field. Capital costs equalled debt service plus depreciation costs. Operating costs were added for total costs. These costs were:

	Prudhoe Oil	Prudhoe Gas
Capital Costs	$1. 24/bbl	$.14/MCF
Operating Costs	$1 .00/bbl	$.08/MCF

In addition, $.12 per barrel and $.02 per MCF were al lowed for overhead as per the legislation. Taxable income was found by subtracting these costs and allowable Alaska taxes from revenues.

3. The ratio of oil and gas taxable income to severance taxes at Prudhoe Bay was applied to Cook Inlet to estimate taxable income from-this production.

4. Estimated corporate income tax was found by applying the .094 rate to this income.

5. A final portion of the tax includes a redistribution of multistate corporate profits. This portion allocates worldwide corporate profits based on three factors: non-production property in Alaska as a percent of worldwide property, nonproduction payroll in Alaska as a percent of worldwide payroll, and Alaskan sales as a percent of worldwide sales. The average of these was taken as the 'proportion of worldwide profits which were taxed at 9.4 percent. Conversation with Alaska Department of Revenue led us to the conclusion that this component would be extremely small, so it was ignored in this study.

BEAUFORT OCS REVENUES

Tables B.7 through B.9 show the revenues associated with each of three Beaufort scenarios. Revenues are based on production estimates provided by the Alaska OCS Office of BLM. Wellhead values are determined by the wellhead value at Prudhoe minus transport costs from the Beaufort. These real 1978 transport costs were $.60 per barrel for oil and $.15 per MCF for gas. Other assumptions included:

1. Half of the production and offshore capital facilities would be located in state waters.

2. A conventional scheme of bonus bidding was used with $10CJ million being bid.

3. Discoveries on state-owned properties will be subject to state royalties and production taxes at current rates.

4. Oil and gas production from the Beaufort is transported via TAPS and ALCAN rather than new pipelines or alternate modes.

TABLE B.7. BEAUFORT MINIMUM SCENARIO
DIRECT REVENUE EFFECTS

(Millions of Nominal Dollars)

	Bonus[1]	Royalties[2]	Production Tax	Property[4] Tax	Corporate[5] Income Tax
1979	50	0	0	0	0
1980	0	0	0	0	0
1981	0	0	0	.31	0
1982	0	0	0	.44	0
1983	0	0	0	.70	0
1984	0	0	0	.71	0
1985	0	0	0	.48	0
1986	0	0	0	2.01	0
1987	0	0	0	4.75	0
1988	0	0	0	8.92	0
1989	0	9.10	7.60	13.29	.42
1990	0	24.10	20.30	15.05	3.77
1991	0	33.00	27.70	16.77	5.66
1992	0	42.80	35.90	17.58	7.84
1993	0	45.10	37.90	19.04	9.27
1994	0	44.00	40.00	20.43	9.10
1995	0	50.20	42.20	20.92	9.06
1996	0	50.60	42.50	20.37	9.21
1997	0	50.70	42.60	19.70	8.72
1998	0	49.40	41.50	18.89	8.18
1999	0	46.30	38.90	17.94	7.14
2000	0	42.80	35.90	16.82	5.81

[1] BLM-Alaska OCS Office.

[2] Royalties estimated at 12.5 percent of total wellhead value.

[3] Production tax equals 12 percent of the nonroyalty portion of total wellhead value.

[4] Tax at 20 mills of petroleum property value.

[5] Corporate income tax at 9.4 percent of taxable petroleum income.

TABLE B.8. BEAUFORT MODERATE SCENARIO
DIRECT REVENUE EFFECTS

(Millions of Nominal Dollars)

	Bonus[1]	Royalties[2]	Production Tax	Property[4] Tax	Corporate[5] Income Tax
1979	50	0	0	0	0
1980	0	0	0	0	0
1981	0	0	0	.31	0
1982	0	0	0	.44	0
1983	0	0	0	.70	0
1984	0	0	0	.71	0
1985	0	0	0	.82	0
1986	0	0	0	3.03	0
1987	0	0	0	6.21	0
1988	0	0	0	11.01	0
1989	0	12.50	10.50	16.22	.43
1990	0	33.10	30.10	18.49	7.12
1991	0	51.00	42.90	20.69	10.41
1992	0	54.70	46.00	22.06	11.13
1993	0	57.80	48.50	24.18	11.96
1994	0	61.00	51.20	26.37	12.74
1995	0	63.20	53.00	27.60	11.29
1996	0	65.40	55.00	28.03	12.41
1997	0	67.70	56.80	28.00	12.77
1998	0	65.90	55.40	27.81	11.79
1999	0	62.20	52.30	27.50	9.87
2000	0	58.10	48.80	27.08	7.63

[1] BLM-Alaska OCS Office.

[2] Royalties estimated at 12.5 percent of total wellhead value.

[3] Production tax equals 12 percent of the nonroyalty portion of total wellhead value.

[4] Tax at 20 mills of petroleum property value.

[5] Corporate income tax at 9.4 percent of taxable petroleum income.

TABLE B.9. BEAUFORT HIGH SCENARIO
DIRECT REVENUE EFFECTS

(Millions of Nominal Dollars)

	Bonus[1]	Royalties[2]	Production Tax	Property[4] Tax	Corporate[5] Income Tax
1979	50	0	0	0	0
1980	0	0	0	0	0
1981	0	0	0	.31	0
1982	0	0	0	.44	0
1983	0	0	0	.70	0
1984	0	0	0	.71	0
1985	0	0	0	.82	0
1986	" o	0	0	3.78	0
1987	o	0	0	9.21	0
1988	0	0	0	16.71	0
1989	0	37.50	31.40	24.88	4.51
1990	0	67.10	56.40	28.60	15.54
1991	0	85.10	71.40	32.35	19.48
1992	0	90.70	76.20	34.72	20.43
1993	0	95.60	80.30	38.43	21.95
1994	0	100.80	84.70	42.18	23.09
1995	0	106.40	89.30	44.34	21.97
1996	0	112.20	94.30	45.13	23.18
1997	0	115.90	97.30	45.23	23.90
1998	0	112.70	94.60	45.21	20.42
1999	0	101.50	85.20	45.04	17.62
2000	0	91.70	77.00	44.73	13.19

[1] BLM-Alaska OCS Office.

[2] Royalties estimated at 12.5 percent of total wellhead value.

[3] Production tax equals 12 percent of the nonroyalty portion of total wellhead value.

[4] Tax at 20 mills of petroleum property value.

[5] Corporate income tax at 9.4 percent of taxable petroleum income.

State Expenditure Assumptions

The fourth set of assumptions underlying the base case concerns state government spending. Unlike the previous assumptions that dealt with the magnitude and change of certain exogenous variables, this one posits the behavioral relationships within a sector. In other words, state expenditures are not exogenously given but are determined within the model. The rule determining spending behavior is given exogenously.

Under normal circumstances, behavioral relationships used in an econometric model of the type being used for these projections are derived from historical relationships. Parameters are usually estimated using various regression techniques, and these estimating equations serve to describe a sector's behavior. This traditional modeling approach has proved non-operational with respect to the state government's spending behavior. The reasons for this are historical and institutional. As a result of oil and gas lease sales and the construction of the trans-Alaska pipeline, state government has received large increments of revenue. In the case of the lease sales, the revenues were large lump sum payments of a magnitude the state is unlikely to receive again. Hence, the state's spending behavior occasioned by these payments is unlikely to be repeated.

In the pipeline case, the construction costs of more than ten billion dollars created an unprecedented four-year boom. It also induced a rapid growth of population. This population pressure created extremely high demands for state services and caused a rapid growth in state expenditures. The probability of a construction project of the magnitude of the pipeline's

occurring in the future is extremely remote. Consequently, a similar surge in service demands causing another rapid growth in state expenditures is unlikely to occur.

Future state revenues are likely to be dominated by revenues from Prudhoe Bay oil and gas production. These revenues are of such a magnitude that even large fluctuations in other state economic activities will have only modest impacts on total state revenues.

The Permanent Fund was established in 1976 as the result of a constitutional amendment. The law requires that at least 25 percent of all mineral (including oil and gas) lease rentals, royalties, bonuses, and federal mineral revenue sharing payments received by the state be deposited into this fund. The balance of these revenues, along with other state revenues, accrue to the General Fund from which state operating expenditure monies are taken. At this time, the rules for spending Permanent Fund revenues have not been developed.

The 25 percent revenue allocations to the Permanent Fund along with the state spending rules seriously limit the usefulness of past behavioral relationships. Future spending behavior for the state will obviously be a matter of policy choice, and past experience can provide only rough guidelines for analyzing or predicting these policies.

In his paper “Behavioral Aspects of the State of Alaska's Operating Budget FY 1970-1977,” Michael Scott found two major elements responsible for the

growth in state operating expenditures. First, real per capita state expenditures were positively related to changes in real per capita income. Secondly, expenditures were positively related to available revenues. The former can be treated as a demand effect; the latter, a supply effect.

Capital expenditures, on the other hand, exhibited a more complex behavior. They showed a strong positive relationship to fund growth, but new expenditure levels were not maintained in subsequent periods.

As a result of Scott's research, the MAP model's demand component for both the operating and capital spending equations relates changes in the level of current state expenditures to lagged changes in real income, population, and the price level. Population and the price level have unitary weights, while the real per capita income component has a weight of .5. Because of this weighting procedure, the state expenditure equation can be interpreted as stating that real per capita state expenditures grow at half the rate of real per capita income.

The supply component of the operating expenditure equation measures the responsiveness of state expenditures to changes in the General Fund balance. The supply influence is characterized by an extremely low elasticity of .02 multiplied by a weighted rate of change in the General Fund balance. A similar specification was developed for state capital expenditures except that the supply response was more heavily weighted. The capital expenditure equation in concert with the operating expenditure specification constitutes the expenditure rule used in analyzing the state government response to economic change over time.

Impact Analysis

The general methodology for conducting the impact analysis of OCS activities in the Lower Cook Inlet is a comparison of the projected key growth indicators (population, income, employment, and state fiscal position) with and without the assumption of OCS development. This comparison of projection against projection provides the means for assessing the OCS impacts.

Base case projections (i.e., those which assume no Lower Cook Inlet OCS development) are obtained by implementing the ISER econometric models using a set of specified base case assumptions. These assumptions reflect the levels and durations of economic activities expected to occur in the state and region without the proposed OCS-related development. In the case of the OCS projections, however, the assumptions include the projected direct employment and production expected to be associated with the particular development scenario. By comparing the projected base case values with the projected OCS development scenario values, we will derive a description of the OCS impacts.

Two adjustments will be made for the OCS projections. The first change concerns the state expenditure rule. The expenditure rule described earlier will not be used for the impact analysis. The rule will be "neutralized" in order to more clearly isolate impacts that can be directly associated with OCS activity. To achieve this neutralization, the real per capita levels of state expenditure projected in the non-OCS base case will be used in the impact projections. This essentially

removes the interactive effect between levels of service provided by the state government as measured by real per capita expenditures and OCS activity. State expenditures in the impact case will differ from the base case as a result of changes in population and the price level. This change allows a pure assessment of the effect of OCS development on the state's fiscal position.

The second adjustment to the OCS-related input assumptions concerns the direct employment associated with OCS development. These employment projections will remodified to reflect the residencies of the OCS work force. Without this modification, all of the impacts would occur in the state and the region. Since many employees will be imported, it is necessary to modify the employment numbers to reflect the portion of the employment impacts actually expected to affect the state and region. This modification is described in more detail in the following paragraphs.

The major determinant of the magnitude and duration of employment and income impacts associated with any particular OCS scenario is the assumed size of discovered recoverable hydrocarbon reserves. Reserve size determines the number of drilling rigs used during field development and the eventual number of production platforms and wells. In addition, large fields are likely to require multiple onshore bases and pipeline terminals. In other words, the direct employment (both offshore and onshore) required for development and production is a direct function of reserve size.

The geological, technical, and employment data used to generate impacts for this study will be taken directly from Dames and Moore. Even though these data set limits on the magnitude and duration of the direct employment and income impacts associated with the development scenario, there are a number of factors that influence the transmission of these direct activities to the Alaskan economy.

The direct employment itself is of two types, field and headquarters. The field employment encompasses the activities, onshore and offshore, occurring at the location of the development. Headquarters employment includes engineering support and general administration. Headquarters employment will be based on Dames and Moore scenarios as in the Northern Gulf Study.

There are three major factors affecting the relationship between direct employment impacts and indirect and induced employment impacts. These are (1) the location of the primary development activities, (2) the wage and salary levels of workers engaged in direct activities, and (3) the place of residency of the direct work force.

Developments that occur in remote, relatively inaccessible regions are likely to be highly self-sufficient. Workers in these enclaves have little interaction with the state economy except during their off-work rotation periods. As a result, they may spend little of their income within the state. In many cases, the enclave may be so isolated that supplies are received directly from the Lower 48, further reducing the possibility of generating indirect and induced activity within the state.

In summary, other things being equal, the closer an activity is to a well-developed, low-cost transportation network (i.e., the less remote it is), the greater is the likelihood that its direct employment will cause indirect and induced employment impacts.

The wage and salary levels of the primary work force are positively related to the indirect impacts associated with the development. This effect is partially mitigated because the higher paying jobs are highly specialized and often performed by crews that can be characterized as "nomadic" in that they travel worldwide, performing a given task. This nomadic character (particularly during exploration and development) clearly reduces their spending within the state.

Consequently, the distinction between where income is earned and where it is spent is an important one. The residency of the direct work force will have a profound effect on the magnitude and duration of the secondary impacts generated by a specific development scenario. Therefore, a major step in estimating the impact of OCS development is the estimation of the share of direct employment that will go to Alaskan residents (SEAR).

Table B.10 summarizes SEAR estimates by task. Further discussion is given in Appendix C of the Northern Gulf of Alaska Impact Analysis (ISER, 1979). These estimates were used to adjust the basic employment estimates developed by Dames and Moore (1979). For purposes of this study, a resident is any worker who resides in the state during off-duty rotation. This SEAR-adjusted direct field employment is used in the development scenario as an input into the MAP model for impact estimating purposes.

TABLE B.10. ESTIMATED SHARE OF ALASKA RESIDENT EMPLOYMENT BY OCS TASK

Task	Phase	Time Period		
		1979-1984	1985-1989	1990-2000
Onshore				
1. Service Base	all phases	1.00	1.00	1.00
2. Helicopter Service	exploration & development	.50	.53	.58
	production	1.00	1.00	1.00
3. Service Base Construction	development	.50	.53	.58
4. Pipe Coating	development	.20	.21	.23
5. Onshore Pipeline Construction	development	.20	.21	.23
6. Oil Terminal Construction	development	.50	.53	.58
7. LNG Plant Construction	development	.50	.53	.58
8. Oil Terminal Operations	production	1.00	1.00	1.00
9. LNG Plant Operations	production	1.00	1.00	1.00
Offshore				
1. Surveys	exploration	.20	.21	.23
2. Rigs	exploration	.20	.21	.23
3. Platforms	development	.10	.30	.33
	production	1.00	1.00	1.00
4. Platform Installation	development	.10	.105	.116
5. Offshore Pipeline Construction	development	.10	.105	.116
6. Tugboats	exploration	.40	.42	.46
	development	.80	.88	.97
	production	.80	.88	.97

The SEAR coefficients were developed by considering both task requirements and labor market factors within the state. Ideally, these coefficients would be empirically determined, but resources and time constraints prevented this. As a result, expert opinion and information from other studies were used to arrive at the values used here. It was assumed that longer off-duty rotation periods reduced the likelihood of aworker's becoming an Alaskan resident since, in these cases, travel time outside of the state decreases relative to the total time off. Specialized jobs (of both long and short duration) were assumed to be filled primarily by imported labor.

Table B." O further indicates that these coefficients change over time and that the economy internalizes additional direct labor force impacts. This internal·zation results from two separate but interdependent influences. First, the long-run pyramiding of separate OCS sales and developments transforms many of the transitory tasks into long-run employment opportunities and encourages the growth in the state's inventory of labor skills Secondly, a certain percentage of the OCS workers who initially migrate to Alaska on a temporary basis are attracted to the state's amenities and become residents. Both of these factors imply that the SEAR coefficients increase over time as well as have higher initial values for later OCS developments than for ear" ier ones. This effect is captured by an assumption that calls for a one percent annual average growth rate in SEAR coefficients having an in·tial value of less than one.

This dynamic or evolutionary aspect of the SEAR means that the relationship between direct employment and indirect/induced employment changes over time as the wage and salary "leakage" declines, Because of this decline in the wage and salary "leakage," the employment (and income) multipliers associated with the direct OCS employment increase over the projection period.

One other aspect related to the application of SEAR coefficients influences the magnitude and duration of the indirect and induced impacts. SEAR-adjusted direct employment reaches peaks and troughs at different times than unadjusted direct employment and is of a lesser amplitude. This imparts a greater degree of stability to the growth process than would otherwise be the case.

APPENDIX C

Assessment of Recent Changes in the MAP Econometric Model

This appendix will discuss the reasons for major differences between the projections for Lower Cook base case and the Western Gulf scenario projections (Huskey and Nebesky, 1979). The same set of events are assumed to occur in these scenarios. Table C.1 illustrates the extent of the projection differences. By 2000, population is 25 percent lower in the Lower Cook moderate case, employment is 15 percent lower, and personal income is 29 percent lower. These differences are a result of two factors. First, the scenarios are slightly different in each case. Secondly, major structural adjustments were made to the MAP model after the Western Gulf projections were completed. The changes to the MAP model are responsible for the majority of the difference in the projections.

TABLE C1. ALTERNATE SCENARIOS

(Lower Cook Mean Base Case as a Percent Of the Western Gulf Mean Senario)

	Population	Employment	Personal Income
1980	.93	1.01	.85
1990	.83	.97	.75
2000	.75	.85	.71

Alternate Exogenous Assumptions

The Western Gulf scenarios (W.G.) and the Lower Cook base cases (L.C.) differ only in their assumptions about the level of Northern Gulf OCS activity. The L.C. projections assume a much lower level of OCS activity in the Northern Gulf. In the L.C., Northern Gulf employment assumptions are from the E.I.S., while the assumptions in the W.G. were those used in the studies program (Dames and Moore, 1978). The peak Northern Gulf mean scenario employment assumed in L.C. is 450, which is 22 percent of the peak Northern Gulf employment (2,061) assumed in the W.G. The long-run operations employment in the L.C. is 27 percent of the long-run employment in the W.G.

These scenario differences account for only a small portion of the differences in the Western Gulf and Lower Cook projections, An estimate of the effect of the scenario change can be made by finding the ratio of total population and employment change to the change in the direct OCS employment and multiplying that times the difference in direct OCS employment in each scenario. Using the year 2000, the difference in the scenarios accounts for approximately 3,600 of the employment difference and 9,500 of the population difference. The scenario change explains approximately 5.0 percent of the population difference and 6.3 percent of the employment difference. The proportion may be slightly larger because of the dynamic properties of the model, such as the effect of population growth on state expenditures.

Model Changes

Modeling is a process which does not produce a single static model. Models are subject to evaluation and revision as new information and data become available. The ultimate aim in modeling is to reach a stage at which the introduction of new information will result in only marginal changes. This section will discuss the reasons for and content of major structural adjustments which have been introduced since January 1, 1979. The adjustments were made to the industry-specific wage rate and output equations and the statewide relative price index.

Changes in the model were the direct result of the OCS work of the Institute of Social and Economic Research (ISER). The primary objective of these changes centered on the model's ability to reflect the impact of small exogenous changes. The MAP model was originally designed to deal with alternate scenarios which had large differences in the exogenous assumptions (Kresge, et al, 1978). A model designed to examine large alternative scenarios must emphasize the structural changes which result from growth. Such a model is not the best type to use in analyzing the impact of small changes such as the introduction of an OCS scenario. One of the major reasons for changing the model was to better estimate the effects of these small exogenous changes.

A second reason for making the model changes was that the growth of the economy projected by the model was perceived as too large. This involved both the model's projected response to exogenous change and the long-run

growth projected by the model. Major criticism of MAP model projections has involved the large response to exogenous change. Criticism of the Alpetco study (Goldsmith and Huskey, 1978) centered on the large multipliers. Work on the Beaufort E.I.S. convinced us that the relation between total employment change and exogenous change was too large. OCS analysis provided the opportunity to examine the model projections with little exogenous sector growth. In such a scenario, the model produced growth which, we felt, was too large.

Finally, model changes were made to attempt to better project recent economic activity. The recent economic activity connected with the construction of the Trans-Alaska Pipeline System (TAPS) and the downturn after its completion represents a pattern which will be repeated, although not at this magnitude, throughout Alaska's economic future. The major problem with modeling this period is that the buildup and downturn are not symmetrical. The downturn does not occur as rapidly as the falloff in direct activity. Specifically, there are factors which sustain economic activity during a bust or period of decline. These include:

(1) personal income reserves which accumulate during a boom and contribute to higher post-boom spending;

(2) the capital stock effect which resists short-run change and, instead, adds stability to cyclical variation in the economy;

(3) the attempts of business organizations to continue operations under economic circumstances which encourage exit from the industry; and

(4) the elimination of bottlenecks for factor supplies so that planned expansion can occur.

Because this effect will be important for any impact with direct effects that peak, the model should be able to replicate this.

The model changes occurred in two stages. Changes to reduce the impacts were made for completion of the Northern and Western Gulf studies. These changes were cosmetic, attempting to deal with specific problems in time to produce these reports. The second stage involved following these changes with major model revisions. The next section describes these changes.

Changes in the Wage Rate Equations

In the earlier (pre-1979) version of the MAP model, WR equations in those sectors where labor market conditions are considered to be sensitive to the level of petroleum development (i.e., services, transportation-communications-public utilities, construction, and mining) were appended with a "boom term."

These wage rate equations have the general form:

$$WR_i = e^a \cdot \left(\frac{WEUS}{CPI}\right)^b \cdot RPI^c \cdot \underbrace{(EMP9 + ECONX)^d}_{\text{"boom term"}} \qquad (1)$$

where WR_i = wage rate in industry i

WEUS/CPI = inflation-adjusted average weekly U.S. compensation

RPI = Alaska Relative Price Index

EMP9+ECONX = exogenous mining and construction employment, respectively

The boom term was designed to transmit the effects of tightness (i.e., binding supply constraints) in the labor markets to other sectors of the economy. (The coefficient d is positive.)

Relatively high employment, normally maintained 'in the mining sector, exerted continual upward pressure on wage rates. As a result, personal income and employment grew continually, amplifying economic growth and impacting net migration and population. In cases where the mining sector did not grow, however, the boom effect reman ned constant, rather than gradually dissipating. To correct this problem, EMP9 was restricted to 1976 levels throughout the projection. This permitted ECONX to transmit the "boom" effect.

Changes in the RPI Equation

Specification adjustments in the pre-1979 RPI equation involved the coordination of boom and scale effects of growth. Given the general representation,

$$\frac{RPI}{CPI} = RPI\ (constant,\ EM991,\ EM991(\%\Delta)\ ) \qquad (2)$$

where CPI = U.S. consumer price index

EM991 = total nonenclave employment,

the dependent variable in the expression is equal to the ratio of RPI and CPI. The annual percentage change in employment, EM991(%Δ), is the boom

component in (2). We assume that rapid employment growth would reflect tight local supply markets, putting upward pressure on prices. The scale term (EM991) is a four-year moving average of employment. Under conditions of stable economic growth, the percent difference between USCPI and RPI is assumed to decrease over time. The boom effect, therefore, increases the RPI-USCPI ratio in the short run (i.e., two-to-three years), while the effect of scale economies associated with growth tends to reduce this ratio over time.

Simulation experiments suggested that under conditions of small exogenous employment increases, the scale effect would dominate the effects of labor market tightness so that prices would fall below reasonable levels. In the context of relatively large employment increases, the boom effect would subsume the effects of scale economies and result in excessive price increases.

A wide range of RPI specification alternatives were examined using regression analysis and additional simulation experiments. The specification selected for the Northern and Western Gulf lease sale impact analysis postulates a simple linear relationship between the rate of change in RPI and the rate of change in CPI and in employment. That is,

$$RPI(\%\Delta) = a + b \cdot CPI(\%\Delta) + c \cdot EM991(\%\Delta) \quad (3)$$

Scale effects are captured in the historical relation between the growth in CPI and in RPI. EM991(%Δ) transmits the effects of boom and scale on RPI. To see this, note that EM991(%Δ) = EM991 (i) - EM991(i-1)/EM991(i-1) (where

i = a given period). The denominator controls for scale, while the numerator controls for boom. As the economy grows, EM991(i-1) in the denominator increases, so that the effect on RPI of a given change in employment (as a component of EM991) is reduced over time. Thus, the boom effect becomes less important as the economy grows.

Moderating the boom term in the RPI equation and restricting EMP9 in the WR equations reduced the impacts generated by the MAP model. These changes cover the scope of model editing that occurred between the Beaufort and the Northern and Western Gulf impact analyses. Further refinements have been introduced as a result of experimentation associated with documentation of the MAP model.

Changes in the Wage Rate Equations: Round 2

Nominal sector-specific wage rates have been replaced by real wage rates in the dependent variable. This is equivalent to imposing a unitary elasticity on the RPI coefficient in the original version of the WR equations. In the previous WR specification, the RPI coefficients fell within a range of 1 to 1.5. Thus, RPI's effect on WRs has been neutralized (and reduced). Removal of the RPI term from the right-hand side may also reduce the presence of significant correlation between the explanatory variables (i.e., multicollinearity) and, therefore, increase the precision of coefficient estimates,

EMP9, which was previously (and somewhat arbitrarily) held constant, has been removed from the boom term. Additionally, the boom component no longer depends solely on the level of construction employment (ECONX) and is, instead,

a function of the size of ECONX relative to the remainder of Alaskan employment (EM991). Thus, the effect of an exogenous employment injection via ECONX is transmitted relative to the size of the nonenclave economy. The boom component is also a distributed lag having a two-period length. Sector-specific WRs are now capable of diminishing growth in periods of relative economic decline.

Changes in the RPI Equation: Round 2

The new version of the RPI equation is a composite of separable boom (or cyclical) and scale components.

$$RPI = f(SCALE) + f(CYCLE). \tag{4}$$

Explicit separation of these relationships in the construction of the equation follows from the assumption of structural change in the economy. The RPI format is as follows: First, isolate information which does not account for scale effects in a vector of residuals (RESID), obtained by regressing the ratio of RPI to CPI on an indicator of economic scale. (See equation (5).)

$$\frac{RPI}{CPI} = f(SCALE) + RESID \tag{5}$$

The scale term is assumed to be a simple two-period moving average of non-enclave employment (EM991). The time series for this regression ends in 1974, when pipeline construction begins.

Next, regress the residual vector[1] RESID on an indicator that is capable of transmitting the effects of rapid growth in the Alaskan economy. (See equation (6).)

$$RESID = f(CYCLE) \tag{6}$$

We have selected the annual rate of EM991 growth, squared, as the boom indicator (CYCLE). The effect is symmetrical: a decline in EM991 growth will produce a decline in RESID, the boom component of RPI, and vice versa.

Finally, we merge the results of this "2-stage" procedure into a single expression for RPI. (See equation (4).)

Over the projection period, the new RPI equation appears to perform with less volatility than its predecessor. The scale effect will generally dominate the boom effect, with the exception of a large or an abrupt fluctuation in employment.

[1] By definition, residuals equal the difference between actual and fitted values. Even though the "scale" regression (equation (4)) was performed on data limited to 1973, fitted values were calculated to 1977 using actual data for right-hand-side variables in (4), Thus, the residual vector (i.e., dependent variable in the "boom" regression, equation (5)) includes "projected" residuals, which contain information regarding the pipeline boom;

Changes in the Output Demand Equations

The original specification for industry output is

$$XX_i = a + b \cdot DP13R + c \cdot DPIXR \quad (7)$$

where XX_i = output in industry i

$DP13R$ = real disposable personal nonpipeline income (nonenclave)

$DPIXR$ = real disposable personal pipeline income (enclave)

In the boom term of the original WR equations (see expression (l)), exogenous mining employment (EMP9) is a surrogate for post-boom income and capital stock effects. (Note that real disposable personal income, which determines output, is a function of wages and salaries which, in turn, depend on wage rates. Thus, wage rates affect output.)

Recall that EMP9 has been removed from the revised WR equations. Therefore, boom-bust cycles are amplified in the WR equations and, consequently, in disposable personal income. As a proxy for post-boom income and capital effects, nonenclave real disposable personal income, lagged one period (DPI3R(-1)), has been appended to output equations in all sectors. This tends to extend and smooth the "post-boom decline.

Relative Effect of Model Changes

The majority of the difference between the Western Gulf scenarios and the Lower Cook base cases is the result of the wage rate changes. The effect of the changes in the wage rate equations was to reduce wage rates. This

reduced wages and salaries and incomes. The reduced incomes had two effects. First, it reduced the demand for goods and services from a given level of employment. This reduced the relative growth of the support sector and the employment response to any exogenous change. The second effect was to reduce net migration, since it reduced Alaska incomes relative to the United States. The reduced employment growth also reduced net migration. The change in the output and RPI equations primarily affected the pattern of growth.

Summary of Model Changes

Changes in the character of impacts associated with the original and new version of the MAP model are examined in connection with the Beaufort moderate scenario.

The ratio of new version to original version Beaufort moderate impacts are listed for selected aggregate indicators in Table C.2.

TABLE C.2. IMPACT COMPARISON, THE RATIO OF NEW TO OLD VERSION IMPACTS IN THE BEAUFORT MODERATE SCENARIO

	Population	Employment	Personal Income
1980	1.06	1.06	1.31
1990	.87	.90	.60
2000	.42	.39	.43

The impact ratios in Table C.2. show that the new model version impacts taper off over the projection period relative to those of the original model . New version impacts experience increasing moderation as the projection range advances.

With the exception of minor oscillations, personal income impacts in the new version stabilize at approximately $275 million between 1994 and 2000, when direct exogenous employment injections level off. On the other hand, impacts in the original version continue to grow and reach a level of about $663 million in 2000. Over this forecast interval, the average annual rates of personal income impact growth for the new and original models are 0.6 and 7.3 percent, respectively.

These impact level and growth rate differentials follow from the removal of the cumulative effect on aggregate demand in the WR equations. That is, moderation of average WR growth (particularly during periods of constant direct employment growth) reduces the level of WRs in any given period and, therefore, the start value for simulation in the next period. WRS are an important determinant of income and population growth in the MAP model. In the new version, average WR growth is comparable to the national average of about 2 percent per year.

The decline in aggregate demand as a result of WR moderation is felt most in the endogenous support sector of the economy. Support sector employment is reduced by about 92 percent between original and new model versions. The Anchorage region is most sensitive to the redistribution away from support sector activity.

APPENDIX D

Selected Model Output-

Variable Definitions

POP	Population (10^3 persons)
MIGNET	Net migration (10^3 persons)
NINCTOT	Natural increase (103 persons)
EM99	Total employment (10^3 persons)
EMSPP	Proportion of employment in the support sector
EMG9P	Proportion of employment in the government sector
EMNSP	Proportion of employment in the basic sector
EMA9	Employment in agriculture-forestry-fisheries (103 persons)
EMGF	Employment in federal government (10^3 persons)
EMP9	Employment in mining (103 persons)
EMT9	Employment in transportation (10^3 persons)
EMS9	Employment in services (10^3 persons)
EMPU	Employment in utilities (103 persons)
EMM9	Employment in manufacturing (10^3 persons)
EMFI	Employment in finance-insurance-real estate (10^3 persons)
EMD9	Employment in trade (103 persons)
EMCN	Employment in construction (103 persons)
EMCNl	Employment in local construction (10^3 persons)
EMGA	Employment in state and local government (10^3 persons)
EMOT	Other employment (10^3 persons)
PI	Personal income (millions of nominal dollars)
PIRPC	Real per capita personal income
RPI	Relative price index ($1957 US = 100)
E99S	Total state expenditures (millions of nominal dollars)
EXOPS	Total state operating expenditures (millions of nominal dollars)
EXCAP	Total state capital expenditures (millions of nominal dollars)
E99SRPC	Real per capita state expenditures
REVGF	Total general fund revenue (millions of nominal dollars)
RP9S	Total petroleum revenues (millions of nominal dollars)
RT98	Total nonpetroleum tax revenues (millions of nominal dollars)
RENS	Total endogenous revenues (millions of nominal dollars)

Variable Definitions (continued)

GFBAL	General fund balance (millions of nominal dollars)
PFBAL	Permanent fund balance (millions of nominal dollars)
RINS	Fund balance interest (millions of nominal dollars)
FUND	Total fund balance (millions of nominal dollars)
FUND77	Real fund balance (millions of real 1977 dollars)
SIMP	General -Fund revenue minus general fund expenditure (roil l ions of nominal dollars)
EXBITES	State total expenditure as a percentage of personal income
VIABL2	Nonpetroleum revenues as a percentage of general fund expenditures
RENSRAT	Endogenous revenues as a percentage of personal income

MODERATE BASE CASE

SIMULATION OUTPUT BY ISET

NWMLK2

	POP	MIGNET	NINCTOT	EM99	EMSP.EM	EMG9.EX	EMNS.EM	EMA9
1978	434.436	-5.	7.394	197.185	0.361	0,417	0.222	1.2
1979	403.256	-13.289	7.089	193.51	0.345	0.424	0.231	1.2
1980	407.511	-2.203	6.431	196.419	0.345	0.412	0.243	1.2
1981	419 .56,2	5.783	6.258	204.746	0.354	0..394	0.251	1.3
1982	440.274	14.314	6.4	218.508	0.369	0.368	0.263	1.3
1983	457.932	10.797	6.877	227.878	0.382	0.363	0.255	1.4
1984	462.438	-2.669	7.186	227, 33	0.386	O. 376	0.238	1●4
1985	465.28	-4.118	6.948	227.557	0.384	0.376	0.24	1.4
1986	469.501	-2.482	6.688	229.76	0.385	0.37	0.245	1.5
1987	477.136	1.108	6.514	234.561	0.39	0.363	0.246	1.5
1988	487.542	3.9	6.458	241.309	0.396	0.356	0.248	1.6
1989	498.194	4.048	6.601	248.002	0.403	0.35	0.247	1.6
1990	507.57	2.663	6.711	253.644	0.409	0.346	0.245	1.7
1991	514.843	0.498	6.769	257.783	0.416	0.342	0.242	1.7
1992	521.645	0.044	6.748	261.698	0.422	O. 336	0.242	1.8
1993	529.306	0.931	6.719	266.319	0.428	0.33	0.242	1.8
1994	537.641	1.592	6.734	271, 437	0.434	0.324	0.242	1.8
1995	546.636	2.207	6.779	276.995	0.44	0.318	0.242	1.9
1996	557.134	3.637	6.852	283.627	0.446	0.311	0.243	2.
1997	567.907	3.785	6.982	290.334	0.453	0.305	0.243	2.1
1998	579.424	4.396	7.115	297.495	0.459	0, 298	0.243	2.1
1999	591.673	4.974	7.269	305.107	0.465	0.291	0.243	2.2
2000	604.521	5.4	7.442	313.03	0.472	0.285	0.244	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1978	42.921	4.351	11.132	23.812	1.304	15.008	11.73	6.374
1979	112.9.2,1	4.563	10.372	22.09	1.213	14.865	12.297	5.836
1980	42.921	5,104	1(3.245	22.337	1. 198	14.978	12.822	5.883
1981	42.521	5.067	10.734	24.198	1,246	15.297	13.322	6.362
1982	42.921	4.759	11.424	27.392	1.319	15.81	13.811	7.165
1983	42.921	4.407	12.217	29.699	1.415	16.15	14.299	7.924
1984	42.921	4. 568	12.51	29.672	1.462	16.13	14.$354	8.088
1985	42.921	4.403	12.609	29.52	1.461	16.1313	15.356	8.05%
1986	42.921	4.43	12.569	29.845	1.457	16.217	15.872	8.135
1987	42.921	4.57	12.874	31.007	1.485	16.388	16.4	8.449
1988	42,021	4.702	13.248	32.613	1.526	16.624	16.945	8.883
1989	42.921	5.22	13.672	34.32	1●574	16.856	17.506	9.351
1990	42.921	5.225	14.055	35.042	1.617	17,04')	18.084	9.778
1991	42.921	4.75	14.401	37.239	1.657	"17. 188	18.68	10.163
1992	42.921	4.678	14.607	38.48	1.687	17.32	19.296	10.505
1993	42.921	4.54	14.91	39.905	1.722	17.474	19.932	10.1392
1994	42.'321	4.491	15.239	41.455	1.759	17.642	21.59	11.316
1995	42.921	4.497	15.591	43.117	1.798	17.824	21.269	11.773
1996	42.921	4.499	15.972	45.006	1.84	18.037	21.971	12.284
1997	42.921	4.476	16.378	46.963	1.006	1)3.251	22.696	12.827
1998	42.921	4.452	16.811	49.078	1.934	18.477	23.445	13.406
1999	42.921	4.44	17.244	51.291	1.932	18.713	24.219	14.$51
2000	42.921	4.389	17.689	53.604	2.033	18.956	25.019	14.661

1981	26.719	16.45	13.807	37.81	5288.43	3829.77	329.119	1175.07
1982	29.747	21.869	15.27	37.497	6472.98	4252.16	345.764	1313.18
1983	.31 .968	21.831	16.374	39.869	7205.2	4358.4	361.016	1524.39
1984	32.114	17.273	16.356	42.565	7201.34	4113.7	376.55	1680.46
1985	31.983	17.236	16. 949	42.666	7531.93	4057.24	338.992	1762.07
1986	32.626	18.309	17.76	42. 081	8198.2	4157.61	419.987	1887.71
1987	.33 .876	18.907	18.229	42.317	9016.49	4281.78	441.337	2061.12
1988	35. 428	19.661	18.887	42.989	9967.37	4414.55	463.11	2265.73
1989	36.981	19.981	19 .427	43.939	10946.6	4525.67	485.51	2496.39
1990	38.375	20.035	19.833	44.782	11919.9	4612.9	509.096	2735.36
1991	39.554	20.075	19.872	45.179	12913.5	4694.7	53s.273	2968.45
1992	40.734	20.181	20.055	45.139	14025.1	479.2.48	561.172	3199.62
1993	42.054	20.642	20.437	45.095	15296.	490.2.52	589.454	3447..35
1994	43.49	21.043	20.887	45. 119	16700.1	5018.32	618.966	3717.83
1995	45.024	21.483	21.354	45.181	18233.2	5132.84	649.84	4006.42
1996	46.74	22.397	22.124	45.235	20013.3	5265.89	682.157	4315.
1997	48.543	22.965	22.912	45.498	21895.5	5385.92	715.845	6672.69
1998	5[.4[3	23.803	23.748	45.716	23989.3	5510.9	751.277	5047.06
1999	52.391	24.712	24.656	45.92	26328,9	5643.94	788.445	5457.78
2000	54.467	25.662	25.604	46.18	28856.8	5776.35	827.451	5909.03

	EXCAP	E99S	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1978	280.	1276. 12	1121.45	1(,92.41	471 .4	261.121	334.168	651.
1979	290.	1371.84	1145.56	1431.12	860.7	206.211	281 .455	843.106
1980	475.789	1626.58	?274.15	1576.85	?96.3	189.325	268.669	940.267
1981	5"3 .672	1756.73	1272.2	1895.12	1278.42	196.071	284 .238	1226.71
1982	581.905	1986 .13	1304.68	2190.59	1475.75	244. 558	344.101	1613.33
1983	676.882	2304.7	1394.08	2484.41	164,2.71	310.021	4.25.695	2021.59
1984	743.873	2543.04	1452.7	3060.7	2121.72	349.944	480.033	2760.79
1985	862.399	2759.6	1486.51	3447.26	2422.26	356.959	4'34.936	3720.27
1986	990.58	3036.35	1539.85	3578.45	243'.).97	383.16	532.794	4609.6
1987	1055.92	3301.34	1567.75	3767.27	2480.15	424.604	588.415	5472.63
1988	1134.02	3613.38	1600.36	3963.07	2520.75	479.216	660.672	6270.41
1989	1194.85	3936.02	1627.27	4183.46	2575.2	545.9'38	747.801	7005.29
1990	1250.7	4262.87	1649.71	4243.04	2471.56	613.01	835.659	7522.04
1991	1245.54	4524.18	1644.76	4344.86	2418.85	686.431	933.351	7889.25
1992	1261.87	4803.1	1640.78	4513.11	2443.2'3	759.9(39	1030.51	8159.79
1993	1305.69	5119 .25	1640.78	$696.36	2472.49	846.548	1144.07	8327.78
1994	1356.59	5465.71	1642.43	4824.63	2440.84	942.457	127?.15	8319.53
1995	1400.07	5826.12	164(J. 11	4939.62	2367.32	1055.39	1417.12	8104.95
1996	1504.	6271.57	1650.18	5101.05	2379.69	1179.15	1578.88	7678.63
?997	1619.42	6768.68	1664.97	5287.43	2381.19	1328.29	1771.21	7021.3
199 8	1744.72	7301 .4	1677.3	5467.21	2379.1	1405.11	1'376.33	6096.83
1999	1878.18	7870.26	1687.08	5673.34	2385.18	1673.51	2217.97	4902.8
2000	2924.7	8493.8	1698.04	5880.49	2386.62	1879.31	2483.84	3394.95

	PFBAL	RINs	FUND	FUND78	E99L.PI	R99L	E99L	SIMP
1978	54.475	47.07	705.475	705.457	0.158	601."57	628.333	38.844
1979	158. 175	49.656	1011.88	944.745	?. 152	598.358	626 .727	296.406
1980	280.5	70.426	1220.77	1091.24	0. 149	654.946	685.017	218.886
1981	416.975	86.856	1643.69	1398.52	0.142	726.169	752.344	422.919
1982	568.925	117.143	2182.26	1767.38	0.129	800.964	834 .751	538.574
1983	737.199	155.603	2758.79	2139.91	0.132	912.183	947.998	576.534
1984	954.149	1[f3.till	3714.94	2748.1	[.145	1095.38	1043.35	556.153
1985	1193.05	264.816	4913.32	3448.36	0.146	1060.86	1101.1	1198.38
1986	1442.85	349.857	6052.45	4035.51	0.142	11111.71	1151..36	1139.14

1991	2694 .37	710.294	10583.6	5547.2	0.135	1682.94	1740.02	6$1.562
1992	2942. 25	754.325	11192.	5549.	0.133	1810.31	1870.82	518.419
1993	3193.77	791.854	11521.6	5473.49	0.132	1952.3	2016.43	419.508
1Y9U	3442.52	822.477	11762.1	5321.32	0.13	2108.45	2176.43	240.500
1995	3686.82	846.556	11791.	5080.96	0. 129	2280.69	2352.75	28.922
1996	3929 .22	843.798	11607.9	4765.09	0.127	2468.25	2544.64	-183.117
1997	4173.64	852.196	11194.9	4379.32	0.126	2677.49	2758.66	-412.91
1998	4418.72	804.514	10515.5	3919.54	0.125	2905.24	2991.07	-679.402
1999	4665.07	758.182	9567.86	3398.18	0.123	3151.33	3242.31	-947.684
2000	4912.57	693.075	8307.52	2811.46	0.122	3423.14	3519.58	-1260.54

	E99S.PI	RENS.PI	EP9S.GF
1978	0.319	0.084	0.432
1979	13,332	0 .068	0.601
1980	0.355	0.059	0.632
1981	0.332	0.054	0.675
1982	0.307	0.053	0.674
1983	0.32	0.059	0.661
1984	0.353	0.067	0.693
1985	0.366	0.066	0.703
1986	0.37	0.065	0.679
1987	0.366	0.065	0.658
1988	0.363	0.066	0.636
1989	0.36	0.068	0.616
1990	0.358	0.07	0.582
1991	0 .35	0.072	0.557
1992	0.342	0.073	0.541
1993	0 , 335	0.075	0.526
1994	0.327	0.076	0.506
1995	0.32	0.078	0.483
1996	0.313	0.079	0.467
1997	0.309	0.001	0.45
1998	0.304	0.082	0. 435
1999	0 .299	0.084	0.42
2000	0.294	0.086	0.406

LOW BASE CASE

WLLR2

	POP	MIGNET	NINCIOT	EM99	EMSP.EM	EMG9.EM	EMNS. EM	EMA9
1978	404.436	-5.	7.394	197.206	0.361	0.417	0.222	1.2
1979	402.677	-13.868	7.088	1s3.099	0.345	0.425	0.229	1.2
1980	405.846	-3.267	6.407	195.28	0.345	0.414	0.241	1.2
1981	416.643	4.592	6.193	202.849	0.354	0.397	0.249	1.3
1982	436.874	13.941	6.291	216.471	O. 368	0.37	0.262	1.3
1983	454.526	10. Y1	6.758	225.989	0.381	0.365	0.254	1.4
1984	458.22	-3.373	7.376	224.944	0.385	0.379	0.236	1.4
1985	460.511	-4.536	6.814	224.994	0.383	0.379	0.238	1.4
1986	464.369	-2.701	6.544	227.111	0.384	0.373	0 .243	1.5
1987	471.952	1.203	6.367	232.033	0.389	0.366	0.245	1.5
1988	481.886	3.567	6.361	238.535	0.395	0.159	0.245.	1.6
1989	491.974	3.629	6.454	244.953	0.402	0.353	0 .244	1.6
1990	501.325	2.796	6.553	250.73	0.408	0.348	0.243	1.7
1991	508.724	0.771	6.623	255.072	0.415	0.344	0.241	1 . 7
1992	515.563	0.213	6.617	259. 092	0.421	0.339	0.24	1.8
1993	523.356	1.186	6.598	263.887	0.427	0. 332	0.241	1.8
1994	531.722	1.731	6.626	269.068	0.433	0.326	0.241	1.8
1995	540.563	2.154"	6.678	274.548	0.44	0.32	0.241	1.9
1996	550.295	2.974	6.749	280. 647	0.446	0.313	0.241	2.
1997	560.968	3.811	6.854	287.369	0.452	0.307	0.242	2.1
1998	572.348	4.304	6.99	294.503	o. 458	0.3	0.242	2.1
1999	584.66	5.1.61	7.145	302.21	0.465	0.293	0. 243	2* 2
2000	597.652	5.659	7.327	319.278	0.471	0.286	0.243	2*2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1978	42.921	4.365	11. 132	23.814	1.304	15.009	11.73	6.374
1979	42.921	4.368	10.373	22.055	1.213	14.849	12.297	5.827
1980	42.921	4. 692	10.217	22.18	1.194	14.934	12.022	5.84
1981	42.921	4.465	10.676	23.894	1.238	15.225	13.322	6.279
1982	42.921	4.296	11.327	27.016	1.307	15.735	13.811	7.062
1983	42.921	3.95	12. 117	29.351	1.404	16.082	14.299	7.828
1984	42.921	3.91	12.422	29.274	1.452	16.044	14.854	7.981
1985	42.921	3.791	12.448	29.01	1.446	16.046	15.356	7.92
1986	42.921	3.725	12.417	29.348	1.443	76.122	15.872	8.
1987	42.921	3.854	12.706	30.53	1.471	16.298	16.4	8.319
1988	42.921	4.111	13.172	32.11	1.514	26 .527	16.945	8.748
1989	42.921	4.389	13.472	33. 255	1.559	16.751	17.506	9.199
1990	42.921	4.591	13.844	35.259	1.602	16.949	18.084	9.619
1991	42.921	4.18	14.204	36.69.2	1.642	17.097	18.68	10.014
1992	42.921	4.068	14.485	37.958'	1.674	17.232	19.296	10.362
1993	42.921	4.64	14.789	39.392	1.708	17.393	19.932	10.752
1994	42.921	3.966	15.128	40.964	1.747	17.564	20.59	11.182
1995	42.921	3.894	15.48	42.61	1.786	17.744	21.269	11.635
1996	42.921	3.852	15.848	44.378	1.828	17.942	21.971	12.12
1997	42.921	3.8133	16.241	46.313	1.871	18.157	22.696	12.649
1998	42.921	3.831	16.667	48.409	1.919	18.383	23.445	13.223
1999	42.921	3.828	17. 108	50.641	1.967	18.624	24.219	13.833
2000	42.921	3.826	17.578	53.026	2.019	18.872	25.019	14.4136

	EMD9	EMCN	EMCN1	EMGA	PI	PIEPC	KPI	EXOPS
1978	25.12	11.566	11. 439	39.242	3975,88	3511.39	280.336	944.

1979	23.9	11.568	11.351	39.2	4111.46	3 3.07	296.9	1079.
1980	24.681	13.435	13.072	37.992	4539.17	3568.07	313.457	1080.67
1981	26.383	16.189	13.654	37.6523	5219.2	3892.93	329.395	1170.88
1982	29.396	21.599	15.098	37.175	6406.9.7	4236.22	346.2	1306.92
1983	31.656	21.677	16.22	39.551	7147.31	4349.94	361.501	1516.91
1984	31.676	16.844	16.167	42.373	7095.52	4084.63	379.1	1674.43
1985	31.514	16.97	16.738	42.403	7429.43	4035.98	399 .724	1755.95
1986	32.168	19.036	17.542	41.794	8092.19	4141.17	421.807	1881.85
1987	33.441	18.691	18.015	42.03	8913.56	4271.05	442.201	2055.21
1988	34.958	19.353	18.65	42.75	9836.78	4399.68	463.963	2261.34
1989	36.45.2	19.638	19.155	43.666	10789.3	4508.44	486.437	2488.76
1990	37.859	19.721	19.542	44.438	11773.1	4603.81	510.1	2723.77
1991	39.074	19.758	19.578	44.868	12769.1	4689.51	535.24	2957.92
1992	40.264	19.864	19.749	44.849	13875.8	4788.14	562.095	3185.49
1993	41.61	20.345	20.163	44.803	15145.6	4902.01	590.356	3434.44
1994	43.053	20.8	21.617	44.859	16537.9	5017.91	619.833	3704.87
1995	44.567	21.229	21.1111	44.924	18050.1	5131.5	650.708	3992.87
1996	46.189	21.896	21.825	45.014	19742,9	5252.29	683.071	4303.35
1997	47.957	22.668	22.614	45.167	21634.6	5379.48	716 .922	4645.49
1998	49.828	23.507	23. 452	45.36	23726.9	5510,11	752.357	5022.04
1999	51.83	24.42	24.364	45.591	26055.1	5644.39	789.539	5433.12
2000	53.925	25.38	25. 322	45.871	28619.8	5779.81	828.522	5884.69

	EXCAP	ESSS	E99SBPC	REVGF	FP9S	RT98	RENS	GFBAL
1977	280.	1270.12	1121.05	1092.41	471.u	261.127	334.174	651.
1979	290.	1371.84	1147.13	1430.74	860.7	206.649	281.302	842.735
1980	474.16	1625.02	1277. 38	1574.57	956.3	187.974	267.059	938.741
1981	499.582	1748.41	1273.98	1890.38	1278.53	193.143	280.62	1227.02
1982	576.389	1S72.22	1303.98	2184.34	1475.86	240.294	338.739	1618.47
1983	672.725	229,2.83	1295.U2	2478.3	1642.82	305.955	420.426	2030.78
1984	740.413	2533.27	1458.32	3054.47	2121.98	345.449	474. 522	2772.23
1985	055.611	2746.36	1491.96	3437.31	2422.15	349.933	488.141	3732.93
1986	984.849	3024.33	1547.69	3567.3	2430.19	375.654	523.44	4621.67
1987	1049.45	3288.49	1575.72	3758.03	2481.69	416.796	578.794	5486.38
1988	1128.51	3602.91	1611.48	3952.95	2521.75	471.151	650.776	6283.35
1989	1186.78	3919.7	1637.89	4151.63	2557.09	535.949	735.567	7000.78
1990	1234.48	4234.29	1655.79	41 88.64	2434.23	601.398	822.376	7486.84
1991	1224 .62	4491.46	1649.52	4274.46	2367.73	674.9	919.179	7810.17
1992	1236.41	4764.5	16 44 .09	4450.96	2404.01	748.167	101G.1U	8046.39
1993	1203.12	5080.77	1644.44	4628.92	2431.64	833.894	1128.56	8176.59
1994	1334.12	5426.45	1646. 48	4750.97	2396.8	929.583	1254.48	8125.19
1995	1389.24	57s 7.07	1648.07	4862.96	2345.06	1041.3	1399.99	7861.4
1996	1491.91	6238 .52	1659.77	5010.64	2331.47	1161.71	1557.94	7375.77
1997	1604.47	6721.37	1671.27	5180.17	2327.26	1305.12	1743.61	6654.92
1998	1727.74	7253.91	1684.56	5354.59	2325.b	1461.71	1947.74	5661.47
1999	1861.39	7822.96	1694.7	5554.91	2332.9	1648.32	2187.48	4392.47
2000	2007.49	8446.04	1705.69	5756.18	2335.62	1852.77	2451.68	2804.33

	PFBAL	RINS	FUND	FUND78	E99L.PI	!?99L	E99L	SIMP
1978	54.475	47.47	705.475	705.457	0.158	001.57	628 .333	38.851
1979	158.775	49.656	1001.51	944.332	0.152	598.41	626.779	296.035
1980	280.5	70.9	1219.24	1089.22	0.151	653.128	683.199	217.73
1981	416.975	86.749	1643.99	1397.61	0.143	715.443	747.318	424.749
1982	560.925	11?/ .164	2187.4	1769.31	0.129	793.738	827.525	543.406
1983	737.199	155.962	2767.98	2144.16	0.132	905.248	941.663	586.587
1984	954.149	197.445	3726.38	.2752.56	0.146	999.225	1037.19	958.405
1985	1193.05	265.617	4925.98	3450.92	0.147	1049.96	1090.21	1199.6
1986	1442.85	351.783	6064.52	4035.68	0.142	1108.14	1150.79	1138.55
1987	1689.7	431.73	7176.08	4544.34	0.139	1195.14	1240.36	1711.50
1988	1941.3	510.774	8224.65	4964.06	0.137	1351.82	1349.15	1948.57
1989	2197.72	585.431	9198.5	5295.34	0.136	1418.05	1468.86	973.856
1990	2446 .25	654.884	9833.09	5452.96	0.135	1539.98	1593.83	734.587

1992	2931.	748.169	10977.4	5468.8	0.134	1796.19	1856.69	481.113
1993	3179.35	763.072	11355.9	5386.57	0.132	1937.21	2001.35	378.551
1994	3428.75	811.812	11549.9	5218.05	0.131	2093.96	2161.94	193.996
1995	3665.12	825.619	11526.5	4960.38	0.129	2265.05	2337.12	-23.41
1996	3904.62	825.182	11260.3	4624.44	0.126	2450.53	2526.92	-246.187
1997	4144.8	809.146	10799.7	4218.35	0.126	2654.66	2735.63	-480.621
1998	4385.75	776.704	10047.2	3739.6	0.125	2879.46	2965.29	-752.496
1999	4628.12	725.234	9020.59	3199.37	0.123	3125.67	3216.65	-1026.62
2000	4871.79	654.582	7675.82	2594.32	0.122	3396.44	3492.88	-1344.77

	5995.PI	RENS.PI	RP95.GF
1978	0.319	0.084	0.432
1979	0.334	0.088	0.602
1980	0.358	0.059	0.633
1981	0.335	0.054	0.676
1982	0.308	0.053	0.676
1983	0.321	0.059	0.663
1984	0.357	0.067	0.695
1985	0.37	0.066	0.705
1986	0.374	0.065	0.681
1987	0.369	0.065	0.66
1988	0.366	0.066	0.638
1989	0.363	0.068	0.616
1990	0.36	0.07	0.581
1991	0.352	0.072	0.554
1992	0.343	0.073	0.54
1993	0.335	0.075	0.525
1994	0.328	0.076	0.504
1995	0.321	0.078	0.482
1996	0.316	0.079	0.465
1997	0.311	0.081	0.449
1998	0.306	0.082	0.434
1999	0.3	0.084	0.42
2000	0.295	0.086	0.406

HIGH BASE CASE

SIMULATION OUTPUT BY BSET

WHLK2

	POP	MIGNET	MINCTOT	EM99	EMSP.EM	EMG9.EM	EMNS.EM	EMA9
1978	394.436	-5.	7.394	187.206	0.361	0.417	0.222	1.2
1979	402.677	-13.868	7.088	193.099	0.345	0.425	0.229	1.2
1980	405.846	-3.267	6.407	195.28	0.345	0.414	0.241	1.2
1981	417.675	5.624	6.193	203.612	0.354	0.395	0.251	1.3
1982	438.754	14.749	6.333	217.741	0.369	0.368	0.262	1.3
1983	461.66	16.093	6.829	230.925	0.382	0.357	0.261	1.4
1984	473.855	4.858	7.355	235.383	0.39	0.366	0.245	1.4
1985	481.532	0.267	7.41	238.103	0.391	0.365	0.244	1.4
1986	485.916	-2.925	7.301	239.365	0.392	0.362	0.246	1.5
1987	493.04	0.032	7.079	243.088	0.396	0.355	0.249	1.5
1988	503.766	3.718	6.999	249.447	0.401	0.348	0.25	1.6
1989	515.487	4.643	7.075	256.399	0.407	0.343	0.25	1.6
1990	525.771	3.092	7.19	262.247	0.413	0.339	0.249	1.7
1991	533.691	0.669	7.246	266.475	0.419	0.335	0.246	1.7
1992	540.749	-0.164	7.213	270.253	0.424	0.33	0.245	1.8
1993	548.614	0.694	7.159	274.755	0.43	0.325	0.245	1.8
1994	557.101	1.326	7.151	279.76	0.436	0.319	0.245	1.8
1995	566.485	2.202	7.174	285.414	0.442	0.313	0.245	1.9
1996	576.671	2.94	7.237	291.647	0.449	0.306	0.245	2.
1997	587.73	3.72	7.331	298.475	0.455	0.3	0.245	2.1
1998	599.54	4.346	7.457	305.762	0.461	0.293	0.246	2.1
1999	612.349	5.197	7.607	313.686	0.467	0.287	0.246	2.2
2000	625.883	5.742	7.787	322.009	0.474	0.28	0.246	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1978	42.921	4.365	11.132	23.814	1.304	15.009	11.73	6.374
1979	42.921	4.368	10.373	22.055	1.213	14.849	12.297	5.827
1980	42.921	4.692	10.217	22.18	1.194	14.934	12.822	5.84
1981	42.921	4.757	10.669	23.975	1.238	15.254	13.322	6.301
1982	42.921	4.332	11.43	27.277	1.314	15.781	13.611	7.133
1983	42.921	5.304	12.285	30.094	1.414	16.258	14.299	8.02
1984	42.921	5.78	13.024	31.083	1.491	16.417	14.854	8.466
1985	42.921	5.7	13.448	31.617	1.518	16.512	15.416	8.63
1986	42.921	5.417	13.372	31.917	1.52	16.556	15.982	8.702
1987	42.921	5.422	13.564	32.793	1.534	16.686	16.51	8.929
1988	42.921	6.045	13.869	34.325	1.572	16.905	17.055	9.341
1989	42.921	6.74	14.269	36.	1.617	17.142	17.616	9.801
1990	42.921	7.035	14.639	37.504	1.659	17.338	18.194	10.228
1991	42.921	6.555	14.951	38.929	1.699	17.479	18.79	10.622
1992	42.921	6.42	15.2	40.143	1.729	17.603	19.406	10.957
1993	42.921	6.165	15.499	41.575	1.762	17.751	20.042	11.345
1994	42.921	6.049	15.821	43.126	1.798	17.913	20.7	11.769
1995	42.921	6.134	16.169	44.809	1.838	18.095	21.379	12.233
1996	42.921	6.115	16.549	46.645	1.88	18.293	22.081	12.738
1997	42.921	6.094	16.945	48.631	1.924	18.507	22.806	13.282
1998	42.921	6.09	17.376	50.792	1.972	18.734	23.555	13.874
1999	42.921	6.091	17.823	53.106	2.021	18.976	24.329	14.506
2000	42.921	6.085	18.303	55.589	2.073	19.228	25.129	15.186

	EMD9	EMCN	EMCN1	EMGA	PI	PIRPC	SPI	EXOPS
1978	25.12	11.566	11.439	39.242	3976.88	3511.39	280.236	944.

1979	23.5	11.568	11.351	39.2 3	4111.46	3 38.37	296.9)	1019.
1980	24.681	13.435	13.072	37.992	4539.17	3568.07	313.457	1080.67
1981	26.538	16.952	13.704	37.585	5263.41	3824.68	329.479	1170.88
1982	29.673	21.917	15.203	37.28	6475.39	4262.23	346.271	1311.8
1983	32.676	22.979	16.615	39.495	7464.98	4464.01	362.237	1527.47
1984	33.753	19.163	17.041	43.148	7651.15	4267.78	376.34	1722.49
1985	34.012	18.966	17.764	44.021	8022.87	4193.69	397.291	1824.9
1986	34.379	19.382	18.445	43.765	8594.3	4233.2	417.816	1959.19
1987	35.443	20.331	18.807	43.465	9432.13	4353.78	439.401	2117.98
1988	36.931	20.831	19.508	43.968	10401.8	4475.15	461.397	2322.02
1989	38.474	21.062	20.115	44.967	11406.7	4572.89	483.898	2554.07
1990	39.884	20.966	20.611	45.923	12396.4	4646.42	507.431	2798.56
1991	41.057	20.995	21.693	46.395	13408.3	4717.54	532.559	3036.53
1992	42.218	21.05	20.874	46.353	14542.4	4807.11	559.442	3272.97
1993	43.527	21.562	21.258	46.272	15841.7	4912.84	587.763	3525.41
1994	44.964	22.015	21.71	46.262	17282.8	5025.35	617.321	3802.53
1995	46.532	22.365	22.186	46.325	18866.1	5137.55	648.238	4097.98
1996	48.197	22.955	22.866	46.457	20614.9	5252.72	680.564	4418.
1997	50.003	23.732	23.678	46.606	22574.9	5376.54	714.406	4767.26
1998	51.923	24.601	24.546	46.787	24752.2	5505.8	749.857	5151.92
1999	53.988	25.552	25.496	47.013	27179.9	5639.53	787.061	5573.02
2000	56.155	26.554	26.496	47.297	29855.7	5774.53	826.072	6036.26

	SXCAP	E99S	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1978	280.	1270.12	1121.45	1092.41	471.4	261.127	334.174	651.
1979	29 .	1371.84	1147.13	1430.74	860.7	206.049	281.302	842.735
1980	474.16	1625.02	1277.38	1574.57	996.3	187.974	267.059	938.741
1981	499.582	1748.41	1270.5	1891.24	1278.53	193.61	281.087	1227.87
1982	580.267	1982.97	1305.2	2188.33	1475.86	243.139	342.246	1614.97
1983	676.969	2307.72	1379.96	2488.65	1642.82	312.677	428.268	2024.96
1984	764.081	26 5.14	1453.13	3087.34	2122.25	367.576	501.501	2740.47
1985	888.743	2849.08	1489.26	3489.36	2422.78	386.383	533.671	3665.49
1986	1008.86	3126.72	1540.08	3622.97	2432.27	415.669	573.436	4517.
1987	1061.23	3363.94	1552.76	3812.92	2490.13	453.959	624.436	5363.9
1988	1146.08	3681.58	1583.91	4024.08	2546.56	509.133	697.233	6159.84
1989	1213.19	4011.68	1608.25	4288.05	2642.21	577.69	786.449	6926.67
1990	1284.64	4359.73	1634.12	4370.63	2555.95	646.621	877.873	7485.47
1991	1288.68	4635.93	1631.09	4486.56	2510.37	722.373	977.764	7898.77
1992	1308.9	4925.22	1628.07	4666.53	2539.47	798.506	1078.02	8219.17
1993	1356.03	5250.78	1628.38	4862.72	2574.16	887.781	1194.79	8442.38
1994	1409.87	5608.31	1630.75	5005.	2547.94	987.072	1324.82	8494.18
1995	1453.66	5977.53	1627.79	5137.49	2502.07	1103.94	1476.52	8347.84
1996	1545.91	6420.32	1635.91	5315.25	2500.66	1231.08	1642.93	8000.59
1997	1661.91	6914.5	1646.79	5512.87	2504.79	1381.75	1837.35	7435.54
1998	1788.88	7460.11	1659.39	5703.17	2497.21	1546.17	2050.99	6603.27
1999	1926.88	8044.87	1669.21	5911.82	2488.19	1742.81	2302.72	5492.65
2000	2078.05	8686.11	1680.92	6124.82	2476.64	1958.57	2580.57	4060.73

	PFBAL	RINS	FUNC	FUND7	E99L.PI	R99L	E99L	SIMP
1978	54.475	47.07	705.475	705.457	0.158	601.57	628.333	38.851
1979	158.775	49.656	1001.51	944.332	0.152	598.41	626.779	296.035
1980	287.5	70.9	1219.24	1089.22	0.151	653.128	683.199	217.73
1981	416.975	86.749	1644.84	1397.97	0.142	715.478	747.353	425.601
1982	568.925	117.224	2183.9	1766.11	0.128	798.226	832.014	539.055
1983	737.199	155.717	2762.16	2135.3	0.127	912.142	947.957	578.269
1984	954.149	197.037	3494.62	2734.58	0.14	1030.47	1068.43	932.455
1985	1193.05	263.394	4858.54	3424.52	0.143	1107.12	1147.36	1163.92
1986	1442.85	346.062	5959.85	3994.41	0.141	1169.42	1212.08	1101.32
1987	1689.7	424.404	7053.6	4495.23	0.137	1245.47	1290.68	1093.75
1988	1941.3	5 2.2	8111.14	4916.71	0.135	1351.13	1399.65	1047.55
1989	2204.82	576.786	9131.49	5284.34	0.133	1470.34	1521.15	1030.35
1990	2484.1	650.228	9949.57	5490.73	0.133	1597.42	1651.27	818.083

1991	2716.97	708.79	10615.7	5581.94	0.133	1728.92	1786.	666.172
1992	2973.85	756.687	11193.	5602.67	0.132	1857.79	1918.3	577.28
1993	3234.82	798.381	11677.2	5563.39	0.13	2011.94	2066.07	484.18
1994	3493.52	833.578	11987.7	5037:86	0.129	2160.29	"2228.27	310.496
1995	3747.95	856.606	12095.8	5225.2	0.128	2335.91	2407.97	10LJ.O"94
1996	4002.85	8(5.445	12003.4	4939.01	0.126	252U.95	2605.33	-92.352
1997	4259.32	860.255	11694.9	4584.09	0.125	2739.25	2820.22	-308.578
1998	4516.09	839.937	11119.4	4152.45	0.123	2970.81	3056.65	-575.504
1999	4772.27	800.935	10264.9	3652.16	0.122	3224.'39	3315.97	-854.441
20 00	5028.16	742.405	9088.89	3081.03	0.121	3505.26	3601.7	-1176.02

	E99S.PI	BENS.PI	RP9S.GF
1978	0.319	0.084	0.432
1979	".334	0.068	0.602
1980	0.358	o.059	0.633
1981	0.332	0.053	0.676
1982	0.306	0.053	0.674
1983	0.309	0.057	0.66
198U	0.34	0.066	0.687
1935	0.355	0.067	0.694
1986	0.364	0.067	0.671
1987	0.357	0.066	0.653
1988	0.354	0.067	0.633
1989	0.352	0.069	0.616
199fi	0.352	0.071	0.585
1991	0.346	0.073	0.56
1992	0.339	0.074	0.544
1993	0.331	0.075	0.529
1994	0.325	0.077	0.509
1995	0.317	0.078	0.487
1936	0.311	0.00	0.47
1997	0.306	0.081	0.454
1998	0.301	0.083	0.438
19~4	0.296	0.085	0.421
2000	0.291	0.096	0.404

MEAN LOWER COOK OCS

(Moderate Base Case)

SIMULATION OUTPUT BY DSE T

NKM

	PCP	NIGNET	NINCTOT	EM99	EMSP.EM	EMG9.EM	EMNS.EM	EnA9
1978	404.436	-5.	7.394	197.185	'..361	0.417	0.222	1.2
1979	403.256	-13.289	7.088	193.51	0.345	0.424	0.231	1.2
1980	407.511	-2.203	6.431	196.419	0. 345	0..412	0.243	1.2
1981	419.562	5.783	6.258	204.746	1.354	0.394	0.251	1.3
1982	440.684	14.725	6.4	218.824	o. 369	o. 368	0.263	1.3
1983	458.741	11.181	6.893	228.459	0.382	o. 363	0.255	1.4
1984	463.596	-2.441	7.217	22s.052	0.386	0.375	0.239	1.4
1985	466.467	-u .038	6.987	228.316	0. 385	0.375	0.24	1.4
1986	470.497	-2.713	6.729	230.394	0 .386	t4.369	0.245	1.5
1987	478.644	1.591	6.943	235.444	0.391	0.362	0.247	1.5
1988	489.921	4.724	6,546	242.739	0.397	0.354	0. 24U	1.6
1989	5(1.349	4.147	6.643	249.867	0.404	0.349	0.248	1.6
1990	S1l .283	3.118	6.814	255.783	0.41	0.344	0.246	1.7
1991	518.841	0.667	6.886	260.005	0.417	0.34	0.243	1.7
199,?	525.492	-0.225	6.867	263.687	0.423	0.335	0.242	1.8
1993	533.032	0.707	6.822	268.134	0. 428	0.329	0.242	1.8
1994	541.62	1.753	6.825	273.362	0.434	0.323	0.242	1.8
1995	550.871	2.368	6.874	279.039	0.441	0.317	0.242	1.9
1996	561.531	3.7112	6.949	285.746	0.447	0.31	0.243	2.
1997	572. 504	3.888	7.079	292.52	G.453	0.303	0.243	2.1
1998	584.204	4.48	7.213	299.751	0.46	0..297	0.243	2.1
1999	596.637	5.059	7.369	307.431	0.466	0.29	0.244	2.2
2000	609.668	5.483	7.543	315.424	0.472	0.284	O.244	2..2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1978	42.921	4.351	11.132	23.812	.304	15.008	11.73	6.374
1979	02.921	4.563	10.372	22.09	.213	14.865	12.297	5.836
1980	42.921	5.104	10.245	22.337	.1'38	14.978	12.822	5.883
1981	42.921	5.067	10.73Q	24.198	.246	15.297	13.322	b. 362
1982	42.9,?1	4.879	11.486	27.415	.319	15.8.21	13.811	7.17
1983	42.921	4.558	12.315	29.775	.417	16.17	14.299	.7 .944
1984	142.921	4.672	12.617	29.782	.465	16.156	14.854	8.118
1985	42.9.?1	4.486	12.682	29. 656	.464	16.165	15.356	8 .4)96
19UIJ	42.921	4.446	12.609	29. 987	1.462	16,236	15. 872	0.174
1981	42.921	4 .665	13.029	31.148	1.488	16.419	16.4	8.487
1988	42.921	5.13	13. 368	32. 86	1,532	16.674	16.945	8.949
1989	42.921	5.675	13.771	34.674	1.583	lb. 92	17.506	9. 447
1990	42.921	5.727	14. 157	36.23	1.627	17.1.?1	18.084	9. 883
1991	42.921	5.254	14. 547	37.651	1.667	17.263	18.68	10.275
1992	42.921	5.029	1,4.757	38.884	1.696	17.386	19.296	10.615
1993	42.921	4.87	15.047	41.267	1.731	17.534	19.932	11-4.991
1994	42.921	4.847	15.369	41.82	1.767	17.705	20.59	11.415
1995	42.921	4.903	15.729	43.518	1.807	17.89	21.269	11.882
1996	42.921	4.905	16. 115	45. u32	1.85	111.105	21.971	12.4
1997	42.921	U.982	16.523	47. 411	1.896	18. 32	22.696	12.949
1998	42.921	4.858	16. 7761	49.549	1.945	18.547	23.445	13.534
199'1	42.921	4.840	17. 396	51.784	1.992	18.785	24.219	14.145
2000	42 .921	4.795	17.844	54.181	2.044	19.029	25.019	14.802

	EM99	EMCN	EMCN1	EMGA	PI	PIEPC	EPI	EXOPS
1978	2'3. 117	11.565	11.438	39.242	3976.23	351 .32	28 .036	944.

19.	24 J6 1	11.685	11.38	3 9 193	4128.61	3447.61	296 64	1019.
1990	24.892	13.6132	13.157	37.978	4583.8	3590.62	313.268	1080.6
1981	26.719	16. 45	13.807	37.81	5288.43	3829.81	329.119	1175.07
1982	29.79	21. 636	15.297	37.52	6486.61	4255.76	345.87	1314.84
1983	32.054	21. 878	16.421	39.945	7228.43	4363.72	361.096	1527.39
1984	32.223	17.349	16. 412	42.674	7228.67	4119.78	378.555	1684.35
1985	3.2.125	17.399	17.008	42.751	7569.16	4067.23	398.958	1766.43
1986	32.741	18. 383	17.861	42.161	8225.34	4162.66	419.977	1891.68
1987	34.033	19.073	18.303	42.408	9067.16	4291.99	441.366	2067.78
1988	35.704	19.952	19.012	43.122	10061.5	4434.88	463.079	2276.62
1989	37.317	20. 15	19.596	44.2	11052.4	4542.	485.364	2511.46
1990	38.736	.20.227	20.025	45.125	12036.5	4626.31	508.844	2753.98
1991	39.933	20.275	20.072	45.S38	13041.3	4707.42	533.953	2989.67
1992	41.081	20. 356	20.23	45. 487	14145.6	4799.55	560.86	3221.41
1993	42.371	20.806	20.601	45.409	15413.2	4307.49	589.224	3470.26
1994	43.828	21.273	21.067	45.434	16841.1	5125.	618.786	3744.24
1995	45.388	21.675	21.546	45.516	18391.	5139.06	"649.637	4036.22
1996	47.122	22.598	22.325	45.579	20186.2	5271.55	681.933	4351.7
1997	48.942	23.176	23.122	45. 849	22069.6	5391 .22	715.619	4709.05
1998	50.$319	24 .024	23.969	46.075	24202.5	5516.	751.054	5987.23
1999	52.825	24.943	24.887	46.285	26565.	5648.69	788.228	5502.69
2000	54.918	25.903	25.845	46. 551	29157.9	5781.32	827.247	5'357.93

	EXCAP	E99S	E99SFEC	REVGP	EP9S	RT98	nENs	GFBAL
1978	280.	1270.12	1121.45	109Z. 41	471.4	261. 11'3	334.166	65?.
1979	290.	1371.84	1145.56	1431.12	860.7	206.212	261.456	843.105
1980	475.789	1626.58	1274. 15	1576.85	996.3	189.326	268.67	940.267
1981	503.672	1756.73	1272.2	1895.12	1278.42	196.07	284.237	1226.71
1982	582.639	1988.63	1304.71	2192.86	1475.75	244.671	344.214	1611.57
1983	678.215	2303.24	1394.05	2485.69	1642.71	310.883	426.774	2017.4
1984	745.596	2548.93	1452.69	3062.66	2121.72	351.399	481.873	2753.76
1985	864. 533	2766. 43	1486.52	3449.65	2422.26	358.927	499.362	371O.1U
1986	992.664	3042.73	1539./36	3581.12	2430.97	385.539	535.703	4597.09
1987	1059.33	3312.02	1567.76	3769.66	248. .15	426 .828	591.101	5454.04
1988	1139 .47	3630.75	1600.35	3967.33	2520.75	483.005	665.326	6242.27
1989	1202.06	3959 .78	1627.28	4200.41	2583.96	552.321	755.741	6975.08
1990	1259.22	4291.89	1649.69	4261.77	.2481.29	620.829	846.346	7487.17
1991	1254. 46	4556.56	1644.75	4364.66	2428.51	695.371	944.394	7847.75
1992	127 .41	4825.82	1640. 78	4533.45	2452 .34	769.782	1042.72	8111.7
1993	1314.37	5153.27	1640. 77	4715.58	2481.89	856.135	1155.82	8270.77
1994	1366.23	5504.54	16 42 .43	4843.44	2450.05	952.302	1282.21	8249.07
1995	141 .48	5869.45	1640. 12	4959.65	2396.29	1067.06	1431 .48	8018.34
1996	1515.34	6319 .04	1650.2	5121.84	2388.37	1192.59	1595.36	7573.16
1997	1632.02	6821.35	1664.98	5308.71	2389.51	1343.48	1789.78	6893.41
1998	1758.61	7359 .52	1677.31	5489.14	2387.	1502.42	1997.48	5942.
1999	1893.43	793U .17	1687.09	5695.74	2392.59	1693. 14	2241.89	4717.
2000	2041.45	8564. 09	1698.96	5903.32	2393.46	1901.5	2510.84	3173.27

	PFBAL	RINS	FUND	FUND78	E99L.PI	R99L	E99L	SIMP
1978	54.475	47.07	705.475	705.457	0.158	601.57	628.333	38.844
1979	158.775	49.656	1001.88	944.745	0.152	598.358	.626.727	296. 406
1980	28 .5	79.925	1220.77	1691.24	0.149	624.946	685.817	218.886
1981	416.975	86.856	1[43.69	1398.52	J. 142	720.169	752.044	422.914
1982	568.925	117.143	2180.49	1765.41	0.129	800.978	834.766	536.807
1983	737. 199	155.479	2754.6	2136.19	3.131	913.627	949.442	57U .109
1984	954.149	196.508	3707.91	2742.86	0. 145	1007.76	1(745.72	953.31
1985	1193.05	264.324	49R3.1%	3441.55	0.146	1163.63	1183.87	1195.29
1986	1442.85	349.188	6039.94	4027.26	0.142	11?2.52	1165.18	1136.76
1987	1689.7	430.01	7143.74	4532.41	0.138	1208.58	1253.8	1103.8
1988	1) 41.3	508.51	81E3.57	4948.69	.130	1317.42	1365.34	1039.84
1989	2198.57	582.556	9173.66	5292.71	0.135	1439.96	1490.77	990.083
1990	2450.02	653.148	9937.2	5468.64	0.135	1565.68	1619.54	763.54

1991	2698.37	707.854	10542.1	5528.77	0.134	1694.56	1751.65	604.936
1992	2942.25	751.42	11054.	5519.07	0.133	1823. .	1883.51	511.824
1993	3193.77	788.488	11464.5	5448.53	0.132	1963.28	2027.92	416.59
1994	3442.52	818. S87	11691.6	S290.98	0.13	2119.93	2187 .31	227.055
1995	3686.02	835.624	11704.4	5045.22	0.129	2294.39	2366.46	12. 76b
1996	3929.22	837.735	1150 2.8	4723.34	0.127	2483.69	2560.38	-201.977
1997	4173.64	824.813	11066.7	4330.53	U. 126	2694.42	2775.4	-435.637
1998	4418.72	755. 541	10360.7	3862.97	0.124	2924.04	3009.88	-706.027
1999	4665.37	747.344	9382.67	3333.11	0.123	3172.07	3263.05	-978.656
2000	4912.57	600.07	8085.84	2737.12	0.121	3446.01	3542.45	-1296.23

	E99S.PI	RSNS.PI	RP9S.GF
1978	(.319	0.084	0.432
1979	0.332	0.068	0.601
1980	0.355	0.059	0.632
1981	0.332	0.054	0. 675
1982	0.307	0.053	0.674
1983	0.319	0.059	0.661
1984	0.353	0 .067	0.693
1985	0.365	0.066	0.702
1986	0.37	0.065	0.679
1987	0,365	0.065	0.658
1988	0.361	0.066	0.635
1989	(.358	0.068	0.615
1990	0.357	0.07	0.582
1991	0.349	0.072	0.556
1992	0.342	0.074	0.541
1993	0.334	0.075	0.526
1994	0.327	0.076	0.506
1995	0.319	0.078	0.483
1996	0.313	0.079	0.466
1997	0.309	0.081	0.45
1998	0.304	0.083	0.435
1999	0.299	0.084	0.42
2000	0.294	0.086	0.405

LOW LOWER COOKOCS

(Moderate Base Case)

SIMULATION OUTPUT BY DSET

NKL

	POP	MIGNET	NINCTOT	EM99	EMSP.EM	EMG9.EM	EMNS.EM	EHA9
1978	404.436	-5.	7.394	197.185	0.361	0.417	0.222	1.2
1979	403.256	-13.289	7.088	193.51	0.345	0.424	0.231	1.2
1980	427.511	-2.253	6.431	1S6.419	0.345	0.412	0.243	1.2
1981	419 .562	5.783	6.258	204.746	0.354	0.394	0.251	1.3
1982	440.67	14.71	6.4	218.813	c .369	0.368	0.263	1.3
1983	458.739	11.193	6.893	228.459	0.382	0.363	0.255	1.4
1984	463.031	-2.915	7.217	227.704	0.386	0.376	0.238	1.4
1985	465.595	-4.415	6.967	227.711	0.384	0.376	0.24	1.4
1986	469.7?1	-2.604	6.695	229.828	0.385	0.37	0.245	1.5
1987	477.292	1.061	6.516	234.597	0.39	0.363	0.246	1.5
1988	487.701	3.9'-3	6.499	241.335	0 .396	0.356	:1.248	1.6
1989	498.341	4.037	6.601	248.026	0.403	0.35	0.247	1.6
1990	507.71	2.655	6.71	253.668	0.409	0.346	0.245	1.7
1991	514.973	0.498	6.769	257.8')0	0.416	0.342	0..242	1.7
1992	521.766	0.037	6.747	261.710	0.422	0.336	0.242	1.8
1993	529.42	0.924	6.718	266.338	0.428	C.33	0.242	1.8
1994	537.765	1.602	6.733	271.455	0.434	0.324	0.242	1.8
1995	546.754	2.202	6.779	277.012	0.44	u. 318	0.242	1.9
1996	557.250	3.639	6.851	283.646	0.446	0.311	0.243	2.
1997	568.046	3.802	6.982	290.355	0.453	0.305	0.243	2.1
1998	579.561	4.393	7.116	297.519	0.459	0. 298	0.243	2.1
1999	591.813	4.977	7.2-?	305.134	0.465	0..?91	0 .243	2.2
2000	604.667	5.404	7.443	313.058	0.472	0.285	0.244	2.2

	EMGF	EMP9	EMI9	EliS9	EMPU	EMOT	EMM9	EM PI
1978	42.921	4.351	11.132	23.812	1.304	15.008	11.73	6.374
1979	42.921	4.563	10.372	22.09	1.213	14.865	12.297	5.836
1980	42.921	5.1OU	10.2U5	22.337	1.198	14.978	12.$22	5.883
1981	42.9.21	5.?67	1?. 734	24.198	1.2U6	15.,297	13.322	6.362
1982	42.921	4.873	11. 486	27.415	1.319	15.821	13. 811	7.17
1983	42.921	4.561	12.314	29.774	1.417	16.17	14.299	7.944
1984	42.921	4.54	12.552	29.756	1.465	16.143	14.854	8.112
1985	42.921	4.403	12.623	29.562	1.462	16.144	15.356	8.071
1986	42.921	4.43	12.574	29.062	1.458	16.219	15.872	8.14
1987	42.921	4.57	12.877	31.016	1.485	16.389	16.U	8.451
1988	42.921	4.902	13.249	32.618	1.527	16.625	16.945	8.884
1989	42.921	5.22	13.673	34.324	1 .57U	16.857	17.506	9.352
1990	42.921	5.225	14.056	35.847	1.617	17.049	in.ofi4	9.779
1991	42.921	4.75	14.402	37.244	1.657	17.189	18.68	10.164
1992	42.921	4. 678	14.618	38.484	1.688	17.32	19.296	10.506
1993	4.2,921	4,54	14.911	39.908	1.722	17.474	19.932	10. [193
1994	42.92	4.491	15.239	41.459	1.759	17.643	20.59	11.317
1995	42.92	4.497	15.591	43. 121	1.798	17.824	21.269	11.774
1996	42.92	4.499	15.973	45.01	1.841	18.03$3	21.971	12.285
1997	42.92	4.476	16.378	46.968	1.886	18. 25.?	22.696	12.828
1998	42.92	4.452	16.812	49.084	1.934	18.477	23.445	13.407
1999	42.92	4.44	17.245	51.297	1.982	18.714	24.219	14.012
2000	42.92	4.389	17.69	53.671	2.033	18.957	25.019	14.662

	EMI9	EMC N	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1978	25.117	11.565	11.438	39. 242	3976.23	3510.82	280.036	944.

1979	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1980	24.892	13.682	13.157	37.978	4583.8	3590.62	313.268	1080.6
1981	26.719	16.45	13.807	37.81	5208.43	3829.81	329.119	1175.07
1982	29.788	21.835	15.296	37.52	6486.1	4255.61	345.866	1314.78
1983	32.053	21.878	16.421	39.944	7228.57	4363.79	361.096	1527.38
1984	32.177	17.32	16.383	42.643	7214.72	4115.36	378.619	1682.93
1985	32.612	17.248	16.961	42.701	7539.96	4057.19	399.159	1764.02
1986	32.638	18.315	17.766	42.098	8205.47	4157.17	420.227	1889.6
1987	33.882	18.911	18.233	42.328	9023.87	4281.21	441.612	2063.07
1988	35.432	19.665	18.891	42.998	9975.92	4414.04	463.407	2267.92
1989	36.985	19.985	19.431	43.948	10955.1	4524.89	485.824	2498.76
1990	38.379	20.038	19.836	44.791	11929.2	4612.25	509.426	2737.89
1991	39.557	20.078	19.875	45.186	12923.5	4694.07	534.62	2971.12
1992	40.738	20.184	20.058	45.146	14039.9	4791.9	561.537	3202.44
1993	42.057	20.645	20.44	45.101	15307.6	4902.	589.838	3450.35
1994	43.493	21.095	20.889	45.125	16713.4	5017.91	613.37	3721.1
1995	45.027	21.486	21.357	45.186	18246.9	5132.21	650.266	4009.89
1996	46.744	22.4	22.127	45.241	20028.8	5265.41	682.604	4322.8
1997	48.547	22.968	22.915	45.505	21913.3	5385.44	716.314	4676.92
1998	50.408	23.806	23.751	45.724	24007.6	5510.17	751.769	5051.59
1999	52.397	24.716	24.66	45.927	26349.6	5643.32	788.96	5462.68
2000	54.473	25.666	25.608	46.187	28919.8	5776.34	827.991	5914.37

	EXCAP	E99S	E99SRPC	REVGF	RP95	RI98	RENS	GFBAL
1978	280.	1270.12	1121.45	1092.41	471.4	261.119	334.166	651.
1979	290.	1371.84	1145.56	1431.12	860.7	206.212	281.456	843.105
1980	475.789	1626.58	1274.15	1576.85	996.3	189.326	268.67	940.267
1981	523.672	1756.73	1272.2	1855.12	1278.42	196.07	284.237	1226.71
1982	582.613	1988.54	1304.71	2190.85	1475.75	244.667	344.21	1611.63
1983	678.211	2309.23	1394.05	2485.66	1642.71	310.858	426.741	2017.45
1984	744.968	2546.78	1452.71	3062.35	2121.72	351.271	481.745	2755.25
1985	863.352	2762.65	1486.52	3448.14	2422.26	357.881	498.085	3713.16
1986	991.576	3029.4	1539.86	3578.76	2438.97	383.76	533.441	4600.39
1987	1056.92	3304.47	1567.75	3767.32	2480.15	425.111	589.044	5460.99
1988	1135.12	3616.87	1600.36	3962.95	2520.75	479.721	661.302	6255.87
1989	1195.98	3939.76	1627.28	4183.22	2575.2	546.566	748.515	6987.52
1990	1251.86	4266.82	1649.71	4242.6	2471.56	613.615	837.41	7500.64
1991	1246.66	4528.25	1644.75	4344.24	2418.85	687.1	934.183	7863.92
1992	1262.98	4807.53	1640.78	4512.3	2443.29	760.64	1031.42	8130.16
1993	1306.83	5123.71	1640.78	4695.32	2472.49	847.354	1145.37	8293.43
1994	1357.79	5470.53	1642.43	4823.37	2440.84	943.353	1271.26	8279.93
1995	1401.28	5831.16	1640.1	4938.16	2387.32	1056.4	1418.38	8059.67
1996	1515.32	6277.78	1650.2	5099.29	2379.69	1180.26	1583.24	7626.99
1997	1620.88	6774.8	1664.98	5285.43	2381.19	1329.57	1772.78	6962.55
1998	1746.29	7307.96	1677.31	5464.97	2379.1	1486.58	1978.14	6030.36
1999	1879.86	7877.34	1687.09	5670.73	2385.18	1675.15	2219.97	4827.82
2000	2026.53	8501.48	1698.06	5877.59	2386.62	1881.18	2486.13	3310.67

	PFBAL	RINS	FUND	FUND78	E99L.PI	R99L	E99L	SIMP
1978	54.475	47.07	705.475	705.457	0.158	601.57	628.333	38.844
1979	158.775	49.656	1001.88	944.745	0.152	598.358	626.727	296.406
1980	280.5	70.925	1220.77	1091.24	0.149	654.946	685.017	218.886
1981	416.975	86.856	1643.69	1398.52	0.142	720.169	752.044	422.919
1982	568.925	117.143	2180.56	1765.48	0.129	800.978	834.765	536.97
1983	737.199	155.483	2754.65	2136.22	0.131	913.577	949.392	574.091
1984	954.149	196.511	3369.4	2743.5	0.145	1007.75	1045.71	954.751
1985	1193.05	264.428	4906.21	3441.94	0.146	1062.2	1102.44	1196.81
1986	1442.85	349.399	6043.25	4027.07	0.142	1119.48	1162.14	1137.04
1987	1689.7	433.241	7158.69	4534.29	0.139	1206.46	1251.67	1107.45
1988	1941.3	508.697	8197.17	4953.41	0.136	1312.94	1360.97	1046.49
1989	2193.97	581.528	9186.09	5294.86	0.135	1431.25	1482.35	988.92
1990	2450.82	654.019	9950.67	5469.84	0.135	1555.77	1609.63	764.581

1996	3929.22	840.628	11556.2	4740.78	0.127	2469.48	2545.87	-189.477
1997	4173.64	828.581	11136.2	4353.48	0.126	2678.84	2759.81	-420.023
1998	4418.72	800.402	10449.1	3892.21	0.125	2906.76	2992.59	-687.117
1999	4665.07	753.529	9492.89	3369.35	0.123	3153.91	3243.99	-956.187
2000	4912.57	667.827	8223.24	2781.12	0.122	3425.	3521.44	-1269.65

	E99S.PI	BENS.PI	BP9S.GF
1978	0.319	0.084	0.432
1979	0.332	0.068	0.601
1980	0.355	0.059	0.632
1981	0.332	0.054	0.675
1982	0.307	0.053	0.674
1983	0.319	0.059	0.661
1984	0.353	0.067	0.693
1985	0.366	0.066	0.702
1986	0.37	0.065	0.679
1987	0.366	0.065	0.658
1988	0.363	0.066	0.636
1989	0.36	0.068	0.616
1990	0.358	0.07	0.583
1991	0.35	0.072	0.557
1992	0.342	0.073	0.541
1993	0.335	0.075	0.527
1994	0.327	0.076	0.506
1995	0.32	0.078	0.483
1996	0.313	0.079	0.467
1997	0.309	0.081	0.451
1998	0.304	0.082	0.435
1999	0.299	0.084	0.421
2000	0.294	0.086	0.406

HIGH LOWER COOK OCS

(Moderate Base Case)

SIMULATION OUTPUT BY ESET

NKH

	POP	MIG NET	NIN CTOT	EM 99	EMSP.EM	EMG9.EM	EMNS.EM	EMA9
1978	404.436	-5.	7.394	197.185	O. 361	0.417	0.222	1.2
1979	403.256	-13.289	7.088	193.51	0.345	0.424	0.231	1.2
1980	407.511	-2.203	6.431	196. 419	0.345	0.412	0.243	1.2
1981	419.562	5.7*3	6.258	204.746	0. 354	0.394	O. 251	1.3
1982	442.677	14.717	6.4	218.819	0.369	0.368	0.263	1.3
1983	458.897	11.344	6.893	222. 575	0.382	0.363	0.255	1.4
1984	463.748	-2.361	7.223	228.219	0.386	0.375	0.239	1.4
1985	466.762	-3.973	6.996	228.525	0.385	(3.375	0.24	1.4
1986	471 .336	-2.201	6.74	230.908	0. 386	0.369	0.246	1.5
1987	479.175	1.252	6.575	235.751	0.392	0.362	0.246	1.5
1988	490.958	5.214	6.562	243. 407	0.398	0.354	0.249	1.6
1989	505.034	7.359	6.715	252.416	0.405	0.346	0.25	1.6
1990	517. 075	5.09	6.954	259.597	0.412	0.341	0.247	1.7
1991	525. 428	1.255	7.097	264.094	0. 418	0.337	0.244	1.7
1992	532.466	-0.061	7.091	267.798	0.424	0.333	0.244	1.8
1993	540.078	0.557	7.044	272. 05G	0.43	O. 327	0.24.3	1.8
1994	548.515	1.395	7.032	276.974	0.436	0.321	0.243	1.8
1995	557.645	2.262	7.059	202.553	0.442	0.315	0.243	1.9
1996	56 8. 837	3.861	7.123	289. 337	o. 448	0. 308	0.244	2.
1997	580.197	4.1	7.253	296.266	0.454	0.302	0.244	2.1
1998	592.043	4.45	7.39	303. 478	o. 461	0.295	0.244	2.1
1999	604.455	4.868	7.538	311.036	0.467	0.289	0.244	2.2
2000	617.451	5.289	7.7	318.915	0.473	0.282	0.244	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMFI
1978	42.921	4.351	11.132	23.812	1.304	15.008	11.73	6.374
1979	42.921	4.563	10.372	22.09	1.213	14.965	12.297	5.836
1980	42.921	5.104	10.245	22.337	1.198	14.978	12.822	5.883
1981	42.921	5.067	10.734	.24. 198	1.246	15..397	13.322	6.362
1982	42.921	4.876	11. 486	27.415	1.319	15.821	13. till	7.17
1983	42.921	4.604	12.335	29.784	1.417	16.175	14.299	7.946
19UU	42 .921	4.709	12.644	29.807	1.465	16.162	14.854	8.125
1985	42.9,21	4.606	12.754	29.674	1.465	16.173	15.356	8.101
1986	42.921	4.586	12.696	30.038	1.462	16.250	15. 872	8.187
1987	42.921	4.655	13.062	31.25	1.492	16.43	16.u	8.515
1988	42.921	5.165	13.488	32.956	1.533	16.697	16.945	8.974
1989	42.921	6.195	14.043	35.032	1.587	17.007	17.506	9.541
1990	42.921	6.583	14.489	36.948	1.644	17.249	18.084	10.078
1991	42.921	5.142	14.817	38.45	1.687	17.4	18.68	10.494
1992	42.921	5.932	15.04	39.673	1.718	17.512	19.296	10.831
1993	42. 921	5.644	15.331	41.05	1.75	17.662	19.932	11. 205
1994	42. 921	5.549	15.644	42.56	1.785	17.823	20.59	11.616
1995	42.921	5.566	15.989	44. 226	1.824	18.003	21.269	12..075
1996	42.921	5.586	16.374	46.155	1.067	18.22	21.971	1.2.598
1997	42.921	5.583	16.787	48.174	1.913	18.438	22.696	13.157
1998	42.921	5.498	17.217	50 .34	1.962	18.663	23.445	13.751
1999	42.921	5.433	17.635	52.569	2.01	18.896	24.219	14.36
2000	42.921	5.347	18.07	54.952	2.061	19.135	25.01')	15.013

	EMD9	EMCN	EMCN1	EMGA	PI	PIPC	RPI	EXOPS
1978	25.117	11.565	11.438	39.242	3770.23	3519.92	280.236	944.

1979	24.[illegible]1	11.685	11.38	39.[illegible]3	4128.61	[illegible]47.61	296.[illegible]4	1019.
1980	24.892	13.682	13.157	37.978	4583.8	3590.62	313.268	1080.6
1981	26.719	16.45	13.807	37.81	5288.43	3829.81	329.119	1175.07
1982	29.789	21.836	15.297	37.52	6486.36	4255.68	345.868	1314.81
1983	32.069	21.888	16.431	39.954	7233.73	4365.21	361.112	1527.98
1984	32.248	17.362	16.425	42.7	7234.59	4121.2	378.537	1685.15
1985	32.132	17.314	17.027	42.815	7568.15	4964.34	398.919	1767.46
1986	32.833	18.537	17.852	42.208	8256.62	4172.14	419.867	1894.55
1987	34.1	19.075	18.325	42.469	9076.09	4293.36	441.171	2069.14
1988	35.831	20.151	19.068	43.161	10106.	4446.14	462.968	2280.9
1989	37.893	20.734	19.829	44.334	11243.8	4587.7	485.287	2529.48
1990	39.434	20.625	20.366	45.593	12268.8	4667.81	508.317	2782.34
1991	40.646	20.633	20.43	46.173	13269.2	4737.25	533.[illegible]95	3022.79
1992	41.794	20.721	20.595	46.126	14386.5	4826.11	559.923	3258.71
1993	43.061	21.155	20.95	46.039	15656.9	4927.86	588.288	3510.54
1994	44.47	21.598	21.392	46.029	17079.1	5039.02	617.918	3786.62
1995	46.014	21.998	21.869	46.084	18646.2	5151.39	648.861	4082.38
1996	47.769	22.937	22.664	46.153	20472.2	5283.31	681.192	4403.52
1997	49.623	23.536	23.482	46.442	22498.8	5492.74	714.872	4767.35
1998	51.506	24.385	24.33	46.674	24537.2	5523.91	750.282	5150.2
1999	53.498	25.298	25.242	46.867	26910.2	5653.43	787.483	5568.93
2000	55.576	26.253	26.195	47.113	29517.8	5783.7	826.561	6028.99

	EXCAP	E99S	E99SEPC	REVGF	EP9S	RT98	RENS	GFBAL
1978	280.	1270.12	1121.45	1092.41	471.4	261.119	334.166	651.
1979	290.	1371.84	1145.56	1431.12	860.7	206.212	281.456	843.105
1980	475.789	1626.58	1274.15	1576.85	996.3	189.326	268.67	940.267
1981	503.672	1756.73	1272.2	1895.12	1278.42	196.07	284.237	1226.71
1982	582.626	1988.58	1334.71	2190.86	1475.75	244.669	344.212	1611.6
1983	678.476	2310.13	1394.05	2485.77	1642.71	310.913	426.8	2016.8
1984	745.949	2550.14	1452.69	3063.1	2121.72	351.7	482.259	2752.61
1985	865.034	2768.13	1486.52	3450.65	2422.26	359.185	499.72	3708.11
1986	994.174	3047.36	1539.86	3581.73	2430.97	385.968	536.128	4592.01
1987	1060.03	3314.2	1567.75	3771.69	2480.15	428.48	593.274	5449.25
1988	1141.62	3637.58	1600.35	3968.83	2520.75	484.268	666.751	6233.53
1989	1210.68	3988.19	1627.26	4216.25	2594.86	556.686	760.866	6959.44
1990	1272.18	4336.08	1649.72	4288.68	2491.21	633.37	862.198	7462.86
1991	1268.34	4607.	1644.75	4396.53	2438.43	712.341	965.502	7814.12
1992	1285.18	4891.81	1640.78	4565.91	2462.73	787.861	1064.95	8064.42
1993	1329.62	5213.99	1640.77	4748.79	2491.72	875.614	1179.79	8207.21
1994	1381.69	5566.84	1642.44	4875.98	2459.77	972.345	1306.82	8166.3
1995	1426.62	5936.59	1640.1	4990.97	2465.87	1087.37	1456.32	7910.79
1996	1533.43	6394.29	1650.19	5153.33	2397.75	1214.48	1622.18	7434.25
1997	1652.22	6905.79	1664.98	5341.46	2398.66	1368.25	1820.14	6716.42
1998	1780.37	7450.6	1677.31	5523.15	2395.85	1530.58	2031.98	5723.23
1999	1916.43	8030.55	1687.1	5729.41	2401.09	1723.86	2279.36	4451.38
2000	2065.8	8666.23	1698.06	5935.5	2401.54	1934.12	2550.54	2854.51

	PFBAL	RINS	FUND	FUND78	E99L.PI	R99L	E99L	SIMP
1978	54.475	47.[illegible]7	725.475	705.457	[illegible].158	601.57	628.333	38.844
1979	158.775	49.656	1001.88	944.745	0.152	548.358	626.727	296.406
1980	280.5	70.925	1220.77	1091.24	0.149	654.946	685.017	218.886
1981	416.975	86.856	1643.69	1398.52	0.142	720.169	752.044	422.919
1982	568.925	117.143	2180.52	1765.44	0.129	800.978	834.765	536.839
1983	737.199	155.481	2754.	2135.62	0.131	913.607	949.422	573.476
1984	954.149	196.466	3706.76	2742.14	0.145	1008.29	1046.25	952.764
1985	1193.05	264.244	4901.16	3440.47	0.146	1064.24	1104.48	1194.4
1986	1442.85	349.[illegible]46	6034.86	4124.93	[illegible].141	1122.43	1165.99	1133.7
1987	1689.7	429.654	7138.95	4531.38	0.138	1211.75	1256.97	1104.1
1988	1941.3	508.175	8174.83	4944.59	0.135	1318.4	1366.33	1035.88
1989	2198.57	581.944	9158.32	5284.52	[illegible].133	1444.58	1495.38	983.191
1990	2456.02	652.053	9912.88	5460.95	0.134	1585.	1638.85	754.871

1991	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1992	2942.25	749.066	11006.7	5504.66	0.132	1845.93	1906.44	498.178
1993	3193.77	785.178	11401.	5426.94	0.131	1988.	2052.14	394.309
1994	3442.52	814.337	11638.8	5260.9	0.13	2184.35	2212.04	207.84
1995	3686.02	829.83	11596.8	5004.84	0.128	2317.83	2389.9	-12.004
1996	3929.22	830.207	11363.5	4671.37	0.126	2508.65	2585.04	-233.336
1997	4173.64	815.389	11091.1	4265.85	0.125	2722.21	2803.19	-473.414
1998	4418.72	783.173	10142.	3785.3	0.124	2955.13	3040.96	-748.113
1999	4665.07	732.03	9116.45	3241.61	0.122	3208.56	3295.54	-1025.51
2000	4912.57	661.476	7767.08	2631.39	0.121	3479.43	3575.87	-1349.37

	E9SS.PI	RENS.PI	EP9S.GF
1976	0.319	0.094	0.432
1979	0.332	0.068	0.601
1980	0.355	0.059	0.632
1981	0.332	0.054	0.675
1982	0.307	0.053	0.674
1983	0.319	0.059	0.661
1984	0.352	0.067	0.693
1985	0.366	0.066	0.702
1986	0.369	0.065	0.679
1987	0.365	0.065	0.658
1988	0.36	0.066	0.635
1989	0.355	0.068	0.615
1990	0.353	0.07	0.581
1991	0.347	0.073	0.555
1992	0.34	0.074	0.539
1993	0.333	0.075	0.525
1994	0.326	0.077	0.504
1995	0.318	0.078	0.482
1996	0.312	0.079	0.465
1997	0.308	0.081	0.449
1998	0.304	0.083	0.434
1999	0.298	0.085	0.419
2000	0.294	0.086	0.405

LOW LOWER COOK OCS

(Low Base Case)

SIMULATION OUTPUT BY ESET

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	?0P	MIGNET	NINCTCT	EM99	EMSP.EM	EMG9.EM	EMNS.EM	EMA9
1978	404.436	-5.	7.394	197.206	0.361	0.417	0.222	1.2
1979	402.677	-13.868	7.088	193.C99	0.345	0.425	0.229	1.2
1980	405.846	-3..207	6.407	195. 2a	0.345	0.414	0.241	1.2
1981	416.643	11.592	6.193	202.849	0.354	0. 39-1	0.249	1.3
1982	437.27	14.337	6.291	216.777	0.368	0.37	0.262	1.3
1983	455 .335	11.307	6.774	226.571	o. 381	0.364	0.254	1.4
1984	458.815	-3.616	7.107	225.32	0.385	0.379	0.236	1.4
1985	460.833	-4.829	6.833	225.148	0.383	0.379	0.238	1.4
1986	464 .572	-2 .827	6.551	227.179	0.384	0.373	0.243	1.5
1987	472.114	1.159	6.369	232. C73	0.389	0.366	0.245	1.5
1988	482.02	3.538	6.361	238.561	0.396	0.359	0.245	1.6
1989	492.094	3.617	6.453	244.972	0.402	0.353	0.244	1.6
1990	501.438	2.788	6.552	250.748	0.408	0.348	0.243	1.7
1991	508.831	0.766	6.621	255.088	0.415	o. 344	0.241	1.7
1992	515.661	n. 2')6	6.615	259.1178	0.421	0.339	0.24	1.8
1993	523.464	1.196	6. 596	263.903	0.427	0.332	0.241	1.8
1994	531.842	1.143	6.625	269.083	0.433	0.326	0.241	1.0
1995	540.683	2.153	6.678	274.564	9.44	0.32	0.241	1.9
1996	550.412	2.972	6.75	280.665	0.446	0.313	0.241	2.
1997	561.086	3.812	6.854	287.386	0.452	0.307	0.242	2.1
1998	572.47	4.387	6.991	294. 523	0.458	0.3	0.242	2.1
1999	584.79	5.168	7.145	302.234	0.465	0.293	0.243	2.2
2000	597.719	5.596	7.328	310.291	0.471	0.286	0.243	2.2

	EMGF	EMP9	EMT9	EMS9	EM PU	EMOT	EMM9	EMF I
1978	42. 921	4.365	11.132	23.814	1.304	15.00'3	11.73	6.374
1979	42.921	4.368	10.373	22.055	1.213	14.849	12.297	5.827
1980	42.921	4.692	10.217	22.18	1.194	14.934	12.822	5.84
1981	42.921	4.465	10.676	23.894	1.238	15.225	13.322	6.279
1982	42.921	4.41	11.389	27.038	1.307	15.746	13.811	7.068
1983	4.2.921	4.104	12.214	29.426	1.406	16.11)3	14 .299	7.849
1984	42.921	3.942	12.464	29.359	1.455	16.05[1	14.854	8.005
1985	42.921	3.791	12.461	29.052	1.448	16.051	15.356	7.931
1986	42.921	3.725	12.422	29.366	1.444	16.124	15.872	8.005
1987	42 .921	3.894	12.708	30. 539	1.471	16.29'3	16. U	8.321
1988	42.921	4.101	13.074	32.11o	1.514	16.528	16.945	8.75
19,19	42 .921	4.389	13.473	33.758	1.56	16.751	17.506	9.2
1990	42.921	4.591	13.845	35.262	1.602	16.95	18.084	9.62
1991	42.921	o.18	14.215	36.696	1.642	17. 097	18.68	10.015
1992	42.921	4.068	14.486	37.961	1.674	17.233	19.296	10.363
1993	42.921	4.04	14.789	39.395	1.709	17.393	19.93,2	1:.753
1994	42.921	3.966	15.128	40.967	1.747	17.565	20.59	11.183
1995	42.921	3.894	15.48	42.613	1.786	17.744	21.269	11.636
1996	4.2. ')21	3.852	15.849	44.382	1.826	17.942	21.971	12. 121
1997	4/? .921	3.833	16. 242	46.317	1.872	18.158	22 .696	12.65
1998	42.921	3.831	16.668	48.413	1.919	18.383	23.445	13.224
1999	42.921	3.828	17.109	50.646	1.968	18.624	24.219	13.834
2000	42.921	3.826	17.579	53.03	2.019	18.473	25.019	14.487

	EMD9	EMCN	EMCN 1	EMGA	PI	PIRPC	RPI	EXOPS
1978	25.12	11.5o6	11.439	39.242	3976.88	3511.39	26?.?36	944.

1980	24.681	13.435	13.072	37.992	4539. 17	3568.39	313.457	1080.67
1981	26.383	16. 189	13.654	37.C58	5219.2	3892.97	329.395	1171.88
19)12	29.438	21.625	15.124	37. 198	6420.08	4239.71	346.302	1306.52
1983	31.741	21.720	16.267	39.627	7170.79	4355.39	361.503	1519.92
1984	31.74	16. 971	10.194	42.453	7108.91	4086.34	379.167	1676 .92
1985	31.542	16.982	16 .15	42.44	74 37.61	4035.98	399.891	1757.92
1986	32.18	18.043	17.549	41.81	8099.35	4140.61	421.049	1883.77
1981	33. 445?	18.695	18.019	42. 041	8'321.01	4270.46	442.478	2057../2
19Eil?	34.962	1'3 .356	10.653	42.759	9844.41	4399.98	464.261	2263.43
1989	36.455	19.641	19.159	43.672	10797.7	4507.9	486.754	2499.97
1990	37.862	19.723	19.544	44.444	11782.1	4603.24	510.434	.2726.16
19$1	39.076	19. 76	19.58	44.874	12776.8	4689.04	535.591	2960.47
1992	40.267	19.1366	19.751	44.854	13886.3	4787.68	562.465	3191.21
199)	41.613	20.347	20.165	44.809	15157.7	4901.7	590.744	3437.4
199 U	03.056	20.802	20.619	44.865	16551.1	5017.46	62?.24	3708.13
1 995	44.57	21.231	21.12	44.93	18063.9	5130.93	651.136	3996.36
1996	46.192	21.899	21.828	45.02	19758.	5251.13	683.521	4307.12
1997	47.961	22.67	22.616	45.173	21651.2	5378.9	717.395	4649.49
1998	49.033	23.509	23.454	45.366	23745.3	5509.52	752.853	5026.45
1999	51.835	24.423	24 .357	45.598	26075.6	5643.85	7%?.058	5437.94
2000	53.927	25.381	25.323	45.875	28637.4	5778.93	829.066	5889..27

	EXCAP	E99S	E99S5PC	REVGF	BP9S	RT98	RENS	GFBAL
1978	280.	1270.?2	1121.45	1092.41	471.4	261.125	334.172	651.
1979	290.	1371.04	1147.13	1430.74	860 .7	206.05	281.303	842.735
1980	474.16	1625.02	1277.38	1574.57	956.3	187.973	267.059	938.741
1981	099.582	1748.41	1273.98	1890.38	1279.53	193.142	280.619	1227.02
1982	577. 096	1974.63	13 C4.01	2184.31	1875.86	249.493	338.848	1616.76
1983	674,061	2297.39	1395.39	2479.54	1642,82	306.695	421.475	2026.62
1984	741.514	2537.03	1458.34	3056.12	2121.98	346.784	476.243	2766.66
1985	856.574	2749. 45	1491.97	3438.2	2422.15	350.856	489.,291	3725.76
1986	985.855	3027 .42	1547.7	3567.61	2430.19	376.242	524.167	4612,36
1987	195(3.47	3291 .69	1575.72	3758.07	2481.69	417.302	579.421	5474.57
1988	1129.56	3606.24	1611.49	3952.81	2521.75	471.657	651.407	6268.74
1989	1187.83	3923 .18	1637.87	4151.31	.2557 .09	536.476	736.223	6983.06
1990	12"35.56	4238.	1655.79	4188.16	2434 .23	631.975	823.096	7465.66
1991	1225.68	4495.34	1649.51	4273.82	2367.7-3	675.342	919.978	7785.18
1992	1237.46	4760.55	1644.09	4450.13	2404.01	748.874	1017.02	8017.22
1993	1284.23	5065.14	1644.43	4627.9	2431.64	83U.682	1129.54	8142.78
1994	1335.29	5431.22	1646.47	4749.75	2396.8	930.472	1255.59	8086.19
1995	1390.45	5802.13	1643.06	4861 .5	2345.06	1042.29	140 1.22	7816.73
1996	14')3.22	6244.39	1659.78	5008.89	2331.47	1162.79	1559.28	7324.73
1997	1605.86	.5727 .16	1671.26	5178.17	2327.26	1306..35	1745.12	6597.09
1998	1729.25	7260 .27	1684.57	5352.29	2325.6	1463.)9	1949.44	5596.05
1999	1863.04	7829.89	1694.71	5552. 35	2332.9	1649.93	2189.45	4318.69
2000	2009.05	8452 .59	1705.7	5753.26	2335.62	1854.57	2453.89	2721.85

	PFBAL	KINS	FUND	FUND78	E99L.PI	R99L	E99L	SIMP
1978	54.475	47.17	705.475	705.457	0.158	691.57	628.333	38.851
1979	158.775	49.656	1001.51	944.331	O. 152	598.41	626.779	296.035
1980	280.5	70.9	1219.24	1089.22	0.151	653.128	683.199	217.73
1981	416.975	86.749	1643.99	1397.61	0.143	715.443	747.3111	424.749
1982	568.925	117.164	2185.69	1767.41	0.129	793.751	827.539	541.699
1983	737.1')9	155.843	2763.81	2140.44	0.131	906.644	942.458	578. 128
1984	954.149	197.153	3720.81	2747.95	0.146	101)1 .6	1039.57	956.995
1985	1193.05	265.227	4918.8	3444.46	0.147	1051.31	1091.55	1198.
1986	1442.85	350.281	6355.21	4 27.17	0.142	1108.9	1151.55	1135.41
1987	1689.7	431.079	7104.27	4534.61	u. 139	11)5.>!	1241.01	1109.06
1988	1'441.3	509.947	9216.04	4952.06	0.137	1302.47	1350.4	1045.78
1989	2197.72	564.4.9	9186.79	5281.7	.136	1418.71	106').52	970.748
1990	2446.25	653.[43	9911.91	5437.77	0.135	1540.69	1594.55	731.127

1991	2686.1	706.065	10471.3	5%?'$.81	0.135	1669.22	1726.31	559.375
1992	2931.	746.42	10948.2	5450.68	0.134	1797.04	1857.55	476.944
1993	3179.35	781.03	11)22.1	5367.	0.132	1938.16	2002.29	373.906
1994	3424.75	8(a. 446	11512.9	5197.01	?. 131	2094.97	2162.95	188.809
1995	3665.12	822.849	11481.9	4937.91	0.131	2266.16	2338.23	-29.086
1996	3904.62	e22 .055	11229.4	4600 .5	0.128	2451.73	2528.12	-252.5
1997	4144.8	865.577	10741.9	4193.01	0.126	2655.99	2736.97	-887.461
1998	4385.75	772 .656	9981.79	3712.8	0.125	2880, 91	2966.74	-760.058
1999	0628.12	720.654	8946.81	3171.12	?.123	31.27.32	3218.31	-1034.98
2000	4871.79	649.417	7593. 64	2564. 86	0. 122	3398.. 26	3494.7	-1353.17

	E9?S.PI	RENS.PI	BP9S.GF
1978	0.319	0.086	0.432
1979	0.334	0.066	0.602
1980	0.358	0.059	0.633
1981	0.335	0.05$	0.676
1982	'.3 L-a	[illegible]	).676
1983	0.32	13.959	0.663
1984	0.357	0.067	0.694
1985	?.37	0.166	?. 704
1986	0.374	0.065	0.681
1987	0.369	0.065	0.66
1988	".365	0.166	0.638
1989	0.363	0.068	0.616
1990	0.36	0.01	0.581
1991	0.352	0.072	0.554
199.?	0.343	0.073	0.54
1993	0.335	0.075	0. 525
1990	0.328	0.076	0.5-35
1995	0.321	0.078	0.482
1996	'.316	0.079	'2.465
1997	0.311	0.081	0.449
1998	0.306	0.082	0.435
1999	0.3	0.084	O. 42
2000	0.295	0.0116	0.406

HIGH LOWER COOK OCS

(High Base Case

SIMULATION OUTPUT BY CSET

KH

	POP	MIGNET	NINCTOT	EM99	EMSP.EM	EMG9.EM	EMNS.EM	EMA9
1978	404.436	-5.	7.394	197.206	0.361	0.417	0.222	1.2
1979	402.677	-13.868	7.088	193.399	0.345	0.425	0.229	1.2
1980	405.846	-3.267	6.407	195.28	0.345	0.414	0.241	1.2
1981	417.675	5.624	6.193	203.612	0.354	0.395	0.251	1.3
1982	439.157	15.152	6.333	218.623	0.369	0.368	0.263	1.3
1983	462.608	16.623	6.846	231.626	0.383	0.356	0.261	1.4
1984	475.14	5.159	7.392	236.282	0.39	0.365	0.245	1.4
1985	483.005	0.409	7.457	239.075	0.392	0.364	0.244	1.4
1986	487.716	-2.648	7.351	240.516	0.393	0.361	0.246	1.5
1987	495.047	0.18	7.139	244.287	0.397	0.354	0.249	1.5
1988	507.163	5.046	7.062	251.56	0.402	0.346	0.251	1.6
1989	522.325	7.971	7.19	260.836	0.408	0.338	0.253	1.6
1990	535.255	5.5	7.434	268.212	0.415	0.334	0.251	1.7
1991	544.217	1.388	7.574	272.772	0.421	0.331	0.248	1.7
1992	551.479	-0.3	7.554	276.318	0.426	0.327	0.247	1.8
1993	559.281	0.31	7.481	280.451	0.432	0.321	0.246	1.8
1994	567.872	1.136	7.445	285.254	0.438	0.316	0.246	1.8
1995	577.593	2.262	7.45	290.928	0.444	0.31	0.246	1.9
1996	588.286	3.18	7.506	297.314	0.45	0.304	0.246	2.
1997	599.907	4.013	7.6	304.355	0.456	0.297	0.247	2.1
1998	612.046	4.403	7.73	311.691	0.462	0.291	0.247	2.1
1999	625.026	5.101	7.873	319.562	0.469	0.284	0.247	2.2
2000	638.716	5.643	8.042	327.841	0.475	0.278	0.247	2.2

	EMGF	EMP9	EMT9	EMS9	EMPU	EMOT	EMM9	EMF1
1978	42.921	4.365	11.132	23.814	1.304	15.009	11.73	6.374
1979	42.921	4.368	10.373	22.055	1.213	14.849	12.297	5.827
1980	42.921	4.692	11.217	22.18	1.194	14.934	12.822	5.84
1981	42.921	4.757	10.669	23.975	1.238	15.254	13.322	6.301
1982	42.921	4.449	11.492	27.299	1.314	15.792	13.811	7.138
1983	42.921	5.551	12.403	30.181	1.416	16.283	14.299	8.043
1984	42.921	5.981	13.158	31.221	1.495	16.448	14.854	8.503
1985	42.921	5.983	13.593	31.774	1.522	16.546	15.416	8.673
1986	42.921	5.573	13.498	32.112	1.525	16.597	15.982	8.754
1987	42.921	5.937	13.751	33.04	1.541	16.728	16.51	8.996
1988	42.921	6.308	14.178	34.674	1.579	16.978	17.055	9.434
1989	42.921	7.715	14.639	36.723	1.63	17.291	17.616	9.994
1990	42.921	8.363	15.072	38.621	1.686	17.536	18.194	10.532
1991	42.921	7.947	15.365	40.144	1.73	17.686	18.79	10.954
1992	42.921	7.674	15.629	41.334	1.759	17.802	19.406	11.203
1993	42.921	7.269	15.915	42.716	1.791	17.935	20.042	11.658
1994	42.921	7.187	16.221	44.226	1.825	18.09	20.7	12.07
1995	42.921	7.203	16.563	45.912	1.863	18.27	21.379	12.534
1996	42.921	7.202	16.946	47.788	1.906	18.471	22.081	13.05
1997	42.921	7.201	17.35	49.834	1.951	18.69	22.806	13.611
1998	42.921	7.136	17.776	52.046	1.999	18.916	23.555	14.216
1999	42.921	7.184	18.21	54.376	2.048	19.155	24.329	14.854
2000	42.921	7.043	18.68	56.867	2.1	19.403	25.129	15.536

	EM09	EMCN	EMCN1	EMGA	PI	PIRPC	RPI	EXOPS
1978	25.12	1.566	11.439	39.242	3976.88	3511.39	280.036	944.

1980	24.681	13.435	13.07.2	37.992	4539.17	3568.09	313.457	1080.67
1981	26.538	16.452	13.704	37.585	5263. 41	3824.72	329.479	1170.88
1982	2'3.715	21.944	15.23	37.313	6488.95	42?65.79	346.381	1313.45
1983	32.78	23.038	16.674	39.579	7494.61	4470.5	362.392	1531.3
1984	33.89	19.235	17.113	43.283	7686.62	4275. 13	378.42	1727.55
1985	34.161	19.044	17.842	44.17	8061.82	4200.79	397.33	1830.66
1986	34.588	19.612	18.539	43.891	8655.59	4247.63	417.814	1966.44
1987	35.67	29.5	18.914	43.616	9495.05	4365.48	439.356	2126.39
1988	37.338	21.325	19.493	44. 141	10545.2	4506.79	461.361	2337.48
1989	39.301	21.82	20.522	45.362	11710.	4633.99	483.794	2587.36
1990	41.944	21.56	21.148	46.733	12749.7	4699.96	506 .806	2845.57
1991	42.145	21.553	21.252	47.383	13766.6	4758.77	531.57	3090.66
1992	43.269	21.59	21.414	47.328	14903.8	4839.7	558.405	3331.71
1993	44.524	22.075	21.771	47.202	16204.7	4937.5	586 .82	3589.19
1994	45.933	22.519	22.214	47.159	1'7664. ?	5045.7	616.501	3670.88
1995	47.512	22.879	22.7	47.215	19.26.2.	5155.78	647.493	4173.55
1996	49.215	23.493	23.404	47.363	21077.	5270.02	679 .843	4502.23
1997	51.071	24.299	24.245	47.534	23089.6	5392.95	713.684	4861.16
1998	53.014	25.179	25.124	47.728	25303.4	5518.69	749.13	5254 .32
1999	55,002	26.134	26.078	47.945	27765.2	56u8.'1n	786.379	5683.51
2000	5?. 251	27.142	27.084	48.216	30481.3	5781..26	825.473	6155.61

	EXCAP	E99s	E99SRPC	REVGF	RP9S	RT98	RENS	GFBAL
1978	28'.	1270.12	1121.45	1092.41	471.4	261.125	334.172	651.
1979	290.	1371.84	1107.13	1430.74	860.7	206.05	281.303	842.735
1980	474.16	1625.02	1277.30	1574.57	996.3	187.973	267 .959	938.741
1981	499.582	1748.41	1270.5	1891.24	1278.53	193.609	281.086	1227.87
1982	580.997	1985.47	1305.23	2188.61	1475.66	243.251	342. 35tt	1613.21
1983	678.668	2313.51	1380.	2492. 02	1642.82	313.591	429.398	2019.67
1984	766.323	2612.79	1453.14	3089.84	2122.25	369.450	503.867	2731.66
1985	891.55	2858.08	1489.26	3492.29	2422.78	388.766	536.651	3652.37
1986	1012.6	3138.3	1540.09	3626.39	2432.27	418.642	577.073	4498.09
1987	1065.44	3377.31	1552.76	3817. 51	2490.13	458.061	629.572	5338.91
1988	1153.72	3706.09	1583.9	4030.08	2546.56	514.488	703.671	6121.28
1989	1229.	4063.96	1608.23	4321.14	2661.87	588.709	799.933	6879.28
1990	1306.22	4432 .95	1634.14	4416.48	2575.6	667.181	903.736	7424.96
1991	1311.65	4776.57	1631.09	4538.18	2529.95	748.247	1009.99	7822.51
1992	1332.39	5013.61	1628.07	4719.01	2558.91	826. 176	1112.25	8122.75
1993	1380.18	5344.27	1628.37	4914 .79	2593.39	916.531	1230.26	8320.S2
1994	1435.21	5719. 13	1630.74	5056.04	2566.87	1016.69	1361.28	8340.07
1995	1480.46	6087 .75	1627s19	5188.53	2520.62	1135. (J3	1515.52	8152.86
1996	1575.39	6542.73	1635.92	5367.19	2518.72	1266..07	1685.98	7755.36
1997	1694.64	7050.68	1646.8	5566.67	2522.26	1421.46	1886.14	7130.39
1998	1824.44	7608.39	1659.4	5758.61	252-3.96	1591.14	2106.21	6229. 7 ?
1999	1965.08	02,14.36	1669.22	5967.58	2504.1	1792.76	2363.02	5041.66
2000	2119,14	6857.85	1620.03	6179.63	2491.'56	2013.05	.2647 .0$!	3521.15

	PFBAL	RINS	FUNC	FUN D78	E99L. PI	R99L	E99L,	SIMP
1978	54.475	47 .07	105.475	705. 457	0.158	601.57	628.333	38.851
1979	156.775	49. 656	1001.51	944.331	0.152	598.41	626.779	296.035
1980	280.5	70.9	1219. 24	1089.22	0.151	653.128	673.149	217.73
1981	416.975	86.749	1644.84	1397.97	0.142	115.470	747.353	425.602
1982	568.925	117.224	2162.13	1764.13	0.128	798.24	832.028	53? .292
1983	737.199	155.5'10	2757.07	2130. 45	0.127	913.583	949.398	574.938
1984	954.149	1S6 .681	3685.8	2727.48	0.139	1'33.56	1071.53	928.735
1985	1193.05	262.777	4845.42	3414.94	0.143	1110.75	1151.	1159.61
1986	1442.85	345,144	5941.94	3981.76	0.14	1173.37	1216.02	1095.53
1987	1689.7	423. 8	7328.61	4479.75	0.137	1251.69	1296.9	1'87.68
1988	1941.3	500,451	8062.58	4993.68	0.133	1357.54	1405.47	1033.97
1989	2204.82	574.087	9084.11	5258.04	0.131	1484.76	1535.56	1021.53
1990	2464.1	646.911	9889.07	5464.85	0.132	1627.93	1681.78	804.964

1991	2716.97	704.555	10539.5	5552.15	0.132	1764.49	1821.58	650.421
1992	2973.85	751.348	11096.6	5564.73	0.131	18%3.62	1954.13	557.113
1993	3238.82	791.631	11555.6	5514.32	0.13	2037.7$!	2101.92	459.051
1994	3493.52	825.069	11833.6	5375.08	0.128	2196.06	2264.04	277.941
1995	3747.95	845.819	11961.8	51136.89	0.127	2373.21	2465.27	67.238
1996	4002.85	851.797	11756.2	4843.23	0.126	2569.54	2645.93	-142.621
1997	4259.32	843.088	11389.7	4468 .99	0.124	2734.15	2865-13	-368. 5
1998	4516.79	818.576	107 45.8	4016.84	u. 123	3020. 82	3104.65	-643.898
1999	4772.27	774.787	"}?13.93	3494.73	0.121	3278.42	3369.4	-931.879
2000	5026.16	719.836	9549.31	2900.22	0.12	3561.78	3658.22	-1264.62

	E99S.PI	EENS.PI	RP9S.GF
1978	[illegible]	[illegible]	[illegible]
1979	0.334	0.068	0.692
1980	0.358	0.059	0.633
1981	0.332	0.053	0.676
1982	0.306	0.053	0.674
1983	[illegible] X 9	[illegible] 57	0.66
1984	0.34	0.066	0.687
1985	0.355	0.067	0.694
1986	[illegible] .363	[illegible] .067	0.671
1987	9.354	0.066	0.652
1988	0.351	0.067	0.632
1989	0.347	0.068	0.616
1990	0.340	0.071	0.583
1991	[illegible] .343	0.673	0.557
1992	0.336	0.075	0.542
1993	0.33	0.076	0.528
1994	0.323	0.077	0.508
1995	0.316	0.079	0 . 4 9 6
1996	0.31	0.08	0.469
1997	0 . 3 0 5	0.082	o. *53
199fJ	0.301	0.083	0.437
1999	1-,295	0.085	0.42
2090	0.291	"0.087	0.403

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