Alaska Economic Projections for Estimating Electricity Requirements for the Railbelt

Volume IX

S. Goldsmith
E. Porter
Institute of Social and Economic Research
Anchorage - Fairbanks - Juneau, Alaska

September 1982

Prepared for the Office of the Governor
State of Alaska
Division of Policy Development and Planning
and the Governor's Policy Review Committee
under Contract 2311204417

Battelle
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PROLOGUE: THE EFFECT OF LOWER OIL PRICES

At the time the employment and population estimates in this document were done (August 1981), they reflected the main body of expert opinion concerning future world petroleum prices. As late as December 1981, the Alaska Petroleum Revenue Division (APRD) was projecting that the weighted average price of Prudhoe Bay type crude oil would increase from $32.38 per barrel in FY 1982 to $117.56 in FY 1998--about an 8.4% nominal rate of increase or (given 7% inflation) about a 1.4% real price increase per year. This was within the range of increase of 1% to 3% per year assumed in this study. The dramatic collapse of world oil prices in January through March of 1982 reduced nominal crude prices by between $4 and $6 per barrel, dividing oil analysts into two schools of thought--those foreseeing a stabilization of prices at about $25 per barrel and those forecasting further declines to as little as $15 per barrel.

Even without substantial economic recovery in the United States and Organization for Economic Cooperation and Development (OECD) economies, the OPEC market price appears to have stabilized at $32 to $34 per barrel. The prospects for the longer run are much less clear. Industry sources now are forecasting real price increases for the 1980s ranging from minus 3.3% in constant 1982 dollars to plus 2.8%, with low-probability political crises resulting in possibly higher rates of increase (Oil and Gas Journal, May 17, 1982). In any event, the most recent (March 1982) forecast of the APRD for the weighted average price of Prudhoe Bay type crudes between 1982 and 1998 is an increase from $29.84 per barrel in FY 1982 to $87.95 per barrel in FY 1998 or about 7.0% per year (0% above our assumed 7% inflation). The netback wellhead price was assumed by APRD to increase annually at about 8.1% in nominal dollars (1.1% above inflation) due to changes in markets and the Trans-Alaska Pipeline System (TAPS) oil pipeline tariff.

The new lower starting point for oil prices and slower rate of increase now being forecast have resulted in much lower State of Alaska revenues than were assumed in this study. The difference between the March and December forecasts ranges from minus 8.0% for FY 1982 to minus 61.3% for 1998. The difference could actually be even more profound since oil exploration activity and pipeline construction could well be deferred or cancelled at the lower prices. In Alaska, this has been reflected in a slowing down of North Slope field operations and in the now-indefinite delay of the Alaska Highway (ANGTS) gas pipeline. The Alaska economy, which is heavily dependent on oil field activity and state spending, could be expected to grow at a much slower rate at the lower oil prices represented by the new forecast. Moreover, because oil and natural gas prices would not rise as rapidly, the incentives for conservation of oil and gas and for fuel switching into electricity by consumers would be much reduced, possibly further reducing electricity demand.

The original estimates of economic and population growth in this study were done using the Alaska economic models of the University of Alaska Institute of Social and Economic Research (ISER). To estimate the effect of the state's revised oil price projections, a series of calculations were done without benefit of the model to determine whether the low-case government expenditures assumed in the study could be maintained with the revised (lower) state revenue projections. To do these calculations the following assumptions were made:

- The ISER low-case economy, population, and government expenditures forecasts would apply.
- Petroleum revenues available to spend equal severance taxes plus 75% of royalties. Alaska Petroleum Revenue Division forecasts were used.
- General Fund revenues equal available petroleum revenues, plus earnings of the General Fund and Permanent Fund, plus "other unrestricted" revenues: other taxes, licenses, fees, permits, rents, intergovernmental receipts, investments, and miscellaneous. State Department of Revenue forecasts were used to FY 1984, then simply increased with inflation. "Other unrestricted" revenues are forecast to be about $728 million in FY 1985.
- The average balance in both the General Fund and Permanent Fund earns 10% per year throughout the forecast period.

Table 1 summarizes the results of our comparison between new revenues and old expenditures of 1990, given those assumptions. The state is shown to be running deficits after FY 1985.

The state of Alaska cannot legally run the deficits shown in Table 1 for the years after 1985; consequently, the level of expenditures by state government would have to be lower than that shown in the low case. This would reduce employment and population below that shown in the low-case forecast used in the study.

TABLE 1. Alaska Revised State Revenues and Low Case Expenditures (million $)

FY	Production Tax Plus 75% of Royalties	(Million $) General Fund Total Revenues[(a)]	General Fund Expenditures (Low Case)	Average General Fund Balance
1982	2717.0	4292.5	3238.5	2481.1
1983	1932.0	2941.5	3539.2	1863.3
1984	2315.9	3113.4	3893.8	1090.5
1985	2695.0	3797.7	4322.9	539.8
1986	3130.8	4267.8	4913.4	-120.5
1987	3665.5	4889.9	5517.5	-627.6
1988	3759.8	5134.8	5907.3	-772.5
1989	4243.5	5708.1	6306.7	-598.6
1990	4294.8	5893.8	6789.5	-895.7

(a) May not correspond to Department of Revenue estimates because of differences in assumptions concerning General Fund expenditures (affecting the size of the balance), rate of return on General and Permanent Fund, and growth in non-petroleum production revenues.

To estimate the likely size of the change, we altered the moderate and low-case forecasts by reducing government employment to 40 thousand persons in the Railbelt in the years 1990 to 2000 (compared to 72 thousand in the moderate case and 62 thousand in the low case). We proportionately reduced statewide government employment and re-estimated the size of the Railbelt and statewide economies for the moderate and low cases. Table 2 summarizes these results for the Railbelt.

TABLE 2. Revised Year 2000 Forecast of Railbelt Employment and Population (thousands of persons)

	Revised Government Employment	Basic Employment	Government Plus Basic	Revised Total Employment[(a)]	Revised Total Population[(b)]	Previous Total Population[(c)]
Moderate	40.0	56.5	96.5	178.5	385.6	484
Low	40.0	39.0	79.0	146.2	315.7	405

(a) Based on the low-case ratio of total employment to basic plus government employment equal to 1.85.
(b) Based on the low-case ratio of population to employment of 2.16.
(c) See Figure 3.3 in Volume I.

Without actually going through the simulations in the ISER econometric model, it is not possible to say whether slashing government employment as was done in these calculations would actually balance the state budget. However, if government employment in the Railbelt in 1990 were reduced to 40 thousand and the study's low case government spending of $72,726 per worker for 1990 were maintained, General Fund expenditures would be about $4.5 billion in 1990. This about equals petroleum revenues shown in Table 1 for 1990 and shows a substantial current General Fund surplus to take case of inflation in the 1990s. It thus appears that at the level of population and employment shown in Table 2, the budget of the State of Alaska would be in rough balance.

Table 2 results indicate that reduced oil prices, through their effects on state government spending alone could trim Railbelt population by 80 to 100 thousand persons by the end of the century. This would delay the date when new electric generating facilities might be required by about 10 years. For example, population of the Railbelt would reach the vicinity of 400 thousand persons in the moderate case in about the year 2000 to 2005, instead of 1990.

September 1982

PREFACE

This analysis, performed by the University of Alaska, Institute of Social and Economic Research, was funded under a subcontract to Battelle, Pacific Northwest Laboratories as a component of their study entitled "The Railbelt Electric Power Alternatives Study." The study, consisting of seventeen reports (listed below), was undertaken to analyze the economics of various methods of meeting the electric power requirements for the Railbelt portion of Alaska in the coming decades. The study was administered by the Office of the Governor, Division of Policy Development and Planning.

The primary purpose of the subcontract with the Institute of Social and Economic Research was to provide the study with documented projections of economic activity for a twenty-year planning period. The results of that work are reported in this document, Volume IX of the series. All the projections were done using the Man-in-the-Arctic Program (MAP) econometric model of the Alaskan economy, which is extensively described in a separate document published by the Institute of Social and Economic Research.

The projections describe the different growth paths that the Alaskan economy may take during the next twenty years. Each projection assumes certain developments occur in the private sector and a certain state government response to the demands and pressures put upon it by its overwhelming reliance on petroleum revenues to finance government.

The assumptions used in the projections have been chosen by a consensus of interested experts coordinated by Battelle with the approval of the Governor's Policy Review Committee. The Institute provided the initial suggestions for the particular elements to be included in the assumptions, but the ultimate decision for inclusion was made by Battelle.

As the projections are presented in this report, they are descriptions of what the Alaskan economy may look like in the future, but none are predictions of what will occur. It is left to other elements of the study to interpret these results in light of all factors relevant to the determination of the most cost-effective methods of providing electric power to the Railbelt.

October 1981

RAILBELT ELECTRIC POWER ALTERNATIVES STUDY

Volume I - Railbelt Electric Power Alternatives Study: Evaluation of Railbelt Electric Energy Plans

Volume II - Selection of Electric Energy Generation Alternatives for Consideration in Railbelt Electric Energy Plans

Volume III - Executive Summary - Candidate Electric Energy Technologies for Future Application in the Railbelt Region of Alaska

Volume IV - Candidate Electric Energy Technologies for Future Application in the Railbelt Region of Alaska

Volume V - Preliminary Railbelt Electric Energy Plans

Volume VI - Existing Generating Facilities and Planned Additions for the Railbelt Region of Alaska

Volume VII - Fossil Fuel Availability and Price Forecasts for the Railbelt Region of Alaska

Volume VIII - Railbelt Electricity Demand (RED) Model Specifications Appendix - Red Model User's Guide

Volume IX - Alaska Economic Projections for Estimating Electricity Requirements for the Railbelt

Volume X - Community Meeting Public Input for the Railbelt Electric Power Alternatives Study

Volume XI - Over/Under (AREEP Version) Model User's Manual

Volume XII - Coal-Fired Steam-Electric Power Plant Alternatives for the Railbelt Region of Alaska

Volume XIII - Natural Gas-Fired Combined-Cycle Power Plant Alternative for the Railbelt Region of Alaska

Volume XIV - Chakachamna Hydroelectric Alternative for the Railbelt Region of Alaska

Volume XV - Browne Hydroelectric Alternative for the Railbelt Region of Alaska

Volume XVI - Wind Energy Alternative for the Railbelt Region of Alaska

Volume XVII - Coal-Gasification Combined-Cycle Power Plant Alternative for the Railbelt Region of Alaska

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I. Economic Projections for Alaska and the Railbelt

I.A. The Base Case (Moderate-Moderate)

The base case assumes moderate growth in basic sector economic activity and moderate growth in state government expenditures. These factors combine to produce the aggregate statewide population projections shown in Table I.1.

The general pattern of growth reflected in these figures is for a decade of growth in the 1980s similar to that of the 1970s followed by a decade of slightly slower but more stable growth. The cyclical growth in the 1980s is attributable to the simultaneous construction of several large construction projects. These result in a rapid employment and population buildup, followed by a few years of slack activity as the economy "fills in." The assumptions underlying this and all other projections are detailed in an appendix to this report.

Population increases from 400 thousand in 1980 to 562 thousand in 1990 and 675 thousand by 2000. Employment grows from 206 thousand in 1980 to 299 thousand in 1990 and 352 thousand in 2000.

A description of the structure of the economy projected in the moderate-moderate case is shown in Table I.2 which shows the distribution of total employment by three categories. Over time, the proportion of employment that is government related falls, while private sector employment grows. The proportion of employment defined as basic increases from 23 percent to 25 percent. Support sector employment growth is more rapid. It increases from 39 percent to 43 percent.

Some of the important characteristics of the population are highlighted in Table I.3. Both the military and Native segments of the population decline as a proportion of the total over time. This is the result of the substantial net positive migration which augments population by 107 thousand over the twenty-year projection period.

Table I.1. State Projection Values
Moderate-Moderate Case

B.MM

	POP	G.POP	EM99	G.EM99	PI	G.PIRPC
1980	400.457	0.985	206.214	1.01	5342.07	1.
1981	412.395	1.03	214.193	1.039	6141.51	1.023
1982	428.251	1.038	223.028	1.041	6976.55	1.017
1983	444.492	1.038	235.475	1.047	7950.77	1.026
1984	463.274	1.042	244.809	1.049	9138.69	1.036
1985	498.151	1.075	268.663	1.097	11452.1	1.096
1986	531.933	1.066	291.04	1.083	13895.4	1.079
1987	545.304	1.025	299.174	1.028	14644.4	0.974
1988	547.669	1.004	298.113	0.996	14609.1	0.929
1989	558.208	1.019	301.154	1.01	15749.	0.987
1990	562.438	1.008	299.004	0.993	16982.1	0.998
1991	572.732	1.018	303.003	1.013	18690.9	1.008
1992	579.364	1.012	303.739	1.002	20207.1	0.999
1993	588.021	1.015	306.92	1.01	21932.9	0.999
1994	598.543	1.018	311.561	1.015	24060.	1.008
1995	608.963	1.017	316.167	1.015	26379.3	1.009
1996	621.173	1.02	322.484	1.02	29056.4	1.011
1997	634.519	1.021	329.803	1.023	32097.3	1.014
1998	646.899	1.02	336.114	1.019	35236.2	1.01
1999	660.873	1.022	343.883	1.023	38876.4	1.012
2000	674.983	1.021	351.656	1.023	42871.7	1.012

POP = Population
EM99 = Total Employment
PI = Personal Income

G.POP = Annual Growth of Population
G.EM99 = Annual Growth of Employment
G.PIRPC = Annual Growth in Real Per Capita Income

Table I.2. Distribution of Total Employment
Moderate-Moderate Case

B.MM

	EMSP.EM	EMG9.EM	EMNS.EM
1980	0.392	0.379	0.229
1981	0.379	0.384	0.237
1982	0.367	0.389	0.244
1983	0.369	0.379	0.251
1984	0.376	0.371	0.253
1985	0.39	0.342	0.267
1986	0.393	0.334	0.272
1987	0.395	0.346	0.259
1988	0.406	0.353	0.241
1989	0.417	0.344	0.239
1990	0.411	0.345	0.244
1991	0.413	0.339	0.248
1992	0.411	0.342	0.247
1993	0.416	0.339	0.245
1994	0.417	0.335	0.246
1995	0.418	0.333	0.249
1996	0.421	0.33	0.249
1997	0.423	0.326	0.251
1998	0.425	0.325	0.25
1999	0.43	0.321	0.25
2000	0.432	0.318	0.251

EMSP.EM = Proportion of Local Serving Employment
EMG9.EM = Proportion of Government Employment
EMNS.EM = Proportion of Basic Employment

Table I.3. Components of Population
Moderate-Moderate Case

(thousands)

B.MM

	POP	POPC	NATTOT	MIGNET	PLFD9
1980	400.457	377.134	64.237	-9.	250.076
1981	412.395	389.057	65.728	5.896	246.365
1982	428.231	404.975	67.255	9.636	254.269
1983	444.492	421.196	68.814	9.694	264.922
1984	463.274	439.908	70.404	12.093	275.826
1985	498.151	474.888	72.023	27.625	288.753
1986	531.933	508.631	73.667	25.633	313.737
1987	543.304	521.971	75.336	4.527	337.673
1988	547.669	524.299	77.028	-6.74	345.962
1989	558.208	534.881	78.744	1.916	345.834
1990	562.438	539.097	80.481	-4.32	352.274
1991	572.732	549.394	82.241	1.999	354.052
1992	579.364	556.049	84.022	-1.666	360.062
1993	588.021	564.687	85.827	0.588	364.771
1994	598.543	575.233	87.654	2.425	370.229
1995	608.963	585.653	89.504	2.322	377.318
1996	621.173	597.864	91.379	4.069	384.377
1997	634.519	611.171	93.279	5.149	392.824
1998	646.899	623.589	95.204	3.898	402.076
1999	660.873	637.523	97.156	5.501	410.445
2000	674.983	651.628	99.136	5.403	417.997

POP = Population
POPC = Civilian Population
NATTOT = Native Population
MIGNET = Net Migration
PLFD9 = Potential Domestic Labor Force

The potential domestic labor force grows from 250 thousand to 420 thousand.

The number of households and their distribution by type are shown in Table I.4. Although the number of total households does not double over the twenty-year projection period, growth in civilian non-Native households is rapid enough to more than double their total in twenty years. The number of Native households doubles in twenty years.

The number of households grows more rapidly than the population because of a fall in the average size of the household. This is traced in Table I.5, which shows the average household size in Alaska falling from 3.086 in 1980 to 2.657 in 2000. A description of the methods and assumptions of the household projections is presented in an appendix to this report. (The average household size multiplied by the number of households will be slightly less than population because of people living in group quarters.)

Average household size varies considerably by status of the head of household as well as the rate at which household size diminishes. Native households are much larger than either civilian non-Native households or military households.

Table I.6 shows the aggregate state fiscal variables to be consistent with the overall growth projected in the moderate-moderate case. Revenues exceed expenditures consistently until the final year, and the permanent fund and general fund balances increase accordingly.

Table I.4. Households, Moderate-Moderate Case

(thousands)

B.MM

	HH	CHH	MHH	NHH
1980	124.002	99.874	14.352	13.476
1981	128.328	103.686	14.352	13.99
1982	133.603	108.632	14.352	14.519
1983	139.354	113.839	14.352	15.063
1984	146.209	119.736	14.352	15.621
1985	157.451	130.607	14.352	16.192
1986	168.926	141.497	14.352	16.778
1987	175.175	147.147	14.352	17.376
1988	178.266	149.626	14.352	17.988
1989	183.519	154.253	14.352	18.614
1990	186.983	157.076	14.352	19.255
1991	192.117	161.555	14.352	19.91
1992	196.237	165.003	14.352	20.582
1993	200.987	169.065	14.352	21.27
1994	206.343	173.715	14.352	21.976
1995	211.797	178.445	14.352	22.7
1996	217.922	183.826	14.352	23.444
1997	224.583	189.723	14.352	24.209
1998	231.093	195.446	14.352	24.995
1999	238.311	201.854	14.352	25.805
2000	245.755	208.463	14.352	26.64

HH = Households
CHH = Civilian Non-Native Households
MHH = Military Households
NHH = Native Households

Table I.5. Average Alaska Household Size
Moderate-Moderate Case

B.MM

	HHSIZEN	HHSIZEC	HHSIZEM	HHSIZE
1980	4.625	2.829	2.635	3.086
1981	4.559	2.824	2.635	3.073
1982	4.495	2.825	2.635	3.064
1983	4.433	2.823	2.635	3.053
1984	4.374	2.821	2.635	3.04
1985	4.317	2.841	2.635	3.041
1986	4.261	2.846	2.635	3.031
1987	4.208	2.816	2.635	2.998
1988	4.156	2.774	2.635	2.96
1989	4.106	2.748	2.635	2.932
1990	4.057	2.715	2.635	2.9
1991	4.01	2.692	2.635	2.876
1992	3.963	2.665	2.635	2.849
1993	3.917	2.641	2.635	2.824
1994	3.872	2.619	2.635	2.801
1995	3.828	2.597	2.635	2.777
1996	3.784	2.577	2.635	2.754
1997	3.741	2.556	2.635	2.731
1998	3.698	2.534	2.635	2.707
1999	3.655	2.512	2.635	2.682
2000	3.613	2.49	2.635	2.657

HHSIZE = Household Size
HHSIZEN = Native Household Size
HHSIZEC = Civilian Non-Native Household Size
HHSIZEM = Military Household Size

Table I.6. State Fiscal Variables
Moderate-Moderate Case

(million $)

B.MM

	REVGF	EXGF	PFBAL	GFBAL
1980	2244.29	1402.12	483.2	1549.1
1981	3375.83	2381.69	1760.5	1440.
1982	4916.46	3238.56	4076.29	802.114
1983	5999.61	3582.56	6209.62	1085.83
1984	6797.58	4033.22	8122.34	1937.47
1985	8081.55	4556.82	9823.93	3760.62
1986	9278.42	5410.38	11328.8	6123.77
1987	10848.9	6319.21	12664.8	9317.49
1988	12179.	6915.84	13816.5	13428.9
1989	13981.1	7354.87	15089.6	18782.1
1990	15074.3	7908.31	16420.3	24617.2
1991	16688.	8566.23	17830.4	31328.9
1992	17932.5	9202.68	19302.7	38586.4
1993	19395.3	10045.6	20798.8	46439.9
1994	20326.4	11018.5	22302.5	54244.
1995	20666.4	12145.1	23742.5	61325.2
1996	20818.4	13389.9	25108.6	67387.5
1997	20786.7	14818.7	26395.8	72068.2
1998	20519.8	16433.	27568.9	74981.9
1999	20050.1	18144.3	28633.4	75823.1
2000	19509.1	20107.	29603.6	74254.9

REVGF = General Fund Revenues
EXGF = General Fund Expenditures
PFBAL = Permanent Fund Balance
GFBAL = General Fund Balance

The statewide moderate-moderate economic projections are disaggregated in Table I.7 to show the values for the railbelt defined as the following Census Divisions:

Anchorage
Matanuska-Susitna
Kenai-Cook Inlet
Seward

Fairbanks
Southeast Fairbanks

Valdez-Chitina-Whittier

In this projection, the railbelt share of state population and employment remains relatively stable over time.

The final table in this section (Table I.8) presents three variables used to monitor the credibility of the economic projections. The ratio of civilian employment to population increases in the late 1980s and then falls in the early 1990s. This reflects the rapid population growth from in-migration in the late 1980s. The subsequent decline in this ratio does not return it to its former value, indicating that employment as a proportion of the population is continuing its historical trend upward.

The ratio of the Alaskan to the average U.S. price level is projected to decline over time. This is also consistent with the historical trend in the relationship.

The ratio of real personal income per capita in Alaska and the United States is likewise projected to decline over time in a return to the long-standing historical relationship. This trend is reversed in the mid-1980s, the years of very large construction activity.

Table I.7. Railbelt Projection Values
Moderate-Moderate Case

RB.MM

	P.RB	M.RB	B.RB	G.RB	S.RB
1980	285.334	138.478	27.203	52.76	58.515
1981	291.112	142.162	28.707	55.179	58.275
1982	301.699	147.511	31.175	57.764	58.573
1983	314.231	154.639	33.835	58.891	61.913
1984	328.696	163.496	36.932	60.161	66.403
1985	352.747	179.636	42.357	60.889	76.39
1986	373.614	194.212	46.504	64.013	83.696
1987	385.456	200.61	46.898	67.695	86.017
1988	390.621	200.912	44.261	68.691	87.959
1989	396.277	202.596	43.919	67.715	90.962
1990	397.999	200.111	44.282	67.426	88.403
1991	404.127	202.128	45.306	67.266	89.556
1992	409.362	202.846	45.526	67.898	89.422
1993	418.118	205.872	46.389	67.974	91.508
1994	425.714	206.791	47.452	68.282	93.057
1995	433.351	212.05	48.641	68.834	94.575
1996	442.71	216.576	50.029	69.384	97.163
1997	452.695	221.561	51.614	70.144	99.803
1998	462.426	226.547	53.104	71.02	102.423
1999	473.19	232.311	54.761	71.682	105.868
2000	483.686	237.812	56.169	72.542	108.801

P.RB = Population
M.RB = Total Employment
B.RB = Basic Employment
G.RB = Government Employment
S.RB = Support Employment

Table I.8. Projection Monitoring Values
Moderate-Moderate Case

B.MM

	ER	RPI.CPI	PIA.PIU
1980	0.485	1.38	1.086
1981	0.49	1.37	1.093
1982	0.493	1.353	1.107
1983	0.499	1.334	1.113
1984	0.504	1.315	1.129
1985	0.517	1.3	1.209
1986	0.526	1.275	1.271
1987	0.529	1.251	1.211
1988	0.524	1.244	1.103
1989	0.519	1.24	1.065
1990	0.511	1.237	1.042
1991	0.509	1.234	1.028
1992	0.504	1.228	1.006
1993	0.502	1.224	0.984
1994	0.501	1.217	0.971
1995	0.5	1.209	0.96
1996	0.5	1.201	0.95
1997	0.501	1.192	0.743
1998	0.502	1.182	0.732
1999	0.503	1.173	0.724
2000	0.504	1.164	0.716

ER = Civilian Employment/Civilian Population
RPI.CPI = Alaska Price Level/U.S. Average Price Level
PIA.PIU = Alaska Per Capita Real Personal Income/U.S. Per Capita Real Personal Income

I.B. The Low Case (Low-Low)

Tables I.9 through I.13 present the results of the low case projection. This case assumes low growth in basic sector activity in the private economy and growth in state government spending at a rate which maintains the initial real per capita level.

Aggregate growth resulting from this case (Table I.9) is much lower than in the moderate case. Growth is rapid in the mid-1980s during construction of the gas pipeline but slows considerably in the decade of the 1990s, during which population growth is about 50 thousand. Even more striking is the fact that employment peaks in 1987 just as pipeline construction is concluding and does not regain that level again until twelve years later in 1999. During this period, out-migration must be occurring as natural increase in the resident population generates larger yearly increases in the labor force than jobs provided by the economy.

This same pattern is observed in the railbelt (Table I.10). Population growth is slow in the 1990s after a period of rapid increases in the 1980s primarily due to pipeline construction. Employment declines after 1987 and only recovers its previous peak in 1998.

Table I.11 shows that the employment mix or the structure of the economy as measured by employment remains more influenced by government in this case in spite of slower growth in government spending. This results from the associated slow growth in private sector basic activities and the continuing strong presence of the federal government.

The number of households displays annual growth with a spurt in the mid-1980s (Table I.12). Average household size falls in the same general pattern as the base case.

Table I.9. State Projection Values
Low-Low Case

B.LL

	POP	G.POP	EM99	G.EM99	PI	G.PIRPC
1980	400.457	0.985	205.164	1.005	5321.11	0.996
1981	410.809	1.026	211.678	1.032	6071.87	1.018
1982	426.042	1.037	220.048	1.04	6898.77	1.017
1983	437.823	1.028	226.44	1.029	7713.69	1.015
1984	452.251	1.033	234.019	1.033	8735.46	1.026
1985	479.816	1.061	251.666	1.075	10723.9	1.089
1986	509.003	1.061	270.483	1.075	13028.1	1.085
1987	513.303	1.008	270.989	1.002	13385.4	0.962
1988	511.419	0.996	267.191	0.986	13195.5	0.92
1989	513.395	1.004	264.317	0.989	13852.2	0.971
1990	512.694	0.999	259.153	0.98	14778.7	0.991
1991	514.468	1.003	256.785	0.991	15954.	0.998
1992	516.988	1.005	255.505	0.995	17256.4	1.001
1993	521.771	1.009	256.611	1.004	18807.4	1.006
1994	526.362	1.009	257.692	1.004	20458.6	1.006
1995	532.359	1.011	260.224	1.01	22354.8	1.009
1996	538.019	1.011	262.501	1.009	24378.9	1.009
1997	544.539	1.012	265.653	1.012	26662.2	1.01
1998	550.92	1.012	268.701	1.011	29136.9	1.011
1999	557.536	1.012	271.999	1.012	31852.1	1.011
2000	564.285	1.012	275.436	1.013	34833.7	1.011

POP = Population
EM99 = Total Employment
PI = Personal Income
G.POP = Annual Growth of Population
G.EM99 = Annual Growth of Employment
G.PIRPC = Annual Growth in Real Per Capita Income

Table I.10. Railbelt Projection Values
Low-Low Case

RB.LL

	P.RB	M.RB	B.RB	G.RB	S.RB
1980	285.934	138.165	26.933	52.76	58.471
1981	291.186	141.269	28.044	55.121	58.104
1982	301.378	146.306	30.322	57.603	58.381
1983	309.728	150.403	31.422	58.473	60.508
1984	320.794	156.726	33.076	58.942	64.707
1985	339.093	168.829	36.84	59.147	72.842
1986	357.57	181.168	40.923	60.722	79.523
1987	363.388	182.444	40.128	63.054	79.262
1988	365.981	180.943	36.915	63.072	80.955
1989	367.978	179.252	35.959	62.235	81.058
1990	366.782	175.23	35.521	61.745	77.963
1991	367.847	173.535	35.301	61.311	76.924
1992	369.148	172.373	34.864	61.174	76.334
1993	372.735	173.221	35.225	61.104	76.897
1994	376.185	174.135	35.599	61.2	77.336
1995	380.806	176.052	36.107	61.272	78.673
1996	385.12	177.807	36.599	61.44	79.767
1997	390.144	180.147	37.174	61.569	81.404
1998	395.008	182.4	37.758	61.764	82.878
1999	400.155	184.907	38.367	61.93	84.609
2000	405.363	187.478	39.008	62.109	86.36

P.RB = Population
M.RB = Total Employment
B.RB = Basic Employment
G.RB = Government Employment
S.RB = Support Employment

Table I.11. Distribution of Employment
Low-Low Case

B.LL

	EMSP.EM	EMG9.EM	EMNS.EM
1980	0.393	0.381	0.226
1981	0.38	0.388	0.231
1982	0.369	0.393	0.239
1983	0.371	0.388	0.241
1984	0.381	0.379	0.24
1985	0.395	0.354	0.252
1986	0.399	0.339	0.262
1987	0.398	0.353	0.249
1988	0.413	0.358	0.229
1989	0.417	0.356	0.226
1990	0.412	0.36	0.228
1991	0.411	0.361	0.229
1992	0.411	0.361	0.228
1993	0.412	0.359	0.229
1994	0.413	0.358	0.229
1995	0.416	0.355	0.229
1996	0.418	0.353	0.229
1997	0.421	0.35	0.229
1998	0.424	0.347	0.229
1999	0.427	0.344	0.229
2000	0.43	0.34	0.229

EMSP.EM = Proportion of Local Serving Employment
EMG9.EM = Proportion of Government Employment
EMNS.EM = Proportion of Basic Employment

Table I.12. Statewide Household Characteristics
Low-Low Case

B.LL

	HH	HHSIZE	POPGQ
1980	124.002	3.086	17.791
1981	127.904	3.072	17.95
1982	133.187	3.062	18.199
1983	137.72	3.046	18.378
1984	143.072	3.031	18.607
1985	152.166	3.028	19.074
1986	162.135	3.019	19.547
1987	165.508	2.983	19.533
1988	167.028	2.946	19.429
1989	169.416	2.916	19.423
1990	170.983	2.885	19.387
1991	173.12	2.86	19.414
1992	175.162	2.835	19.47
1993	178.464	2.814	19.576
1994	181.473	2.792	19.683
1995	184.966	2.771	19.818
1996	188.447	2.749	19.947
1997	192.277	2.728	20.092
1998	196.165	2.705	20.231
1999	200.216	2.683	20.373
2000	204.412	2.66	20.515

HH = Households
HHSIZE = Household Size
POPGQ = Population in Group Quarters

Table I.13. State Fiscal Variables
Low-Low Case

B.LL

	REVGF	EXGF	PFBAL	GFBAL
1980	2243.85	1402.12	483.2	1549.1
1981	3373.56	2381.67	1760.5	1440.
1982	4911.76	3238.48	4076.29	797.489
1983	5988.64	3539.18	6209.62	1113.62
1984	6779.56	3893.85	8122.34	2086.61
1985	8053.52	4322.91	9823.93	4115.63
1986	9234.75	4913.45	11328.8	6932.04
1987	10809.3	5517.46	12664.8	10887.9
1988	12162.6	5907.34	13816.5	15991.4
1989	14013.3	6306.71	15091.2	22423.3
1990	14976.2	6789.45	16404.	29297.2
1991	16304.1	7325.29	17764.9	36915.2
1992	17340.3	7719.24	19163.	45138.1
1993	18607.	8411.86	20558.6	53937.6
1994	19362.3	9177.04	21940.9	62740.5
1995	19567.6	10001.1	23242.6	71005.2
1996	19643.1	10911.6	24459.7	78519.6
1997	19593.5	11889.8	25594.3	85068.6
1998	19435.	12968.3	26620.3	90529.2
1999	19170.9	14131.2	27547.8	94641.2
2000	18850.8	15401.6	28386.8	97251.5

REVGF = General Fund Revenues
EXGF = General Fund Expenditures
PFBAL = Permanent Fund Balance
GFBAL = General Fund Balance

Finally, Table I.13 shows the primary state fiscal variables in this case. State government runs a surplus throughout. Consequently, the general fund balance grows at a rapid rate and reaches $97 billion in nominal dollars by the year 2000.

I.C. The High Case (High-High)

Tables I.14 through I.18 present the results of the high projection case. This case combines an assumption of high growth in the basic sectors of the private economy with high growth in state government spending. The result is rapid growth of the economy and population throughout the projection period.

The aggregate results shown in Table I.14 indicate the cumulative effect of rapid growth rates. Population growth at 4 percent annually results in a population of 884 thousand by 2000. Employment growth at 4.5 percent annually results in 497 thousand by 2000. The associated growth in personal income is sustained throughout the period.

Under this high growth scenario, the railbelt growth is relatively more rapid than that of the state as a whole. Table I.15 shows the results for the railbelt. Population growth occurs at 4.1 percent annually, while employment growth is again 4.5 percent. In marked contrast to the low case, the growth does not stop in the 1990s. It is more rapid in the decade of the 1980s due to the simultaneous construction of several large projects, but there is no appreciable pause as the decade of the 1980s ends.

Table I.16 shows how the structure of the economy evolves in this high growth case. Both government spending and basic private sector activity are increasing rapidly in this case, but private sector growth on net grows faster. As a result, the proportion of employment classified as government falls from 38 percent in 1980 to 30 percent in 2000, and basic sector employment grows from 23 percent to 28 percent, almost matching government.

Table I.14. State Projection Values
High-High Case

R.HH

	POP	G.POP	EM99	G.EM99	PI	G.PIRPC
1980	400.457	0.985	207.376	1.015	5373.11	1.006
1981	411.271	1.027	214.19	1.033	6126.59	1.017
1982	429.47	1.044	225.139	1.051	7042.09	1.022
1983	448.584	1.045	238.261	1.058	8128.23	1.034
1984	472.623	1.054	254.189	1.067	9510.21	1.045
1985	515.812	1.091	285.314	1.122	12264.3	1.109
1986	568.864	1.103	324.554	1.138	15866.1	1.104
1987	597.499	1.05	344.545	1.062	17331.4	0.992
1988	620.477	1.038	360.396	1.046	18231.	0.956
1989	640.117	1.032	369.33	1.025	19722.6	0.986
1990	656.496	1.026	375.815	1.018	21553.8	0.999
1991	671.785	1.023	381.7	1.016	23515.3	0.998
1992	693.689	1.033	392.723	1.029	26225.8	1.011
1993	710.077	1.024	399.614	1.018	28640.1	1.
1994	733.477	1.033	412.831	1.033	31908.5	1.01
1995	757.925	1.033	426.713	1.034	35568.6	1.012
1996	780.644	1.03	439.142	1.029	39261.3	1.005
1997	806.271	1.033	453.7	1.033	43673.3	1.009
1998	830.444	1.03	466.656	1.029	48379.3	1.008
1999	856.578	1.031	481.264	1.031	53795.5	1.01
2000	884.433	1.033	497.223	1.033	59958.	1.011

POP = Population
EM99 = Total Employment
PI = Personal Income

G.POP = Annual Growth of Population
G.EM99 = Annual Growth of Employment
G.PIRPC = Annual Growth in Real Per Capita Income

Table I.15. Railbelt Projection Values
High-High Case

RB.HH

	P.RB	M.RB	B.RB	G.RB	S.RB
1980	285.113	139.058	27.466	52.823	58.768
1981	290.722	142.398	28.903	55.378	58.118
1982	303.652	149.45	32.197	57.919	59.334
1983	319.814	158.604	36.435	59.565	62.604
1984	337.656	170.344	40.669	61.561	68.114
1985	369.399	191.761	48.931	63.039	79.791
1986	405.516	217.419	58.442	67.673	91.304
1987	425.808	230.937	59.932	75.299	95.705
1988	446.923	243.884	61.486	78.104	104.295
1989	457.162	246.264	60.849	78.829	108.586
1990	466.944	251.58	62.473	78.818	110.289
1991	475.963	254.765	63.8	79.599	111.386
1992	490.167	261.187	65.498	80.238	115.451
1993	502.671	266.52	67.761	81.765	116.994
1994	519.652	275.572	70.957	82.622	121.994
1995	537.86	284.487	74.417	84.514	125.557
1996	556.671	293.99	77.723	86.55	129.717
1997	575.409	304.296	80.76	88.065	135.471
1998	594.306	314.153	84.393	89.878	139.882
1999	615.169	325.359	88.421	91.457	145.502
2000	636.942	336.946	92.814	93.265	150.868

P.RB = Population
M.RB = Total Employment
B.RB = Basic Employment
G.RB = Government Employment
S.RB = Support Employment

Table I.16. Distribution of Employment
High-High Case

B.HH

	EMSP.EM	EMG9.EM	EMNS.EM
1980	0.392	0.377	0.231
1981	0.378	0.385	0.236
1982	0.368	0.386	0.246
1983	0.367	0.376	0.257
1984	0.372	0.366	0.261
1985	0.384	0.335	0.281
1986	0.385	0.319	0.296
1987	0.383	0.338	0.278
1988	0.4	0.337	0.264
1989	0.409	0.332	0.259
1990	0.411	0.326	0.263
1991	0.411	0.324	0.264
1992	0.414	0.318	0.268
1993	0.414	0.319	0.267
1994	0.419	0.312	0.27
1995	0.416	0.309	0.274
1996	0.418	0.308	0.274
1997	0.422	0.304	0.274
1998	0.424	0.302	0.274
1999	0.427	0.299	0.274
2000	0.428	0.295	0.276

EMSP.EM = Proportion of Local Serving Employment
EMG9.EM = Proportion of Government Employment
EMNS.EM = Proportion of Basic Employment

Table I.17. Statewide Household Characteristics
High-High Case

B.HH

	HH	HHSIZE	POPGQ
1980	124.002	3.086	17.791
1981	128.028	3.072	17.959
1982	134.118	3.066	18.262
1983	140.682	3.057	18.571
1984	148.798	3.049	18.959
1985	162.534	3.052	19.689
1986	179.583	3.053	20.549
1987	190.632	3.025	20.906
1988	200.214	2.993	21.148
1989	209.009	2.961	21.338
1990	216.914	2.928	21.478
1991	224.748	2.895	21.617
1992	234.134	2.869	21.893
1993	242.244	2.84	22.07
1994	252.628	2.815	
1995	263.518	2.79	
1996	274.188	2.763	
1997	286.02	2.737	
1998	297.722	2.71	
1999	310.345	2.682	
2000	323.875	2.655	

HH = Households
HHSIZE = Household Size
POPGQ = Population in Group Quarters

Table I.18. State Fiscal Variables
High-High Case

B.HH

	REVGF	EXGF	PFBAL	GFBAL
1980	2245.64	1402.13	483.2	1549.1
1981	3376.99	2381.67	1760.5	1440.
1982	4920.15	3241.78	4076.29	802.575
1983	6009.26	3640.24	6209.62	1038.26
1984	6815.56	4188.23	8122.34	1752.87
1985	8111.62	4847.47	9823.93	3315.43
1986	9380.52	6049.68	11328.8	5141.38
1987	11007.7	7641.15	12664.8	7171.97
1988	12726.6	8649.36	13862.7	10051.3
1989	15407.6	9447.14	15287.1	14587.4
1990	17124.4	10188.5	16843.3	19967.1
1991	19284.8	11193.1	18542.6	26357.5
1992	20888.1	12096.5	20332.6	33361.1
1993	22463.9	13520.2	22144.5	40492.8
1994	23214.6	14956.4	23928.4	46967.1
1995	23123.7	16825.2	25585.2	51610.6
1996	22716.	18932.7	27104.4	53874.7
1997	22074.4	21140.6	28489.1	53423.7
1998	21293.4	23702.7	29725.3	49778.1
1999	20276.5	26479.9	30831.4	42468.6
2000	19085.6	29700.6	31821.2	30863.7

REVGF = General Fund Revenues
EXGF = General Fund Expenditures
PFBAL = Permanent Fund Balance
GFBAL = General Fund Balance

Growth in the number of households occurs at 4.9 percent annually over the twenty-year period (Table I.17). As with the other cases, this reflects a decreasing average household size as well as population growth. Average household size falls over time in the same pattern as the other cases.

The state fiscal variable projections are reported in Table I.18. The rapid growth in government spending has not exhausted the financial resources of the state, but by the end of the 1990s, the growth in expenditures has surpassed that of revenues. The general fund balance peaks in nominal dollars in 1996 at $53.9 billion but falls off rapidly in subsequent years. It is clear that if this projection were to continue for three more years, the general fund would be completely depleted.

I.D. The Industrialization Case

This case is equivalent to the base case (moderate-moderate) with the addition of a series of industrial developments in the private sector predicated upon the availability of electric power in quantities and at a price which makes a railbelt location attractive. The industrial developments which we assume are as follows:

1. Natural gas-based petrochemical production: This development occurs in the late 1980s and early 1990s. It is patterned after the Dow-Shell proposal phase 1 and phase 2 project descriptions consisting of ethylene plants and the production of ethylene derivatives.

2. Beluga coal development for export and synthetic fuel production: This development occurs in the mid-1980s, and production eventually reaches 11 million tons annually.

3. Aluminum smelting: This development occurs in the early 1990s. Production is 180,000 tons annually.

4. Synthetic fuels production: Development of this facility occurs in the late 1980s. Input is 7.3 million tons of Beluga coal annually to produce methanol.

5. Local serving manufacturing: Manufacturing to serve the Alaska market grows over time to equal 5 percent of total manufacturing.

The results of the projection are presented in Tables I.19 through I.23. Growth is more rapid with industrialization, primarily as the result of the steady growth in the manufacturing sector for local requirements. Table I.19 shows population to be 35 thousand higher than the base case in 1990 and 72 thousand higher in 2000. Employment growth is more rapid by a comparable proportion.

In this industrialization case, growth is more concentrated in the railbelt. Analysis of the growth in railbelt employment and population from Table I.20 indicates that the railbelt proportions of both of these variables increase over time. The railbelt proportion of population grows from 71.3 to 73.6 percent, and that of employment grows from 67 to 69.5 percent.

The structure of employment, shown in Table I.21, reflects a more rapid growth in basic sector employment than the base case and a resulting decline in the relative importance of the government sector.

The number of households and average household size shows the same pattern as the other cases (Table I.22).

The industrialization case state fiscal variables (Table I.23) show the government spending more to provide services to the additional population with the result that the general fund balance shows a peak in 1998 at $64 billion in current dollars and subsequently begins to decline.

Table I.19. State Projection Values
Industrialization Case

B.IN

	POP	G.POP	EM99	G.EM99	PI	G.PIRPC
1980	400.457	0.985	206.388	1.011	5346.56	1.001
1981	412.616	1.03	214.57	1.04	6151.04	1.023
1982	429.36	1.041	224.178	1.045	7016.47	1.019
1983	446.752	1.041	235.7	1.051	8031.58	1.028
1984	467.662	1.047	248.904	1.056	9302.4	1.04
1985	506.492	1.083	276.259	1.11	11816.6	1.102
1986	549.615	1.085	306.981	1.111	14831.9	1.094
1987	566.246	1.03	317.305	1.034	15626.7	0.973
1988	578.904	1.022	325.112	1.025	16090.5	0.946
1989	587.325	1.015	324.878	0.999	17035.4	0.976
1990	597.3	1.017	327.066	1.007	18562.	0.999
1991	612.719	1.026	334.685	1.023	20686.4	1.016
1992	619.682	1.011	334.375	0.999	22172.5	0.991
1993	632.293	1.02	340.009	1.017	24175.6	0.998
1994	644.51	1.019	344.991	1.015	26509.	1.007
1995	658.299	1.021	351.52	1.019	29159.8	1.008
1996	673.9	1.024	359.733	1.023	32208.6	1.011
1997	691.374	1.026	369.589	1.027	35701.9	1.013
1998	708.14	1.024	378.625	1.024	39373.6	1.01
1999	727.244	1.027	389.722	1.029	43652.1	1.012
2000	746.848	1.027	401.084	1.029	48399.6	1.013

POP = Population
EM99 = Total Employment
PI = Personal Income
G.POP = Annual Growth of Population
G.EM99 = Annual Growth of Employment
G.PIRPC = Annual Growth in Real Per Capita Income

Table I.20. Railbelt Projection Values
Industrialization Case

RB IM

	P.RB	M.RB	B.RB	G.RB	S.RB
1980	285.419	138.64	27.328	52.76	58.552
1981	291.442	142.507	28.979	55.191	58.336
1982	303.201	148.611	31.983	57.79	58.838
1983	316.972	156.651	35.236	59.029	62.386
1984	333.692	167.1	39.302	60.442	67.355
1985	361.809	186.133	46.502	61.361	78.27
1986	392.76	207.745	55.135	64.88	87.731
1987	405.837	215.366	55.302	70.065	89.998
1988	420.985	222.953	55.585	71.142	96.226
1989	423.401	221.772	53.456	70.865	97.451
1990	431.299	223.079	54.585	69.993	98.5
1991	443.889	228.226	58.623	70.293	99.31
1992	448.067	227.819	57.63	71.446	98.743
1993	460.035	233.056	58.951	71.188	102.917
1994	469.011	236.267	60.71	71.694	103.863
1995	479.716	241.207	62.787	72.263	106.157
1996	492.048	247.348	65.198	72.995	109.155
1997	505.662	254.469	67.972	73.923	112.575
1998	519.24	261.751	70.761	75.031	115.954
1999	534.504	270.304	73.919	75.939	120.446
2000	549.831	278.806	77.291	77.099	124.416

P.RB = Population
M.RB = Total Employment
B.RB = Basic Employment
G.RB = Government Employment
S.RB = Support Employment

Table I.21. Distribution of Employment
Industrialization Case

B.IM

	EMSP.EM	EMG9.EM	EMNS.EM
1980	0.392	0.379	0.229
1981	0.378	0.383	0.238
1982	0.366	0.387	0.247
1983	0.368	0.377	0.255
1984	0.374	0.367	0.259
1985	0.387	0.336	0.277
1986	0.387	0.322	0.291
1987	0.386	0.339	0.274
1988	0.402	0.337	0.262
1989	0.409	0.336	0.255
1990	0.412	0.329	0.259
1991	0.407	0.323	0.271
1992	0.406	0.329	0.265
1993	0.414	0.322	0.264
1994	0.412	0.32	0.268
1995	0.414	0.317	0.27
1996	0.415	0.313	0.272
1997	0.417	0.309	0.275
1998	0.418	0.306	0.275
1999	0.422	0.302	0.277
2000	0.423	0.298	0.279

EMSP.EM = Proportion of Local Serving Employment
EMG9.EM = Proportion of Government Employment
EMNS.EM = Proportion of Basic Employment

Table I.22. Statewide Household Characteristics
Industrialization Case

B.IM

	HH	HHSIZE	POPGQ
1980	124.002	3.086	17.791
1981	128.387	3.074	17.984
1982	134.106	3.065	18.258
1983	140.183	3.055	18.534
1984	147.451	3.044	18.871
1985	159.841	3.047	19.523
1986	174.074	3.041	20.219
1987	181.401	3:009	20.376
1988	187.71	2.975	20.476
1989	192.755	2.941	20.511
1990	195.174	2.91	20.597
1991	205.169	2.885	20.799
1992	209.788	2.854	20.849
1993	216.049	2.829	21.024
1994	222.293	2.804	21.198
1995	229.137	2.78	21.408
1996	236.716	2.755	21.656
1997	245.064	2.732	21.937
1998	253.432	2.707	22.201
1999	262.772	2.682	22.506
2000	272.353	2.656	22.814

HH = Households
HHSIZE = Household Size
POPGQ = Population in Group Quarters

Table I.23. State Fiscal Variables
Industrialization Case

B.IM

	REVGF	EXGF	PFBAL	GFBAL
1980	2244.39	1402.12	483.2	1549.1
1981	3376.26	2381.69	1760.5	1440.
1982	4918.03	3239.47	4076.29	802.766
1983	6003.32	3594.65	6209.62	1078.1
1984	6804.46	4061.46	8122.34	1908.37
1985	8095.84	4620.65	9823.93	3681.98
1986	9313.3	5559.87	11328.8	5930.51
1987	10894.9	6667.54	12664.8	8821.83
1988	12225.	7298.68	13816.5	12596.4
1989	14007.1	7840.69	15089.6	17489.8
1990	15071.8	8358.65	16420.3	22872.3
1991	16670.	9134.45	17830.4	28997.7
1992	17878.4	9918.94	19302.7	35485.
1993	19291.7	10767.2	20798.8	42513.3
1994	20171.7	11852.1	22302.5	49329.1
1995	20451.3	13067.2	23742.5	55273.2
1996	20556.7	14450.9	25108.6	59992.8
1997	20427.3	16035.7	26395.8	63097.1
1998	20068.6	17841.1	27568.9	64151.4
1999	19492.4	19780.5	28633.4	62798.7
2000	18825.9	22018.1	29603.6	58636.4

REVGF = General Fund Revenues
EXGF = General Fund Expenditures
PFBAL = Permanent Fund Balance
GFBAL = General Fund Balance

I.E. Two Sensitivity Cases

I.E.1. The Fiscal Crisis Case

Recent events confirm the hypothesis that state government spending may increase as a function of the availability of revenues and that projections of petroleum-based revenues may turn out to have been too optimistic. In the foregoing cases, government spending growth has been tied to demand factors--prices of government purchases, population, and income. The temptation to spend all available revenues immediately was not considered. In addition, petroleum revenues were generally projected to be adequate to fund whatever growth of government spending chosen--at least until 2000. This was in spite of the fact that in some cases, a continuation of the projections for several more years would show the state exhausting all of its accumulated balances in the general fund.

To examine the situation which may arise in future years if state government spending follows closely, the flow of revenues, and revenues peak in the late 1980s, a special fiscal crisis case projection was done. The essential difference between this case and the base case is that a massive capital expenditure program in the 1980s and early 1990s is stimulated by the availability of general fund balances, and revenues from the development of petroleum resources in the 1990s are much less than anticipated in the base case.

The nature of the revised fiscal situation is shown in Table I.24. Capital expenditure (EXCAP) growth is rapid until a peak of $5 billion is reached in 1990. Subsequently, it falls off to a floor of $200 million. Because of this, the general fund balance never accumulates more than $5.3 billion and is exhausted in 1996. Because of this, operating expenditures must stop growing in 1997 because they have also been partially financed out of accumulated general fund balances. (Revenues still exceed expenditures only because the revenue measure includes mandatory contributions to the permanent fund.)

Table I.24. State Fiscal Variables
Fiscal Crisis Case

B.C

	REVGF	EXGF	PFBAL	GFBAL	EXOPS	EXCAP
1980	[illegible]84.63	1402.12	463.2	1549.1	1209.9	399.923
1981	[illegible]685.66	2388.14	1760.5	1440.	1684.	515.
1982	[illegible]01.43	3244.66	3977.	1080.47	2200.	600.
1983	[illegible]832.62	4132.87	5998.75	758.477	2491.99	1172.43
1984	[illegible].91	4517.05	7814.5	1483.59	2944.28	882.629
1985	[illegible]	5376.02	9438.	2547.6	3260.1	1535.23
1986	[illegible].09	7176.43	10906.2	3659.01	4070.71	2492.84
1987	11517.7	9043.86	12196.7	4642.39	4929.57	3493.11
1988	11775.1	10634.4	13297.7	4682.07	5609.11	4378.15
1989	13093.4	11236.3	14529.7	5307.17	6122.48	4413.86
1990	13083.6	12376.8	15737.2	4806.51	6645.16	4976.45
1991	12804.6	12670.4	16897.5	3780.4	7356.46	4525.86
1992	12797.	12156.7	18055.2	3262.92	7966.55	3602.36
1993	13260.8	12236.5	19258.7	3083.73	8441.09	3136.63
1994	13307.2	12733.6	20438.2	2377.83	9029.28	2975.36
1995	12807.8	12888.7	21558.5	1176.73	9758.77	2340.05
1996	12612.4	12599.3	22653.5	94.789	10475.7	1259.06
1997	13231.	12160.9	23818.2	0.164	10995.7	200.
1998	13415.8	12251.2	24983.	0.016	10908.2	200.
1999	13607.7	12443.	26147.7	0.012	10919.4	200.
2000	13810.3	12645.4	27312.5	0.191	10931.6	200.

REVGF = General Fund Revenues (including permanent fund contributions)
EXGF = General Fund Expenditures
PFBAL = Permanent Fund Balance
GFBAL = General Fund Balance
EXOPS = State Operating Expenditures
EXCAP = State Capital Expenditures

The capital expenditure boom created by state spending is reflected in a boom in construction employment (Table I.25). It rises from 12 thousand in 1980 to almost 46 thousand in 1990, only to fall again almost as precipitously in the 1990s to 17 thousand by 2000. The growth and subsequent cutbacks in government operations spending is also reflected in state and local government employment. It falls from a peak of 72 thousand in 1991 to 51 thousand in 2000.

The effect of this drawn-out boom-bust cycle on the aggregate economy is shown in Table I.26. Population and employment growth are both much more rapid than in the base case in the 1980s. In the 1990s, however, growth ceases. Employment falls from a peak of 355 thousand in 1990 to 303 thousand in 2000. The boom was the result of government spending, and a bust results from the elimination of that spending. Population peaks in the early 1990s and falls slowly through the decade to close out in 2000 at about the same level it had in 1990.

The substantial drop in employment opportunities in the 1990s and the maintenance of a constant population level is reflected in a decline in the civilian employment rate (Table I.27). This is a reflection of the fact that out-migration of job seekers from Alaska is occurring among the young, mobile population with few dependents. This leaves behind a population with a large proportion of dependents. This is the reverse of the situation encountered during the boom in the 1980s when in-migration of workers with a small average number of dependents causes the civilian employment rate to grow to over 55 percent.

Finally, the railbelt projection values for this case are shown in Table I.28. During the state capital spending-induced boom, the railbelt share of population and employment grows; but in the 1990s, its share returns to the proportion it had in the early 1980s.

Table I.25. Employment Patterns
Fiscal Crisis Case

B.C

	EMCN	EMGA
1980	12.017	36.804
1981	13.913	39.996
1982	16.546	44.422
1983	23.627	46.701
1984	23.329	50.808
1985	34.274	50.314
1986	43.591	57.672
1987	45.239	65.919
1988	44.276	70.641
1989	43.324	71.078
1990	45.702	70.957
1991	41.739	72.129
1992	34.176	71.312
1993	30.039	68.769
1994	28.927	66.961
1995	25.658	65.903
1996	21.591	64.332
1997	18.411	61.672
1998	17.493	57.515
1999	17.067	53.876
2000	17.211	50.755

EMCN = Construction Employment
EMGA = State and Local Government Employment

Table I.26. Aggregate Projection Values
Fiscal Crisis Case

	POP	G.POP	EM99	G.EM99	PI	G.PIRPC
1980	400.457	0.985	206.214	1.01	5342.07	0.999
1981	411.019	1.026	212.9	1.032	6102.3	1.019
1982	427.229	1.039	222.141	1.043	6953.25	1.017
1983	450.446	1.054	239.177	1.077	8247.59	1.05
1984	465.693	1.034	246.88	1.032	9232.51	1.022
1985	508.82	1.093	278.276	1.127	12026.3	1.111
1986	550.307	1.082	307.307	1.104	14948.4	1.092
1787	576.594	1.048	326.699	1.063	16386.	0.994
1988	594.905	1.032	339.15	1.038	17105.3	0.956
1989	613.049	1.03	347.26	1.024	18479.4	0.985
1990	629.907	1.027	354.761	1.022	20347.6	1.005
1991	637.786	1.013	354.002	0.998	21855.1	0.991
1992	638.143	1.001	346.667	0.979	22896.2	0.973
1993	638.601	1.001	340.539	0.982	24181.9	0.978
1994	640.35	1.003	335.949	0.987	25940.8	0.992
1995	639.707	0.999	329.622	0.981	27607.4	0.988
1996	638.826	0.999	323.631	0.982	29355.	0.987
1997	636.921	0.997	317.167	0.98	31204.3	0.988
1998	634.387	0.996	310.613	0.979	33242.4	0.991
1999	633.64	0.999	306.261	0.986	35708.3	0.997
2000	633.301	0.999	302.749	0.989	38403.7	0.999

POP = Population
EM99 = Total Employment
PI = Personal Income

G.POP = Annual Growth of Population
G.EM99 = Annual Growth of Employment
G.PIRPC = Annual Growth in Real Per Capita Income

Table I.27. Employment Rate and Household Size Pattern
Fiscal Crisis Case

B.C

	ER	HHSIZE
1980	0.485	3.086
1981	0.489	3.072
1982	0.492	3.064
1983	0.505	3.06
1984	0.505	3.041
1985	0.525	3.048
1986	0.539	3.042
1987	0.548	3.016
1988	0.553	2.984
1989	0.549	2.954
1990	0.546	2.924
1991	0.538	2.869
1992	0.526	2.852
1993	0.516	2.819
1994	0.507	2.789
1995	0.497	2.76
1996	0.488	2.731
1997	0.479	2.704
1998	0.47	2.677
1999	0.464	2.652
2000	0.458	2.627

ER = Civilian Employment Divided by Civilian Population
HHSIZE = Average Household Size

Table I.28. Railbelt Projection Values
Fiscal Crisis Case

RB.CC

	P.RB	M.RB	B.RB	G.RB	S.RB
1980	285.334	138.478	27.203	52.76	58.515
1981	290.29	141.355	28.593	54.683	58.079
1982	301.157	147.	31.087	57.324	58.588
1983	320.319	159.494	37.53	58.717	63.248
1984	330.096	164.732	37.804	61.173	65.754
1985	362.8	187.376	46.646	60.951	79.98
1986	389.924	207.094	54.709	65.302	87.083
1987	412.596	222.192	59.406	70.171	92.615
1988	430.628	232.734	61.503	72.987	98.245
1989	441.742	237.886	61.341	73.307	103.237
1990	454.45	243.137	64.178	73.304	105.655
1991	456.798	240.671	61.437	74.053	105.18
1992	456.238	235.064	55.824	73.645	105.594
1993	457.898	231.122	53.15	72.232	105.74
1994	458.312	227.146	51.948	71.247	103.951
1995	456.324	221.751	49.514	70.7	101.737
1996	454.418	217.011	46.428	67.854	100.729
1997	451.967	211.713	43.878	65.49	99.325
1998	451.375	207.935	43.796	66.022	98.117
1999	451.507	205.214	43.956	63.972	97.286
2000	451.626	202.643	44.163	62.225	96.435

P.RB = Population
M.RB = Total Employment
B.RB = Basic Employment
G.RB = Government Employment
S.RB = Support Employment

I.E.2. The Super High Case (Extreme High)

It is possible that industrialization, as defined by the projects included in the industrialization projection, may accompany the high case projection. The economic activity associated with this possibility is projected in the super high (extreme high) case. Since the high case includes petrochemical development and Beluga coal production, the elements of the super high case in addition to the high case scenario are as follows:

1. Petrochemical development. This is phase II as described by the Dow-Shell report.

2. Synthetic fuel production from Beluga coal.

3. Aluminum smelting.

4. Local serving manufacturing growth to account for 5 percent of total employment.

The addition of these projects and especially the assumption of rapid growth in local serving manufacturing has the effect of stimulating rapid growth of the economy. Analysis of the results shown in Table I.29 indicates an annual growth rate in population of 4.3 percent and of employment of 4.9 percent annually.

The railbelt projection values are shown in Table I.30. They reflect the same trend as in the high scenario of increased concentration of population and employment in the railbelt.

The state fiscal results are presented in Table I.31. Government spending to provide support to the increased population has reduced the general fund balance. It remains positive, but it is clear that if the projection were to continue for two additional years, the general fund balance of the state would become negative.

Table 1.29. State Aggregate Projection Values
Super High Case

B.SH

	POP	G.POP	EM99	G.EM99	PI	G.PIRPC
1980	400.457	0.985	207.475	1.016	5375.65	1.006
1981	411.398	1.027	214.405	1.033	6131.96	1.018
1982	429.794	1.045	225.529	1.052	7052.48	1.022
1983	449.186	1.045	238.893	1.059	8146.59	1.034
1984	473.59	1.054	255.135	1.068	9539.91	1.045
1985	517.273	1.092	286.681	1.124	12312.7	1.109
1986	571.835	1.105	327.256	1.142	16009.5	1.106
1987	601.758	1.052	348.308	1.064	17530.3	0.993
1988	626.318	1.041	365.442	1.049	18499.3	0.957
1989	648.031	1.035	376.174	1.029	20098.1	0.988
1990	668.039	1.031	385.795	1.026	22139.1	1.003
1991	690.844	1.034	398.267	1.032	24604.2	1.008
1992	713.859	1.033	409.611	1.028	27276.7	1.007
1993	734.267	1.029	419.555	1.024	29924.4	1.
1994	759.552	1.034	433.72	1.034	33361.8	1.01
1995	787.144	1.036	449.748	1.037	37296.9	1.012
1996	812.997	1.033	464.257	1.032	41302.7	1.005
1997	842.334	1.036	481.375	1.037	46108.8	1.009
1998	870.643	1.034	497.218	1.033	51293.2	1.008
1999	901.49	1.035	515.167	1.036	57300.5	1.01
2000	934.703	1.037	534.967	1.038	64198.	1.011

POP = Population
EM99 = Total Employment
PI = Personal Income
G.POP = Annual Growth of Population
G.EM99 = Annual Growth of Employment
G.PIRPC = Annual Growth in Real Per Capita Income

Table I.30. Railbelt Projection Values
Super High Case

RR.SH

	P.RB	M.RB	B.RB	G.RB	S.RB
1980	283.161	139.15	27.537	52.823	58.789
1981	290.71	142.594	29.057	55.384	58.152
1982	304.046	149.801	32.457	57.933	59.41[illegible]
1983	320.473	159.16	36.829	59.598	62.733
1984	338.663	171.167	41.232	61.621	68.313
1985	370.877	192.949	49.736	63.127	80.085
1986	405.821	219.882	60.169	67.762	91.951
1987	430.117	234.184	62.076	75.646	96.462
1988	452.585	248.173	64.084	78.578	105.51
1989	464.864	254.055	64.265	79.464	110.325
1990	478.633	259.947	67.42	79.705	112.82[illegible]
1991	496.301	268.71	72.167	80.98	[illegible]
1992	509.747	274.835	72.919	82.706	[illegible]
1993	525.697	282.768	75.652	83.96	[illegible]
1994	544.216	292.604	79.605	85.084	[illegible]
1995	560.237	303.341	83.995	87.048	[illegible]
1996	586.717	314.364	88.326	89.3	[illegible]
1997	605.761	327.012	92.562	91.024	[illegible]
1998	631.241	339.261	97.533	93.103	[illegible]
1999	656.172	353.241	103.104	94.96	[illegible]
2000	682.616	368.013	109.277	97.13	161.607

P.RB = Population
M.RB = Total Employment
B.RB = Basic Employment
G.RB = Government Employment
S.RB = Support Employment

Table I.31. State Fiscal Variables
Super High Case

B.SH

	REVGF	EXGF	PFBAL	GFBAL
1980	2245.7	1402.13	483.2	1549.1
1981	3377.23	2381.67	1760.5	1440.
1982	4920.69	3241.97	4076.29	802.93
1983	6010.32	3642.47	6209.62	1037.45
1984	6817.28	4193.88	8122.34	1748.13
1985	8114.45	4858.42	9823.93	3302.57
1986	9387.29	6070.96	11328.8	5114.01
1987	11019.5	7703.56	12664.8	7093.95
1988	12741.3	8739.27	13862.7	9898.02
1989	15425.3	9571.64	15287.1	14327.3
1990	17148.7	10371.1	16843.3	19548.6
1991	19328.8	11492.6	18542.6	25685.6
1992	20930.9	12648.8	20332.6	32177.7
1993	22484.5	14064.3	22144.5	38786.
1994	23213.7	15615.7	23928.4	44600.
1995	23098.9	17579.8	25585.2	48462.2
1996	22608.2	19332.2	27104.4	49769.
1997	21980.2	22210.2	28489.1	48154.3
1998	21133.8	24986.4	29723.3	43085.5
1999	20083.2	28026.8	30831.4	34035.7
2000	18829.1	31574.8	31821.2	20300.1

REVGF = State General Fund Revenues
EXGF = State General Fund Expenditures
PFBAL = Permanent Fund Balance
GFBAL = General Fund Balance

I.F. Summary

The final three tables (Tables I.32, I.33, and I.34) summarize the statewide population, employment, and household projections for the four basic projections presented in this chapter.

Table I.32. Summary of Four Projections
Population

(thousands)

POP - ENDOGENOUS

	B.LL	B.MM	B.IM	B.HH
1980	400.457	400.457	400.457	400.457
1981	410.809	412.395	412.616	411.271
1982	426.042	428.251	429.36	429.47
1983	437.823	444.492	446.752	448.584
1984	452.251	463.274	467.662	472.623
1985	479.816	498.151	506.492	515.812
1986	507.003	531.933	549.615	568.864
1987	513.303	545.304	566.246	597.499
1988	511.419	547.669	578.904	620.477
1989	513.395	558.208	587.325	640.117
1990	512.694	562.438	597.3	656.496
1991	514.406	572.732	612.719	671.785
1992	516.988	579.364	619.682	693.689
1993	521.771	588.021	632.293	710.077
1994	526.362	598.543	644.51	733.477
1995	532.359	608.965	658.299	757.925
1996	535.017	621.173	673.9	780.644
1997	544.539	634.519	691.374	806.271
1998	550.92	646.879	708.14	830.444
1999	557.336	660.875	727.244	856.578
2000	564.285	674.985	746.848	884.433

B.LL = Low-Low Projection
B.MM = Moderate-Moderate Projection
B.IM = Industrialization Projection
B.HH = High-High Projection

Table I.33. Summary of Four Projections
Employment

(thousands)

EM99 - ENDOGENOUS

	B.LL	B.MM	B.IM	B.HH
1980	205.164	206.214	206.388	207.376
1981	211.678	214.193	214.57	214.19
1982	220.048	223.028	224.178	225.139
1983	226.44	233.475	235.7	238.261
1984	234.019	244.809	248.904	254.189
1985	251.666	268.663	276.259	285.314
1986	270.483	291.04	306.981	324.554
1987	270.989	299.174	317.305	344.545
1988	267.191	298.113	325.112	360.376
1989	264.317	301.134	324.878	369.33
1990	259.133	299.004	327.066	375.813
1991	256.783	303.003	334.685	381.7
1992	255.505	303.139	334.375	392.725
1993	256.611	306.92	340.009	399.61[illegible]
1994	257.692	311.361	344.99[illegible]	412.83
1995	260.214	[illegible].167	351.02	426.7[illegible]
1996	262.501	322.484	359.735	439.14[illegible]
1997	265.633	329.803	369.389	453.7
1998	268.701	336.114	378.625	466.65[illegible]
1999	271.999	343.883	389.722	481.264
2000	275.436	351.636	401.084	497.223

B.LL = Low-Low Projection
B.MM = Moderate-Moderate Projection
B.IM = Industrialization Projection
B.HH = High-High Projection

Table I.34. Summary of Four Projections
Households

(thousands)

HH - DEFINITION

	B.LL	B.MM	B.IM	B.HH
1980	124.002	124.002	124.002	124.002
1981	127.904	128.328	128.387	128.028
1982	133.187	133.803	134.106	134.118
1983	137.72	139.554	140.183	140.682
1984	143.072	146.209	147.451	148.798
1985	152.166	157.451	159.841	162.534
1986	162.133	168.926	174.074	179.583
1987	165.508	175.175	181.401	190.632
1988	167.028	178.266	187.71	200.214
1989	169.416	183.519	192.755	209.009
1990	170.983	186.783	198.174	216.914
1991	173.12	192.117	205.168	224.548
1992	173.462	196.237	209.788	234.134
1993	178.464	200.987	216.049	242.244
1994	181.473	206.343	222.293	252.628
1995	184.966	211.797	229.137	263.518
1996	188.447	217.922	236.716	274.188
1997	192.277	224.583	245.064	286.02
1998	196.163	231.093	253.432	297.722
1999	200.216	238.311	262.772	310.345
2000	204.412	245.755	272.553	323.875

B.LL = Low-Low Projection
B.MM = Moderate-Moderate Projection
B.IM = Industrialization Projection
B.HH = High-High Projection

II. Comparison of Current Projections with Earlier Work

In this section, we analyze the factors responsible for the differences in the economic projections reported in this study and those presented in the earlier study entitled Electric Power Consumption for the Railbelt: A Projection of Requirements (Institute of Social and Economic Research, June 1980). We begin the section with a short comparison of the results of the two studies.

II.A. Comparison of Results

Table II.1 compares the moderate-moderate scenario (moderate economic growth and moderate state expenditure growth) statewide projections of population (POP), employment (EM99), and number of households (HH) taken from the 1980 study with those developed for the current study. The differences between the two studies for this moderate-moderate case are relatively small. The new projection begins slightly lower, is somewhat larger in the middle of the period, and ends again slightly lower.

This pattern is primarily the result of two factors. First, the new projection begins in 1980 with the actual values experienced in that year which are lower than had been predicted, and this slightly lower starting point for the projections carries forward to reduce the values in all years proportionately. Second, the starting dates for several of the large economic projects have been postponed several years, and their combined impact on population and employment is experienced toward the end of the 1980s rather than the beginning.

Although the values for population, employment, and households are lower in 2000 in the new projections, the growth rates over the period from 1980 to 2000 are higher for population and households than previously. Table II.2 shows that in the new moderate-moderate case, the annual growth rates of the three variables are 3.48 percent for households, 2.64 percent for population, and 2.70 percent for employment.

Table II.1. Comparison of Old and New Economic Projections: The Moderate-Moderate Case

Population (000)

POP - ENDOGENOUS

	MES.GM	B.MM	B.MM_ER
1977	407.342	NA	NA
1978	404.436	NA	NA
1979	415.086	NA	NA
1980	421.335	400.457	-20.877
1981	426.013	412.395	-13.618
1982	444.538	428.251	-16.287
1983	475.974	444.492	-31.482
1984	500.704	463.274	-37.431
1985	503.942	498.151	-5.79
1986	514.662	531.933	17.271
1987	525.058	545.304	20.246
1988	531.313	547.669	16.355
1989	539.907	558.208	18.3
1990	547.996	562.438	14.442
1991	560.476	572.732	12.256
1992	576.731	579.364	2.632
1993	594.345	588.021	-6.325
1994	611.4	598.543	-12.856
1995	625.159	608.963	-16.197
1996	639.418	621.173	-18.245
1997	652.827	634.519	-18.308
1998	667.107	646.899	-20.208
1999	682.846	660.873	-21.973
2000	700.076	674.983	-25.093

MES.GM = 1980 Railbelt Study
B.MM = Current Study
B.MM_ER = Difference Between Old and New Projections

Table II.1. (continued)

Employment (000)

EM99 - ENDOGENOUS

	MES.GM	B.MM	B.MM_ER
1977	207.889	NA	NA
1978	205.092	NA	NA
1979	207.457	NA	NA
1980	209.722	206.214	-3.508
1981	210.407	214.193	3.786
1982	222.376	223.028	0.652
1983	243.145	233.475	-9.67
1984	261.45	244.809	-16.641
1985	262.624	268.663	6.039
1986	268.386	291.04	22.654
1987	272.94	299.174	26.234
1988	273.852	298.113	24.261
1989	277.344	301.154	23.811
1990	280.802	299.004	18.201
1991	288.008	303.003	14.995
1992	298.761	303.739	4.977
1993	310.308	306.92	-3.387
1994	321.163	311.561	-9.602
1995	329.047	316.167	-12.881
1996	337.099	322.484	-14.615
1997	344.305	329.803	-14.503
1998	352.094	336.114	-15.98
1999	361.262	343.883	-17.379
2000	371.52	351.656	-19.865

Table II.1. (continued)

Number of Households (000)

HH - DEFINITION

	MES.GM	B.MM	B.MM_ER
1977	124.253	NA	NA
1978	125.534	NA	NA
1979	129.727	NA	NA
1980	132.927	124.002	-8.925
1981	135.625	128.328	-7.297
1982	142.297	133.803	-8.494
1983	152.975	139.554	-13.421
1984	162.082	146.209	-15.873
1985	164.996	157.451	-7.545
1986	170.017	168.926	-1.091
1987	174.959	175.175	0.217
1988	178.651	178.266	-0.385
1989	183.039	183.519	0.48
1990	187.3	186.983	-0.317
1991	192.997	192.117	-0.88
1992	200.046	196.237	-3.809
1993	207.744	200.987	-6.758
1994	215.481	206.343	-9.138
1995	222.314	211.797	-10.517
1996	229.436	217.922	-11.513
1997	236.396	224.583	-11.813
1998	243.769	231.093	-12.676
1999	251.787	238.311	-13.476
2000	260.497	245.755	-14.743

Table II.2. Annual Average Growth Rates in Economic Projection Variables[a]

(percent)

	1980 Railbelt Study	Current Study
Households	3.42	3.48
Population	2.57	2.64
Employment	2.90	2.70

[a]Calculated between 1980 and 2000.

The moderate-moderate case is the only one which is directly comparable between the two studies. The other cases analyzed in detail in the 1980 Railbelt study were low and high economic growth, respectively, combined with moderate state government spending. In the current study, low and high economic growth cases are analyzed, but they are combined with low and high state government spending growth, respectively, to produce a wider "fan" of projection values. Nevertheless, the projection values in 2000 for the low-low and high-high cases in the old and current studies are available and are presented in Table II.3. The fan is consistently lower in newer projections. The difference is quite small, however, and consistent across both cases primarily reflecting the downward revision of the initial model values for 1980.

The regional allocation of statewide economic activity to the railbelt is practically identical between the old and the new projections. A slightly larger proportion of the state's population is allocated to the railbelt in the new projection, but the variation in that proportion over time is consistent between the old and new studies.

Table II.3. Comparison of Year 2000 Values for Former and Current Extreme Projection Cases

(thousands)

	1980 Railbelt Study	Current Study
Low-Low Scenario		
Population	574	565
Employment	288	275
Households	211	204
High-High Scenario		
Population	908	884
Employment	510	497
Households	343	324

Table II.4 indicates this by showing the proportion of the population allocated to the railbelt in the moderate-moderate case in each study.

Table II.4. Proportion of State Population in the Railbelt

	1980 Railbelt Study	Current Study
1980	67.45	71.25
2000	67.45	71.70

As a consequence of these two offsetting changes between the old and new studies--slightly lower statewide projections but slightly higher proportion allocated to the railbelt--the resultant economic projections for the railbelt are quite similar to those published in 1980. Table II.5 compares the railbelt projection values for the moderate-moderate case. These numbers reflect a slightly larger initial proportion of economic activity allocated to the railbelt throughout the projection period in the new study. In addition, the differences in 1990 reflect the change in assumptions about the timing of large project activity.

Table II.5. Moderate-Moderate Case Economic Projections for the Railbelt

(thousand)

	1980 Railbelt Study	Current Study
Population		
1980	284.4	285.3
1990	370.4	398.0
2000	472.6	483.7
Employment		
1980	134.3	138.5
1990	173.0	200.1
2000	231.3	237.8

II.B. New Initial Values

The new projections start in 1980 (rather than in 1977) using actual values or close approximations of values for that year for all variables. These values are somewhat lower, particularly for population and households, than had been previously predicted. For example, the actual value from the 1980 Census is now used for population rather than the predicted value of 421 thousand. The value for households for 1980 in the projections is still an estimate because the

1980 Census result for this variable is not yet available. Likewise, final employment totals for 1980 have not yet been published, but estimates based upon data for the first three-quarters are possible and have been utilized.

II.C. Scenario Changes

The input scenario assumptions describing both economic activity levels and state government activity levels have been completely revised and updated since the 1980 railbelt study. For the economic assumptions, this has resulted in the addition or deletion of specific projects, changes in the timing of particular projects, and changes in the employment requirements of projects. For the state government assumptions, this has resulted in the addition of new categories of expenditures as well as a higher initial base for future growth in expenditures.

Table II.6 provides a brief description, by project or sector of the economy, of input scenario assumption changes for the moderate-moderate case. Several projects have been delayed, most notably the Northwest Gas Pipeline, petroleum refinery, and the Pacific Alaska LNG project. The general level of petroleum-related activity has increased. Local-serving manufacturing employment is now assumed to expand more rapidly. The base for calculating the growth of state government spending is higher.

The result of these changes for the economic assumptions of the moderate case, as well as similar types of changes for the low and high cases are shown in Table II.7. Exogenous employment projections are higher in the current study than in the 1980 railbelt study. Comparisons of employment in agriculture-forestry-fisheries and in manufacturing cannot be made due to differences in model structure between the two studies.

Table II.6. Description of Revised Scenario Assumptions for the Moderate-Moderate Case

Project or Sector	1981 Study
1. Trans-Alaska Pipeline	No Change
2. Northwest Gas Pipeline	Delayed to become operational in 1987
3. Prudhoe Bay Petroleum Production	Across-the-board increase in activity beginning in 1981
4. Upper Cook Inlet Petroleum Production	No change
5. Development of National Petroleum Reserve Alaska	Leasing begins in 1982 with eventual discovery and development of 5 commercial fields representing 1.85 billion barrels of oil and 3.73 billion cubic feet of gas
6. Outer Continental Shelf Petroleum Production	About 6.7 billion barrels of recoverable oil and 16.4 trillion cubic feet of gas are discovered and developed from the following lease areas (year of initial lease): Beaufort 1 (1979) Cook Inlet (1981) Beaufort 2 (1983) Navarin Basin 1 (1984) Chukchi 1 (1985) Chukchi 2 (1989)
7. Petroleum Refinery	100,000 barrels per day refinery (reduced from 150,000) constructed between 1983 and 1985 (delayed one year)
8. Pacific Alaska LNG Project	Delayed one year
9. Beluga Coal Production	Development begins in 1985, and production eventually reaches 4.4 million tons per year
10. Other Mining	Other mining employment grows at 1% annually

Table II.6. (continued)

Project or Sector	1981 Study
11. Agriculture	No change
12. Fisheries/Food Processing	No change
13. Forestry/Lumber and Pulp and Paper Manufacture	No change
14. Other Manufacturing	Employment grows to equal 2% of total employment
15. Federal Government	No change
16. Tourism	Tourism employment grows at 4% annually
17. State Government	Growth in real per capita expenditures at same rates as real per capita income based upon higher FY 1982 budget.

Table II.7. Comparison of Old and New Exogenous Employment Assumptions

Low Case

B.LL

	EMGF	ECONX	EMP9	EMT9X
1980	41.328	0.09	6.377	1.533
1981	41.418	0.404	7.115	1.599
1982	41.508	1.014	7.358	1.6
1983	41.599	1.763	7.441	1.588
1984	41.69	3.169	6.461	1.55
1985	41.782	7.365	6.677	1.54
1986	41.874	11.059	6.949	1.546
1987	41.967	6.553	7.078	1.665
1988	42.06	1.301	7.34	1.658
1989	42.154	0.68	7.272	1.627
1990	42.248	0.664	7.307	1.619
1991	42.343	0.564	7.243	1.619
1992	42.438	0.611	7.269	1.619
1993	42.534	0.527	7.32	1.619
1994	42.63	0.264	7.34	1.619
1995	42.726	0.191	7.388	1.619
1996	42.823	0.084	7.341	1.619
1997	42.921	0.132	7.307	1.619
1998	43.019	0.132	7.283	1.619
1999	43.117	0.059	7.281	1.619
2000	43.216	0.018	7.278	1.619

LES.GM

	EMGF	ECONX	EMP9	EMT9X
1977	42.831	5.3	4.6	1.5
1978	42.825	0. .	5.562	1.5
1979	43.	0.09	4.827	1.5
1980	43.2	0.09	5.075	1.5
1981	43.4	0.59	5.163	1.5
1982	43.6	2.885	7.322	1.5
1983	43.7	7.823	8.096	1.5
1984	43.8	7.038	7.624	1.5
1985	43.9	1.563	5.134	1.5
1986	44.	0.	5.097	1.7
1987	44.1	0.	5.075	1.7
1988	44.2	0.	5.054	1.7
1989	44.3	0.	4.25	1.7
1990	44.4	0.	5.011	1.7
1991	44.5	0.	4.99	1.7
1992	44.6	0.	4.969	1.7
1993	44.7	0.	4.949	1.7
1994	44.8	0.	4.928	1.7
1995	44.9	0.	4.908	1.7
1996	45.	0.	4.888	1.7
1997	45.1	0.	4.868	1.7
1998	45.2	0.	4.848	1.7
1999	45.3	0.	4.829	1.7
2000	45.4	0.	4.81	1.7

B.LL = New Scenario

LES.GM = Old Scenario

EMGF = Federal Government Employment
ECONX = Exogenous Construction Employment
EMP9 = Mining Employment
EMT9X = Exogenous Transportation Employment

Table II.7. (continued)

Moderate Case

B.MM

	EMGF	ECONX	EMP9	EMT9X
1980	41.328	0.09	6.408	1.533
1981	41.418	1.092	7.112	1.599
1982	41.508	1.626	7.34	1.6
1983	41.599	3.366	7.632	1.641
1984	41.69	5.432	6.92	1.692
1985	41.782	10.815	7.376	1.988
1986	41.874	13.056	7.605	1.869
1987	41.967	8.58	7.744	2.093
1988	42.06	3.218	7.73	2.2
1989	42.154	3.259	8.122	2.331
1990	42.248	3.329	8.856	2.66
1991	42.343	3.49	10.05	2.937
1992	42.438	2.669	10.487	2.761
1993	42.534	1.906	10.711	2.73
1994	42.63	2.473	10.822	2.722
1995	42.726	2.313	11.058	2.722
1996	42.823	2.195	11.431	2.722
1997	42.921	2.457	11.734	2.722
1998	43.019	1.592	12.05	2.722
1999	43.117	1.295	12.426	2.722
2000	43.216	1.472	12.454	2.722

MES.GM

	EMGF	ECONX	EMP9	EMT9X
1977	42.831	5.3	4.6	1.5
1978	42.825	0.	5.562	1.5
1979	43.	0.09	4.827	1.5
1980	43.2	0.09	5.139	1.5
1981	43.4	0.714	5.317	1.5
1982	43.6	4.335	7.713	1.525
1983	43.7	9.889	8.477	1.536
1984	43.8	9.583	8.061	1.536
1985	43.9	2.355	5.423	1.577
1986	44.	1.027	5.774	2.185
1987	44.1	1.139	6.366	2.318
1988	44.2	1.138	6.655	1.31
1989	44.3	1.083	6.747	2.349
1990	44.4	0.482	6.537	2.331
1991	44.5	1.909	6.538	2.259
1992	44.6	2.519	6.849	2.549
1993	44.7	2.701	7.261	2.621
1994	44.8	1.084	8.089	2.668
1995	44.9	0.307	8.151	2.705
1996	45.	0.252	8.249	2.876
1997	45.1	0.152	8.165	2.716
1998	45.2	0.305	8.007	2.662
1999	45.3	0.4	8.042	2.596
2000	45.4	0.545	8.054	2.573

B.MM = New Scenario

MES.GM = Old Scenario

EMGF = Federal Government Employment
ECONX = Exogenous Construction Employment
EMP9 = Mining Employment
EMT9X = Exogenous Transportation Employment

Table II.7. (continued)

High Case

B.HH

	EMGF	ECONX	EMP9	EMT9X
1980	41.417	0.3	6.599	1.533
1981	41.598	0.51	7.215	1.534
1982	41.781	1.54	7.423	1.569
1983	41.965	4.305	7.707	1.659
1984	42.152	7.14	7.069	1.717
1985	42.34	14.727	7.779	1.904
1986	42.53	21.477	8.843	2.417
1987	42.722	14.844	9.929	2.939
1988	42.916	8.383	12.39	3.838
1989	43.112	6.224	13.624	4.384
1990	43.31	5.11	16.063	4.569
1991	43.51	4.743	16.777	4.826
1992	43.712	6.787	16.878	4.722
1993	43.916	4.916	17.516	4.872
1994	44.122	3.986	19.535	5.163
1995	44.33	5.183	20.1	5.044
1996	44.54	3.993	20.726	5.09
1997	44.752	2.681	22.027	5.09
1998	44.966	2.067	22.113	5.09
1999	45.183	0.854	23.05	5.09
2000	45.401	1.345	22.894	5.09

HES.GM

	EMGF	ECONX	EMP9	EMT9X
1977	42.831	5.3	4.6	1.5
1978	42.825	0.	5.562	1.5
1979	43.	0.09	4.827	1.5
1980	43.2	0.24	5.163	1.5
1981	43.4	0.789	5.364	1.5
1982	43.6	3.96	7.784	1.525
1983	43.8	11.289	8.695	1.582
1984	43.9	14.488	8.41	1.644
1985	44.1	8.963	6.051	1.855
1986	44.3	8.372	6.599	2.481
1987	44.5	3.458	7.259	2.558
1988	44.7	2.933	7.999	2.929
1989	44.9	2.749	8.401	2.662
1990	45.1	3.884	9.885	2.744
1991	45.3	6.293	10.601	2.972
1992	45.5	6.701	11.261	3.291
1993	45.8	6.279	11.911	3.397
1994	46.	4.158	12.749	3.722
1995	46.2	3.193	13.243	3.776
1996	46.4	3.436	13.808	3.901
1997	46.6	3.101	13.966	3.986
1998	46.8	2.66	14.259	3.913
1999	47.	0.714	14.65	3.796
2000	47.3	0.798	14.639	3.751

B.HH = New Scenario

HES.GM = Old Scenario

EMGF = Federal Government Employment
ECONX = Exogenous Construction Employment
EMP9 = Mining Employment
EMT9X = Exogenous Transportation Employment

II.D. Model Changes

A large number of changes to the structure of the MAP econometric model and the regionalization procedure have been incorporated into this study. These changes are designed to improve the ability of the models to describe the economy and its response to change. The changes are described briefly in this section, and then the effect of the changes is assessed.

Stochastic equations. All of the stochastic equations in the economic component of the model as well as a majority of the equations in the other model components have been reestimated incorporating data for 1978 and 1979. These new equations, the resulting coefficients, and the accompanying statistics are presented in an appendix to this report.

In general, the relationships represented by the equations proved to be relatively stable with the addition of two new data points covering the post-Alyeska pipeline "soft" years of the Alaskan economy. The major exception to this is in the set of equations which determines wage rates by industry.

What has happened is that for the first time, a time series is available covering all phases of the major economic event of the 1970s--Alyeska pipeline construction. Thus, we can now more accurately assign explanatory power for wage rates between direct pipeline construction activity and other activity within the economy. The new results reflect an increase in the proportion of the annual change in the real wage rate explained by direct pipeline construction activity. The implication of this is that the long-run general responsiveness of real wage rates as reflected by the model is somewhat reduced. This leads to a reduction in projection results when other factors are held constant. This change is analyzed in more detail in an appendix to this study.

In addition to adding two data points to most stochastic equations, the specification of some equations has been changed. These specification changes are designed to better represent the relationship between the independent variables and the dependent variable.

Tourism. The tourism industry is now explicitly identified within the model, whereas it was previously only implicit. Implicit treatment of the industry did not introduce major problems in model projections as long as tourism was projected to grow at about the same rate as the overall economy.

The primary reason for not explicitly treating the tourism industry has been a lack of any reliable employment or output data for the industry in time series form. This is because tourism is a component of several industries, primarily transportation, services, and trade, but the proportion of each of these industries which supports tourism actively is difficult to separate out from other demands for industry output.

It is important to treat tourism explicitly in two instances. First, for impact analysis, the implicit treatment of tourism results in an overestimate of the economic impact of projects and policies since some of the calculated impact is really a change in tourism activity. Second, when projection scenarios require different assumptions about the growth of the tourism industry which is one of the basic sectors of the economy, it is necessary to treat tourism explicitly.

Tourism is explicitly treated in the current version of the model by netting out a portion of activity in the transportation, services, and trade industries and reassigning that activity to tourism. This tourism activity is a function of the number of tourists who visit the state. The analysis underlying this model change is described in detail in a working paper prepared for the Alaskan Outer Continental Shelf Office of the Bureau of Land Management, entitled Improvements to Specification of the MAP Model (November 1981).

Fisheries. In the past, data on the number of Alaskan fishermen has not been available in a form comparable to employment data for other industries. A comparable time series for Alaskan fishermen has recently been compiled by George Rogers and published in Measuring the Socioeconomic Impacts of Alaska's Fisheries (ISER, 1980).

The previous method of dealing with the fishing industry was to treat it primarily as a component of proprietary employment with a small portion as wage and salary employment in the agriculture-forestry-fishery sector. Since proprietary employment is a function of total employment, the fishing industry generally grew at the same rate as the overall economy.

Now economic activity in the fishing industry is independent of other proprietary income or employment. It is specified as a part of the economic scenario and is added to nonfishery proprietary employment to yield total proprietary employment. The analysis underlying this change is described in detail in the working paper Improvements to Specification of the MAP Model.

Manufacturing. Previously, manufacturing was treated exogenously as a single industry. Employment and output were specified in the economic scenarios. In recognition of the fact that there is a small but identifiable local-serving component of the manufacturing industry within the state, manufacturing is now divided into exogenous and local-serving components.

The local-serving component of manufacturing is now a function of overall local Alaskan demand. The exogenous component of manufacturing is also divided into two parts. One part, consisting of all current exogenous manufacturing in lumber, pulp and paper, and food processing, is defined as regular-wage manufacturing. The other part is defined as premium-wage manufacturing and is designed to accommodate manufacturing employment additions at substantially higher wage rates than the current industry average. Examples of such industries would be petrochemicals or large-scale petroleum refining.

Construction. The construction industry has always been separated into exogenous and local-serving components. Furthermore, exogenous construction is of two types. The first involves premium-wage, remote-site, enclave-type employment, while the latter involves employment at the normal construction wage in urbanized parts of the economy.

In addition to earning different annual average wage rates due to special skill differences as well as hours worked, the two types of exogenous construction employment have different effects on the economy in other ways. Specifically, the disposable income associated with premium wage construction employment has a different effect on aggregate demand than other sources of income.

In past versions of the model, exogenous construction employment has also had a positive effect on real wage rates, reflecting the fact that this employment was associated with labor market tightness. In the current version of the model, only premium-wage construction employment has this effect. It is assumed that regular-wage exogenous construction employment by itself does not directly affect the level of real wages in other industries.

State Expenditures. In this analysis, as in the 1980 Railbelt Study, state government expenditures are programmed to grow in a way which reflects different elasticities of real per capita expenditures to real per capita income. In the previous version of the model, the definition of real per capita income included all income and all population. As a result, during periods of substantial high-wage, temporary construction employment which would increase the level of real per capita personl income substantially above the long-term trend, state government expenditures would rise rapidly and essentially ratchet upward.

This result does not appear consistent with the historical pattern of growth of state expenditures which appears to follow a trend more closely and to ratchet upward when state revenues increase at an unexpectedly rapid rate. Consequently, in the current version of the model, the definition of real personal income used to drive growth of government spending excludes premium wage enclave-type construction-related income. This is consistent with the idea that a portion of that income and population are only in the state temporarily.

Household Formation. The household formation model has been recalibrated based upon recent national trends and fragmentary non-census data for Alaska. Data from the 1980 Census with which to do a full recalibration is not yet available. The changes made and current model structure are described in an appendix to this report.

The Components of State Government Spending. Since the formulation of the model to do the projections for the 1980 Railbelt Study, state government spending has expanded much more rapidly than had previously been anticipated. The growth in government employment, however, has not kept pace. Rather, what has happened is that a large portion of the additional expenditures has gone into new or expanded programs which do not require a lot of labor. These include transfers to individuals, expanded tax assistance programs for local government, subsidies for certain activities like home purchase, special capital project funds, and wage increases for employees.

These structural changes are reflected in the current version of the model. The specific assumptions surrounding these new programs are described in more detail in the appendix in which the economic and policy scenario assumptions are discussed.

Effect of Model Changes. It has not been possible to compare the model version used in the 1980 Railbelt Study with the current version of the model used in this study. This is because changes in the structure of the model make it impossible to use exactly the same economic and policy scenario assumptions in each model. For example, in the old version of the model, tourism and fisheries employment were not specified while in the new version of the model, they are exogenously determined. On the other hand, manufacturing employment now has a local-serving component while previously it was all exogenous. It is particularly difficult to force comparability between the two models in the state government sector.

Nevertheless, some exploratory testing was done to compare the two models by running both with the same input scenario as much as possible. The newer version of the model results in substantially lower projection values than the older version of the model. If we look at employment, it appears that about half of the difference is the result of differences in starting values (1980) and different levels of government spending. The rest of the difference apparently is due to the new coefficient values in the wage rate equations.

III. Summary of Appendix Material

The appendixes to this report are technical documents which will only interest the specialist. They describe various model elements and studies of the structure of particular model elements in an effort to document as completely as possible the work done under this project. Brief summaries of each appendix follow.

III.A. Economic and Policy Scenarios for Railbelt Electric Power Study

All the assumptions about economic activity and state government spending behavior used in the projections are laid out in detail.

III.B. Assumptions Used to Calculate OCS Employment

Development of petroleum resources of the Outer Continental Shelf is an important element of the development scenarios. This paper describes in detail how the assumptions about discoveries are converted into assumptions about employment which can be used to project economic activity.

III.C. Description of the Household Formation Model

The household formation model was revised for this study. The parameter values were adjusted to reflect the trend toward smaller average household size observed since 1970. The assumptions used to project a continuing decline in average household size in future years are presented and defended.

III.D. MAP Model Wage Rate Specification

The form of the equations used to determine the wage rates in the MAP model is described. Historical patterns of wage rate movements in Alaska and the United States are reviewed to support the form of the equations chosen. The results of several simulation tasks are presented which test the sensitivity of the projection results to changes in coefficient values and projected national trends. The projections are insensitive to coefficient variation but exhibit sensitivity to the projected growth rate in the real wage in the United States.

III.E. MAP Model Migration Specification

The method used in the MAP model to project migration is described. Test results are presented which indicate the stability of the projections to this formulation. Simulation test results are presented which test the sensitivity of projection results to changes in coefficient values and projected national trends. The model is not sensitive to the projected growth rate of real per capita income in the United States. It is sensitive to a change in the coefficient of the migration equation determining the migration response to a change of employment in Alaska. The projection results in such a test are not reasonable, however, because the proportion of the total population employed rises too high (reduction in coefficient value) or falls too low (increase in coefficient value).

III.F. Regionalization Model

A new method was developed for allocating statewide economic activity to the railbelt for this study. It is based upon a sound theoretical framework which reflects the idea that railbelt economic growth is determined not only by activity occurring within the railbelt but also by activity which occurs outside the railbelt. This is because the railbelt forms the economic support center for the entire state.

III.G. Stochastic Equation Estimation Results

Most equations of the MAP model using coefficients which are statistically estimated have been re-estimated incorporating data from the most recent years. The statistics for these equations are presented in this final appendix.

Appendix A

ECONOMIC AND POLICY SCENARIOS FOR RAILBELT ELECTRIC POWER STUDY

Contents

I. Introduction

The forecasting of future economic activity requires the use of a methodology which adequately captures the inherent uncertainty characteristic of events and policies critical to the shaping of such future development. The approach used in this study involves construction of a set of scenarios, each consisting of a consistent set of explicit assumptions concerning the variables treated as exogenous by the forecasting model. Collectively, these scenarios span what we consider to be a plausible range of future development patterns, although no single scenario is to be interpreted as a best guess of such development. This report describes in detail the scenarios to be utilized in the study.

Each scenario combines two general categories of assumptions--those concerned with the level of employment in the sectors of the Alaskan economy treated as exogenous by the MAP model and those concerned with policy choices which will be made by state government. These two categories of assumptions, which will be described as "economic" assumptions and policy assumptions, are described fully in the following two sections.

II. The Economic Assumptions

A. OVERVIEW

Five sets of economic assumptions were developed. The first three sets of assumptions correspond to a range of economic activity whose occurrence depends largely on factors other than the availability of Susitna hydropower. These three scenarios--the high, moderate, and low cases--are updated versions of the three economic scenarios presented by the Institute of Social and Economic Research (ISER) to the State of Alaska House Power Alternatives Study Committee (see Goldsmith and Huskey, 1980) in May of 1980. The fourth scenario, which will be called the industrialization scenario, consists of the addition of several major industrial projects in the railbelt region, at least several of which may be contingent on the availability of low-cost hydropower.

A fifth scenario, which will be called the "extreme" high case, consists of all activities in the basic high-growth case as well as those included in the industrialization scenario and, consequently, may be interpreted as a somewhat extreme upper bound on activity likely to occur during the forecast period.

These scenarios consist of two general types of assumptions--those concerned with employment generated by specific projects affecting several industries simultaneously and those concerning the development of several exogenous industries in the Alaskan economy. Part B proceeds to describe the special project assumptions. Part C then turns to the industry-wide assumptions.

B. SPECIAL PROJECT ASSUMPTIONS

Widely differing special projects with major implications for future Alaskan development have been proposed by a variety of federal and state agencies and private developers. Each project generates direct employment in one or more of the sectors of the Alaskan economy treated as exogenous by the MAP forecasting model. These sectors are manufacturing, mining, and parts of the construction and transportation sectors. This section examines the direct employment generated by each of the major projects either currently in operation or proposed, the sectoral composition of such employment, and its location in the state.

Each of the tables prefixed by "S" on the following pages presents a breakdown of statewide exogenous employment by sector, as shown in Table 1. Each table prefixed by an "R" presents the locational breakdown of such exogenous employment by region, with the regions given in Figure 1 and Table 2. Generally, the regions correspond to census divisions, with two exceptions. Region Ø6 corresponds to a combination of the Bristol Bay and Bristol Bay Borough Census Divisions, and Region 11 corresponds to the eight census divisions of Southeast Alaska.

TABLE 1. EMPLOYMENT SECTOR CODES

Code	Sector
EMP9	Mining
ECONX1	High Wage Construction
ECONX2	Average Wage Construction
EMMX1	High Wage Manufacturing
EMMX2	Average Wage Manufacturing
EMT9X	Transportation
EMA9	Agriculture and Forestry Employment
EMPROF	Fish Harvesting
EMGF	Federal Government

FIGURE 1
Census Divisions

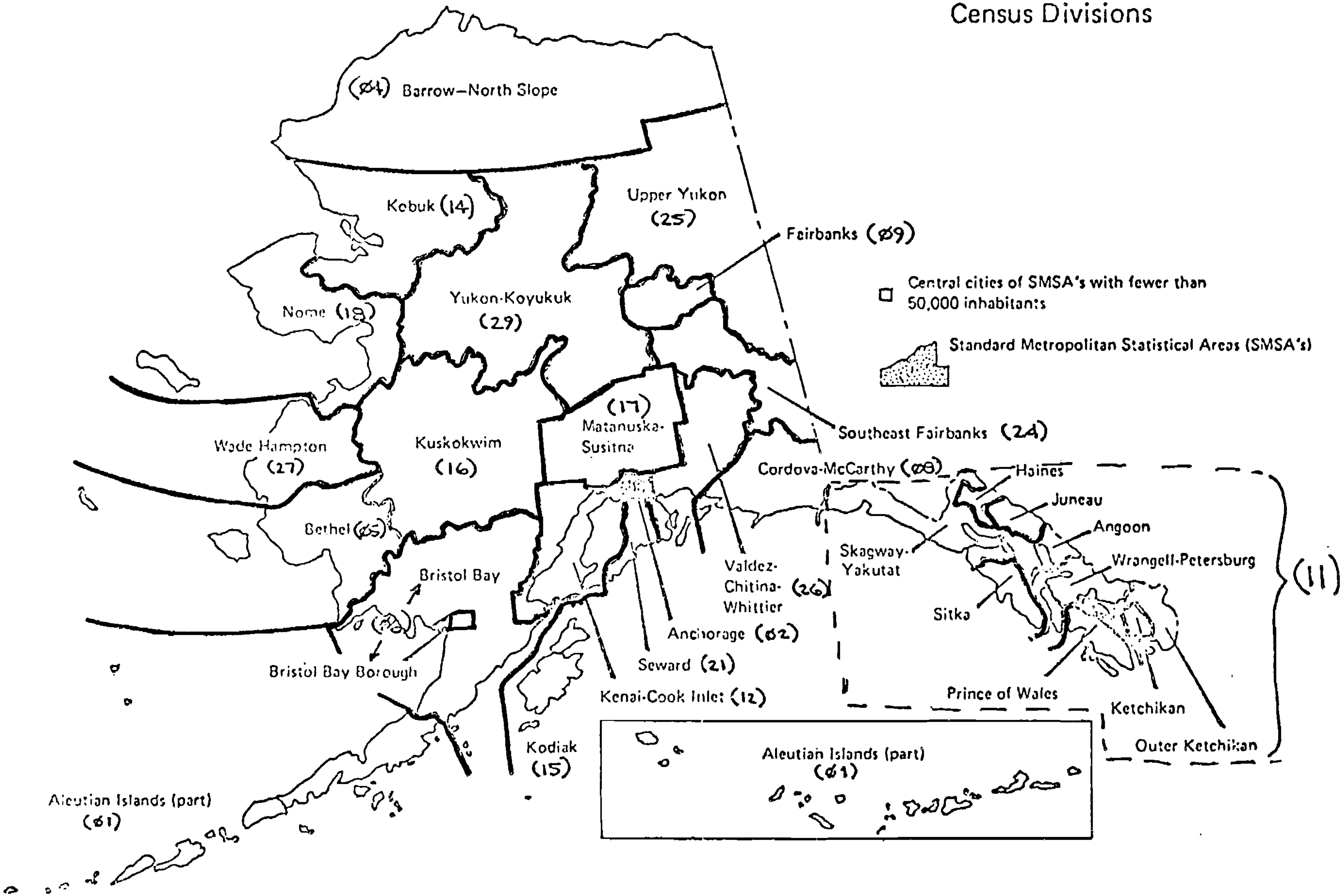

TABLE 2. REGIONAL IDENTIFIERS

Code	Region	
Ø1	Aleutian Islands CD	
Ø2	Anchorage CD	
Ø4	Barrow/North Slope CD	
Ø5	Bethel CD	
Ø6	Bristol Bay, includes:	Bristol Bay CD
		Bristol Bay Borough CD
Ø8	Cordova/McCarthy CD	
Ø9	Fairbanks CD	
11	Southeast, includes:	Angoon CD
		Haines CD
		Juneau CD
		Ketchikan CD
		Outer Ketchikan CD
		Prince of Wales CD
		Sitka CD
		Skagway-Yakutat CD
		Wrangell-Petersburg CD
12	Kenai/Cook Inlet CD	
14	Kobuk CD	
15	Kodiak CD	
16	Kuskokwim CD	
17	Matanuska/Susitna CD	
18	Nome CD	
21	Seward CD	
24	Southeast Fairbanks CD	
25	Upper Yukon CD	
26	Valdez/Chitina/Whittier CD	
27	Wade Hampton CD	
29	Yukon/Koyukuk CD	

1. Trans-Alaska Pipeline (Alyeska)

Trans-Alaska Pipeline Service (TAPS) employment through 1977 included only the exogenous construction employment engaged in the initial construction of the pipeline. After completion in 1977, employment has been of two types. First, there is additional construction of four pump stations (see Oil and Gas Journal, 2/25/80, p. 72), and second, there is exogenous transportation sector employment associated with operation of the line. These employment schedules are given in Tables S-1 and R-1 and are common to all five economic scenarios.

TABLE S-1. STATEWIDE EMPLOYMENT BY SECTOR
TAPS PROJECT

- ALL CASES -

TAP.XXX

	ECONX1	EMT9X	MTOT
1980	0.09	1.5	1.59
1981	0.09	1.5	1.59
1982	0.09	1.5	1.59
1983	0.	1.5	1.5
1984	0.	1.5	1.5
1985	0.	1.5	1.5
1986	0.	1.5	1.5
1987	0.	1.5	1.5
1988	0.	1.5	1.5
1989	0.	1.5	1.5
1990	0.	1.5	1.5
1991	0.	1.5	1.5
1992	0.	1.5	1.5
1993	0.	1.5	1.5
1994	0.	1.5	1.5
1995	0.	1.5	1.5
1996	0.	1.5	1.5
1997	0.	1.5	1.5
1998	0.	1.5	1.5
1999	0.	1.5	1.5
2000	0.	1.5	1.5

SOURCE: Construction estimate based on assumed installation of four pump stations adding capacity of .15 mmbd each, from Beaufort OCS Development Scenarios, Dames and Moore, 1978.

Operations employment from Alaska Economic Trends, Alaska Dept. of Labor, October 1978.

TABLE R-1. REGIONAL DISTRIBUTION OF EMPLOYMENT
TAPS PROJECT

- ALL CASES -

TAP.XXX

	B04	B09	B24	B26	B29	MTOTR
1980	0.474	0.169	0.079	0.316	0.552	1.59
1981	0.474	0.079	0.079	0.316	0.642	1.59
1982	0.474	0.079	0.079	0.406	0.552	1.59
1983	0.474	0.079	0.079	0.316	0.552	1.5
1984	0.474	0.079	0.079	0.316	0.552	1.5
1985	0.474	0.079	0.079	0.316	0.552	1.5
1986	0.474	0.079	0.079	0.316	0.552	1.5
1987	0.474	0.079	0.079	0.316	0.552	1.5
1988	0.474	0.079	0.079	0.316	0.552	1.5
1989	0.474	0.079	0.079	0.316	0.552	1.5
1990	0.474	0.079	0.079	0.316	0.552	1.5
1991	0.474	0.079	0.079	0.316	0.552	1.5
1992	0.474	0.079	0.079	0.316	0.552	1.5
1993	0.474	0.079	0.079	0.316	0.552	1.5
1994	0.474	0.079	0.079	0.316	0.552	1.5
1995	0.474	0.079	0.079	0.316	0.552	1.5
1996	0.474	0.079	0.079	0.316	0.552	1.5
1997	0.474	0.079	0.079	0.316	0.552	1.5
1998	0.474	0.079	0.079	0.316	0.552	1.5
1999	0.474	0.079	0.079	0.316	0.552	1.5
2000	0.474	0.079	0.079	0.316	0.552	1.5

2. Alaska Natural Gas Transportation System

In December 1980, the Northwest Alaskan Pipeline Company received rights of way for the Alaskan portion of a 4,800-mile pipeline to transport natural gas from Prudhoe Bay to the United States West Coast and Midwest (see Oil and Gas Journal, 12/8/80, p. 50). Construction of the 741-mile Alaskan portion of the line and an accompanying gas conditioning plant on the North Slope is expected to get underway in 1981 and to be operational by 1987. Construction employment is expected to peak at 10,589 in 1986, falling to a long-term employment of 319 persons in transportation and petroleum sector employment, as shown in Tables S-2 and R-2. These assumptions are common to all five economic scenarios.

Table S-2. Statewide Employment By Sector
Alaska Natural Gas Transportation System

- All Cases -

NWG.MG1

	EMP9	ECONX1	EMT9X	MTOT
1980	0.	0.	0.	0.
1981	0.	0.217	0.	0.217
1982	0.	0.217	0.	0.217
1983	0.	0.563	0.	0.563
1984	0.	2.435	0.	2.435
1985	0.	7.103	0.	7.103
1986	0.16	10.589	0.	10.749
1987	0.2	6.074	0.119	6.393
1988	0.2	0.468	0.119	0.787
1989	0.2	0.	0.119	0.319
1990	0.2	0.	0.119	0.319
1991	0.2	0.	0.119	0.319
1992	0.2	0.	0.119	0.319
1993	0.2	0.	0.119	0.319
1994	0.2	0.	0.119	0.319
1995	0.2	0.	0.119	0.319
1996	0.2	0.	0.119	0.319
1997	0.2	0.	0.119	0.319
1998	0.2	0.	0.119	0.319
1999	0.2	0.	0.119	0.319
2000	0.2	0.	0.119	0.319

SOURCE: M. Mogford and S. Goldsmith, "The Relationship Between the Alaska Natural Gas Pipeline and State and Local Government Expenditures," Institute of Social and Economic Research, 1980.

Table R-2. Regional Distribution of Employment
Alaska Natural Gas Transportation System

- All Cases -

NWG.MG1

	B04	B09	B24	B25	MTOTR
1980	0.	0.	0.	0.	0.
1981	0.046	0.069	0.037	0.065	0.217
1982	0.046	0.069	0.037	0.065	0.217
1983	0.209	0.225	0.047	0.082	0.563
1984	0.787	0.741	0.33	0.577	2.435
1985	2.207	1.637	1.185	2.074	7.103
1986	2.997	2.062	2.069	3.621	10.749
1987	1.663	1.491	1.191	2.048	6.393
1988	0.331	0.145	0.126	0.185	0.787
1989	0.228	0.008	0.043	0.04	0.319
1990	0.228	0.008	0.043	0.04	0.319
1991	0.228	0.008	0.043	0.04	0.319
1992	0.228	0.008	0.043	0.04	0.319
1993	0.228	0.008	0.043	0.04	0.319
1994	0.228	0.008	0.043	0.04	0.319
1995	0.228	0.008	0.043	0.04	0.319
1996	0.228	0.008	0.043	0.04	0.319
1997	0.228	0.008	0.043	0.04	0.319
1998	0.228	0.008	0.043	0.04	0.319
1999	0.228	0.008	0.043	0.04	0.319
2000	0.228	0.008	0.043	0.04	0.319

3. Prudhoe Bay Petroleum Production

Prudhoe Bay developments include employment associated with primary recovery operations from the Sadlerochit formation, secondary recovery (using water flooding) of that formation, new developments of the Kuparuk formation west of Prudhoe Bay, and the permanent work force of Atlantic Richfield Company (ARCO) and British Petroleum (BP) at the main Prudhoe base headquarters, and a variety of exploration efforts outside of the Sadlerochit and Kuparuk areas. The key assumptions serving as the basis for the employment forecasts are the following:

- Seven rigs (4 Sohio, 3 ARCO) continue development drilling at a rate of 14 wells per year per rig through 1983 (based on estimated activity in Oil and Gas Journal, 2/25/80, p. 88).
- The proposed Prudhoe water flooding project begins in 1981 and is completed by 1985, adding approximately 1 billion barrels of recoverable reserves to Prudhoe. Construction employment peaks at over 1,000 in 1983, and operations employment adds 300 to the permanent Prudhoe work force (Corps of Engineers, 1980).
- The Kuparuk formation west of Prudhoe is developed. Production at a rate of 60,000 bbls. per day begins in 1982, rising to 120,000 bbls. per day by 1984 (Oil and Gas Journal, 4/2/79).
- Permanent ARCO and BP employment on the North Slope rises from 1,000 in 1977 to 1,667 in 1983, remaining constant thereafter (based on Prudhoe Bay Case Study, OCS Program Technical Report No. 4).
- Ten additional rigs are active in exploration and development outside of the Sadlerochit and Kuparuk areas.

The resulting employment forecast for Prudhoe Bay, which again is common to all economic scenarios, is presented in Tables S-3 and R-3.

Table S-3. Statewide Employment By Sector
Prudhoe Bay Petroleum Production

- All Cases -

PRB.081

	EMP9	ECONX2	MTOT
1980	2.369	0.	2.369
1981	2.907	0.035	2.942
1982	3.018	0.491	3.509
1983	3.129	1.065	4.194
1984	2.202	0.484	2.686
1985	2.502	0.05	2.552
1986	2.502	0.	2.502
1987	2.502	0.	2.502
1988	2.502	0.	2.502
1989	2.502	0.	2.502
1990	2.502	0.	2.502
1991	2.502	0.	2.502
1992	2.502	0.	2.502
1993	2.502	0.	2.502
1994	2.502	0.	2.502
1995	2.502	0.	2.502
1996	2.502	0.	2.502
1997	2.502	0.	2.502
1998	2.502	0.	2.502
1999	2.502	0.	2.502
2000	2.502	0.	2.502

SOURCE: Construction employment is that associated with Prudhoe waterflood project, from U.S. Army Corps of Engineers, Final EIS, Prudhoe Bay Oilfield Waterflood Project, pp. 2-60. For mining employment sources, see text.

Table R-3. Regional Distribution of Employment
Prudhoe Bay Petroleum Production

- All Cases -

PRB.081

	BO4	MTOTR
1980	2.369	2.369
1981	2.942	2.942
1982	3.509	3.509
1983	4.194	4.194
1984	2.686	2.686
1985	2.552	2.552
1986	2.502	2.502
1987	2.502	2.502
1988	2.502	2.502
1989	2.502	2.502
1990	2.502	2.502
1991	2.502	2.502
1992	2.502	2.502
1993	2.502	2.502
1994	2.502	2.502
1995	2.502	2.502
1996	2.502	2.502
1997	2.502	2.502
1998	2.502	2.502
1999	2.502	2.502
2000	2.502	2.502

4. Upper Cook Inlet Petroleum Production

Petroleum sector employment in the Kenai-Cook Inlet Census Division was 778 in 1979 (4 quarter average employment, taken from Alaska Department of Labor, Statistical Quarterly, 1979 issues), consisting of exploration, development, and production associated with the Kenai oil and gas fields. Currently, the 120,000 barrels per day output of oil is expected to decline drastically over the forecast period, possibly as fast as 15-20 percent per year. The decline may be partially slowed, however, by a possible redrilling program being considered by the operators (see Oil and Gas Journal, 2/4/80, p. 36); and in any case, the prospects for gas development are brighter than those for oil. Gas production is likely to expand from its current 5,000 MMCF per day once the LNG facility proposed by Pacific Lighting and Pacific Gas and Electric (see below) are constructed even without any substantial new discoveries. It is assumed that these increases, coupled with continued exploration activity and possible enhanced recovery of oil, will be adequate to maintain Upper Cook Inlet petroleum employment at its 1978 level throughout the forecast period, as shown in Table S-4 and R-4. This employment forecast is common to all economic scenarios.

Table S-4. Statewide Employment By Sector
Upper Cook Inlet Petroleum Production

- All Cases -

UPC.011

	EMP9	MTOT
1980	0.778	0.778
1981	0.778	0.778
1982	0.778	0.778
1983	0.778	0.778
1984	0.778	0.778
1985	0.778	0.778
1986	0.778	0.778
1987	0.778	0.778
1988	0.778	0.778
1989	0.778	0.778
1990	0.778	0.778
1991	0.778	0.778
1992	0.778	0.778
1993	0.778	0.778
1994	0.778	0.778
1995	0.778	0.778
1996	0.778	0.778
1997	0.778	0.778
1998	0.778	0.778
1999	0.778	0.778
2000	0.778	0.778

Table R-4. Regional Distribution of Employment
Upper Cook Inlet Petroleum Production

\- All Cases -

UPC.O11

	B12	MTOTR
1980	0.778	0.778
1981	0.778	0.778
1982	0.778	0.778
1983	0.778	0.778
1984	0.778	0.778
1985	0.778	0.778
1986	0.778	0.778
1987	0.778	0.778
1988	0.778	0.778
1989	0.778	0.778
1990	0.778	0.778
1991	0.778	0.778
1992	0.778	0.778
1993	0.778	0.778
1994	0.778	0.778
1995	0.778	0.778
1996	0.778	0.778
1997	0.778	0.778
1998	0.778	0.778
1999	0.778	0.778
2000	0.778	0.778

5. Development of the National Petroleum Reserve in Alaska (NPR-A)

The National Petroleum Reserve in Alaska (previously NPR-4) has been the target of publicly sponsored exploration for oil and gas since World War II, first by the Navy and later by the Interior Department. The first exploration program began in 1944 and ended in 1953, after discovery of nine oil and gas fields, all but one being noncommercial (the largest gas field, the Barrow gas field, currently produces for local consumption). In 1974 Congress directed the Navy to resume exploration, eventually transferring the program to the Department of Interior in 1977. To date, this most recent exploration program has produced 22 dry holes and several test wells planned or in progress (Oil and Gas Journal, 12/8/80, p. 36).

Nonetheless, USGS estimates that NPR-A can be expected to contain 5.96 billion barrels of oil in place and 11.3 trillion cubic feet of gas, about 26 percent of which is likely to be recoverable. A study of alternative methods for development of the reserve was completed in 1979 by Interior (see Final Report of the 105(b) Economic and Policy Analysis, 12/15/79). In late 1980, Congress passed legislation requiring that the reserve be opened to private leasing by 1982 (Oil and Gas Journal, 12/8/80). Interior has issued a call for nominations and has scheduled the first sale on December 16, 1981 (Oil and Gas Journal, September 21, 1981).

In the high and extreme high scenarios, it is assumed that leasing begins as planned late this year. Traditional bonus bidding with fixed royalties is the leasing method, as described in Management Plan 2 of the Interior 105(b) study. Five commercial fields are discovered and developed, representing 1.85 billion barrels of oil and 3.73 trillion cubic feet of gas, as in the mean scenario of the 105(b) study. Construction associated with the development includes 525 miles of pipeline. Construction employment peaks at about 1,000 following each of the several discoveries. Petroleum sector employment averages 460/year, and pipeline operation adds 137 to the transportation sector work force, as shown in Tables S-5a and R-5a.

Table S-5a. Statewide Employment By Sector
National Petroleum Reserve in Alaska

- High Case -
- Extreme High Case -

NPR.HGH

	EMP9	ECONX2	EMT9X	MTOT
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.075	0.	0.075
1983	0.	0.075	0.	0.075
1984	0.088	0.363	0.	0.451
1985	0.176	0.987	0.	1.163
1986	0.23	1.099	0.	1.329
1987	0.443	0.765	0.	1.208
1988	0.354	0.314	0.107	0.775
1989	0.374	0.541	0.137	1.052
1990	0.354	1.092	0.137	1.583
1991	0.408	1.174	0.137	1.719
1992	0.533	0.765	0.137	1.435
1993	0.444	0.314	0.137	0.895
1994	0.464	0.541	0.137	1.142
1995	0.444	1.092	0.137	1.673
1996	0.498	1.174	0.137	1.809
1997	0.623	0.765	0.137	1.525
1998	0.534	0.314	0.137	0.985
1999	0.554	0.541	0.137	1.232
2000	0.534	1.092	0.137	1.763

SOURCE: See text.

Table R-5a. Regional Distribution of Employment
National Petroleum Reserve in Alaska

- High Case -
- Extreme High Case -

NPR.HGH

	B02	B04	MTOTR
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.075	0.075
1983	0.	0.075	0.075
1984	0.009	0.442	0.451
1985	0.018	1.145	1.163
1986	0.023	1.306	1.329
1987	0.044	1.164	1.208
1988	0.035	0.74	0.775
1989	0.037	1.015	1.052
1990	0.035	1.548	1.583
1991	0.041	1.678	1.719
1992	0.053	1.382	1.435
1993	0.044	0.851	0.895
1994	0.046	1.096	1.142
1995	0.044	1.629	1.673
1996	0.05	1.759	1.809
1997	0.062	1.463	1.525
1998	0.053	0.932	0.985
1999	0.055	1.177	1.232
2000	0.053	1.71	1.763

In the moderate and the industrialization scenarios, it is assumed that the same level of resources are eventually discovered, but at a far slower rate. Again, leasing begins in late 1981, but employment reaches only half the levels assumed in the high scenario, as shown in Tables S-5b and R-5b.

In the low scenario, private leasing again occurs in 1981, but the ensuing development consists only of a string of unsuccessful exploratory wells. In this case, the only employment generated is that associated with exploratory drilling, which simply replaces employment lost in phasing out the public program ending in 1981 so that there is no net increase in exogenous petroleum employment.

Table S-5b. Statewide Employment By Sector
National Petroleum Reserve in Alaska

- Moderate Case -
- Industrialization Case -

NPR.MOD

	EMP9	ECONX2	EMT9X	MTOT
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.038	0.	0.038
1983	0.	0.038	0.	0.038
1984	0.044	0.132	0.	0.176
1985	0.088	0.494	0.	0.582
1986	0.115	0.55	0.	0.665
1987	0.222	0.383	0.	0.605
1988	0.177	0.157	0.054	0.388
1989	0.187	0.271	0.069	0.527
1990	0.177	0.546	0.069	0.792
1991	0.204	0.587	0.069	0.86
1992	0.267	0.383	0.069	0.719
1993	0.222	0.157	0.069	0.448
1994	0.232	0.271	0.069	0.572
1995	0.222	0.546	0.069	0.837
1996	0.249	0.587	0.069	0.905
1997	0.312	0.383	0.069	0.764
1998	0.267	0.157	0.069	0.493
1999	0.277	0.271	0.069	0.617
2000	0.267	0.546	0.069	0.882

Table R-5b. Regional Distribution of Employment
National Petroleum Reserve in Alaska

- Moderate Case -
- Industrialization Case -

NPR.MOD

	BO2	BO4	MTOTR
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.038	0.038
1983	0.	0.038	0.038
1984	0.004	0.172	0.176
1985	0.009	0.573	0.582
1986	0.012	0.653	0.665
1987	0.022	0.583	0.605
1988	0.018	0.37	0.388
1989	0.019	0.508	0.527
1990	0.018	0.774	0.792
1991	0.02	0.84	0.86
1992	0.027	0.692	0.719
1993	0.022	0.426	0.448
1994	0.023	0.549	0.572
1995	0.022	0.815	0.837
1996	0.025	0.88	0.905
1997	0.031	0.733	0.764
1998	0.027	0.466	0.493
1999	0.028	0.589	0.617
2000	0.027	0.855	0.882

6. Outer Continental Shelf Development

USGS estimates that between 7 and 32 billion barrels of recoverable oil and between 30 and 97 trillion cubic feet of recoverable natural gas will eventually be discovered in the offshore areas surrounding Alaska (Oil and Gas Journal, 3/17/80, p. 85). The expected levels of discoveries and the associated 5-95 percent confidence intervals for those discoveries are distributed by area as follows:

Location	Oil (billion barrels)			Gas (trillion cubic feet)		
	95%	Mean	5%	95%	Mean	5%
Gulf of Alaska	0	0.1	0.7	0	0.4	1.9
Kodiak	0	0.23	1.1	0	0.69	3.5
Lower Cook Inlet	< 0.1	0.5	1.5	0.4	1.5	3.3
N. Aleutian Shelf	0	0.2	1.0	0	0.8	3.2
St. George	0	1.6	5.8	0	6.2	15.7
Navarim	0	3.8	11.8	0	14.2	38.3
Norton	0	0.3	1.3	0	1.2	3.8
Hope	0	0.13	0.6	0	0.86	3.3
Chukchi	0	6.4	14.5	0	19.8	38.8
Beaufort	0	4.3	10.4	4.1	16.5	32.0
S. Aleutian Shelf	0	0.04	0.2	0	0.08	0.5

In order to exploit these resources, the Department of Interior in 1976 extended the federal OCS oil and gas leasing program to Alaska. Since 1976, four sales have already occurred, as follows:

Sale	Location	Date
46	Gulf of Alaska	1976
CI	Lower Cook Inlet	1977
BF	Beaufort Sea	1979
55	Gulf of Alaska	1980

High Case OCS Development

Year of Sale	Location	Discoveries	
		Oil (BBO)	Gas (TCFG)
1976	Gulf of Alaska	0	0
1977	Cook Inlet	0	0
1979	Beaufort	1.9	4.75
1980	Gulf of Alaska	0.45	1.25
1981	Cook Inlet	0.67	1.173
1982	Bering-Norton	0.38	1.2
1982	St. George	2.16	6.12
1983	Beaufort	1.3	3.25
1983	Kodiak	0.332	0.581
1983	N. Aleutian	0.332	0.581
1984	Navarin	2.16	6.12
1985	Chukchi	1.9	4.75
1985	Hope	0.5	0.37
1986	Beaufort	0.8	1.6
1987	Navarin	2.16	6.12
1988	Chukchi	1.9	4.75
1989	Navarin	0	0
1990	Chukchi	1.9	4.75
	Total	18.844	47.365
	USGS Mean	17.56	62.15

The employment generated by this level of OCS development is presented in Tables S-6a and R-6a.[1] Petroleum sector employment peaks at over 11,000 in 1999; and construction, at nearly 3,300 in 1995. Exogenous transportation employment reaches over 3,100 by the late 1990s as manufacturing reaches 80.

[1]See Appendix B for a description of the method used to derive employment estimates from discoveries.

Table S-6a. Statewide Employment By Sector
OCS Development

- High Case -
- Extreme High Case -

OCS.HGH

	EMP9	ECONX1	ECONX2	EMT9X	EMMX1	MTOT
1980	0.209	0.	0.06	0.033	0.	0.302
1981	0.223	0.	0.018	0.034	0.	0.275
1982	0.255	0.131	0.086	0.069	0.	0.541
1983	0.361	0.018	0.086	0.159	0.	0.624
1984	0.494	0.154	0.099	0.217	0.	0.964
1985	0.717	0.261	0.24	0.404	0.	1.622
1986	1.19	0.685	1.74	0.84	0.	4.455
1987	1.645	1.716	1.492	1.127	0.	5.98
1988	2.981	1.744	0.182	1.919	0.	6.826
1989	4.12	2.407	0.23	2.435	0.	9.192
1990	5.193	1.876	0.432	2.62	0.08	10.201
1991	5.775	1.063	1.126	2.877	0.08	10.921
1992	5.571	1.848	3.044	2.773	0.08	13.316
1993	6.117	1.139	2.613	2.923	0.08	12.872
1994	8.033	0.873	1.772	3.214	0.08	13.972
1995	8.533	0.619	2.672	3.095	0.08	14.999
1996	9.019	0.	2.019	3.141	0.08	14.259
1997	10.107	0.	1.766	3.141	0.08	15.094
1998	10.193	0.	1.603	3.141	0.08	15.017
1999	11.018	0.	0.163	3.141	0.08	14.402
2000	10.789	0.	0.103	3.141	0.08	14.113

SOURCE: See text.

Table R-6a. Regional Distribution of Employment
OCS Development

- High Case -
- Extreme High Case -

OCS.HGH

	B01	B02	B04	B11	B12	B14
1980	0.	0.021	0.167	0.	0.114	0.
1981	0.	0.022	0.111	0.058	0.084	0.
1982	0.	0.025	0.126	0.116	0.274	0.
1983	0.151	0.036	0.126	0.116	0.117	0.
1984	0.323	0.049	0.139	0.139	0.117	0.
1985	0.631	0.072	0.324	0.055	0.151	0.
1986	0.794	0.119	2.095	0.093	0.766	0.037
1987	2.109	0.164	2.005	0.265	0.88	0.036
1988	2.725	0.298	1.589	0.284	0.757	0.042
1989	3.97	0.412	1.617	0.406	0.771	0.042
1990	3.76	0.519	1.811	0.407	0.813	0.026
1991	3.484	0.577	2.484	0.416	0.755	0.006
1992	3.883	0.557	4.467	0.305	0.755	0.064
1993	3.717	0.612	4.219	0.316	0.755	0.378
1994	3.962	0.803	4.628	0.318	0.755	0.377
1995	3.733	0.853	5.907	0.321	0.755	0.413
1996	3.364	0.902	5.808	0.321	0.755	0.427
1997	3.42	1.011	6.532	0.321	0.755	0.37
1998	3.484	1.019	6.366	0.321	0.755	0.377
1999	3.456	1.102	5.688	0.321	0.755	0.377
2000	3.429	1.079	5.443	0.321	0.755	0.374

	B15	B18	B27	MTOTR
1980	0.	0.	0.	0.302
1981	0.	0.	0.	0.275
1982	0.	0.	0.	0.541
1983	0.	0.079	0.	0.624
1984	0.071	0.126	0.	0.964
1985	0.1	0.214	0.075	1.622
1986	0.114	0.311	0.126	4.455
1987	0.133	0.159	0.228	5.98
1988	0.445	0.334	0.352	6.826
1989	0.474	0.498	1.	9.192
1990	0.431	1.207	1.226	10.201
1991	0.442	1.184	1.572	10.921
1992	0.39	0.914	1.981	13.316
1993	0.403	0.724	1.747	12.872
1994	0.403	0.697	2.028	13.972
1995	0.403	0.778	1.835	14.999
1996	0.403	0.778	1.5	14.259
1997	0.403	0.778	1.504	15.094
1998	0.403	0.778	1.514	15.017
1999	0.403	0.778	1.522	14.402
2000	0.403	0.778	1.531	14.113

SOURCE FOR EMPLOYMENT ESTIMATES
HIGH CASE OCS DEVELOPMENT

	Year	Location	Source
1.	1976	Gulf of Alaska	Activity associated with this sale has terminated.
2.	1977	Cook Inlet	Exploration employment estimates from Alaska OCS Office as estimated for Sale 60 EIS.
3.	1979	Beaufort	Alaska OCS Studies Technical Report 18, Beaufort Sea Petroleum Development Scenarios: Economic and Demographic Impacts, Table 3.2, p. 80.
4.	1980	Gulf of Alaska	Moderate Case, Eastern Gulf of Alaska Sale 55 Final EIS.
5.	1981	Cook Inlet	From Lower Cook Inlet Statewide and Regional Population and Economic Systems Impact Analysis, Table 3, p. 7.
6.	1982	Bering-Norton	Low Case from Bering-Norton Petroleum Development Scenarios Economic and Demographic Analysis, Table 24, p. 140.
7.	1982	St. George	Moderate Case Scenarios as received from the Alaska OCS Office for St. George Sale 70 OCS Study.
8.	1983	Beaufort	Adapted from Moderate Find Scenario, Alaska OCS Studies Technical Report 18, Beaufort and Demographic Impacts, Table 3.8, p. 89.
9.	1983	Kodiak	Both adapted from Low Case, Lower Cook Inlet Statewide and Regional Population and Economic Systems Impact Analysis.
10.	1983	N. Aleutian	
11.	1984	Navarin	Adapted from case described in (7).
12.	1985	Chukchi	Adapted from case described in (3).

SOURCE FOR EMPLOYMENT ESTIMATES
HIGH CASE OCS DEVELOPMENT

(continued)

	Year	Location	Source
13.	1985	Hope	Based on Low Case Scenario received from Alaska OCS Office describing development of Western Beaufort Sea (Sale 71).
14.	1986	Beaufort	Adapted from Low Find Case, OCS Studies Technical Report 18, Beaufort Sea Petroleum Development Scenarios: Economic and Demographic Impacts, Table 3.6, p. 86.
15.	1987	Navarin	Adapted from Moderate Find Scenario developed by Alaska OCS Office for study of development in St. George Basin after Sale 70.
16.	1988	Chukchi	Adapted from case described in (3).
17.	1989	Navarin	Exploration Only Scenario adapted from Low Discovery Scenario developed by Alaska OCS Office for Study of St. George OCS Sale 70 Development.
18.	1990	Chukchi	Adapted from case described in (3).

In the moderate and industrialization scenarios, it is assumed that lease sales are held as scheduled until 1985 but that the results of exploration are more discouraging than in the high case, resulting in fewer post-1985 sales than in the high case. About 6.7 billion barrels of recoverable oil and 16.4 trillion cubic feet of gas are discovered on properties leased in such sales, as shown below:

Moderate and Industrialization Case
OCS Development

Year of Sale	Location	Discoveries Oil (BBO)	Discoveries Gas (TCFG)
1976	Gulf of Alaska	0	0
1977	Cook Inlet	0	0
1979	Beaufort Sea	1.3	3.25
1980	Gulf of Alaska	0	0
1981	Cook Inlet	0.332	0.581
1982	Bering Norton	0	0
1982	St. George	0	0
1983	Beaufort Sea	0.8	1.6
1983	Kodiak	0	0
1983	N. Aleutian	0	0
1984	Navarin	2.16	6.12
1985	Chukchi	1.3	3.25
1985	Hope	0	0
1988	Navarin	0	0
1989	Chukchi	0.8	1.6
	Total	6.692	16.401

The employment generated by this level of OCS development is presented in Tables S-6b and R-6b. Petroleum sector employment reaches over 4,400 by 1999; construction peaks at over 2,100 in 1991; and transportation employment reaches about 900.

Table S-6b. Statewide Employment By Sector
OCS Development

- Moderate Case -
- Industrialization Case -

OCS.MOD

	EMP9	ECONX1	ECONX2	EMT9X	MTOT
1980	0.09	0.	0.	0.033	0.123
1981	0.224	0.	0.	0.099	0.323
1982	0.309	0.028	0.012	0.1	0.449
1983	0.458	0.	0.052	0.141	0.651
1984	0.596	0.005	0.03	0.192	0.823
1985	0.675	0.071	0.122	0.488	1.356
1986	0.683	0.205	0.242	0.369	1.499
1987	0.642	0.238	0.735	0.434	2.049
1988	0.639	0.195	1.298	0.487	2.619
1989	0.986	1.165	0.873	0.603	3.627
1990	1.486	1.075	0.858	0.879	4.298
1991	2.409	0.873	1.28	1.104	5.666
1992	2.747	0.619	0.917	0.928	5.211
1993	2.981	0.	0.999	0.897	4.877
1994	3.046	0.	1.452	0.889	5.387
1995	3.255	0.	1.017	0.889	5.161
1996	3.564	0.	0.858	0.889	5.311
1997	3.767	0.	1.324	0.889	5.98
1998	4.091	0.	0.685	0.889	5.665
1999	4.419	0.	0.274	0.889	5.582
2000	4.419	0.	0.176	0.889	5.484

SOURCE: See text.

Table R-6b. Regional Distribution of Employment
OCS Development

- Moderate Case -
- Industrialization Case -

OCS.MOD

	B01	B02	B04	B11	B12	B14
1980	0.	0.009	0.	0.	0.114	0.
1981	0.	0.022	0.	0.216	0.084	0.
1982	0.	0.031	0.088	0.216	0.114	0.
1983	0.114	0.046	0.143	0.165	0.1	0.
1984	0.213	0.06	0.196	0.036	0.114	0.
1985	0.467	0.067	0.283	0.	0.133	0.
1986	0.328	0.068	0.389	0.	0.445	0.038
1987	0.322	0.064	0.829	0.	0.474	0.086
1988	0.277	0.064	1.522	0.	0.431	0.048
1989	0.908	0.099	1.271	0.	0.442	0.
1990	1.011	0.149	1.737	0.	0.39	0.
1991	1.304	0.241	2.415	0.	0.403	0.
1992	1.1	0.275	2.333	0.	0.403	0.
1993	0.759	0.298	2.659	0.	0.403	0.
1994	0.756	0.305	3.166	0.	0.403	0.
1995	0.783	0.325	2.866	0.	0.403	0.
1996	0.765	0.356	3.021	0.	0.403	0.
1997	0.747	0.377	3.705	0.	0.403	0.
1998	0.73	0.409	3.392	0.	0.403	0.
1999	0.756	0.442	3.224	0.	0.403	0.
2000	0.783	0.442	3.072	0.	0.403	0.

	B15	B18	B27	MTOTR
1980	0.	0.	0.	0.123
1981	0.	0.	0.	0.323
1982	0.	0.	0.	0.449
1983	0.046	0.038	0.	0.651
1984	0.118	0.086	0.	0.823
1985	0.281	0.048	0.075	1.356
1986	0.105	0.	0.126	1.499
1987	0.046	0.	0.228	2.049
1988	0.	0.	0.277	2.619
1989	0.	0.	0.908	3.627
1990	0.	0.	1.011	4.298
1991	0.	0.	1.304	5.666
1992	0.	0.	1.1	5.211
1993	0.	0.	0.759	4.877
1994	0.	0.	0.756	5.387
1995	0.	0.	0.783	5.161
1996	0.	0.	0.765	5.311
1997	0.	0.	0.747	5.98
1998	0.	0.	0.73	5.665
1999	0.	0.	0.756	5.582
2000	0.	0.	0.783	5.484

SOURCE FOR EMPLOYMENT ESTIMATES
MODERATE AND INDUSTRIALIZATION CASES
OCS DEVELOPMENT

	Year	Location	Source
1.	1976	Gulf of Alaska	Activity associated with this sale has terminated.
2.	1977	Cook Inlet	Same as (2) in High Case.
3.	1979	Beaufort Sea	Alaska OCS Studies Technical Report 18, Moderate Find Scenario, Table 3.8, p. 89.
4.	1980	Gulf of Alaska	Exploration Only Scenario from Northern Gulf of Alaska Petroleum Development Scenarios: Economic and Demographic Impacts, OCS Technical Report 34, Table 58, p. 187.
5.	1981	Cook Inlet	Low Scenario from Lower Cook Inlet Statewide and Regional Population and Economic Systems Impact Analysis, Table 2, p. 6.
6.	1982	Bering Norton	Exploration Only Scenario, Bering-Norton Petroleum Development Scenario: Economic and Demographic Impacts Analysis, Table 23, p. 139.
7.	1982	St. George	Low Scenario provided by Alaska OCS Office for study of Sale 70.
8.	1983	Beaufort Sea	Low Find Scenario in OCS Technical Report 18, Beaufort Sea Petroleum Development Scenario: Economic and Demographic Impacts, Table 3.6, p. 86.
9.	1983	Kodiak	Exploration Only Scenarios from scenarios provided by Alaska OCS Office for study of Sale 46. See 95 Percent Scenario Exploratory Phase.
10.	1983	N. Aleutian	
11.	1984	Navarin	Adapted from source described in (15) of High Case.
12.	1985	Chukchi	Adapted from source in (8) in High Case.

SOURCE FOR EMPLOYMENT ESTIMATES
MODERATE AND INDUSTRIALIZATION CASES
OCS DEVELOPMENT

(continued)

	Year	Location	Source
13.	1985	Hope	Adapted from Exploration Only Scenario in Bering-Norton Petroleum Development Scenario: Economic and Demographic Analysis, Table 23, p. 139.
14.	1988	Navarin	Adapted from source described in (17) of High Case.
15.	1989	Chukchi	Adapted from same source as (8).

In the low scenario, the areas of lowest resource potential are dropped entirely from the lease schedule, and discoveries are limited to the Beaufort Sea. No sales are held after 1985. The schedule and corresponding discoveries are as follows:

Low Case OCS Development

Year of Sale	Location		Discoveries Oil (BBO)	Discoveries Gas (TCFG)
1976	Gulf of Alaska		0	0
1977	Cook Inlet		0	0
1979	Beaufort Sea		0.5	0.875
1980	Gulf of Alaska		0	0
1981	Cook Inlet		0	0
1983	Beaufort Sea		0.5	0.875
1984	Navarin		0	0
1985	Chukchi		0	0
		Total	1.0	1.75

Except for the Beaufort Sea, employment in this case consists solely of activities associated with exploration. As shown in Tables S-6c and R-6c, petroleum sector employment peaks at nearly 770 in 1995; construction, at 833 in 1988; and transportation peaks at 100 in 1983 before falling back to zero by 1990.

Table S-6c. Statewide Employment By Sector
OCS Development

- Low Case -

OCS.LOW

	EMP9	ECONX1	ECONX2	EMT9X	MTOT
1980	0.09	0.	0.	0.033	0.123
1981	0.29	0.	0.062	0.099	0.451
1982	0.422	0.028	0.188	0.1	0.738
1983	0.394	0.	0.135	0.088	0.617
1984	0.341	0.	0.25	0.05	0.641
1985	0.257	0.	0.212	0.04	0.509
1986	0.369	0.	0.47	0.046	0.885
1987	0.458	0.	0.479	0.046	0.983
1988	0.72	0.	0.833	0.039	1.592
1989	0.652	0.	0.68	0.008	1.34
1990	0.687	0.	0.664	0.	1.351
1991	0.623	0.	0.564	0.	1.187
1992	0.649	0.	0.611	0.	1.26
1993	0.7	0.	0.527	0.	1.227
1994	0.72	0.	0.264	0.	0.984
1995	0.768	0.	0.191	0.	0.959
1996	0.721	0.	0.084	0.	0.805
1997	0.687	0.	0.132	0.	0.819
1998	0.663	0.	0.132	0.	0.795
1999	0.661	0.	0.059	0.	0.72
2000	0.658	0.	0.018	0.	0.676

SOURCE: See text.

Table R-6c. Regional Distribution of Employment
OCS Development

- Low Case -

OCS.LOW

	B01	B02	B04	B11	B12	B27
1980	0.	0.009	0.	0.	0.114	0.
1981	0.	0.029	0.121	0.216	0.084	0.
1982	0.	0.042	0.365	0.216	0.114	0.
1983	0.	0.039	0.312	0.165	0.101	0.
1984	0.	0.034	0.457	0.036	0.114	0.
1985	0.034	0.026	0.331	0.	0.084	0.034
1986	0.047	0.037	0.71	0.	0.043	0.047
1987	0.055	0.046	0.826	0.	0.	0.055
1988	0.049	0.072	1.422	0.	0.	0.049
1989	0.024	0.065	1.227	0.	0.	0.024
1990	0.	0.069	1.282	0.	0.	0.
1991	0.	0.062	1.125	0.	0.	0.
1992	0.	0.065	1.195	0.	0.	0.
1993	0.	0.07	1.157	0.	0.	0.
1994	0.	0.072	0.912	0.	0.	0.
1995	0.	0.077	0.882	0.	0.	0.
1996	0.	0.072	0.733	0.	0.	0.
1997	0.	0.069	0.75	0.	0.	0.
1998	0.	0.066	0.729	0.	0.	0.
1999	0.	0.066	0.654	0.	0.	0.
2000	0.	0.066	0.61	0.	0.	0.

	MTOTR
1980	0.123
1981	0.451
1982	0.738
1983	0.617
1984	0.641
1985	0.509
1986	0.885
1987	0.983
1988	1.592
1989	1.34
1990	1.351
1991	1.187
1992	1.26
1993	1.227
1994	0.984
1995	0.959
1996	0.805
1997	0.819
1998	0.795
1999	0.72
2000	0.676

SOURCE FOR EMPLOYMENT ESTIMATES
LOW CASE OCS DEVELOPMENT

	Year	Location	Source
1.	1976	Gulf of Alaska	Activity associated with this sale has terminated.
2.	1977	Cook Inlet	Same as (2) in High Case.
3.	1979	Beaufort Sea	Low Find Scenario in Beaufort Sea Draft EIS, Table III.C.2.3, p. 238.
4.	1980	Gulf of Alaska	Exploration Only Scenario from Northern Gulf of Alaska Petroleum Development Scenario: Economic and Demographic Impacts Technical Report 34, Table 58, p. 187.
5.	1981	Cook Inlet	Adapted from source described in (2) in High Case.
6.	1983	Beaufort Sea	Adapted from source cited in (3).
7.	1984	Navarin	Adapted from source described in (7) in Moderate Case.
8.	1985	Chukchi	Exploration Only Scenario adapted from Minimum Case in Beaufort Sea Draft EIS, Table III.C.2-3, Exploration Employment Only.

7. Alaska Oil Company Refinery (Formerly ALPETCO)

In 1978 the State of Alaska awarded Alaska Petrochemical Company a 27-year contract to purchase up to 150,000 BPD of state-owned royalty oil to build and operate a petrochemical complex at Valdez. Revision of the original proposal to a 150,000 BPD refinery complex, combined with ALPETCO's difficulty in financing the revised project, caused the state to cut the amount of royalty oil to 75,000 BPD and to require that a 100,000 BPD refinery be designed by 1981 and operational by 1986 as conditions of the contract (Oil and Gas Journal, 6/23/80, p. 97).

This year, further financing difficulties initially led to an announcement of the plan's abandonment (Oil and Gas Journal, June 8, 1981). However, in a more recent proposal to the state for purchase of 1982 royalty oil, AOC announced that it has revived its plans to construct a 100,000 bpd refinery at Valdez (Oil and Gas Journal, September 28, 1981).

In the moderate, high, extreme high, and industrialization scenarios, it is assumed that the 100,000 bpd facility is constructed, beginning in 1983, and is operational by 1986, generating direct employment as shown in Tables S-7 and R-7.

In the low scenario, it is assumed that no refinery is constructed.

Table S-7. Statewide Employment By Sector
Alaska Oil Company

- High Case -
-Moderate Case -
- Industrialization Case -
- Extreme High Case -

ALP.100

	ECONX2	EMMX1	MTOT
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.752	0.	0.752
1984	0.752	0.	0.752
1985	0.752	0.	0.752
1986	0.	0.386	0.386
1987	0.	0.386	0.386
1988	0.	0.386	0.386
1989	0.	0.386	0.386
1990	0.	0.386	0.386
1991	0.	0.386	0.386
1992	0.	0.386	0.386
1993	0.	0.386	0.386
1994	0.	0.386	0.386
1995	0.	0.386	0.386
1996	0.	0.386	0.386
1997	0.	0.386	0.386
1998	0.	0.386	0.386
1999	0.	0.386	0.386
2000	0.	0.386	0.386

SOURCE: Assumes construction of a 100,000 bpd refinery with manpower requirements two-thirds of those required for the 150,000 bpd facility described in EPA, Draft EIS, Alaska Petrochemical Company Refining and Petrochemical Facility, Valdez, Alaska, 1979, p. 42.

Table R-7. Regional Distribution of Employment
Alaska Oil Company

- High Case -
- Moderate Case -
- Industrialization Case -
- Extreme High Case -

ALP.100

	B26	MTOTR
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.752	0.752
1984	0.752	0.752
1985	0.752	0.752
1986	0.386	0.386
1987	0.386	0.386
1988	0.386	0.386
1989	0.386	0.386
1990	0.386	0.386
1991	0.386	0.386
1992	0.386	0.386
1993	0.386	0.386
1994	0.386	0.386
1995	0.386	0.386
1996	0.386	0.386
1997	0.386	0.386
1998	0.386	0.386
1999	0.386	0.386
2000	0.386	0.386

8. Pacific Alaska LNG

Pacific Alaska LNG Associates, a partnership consisting of Pacific Lighting Company and Pacific Gas and Electric Company, has proposed an LNG facility on the Kenai Peninsula at Nikiski to liquify gas from various natural gas fields in Cook Inlet (see above). The project calls for construction of a 300-mile pipeline gathering system, a 400 mmcf per day liquefaction plant, and a loading dock. Approval of the plan was granted by the Federal Energy Regulatory Commission in August 1979. Construction is expected to begin in 1983.

In the high, extreme high, moderate, and industrialization scenarios, construction begins in 1983 with employment peaking at 1,323 in 1985, becoming operational in 1987, employing a permanent work force of 100, as shown in Tables S-8 and R-8.

In the low scenario, it is assumed that the plant is not constructed due to lawsuits in California over the vaporization plant proposed for receiving the Alaska LNG.

Table S-8. Statewide Employment By Sector
Pacific Alaska LNG Project

- High Case -
- Moderate Case -
- Industrialization Case -
- Extreme High Case -

PAL.EIS

	ECONX2	EMT9X	EMMX1	MTOT
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.146	0.	0.	0.146
1983	0.844	0.	0.	0.844
1984	1.323	0.	0.	1.323
1985	0.42	0.	0.	0.42
1986	0.	0.04	0.06	0.1
1987	0.	0.04	0.06	0.1
1988	0.	0.04	0.06	0.1
1989	0.	0.04	0.06	0.1
1990	0.	0.04	0.06	0.1
1991	0.	0.04	0.06	0.1
1992	0.	0.04	0.06	0.1
1993	0.	0.04	0.06	0.1
1994	0.	0.04	0.06	0.1
1995	0.	0.04	0.06	0.1
1996	0.	0.04	0.06	0.1
1997	0.	0.04	0.06	0.1
1998	0.	0.04	0.06	0.1
1999	0.	0.04	0.06	0.1
2000	0.	0.04	0.06	0.1

SOURCE: Construction employment estimates based on letter to Alaska Department of Natural Resources from Southern California Gas dated March 17, 1978. Other employment estimates from Federal Energy Regulatory Commission, Western LNG Project: Final EIS, 1978.

Table R-8. Regional Distribution of Employment
Pacific Alaska LNG Project

- High Case -
- Moderate Case -
- Industrialization Case -
- Extreme High Case -

PAL.EIS

	B12	MTOTR
1980	0.	0.
1981	0.	0.
1982	0.146	0.146
1983	0.844	0.844
1984	1.323	1.323
1985	0.42	0.42
1986	0.1	0.1
1987	0.1	0.1
1988	0.1	0.1
1989	0.1	0.1
1990	0.1	0.1
1991	0.1	0.1
1992	0.1	0.1
1993	0.1	0.1
1994	0.1	0.1
1995	0.1	0.1
1996	0.1	0.1
1997	0.1	0.1
1998	0.1	0.1
1999	0.1	0.1
2000	0.1	0.1

9. Petrochemical Development

In the spring of 1980, the State of Alaska issued a call for proposals to build a world-scale petrochemical plant in Alaska using natural gas liquids (NGL) from Prudhoe Bay (Oil and Gas Journal, 5/5/80). After six proposals were submitted in June (Oil and Gas Journal, 6/23/80), the state selected a group headed by Dow Chemical Company and Shell Chemical Company to conduct feasibility studies of a petrochemical plant in the state. Dow has proposed a plant to produce polyethylene, ethylene glycol, ethyl benzene, styrene, cumene, propylene, butanol, and other products from the 230,000 BPD of NGL which will be produced once the Northwest gas line becomes operational and Prudhoe gas is produced for sale (Oil and Gas Journal, 9/8/80).

However, the State of Alaska has only a one-eighth royalty interest in the NGL produced. The major owners are Exxon, Arco, and Sohio. Since studies indicate that a large proportion of the NGL will be required to make a plant economical, the final decision on what type, if any, plant will be constructed is presently uncertain even if a plant is determined to be feasible. Exxon has authorized its own study of alternatives, and the Dow/Shell feasibility study will not be completed until late this year. Consequently, estimation of future development is quite speculative.

Employment estimates were developed based on preliminary results of the Dow/Shell feasibility study as presented in monthly progress reports to the state. Currently, Dow/Shell sees the development as a two-stage process, the first involving construction of a natural gas liquids pipeline between Prudhoe and either Fairbanks or a tidewater location, as well as development of a plant and marine terminal facility, and the second involving an expansion of Phase I capacity.

In the high case, it is assumed that only Phase I capacity is developed, generating employment as shown in Tables S-9a and R-9a. In both the industrialization and extreme high cases, both phases are completed, generating direct employment as shown in Table S-9b and R-9b.

Table S-9a. Statewide Employment By Sector
Petrochemical Development

- High Case -

PTC.DW2

	EMP9	ECONX2	MTOT
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	0.	0.409	0.409
1985	0.	2.001	2.001
1986	0.	5.284	5.284
1987	0.	3.747	3.747
1988	1.14	4.875	6.015
1989	1.14	1.987	3.127
1990	2.28	1.177	3.457
1991	2.28	2.868	5.148
1992	2.28	1.027	3.307
1993	3.23	0.	3.23
1994	3.23	0.	3.23
1995	3.23	0.	3.23
1996	3.23	0.	3.23
1997	3.23	0.	3 23
1998	3.23	0.	3.23
1999	3.23	0.	3.23
2000	3.23	0.	3.23

SOURCE: See text.

Table R-9a. Regional Distribution of Employment
Petrochemical Development

- High Case -

PTC.DW2

	B04	B09	B24	B26	B29	MTOTR
1980	0.	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.
1984	0.054	0.07	0.011	0.266	0.008	0.409
1985	0.292	0.326	0.062	1.279	0.042	2.001
1986	0.846	0.822	0.184	3.306	0.126	5.284
1987	0.436	0.669	0.087	2.496	0.059	3.747
1988	0.86	0.763	0.19	4.073	0.129	6.015
1989	0.244	0.395	0.049	2.406	0.033	3.127
1990	0.308	0.215	0.07	2.816	0.048	3.457
1991	0.603	0.465	0.135	3.853	0.092	5.148
1992	0.222	0.225	0.048	2.779	0.033	3.307
1993	0.182	0.03	0.045	2.943	0.03	3.23
1994	0.182	0.03	0.045	2.943	0.03	3.23
1995	0.182	0.03	0.045	2.943	0.03	3.23
1996	0.182	0.03	0.045	2.943	0.03	3.23
1997	0.182	0.03	0.045	2.943	0.03	3.23
1998	0.182	0.03	0.045	2.943	0.03	3.23
1999	0.182	0.03	0.045	2.943	0.03	3.23
2000	0.182	0.03	0.045	2.943	0.03	3.23

Table S-9b. Statewide Employment By Sector
Petrochemical Development

- Industrialization Case -
- Extreme High Case -

PTC.DW1

	EMP9	ECONX2	MTOT
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	0.	0.409	0.409
1985	0.	2.001	2.001
1986	0.	5.284	5.284
1987	0.	3.747	3.747
1988	1.14	4.875	6.015
1989	1.14	1.746	2.886
1990	2.28	0.	2.28
1991	2.28	0.	2.28
1992	2.28	0.	2.28
1993	2.28	0.	2.28
1994	2.28	0.	2.28
1995	2.28	0.	2.28
1996	2.28	0.	2.28
1997	2.28	0.	2.28
1998	2.28	0.	2.28
1999	2.28	0.	2.28
2000	2.28	0.	2.28

SOURCE: See text.

Table R-9b. Regional Distribution of Employment
Petrochemical Development

- Industrialization Case -
- Extreme High Case -

PTC.DW1

	B04	B09	B24	B26	B29	MTOTR
1980	0.	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.
1984	0.054	0.07	0.011	0.266	0.008	0.409
1985	0.292	0.326	0.062	1.279	0.042	2.001
1986	0.846	0.822	0.184	3.306	0.126	5.284
1987	0.436	0.669	0.087	2.496	0.059	3.747
1988	0.86	0.763	0.19	4.073	0.129	6.015
1989	0.212	0.354	0.032	2.26	0.028	2.886
1990	0.137	0.023	0.033	2.064	0.023	2.28
1991	0.137	0.023	0.033	2.064	0.023	2.28
1992	0.137	0.023	0.033	2.064	0.023	2.28
1993	0.137	0.023	0.033	2.064	0.023	2.28
1994	0.137	0.023	0.033	2.064	0.023	2.28
1995	0.137	0.023	0.033	2.064	0.023	2.28
1996	0.137	0.023	0.033	2.064	0.023	2.28
1997	0.137	0.023	0.033	2.064	0.023	2.28
1998	0.137	0.023	0.033	2.064	0.023	2.28
1999	0.137	0.023	0.033	2.064	0.023	2.28
2000	0.137	0.023	0.033	2.064	0.023	2.28

10. Beluga-Chuitna Coal Production

USGS has long recognized the potential economic significance of a large number of beds of subbituminous coal on the west side of Cook Inlet near Tyonek (see USGS, Coal Resources of Alaska, 1967). Recently, several alternative proposals for developing the Beluga-Chuitna fields for export to Japan or other Pacific rim locations have been considered (see Pacific Northwest Laboratory, Beluga Coal Field Development: Social Effects and Management Alternatives, 1979, and Bechtel, Preliminary Feasibility Study: Coal Export Program, Chuitna River Field, Alaska, 1980). In addition, a feasibility study is currently underway to examine the potential for use of such coal in the production of synthetic fuels (see below).

In the high scenario and the extreme high scenario as well as the industrialization scenario, it is assumed that an 11-million-ton-per-year operation is developed in the Beluga-Chuitna area for export or use as input to a synthetic fuel production process. Construction employment peaks at 400 in 1984, and the mine becomes operational in 1986, requiring a labor force of 765 (80 percent in mining, 20 percent in transportation) as shown in Tables S-10a and R-10a.

In the moderate case, a more modest export program is implemented on a slower timetable. Production begins in 1989 and eventually reaches 4.4 tons per year. Construction begins in 1985, with peak employment of 400 in 1987. Operations employment is 524 distributed 80 percent in mining and 20 percent in transportation, as shown in Tables S-10b and R-10b.

No coal development is assumed to occur in the low case.

Table S-10a. Statewide Employment By Sector
Beluga-Chuitna Coal Production

- High Case -
- Extreme High Case -
- Industrialization Case -

BCL.11T

	EMP9	ECONX2	EMT9X	MTOT
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.3	0.	0.3
1983	0.	0.6	0.	0.6
1984	0.	0.8	0.	0.8
1985	0.	0.7	0.	0.7
1986	0.306	0.4	0.077	0.783
1987	0.612	0.2	0.153	0.965
1988	0.612	0.	0.153	0.765
1989	0.612	0.	0.153	0.765
1990	0.612	0.	0.153	0.765
1991	0.612	0.	0.153	0.765
1992	0.612	0.	0.153	0.765
1993	0.612	0.	0.153	0.765
1994	0.612	0.	0.153	0.765
1995	0.612	0.	0.153	0.765
1996	0.612	0.	0.153	0.765
1997	0.612	0.	0.153	0.765
1998	0.612	0.	0.153	0.765
1999	0.612	0.	0.153	0.765
2000	0.612	0.	0.153	0.765

SOURCE: Construction employment based on Battelle Pacific Northwest Laboratories, Beluga Coal Field Development: Social Effects and Management Alternatives, 1979. Other employment based on Bechtel, Preliminary Feasibility Study: Coal Export Program, Chuitna River Field, Alaska, 1980.

Table R-10a. Regional Distribution of Employment
Beluga Chuitna Coal Production

- High Case -
- Extreme High Case -
- Industrialization Case -

BCL.11T

	B12	MTOTR
1980	0.	0.
1981	0.	0.
1982	0.3	0.3
1983	0.6	0.6
1984	0.8	0.8
1985	0.7	0.7
1986	0.783	0.783
1987	0.965	0.965
1988	0.765	0.765
1989	0.765	0.765
1990	0.765	0.765
1991	0.765	0.765
1992	0.765	0.765
1993	0.765	0.765
1994	0.765	0.765
1995	0.765	0.765
1996	0.765	0.765
1997	0.765	0.765
1998	0.765	0.765
1999	0.765	0.765
2000	0.765	0.765

Table S-10b. Statewide Employment By Sector
Beluga-Chuitna Coal Production

- Moderate Case -

BCL.04T

	EMP9	ECONX2	EMT9X	MTOT
1980	0.	0.	0.	0.
1981	0.	0.	0.	0.
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.	0.	0.	0.
1985	0.	0.15	0.	0.15
1986	0.	0.3	0.	0.3
1987	0.	0.4	0.	0.4
1988	0.	0.35	0.	0.35
1989	0.	0.2	0.	0.2
1990	0.21	0.1	0.053	0.363
1991	0.419	0.	0.105	0.524
1992	0.419	0.	0.105	0.524
1993	0.419	0.	0.105	0.524
1994	0.419	0.	0.105	0.524
1995	0.419	0.	0.105	0.524
1996	0.419	0.	0.105	0.524
1997	0.419	0.	0.105	0.524
1998	0.419	0.	0.105	0.524
1999	0.419	0.	0.105	0.524
2000	0.419	0.	0.105	0.524

SOURCE: Pacific Northwest Laboratories, op. cit., and Bechtel, op. cit.

Table R-10b. Regional Distribution of Employment
Beluga-Chuitna Coal Production

- Moderate Case -

BCL.O4T

	B12	MTOTR
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	0.	0.
1985	0.15	0.15
1986	0.3	0.3
1987	0.4	0.4
1988	0.35	0.35
1989	0.2	0.2
1990	0.363	0.363
1991	0.524	0.524
1992	0.524	0.524
1993	0.524	0.524
1994	0.524	0.524
1995	0.524	0.524
1996	0.524	0.524
1997	0.524	0.524
1998	0.524	0.524
1999	0.524	0.524
2000	0.524	0.524

11. U.S. Borax Mining Development

U.S. Borax holds claim to a large molybdenum discovery near Ketchikan. In the high and extreme high scenarios, it is assumed that this deposit will be developed quickly. Mining employment begins in late 1980, reaching a long-term level of 440 by 1993, as shown in Tables S-11 and R-11. In the moderate and low scenarios, as well as the industrialization case, no development is assumed.

Table S-11. Statewide Employment By Sector
Molybdenum Mining

- High Case -
- Extreme High Case -

BXM.EIS

	EMP9	MTOT
1980	0.04	0.04
1981	0.04	0.04
1982	0.04	0.04
1983	0.04	0.04
1984	0.04	0.04
1985	0.07	0.07
1986	0.07	0.07
1987	0.07	0.07
1988	0.07	0.07
1989	0.07	0.07
1990	0.24	0.24
1991	0.24	0.24
1992	0.34	0.34
1993	0.44	0.44
1994	0.44	0.44
1995	0.44	0.44
1996	0.44	0.44
1997	0.44	0.44
1998	0.44	0.44
1999	0.44	0.44
2000	0.44	0.44

SOURCE: U.S.D.A. Forest Service, EIS: U.S. Borax Mining Access Road for Quartz Hill Proposal, 1977.

Table R-11. Regional Distribution of Employment
Molybdenum Mining

- High Case -
- Extreme High Case -

BXM.EIS

	B11	MTOTR
1980	0.04	0.04
1981	0.04	0.04
1982	0.04	0.04
1983	0.04	0.04
1984	0.04	0.04
1985	0.07	0.07
1986	0.07	0.07
1987	0.07	0.07
1988	0.07	0.07
1989	0.07	0.07
1990	0.24	0.24
1991	0.24	0.24
1992	0.34	0.34
1993	0.44	0.44
1994	0.44	0.44
1995	0.44	0.44
1996	0.44	0.44
1997	0.44	0.44
1998	0.44	0.44
1999	0.44	0.44
2000	0.44	0.44

12. Aluminum Smelting

One possible effect of the availability of low-cost hydropower on Alaska would be the attraction of energy intensive industries to the state. Recent studies have examined the potential of low-cost hydropower for attraction of such industries to the state (see, for example, Pacific Northwest Laboratory, Energy Intensive Industries for Alaska, 1978). Of all industries generally examined for such potential, the primary aluminum industry generally emerges as the most likely to succeed in Alaska.

In the industrialization and extreme high scenarios, it is assumed that a 180,000-ton-per-year aluminum smelter is developed in the Railbelt area, with construction beginning in 1990. The plant is operational by 1992. Construction employment peaks at 1,126 in 1991, and operations employment reaches its long-term level of 800 by 1992, as shown in Tables S-12 and R-12.

No such development is assumed in any of the other scenarios.

Table S-12. Statewide Employment By Sector
Aluminum Smelting

- Industrialization Case -
- Extreme High Case -

ASM.ALX

	ECONX2	EMMX1	MTOT
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	0.	0.	0.
1985	0.	0.	0.
1986	0.	0.	0.
1987	0.	0.	0.
1988	0.	0.	0.
1989	0.	0.	0.
1990	0.414	0.	0.414
1991	1.126	0.083	1.209
1992	0.327	0.705	1.032
1993	0.	0.8	0.8
1994	0.	0.8	0.8
1995	0.	0.8	0.8
1996	0.	0.8	0.8
1997	0.	0.8	0.8
1998	0.	0.8	0.8
1999	0.	0.8	0.8
2000	0.	0.8	0.8

SOURCE: Battelle Pacific Northwest Laboratories, Energy Intensive Industry for Alaska, Volume II: Case Analysis, p. 2.21, Table C.1.

Table R-12. Regional Distribution of Employment
Aluminum Smelting

- Industrialization Case -
- Extreme High Case -

ASM.ALX

	B17	MTOTR
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	0.	0.
1985	0.	0.
1986	0.	0.
1987	0.	0.
1988	0.	0.
1989	0.	0.
1990	0.414	0.414
1991	1.209	1.209
1992	1.032	1.032
1993	0.8	0.8
1994	0.8	0.8
1995	0.8	0.8
1996	0.8	0.8
1997	0.8	0.8
1998	0.8	0.8
1999	0.8	0.8
2000	0.8	0.8

13. Synthetic Fuels Development

Together with Placer Amex, Inc., of California, the Cook Inlet Regional Corporation has begun to investigate the feasibility of constructing a $1.6 billion synthetic fuels plant on Cook Inlet, using coal from its Beluga field coal leases (see above). The plant would consume about 7.3 million tons of coal annually (Anchorage Daily News, 4/26/80) and produce 54,000 barrels of methanol per day, using technology demonstrated in about 20 methanol conversion facilities outside of the United States. The companies were awarded a grant in August 1980 from the Department of Energy to conduct a $3.8 million feasibility study for the plant, which is not expected to be complete until late 1981. Consequently, employment estimates are highly speculative.

In the industrialization scenario, it is assumed that the synthetic fuels plant is constructed in conjunction with the 11 million ton/year Beluga mining development, with the 7.3 million tons required by the plant used on site to produce methanol for export to the West Coast.

Construction begins in 1986, and the plant is operational by 1990, employing a full-time work force of 200 persons.

No synthetic fuels development is included in any of the other scenarios.

Table S-13. Statewide Employment By Sector
Synthetic Fuels Development

- Industrialization Case -
- Extreme High Case -

SFD.PAX

	ECONX2	EMMX1	MTOT
1980	0.	0.	0.
1981	0.	0.	0.
1982	0.	0.	0.
1983	0.	0.	0.
1984	0.	0.	0.
1985	0.	0.	0.
1986	0.5	0.	0.5
1987	0.5	0.	0.5
1988	0.5	0.	0.5
1989	0.5	0.1	0.6
1990	0.	0.2	0.2
1991	0.	0.2	0.2
1992	0.	0.2	0.2
1993	0.	0.2	0.2
1994	0.	0.2	0.2
1995	0.	0.2	0.2
1996	0.	0.2	0.2
1997	0.	0.2	0.2
1998	0.	0.2	0.2
1999	0.	0.2	0.2
2000	0.	0.2	0.2

SOURCE: Construction estimates assume 2,000 man-years for plant construction. Operations employment estimates based on informal conversations with Placer Amex officials. Includes only synfuels plant operations employment, not mining employment (which is included above as part of Beluga coal development).

Table R-13. Regional Distribution of Employment
Synthetic Fuels Development

- Industrialization Case -
- Extreme High Case -

SFO.PAX

	B12	MTOTR
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.	0.
1984	0.	0.
1985	0.	0.
1986	0.5	0.5
1987	0.5	0.5
1988	0.5	0.5
1989	0.6	0.6
1990	0.2	0.2
1991	0.2	0.2
1992	0.2	0.2
1993	0.2	0.2
1994	0.2	0.2
1995	0.2	0.2
1996	0.2	0.2
1997	0.2	0.2
1998	0.2	0.2
1999	0.2	0.2
2000	0.2	0.2

14. State Capital Move

Alaskan voters in a referendum in 1974 elected to move the state capital from its current site in Juneau to a new site subsequently chosen at Willow, on the railbelt.

In the high and extreme high scenarios, it is assumed that this move begins in 1983. It is a full move involving the relocation of some 2,750 state employees, completed in 1996. As shown in Tables S-14 and R-14, construction employment peaks at 1,560 in 1990.

In the low, moderate, and industrialization scenarios, it is assumed that no capital move is successfully funded so that state government remains in Juneau.

Table S-14. Statewide Employment By Sector
Capital Move

- High Case -
- Extreme High Case -

CAP.SCS

	ECONX2	MTOT
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.85	0.85
1984	0.65	0.65
1985	1.16	1.16
1986	1.11	1.11
1987	0.7	0.7
1988	0.65	0.65
1989	1.15	1.15
1990	1.56	1.56
1991	1.23	1.23
1992	0.98	0.98
1993	0.7	0.7
1994	0.65	0.65
1995	0.65	0.65
1996	0.65	0.65
1997	0.	0.
1998	0.	0.
1999	0.	0.
2000	0.	0.

SOURCE: M. Scott, Southcentral Alaska's Economy and Population, 1965-2025: A Base Study and Projections, 1979, High Scenario.

Table R-14. Regional Distribution of Employment
Capital Move

- High Case -
- Extreme High Case -

CAP.SCS

	B17	MTOTR
1980	0.	0.
1981	0.	0.
1982	0.	0.
1983	0.85	0.85
1984	0.65	0.65
1985	1.16	1.16
1986	1.11	1.11
1987	0.7	0.7
1988	0.65	0.65
1989	1.15	1.15
1990	1.56	1.56
1991	1.23	1.23
1992	0.98	0.98
1993	0.7	0.7
1994	0.65	0.65
1995	0.65	0.65
1996	0.65	0.65
1997	0.	0.
1998	0.	0.
1999	0.	0.
2000	0.	0.

C. INDUSTRY ASSUMPTIONS

In addition to the project-specific assumptions described above, other portions of the exogenous sectors are affected by trends and events which must be anticipated, although they are not as directly traceable to specific development projects. These sectors include the following: the portion of mining sector employment not accounted for by the above projects, which will be called "other mining"; the agriculture, forestry, and fisheries industries in their entirety; and the residual component of manufacturing employment not accounted for by specific projects or by activities associated with fisheries (i.e., food processing) or forestry (i.e., pulp and paper manufacturing). The final exogenous component of employment is federal government sector employment. We turn now to a discussion of the assumptions used to describe developments in these sectors.

1. Other Mining Activity

In 1979, total mining sector employment in Alaska was 5,773, of which 5,354 was in oil and gas. Of this, 2,633 was accounted for by projects discussed above. The residual, or 3,140, is classified as "other mining." It consists of administrative personnel in Anchorage associated with minerals industries, a variety of petroleum exploration activities on the North Slope and elsewhere not broken down by project (i.e., the Husky operation in NPR-A, various drilling contractors on state and Native lands, seismic work being conducted offshore prior to OCS lease sales, etc.), and hardrock mining activities.

In the high and extreme high scenarios, it is assumed that such employment increases at a 2 percent annual rate from its current level. In both the moderate and industrialization scenarios, it is assumed that such employment increases at 1 percent annually. In the low scenario, such employment is assumed to maintain its 1979 level, as shown in Tables S-15 and R-15.

Table S-15a. Statewide Employment By Sector
Other Mining

- High Case -
- Extreme High Case -

OMN.08H

	EMP9	MTOT
1980	3.203	3.203
1981	3.267	3.267
1982	3.332	3.332
1983	3.399	3.399
1984	3.467	3.467
1985	3.536	3.536
1986	3.607	3.607
1987	3.679	3.679
1988	3.753	3.753
1989	3.828	3.828
1990	3.904	3.904
1991	3.982	3.982
1992	4.062	4.062
1993	4.143	4.143
1994	4.226	4.226
1995	4.311	4.311
1996	4.397	4.397
1997	4.485	4.485
1998	4.574	4.574
1999	4.666	4.666
2000	4.759	4.759

SOURCE: See text.

Table R-15a. Regional Distribution of Employment
Other Mining

- High Case -
- Extreme High Case -

OMN.08H

	B01	B02	B04	B05	B08	B09
1980	0.015	2.015	0.813	0.004	0.053	0.033
1981	0.016	2.056	0.829	0.004	0.054	0.033
1982	0.016	2.097	0.846	0.004	0.055	0.034
1983	0.016	2.139	0.863	0.004	0.056	0.035
1984	0.017	2.181	0.88	0.005	0.058	0.035
1985	0.017	2.225	0.897	0.005	0.059	0.036
1986	0.017	2.269	0.915	0.005	0.06	0.037
1987	0.018	2.315	0.934	0.005	0.061	0.038
1988	0.018	2.361	0.952	0.005	0.062	0.038
1989	0.018	2.408	0.971	0.005	0.064	0.039
1990	0.019	2.457	0.991	0.005	0.065	0.04
1991	0.019	2.506	1.011	0.005	0.066	0.041
1992	0.019	2.556	1.031	0.005	0.067	0.041
1993	0.02	2.607	1.052	0.005	0.069	0.042
1994	0.02	2.659	1.073	0.005	0.07	0.043
1995	0.021	2.712	1.094	0.006	0.072	0.044
1996	0.021	2.766	1.116	0.006	0.073	0.045
1997	0.022	2.822	1.138	0.006	0.074	0.046
1998	0.022	2.878	1.161	0.006	0.076	0.047
1999	0.022	2.936	1.184	0.006	0.077	0.048
2000	0.023	2.995	1.208	0.006	0.079	0.049

	B11	B14	B16	B17	B18	B21
1980	0.04	0.002	0.004	0.003	0.099	0.017
1981	0.041	0.002	0.004	0.003	0.101	0.018
1982	0.041	0.002	0.004	0.003	0.103	0.018
1983	0.042	0.002	0.004	0.003	0.105	0.018
1984	0.043	0.002	0.005	0.003	0.107	0.019
1985	0.044	0.002	0.005	0.004	0.109	0.019
1986	0.045	0.002	0.005	0.004	0.111	0.019
1987	0.046	0.002	0.005	0.004	0.114	0.02
1988	0.047	0.002	0.005	0.004	0.116	0.02
1989	0.047	0.002	0.005	0.004	0.118	0.021
1990	0.048	0.002	0.005	0.004	0.121	0.021
1991	0.049	0.002	0.005	0.004	0.123	0.022
1992	0.05	0.002	0.005	0.004	0.126	0.022
1993	0.051	0.002	0.005	0.004	0.128	0.022
1994	0.052	0.003	0.005	0.004	0.131	0.023
1995	0.053	0.003	0.006	0.004	0.133	0.023
1996	0.055	0.003	0.006	0.004	0.136	0.024
1997	0.056	0.003	0.006	0.004	0.139	0.024
1998	0.057	0.003	0.006	0.005	0.141	0.025
1999	0.058	0.003	0.006	0.005	0.144	0.025
2000	0.059	0.003	0.006	0.005	0.147	0.026

	B25	B26	B29	MTOTR
1980	0.01	0.004	0.09	3.203
1981	0.01	0.004	0.091	3.267
1982	0.011	0.004	0.093	3.332
1983	0.011	0.004	0.095	3.399
1984	0.011	0.005	0.097	3.467
1985	0.011	0.005	0.099	3.536
1[illegible]	0.012	0.005	0.101	3.607
1[illegible]	0.012	0.005	0.103	3.679
1988	0.012	0.005	0.105	3.753
1989	0.012	0.005	0.107	3.828
1990	0.012	0.005	0.109	3.904
1991	0.013	0.005	0.112	3.982
1992	0.013	0.005	0.114	4.062
1993	0.013	0.005	0.116	4.143
1994	0.014	0.005	0.118	4.226
1995	0.014	0.006	0.121	4.311
1996	0.014	0.006	0.123	4.397
1997	0.014	0.006	0.126	4.485
1998	0.015	0.006	0.128	4.574
1999	0.015	0.006	0.131	4.666
2000	0.015	0.006	0.133	4.759

Table S-15b. Statewide Employment By Sector
Other Mining

- Moderate Case -
- Industrialization Case -

OMN.EPH

	EMP9	MTOT
1980	3.171	3.171
1981	3.203	3.203
1982	3.235	3.235
1983	3.267	3.267
1984	3.3	3.3
1985	3.333	3.333
1986	3.367	3.367
1987	3.4	3.4
1988	3.434	3.434
1989	3.469	3.469
1990	3.503	3.503
1991	3.538	3.538
1992	3.574	3.574
1993	3.609	3.609
1994	3.645	3.645
1995	3.682	3.682
1996	3.719	3.719
1997	3.756	3.756
1998	3.793	3.793
1999	3.831	3.831
2000	3.869	3.869

SOURCE: See text.

Table R-15b. Regional Distribution of Employment
Other Mining

- Moderate Case -
- Industrialization Case -

OMN.EPH

	B01	B02	B04	B05	B08	B09	B11	B14
1980	0.015	1.995	0.805	0.004	0.053	0.032	0.039	0.002
1981	0.015	2.015	0.813	0.004	0.053	0.033	0.04	0.002
1982	0.016	2.035	0.821	0.004	0.054	0.033	0.04	0.002
1983	0.016	2.056	0.829	0.004	0.054	0.033	0.041	0.002
1984	0.016	2.076	0.838	0.004	0.055	0.034	0.041	0.002
1985	0.016	2.097	0.846	0.004	0.055	0.034	0.041	0.002
1986	0.016	2.119	0.855	0.004	0.056	0.034	0.042	0.002
1987	0.016	2.139	0.863	0.004	0.056	0.035	0.042	0.002
1988	0.016	2.161	0.872	0.004	0.057	0.035	0.043	0.002
1989	0.017	2.183	0.88	0.005	0.058	0.035	0.043	0.002
1990	0.017	2.204	0.889	0.005	0.058	0.036	0.043	0.002
1991	0.017	2.226	0.898	0.005	0.059	0.036	0.044	0.002
1992	0.017	2.249	0.907	0.005	0.059	0.036	0.044	0.002
1993	0.017	2.271	0.916	0.005	0.06	0.037	0.045	0.002
1994	0.017	2.293	0.925	0.005	0.061	0.037	0.045	0.002
1995	0.018	2.317	0.934	0.005	0.061	0.038	0.046	0.002
1996	0.018	2.34	0.944	0.005	0.062	0.038	0.046	0.002
1997	0.018	2.363	0.953	0.005	0.062	0.038	0.047	0.002
1998	0.018	2.387	0.963	0.005	0.063	0.039	0.047	0.002
1999	0.018	2.41	0.972	0.005	0.064	0.039	0.048	0.002
2000	0.019	2.434	0.982	0.005	0.064	0.039	0.048	0.002

	B16	B17	B18	B21	B25	B26	B29	MTOTR
1980	0.004	0.003	0.098	0.017	0.01	0.004	0.089	3.171
1981	0.004	0.003	0.099	0.017	0.01	0.004	0.09	3.203
1982	0.004	0.003	0.1	0.017	0.01	0.004	0.091	3.235
1983	0.004	0.003	0.101	0.018	0.01	0.004	0.091	3.267
1984	0.004	0.003	0.102	0.018	0.011	0.004	0.092	3.3
1985	0.004	0.003	0.103	0.018	0.011	0.004	0.093	3.333
1986	0.004	0.003	0.104	0.018	0.011	0.004	0.094	3.367
1987	0.004	0.003	0.105	0.018	0.011	0.004	0.095	3.4
1988	0.004	0.003	0.106	0.019	0.011	0.004	0.096	3.434
1989	0.005	0.003	0.107	0.019	0.011	0.005	0.097	3.469
1990	0.005	0.004	0.108	0.019	0.011	0.005	0.098	3.503
1991	0.005	0.004	0.109	0.019	0.011	0.005	0.099	3.538
1992	0.005	0.004	0.11	0.019	0.011	0.005	0.1	3.574
1993	0.005	0.004	0.112	0.019	0.012	0.005	0.101	3.609
1994	0.005	0.004	0.113	0.02	0.012	0.005	0.102	3.645
1995	0.005	0.004	0.114	0.02	0.012	0.005	0.103	3.682
1996	0.005	0.004	0.115	0.02	0.012	0.005	0.104	3.719
1997	0.005	0.004	0.116	0.02	0.012	0.005	0.105	3.756
1998	0.005	0.004	0.117	0.02	0.012	0.005	0.106	3.793
1999	0.005	0.004	0.118	0.021	0.012	0.005	0.107	3.831
2000	0.005	0.004	0.12	0.021	0.012	0.005	0.108	3.869

Table S-15c. Statewide Employment By Sector
Other Mining

- Low Case -

	EMP9	MTOT
1980	3.140	3.140
1981		
1982		
1983		
1984		
1985		
1986		
1987		
1988		
1989		
1990		
1991		
1992		
1993		
1994		
1995		
1996		
1997		
1998		
1999		
2000	3.140	3.140

SOURCE: See text.

Table R-15c. Regional Distribution of Employment
Other Mining

- Low Case -

OMN.EPM

	B01	B02	B04	B05	B08	B09
1980	0.015	1.976	0.797	0.004	0.052	0.032
1981	0.015	1.976	0.797	0.004	0.052	0.032
1982	0.015	1.976	0.797	0.004	0.052	0.032
1983	0.015	1.976	0.797	0.004	0.052	0.032
1984	0.015	1.976	0.797	0.004	0.052	0.032
1985	0.015	1.976	0.797	0.004	0.052	0.032
1986	0.015	1.976	0.797	0.004	0.052	0.032
1987	0.015	1.976	0.797	0.004	0.052	0.032
1988	0.015	1.976	0.797	0.004	0.052	0.032
1989	0.015	1.976	0.797	0.004	0.052	0.032
1990	0.015	1.976	0.797	0.004	0.052	0.032
1991	0.015	1.976	0.797	0.004	0.052	0.032
1992	0.015	1.976	0.797	0.004	0.052	0.032
1993	0.015	1.976	0.797	0.004	0.052	0.032
1994	0.015	1.976	0.797	0.004	0.052	0.032
1995	0.015	1.976	0.797	0.004	0.052	0.032
1996	0.015	1.976	0.797	0.004	0.052	0.032
1997	0.015	1.976	0.797	0.004	0.052	0.032
1998	0.015	1.976	0.797	0.004	0.052	0.032
1999	0.015	1.976	0.797	0.004	0.052	0.032
2000	0.015	1.976	0.797	0.004	0.052	0.032

	B11	B14	B16	B17	B18	B21
1980	0.039	0.002	0.004	0.003	0.097	0.017
1981	0.039	0.002	0.004	0.003	0.097	0.017
1982	0.039	0.002	0.004	0.003	0.097	0.017
1983	0.039	0.002	0.004	0.003	0.097	0.017
1984	0.039	0.002	0.004	0.003	0.097	0.017
1985	0.039	0.002	0.004	0.003	0.097	0.017
1986	0.039	0.002	0.004	0.003	0.097	0.017
1987	0.039	0.002	0.004	0.003	0.097	0.017
1988	0.039	0.002	0.004	0.003	0.097	0.017
1989	0.039	0.002	0.004	0.003	0.097	0.017
1990	0.039	0.002	0.004	0.003	0.097	0.017
1991	0.039	0.002	0.004	0.003	0.097	0.017
1992	0.039	0.002	0.004	0.003	0.097	0.017
1993	0.039	0.002	0.004	0.003	0.097	0.017
1994	0.039	0.002	0.004	0.003	0.097	0.017
1995	0.039	0.002	0.004	0.003	0.097	0.017
1996	0.039	0.002	0.004	0.003	0.097	0.017
1997	0.039	0.002	0.004	0.003	0.097	0.017
1998	0.039	0.002	0.004	0.003	0.097	0.017
1999	0.039	0.002	0.004	0.003	0.097	0.017
2000	0.039	0.002	0.004	0.003	0.097	0.017

	B25	B26	B29	MTOTR
1980	0.01	0.004	0.088	3.14
1981	0.01	0.004	0.088	3.14
1982	0.01	0.004	0.088	3.14
1983	0.01	0.004	0.088	3.14
1984	0.01	0.004	0.088	3.14
1985	0.01	0.004	0.088	3.14
[illegible]	0.01	0.004	0.088	3.14
[illegible]	0.01	0.004	0.088	3.14
1988	0.01	0.004	0.088	3.14
1989	0.01	0.004	0.088	3.14
1990	0.01	0.004	0.088	3.14
1991	0.01	0.004	0.088	3.14
1992	0.01	0.004	0.088	3.14
1993	0.01	0.004	0.088	3.14
1994	0.01	0.004	0.088	3.14
1995	0.01	0.004	0.088	3.14
1996	0.01	0.004	0.088	3.14
1997	0.01	0.004	0.088	3.14
1998	0.01	0.004	0.088	3.14
1999	0.01	0.004	0.088	3.14
2000	0.01	0.004	0.088	3.14

2. Agriculture

The assumptions used for the agriculture sector are based on scenarios developed by Michael Scott in Southcentral Alaska's Economy and Population, 1965-2025: A Base Study and Projections, 1979.

In the high and extreme high scenarios, favorable state and federal policies combine with favorable market conditions to produce major agricultural developments in Alaska, with employment reaching 4,600 by the year 2000.

In both the moderate and industrialization scenarios, either less favorable market conditions or restrictive land policies lower growth in agriculture, with employment reaching only 1,037 by the year 2000.

The low scenario represents a "worst case" for agriculture development. Due either to restrictive state and federal policies or to unfavorable market conditions, agriculture begins a long period of decline, eventually disappearing by 1992.

These assumptions are presented in Tables S-16 and R-16.

Table S-16a. Statewide Employment By Sector
Agriculture

- High Case -
- Extreme High Case -

AGR.SCH

	EMA9	MTOT
1980	0.178	0.178
1981	0.178	0.178
1982	0.166	0.166
1983	0.214	0.214
1984	0.27	0.27
1985	0.31	0.31
1986	0.338	0.338
1987	0.376	0.376
1988	0.468	0.468
1989	0.59	0.59
1990	0.784	0.784
1991	1.014	1.014
1992	1.314	1.314
1993	1.712	1.712
1994	2.122	2.122
1995	2.406	2.406
1996	2.706	2.706
1997	3.104	3.104
1998	3.528	3.528
1999	4.018	4.018
2000	4.608	4.608

SOURCE: See text.

Table R-16a. Regional Distribution of Employment
Agriculture

- High Case -
- Extreme High Case -

AGR.SCH

	B01	B09	B12	B17	MTOTR
1980	0.013	0.044	0.008	0.113	0.178
1981	0.013	0.044	0.008	0.113	0.178
1982	0.013	0.04	0.008	0.105	0.166
1983	0.013	0.054	0.008	0.139	0.214
1984	0.013	0.069	0.008	0.18	0.27
1985	0.013	0.08	0.008	0.209	0.31
1986	0.013	0.088	0.008	0.229	0.338
1987	0.013	0.099	0.008	0.256	0.376
1988	0.013	0.124	0.008	0.323	0.468
1989	0.013	0.158	0.008	0.411	0.59
1990	0.013	0.212	0.008	0.551	0.784
1991	0.013	0.276	0.008	0.717	1.014
1992	0.013	0.36	0.008	0.933	1.314
1993	0.013	0.47	0.008	1.221	1.712
1994	0.013	0.584	0.008	1.517	2.122
1995	0.013	0.663	0.008	1.722	2.406
1996	0.013	0.747	0.008	1.938	2.706
1997	0.013	0.857	0.008	2.226	3.104
1998	0.013	0.975	0.008	2.532	3.528
1999	0.013	1.112	0.008	2.885	4.018
2000	0.013	1.276	0.008	3.311	4.608

Table S-16b. Statewide Employment By Sector
Agriculture

- Moderate Case -
- Industrialization Case -

AGR.SCM

	EMA9	MTOT
1980	0.178	0.178
1981	0.178	0.178
1982	0.166	0.166
1983	0.204	0.204
1984	0.228	0.228
1985	0.252	0.252
1986	0.276	0.276
1987	0.3	0.3
1988	0.357	0.357
1989	0.413	0.413
1990	0.47	0.47
1991	0.527	0.527
1992	0.583	0.583
1993	0.64	0.64
1994	0.697	0.697
1995	0.753	0.753
1996	0.81	0.81
1997	0.867	0.867
1998	0.923	0.923
1999	0.98	0.98
2000	1.037	1.037

Table R-16b. Regional Distribution of Employment
Agriculture

- Moderate Case -
- Industrialization Case -

AGR.SCM

	B01	B09	B12	B17	MTOTR
1980	0.013	0.044	0.008	0.113	0.178
1981	0.013	0.044	0.008	0.113	0.178
1982	0.013	0.04	0.008	0.105	0.166
1983	0.013	0.051	0.008	0.132	0.204
1984	0.013	0.058	0.008	0.149	0.228
1985	0.013	0.064	0.008	0.167	0.252
1986	0.013	0.071	0.008	0.184	0.276
1987	0.013	0.078	0.008	0.201	0.3
1988	0.013	0.093	0.008	0.243	0.357
1989	0.013	0.109	0.008	0.283	0.413
1990	0.013	0.125	0.008	0.324	0.47
1991	0.013	0.141	0.008	0.365	0.527
1992	0.013	0.156	0.008	0.406	0.583
1993	0.013	0.172	0.008	0.447	0.64
1994	0.013	0.188	0.008	0.488	0.697
1995	0.013	0.204	0.008	0.528	0.753
1996	0.013	0.219	0.008	0.57	0.81
1997	0.013	0.235	0.008	0.611	0.867
1998	0.013	0.251	0.008	0.651	0.923
1999	0.013	0.267	0.008	0.692	0.98
2000	0.013	0.283	0.008	0.733	1.037

Table S-16c. Statewide Employment By Sector
Agriculture

- Low Case -

AGR.SCL

	EMA9	MTOT
1980	0.178	0.178
1981	0.178	0.178
1982	0.166	0.166
1983	0.156	0.156
1984	0.156	0.156
1985	0.128	0.128
1986	0.126	0.126
1987	0.096	0.096
1988	0.076	0.076
1989	0.058	0.058
1990	0.046	0.046
1991	0.032	0.032
1992	0.	0.
1993	0.	0.
1994	0.	0.
1995	0.	0.
1996	0.	0.
1997	0.	0.
1998	0.	0.
1999	0.	0.
2000	0.	0.

Table R-16c. Regional Distribution of Employment
Agriculture

- Low Case -

AGR.SCL

	B01	B09	B12	B17	MTOTR
1980	0.012	0.044	0.007	0.114	0.178
1981	0.012	0.044	0.007	0.114	0.178
1982	0.011	0.041	0.007	0.107	0.166
1983	0.011	0.039	0.007	0.1	0.156
1984	0.011	0.039	0.007	0.1	0.156
1985	0.009	0.032	0.005	0.082	0.128
1986	0.009	0.031	0.005	0.081	0.126
1987	0.007	0.024	0.004	0.062	0.096
1988	0.005	0.019	0.003	0.049	0.076
1989	0.004	0.014	0.002	0.037	0.058
1990	0.003	0.011	0.002	0.03	0.046
1991	0.002	0.008	0.001	0.021	0.032
1992	0.	0.	0.	0.	0.
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

3. Fisheries/Food Processing

In all cases, existing fisheries harvesting employment remains constant throughout the forecast period at its current level of about 6,363.[2]

In the high and extreme high scenarios, major expansion of bottomfishing occurs, with 100 percent replacement of the foreign fishing effort within the 200-mile limit by the year 2000. Total fisheries harvesting and processing employment rises to 17,489 by the year 2000, as shown in Tables S-17a and R-17a.

In both the moderate and industrialization cases, a more moderate expansion of bottomfishing replaces 50 percent of the foreign fishing effort within the 200-mile limit by the year 2000. Total employment reaches 16,483, as shown in Tables S-17b and R-17b.

In the low scenario, no bottomfishing development occurs. Total employment remains at 13,486, as shown in Tables S-17c and R-17c.

(In all cases, food processing employment increases in the same proportion as fisheries employment. This assumes that any increase in the productivity of fisheries can be matched by corresponding increases in food processing productivity.)

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[2]Based on projection to 1980 of estimates presented in G. Rogers, Measuring the Socioeconomic Impacts of Alaska's Fisheries, ISER, 4/80.

Table S-17a. Statewide Employment By Sector
Fisheries/Food Processing

- High Case -
- Extreme High Case -

FFP.RGH

	ECONX2	EMMX2	EMPROF	MTOT
1980	0.15	7.462	6.666	14.278
1981	0.15	7.598	6.787	14.535
1982	0.15	7.734	6.909	14.793
1983	0.15	7.869	7.029	15.048
1984	0.15	8.005	7.151	15.306
1985	0.15	8.141	7.272	15.563
1986	0.15	8.208	7.332	15.69
1987	0.15	8.276	7.393	15.819
1988	0.15	8.334	7.445	15.929
1989	0.15	8.412	7.514	16.076
1990	0.15	8.48	7.575	16.205
1991	0.15	8.548	7.636	16.334
1992	0.15	8.615	7.696	16.461
1993	0.15	8.683	7.757	16.59
1994	0.15	8.751	7.817	16.718
1995	0.15	8.819	7.878	16.847
1996	0.15	8.887	7.939	16.976
1997	0.15	8.955	8.	17.104
1998	0.15	9.022	8.059	17.231
1999	0.15	9.09	8.12	17.36
2000	0.15	9.158	8.181	17.489

Table R-17a. Regional Distribution of Employment Fisheries/Food Processing

- High Case -
- Extreme High Case -

FFP.RGH

	B01	B02	B05	B06	B08	B11
1980	2.314	0.512	0.285	1.724	0.763	3.818
1981	2.356	0.521	0.291	1.755	0.777	3.887
1982	2.397	0.531	0.296	1.786	0.79	3.956
1983	2.438	0.54	0.301	1.817	0.804	4.025
1984	2.48	0.549	0.306	1.848	0.818	4.094
1985	2.521	0.558	0.311	1.879	0.832	4.163
1986	2.542	0.562	0.314	1.894	0.838	4.197
1987	2.562	0.567	0.316	1.91	0.845	4.231
1988	2.58	0.571	0.319	1.923	0.851	4.261
1989	2.604	0.576	0.322	1.941	0.859	4.3
1990	2.625	0.581	0.324	1.957	0.866	4.335
1991	2.645	0.585	0.327	1.972	0.873	4.369
1992	2.666	0.59	0.329	1.988	0.88	4.403
1993	2.687	0.594	0.332	2.003	0.887	4.438
1994	2.707	0.599	0.334	2.019	0.894	4.472
1995	2.728	0.604	0.337	2.034	0.901	4.507
1996	2.749	0.608	0.34	2.05	0.907	4.541
1997	2.77	0.613	0.342	2.065	0.914	4.576
1998	2.79	0.617	0.345	2.081	0.921	4.61
1999	2.811	0.622	0.347	2.096	0.928	4.644
2000	2.832	0.626	0.35	2.112	0.935	4.679

	B12	B14	B15	B16	B18	B21
1980	1.326	0.045	3.079	0.005	0.057	0.062
1981	1.35	0.045	3.135	0.005	0.058	0.063
1982	1.374	0.046	3.19	0.005	0.059	0.064
1983	1.397	0.047	3.246	0.005	0.06	0.065
1984	1.421	0.048	3.301	0.005	0.061	0.067
1985	1.445	0.049	3.357	0.005	0.062	0.068
1986	1.457	0.049	3.384	0.005	0.062	0.068
1987	1.469	0.05	3.412	0.005	0.063	0.069
1988	1.479	0.05	3.435	0.005	0.063	0.069
1989	1.493	0.05	3.467	0.005	0.064	0.07
1990	1.505	0.051	3.495	0.005	0.064	0.07
1991	1.517	0.051	3.523	0.005	0.065	0.071
1992	1.529	0.052	3.55	0.005	0.065	0.072
1993	1.541	0.052	3.578	0.005	0.066	0.072
1994	1.552	0.052	3.606	0.005	0.066	0.073
1995	1.564	0.053	3.633	0.006	0.067	0.073
1996	1.576	0.053	3.661	0.006	0.067	0.074
1997	1.588	0.054	3.689	0.006	0.068	0.074
1998	1.6	0.054	3.716	0.006	0.069	0.075
1999	1.612	0.054	3.744	0.006	0.069	0.076
2000	1.624	0.055	3.772	0.006	0.07	0.076

	B26	B27	MTOTR
1980	0.056	0.232	14.278
1981	0.057	0.237	14.535
1982	0.058	0.241	14.793
1983	0.059	0.245	15.048
1984	0.06	0.249	15.306
1985	0.061	0.253	15.563
[illegible]	0.061	0.256	15.69
[illegible]	0.062	0.258	15.819
1988	0.062	0.259	15.929
1989	0.063	0.262	16.076
1990	0.063	0.264	16.205
1991	0.064	0.266	16.334
1992	0.064	0.268	16.461
1993	0.065	0.27	16.589
1994	0.065	0.272	16.718
1995	0.066	0.274	16.847
1996	0.066	0.277	16.976
1997	0.067	0.279	17.104
1998	0.067	0.281	17.231
1999	0.068	0.283	17.36
2000	0.068	0.285	17.489

Table S-17b. Statewide Employment By Sector
Fisheries/Food Processing

- Moderate Case -
- Industrialization Case -

FFP.RGM

	ECONX2	EMMX2	EMPROF	MTOT
1980	0.	7.462	6.666	14.128
1981	0.75	7.53	6.727	15.007
1982	0.75	7.598	6.787	15.135
1983	0.75	7.666	6.848	15.264
1984	0.75	7.734	6.909	15.393
1985	0.75	7.801	6.969	15.52
1986	0.75	7.835	6.999	15.584
1987	0.75	7.869	7.029	15.648
1988	0.75	7.903	7.06	15.713
1989	0.75	7.937	7.09	15.777
1990	0.75	7.971	7.12	15.841
1991	0.75	8.005	7.151	15.906
1992	0.75	8.039	7.181	15.97
1993	0.75	8.073	7.212	16.035
1994	0.75	8.107	7.242	16.099
1995	0.75	8.141	7.272	16.163
1996	0.75	8.174	7.302	16.226
1997	0.75	8.208	7.332	16.29
1998	0.75	8.242	7.363	16.355
1999	0.75	8.276	7.393	16.419
2000	0.75	8.31	7.423	16.483

Table R-17b. Regional Distribution of Employment
Fisheries/Food Processing

- Moderate Case -
- Industrialization Case -

FFP.RGM

	B01	B02	B05	B06	B08	B11	B12	B14
1980	2.277	0.502	0.283	1.708	0.758	3.787	1.312	0.045
1981	2.481	0.557	0.296	1.803	0.79	3.979	1.391	0.045
1982	2.502	0.562	0.298	1.818	0.797	4.013	1.403	0.045
1983	2.523	0.566	0.301	1.834	0.804	4.048	1.415	0.046
1984	2.544	0.571	0.303	1.849	0.811	4.082	1.427	0.046
1985	2.564	0.575	0.306	1.865	0.818	4.116	1.439	0.047
1986	2.574	0.578	0.307	1.872	0.821	4.133	1.445	0.047
1987	2.585	0.58	0.309	1.88	0.824	4.151	1.451	0.047
1988	2.595	0.582	0.31	1.888	0.828	4.168	1.457	0.047
1989	2.605	0.585	0.311	1.896	0.831	4.185	1.463	0.048
1990	2.616	0.587	0.312	1.904	0.835	4.202	1.469	0.048
1991	2.626	0.589	0.314	1.911	0.838	4.22	1.474	0.048
1992	2.637	0.591	0.315	1.919	0.842	4.237	1.48	0.048
1993	2.647	0.594	0.316	1.927	0.845	4.254	1.486	0.048
1994	2.657	0.596	0.318	1.935	0.849	4.271	1.492	0.049
1995	2.668	0.598	0.319	1.942	0.852	4.289	1.498	0.049
1996	2.678	0.601	0.32	1.95	0.855	4.305	1.504	0.049
1997	2.688	0.603	0.321	1.958	0.859	4.323	1.51	0.049
1998	2.699	0.605	0.323	1.966	0.862	4.34	1.516	0.049
1999	2.709	0.607	0.324	1.973	0.866	4.357	1.522	0.05
2000	2.719	0.61	0.325	1.981	0.869	4.374	1.528	0.05

	B15	B16	B18	B21	B26	B27	MTOTR
1980	3.046	0.005	0.057	0.062	0.055	0.231	14.128
1981	3.242	0.005	0.057	0.063	0.058	0.241	15.007
1982	3.27	0.005	0.058	0.063	0.059	0.243	15.135
1983	3.297	0.005	0.058	0.064	0.059	0.245	15.264
1984	3.325	0.005	0.059	0.064	0.06	0.247	15.393
1985	3.352	0.005	0.059	0.065	0.06	0.249	15.52
1986	3.366	0.005	0.059	0.065	0.06	0.25	15.584
1987	3.38	0.005	0.06	0.065	0.061	0.251	15.648
1988	3.394	0.005	0.06	0.066	0.061	0.252	15.713
1989	3.408	0.005	0.06	0.066	0.061	0.253	15.777
1990	3.422	0.005	0.061	0.066	0.061	0.254	15.841
1991	3.436	0.005	0.061	0.067	0.062	0.256	15.906
1992	3.45	0.005	0.061	0.067	0.062	0.257	15.97
1993	3.463	0.005	0.061	0.067	0.062	0.258	16.035
1994	3.477	0.005	0.062	0.067	0.062	0.259	16.099
1995	3.491	0.005	0.062	0.068	0.063	0.26	16.163
1996	3.505	0.005	0.062	0.068	0.063	0.261	16.226
1997	3.519	0.005	0.062	0.068	0.063	0.262	16.29
1998	3.532	0.005	0.063	0.068	0.063	0.263	16.355
1999	3.546	0.005	0.063	0.069	0.064	0.264	16.419
2000	3.56	0.005	0.063	0.069	0.064	0.265	16.483

Table S-17c. Statewide Employment By Sector
Fisheries/Food Processing

- Low Case -

FFP.RGL

	ECONX2	EMMX2	EMPROF	MTOT
1980	0.	7.123	6.363	13.486
1981	0.	7.123	6.363	13.486
1982	0.	7.123	6.363	13.486
1983	0.	7.123	6.363	13.486
1984	0.	7.123	6.363	13.486
1985	0.	7.123	6.363	13.486
1986	0.	7.123	6.363	13.486
1987	0.	7.123	6.363	13.486
1988	0.	7.123	6.363	13.486
1989	0.	7.123	6.363	13.486
1990	0.	7.123	6.363	13.486
1991	0.	7.123	6.363	13.486
1992	0.	7.123	6.363	13.486
1993	0.	7.123	6.363	13.486
1994	0.	7.123	6.363	13.486
1995	0.	7.123	6.363	13.486
1996	0.	7.123	6.363	13.486
1997	0.	7.123	6.363	13.486
1998	0.	7.123	6.363	13.486
1999	0.	7.123	6.363	13.486
2000	0.	7.123	6.363	13.486

Table R-17c. Regional Distribution of Employment
Fisheries/Food Processing

- Low Case -

FFP.RGL

	B01	B02	B05	B06	B08	B11
1980	2.174	0.479	0.271	1.63	0.723	3.615
1981	2.174	0.479	0.271	1.63	0.723	3.615
1982	2.174	0.479	0.271	1.63	0.723	3.615
1983	2 174	0.479	0.271	1.63	0.723	3.615
1984	2.174	0.479	0.271	1.63	0 723	3.615
1985	2.174	0.479	0.271	1.63	0.723	3.615
1986	2.174	0.479	0.271	1.63	0.723	3.615
1987	2.174	0.479	0.271	1.63	0.723	3.615
1988	2.174	0.479	0.271	1.63	0.723	3.615
1989	2.174	0.479	0.271	1.63	0.723	3.615
1990	2.174	0.479	0.271	1.63	0.723	3.615
1991	2.174	0.479	0.271	1.63	0.723	3.615
1992	2.174	0.479	0.271	1.63	0.723	3.615
1993	2.174	0.479	0.271	1.63	0.723	3.615
1994	2.174	0.479	0.271	1.63	0.723	3.615
1995	2.174	0.479	0.271	1.63	0.723	3.615
1996	2.174	0.479	0.271	1.63	0.723	3.615
1997	2.174	0.479	0.271	1.63	0.723	3.615
1998	2.174	0.479	0.271	1.63	0.723	3.615
1999	2.174	0.479	0.271	1.63	0.723	3.615
2000	2.174	0.479	0.271	1.63	0.723	3.615

	B12	B14	B15	B16	B18	B21
1980	1.253	0.043	2.907	0.004	0.054	0.059
1981	1.253	0.043	2.907	0.004	0.054	0.059
1982	1.253	0.043	2.907	0.004	0.054	0.059
1983	1.253	0.043	2.907	0.004	0.054	0.059
1984	1.253	0.043	2.907	0.004	0.054	0.059
1985	1.253	0.043	2.907	0.004	0.054	0.059
1986	1.253	0.043	2.907	0.004	0.054	0.059
1987	1.253	0.043	2.907	0.004	0.054	0.059
1988	1.253	0.043	2.907	0.004	0.054	0.059
1989	1.253	0.043	2.907	0.004	0.054	0.059
1990	1.253	0.043	2.907	0.004	0.054	0.059
1991	1.253	0.043	2.907	0.004	0.054	0.059
1992	1.253	0.043	2.907	0.004	0.054	0.059
1993	1.253	0.043	2.907	0.004	0.054	0.059
1994	1.253	0.043	2.907	0.004	0.054	0.059
1995	1.253	0.043	2.907	0.004	0.054	0.059
1996	1.253	0.043	2.907	0.004	0.054	0.059
1997	1.253	0.043	2.907	0.004	0.054	0.059
1998	1.253	0.043	2.907	0.004	0.054	0.059
1999	1.253	0.043	2.907	0.004	0.054	0.059
2000	1.253	0.043	2.907	0.004	0.054	0.059

	B26	B27	MTOTR
1980	0.053	0.22	13.486
1981	0.053	0.22	13.486
1982	0.053	0.22	13.486
1983	0.053	0.22	13.486
1984	0.053	0.22	13.486
1985	0.053	0.22	13.486
[illegible]	0.053	0.22	13.486
[illegible]	0.053	0.22	13.486
1988	0.053	0.22	13.486
1989	0.053	0.22	13.486
1990	0.053	0.22	13.486
1991	0.053	0.22	13.486
1992	0.053	0.22	13.486
1993	0.053	0.22	13.486
1994	0.053	0.22	13.486
1995	0.053	0.22	13.486
1996	0.053	0.22	13.486
1997	0.053	0.22	13.486
1998	0.053	0.22	13.486
1999	0.053	0.22	13.486
2000	0.053	0.22	13.486

4. Forestry/Lumber, Pulp and Paper Manufacturing

In 1979, the Alaskan timber industry harvested approximately 500 million board feet of lumber. Employment in this industry is divided between two sectors of the economy. A small portion of employment (about 23 persons) is classified as forestry. The remainder falls into manufacturing (3,221 in 1979).

In the high and extreme high scenarios, the output of timber rises to 1.3 billion board feet by the year 2000, representing a near doubling of historical growth of output in the industry. Assuming no increase in the productivity of labor in timber, the manufacturing employment component of the industry grows to 8,375 by the year 2000, while forestry grows to 60, as shown in Tables S-18a and R18a.

In the moderate, low, and industrialization scenarios, timber output rises to 960 million board feet by the year 2000, implying a rise in manufacturing employment to 6,184, and forestry to 44, as shown in Tables S-18b and R-18b. The rate of growth in output in this case is approximately equal to the historical growth in the industry.

Table S-18a. Statewide Employment By Sector
Forestry/Lumber, Pulp, and Paper

- High Case -
- Extreme High Case -

FLP.SCH

	EMA9	EMMX2	MTOT
1980	0.024	3.371	3.395
1981	0.025	3.528	3.553
1982	0.026	3.692	3.718
1983	0.028	3.864	3.892
1984	0.029	4.044	4.073
1985	0.03	4.232	4.262
1986	0.032	4.429	4.461
1987	0.033	4.635	4.668
1988	0.035	4.851	4.886
1989	0.036	5.077	5.113
1990	0.038	5.313	5.351
1991	0.04	5.561	5.601
1992	0.042	5.819	5.861
1993	0.043	6.09	6.133
1994	0.046	6.374	6.42
1995	0.048	6.671	6.719
1996	0.05	6.981	7.031
1997	0.052	7.306	7.358
1998	0.055	7.646	7.701
1999	0.057	8.002	8.059
2000	0.06	8.375	8.435

SOURCE: See text.

Table R-18a. Regional Distribution of Employment
Forestry/Lumber, Pulp, and Paper

- High Case -
- Extreme High Case -

FLP.SCH

	B02	B08	B09	B11	B12	B15
1980	0.137	0.092	0.045	2.276	0.15	0.192
1981	0.144	0.096	0.047	2.382	0.157	0.201
1982	0.15	0.1	0.049	2.492	0.164	0.21
1983	0.157	0.105	0.052	2.609	0.172	0.22
1984	0.165	0.11	0.054	2.73	0.18	0.23
1985	0.172	0.115	0.057	2.857	0.188	0.241
1986	0.18	0.12	0.059	2.99	0.197	0.252
1987	0.189	0.126	0.062	3.129	0.206	0.264
1988	0.197	0.132	0.065	3.275	0.215	0.276
1989	0.207	0.138	0.068	3.427	0.225	0.289
1990	0.216	0.144	0.071	3.587	0.236	0.302
1991	0.226	0.151	0.074	3.754	0.247	0.316
1992	0.237	0.158	0.078	3.929	0.258	0.331
1993	0.248	0.166	0.082	4.111	0.27	0.347
1994	0.259	0.173	0.085	4.303	0.283	0.363
1995	0.271	0.181	0.089	4.504	0.296	0.38
1996	0.284	0.19	0.094	4.713	0.31	0.397
1997	0.297	0.199	0.098	4.932	0.324	0.416
1998	0.311	0.208	0.102	5.162	0.34	0.435
1999	0.326	0.218	0.107	5.402	0.355	0.455
2000	0.341	0.228	0.112	5.654	0.372	0.477

	B21	MTOTR
1980	0.504	3.395
1981	0.527	3.553
1982	0.552	3.718
1983	0.578	3.892
1984	0.604	4.073
1985	0.632	4.262
1986	0.662	4.461
1987	0.693	4.668
1988	0.725	4.886
1989	0.759	5.113
1990	0.794	5.351
1991	0.831	5.601
1992	0.87	5.861
1993	0.91	6.133
1994	0.953	6.42
1995	0.997	6.719
1996	1.043	7.031
1997	1.092	7.358
1998	1.143	7.701
1999	1.196	8.059
2000	1.252	8.435

Table S-18b. Statewide Employment By Sector
Forestry/Lumber, Pulp, and Paper

- Moderate Case -
- Industrialization Case -
- Low Case -

FLP.SCM

	EMA9	EMMX2	MTOT
1980	0.024	3.322	3.346
1981	0.024	3.426	3.45
1982	0.025	3.534	3.559
1983	0.026	3.645	3.671
1984	0.027	3.759	3.786
1985	0.028	3.877	3.905
1986	0.029	3.999	4.028
1987	0.029	4.124	4.153
1988	0.03	4.253	4.283
1989	0.031	4.387	4.418
1990	0.032	4.524	4.556
1991	0.033	4.666	4.699
1992	0.034	4.813	4.847
1993	0.035	4.964	4.999
1994	0.037	5.119	5.156
1995	0.038	5.28	5.318
1996	0.039	5.446	5.485
1997	0.04	5.617	5.657
1998	0.041	5.793	5.834
1999	0.043	5.974	6.017
2000	0.044	6.184	6.228

Table R-18b. Regional Distribution of Employment
Forestry/Lumber, Pulp, and Paper

- Moderate Case -
- Industrialization Case -
- Low Case -

FLP.SCM

	B02	B08	B09	B11	B12	B15	B21	MTOTR
1980	0.135	0.09	0.045	2.243	0.148	0.189	0.497	3.346
1981	0.139	0.093	0.046	2.313	0.152	0.195	0.512	3.45
1982	0.144	0.096	0.047	2.386	0.157	0.201	0.528	3.559
1983	0.148	0.099	0.049	2.461	0.162	0.207	0.545	3.671
1984	0.153	0.102	0.05	2.538	0.167	0.214	0.562	3.786
1985	0.158	0.105	0.052	2.618	0.172	0.221	0.58	3.905
1986	0.163	0.109	0.054	2.7	0.178	0.228	0.598	4.028
1987	0.168	0.112	0.055	2.784	0.183	0.235	0.616	4.153
1988	0.173	0.116	0.057	2.871	0.189	0.242	0.636	4.283
1989	0.178	0.119	0.059	2.961	0.195	0.25	0.656	4.418
1990	0.184	0.123	0.061	3.054	0.201	0.257	0.676	4.556
1991	0.19	0.127	0.062	3.15	0.207	0.265	0.697	4.699
1992	0.196	0.131	0.064	3.249	0.214	0.274	0.719	4.847
1993	0.202	0.135	0.066	3.351	0.22	0.282	0.742	4.999
1994	0.208	0.139	0.069	3.456	0.227	0.291	0.765	5.156
1995	0.215	0.144	0.071	3.565	0.235	0.3	0.789	5.318
1996	0.222	0.148	0.073	3.677	0.242	0.31	0.814	5.485
1997	0.229	0.153	0.075	3.792	0.249	0.32	0.839	5.657
1998	0.236	0.158	0.078	3.911	0.257	0.33	0.866	5.834
1999	0.243	0.162	0.08	4.033	0.265	0.34	0.893	6.017
2000	0.252	0.168	0.083	4.175	0.275	0.352	0.924	6.228

5. Other Manufacturing

Exogenous manufacturing employment presented thus far consists of special project employment, timber employment, and food processing employment. The residual, composed of 2,356 persons in 1979, or about 1.4 percent of total employment, produces a variety of manufactured products primarily for Alaskan consumption. One interpretation of this residual component is then as the "local serving" component of manufacturing.

Under this interpretation, other manufacturing may be interpreted as endogenous, and the question arises as to how the endogenous relationship should be specified in the MAP model.

Research done at the University of Washington in the early 1970s by Ullman, Dacey, and Brodsky (see The Economic Base of American Cities, 1971) suggests that there is a minimum percentage of employment required in regions to serve local needs and that this percentage rises with the population of the region. That is, as the region becomes larger, its minimum requirements become a larger share of total employment so that larger areas are more self-contained, or autonomous.

They estimate that the minimum manufacturing requirement in cities of 10,000 to 12,500 is 1.5 percent of total employment but that for cities of 100,000 to 150,000, this requirement rises to 5 percent; however, for areas as large as a million persons, the proportion only rises to 6.8 percent.

In the high scenario, it is assumed that increased population concentration raises the local serving manufacturing requirement to 3 percent. In the moderate scenario, the proportion rises to 2 percent from its current 1.4 percent; and in the low scenario, the share remains 1.4 percent of total employment. In the industrialization and extreme high scenarios, it is assumed that this effect is most pronounced, raising the required share to 5 percent of total employment.

6. Federal Government

Federal government has always played a dominant role in Alaskan employment. In recent years, however, such employment has been stable as decreasing military employment has been offset by rising civilian employment.

In all scenarios, federal military employment remains constant at existing levels, as shown in Tables S-19 and R-19. In the low, moderate, and industrialization scenarios, federal civilian employment grows at its historical rate of 0.5 percent annually, as shown in Tables S-20b and R-20b. In the high case, this growth rate doubles to 1 percent annually, as shown in Tables S-20a and R-20a.

Table S-19. Statewide Employment By Sector
Active-Duty Military

- All Cases -

GFM.EPM

	EMGF	MTOT
1980	23.323	23.323
1981	23.323	23.323
1982	23.323	23.323
1983	23.323	23.323
1984	23.323	23.323
1985	23.323	23.323
1986	23.323	23.323
1987	23.323	23.323
1988	23.323	23.323
1989	23.323	23.323
1990	23.323	23.323
1991	23.323	23.323
1992	23.323	23.323
1993	23.323	23.323
1994	23.323	23.323
1995	23.323	23.323
1996	23.323	23.323
1997	23.323	23.323
1998	23.323	23.323
1999	23.323	23.323
2000	23.323	23.323

SOURCE: Current value from Alaska Department of Labor, assumed constant thereafter.

Table R-19. Regional Distribution of Employment Active-Duty Military

- All Cases -

GFM.EPM

	G01	G02	G04	G05	G06	G08	G09	G11
1980	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1981	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1982	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1983	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1984	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1985	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1986	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1987	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1988	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1989	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1990	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1991	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1992	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1993	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1994	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1995	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1996	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1997	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1998	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
1999	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686
2000	2.176	11.864	0.016	0.014	0.369	0.054	5.579	0.686

	G12	G14	G15	G16	G17	G18	G21	G24
1980	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1981	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1982	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1983	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1984	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1985	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1986	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1987	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1988	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1989	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1990	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1991	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1992	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1993	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1994	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1995	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1996	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1997	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1998	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
1999	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849
2000	0.056	0.016	0.891	0.054	0.147	0.042	0.014	0.849

	G25	G26	G27	G29	MTOTR
1980	0.028	0.042	0.014	0.413	23.323
1981	0.028	0.042	0.014	0.413	23.323
1982	0.028	0.042	0.014	0.413	23.323
1983	0.028	0.042	0.014	0.413	23.323
1984	0.028	0.042	0.014	0.413	23.323
1985	0.028	0.042	0.014	0.413	23.323
19[illegible]	0.028	0.042	0.014	0.413	23.32[illegible]
19[illegible]	0.028	0.042	0.014	0.413	23.32[illegible]
1988	0.028	0.042	0.014	0.413	23.323
1989	0.028	0.042	0.014	0.413	23.323
1990	0.028	0.042	0.014	0.413	23.323
1991	0.028	0.042	0.014	0.413	23.323
1992	0.028	0.042	0.014	0.413	23.323
1993	0.028	0.042	0.014	0.413	23.323
1994	0.028	0.042	0.014	0.413	23.323
1995	0.028	0.042	0.014	0.413	23.323
1996	0.028	0.042	0.014	0.413	23.323
1997	0.028	0.042	0.014	0.413	23.323
1998	0.028	0.042	0.014	0.413	23.323
1999	0.028	0.042	0.014	0.413	23.323
2000	0.028	0.042	0.014	0.413	23.323

Table S-20a. Statewide Employment By Sector
Federal Civilian

- High Case -
- Extreme High Case -

GFC.EPH

	EMGF	MTOT
1980	18.094	18.094
1981	18.275	18.275
1982	18.458	18.458
1983	18.642	18.642
1984	18.829	18.829
1985	19.017	19.017
1986	19.207	19.207
1987	19.399	19.399
1988	19.593	19.593
1989	19.789	19.789
1990	19.987	19.987
1991	20.187	20.187
1992	20.389	20.389
1993	20.593	20.593
1994	20.799	20.799
1995	21.007	21.007
1996	21.217	21.217
1997	21.429	21.429
1998	21.643	21.643
1999	21.86	21.86
2000	22.078	22.078

SOURCE: 1979 value from Alaska Department of Labor, Statistical Quarterly; thereafter, see text for assumptions.

Table R-20a. Regional Distribution of Employment
Federal Civilian

- High Case -
- Extreme High Case -

GFC.EPH

	G01	G02	G04	G05	G06	G08
1980	0.709	9.843	0.25	0.414	0.194	0.036
1981	0.716	9.942	0.252	0.418	0.196	0.037
1982	0.724	10.041	0.255	0.423	0.197	0.037
1983	0.731	10.141	0.257	0.427	0.199	0.037
1984	0.738	10.243	0.26	0.431	0.201	0.038
1985	0.745	10.345	0.262	0.435	0.203	0.038
1986	0.753	10.449	0.265	0.44	0.206	0.038
1987	0.76	10.553	0.268	0.444	0.208	0.039
1988	0.768	10.659	0.27	0.449	0.21	0.039
1989	0.776	10.765	0.273	0.453	0.212	0.04
1990	0.783	10.873	0.276	0.458	0.214	0.04
1991	0.791	10.982	0.279	0.462	0.216	0.04
1992	0.799	11.092	0.281	0.467	0.218	0.041
1993	0.807	11.202	0.284	0.472	0.22	0.041
1994	0.815	11.314	0.287	0.476	0.223	0.042
1995	0.823	11.428	0.29	0.481	0.225	0.042
1996	0.832	11.542	0.293	0.486	0.227	0.042
1997	0.84	11.657	0.296	0.491	0.229	0.043
1998	0.848	11.774	0.299	0.496	0.232	0.043
1999	0.857	11.892	0.302	0.501	0.234	0.044
2000	0.865	12.011	0.305	0.506	0.236	0.044

	G09	G11	G12	G14	G15	G16
1980	2.34	2.428	0.105	0.25	0.288	0.078
1981	2.363	2.453	0.106	0.252	0.291	0.079
1982	2.387	2.477	0.107	0.255	0.293	0.079
1983	2.41	2.502	0.108	0.257	0.296	0.08
1984	2.435	2.527	0.109	0.26	0.299	0.081
1985	2.459	2.552	0.11	0.262	0.302	0.082
1986	2.484	2.578	0.111	0.265	0.305	0.083
1987	2.508	2.603	0.113	0.268	0.308	0.083
1988	2.533	2.629	0.114	0.27	0.312	0.084
1989	2.559	2.656	0.115	0.273	0.315	0.085
1990	2.584	2.682	0.116	0.276	0.318	0.086
1991	2.61	2.709	0.117	0.279	0.321	0.087
1992	2.636	2.736	0.118	0.281	0.324	0.088
1993	2.663	2.764	0.119	0.284	0.327	0.089
1994	2.689	2.791	0.121	0.287	0.331	0.089
1995	2.716	2.819	0.122	0.29	0.334	0.09
1996	2.743	2.847	0.123	0.293	0.337	0.091
1997	2.771	2.876	0.124	0.296	0.341	0.092
1998	2.798	2.905	0.126	0.299	0.344	0.093
1999	2.826	2.934	0.127	0.302	0.348	0.094
2000	2.855	2.963	0.128	0.305	0.351	0.095

	G17	G18	G21	G24	G25	G26
1980	0.098	0.179	0.069	0.338	0.034	0.045
1981	0.099	0.181	0.069	0.342	0.035	0.046
1982	0.1	0.183	0.07	0.345	0.035	0.046
1983	0.101	0.185	0.071	0.349	0.035	0.047
1984	0.102	0.186	0.072	0.352	0.036	0.047
1985	0.103	0.188	0.072	0.356	0.036	0.048
[illegible]	0.104	0.19	0.073	0.359	[illegible]	0.048
[illegible]	0.105	0.192	0.074	0.363	[illegible]	0.048
1988	0.106	0.194	0.074	0.366	0.037	0.049
1989	0.107	0.196	0.075	0.37	0.038	0.049
1990	0.108	0.198	0.076	0.374	0.038	0.05
1991	0.109	0.2	0.077	0.377	0.038	0.05
1992	0.11	0.202	0.077	0.381	0.039	0.051
1993	0.111	0.204	0.078	0.385	0.039	0.051
1994	0.112	0.206	0.079	0.389	0.04	0.052
1995	0.113	0.208	0.08	0.393	0.04	0.053
1996	0.115	0.21	0.081	0.397	0.04	0.053
1997	0.116	0.212	0.081	0.401	0.041	0.054
1998	0.117	0.214	0.082	0.405	0.041	0.054
1999	0.118	0.216	0.083	0.409	0.042	0.055
2000	0.119	0.219	0.084	0.413	0.042	0.055

	G27	G29	MTOTR
1980	0.136	0.261	18.094
1981	0.137	0.263	18.275
1982	0.138	0.266	18.458
1983	0.14	0.268	18.642
1984	0.141	0.271	18.829
1985	0.143	0.274	19.017
1986	0.144	0.277	19.207
1987	0.145	0.279	19.399
1988	0.147	0.282	19.593
1989	0.148	0.285	19.789
1990	0.15	0.288	19.987
1991	0.151	0.291	20.187
1992	0.153	0.294	20.389
1993	0.154	0.297	20.593
1994	0.156	0.3	20.799
1995	0.158	0.302	21.007
1996	0.159	0.306	21.217
1997	0.161	0.309	21.429
1998	0.162	0.312	21.643
1999	0.164	0.315	21.859
2000	0.166	0.318	22.078

Table S-20b. Statewide Employment By Sector
Federal Civilian

- Moderate Case -
- Industrialization Case -
- Low Case -

GFC.EPM

	EMGF	MTOT
1980	18.005	18.005
1981	18.095	18.095
1982	18.185	18.185
1983	18.276	18.276
1984	18.367	18.367
1985	18.459	18.459
1986	18.551	18.551
1987	18.644	18.644
1988	18.737	18.737
1989	18.831	18.831
1990	18.925	18.925
1991	19.02	19.02
1992	19.115	19.115
1993	19.211	19.211
1994	19.307	19.307
1995	19.403	19.403
1996	19.5	19.5
1997	19.598	19.598
1998	19.696	19.696
1999	19.794	19.794
2000	19.893	19.893

SOURCE: See text.

Table R-20b. Regional Distribution of Employment
Federal Civilian

- Moderate Case -
- Industrialization Case -
- Low Case -

GFC.EPM

	G01	G02	G04	G05	G06	G08	G09	G11
1980	0.706	9.794	0.248	0.412	0.193	0.036	2.328	2.416
1981	0.709	9.843	0.25	0.414	0.194	0.036	2.34	2.428
1982	0.713	9.893	0.251	0.416	0.195	0.036	2.351	2.44
1983	0.716	9.942	0.252	0.419	0.196	0.037	2.363	2.453
1984	0.72	9.992	0.253	0.421	0.197	0.037	2.375	2.465
1985	0.724	10.042	0.255	0.423	0.198	0.037	2.387	2.477
1986	0.727	10.092	0.256	0.425	0.199	0.037	2.399	2.49
1987	0.731	10.142	0.257	0.427	0.199	0.037	2.411	2.502
1988	0.735	10.193	0.259	0.429	0.2	0.037	2.423	2.515
1989	0.738	10.244	0.26	0.431	0.201	0.038	2.435	2.527
1990	0.742	10.295	0.261	0.433	0.203	0.038	2.447	2.54
1991	0.746	10.347	0.262	0.436	0.204	0.038	2.459	2.552
1992	0.749	10.399	0.264	0.438	0.205	0.038	2.472	2.565
1993	0.753	10.451	0.265	0.44	0.206	0.038	2.484	2.578
1994	0.757	10.503	0.266	0.442	0.207	0.039	2.496	2.591
1995	0.761	10.555	0.268	0.444	0.208	0.039	2.509	2.604
1996	0.764	10.608	0.269	0.447	0.209	0.039	2.521	2.617
1997	0.768	10.661	0.27	0.449	0.21	0.039	2.534	2.63
1998	0.772	10.714	0.272	0.451	0.211	0.039	2.547	2.643
1999	0.776	10.768	0.273	0.453	0.212	0.04	2.559	2.656
2000	0.78	10.822	0.275	0.456	0.213	0.04	2.572	2.67

	G12	G14	G15	G16	G17	G18	G21	G24
1980	0.104	0.248	0.286	0.077	0.097	0.178	0.068	0.337
1981	0.105	0.25	0.288	0.078	0.098	0.179	0.069	0.338
1982	0.105	0.251	0.289	0.078	0.098	0.18	0.069	0.34
1983	0.106	0.252	0.291	0.079	0.099	0.181	0.069	0.342
1984	0.107	0.253	0.292	0.079	0.099	0.182	0.07	0.343
1985	0.107	0.255	0.294	0.079	0.1	0.183	0.07	0.345
1986	0.108	0.256	0.295	0.08	0.1	0.184	0.07	0.347
1987	0.108	0.257	0.296	0.08	0.101	0.185	0.071	0.349
1988	0.109	0.259	0.298	0.081	0.101	0.186	0.071	0.35
1989	0.109	0.26	0.299	0.081	0.102	0.186	0.072	0.352
1990	0.11	0.261	0.301	0.081	0.102	0.187	0.072	0.354
1991	0.11	0.262	0.302	0.082	0.103	0.188	0.072	0.356
1992	0.111	0.264	0.304	0.082	0.103	0.189	0.073	0.357
1993	0.111	0.265	0.305	0.083	0.104	0.19	0.073	0.359
1994	0.112	0.266	0.307	0.083	0.104	0.191	0.073	0.361
1995	0.113	0.268	0.309	0.083	0.105	0.192	0.074	0.363
1996	0.113	0.269	0.31	0.084	0.105	0.193	0.074	0.365
1997	0.114	0.27	0.312	0.084	0.106	0.194	0.074	0.366
1998	0.114	0.272	0.313	0.085	0.106	0.195	0.075	0.368
1999	0.115	0.273	0.315	0.085	0.107	0.196	0.075	0.37
2000	0.115	0.275	0.316	0.086	0.107	0.197	0.076	0.372

	G25	G26	G27	G29	MTOTR
1980	0.034	0.045	0.135	0.259	18.004
1981	0.034	0.045	0.136	0.261	18.094
1982	0.035	0.045	0.136	0.262	18.185
1983	0.035	0.046	0.137	0.263	18.276
1984	0.035	0.046	0.138	0.264	18.367
1985	0.035	0.046	0.138	0.266	18.459
1[illegible]	0.035	0.046	0.139	0.267	18.55
1[illegible]	0.035	0.047	0.14	0.268	18.64
1988	0.036	0.047	0.141	0.27	18.737
1989	0.036	0.047	0.141	0.271	18.831
1990	0.036	0.047	0.142	0.273	18.925
1991	0.036	0.048	0.143	0.274	19.02
1992	0.036	0.048	0.143	0.275	19.115
1993	0.037	0.048	0.144	0.277	19.21
1994	0.037	0.048	0.145	0.278	19.306
1995	0.037	0.049	0.146	0.279	19.403
1996	0.037	0.049	0.146	0.281	19.5
1997	0.037	0.049	0.147	0.282	19.598
1998	0.037	0.049	0.148	0.284	19.695
1999	0.038	0.049	0.148	0.285	19.794
2000	0.038	0.05	0.149	0.286	19.893

7. Tourism

Recent changes in the specification of the MAP model have been made to net out those portions of transportation, trade, and service sector employment generated by tourist activity in the state. Such estimates are now generated in forecasts as a function of an exogenously forecast estimate of total tourists visiting Alaska during the forecast period. In 1979, the Alaska Division of Tourism estimated that 505,400 tourists visited the state.

In the high and extreme high cases, it is assumed that the number of visitors continues to grow at a constant annual rate of 6 percent, reaching over 1.7 million persons annually by the year 2000. In the moderate and industrialization cases, constant growth of 4 percent annually raises the number of visitors to 1.1 million by the end of the forecast period. In the low case, the number of visitors grows at 2 percent annually to over 760,000 by the year 2000.

D. SUMMARY

The following tables summarize the exogenous employment assumptions for each of the five scenarios.

Table S-21. Statewide Employment By Sector

- Extreme High Case -

EPSPH

	EMP9	ECONX1	ECONX2	EMT9X	EMMX1	EMMX2
1980	6.599	0.09	0.21	1.533	0.	10.833
1981	7.215	0.307	0.203	1.534	0.	11.126
1982	7.423	0.438	1.102	1.569	0.	11.426
1983	7.707	0.581	3.724	1.659	0.	11.733
1984	7.069	2.589	4.551	1.717	0.	12.049
1985	7.779	7.364	7.363	1.904	0.	12.373
1986	8.843	11.274	10.703	2.417	0.386	12.637
1987	9.929	7.79	7.554	2.939	0.446	12.911
1988	12.39	2.212	6.671	3.838	0.446	13.185
1989	13.624	2.407	4.558	4.384	0.546	13.489
1990	16.063	1.876	4.825	4.569	0.726	13.793
1991	16.777	1.063	7.674	4.826	0.809	14.109
1992	16.878	1.848	6.293	4.722	1.431	14.434
1993	18.466	1.139	3.777	4.872	1.526	14.773
1994	20.485	0.873	3.113	5.163	1.526	15.125
1995	21.05	0.619	4.564	5.044	1.526	15.49
1996	21.676	0.	3.993	5.09	1.526	15.868
1997	22.977	0.	2.681	5.09	1.526	16.261
1998	23.063	0.	2.067	5.09	1.526	16.668
1999	24.	0.	0.854	5.09	1.526	17.092
2000	23.844	0.	1.345	5.09	1.526	17.533

	EMA9	EMPROF	EMGF	MTOT
1980	0.202	6.666	41.417	67.55
1981	0.203	6.787	41.598	68.973
1982	0.192	6.909	41.781	70.84
1983	0.242	7.029	41.965	74.641
1984	0.299	7.151	42.152	77.576
1985	0.34	7.272	42.34	86.736
1986	0.37	7.332	42.53	96.492
1987	0.409	7.393	42.722	92.093
1988	0.503	7.445	42.916	89.606
1989	0.626	7.514	43.112	90.26
1990	0.822	7.575	43.31	93.559
1991	1.054	7.636	43.51	97.458
1992	1.356	7.696	43.712	98.37
1993	1.755	7.757	43.916	97.98
1994	2.168	7.817	44.122	100.392
1995	2.454	7.878	44.33	102.954
1996	2.756	7.939	44.54	103.387
1997	3.156	8.	44.752	104.442
1998	3.583	8.059	44.966	105.023
1999	4.075	8.12	45.183	105.939
2000	4.668	8.181	45.401	107.588

Table R-21. Regional Distribution of Employment

- Extreme High Case -

EPSPH

	R01	R02	R04	R05	R06	R08
1980	5.228	24.393	4.089	0 718	2.286	0.997
1981	5.277	24.549	4.67	0.727	2.319	1.017
1982	5.326	24 708	5.346	0.737	2.352	1.037
1983	5.525	24.877	6 214	0.746	2.385	1 056
1984	5 747	25.06	5.738	0.756	2 418	1.077
1985	6.104	25.254	8.17	0.765	2 451	1.097
1986	6.295	25.467	11 416	0 772	2.468	1.111
1987	7.639	25.697	9 461	0 779	2.486	1.125
1988	8.28	25.986	7 734	0.786	2.501	1.138
1989	9.558	26.27	7 34	0.794	2 521	1 154
1990	9.376	26.546	8.153	0 801	2 539	1 169
1991	9.129	26.782	9 275	0.808	2.557	1.184
1992	9.557	26.949	10 603	0 815	2 574	1.2
1993	9.42	27.172	9.807	0 823	2.592	1.216
1994	9 694	27.546	10.485	0 83	2.61	1.232
1995	9 494	27.777	12.322	0 838	2.628	1.249
1996	9.155	28.017	12.378	0 845	2.645	1 266
1997	9.24	28.327	12.831	0 853	2 663	1.284
1998	9 333	28.518	12.159	0.86	2.681	1 302
1999	9 335	28.796	11.753	0.868	2 699	1.32
2000	9.338	28.969	12.067	0.876	2.717	1.339

	R09	R11	R12	R14	R15	R16
1980	8.209	9.287	2.536	0.313	4.45	0.14
1981	8.214	9.545	2.539	0.316	4.517	0.141
1982	8.237	9.808	3.061	0.319	4.585	0.142
1983	8.433	10.019	3.382	0.323	4.653	0.143
1984	9.062	10.258	4.313	0.326	4.793	0.144
1985	10 253	10.426	4 759	0.33	4.89	0.145
1986	11.21	10.658	5.076	0.37	4 946	0.146
1987	10.525	11.03	5.074	0.372	5.008	0.147
1988	9.327	11.251	4.772	0.381	5.359	0.148
1989	8.885	11.592	4.912	0.385	5.438	0.149
1990	8 788	11.985	4.577	0.372	5 437	0.15
1991	9.132	12.223	4.543	0.354	5.493	0.151
1992	9.006	12.449	4.567	0 416	5.486	0 152
1993	8.953	12.806	4.592	0.733	5.546	0 153
1994	9 098	13.063	4.618	0.735	5.593	0 154
1995	9.209	13.33	4.644	0 775	5.641	0 155
1996	9.324	13.603	4.671	0 792	5.69	0.156
1997	9.468	13.886	4 699	0.738	5.739	0.157
1998	9.619	14.18	4.727	0.749	5.789	0.158
1999	9.789	14.484	4.756	0.752	5.841	0.159
2000	9.987	14.801	4.786	0.753	5.893	0.16

	R17	R18	R21	R24	R25	R26
1980	0.361	0.377	0.666	1.266	0.073	0.463
1981	0.362	0.382	0.691	1.307	0.138	0.465
1982	0.355	0.386	0.718	1.31	0.139	0.556
1983	1.24	0.47	0.746	1.324	0.156	1.22
1984	1.082	0.522	0.775	1.621	0.652	1.487
1985	1.622	0.616	0.805	2.531	2 149	2.502
[illegible]	1.593	0.717	0.837	3.54	3.69[illegible]	4.164
[illegible]	1.212	0.569	0.869	2.569	2.12	3.355
1988	1.229	0.749	0.903	1.61	0.262	4.933
1989	1.818	0.919	0.939	1.39	0.118	3.267
1990	2.784	1 632	0.976	1.415	0.118	3.678
1991	3.416	1.614	1.014	1 483	0.119	4.717
1992	3.207	1.349	1.055	1.4	0.12	3.644
1993	2.983	1.164	1.097	1.401	0.12	3.809
1994	3.23	1.142	1.141	1.405	0.121	3.81
1995	3 436	1.229	1.187	1.409	0.122	3.811
1996	3.654	1.234	1.236	1 413	0.122	3.812
1997	3.293	1.239	1.286	1.417	0.123	3.813
1998	3.6	1.245	1.339	1.421	0.124	3.815
1999	3.955	1.25	1.394	1.425	0.124	3.816
2000	4.382	1.256	1.451	1.429	0.125	3.817

	R27	R29	MTOTR
1980	0.382	1.315	67.55
1981	0.388	1.409	68.973
1982	0.393	1.324	70.84
1983	0.399	1.328	74 64
1984	0.404	1.341	77.576
1985	0.485	1.38	86.735
1986	0.54	1 468	96.492
1987	0.645	1 406	92.093
1988	0.773	1 481	89.606
1989	1.424	1 39	90.26
1990	1.654	1.41	93.559
1991	2.004	1.459	97 458
1992	2 416	1.405	98.369
1993	2 186	1 407	97 98
1994	2.471	1.413	100.392
1995	2 281	1 418	102.954
1996	1 95	1.423	103 387
1997	1 957	1 429	104 442
1998	1 971	1 435	105.023
1999	1 983	1.44	105 939
2000	1 995	1 446	107 588

Table S-22. Statewide Employment By Sector

- High Case -

EPHGH

	EMP9	ECONX1	ECONX2	EMT9X	EMMX1	EMMX2
1980	6.599	0.09	0.21	1.533	0.	10.833
1981	7.215	0.307	0.203	1.534	0.	11.126
1982	7.423	0.438	1.102	1.569	0.	11.426
1983	7.707	0.581	3.724	1.659	0.	11.733
1984	7.069	2.589	4.551	1.717	0.	12.049
1985	7.779	7.364	7.363	1.904	0.	12.373
1986	8.843	11.274	10.203	2.417	0.386	12.637
1987	9.929	7.79	7.054	2.939	0.446	12.911
1988	12.39	2.212	6.171	3.838	0.446	13.185
1989	13.624	2.407	3.817	4.384	0.446	13.489
1990	16.063	1.876	3.234	4.569	0.526	13.793
1991	16.777	1.063	3.68	4.826	0.526	14.109
1992	16.878	1.848	4.939	4.722	0.526	14.434
1993	17.516	1.139	3.777	4.872	0.526	14.773
1994	19.535	0.873	3.113	5.163	0.526	15.125
1995	20.1	0.619	4.564	5.044	0.526	15.49
1996	20.726	0.	3.993	5.09	0.526	15.868
1997	22.027	0.	2.681	5.09	0.526	16.261
1998	22.113	0.	2.067	5.09	0.526	16.668
1999	23.05	0.	0.854	5.09	0.526	17.092
2000	22.894	0.	1.345	5.09	0.526	17.533

	EMA9	EMPROF	EMGF	MTOT
1980	0.202	6.666	41.417	67.55
1981	0.203	6.787	41.598	68.973
1982	0.192	6.909	41.781	70.84
1983	0.242	7.029	41.965	74.641
1984	0.299	7.151	42.152	77.576
1985	0.34	7.272	42.34	86.736
1986	0.37	7.332	42.53	95.992
1987	0.409	7.393	42.722	91.593
1988	0.503	7.445	42.916	89.106
1989	0.626	7.514	43.112	89.419
1990	0.822	7.575	43.31	91.768
1991	1.054	7.636	43.51	93.181
1992	1.356	7.696	43.712	96.111
1993	1.755	7.757	43.916	96.03
1994	2.168	7.817	44.122	98.442
1995	2.454	7.878	44.33	101.004
1996	2.756	7.939	44.54	101.437
1997	3.156	8.	44.752	102.492
1998	3.583	8.059	44.966	103.073
1999	4.075	8.12	45.183	103.99
2000	4.668	8.181	45.401	105.638

Table R-22. Regional Distribution of Employment

- High Case -

EPHGH

	R01	R02	R04	R05	R06	R08
1980	5.228	24.393	4.089	0.718	2.288	0.997
1981	5.277	24 549	4.67	0.727	2.319	1.017
1982	5.326	24.708	5.346	0.737	2.352	1 037
1983	5.525	24.877	6.214	0.746	2.385	1.056
1984	5.747	25.06	5.738	0 756	2.418	1.077
1985	6.104	25.254	8.17	0.765	2.451	1.097
1986	6.295	25.467	11.416	0.772	2.468	1.111
1987	7.639	25.697	9.461	0.779	2.486	1 125
1988	8.28	25 986	7.734	0.786	2.501	1.138
1989	9.558	26.27	7.308	0.794	2.521	1.154
1990	9.376	26.546	7.982	0.801	2 539	1.169
1991	9 129	26.782	8 809	0.808	2.557	1.184
1992	9.557	26.949	10.518	0.815	2.574	1.2
1993	9.42	27.172	9.762	0.823	2.592	1.216
1994	9.694	27.546	10.44	0.83	2.61	1.232
1995	9.494	27.777	12.277	0 838	2.628	1.249
1996	9.155	28.017	12.333	0.845	2.645	1.266
1997	9.24	28.327	12.786	0.853	2.663	1.284
1998	9.333	28.518	12.114	0 86	2.681	1.302
1999	9.335	28.796	11.708	0.868	2.699	1.32
2000	9.338	28.969	12.022	0.876	2.717	1.339

	R09	R11	R12	R14	R15	R16
1980	8.209	9.287	2.536	0.313	4 45	0.14
1981	8.214	9 545	2.539	0.316	4 517	0.141
1982	8.237	9.808	3.061	0.319	4.585	0.142
1983	8.433	10.019	3.382	0.323	4.653	0.143
1984	9.062	10.258	4.313	0.326	4.793	0.144
1985	10.253	10 426	4.759	0.33	4.89	0.145
1986	11.21	10.658	4.576	0.37	4.946	0.146
1987	10.525	11.03	4.574	0 372	5.008	0.147
1988	9.327	11.251	4.272	0.381	5.359	0.148
1989	8.844	11.592	4.312	0.385	5.436	0.149
1990	8.596	11.985	4.377	0.372	5.437	0.15
1991	8.69	12.223	4.343	0.354	5.493	0.151
1992	8.804	12.449	4.367	0.416	5.486	0.152
1993	8.946	12.806	4.392	0.733	5 546	0.153
1994	9.091	13.063	4 418	0.735	5.593	0.154
1995	9.202	13.33	4.444	0.775	5.641	0.155
1996	9.317	13.603	4.471	0.792	5.69	0.156
1997	9.461	13.886	4.499	0.738	5.739	0.157
1998	9.612	14.18	4.527	0.749	5.789	0.158
1999	9.782	14.484	4.556	0.752	5.841	0.159
2000	9.98	14.801	4.586	0.753	5.893	0.16

	R17	R18	R21	R24	R25	R28
1980	0.381	0.377	0.666	1.266	0.073	0.463
1981	0.362	0.382	0.691	1.307	0.138	0.465
1982	0.355	0.386	0.718	1.31	0.139	0.556
1983	1.24	0.47	0.746	1.324	0.156	1.22
1984	1.082	0.522	0.775	1.621	0.652	1.487
1985	1.622	0.616	0.805	2.531	2.149	2.502
[illegible]	1.593	0.717	0.837	3.54	3.69[illegible]	4.164
[illegible]	1.212	0.569	0.869	2.569	2.1[illegible]	3.355
1988	1.229	0.749	0.903	1.61	0.262	4.933
1989	1.818	0.919	0.939	1.373	0.118	3.121
1990	2.37	1.632	0.976	1.378	0.118	2.926
1991	2.207	1.614	1.014	1 381	0.119	2.928
1992	2.175	1.349	1.055	1.385	0.12	2.929
1993	2.183	1.164	1.097	1.389	0.12	2.93
1994	2.43	1.142	1.141	1.393	0.121	2.931
1995	2.636	1.229	1.187	1.397	0.122	2.932
1996	2.854	1.234	1.236	1.401	0.122	2.933
1997	2.493	1.239	1.286	1.405	0.123	2.934
1998	2.8	1.245	1 339	1.409	0.124	2.936
1999	3.155	1.25	1.394	1.413	0.124	2.937
2000	3.582	1.256	1 451	1.417	0.125	2.938

	R27	R29	MTOTR
1980	0.382	1.315	67.55
1981	0 388	1.409	68.973
1982	0.393	1.324	70.84
1983	0.399	1.328	74.64
1984	0.404	1.341	77.576
1985	0.485	1.38	86.735
1986	0 54	1.468	95.992
1987	0.645	1.406	91.593
1988	0.773	1.481	89.106
1989	1.424	1.385	89 419
1990	1.654	1.385	91.768
1991	2.004	1.39	93.181
1992	2.416	1 395	96.11
1993	2.186	1.4	96.03
1994	2.471	1 406	98 442
1995	2.281	1.411	101.004
1996	1.95	1 416	101.437
1997	1.957	1 422	102 492
1998	1 971	1.428	103 073
1999	1 983	1.433	103.989
2000	1.995	1 439	105 638

Table S-23. Statewide Employment By Sector

- Moderate Case -

EPMDD

	EMP9	ECONX1	ECONX2	EMT9X	EMMX1	EMMX2
1980	6.408	0.09	0.	1.533	0.	10.784
1981	7.112	0.307	0.785	1.599	0.	10.956
1982	7.34	0.335	1.291	1.6	0.	11.132
1983	7.632	0.563	2.803	1.641	0.	11.311
1984	6.92	2.44	2.992	1.692	0.	11.493
1985	7.376	7.174	3.641	1.988	0.	11.678
1986	7.605	10.794	2.262	1.869	0.386	11.834
1987	7.744	6.312	2.268	2.093	0.446	11.993
1988	7.73	0.663	2.555	2.2	0.446	12.156
1989	8.122	1.165	2.094	2.331	0.446	12.324
1990	8.856	1.075	2.254	2.66	0.446	12.495
1991	10.05	0.873	2.617	2.937	0.446	12.671
1992	10.487	0.619	2.05	2.761	0.446	12.852
1993	10.711	0.	1.906	2.73	0.446	13.037
1994	10.822	0.	2.473	2.722	0.446	13.226
1995	11.058	0.	2.313	2.722	0.446	13.421
1996	11.431	0.	2.195	2.722	0.446	13.62
1997	11.734	0.	2.457	2.722	0.446	13.825
1998	12.05	0.	1.592	2.722	0.446	14.035
1999	12.426	0.	1.295	2.722	0.446	14.25
2000	12.454	0.	1.472	2.722	0.446	14.494

	EMA9	EMPROF	EMGF	MTOT
1980	0.202	6.666	41.328	67.01
1981	0.202	6.727	41.418	69.105
1982	0.191	6.787	41.508	70.184
1983	0.23	6.848	41.599	72.627
1984	0.255	6.909	41.69	74.391
1985	0.28	6.969	41.782	80.888
1986	0.305	6.999	41.874	83.928
1987	0.329	7.029	41.967	80.182
1988	0.387	7.06	42.06	75.257
1989	0.444	7.09	42.154	76.17
1990	0.502	7.12	42.248	77.657
1991	0.56	7.151	42.343	79.648
1992	0.617	7.181	42.438	79.451
1993	0.675	7.212	42.534	79.25
1994	0.734	7.242	42.63	80.295
1995	0.791	7.272	42.726	80.749
1996	0.849	7.302	42.823	81.388
1997	0.907	7.332	42.921	82.344
1998	0.964	7.363	43.019	82.19
1999	1.023	7.393	43.117	82.672
2000	1.081	7.423	43.216	83.308

Table R-23. Regional Distribution of Employment

- Moderate Case -

EPMOD

	R01	R02	R04	R05	R06	R08
1980	5.187	24.3	3.913	0.714	2.269	0.99
1981	5.395	24.442	4.541	0.728	2.365	1.026
1982	5.419	24.529	5.243	0.733	2.381	1.037
1983	5.558	24.623	6.156	0.738	2.398	1.047
1984	5.681	24.721	5.422	0.742	2.414	1.058
1985	5.96	24.813	7.206	0.747	2.431	1.069
1986	5.835	24.895	8.142	0.75	2.439	1.076
1987	5.843	24.98	7.187	0.754	2.448	1.084
1988	5.812	25.055	6.346	0.757	2.457	1.092
1989	6.457	25.172	6.14	0.761	2.466	1.1
1990	6.575	25.301	6.882	0.764	2.475	1.107
1991	6.881	25.478	7.635	0.768	2.483	1.116
1992	6.692	25.6	7.416	0.771	2.492	1.124
1993	6.365	25.702	7.486	0.775	2.501	1.132
1994	6.377	25.793	8.127	0.778	2.51	1.141
1995	6.418	25.897	8.103	0.782	2.519	1.149
1996	6.415	26.016	8.334	0.786	2.527	1.158
1997	6.411	26.128	8.882	0.789	2.536	1.167
1998	6.408	26.242	8.313	0.793	2.545	1.176
1999	6.449	26.363	8.279	0.796	2.554	1.185
2000	6.49	26.451	8.404	0.8	2.563	1.195

	R09	R11	R12	R14	R15	R16
1980	8.196	9.171	2.52	0.311	4.412	0.14
1981	8.189	9.661	2.575	0.313	4.615	0.14
1982	8.199	9.781	2.622	0.315	4.651	0.141
1983	8.379	9.852	2.77	0.316	4.732	0.141
1984	8.915	9.847	3.5	0.318	4.84	0.142
1985	9.832	9.938	4.166	0.32	5.039	0.142
1986	10.277	10.05	3.736	0.36	4.884	0.143
1987	9.727	10.164	3.558	0.409	4.848	0.143
1988	8.411	10.282	3.477	0.372	4.825	0.144
1989	8.304	10.402	3.351	0.326	4.848	0.144
1990	8.334	10.525	3.474	0.327	4.871	0.145
1991	8.364	10.651	3.661	0.329	4.895	0.145
1992	8.395	10.781	3.674	0.33	4.918	0.146
1993	8.425	10.913	3.687	0.332	4.942	0.146
1994	8.456	11.049	3.701	0.333	4.967	0.146
1995	8.487	11.189	3.714	0.335	4.991	0.147
1996	8.518	11.331	3.728	0.337	5.016	0.147
1997	8.549	11.477	3.742	0.338	5.041	0.148
1998	8.58	11.626	3.757	0.34	5.066	0.148
1999	8.611	11.78	3.771	0.341	5.092	0.149
2000	8.643	11.952	3.787	0.343	5.119	0.149

	R17	R18	R21	R24	R25	R26
1980	0.361	0.375	0.658	1.265	0.072	0.463
1981	0.381	0.377	0.675	1.303	0.138	0.465
1982	0.353	0.38	0.692	1.305	0.138	0.556
1983	0.381	0.42	0.71	1.317	0.155	1.219
1984	0.399	0.471	0.728	1.601	0.65	1.22
1985	0.417	0.435	0.746	2.458	2.148	1.22
1[illegible]	0.435	0.389	0.766	3.344	3.69[illegible]	0.855
1[illegible]	0.452	0.391	0.785	2.468	2.12	0.856
1988	0.494	0.394	0.805	1.404	0.26	0.856
1989	0.535	0.396	0.826	1.323	0.115	0.857
1990	0.577	0.398	0.847	1.325	0.115	0.857
1991	0.618	0.4	0.869	1.327	0.115	0.858
1992	0.659	0.403	0.892	1.328	0.116	0.858
1993	0.701	0.405	0.915	1.33	0.116	0.859
1994	0.743	0.407	0.94	1.332	0.116	0.859
1995	0.784	0.41	0.964	1.334	0.117	0.86
1996	0.826	0.412	0.99	1.336	0.117	0.86
1997	0.867	0.414	1.016	1.337	0.117	0.861
1998	0.908	0.417	1.044	1.339	0.118	0.861
1999	0.95	0.419	1.072	1.341	0.118	0.862
2000	0.992	0.422	1.104	1.343	0.118	0.863

	R27	R29	MTOTR
1980	0.38	1.313	67.01
1981	0.391	1.405	69.105
1982	0.393	1.317	70.184
1983	0.396	1.319	72.627
1984	0.399	1.322	74.391
1985	0.477	1.324	80.888
1986	0.529	1.326	83.928
1987	0.633	1.328	80.181
1988	0.684	1.331	75.257
1989	1.316	1.333	76.17
1990	1.422	1.335	77.657
1991	1.716	1.338	79.648
1992	1.514	1.34	79.451
1993	1.174	1.343	79.25
1994	1.174	1.345	80.294
1995	1.203	1.347	80.749
1996	1.186	1.35	81.388
1997	1.17	1.352	82.344
1998	1.155	1.355	82.19
1999	1.183	1.357	82.672
2000	1.212	1.36	83.308

Table S-24. Statewide Employment By Sector

- Industrialization Case -

EPIND

	EMP9	ECONX1	ECONX2	EMT9X	EMMX1	EMMX2
1980	6.408	0.09	0.	1.533	0.	10.784
1981	7.112	0.307	0.785	1.599	0.	10.956
1982	7.34	0.335	1.591	1.6	0.	11.132
1983	7.632	0.563	3.403	1.641	0.	11.311
1984	6.92	2.44	4.201	1.692	0.	11.493
1985	7.376	7.174	6.192	1.988	0.	11.678
1986	7.911	10.794	8.146	1.946	0.386	11.834
1987	8.356	6.312	6.315	2.246	0.446	11.993
1988	9.482	0.663	7.58	2.353	0.446	12.156
1989	9.874	1.165	4.381	2.484	0.546	12.324
1990	11.538	1.075	3.745	2.76	0.646	12.495
1991	12.523	0.873	6.611	2.985	0.729	12.671
1992	12.96	0.619	3.404	2.809	1.351	12.852
1993	14.134	0.	1.906	2.778	1.446	13.037
1994	14.245	0.	2.473	2.77	1.446	13.226
1995	14.481	0.	2.313	2.77	1.446	13.421
1996	14.854	0.	2.195	2.77	1.446	13.62
1997	15.157	0.	2.457	2.77	1.446	13.825
1998	15.473	0.	1.592	2.77	1.446	14.035
1999	15.849	0.	1.295	2.77	1.446	14.25
2000	15.877	0.	1.472	2.77	1.446	14.494

	EMA9	EMPROF	EMGF	MTOT
1980	0.202	6.666	41.328	67.01
1981	0.202	6.727	41.418	69.105
1982	0.191	6.787	41.508	70.484
1983	0.23	6.848	41.599	73.227
1984	0.255	6.909	41.69	75.6
1985	0.28	6.969	41.782	83.439
1986	0.305	6.999	41.874	90.195
1987	0.329	7.029	41.967	84.994
1988	0.387	7.06	42.06	82.187
1989	0.444	7.09	42.154	80.462
1990	0.502	7.12	42.248	82.13
1991	0.56	7.151	42.343	86.446
1992	0.617	7.181	42.438	84.231
1993	0.675	7.212	42.534	83.721
1994	0.734	7.242	42.63	84.766
1995	0.791	7.272	42.726	85.22
1996	0.849	7.302	42.823	85.859
1997	0.907	7.332	42.921	86.815
1998	0.964	7.363	43.019	86.661
1999	1.023	7.393	43.117	87.143
2000	1.081	7.423	43.216	87.779

Table R-24. Regional Distribution of Employment

- Industrialization Case -

EPIND

	R01	R02	R04	R05	R06	R08
1980	5.187	24.3	3.913	0.714	2.269	0.99
1981	5.395	24.442	4.541	0.728	2.365	1.026
1982	5.419	24.529	5.243	0.733	2.381	1.037
1983	5.558	24.623	6.156	0.738	2.398	1.047
1984	5.681	24.721	5.476	0.742	2.414	1.056
1985	5.96	24.813	7.498	0.747	2.431	1.069
1986	5.835	24.895	8.988	0.75	2.439	1.076
1987	5.843	24.98	7.623	0.754	2.448	1.084
1988	5.812	25.055	7.206	0.757	2.457	1.092
1989	6.457	25.172	6.384	0.761	2.466	1.1
1990	6.575	25.301	7.19	0.764	2.475	1.107
1991	6.881	25.478	8.238	0.768	2.483	1.116
1992	6.692	25.6	7.638	0.771	2.492	1.124
1993	6.365	25.702	7.668	0.775	2.501	1.132
1994	6.377	25.793	8.309	0.778	2.51	1.141
1995	6.418	25.897	8.285	0.782	2.519	1.149
1996	6.415	26.016	8.516	0.786	2.527	1.158
1997	6.411	26.128	9.064	0.789	2.536	1.167
1998	6.408	26.242	8.495	0.793	2.545	1.176
1999	6.449	26.363	8.461	0.796	2.554	1.185
2000	6.49	26.451	8.586	0.8	2.563	1.195

	R09	R11	R12	R14	R15	R16
1980	8.196	9.171	2.52	0.311	4.412	0.14
1981	8.189	9.661	2.575	0.313	4.615	0.14
1982	8.199	9.781	2.922	0.315	4.651	0.141
1983	8.379	9.852	3.37	0.316	4.732	0.141
1984	8.985	9.847	4.3	0.318	4.64	0.142
1985	10.158	9.938	4.716	0.32	5.039	0.142
1986	11.099	10.05	4.719	0.36	4.884	0.143
1987	10.396	10.164	4.623	0.409	4.848	0.143
1988	9.174	10.282	4.392	0.372	4.825	0.144
1989	8.699	10.402	4.516	0.326	4.848	0.144
1990	8.549	10.525	4.076	0.327	4.871	0.145
1991	8.829	10.651	4.102	0.329	4.895	0.145
1992	8.62	10.781	4.115	0.33	4.918	0.146
1993	8.455	10.913	4.128	0.332	4.942	0.146
1994	8.486	11.049	4.142	0.333	4.967	0.146
1995	8.517	11.189	4.155	0.335	4.991	0.147
1996	8.548	11.331	4.169	0.337	5.016	0.147
1997	8.579	11.477	4.183	0.338	5.041	0.148
1998	8.61	11.626	4.198	0.34	5.066	0.148
1999	8.641	11.78	4.212	0.341	5.092	0.149
2000	8.673	11.952	4.228	0.343	5.119	0.149

	R17	R18	R21	R24	R25	R26
1980	0.361	0.375	0.658	1.265	0.072	0.463
1981	0.361	0.377	0.675	1.303	0.138	0.465
1982	0.353	0.38	0.692	1.305	0.138	0.556
1983	0.381	0.42	0.71	1.317	0.155	1.219
1984	0.399	0.471	0.728	1.612	0.65	1.486
1985	0.417	0.435	0.746	2.52	2.148	2.499
[illegible]	0.435	0.369	0.766	3.528	3.6[illegible]	4.161
[illegible]	0.452	0.391	0.785	2.555	2.1[illegible]	3.352
1988	0.494	0.394	0.805	1.594	0.26	4.929
1989	0.535	0.396	0.826	1.372	0.115	3.263
1990	0.991	0.398	0.847	1.395	0.115	3.673
1991	1.827	0.4	0.869	1.462	0.115	4.711
1992	1.691	0.403	0.892	1.376	0.116	3.837
1993	1.501	0.405	0.915	1.375	0.116	3.802
1994	1.543	0.407	0.94	1.377	0.116	3.802
1995	1.584	0.41	0.964	1.379	0.117	3.803
1996	1.626	0.412	0.99	1.381	0.117	3.803
1997	1.667	0.414	1.016	1.382	0.117	3.804
1998	1.708	0.417	1.044	1.384	0.118	3.804
1999	1.75	0.419	1.072	1.386	0.118	3.805
2000	1.792	0.422	1.104	1.388	0.118	3.806

	R27	R29	NTOTR
1980	0.38	1.313	67.01
1981	0.391	1.405	69.105
1982	0.393	1.317	70.484
1983	0.396	1.319	73.227
1984	0.399	1.33	75.6
1985	0.477	1.366	83.439
1986	0.529	1.452	90.195
1987	0.633	1.387	84.993
1988	0.684	1.46	82.187
1989	1.316	1.366	80.462
1990	1.422	1.383	82.13
1991	1.716	1.43	86.446
1992	1.514	1.373	84.231
1993	1.174	1.373	83.721
1994	1.174	1.375	84.765
1995	1.203	1.377	85.22
1996	1.186	1.38	85.859
1997	1.17	1.382	86.815
1998	1.155	1.385	86.661
1999	1.183	1.387	87.143
2000	1.212	1.39	87.779

Table S-25. Statewide Employment By Sector

- Low Case -

EPLOW

	EMP9	ECONX1	ECONX2	EMT9X	EMMX1	EMMX2
1980	6.377	0.09	0.	1.533	0.	10.445
1981	7.115	0.307	0.097	1.599	0.	10.549
1982	7.358	0.335	0.679	1.6	0.	10.657
1983	7.441	0.563	1.2	1.588	0.	10.768
1984	6.461	2.435	0.734	1.55	0.	10.882
1985	6.677	7.103	0.262	1.54	0.	11.
1986	6.949	10.589	0.47	1.546	0.	11.122
1987	7.078	6.074	0.479	1.665	0.	11.247
1988	7.34	0.468	0.833	1.658	0.	11.376
1989	7.272	0.	0.68	1.627	0.	11.51
1990	7.307	0.	0.664	1.619	0.	11.647
1991	7.243	0.	0.564	1.619	0.	11.789
1992	7.269	0.	0.611	1.619	0.	11.936
1993	7.32	0.	0.527	1.619	0.	12.087
1994	7.34	0.	0.264	1.619	0.	12.242
1995	7.388	0.	0.191	1.619	0.	12.403
1996	7.341	0.	0.084	1.619	0.	12.569
1997	7.307	0.	0.132	1.619	0.	12.74
1998	7.283	0.	0.132	1.619	0.	12.916
1999	7.281	0.	0.059	1.619	0.	13.097
2000	7.278	0.	0.018	1.619	0.	13.307

	EMA9	EMPROF	EMGF	MTOT
1980	0.202	6.363	41.328	66.338
1981	0.202	6.363	41.418	67.65
1982	0.191	6.363	41.508	68.691
1983	0.182	6.363	41.599	69.704
1984	0.183	6.363	41.69	70.298
1985	0.156	6.363	41.782	74.883
1986	0.155	6.363	41.874	79.068
1987	0.125	6.363	41.967	74.998
1988	0.106	6.363	42.06	70.204
1989	0.089	6.363	42.154	69.695
1990	0.078	6.363	42.248	69.926
1991	0.065	6.363	42.343	69.986
1992	0.034	6.363	42.438	70.27
1993	0.035	6.363	42.534	70.484
1994	0.037	6.363	42.63	70.495
1995	0.038	6.363	42.726	70.728
1996	0.039	6.363	42.823	70.838
1997	0.04	6.363	42.921	71.122
1998	0.041	6.363	43.019	71.373
1999	0.043	6.363	43.117	71.579
2000	0.044	6.363	43.216	71.845

Table R-25. Regional Distribution of Employment

- Low Case -

EPLOW

	R01	R02	R04	R05	R06	R08
1980	5.083	24.258	3.905	0.701	2.191	0.955
1981	5 067	24.331	4.646	0.703	2.192	0.958
1982	5 089	24.398	5.459	0.705	2.193	0.961
1983	5.092	24 449	6.255	0.70T	2.194	0.965
1984	5.096	24.498	5.471	0.709	2.195	0.968
1985	5 131	24.545	6.632	0.711	2.196	0.971
1986	5 148	24.611	7.753	0.714	2.197	0.975
1987	5.158	24.675	6.536	0.716	2.198	0.978
1988	5.154	24.758	5.801	0.718	2.199	0.982
1989	5.131	24.807	5 504	0.72	2.2	0.986
1990	5.11	24 868	5 561	0.722	2.201	0.99
1991	5.113	24 918	5 404	0.724	2.202	0.994
1992	5.114	24 979	5.476	0 726	2.203	0.998
1993	5.118	25 042	5 439	0.729	2.204	1.002
1994	5.122	25.103	5.196	0.731	2 205	1.007
1995	5.126	25.166	5 167	0.733	2.206	1.011
1996	5.129	25.221	5.019	0.735	2.207	1.016
1997	5.133	25.278	5.038	0.737	2.208	1.021
1998	5.137	25.336	5.018	0.74	2.21	1.026
1999	5 141	25 397	4.944	0.742	2.211	1.031
2000	5.145	25 459	4.902	0.744	2.212	1.037

	R09	R11	R12	R14	R15	R16
1980	8.196	8.998	2.46	0.309	4.274	0.14
1981	8 188	9.296	2.436	0.311	4.281	0.14
1982	8.199	9.381	2.471	0.312	4.289	0.14
1983	8.365	9 417	2.462	0.313	4.296	0.141
1984	8.895	9.378	2.481	0.314	4 304	0.141
1985	9.797	9.434	2.456	0.316	4.312	0.142
1986	10.235	9.529	2.421	0.317	4.321	0.142
1987	9.671	9.625	2.382	0.318	4.329	0.142
1988	8.333	9.725	2.388	0.319	4.338	0.143
1989	8.206	9.828	2.393	0.321	4.347	0.143
1990	8 217	9.933	2.399	0.322	4.357	0.144
1991	8.228	10.041	2 406	0.323	4.366	0.144
1992	8.234	10.153	2.411	0.325	4.376	0.144
1993	8.248	10 268	2.419	0.326	4.386	0.145
1994	8.263	10.386	2.426	0.327	4.397	0.145
1995	8.277	10 508	2.434	0.329	4.407	0.146
1996	8.292	10.633	2.442	0.33	4.418	0.146
1997	8.307	10.761	2.45	0.331	4.43	0.146
1998	8.322	10.893	2.458	0.333	4 441	0.147
1999	8.337	11.029	2.467	0.334	4.453	0.147
2000	8.353	11.184	2.477	0.335	4.466	0.148

	R17	R18	R21	R24	R25	R26
1980	0.362	0.371	0.655	1.265	0.072	0.46
1981	0.362	0.372	0.671	1.303	0.137	0.46
1982	0.355	0.373	0.687	1.305	0.138	0.55
1983	0.349	0.374	0.704	1.317	0.155	0.461
1984	0.349	0.375	0.722	1.601	0.65	0.461
1985	0.332	0.376	0.74	2.458	2.147	0.461
[illegible]	0.331	0.377	0.758	3.344	3.6[illegible]	0.461
[illegible]	0.312	0.378	0.777	2.468	2.1[illegible]	0.462
1988	0.3	0.379	0.797	1.404	0.259	0.462
1989	0.289	0.38	0.817	1.323	0.114	0.462
1990	0.282	0.38	0.838	1.325	0.114	0 462
1991	0.273	0.381	0.86	1.327	0.114	0.463
1992	0.253	0 382	0.882	1.328	0.114	0.463
1993	0.254	0.383	0.905	1.33	0.115	0.463
1994	0.254	0.384	0.929	1.332	0.115	0.463
1995	0.255	0.385	0.953	1.334	0.115	0.464
1996	0.255	0.386	0.978	1.336	0.115	0.464
1997	0.256	0.387	1.004	1.337	0.115	0.464
1998	0.256	0.388	1.031	1.339	0.115	0.464
1999	0.257	0 389	1.058	1.341	0.116	0.465
2000	0.257	0.39	1 09	1.343	0.116	0.465

	R27	R29	MTOTR
1980	0.369	1.312	66.337
1981	0.37	1.403	67.649
1982	0.371	1.315	68 691
1983	0.371	1.316	69.704
1984	0.372	1.317	70.298
1985	0.407	1.319	74 883
1986	0 421	1.32	79 068
1987	0.43	1.321	74 998
1988	0 424	1.323	70 204
1989	0.399	1 324	69 695
1990	0.376	1.325	69 926
1991	0.377	1 327	69.986
1992	0.378	1.328	70.27
1993	0 379	1 329	70 484
1994	0.379	1.331	70.494
1995	0 38	1.332	70.728
1996	0.381	1.334	70.838
1997	0.381	1 335	71 121
1998	0 382	1 336	71 372
1999	0 383	1 338	71 579
2000	0 384	1 339	71.845

III. The Fiscal Policy Assumptions

Virtually all past work done using the MAP forecasting model as well as work by other forecasters confirms the central role that state government fiscal policy will play in shaping the pattern of future economic development in Alaska. State expenditures not only determine direct government employment but also affect all endogenous sectors of the economy through expenditures on goods and services and capital improvements. The state fiscal scenarios described in this section attempt to cover the range of plausible state fiscal behavior.

Two factors affect our ability to project the course of future state fiscal policy. First, since the onset of petroleum production from Prudhoe Bay, state royalty and severance taxes and other resource-based revenues have overtaken expenditures and are expected to continue to increase over a substantial portion of the forecast period. Secondly, the establishment of the Permanent Fund and recent tax repeals and grant programs constrain the use of certain petroleum revenues. These recent changes limit the usefulness of past fiscal behavior as a guide to forecasting the future.

In this study, three separate scenarios describe state fiscal behavior. The assumptions determining the growth of state expenditures are similar to those used in the May 1980 Electric Power Consumption for the Railbelt Study. Growth is defined in terms of real per capita government expenditures.

Between 1970 and 1972, real per capita expenditures grew at almost 24 percent annually in response to the $900 million bonus payment received for leases at Prudhoe Bay in 1969. After 1972, the rate of growth dropped to .5 percent annually. In these three scenarios, the growth of real per capita state expenditures is determined by its relationship to real per capita income. In the low response case, it is assumed that the level of real per capita expenditures stays constant throughout the forecast period, implying that real per capita expenditures decline as a fraction of real per capita income. The moderate response case assumes that real per capita expenditures grow at the same rate as real per capita income so that real per capita expenditures maintain a constant share of real per capita income. In the high response scenario, real per capita expenditures grow at 1.5 times the rate of real per capita income, thus increasing as a proportion of real per capita income.

Real per capita income is defined to exclude the income and population directly associated with premium-wage, enclave-type construction projects which can drive up average real per capita income in the short run quite dramatically, although only temporarily.

These growth rates apply to both operating and capital expenditures beginning with the approximate base levels established by the 1982 budget. There are four uses of state funds which are not covered by the normal operating and capital programs. Debt service is a function of the level of past capital budgets and interest rates. It is a growing but small increment to expenditures.

The three other components are independent of the choice of scenario. They have the same value in the low, moderate, and high case. First, beginning with the 1981 fiscal year, a large expansion of government subsidies for such things as housing and businesses was initiated through subsidized loan programs. These programs are assumed to remain constant in real per capita terms. Second, beginning in 1982, a special capital projects account is funded at $250 million annually for a period of ten years. This account is in addition to the regular capital budget, and it terminates in 1992. Third, permanent fund contributions of two types occur. Twenty-five percent of royalties and lease bonuses from state lands automatically go into the permanent fund. In addition, we assume that, following the example set by the 1980 and 1981 legislatures, supplementary contributions are made into the fund for several years in the early 1980s. These supplementary contributions terminate in 1987.

The values assumed for these variables in all three fiscal behavior scenarios are shown in Table 26.

Permanent fund earnings are all deposited in the state general fund. A transfer program is instituted in 1981 along the lines, but not modeled after, the permanent fund distribution program currently under consideration by the U.S. Supreme Court. Initially funded at $130 million, it grows to maintain a constant per capita level. This program, shown in Table 27, is a part of the state operating budget and not in addition to it.

Government revenues will vary between the projections because of different levels of tax collections generated by different levels of economic activity. The petroleum-revenue projections used in this study and summarized in Table 28 are derived from the June 1981 Petroleum Production Revenue Forecast of the Alaska Department of Revenue and estimates made by the authors for revenues, reservoirs, and years not covered in that document.

There has been no attempt to restrain the growth of expenditures in these three fiscal behavior scenarios in response to revenue limitations. The situation is summarized by the two major funds of state government--the general fund and the permanent fund. Table 29 shows the annual balance in each fund in the moderate-moderate projection. Both funds show substantial balances at the end of the projection period. It is noteworthy, however, that the general fund balance in nominal dollars has peaked in 1999, and in real dollars, both the general fund and permanent fund balances peaked in the mid-1990s.

Table 26. State Government Disbursements Common to All Three Fiscal Behavior Scenarios

(million $)

	EXSUBS	EXSPCAP	PFCONX	PFCON
1980	0.	0.	0.	229.4
1981	450.	0.	900.	1255.59
1982	502.876	250.	1800.	2315.79
1983	558.688	250.	1500.	2133.33
1984	619.795	250.	1200.	1912.72
1985	708.51	250.	900.	1701.39
1986	797.099	250.	600.	1504.89
1987	862.184	250.	300.	1336.
1988	925.367	250.	0.	1151.72
1989	1011.12	250.	0.	1273.08
1990	1093.5	250.	0.	1330.71
1991	1192.82	250.	0.	1410.12
1992	1291.37	0.	0.	1472.21
1993	1402.61	0.	0.	1496.11
1994	1527.15	0.	0.	1503.77
1995	1679.67	0.	0.	1439.98
1996	1807.54	0.	0.	1366.1
1997	1969.38	0.	0.	1287.16
1998	2141.55	0.	0.	1173.16
1999	2334.21	0.	0.	1064.53
2000	2542.42	0.	0.	970.13

EXSUBS = subsidies
EXSPCAP = special capital account
PFCONX = supplementary permanent fund deposits
PFCON = total permanent fund deposits

Table 27. The State Transfer Program Initiated in 1981 Common to All Three Fiscal Behavior Scenarios

(million $)

EXTRNS
0.
130.
133.
147.77
163.917
187.394
210.826
228.055
244.727
267.404
286.9[illegible]3
315.435
341.563
371.176
403.356
438.91
478.031
520.808
566.554
617.277
673.302

Table 28. Total Petroleum Revenues for the Three Economic Activity Scenarios

(million $)

RP9S - DEFINITION

	B.LL	B.MM	B.HH
1980	1721.02	172.02	1721.72
1981	3036.94	3036.74	3037.74
1982	4132.26	4132.72	4134.72
1983	5029.54	5030.42	5033.22
1984	5597.21	5598.61	5603.87
1985	6619.07	6623.78	6631.41
1986	7409.61	7427.63	7473.69
1987	8583.55	8612.34	8694.1
1988	9500.16	9549.51	10044.1
1989	10847.5	10907.4	12324.6
1990	11197.2	11456.4	13509.1
1991	11666.3	12468.2	13053.5
1992	12173.5	13032.7	15927.2
1993	12658.4	13766.2	16721.
1994	12581.4	13911.1	16651.
1995	11946.6	13456.9	15762.4
1996	11222.6	12864.1	14691.9
1997	10429.	12155.1	13556.4
1998	9576.01	11311.7	12482.
1999	8743.07	10396.9	11397.2
2000	7933.09	9559.23	10386.4

B.LL = Low Case
B.MM = Moderate Case
B.HH = High Case

Table 29. Annual State Fund Balances in the Moderate-Moderate Projection

	GFBAL	PFBAL
1980	1549.1	483.2
1981	1440.	1760.5
1982	802.114	4076.29
1983	1085.35	6209.62
1984	1737.47	8122.34
1985	3760.62	9623.93
1986	6[illegible]25.77	11328.5
1987	9317.49	12664.6
1988	13416.9	13516.5
1989	18782.1	15[illegible]89.0
1990	2[illegible]617.2	16420.3
1991	31576.9	17830.4
1992	[illegible]6586.4	19502.7
1993	4[illegible]437.9	20[illegible]98.8
1994	[illegible]	22302.5
1995	[illegible]	2[illegible]42.5
1996	[illegible]7557.5	25108.6
1997	7[illegible]8.2	[illegible]375.8
1998	74281.9	27308.9
1999	[illegible]825.1	26633.1
2000	[illegible]4254.9	29[illegible]03.0

GFBAL = state general fund balance
PFBAL = permanent fund balance

The expenditure rules in these three fiscal behavior scenarios do not reflect the spending limit initiative passed during the special session of the 1981 legislature. This spending limit has not yet been approved by the voters, and it is not clear how it would affect expenditure patterns. In all three cases, however, the above expenditure rules imply a considerable degree of fiscal restraint in state spending, resulting in the accumulation of substantial permanent and general fund balances by the end of the forecast period.

However, should the legislature fail to exhibit such restraint, a quite different scenario could develop in which all "surplus" revenues are spent as accrued, thus reinforcing the expected mid-1980s boom, only to be followed by a fiscal crisis throughout the 1990s as petroleum revenues drop in the face of rising expenditures. Consequently, an alternative scenario, termed the fiscal crisis scenario, was developed to be contrasted with the previous three cases.

In the fiscal crisis scenario, all of the economic scenario assumptions of the moderate case are maintained, but several variations on the policy scenarios are introduced. First, on the revenue side, the Petroleum Production Revenue Forecast of the October 1981 Alaska Department of Revenue was introduced. However, any additional revenues from developments not included in the Revenue Department forecast which had been included in the moderate case are omitted from the fiscal crisis case. This represents a somewhat more pessimistic assumption as to the location of other North Slope development activity (namely placing it outside of state jurisdiction on federal properties offshore). These revenue assumptions are presented in Table 30 in comparison with similar assumptions from the moderate case. Second, on the expenditure side, operating expenditures are initially assumed to follow the same rule as in the moderate case, with real per capita operating expenditures rising (or falling) at the same rate as real per capita income. Capital expenditures, on the other hand, are determined entirely by revenue availability. Specifically, such expenditures are assumed to equal 90 percent of any

Table 30. Total Petroleum Revenues
Fiscal Crisis and Moderate Scenarios

RP9S - DEFINITION

	B.MM	B.CC
1980	1721.02	1661.32
1981	3036.74	3548.
1982	4132.72	4319.76
1983	5030.42	4842.37
1984	5598.61	5695.05
1985	6623.78	6647.27
1986	7427.63	7983.82
1987	8612.34	9216.57
1988	9549.51	9400.3
1989	10907.4	10549.8
1990	11456.4	10320.6
1991	12468.2	9919.37
1992	13032.7	9858.7
1993	13766.2	10237.
1994	13911.1	10056.5
1995	13456.9	9563.93
1996	12864.1	9316.39
1997	12155.1	9871.79
1998	11311.7	9908.27
1999	10396.9	9932.04
2000	9559.23	9952.09

B.MM = Moderate Case
B.CC = Fiscal Crisis Case

accumulated general fund balance in the previous year. Such behavior prompts a surge in capital expenditures throughout the late 1980s, as shown in Table 31. By 1990, such expenditures have peaked at nearly 5 billion dollars and begin to fall with the exhaustion of petroleum revenues. By 1997, such expenditures are curtailed as the general fund balance is exhausted, and capital expenditures thereafter are limited to 200 million dollars annually, financed by bond issues. The exhaustion of the general fund, however, prohibits expansion of operating expenditures, which are thereafter limited to those expenditures which may be financed out of available current revenues, as shown in Table 31.

Table 31. Expenditures and Fund Balances
Fiscal Crisis Scenario

B.CC

	EXCAP	EXOPS	GFBAL	PFBAL
1980	399.923	1209.9	1549.1	483.2
1981	515.	1684.	1440.	1760.5
1982	600.	2200.	1080.47	3977.
1983	1172.43	2491.99	758.477	5998.75
1984	882.629	2944.28	1483.59	7814.5
1985	1535.23	3260.1	2547.6	9438.
1986	2492.84	4070.71	3659.01	10906.2
1987	3493.11	4929.57	4642.39	12196.7
1988	4378.15	5609.11	4682.07	13297.7
1989	4413.86	6122.48	5307.17	14529.7
1990	4976.45	6645.16	4806.51	15737.2
1991	4525.86	7356.46	3780.4	16897.5
1992	3602.36	7966.55	3262.92	18055.2
1993	3136.63	8441.09	3083.73	19258.7
1994	2975.36	9029.28	2377.83	20438.2
1995	2340.05	9758.77	1176.73	21558.5
1996	1259.06	10475.7	94.789	22653.5
1997	200.	10995.7	0.164	23818.2
1998	200.	10908.2	0.016	24983.
1999	200.	10919.4	0.012	26147.7
2000	200.	10931.6	0.191	27312.5

EXCAP = Capital Expenditures
EXOPS = Operating Expenditures
GFBAL = General Fund Balance
PFBAL = Permanent Fund Balance

Appendix B

ASSUMPTIONS USED TO CALCULATE OCS EMPLOYMENT

I. Introduction

This appendix describes in fuller detail the assumptions underlying the direct OCS employment estimates presented in the text. In Part II, the major determinants of direct OCS employment in Alaska are examined. Part III then presents the detailed development assumptions for each of the ten OCS areas scheduled for leasing.

II. Determinants of Direct OCS Employment in Alaska

The direct employment generated by Federal OCS development in Alaska will depend on three factors:

- the technology of exploration and production used to find and develop OCS resources
- the rate at which OCS properties are offered for lease by the Federal government
- the rate and size of resource discoveries on such properties

This section examines the relationship of each of these factors to the employment estimates presented in Part III.

A. Technology of OCS Development

The development of OCS oil and gas resources occurs in a series of stages: the exploration phase, the development phase, and the production phase. While these phases will typically overlap, each consists of a distinctive set of activities which generate direct employment.

1. Exploration

Exploration activity typically will begin prior to the sale, as potential bidders (and the government) attempt to identify potential oil and gas leasing structures. These activities, which may consist of seismic surveys, bottom sampling, core drilling, or off-structure deep stratigraphic drilling, are typically conducted by specialized crews on various types of vessels, which move on to other areas upon completion of short-term assignments, resulting in little, if any, onshore direct employment. In the estimates presented below, such activity is not included explicitly in any of the direct employment estimates.

While the geophysical techniques described are capable of locating prospective oil- and gas-bearing structures, no technique short of drilling into such structures is currently capable of establishing the existence of recoverable oil and/or gas or of delineating the extent of such resources. Thus, the next stage of exploration consists of actual drilling into the prospective structures by winning bidders after the lease sale. The onset of exploratory drilling marks the beginning of significant direct employment generation in Alaska.

The technology used in exploratory drilling may involve one of several possible alternatives. Three methods are commonly in use: drill ships, semisubmersible drilling rigs, and jackup rigs.

Drill ships are self-propelled vessels with one or more drilling rigs located directly on the deck of the vessel. Drilling is accomplished by positioning the vehicle over the drill site, while the vessel is held in position by either a system of anchors and chains or a dynamic positioning system consisting of a series of propellers and thrusters activated by sensors detecting any vessel movement. While drill ships may be used in deep waters (over 400 feet), they are subject to the greatest degree of platform movement due to wave action and are thus subject to the greatest risk of breaking the drill string during periods of rough weather.

The semisubmersible drilling rig is also a floating platform, but it is designed specifically for rough weather. Movements due to wave forces are reduced by locating the major buoyant members of the structure beneath the surface of the water. The platform is supported by steel columns attached to these large underwater hulls. It is positioned either by a mooring system or a dynamic positioning system and may be used in water depths from 150 to over 2,000 feet.

Jackup rigs consist of floating platforms attached to vertically moveable legs which can be extended to the ocean floor, thus lifting the platform out of the water and making it a bottom-standing rig. While this eliminates the problems of motion and positioning characteristic of floating rigs, it imposes a rather severe limitation on the depth of water in which the jackup may be used. Current designs are limited to water depths of 350 feet.

Such techniques as drill ships, semisubmersibles, and jackups are of limited usefulness in ice-infested waters such as those which may be encountered in Northern Alaska and some Western Alaska waters.[1] In such waters, drilling may be limited to the ice-free period, using drill ships or semis. Alternatively, other techniques pioneered in areas such as the Canadian Beaufort may extend the drilling season. Five such techniques have been developed.

First, in some limited applications, directional drilling from onshore to reach offshore targets may be possible, although this is not expected to have much application in Alaska.

A technique currently in common use in the southern Canadian Beaufort Sea involves drilling from artificial islands. Such islands are generally limited to shallow waters (less than 50 feet) and are constructed from locally available materials such as gravel, sand, or silt. Alternatively, an island may be constructed of ice by thickening the existing ice sheet to produce a grounded ice island. Such an island was constructed in the Alaskan Beaufort Sea by Union Oil in 8 feet of water in 1976.

Third, ballasted barges may be used to construct a drilling platform under such conditions by floating a barge to the drill site and

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[1]Much of the discussion on ice technologies is based on Dames and Moore, "Alaska OCS Studies Program Norton Basin OCS Lease Sale No. 57 Petroleum Development Scenarios," Appendix C, "Petroleum Technology and Production."

sinking it to the ocean floor. Again, the technique is limited to very shallow water (5 to 17 feet).

Fourth, in areas of land-fast ice, drilling has been done from the ice itself. This has been done in deep waters in the Canadian Arctic islands but is not expected to be feasible in Alaska.

Finally, ice-strengthened drill ships have been used successfully in the Canadian Beaufort. Such drill ships permit drilling in deeper waters than can be accomplished using artificial islands, but they are limited to minimum depths of over 66 feet.

Employment generated during the exploratory drilling phase will consist of drilling personnel as well as support personnel to construct and/or operate onshore supply bases and to supply boats and helicopters to shuttle supplies and personnel to the drill site.

The onshore economic and social effects of the exploratory drilling phase of OCS operations will depend largely on the number and type of offshore rigs being utilized. Because of the specialized and transitory nature of exploration activity, much of the personnel employed in such drilling will be experienced personnel from outside Alaska rather than local residents. Some local residents, however, will be hired for such operations, and other migrants to the area may take up residence in Alaska, with the extent of this impact dependent upon the technology employed. Drill ships are likely to have permanent crews and are likely to require relatively little local labor, while jackups and semis will require relatively more. Any of the rigs, however, will require substantial amounts of support activity, performed by largely resident labor.

2. Field Development and Production

Once oil and gas deposits have been demonstrated and delineated by exploratory drilling, a series of activities are begun to bring the field into production. The specific activities involved in this phase and their sequence depend on the production technology utilized. The technologies currently available include both fixed platform systems and subsea production systems.

Fixed platforms include both drilling and production equipment on a platform mounted on a structure which rests on the ocean floor. While most conventional fixed platforms consists of steel truss structures attached to the ocean floor by pilings, the rought seas commonly encountered in the North Sea have led to the development of new platforms constructed primarily of concrete and held in place by their own weight, which may range up to a quarter of a million tons. Because of the dynamic response of fixed platforms to turbulent wave motion, it is generally felt that such systems will be limited to waters well under 1,000 feet in depth.

Subsea completions, currently in limited use, involve technologies which permit production in much deeper waters by drilling the production well from a mobile rig, then placing the wellhead and production equipment on the ocean floor. While this eliminates the vulnerability of the system to turbulent seas, it obviously limits accessibility to the system to divers, diving bells, and remote-controlled robots.

The sequence of activities for fixed platforms begins with the fabrication of the permanent platform onshore. For steel platforms, large numbers of skilled personnel are required for fabrication, primarily welders. The fabrication of concrete platforms is also highly labor intensive, though requiring relatively fewer skilled workers. Once the platform is completed, it must be transported to the production site and installed at a permanent location. Inasmuch as decks and producing equipment must be installed on steel platforms after placement at the site, while concrete platforms are completed onshore, the installation crews for steel platforms will be relatively larger. In the scenarios presented below, all fabrication of platforms is assumed to be done outside of Alaska. Only installation employment is generated in Alaska.

Once permanent platforms are installed, production drilling begins. After reaching the maximum number of production wells supportable by a single platform, the drilling personnel will move on, leaving a small contingent for workover operations. As production commences on the platform, crews will be required for monitoring the performance of each well and controlling and maintaining the production equipment. These crews will remain throughout the productive life of the field. In addition, supply bases and boats will be required for both the drilling and production activities offshore.

For subsea completions, the sequence of activities is somewhat different in that drilling precedes the installation of production equipment. Drilling occurs from mobile rigs such as those used for exploratory drilling. The production equipment is installed on the well by a highly specialized and mobile crew and requires relatively little manpower for either maintenance or monitoring after installation.

3. Treatment, Storage, and Transportation

After production, oil and gas resources must be treated and transported to storage areas, then finally transported to market. The nature of facilities required in this stage of development will depend on a large number of site-specific features such as distance to land, ocean depth, port availability, and rates of resource production. Treatment facilities could range from facilities simply to separate produced oil, gas, and water to oil refineries and/or LNG plants. Storage and/or transfer facilities may be located either onshore or offshore, connected to producing wells by systems of gathering lines and offshore pipelines.

Direct employment requirements during this phase involve both the construction and operation of facilities required at each particular site. The proportion of this labor who are or become Alaskan residents will depend on the type of facility required. Offshore terminals and/or pipelines will require specialized construction crews largely composed of nonresident labor. Operations personnel, inasmuch as they will be employed for long periods extending throughout the production life of the field, will represent a largely resident workforce.

B. Resource Occurrence

A major determinant of the level of OCS employment in Alaska, and the most significant determinant of long-term OCS employment, is the quantity of recoverable resources eventually discovered on the OCS.

Ten areas surrounding Alaska, shown in Figure B-1, are under consideration for OCS leasing (see below). USGS has estimated undiscovered recoverable resources[1] in each of these areas as follows:

Location	Oil (Billion Barrels)			Gas (Trillion Cubic Feet)		
	95%[2]	Mean	5%[3]	95%[2]	Mean	5%[3]
Gulf of Alaska	0	0.1	0.7	0	0.4	1.9
Cook Inlet	0.1	0.5	1.5	0.4	1.5	3.3
Beaufort Sea	0	4.3	10.4	4.1	16.5	32.0
Norton Basin	0	0.3	1.3	0	1.2	3.8
St. George Basin	0	1.6	5.8	0	6.2	15.7
Kodiak	0	0.23	1.1	0	0.69	3.5
N. Aleutian Shelf	0	0.2	1.0	0	0.8	3.2
Navarin Basin	0	3.8	11.8	0	14.2	38.3
Chukchi Sea	0	6.4	14.5	0	19.8	38.8
Hope Basin	0	0.13	0.6	0	0.86	3.3
Total of 10 Areas[4]	7	17.56	32	30	62.15	97

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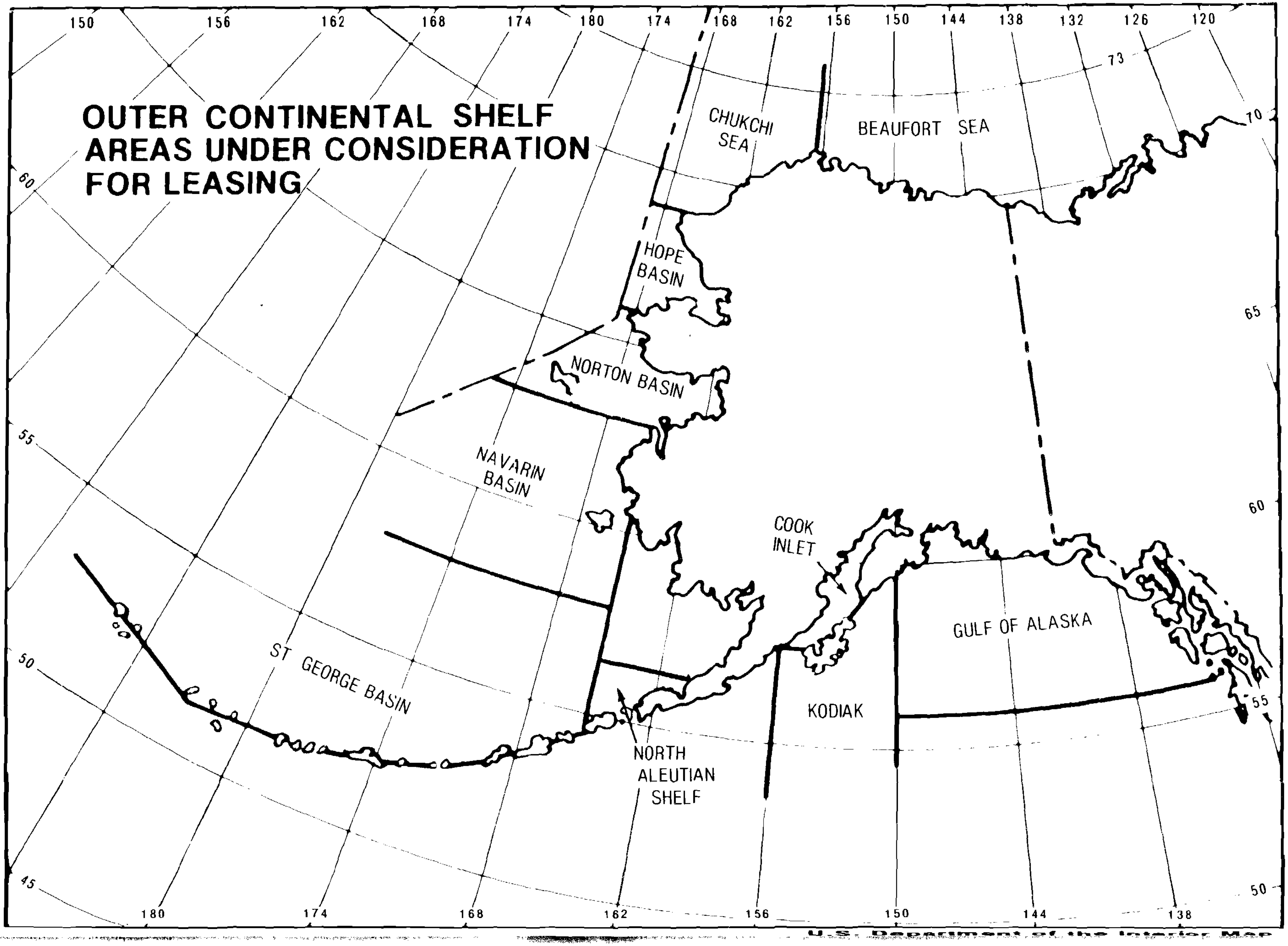
[1] See Oil and Gas Journal, 3/17/80, p. 85.

[2] There is a 95 percent probability that at least this amount of recoverable resources will be discovered.

[3] There is a 5 percent probability that at least this amount of recoverable resources will be discovered.

[4] Only the means of the individual areas are additive, not the 5 percent and 95 percent levels, so that column does not sum to total.



OUTER CONTINENTAL SHELF AREAS UNDER CONSIDERATION FOR LEASING
CHUKCHI SEA
BEAUFORT SEA
HOPE BASIN
NORTON BASIN
NAVARIN BASIN
COOK INLET
GULF OF ALASKA
ST GEORGE BASIN
KODIAK
NORTH ALEUTIAN SHELF
150
156
162
168
174
180
174
168
162
156
150
144
138
132
126
120
73
70
65
60
55
50
45
180
174
168
162
156
150
144
138
U.S. Department of the Interior Map

The actual amount of resources recovered from these areas, however, is likely to be substantially lower than this for several reasons. First, for environmental or technical reasons, not all of the acreage in each area will be leased. Second, even if these resources are discovered, unless they occur in sufficiently close proximity to each other or to transport facilities, they may not be produced. Third, in some of the areas in northern and western coastal waters, the estimates are contingent on the availability of technology as yet unproved.

In the high scenario, it is assumed that discoveries of recoverable resources eventually reach 18.8 billion barrels of oil and 47.4 trillion cubic feet of natural gas. These discoveries are reasonably consistent with USGS mean estimates, as shown above.

In the moderate scenario, only 6.7 billion barrels of oil and 16.4 trillion cubic feet of natural gas are discovered. This may be interpreted as due to a low level of actual resource occurrence and/or to some combination of wide dispersion of discoveries, environmental constraints, or technical problems.

In the low scenario, these factors combine in an even more serious limitation of discoveries to 1 billion barrels of oil and 1.75 trillion cubic feet of natural gas.

C. The OCS Leasing Schedule

A major determinant of OCS-related employment in Alaska will be the rate at which the federal government chooses to open the Outer Continental Shelf to development. In the development scenarios used in this report, the proposed five-year schedule of leasing prepared by the Secretary of Interior in 1980 provides the point of reference for assumptions regarding the rate of OCS leasing. The schedule, shown in Figure B-2, describes the pattern of proposed OCS lease sales through 1985. Most likely, future sales will be held after 1985, with the schedule at least partially dependent on the results of pre-1985 leasing.

In the high case, it is assumed that all of the planned sales before 1985 are in fact held on schedule and that three additional sales in the areas of greatest resource potential (Beaufort Sea, Navarin, and Chukchi) are held between 1985 and 1990.

In the moderate and industrialization scenarios, it is assumed that all planned pre-1985 sales are held on schedule, but that less encouraging rates of discovery of recoverable resources result in fewer post-1985 sales. Two such sales are held after 1985 in the Navarin Basin and the Chukchi Sea.

In the low scenario, only the areas of greatest resource potential (Beaufort Sea, Navarin, and Chukchi) are leased between now and 1985, and no sales are held thereafter.

PROPOSED FINAL OCS OIL & GAS LEASING SCHEDULE MARCH 1980

PROPOSED SALE AREA	PROPOSED DATE	1980 J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico	9/80		F		P		S_c	R	N	S			
55 Gulf of Alaska	10/80			F		P		S_c	R	N	S		
62 Gulf of Mexico	11/80		F				P		S_c	R	N	S	
53 Central N. Calif.	5/81				E		H				F		P
RS-1 Reoffering Sale	6/81												
A66 Gulf of Mexico	7/81							E		H			F
56 South Atlantic	8/81							E		H			
60 Cook Inlet	9/81								E		H		
66 Gulf of Mexico	10/81							E		H			F
59 Mid-Atlantic	12/81											E	
67 Gulf of Mexico	3/82	C		D		T							
RS-2 Reoffering Sale	5/82												
68 Southern California	6/82		D			T							
69 Gulf of Mexico	8/82	C		D		T							
57 Norton Basin	9/82		T										
52 North Atlantic	10/82		D				T						
70 St. George Basin	12/82		T										
71 Beaufort Sea	2/83			T									
72 Gulf of Mexico	3/83												
61 Kodiak	4/83									C		D	
73 California	5/83											C	
RS-3 Reoffering Sale	6/83												
74 Gulf of Mexico	9/83												
75 No. Aleutian Shelf	10/83					C			D				T
76 Mid-Atlantic	11/83												
78 So. Atlantic	1/84												
79 Gulf of Mexico	3/84												
RS-4 Reoffering Sale	4/84												
80 California	6/84												
81 Gulf of Mexico	7/84												
82 North Atlantic	10/84												
83 Navarin Basin	12/84												
84 Gulf of Mexico	1/85												
☆ 85 Chukchi Sea	2/85												
RS-5 Reoffering Sale	5/85												
86 Hope Basin	5/85												

PROPOSED SALE AREA	1981 J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
53 Central N. Calif.		S_c	R	N	S							
RS-1 Reoffering Sale				R	N	S						
A66 Gulf of Mexico		P		S_c	R	N	S					
56 South Atlantic	F		P		S_c	R	N	S				
60 Cook Inlet		F		P		S_c	R	N	S			
66 Gulf of Mexico					P		S_c	R	N	S		
59 Mid-Atlantic	H				F		P		S_c	R	N	S
67 Gulf of Mexico			E		H			F		P		S_c
RS-2 Reoffering Sale												
68 Southern California					E		H				F	
69 Gulf of Mexico			E		H			F				
57 Norton Basin						E				H		
52 North Atlantic									E		H	
70 St. George Basin										E		
71 Beaufort Sea												E
72 Gulf of Mexico	C		D		T							
61 Kodiak		T										
73 California	D			T								
RS-3 Reoffering Sale												
74 Gulf of Mexico	C		D		T							
75 No. Aleutian Shelf												
76 Mid-Atlantic					C		D			T		
78 So. Atlantic			C			D				T		
79 Gulf of Mexico												
RS-4 Reoffering Sale												
80 California										C		D
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin						C			D			
84 Gulf of Mexico												
☆ 85 Chukchi Sea							C			D		
RS-5 Reoffering Sale												
86 Hope Basin									C			D

PROPOSED SALE AREA	1982 J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
53 Central N. Calif.												
RS-1 Reoffering Sale												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico	R	N	S									
RS-2 Reoffering Sale			R	N	S							
68 Southern California	P		S_c	R	N	S						
69 Gulf of Mexico			P		S_c	R	N	S				
57 Norton Basin		F		P		S_c	R	N	S			
52 North Atlantic			F		P		S_c	R	N	S		
70 St. George Basin	H				F		P		S_c	R	N	S
71 Beaufort Sea			H				F		P		S_c	R
72 Gulf of Mexico			E		H			F		P		S_c
61 Kodiak			E			H			F		P	
73 California				E		H				F		P
RS-3 Reoffering Sale												
74 Gulf of Mexico			E		H			F				
75 No. Aleutian Shelf								E			H	
76 Mid-Atlantic										E		H
78 So. Atlantic											E	
79 Gulf of Mexico	C		D		T							
RS-4 Reoffering Sale												
80 California			T									
81 Gulf of Mexico	C		D		T							
82 North Atlantic				C		D			T			
83 Navarin Basin	T											
84 Gulf of Mexico											C	
☆ 85 Chukchi Sea		T										
RS-5 Reoffering Sale												
86 Hope Basin				T								

PROPOSED SALE AREA	1983 J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
53 Central N. Calif.												
RS-1 Reoffering Sale												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico												
RS-2 Reoffering Sale												
68 Southern California												
69 Gulf of Mexico												
57 Norton Basin												
52 North Atlantic												
70 St. George Basin												
71 Beaufort Sea	N	S										
72 Gulf of Mexico	R	N	S									
61 Kodiak	S_c	R	N	S								
73 California		S_c	R	N	S							
RS-3 Reoffering Sale				R	N	S						
74 Gulf of Mexico				P		S_c	R	N	S			
75 No. Aleutian Shelf			F		P		S_c	R	N	S		
76 Mid-Atlantic				F		P		S_c	R	N	S	
78 So. Atlantic		H				F		P		S_c	R	N
79 Gulf of Mexico			E		H			F		P		S_c
RS-4 Reoffering Sale												
80 California					E		H				F	
81 Gulf of Mexico			E		H			F				
82 North Atlantic									E		H	
83 Navarin Basin										E		
84 Gulf of Mexico	D		T									
☆ 85 Chukchi Sea												E
RS-5 Reoffering Sale												
86 Hope Basin												

PROPOSED SALE AREA	1984 J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
53 Central N. Calif.												
RS-1 Reoffering Sale												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico												
RS-2 Reoffering Sale												
68 Southern California												
69 Gulf of Mexico												
57 Norton Basin												
52 North Atlantic												
70 St. George Basin												
71 Beaufort Sea												
72 Gulf of Mexico												
61 Kodiak												
73 California												
RS-3 Reoffering Sale												
74 Gulf of Mexico												
75 No. Aleutian Shelf												
76 Mid-Atlantic												
78 So. Atlantic	S											
79 Gulf of Mexico	R	N	S									
RS-4 Reoffering Sale		R	N	S								
80 California	P		S_c	R	N	S						
81 Gulf of Mexico		P		S_c	R	N	S					
82 North Atlantic			F		P		S_c	R	N	S		
83 Navarin Basin	H				F		P		S_c	R	N	S
84 Gulf of Mexico	E		H			F		P		S_c	R	N
☆ 85 Chukchi Sea			H				F		P		S_c	R
RS-5 Reoffering Sale												
86 Hope Basin			E			H				F		P

PROPOSED SALE AREA	1985 J	F	M	A	M	J	J	A	S	O	N	D
A62 Gulf of Mexico												
55 Gulf of Alaska												
62 Gulf of Mexico												
53 Central N. Calif.												
RS-1 Reoffering Sale												
A66 Gulf of Mexico												
56 South Atlantic												
60 Cook Inlet												
66 Gulf of Mexico												
59 Mid-Atlantic												
67 Gulf of Mexico												
RS-2 Reoffering Sale												
68 Southern California												
69 Gulf of Mexico												
57 Norton Basin												
52 North Atlantic												
70 St. George Basin												
71 Beaufort Sea												
72 Gulf of Mexico												
61 Kodiak												
73 California												
RS-3 Reoffering Sale												
74 Gulf of Mexico												
75 No. Aleutian Shelf												
76 Mid-Atlantic												
78 So. Atlantic												
79 Gulf of Mexico												
RS-4 Reoffering Sale												
80 California												
81 Gulf of Mexico												
82 North Atlantic												
83 Navarin Basin												
84 Gulf of Mexico	S											
☆ 85 Chukchi Sea	N	S										
RS-5 Reoffering Sale			R	N	S							
86 Hope Basin		S_c	R	N	S							

C - Call For Nominations
D - Nominations Due
T - Tentative Tract Selection
E - Draft Environmental Statement
H - Pubic Hearing
F - Final Environmental Statement
P - Proposed Notice of Sale
S_c - State Comments Due
R - Energy Review
N - Notice of Sale
S - Sale

☆ The holding of the Chukchi Sale at this time is contingent upon a reasonable assumption that technology will be available for exploration and development of the tracts included in the sale.

FIGURE B-2

III. OCS Development Scenarios

A. Gulf of Alaska

In the high scenario, it is assumed that 0.45 billion barrels of oil and 1.25 trillion cubic feet of gas are discovered on acreage leased in 1980. Employment peaks at 440 in 1989, falling to a long-term level of about 350 by 1993, as shown in Table B-1.

In the moderate and low cases, exploration of tracts leased in 1980 results in no commercial discoveries, and the tracts are abandoned by 1985, as shown in Table B-2.

TABLE B-1. DIRECT EMPLOYMENT REQUIREMENTS: GULF OF ALASKA[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.045	0.	0.017	0.	0.062
1982	0.09	0.	0.035	0.	0.125
1983	0.09	0.	0.035	0.	0.125
1984	0.083	0.038	0.026	0.	0.147
1985	0.038	0.012	0.009	0.	0.059
1986	0.	0.093	0.	0.	0.093
1987	0.09	0.098	0.086	0.	0.274
1988	0.179	0.037	0.086	0.	0.302
1989	0.34	0.	0.1	0.	0.44
1990	0.333	0.	0.107	0.	0.44
1991	0.343	0.	0.107	0.	0.45
1992	0.292	0.	0.042	0.	0.334
1993	0.305	0.	0.042	0.	0.347
1994	0.307	0.	0.042	0.	0.349
1995	0.31	0.	0.042	0.	0.352
1996	0.31	0.	0.042	0.	0.352
1997	0.31	0.	0.042	0.	0.352
1998	0.31	0.	0.042	0.	0.352
1999	0.31	0.	0.042	0.	0.352
2000	0.31	0.	0.042	0.	0.352

KEY: EMP9 = Petroleum
ECONX = Construction
EMT9X = Transportation
EMMX = Manufacturing

[1]Assumes two lease sales, in 1976 and 1980. Activity associated with the 1976 sale has ended with no commercial discoveries. The 1980 sale is assumed to result in commercial discoveries of 0.45 BBO and 1.25 TCFG. Employment estimates taken from moderate case scenario described in Eastern Gulf of Alaska Sale 55 Final EIS.

TABLE B-2. DIRECT EMPLOYMENT REQUIREMENTS, GULF OF ALASKA[1]

MODERATE CASE
LOW CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.149	0.	0.082	0.	0.231
1982	0.149	0.	0.082	0.	0.231
1983	0.114	0.	0.062	0.	0.176
1984	0.021	0.	0.017	0.	0.038
1985	0.	0.	0.	0.	0.
1986	0.	0.	0.	0.	0.
1987	0.	0.	0.	0.	0.
1988	0.	0.	0.	0.	0.
1989	0.	0.	0.	0.	0.
1990	0.	0.	0.	0.	0.
1991	0.	0.	0.	0.	0.
1992	0.	0.	0.	0.	0.
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

See Table B-1 for key to variables.

[1]Assumes two lease sales, in 1976 and 1980. Activity associated with the 1976 sale has terminated with no commercial discoveries. No commercial discoveries result from the 1980 sale. Employment consists solely of exploration activity, estimated as described in the "exploration only" scenario presented in Huskey and Nebesky, Northern Gulf of Alaska Petroleum Development Scenarios: Economic and Demographic Impacts, OCS Technical Report 34, Table 58, p. 187.

B. Cook Inlet

In the high case, it is assumed that 0.67 billion barrels of oil and 1.173 trillion cubic feet of gas are discovered on tracts leased this year (1981). Direct employment peaks at over 900 in 1987, before falling to a long-term level of about 800 in 1991, as shown in Table B-3.

In the moderate case, acreage leased in 1981 yields .332 billion barrels of recoverable oil and 0.581 trillion cubic feet of recoverable gas. Employment peaks at about 500 in 1987, falling to a long-term level of 428 in 1991, as shown in Table B-4.

In the low case, no commercial discoveries result from exploration of tracts leased in 1981, and tracts are abandoned in 1987, as shown in Table B-5.

TABLE B-3. DIRECT EMPLOYMENT REQUIREMENTS, COOK INLET[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.09	0.	0.033	0.	0.123
1981	0.075	0.	0.017	0.	0.092
1982	0.121	0.131	0.034	0.	0.286
1983	0.09	0.	0.036	0.	0.126
1984	0.09	0.	0.036	0.	0.126
1985	0.084	0.048	0.027	0.	0.159
1986	0.208	0.299	0.28	0.	0.787
1987	0.358	0.133	0.425	0.	0.916
1988	0.369	0.	0.425	0.	0.794
1989	0.385	0.	0.425	0.	0.81
1990	0.411	0.	0.443	0.	0.854
1991	0.432	0.	0.366	0.	0.798
1992	0.432	0.	0.366	0.	0.798
1993	0.432	0.	0.366	0.	0.798
1994	0.432	0.	0.366	0.	0.798
1995	0.432	0.	0.366	0.	0.798
1996	0.432	0.	0.366	0.	0.798
1997	0.432	0.	0.366	0.	0.798
1998	0.432	0.	0.366	0.	0.798
1999	0.432	0.	0.366	0.	0.798
2000	0.432	0.	0.366	0.	0.798

See Table B-1 for key to variables.

[1]Assumes two lease sales, in 1977 and 1981. The 1977 sale results in no commercial discoveries, but the 1981 sale results in discovery of 0.67 BBO and 1.173 TCFG. Employment estimates for the 1977 sale consist of exploration only. Employment estimates for the 1981 sale are taken from a development scenario described in ISER, Lower Cook Inlet Statewide and Regional Population and Economic Systems Impact Analysis, Table 3, p. 7.

TABLE B-4. DIRECT EMPLOYMENT REQUIREMENTS, COOK INLET[1]

MODERATE CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.09	0.	0.033	0.	0.123
1981	0.075	0.	0.017	0.	0.092
1982	0.076	0.028	0.018	0.	0.122
1983	0.083	0.	0.025	0.	0.108
1984	0.09	0.	0.033	0.	0.123
1985	0.076	0.048	0.017	0.	0.141
1986	0.143	0.15	0.166	0.	0.459
1987	0.218	0.061	0.217	0.	0.496
1988	0.238	0.	0.217	0.	0.455
1989	0.25	0.	0.217	0.	0.467
1990	0.182	0.	0.226	0.	0.408
1991	0.25	0.	0.178	0.	0.428
1992	0.25	0.	0.178	0.	0.428
1993	0.25	0.	0.178	0.	0.428
1994	0.25	0.	0.178	0.	0.428
1995	0.25	0.	0.178	0.	0.428
1996	0.25	0.	0.178	0.	0.428
1997	0.25	0.	0.178	0.	0.428
1998	0.25	0.	0.178	0.	0.428
1999	0.25	0.	0.178	0.	0.428
2000	0.25	0.	0.178	0.	0.428

See Table B-1 for key to variables.

[1]Assumes two lease sales, in 1977 and 1981. The 1977 sale results in no commercial discoveries, but the 1981 sale results in discovery of 0.332 BBO and 0.581 TCFG. Employment estimates for the 1977 sale consist of exploration only. Employment estimates for the 1981 sale are taken from a development scenario described in ISER, Lower Cook Inlet Statewide and Regional Population and Economic Systems Impact Analysis, Table 2, p. 6.

TABLE B-5. DIRECT EMPLOYMENT REQUIREMENTS, COOK INLET[1]

LOW CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.09	0.	0.033	0.	0.123
1981	0.075	0.	0.017	0.	0.092
1982	0.076	0.028	0.018	0.	0.122
1983	0.083	0.	0.026	0.	0.109
1984	0.09	0.	0.033	0.	0.123
1985	0.075	0.	0.017	0.	0.092
1986	0.038	0.	0.009	0.	0.047
1987	0.	0.	0.	0.	0.
1988	0.	0.	0.	0.	0.
1989	0.	0.	0.	0.	0.
1990	0.	0.	0.	0.	0.
1991	0.	0.	0.	0.	0.
1992	0.	0.	0.	0.	0.
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

See Table B-1 for key to variables.

[1]Assumes two lease sales, in 1977 and 1981, each followed by exploration activity but no commercial discoveries. Exploration employment estimated by Alaska OCS Office for study of Lower Cook Inlet OCS Sale 60.

C. Beaufort Sea

In the high scenario, it is assumed that two additional lease sales are held in the Beaufort Sea in 1983 and 1986. Acreage leased in the 1979 sale yields discoveries of 1.9 billion barrels of oil and 4.74 trillion cubic feet of gas. Discoveries from 1983 leased acreage total 1.3 billion barrels of oil and 3.25 trillion cubic feet of gas. The 1986 sale results in discoveries of 0.8 billion barrles of oil and 1.6 trillion cubic feet of gas. Total discoveries amount to 4 billion barrels of oil and 9.6 trillion cubic feet of gas. Employment peaks at over 3,300 in 1994, falling to about 2,640 by the end of the forecast period, as shown in Table B-6.

In the moderate case, acreage leased in 1979 yields discoveries of 1.3 billion barrels of oil and 3.25 trillion cubic feet of gas. A second sale in 1983 adds 0.8 billion barrels of oil and 1.6 trillion cubic feet of gas, bringing total discoveries to 2.1 billion barrels of oil and 4.85 trillion cubic feet of gas. Employment peaks at over 2,200 in 1991 but falls to under 1,500 by the year 2000, as shown in Table B-7.

In the low case, 1 billion barrels of oil and 1.75 trillion cubic feet of gas are assumed, half discovered on acreage leased in 1979 and half on acreage leased in 1983. Employment peaks at over 1,200 in 1993, falling to less than 700 by the year 2000, as shown in Table B-8.

TABLE B-6. DIRECT EMPLOYMENT REQUIREMENTS, BEAUFORT SEA[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.119	0.06	0.	0.	0.179
1981	0.103	0.018	0.	0.	0.121
1982	0.044	0.086	0.	0.	0.13
1983	0.044	0.086	0.	0.	0.13
1984	0.044	0.099	0.	0.	0.143
1985	0.027	0.24	0.	0.	0.267
1986	0.275	1.68	0.	0.	1.955
1987	0.467	1.474	0.	0.	1.941
1988	1.453	0.096	0.	0.	1.549
1989	1.378	0.084	0.	0.	1.462
1990	1.319	0.315	0.	0.	1.634
1991	1.319	0.74	0.	0.	2.059
1992	1.243	1.272	0.	0.	2.515
1993	1.396	1.006	0.	0.	2.402
1994	1.887	1.441	0.	0.	3.328
1995	2.145	0.9	0.	0.	3.045
1996	2.668	0.352	0.	0.	3.02
1997	2.675	0.088	0.	0.	2.763
1998	2.682	0.171	0.	0.	2.853
1999	2.654	0.148	0.	0.	2.802
2000	2.553	0.088	0.	0.	2.641

See Table B-1 for key to variables.

[1]Assumes three lease sales--in 1979, 1983, and 1986--resulting in total commercial discoveries of 4.0 BBO and 9.6 TCFG. Discoveries associated with the first sale total 1.9 BBO and 4.75 TCFG; those associated with the second are 1.3 BBO and 3.25 TCFG; and those with the third are 0.8 BBO and 1.6 TCFG. Employment estimates associated with the 1979, 1983, and 1986 sales correspond to the High Find Scenario, the Moderate Find Scenario, and the Low Find Scenario, respectively, as presented in Alaska OCS Studies Technical Report 18, Beaufort Sea. Petroleum Development Scenarios: Economic and Demographic Impacts, Tables 3.2, 3.8, and 3.6, respectively.

TABLE B-7. DIRECT EMPLOYMENT REQUIREMENTS, BEAUFORT SEA[1]

MODERATE CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.084	0.012	0.	0.	0.096
1983	0.101	0.052	0.	0.	0.153
1984	0.185	0.03	0.	0.	0.215
1985	0.179	0.122	0.	0.	0.301
1986	0.163	0.242	0.	0.	0.405
1987	0.104	0.735	0.	0.	0.839
1988	0.165	1.286	0.	0.	1.451
1989	0.341	0.821	0.	0.	1.162
1990	0.792	0.828	0.	0.	1.62
1991	1.082	1.158	0.	0.	2.24
1992	1.41	0.675	0.	0.	2.085
1993	1.74	0.264	0.	0.	2.004
1994	1.74	0.166	0.	0.	1.906
1995	1.713	0.196	0.	0.	1.909
1996	1.611	0.03	0.	0.	1.641
1997	1.564	0.166	0.	0.	1.73
1998	1.598	0.01	0.	0.	1.608
1999	1.538	0.01	0.	0.	1.548
2000	1.478	0.01	0.	0.	1.488

See Table B-1 for key to variables.

[1]Assumes two lease sales, in 1979 and 1983, resulting in total commercial discoveries of 2.1 BBO and 4.85 TCFG. The 1979 sale results in discoveries of 1.3 BBO and 3.25 TCFG. Employment estimates for this sale are taken from Alaska OCS Studies Technical Report 18, Beaufort Sea Petroleum Development Scenarios: Economic and Demographic Impacts, Moderate Find Scenario, Table 3.8, p. 89. The 1983 sale results in discoveries of 0.8 BBO and 1.6 TCFG. Employment estimates are also from Alaska OCS Studies Technical Report 18, Low Find Scenario, Table 3.6, p. 86.

TABLE B-8. DIRECT EMPLOYMENT REQUIREMENTS, BEAUFORT SEA[1]

LOW CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.066	0.062	0.	0.	0.128
1982	0.197	0.188	0.	0.	0.385
1983	0.197	0.135	0.	0.	0.332
1984	0.23	0.25	0.	0.	0.48
1985	0.132	0.212	0.	0.	0.344
1986	0.267	0.47	0.	0.	0.737
1987	0.32	0.417	0.	0.	0.737
1988	0.458	0.645	0.	0.	1.103
1989	0.411	0.545	0.	0.	0.956
1990	0.457	0.414	0.	0.	0.871
1991	0.557	0.414	0.	0.	0.971
1992	0.616	0.461	0.	0.	1.077
1993	0.7	0.527	0.	0.	1.227
1994	0.72	0.264	0.	0.	0.984
1995	0.768	0.191	0.	0.	0.959
1996	0.721	0.084	0.	0.	0.805
1997	0.687	0.132	0.	0.	0.819
1998	0.663	0.132	0.	0.	0.795
1999	0.661	0.059	0.	0.	0.72
2000	0.658	0.018	0.	0.	0.676

See Table B-1 for key to variables.

[1]Assumes two lease sales, in 1979 and 1983, resulting in total discoveries of 1.0 BBO and 1.75 TCFG, half on acreage leased in the first sale, half in the second. Employment estimates for each sale taken from scenario described in Beaufort Sea Draft EIS, Table III.C.2.3, p. 238.

D. Norton Basin

In the high case, it is assumed that 0.38 billion barrels of oil and 1.2 trillion cubic feet of gas are discovered on acreage leased in the scheduled 1982 sale. Employment peaks at about 1,300 in 1990 before falling to a long-term level of about 850 by 1995, as shown in Table B-9.

In the moderate case, acreage leased in the scheduled 1982 sale results in no commercial discoveries. Employment in exploration peaks at 92 in 1984, before the tracts are abandoned in 1986, as shown in Table B-10.

In the low scenario, no sale occurs in the Norton Basin.

TABLE B-9. DIRECT EMPLOYMENT REQUIREMENTS, NORTON BASIN[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.053	0.	0.031	0.	0.084
1984	0.083	0.005	0.046	0.	0.134
1985	0.116	0.011	0.099	0.	0.226
1986	0.168	0.011	0.149	0.	0.328
1987	0.063	0.052	0.05	0.	0.165
1988	0.08	0.124	0.138	0.	0.342
1989	0.195	0.192	0.131	0.	0.518
1990	1.116	0.01	0.113	0.08	1.319
1991	1.136	0.	0.082	0.08	1.298
1992	0.836	0.	0.082	0.08	0.998
1993	0.625	0.	0.082	0.08	0.787
1994	0.595	0.	0.082	0.08	0.757
1995	0.685	0.	0.082	0.08	0.847
1996	0.685	0.	0.082	0.08	0.847
1997	0.685	0.	0.082	0.08	0.847
1998	0.685	0.	0.082	0.08	0.847
1999	0.685	0.	0.082	0.08	0.847
2000	0.685	0.	0.082	0.08	0.847

See Table B-1 for key to variables.

[1]Assumes a single lease sale held in 1982, resulting in commercial discoveries totaling 0.38 BBO and 1.2 TCFG. Employment estimates from scenario described in Porter, "Bering-Norton Petroleum Development Scenarios: Economic and Demographic Analysis, Table 24, p. 140.

TABLE B-10. DIRECT EMPLOYMENT REQUIREMENTS, NORTON BASIN[1]

MODERATE CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.026	0.	0.015	0.	0.041
1984	0.056	0.005	0.031	0.	0.092
1985	0.03	0.005	0.016	0.	0.051
1986	0.	0.	0.	0.	0.
1987	0.	0.	0.	0.	0.
1988	0.	0.	0.	0.	0.
1989	0.	0.	0.	0.	0.
1990	0.	0.	0.	0.	0.
1991	0.	0.	0.	0.	0.
1992	0.	0.	0.	0.	0.
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

See Table B-1 for key to variables.

[1]Assumes a single lease sale held in 1982, followed by exploration but no commercial discoveries. Employment estimates from "exploration only" scenario described in Porter, "Bering-Norton Petroleum Development Scenarios: Economic and Demographic Analysis," Table 23, p. 139.

E. St. George Basin

In the high case, it is assumed that 2.16 billion barrels of oil and 6.12 trillion cubic feet of gas are discovered on tracts leased in the scheduled 1982 sale. Employment peaks at nearly 2,600 in 1989, eventually falling to a long-term level of about 1,600, as shown in Table B-11.

In the moderate case, it is assumed that exploration following the planned 1982 sale results in no commercial discoveries. Exploration employment peaks at over 100 before the tracts are abandoned in 1988, as shown in Table B-12.

In the low case, no sale is held in the St. George Basin.

TABLE B-11. DIRECT EMPLOYMENT REQUIREMENTS, ST. GEORGE BASIN[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.084	0.018	0.057	0.	0.159
1984	0.118	0.055	0.091	0.	0.264
1985	0.136	0.172	0.162	0.	0.47
1986	0.122	0.19	0.254	0.	0.566
1987	0.244	1.165	0.363	0.	1.772
1988	0.263	1.075	0.616	0.	1.954
1989	0.826	0.873	0.88	0.	2.579
1990	0.859	0.619	0.711	0.	2.189
1991	0.843	0.	0.711	0.	1.554
1992	0.891	0.	0.711	0.	1.602
1993	0.951	0.	0.711	0.	1.662
1994	0.911	0.	0.711	0.	1.622
1995	0.871	0.	0.711	0.	1.582
1996	0.833	0.	0.711	0.	1.544
1997	0.891	0.	0.711	0.	1.602
1998	0.951	0.	0.711	0.	1.662
1999	0.911	0.	0.711	0.	1.622
2000	0.871	0.	0.711	0.	1.582

See Table B-1 for key to variables.

[1] Assumes a single lease sale held in 1982, resulting in discovery of 2.16 BBO and 6.12 TCFG. Employment estimates from "Moderate Find" scenario developed by Alaska OCS Office for study of St. George OCS Sale 70.

TABLE B-12. DIRECT EMPLOYMENT REQUIREMENTS, ST. GEORGE BASIN[1]

MODERATE CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.05	0.	0.023	0.	0.073
1984	0.064	0.	0.037	0.	0.101
1985	0.072	0.	0.046	0.	0.118
1986	0.065	0.	0.039	0.	0.104
1987	0.044	0.	0.008	0.	0.052
1988	0.	0.	0.	0.	0.
1989	0.	0.	0.	0.	0.
1990	0.	0.	0.	0.	0.
1991	0.	0.	0.	0.	0.
1992	0.	0.	0.	0.	0.
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

See Table B-1 for key to variables.

[1]Assumes a single lease sale held in 1982, resulting in no commercial discoveries. Employment estimates associated with exploration activity only, as estimated by Alaska OCS Office for study of St. George OCS Sale 70, Low Scenario.

F. Kodiak

In the high case, it is assumed that 0.332 billion barrels of oil and 0.581 trillion cubic feet of gas are discovered on acreage leased in the scheduled 1983 sale. Employment peaks at nearly 500 in 1989 before falling to a long-term level of about 430, as shown in Table B-13.

In the moderate case, exploration following the scheduled 1983 sale results in no commercial discoveries. Exploration employment peaks at nearly 300 in 1985 (see Table B-14), before the tracts are abandoned in 1988.

In the low case, no Kodiak sale is held.

G. North Aleutian Shelf

In the high case, it is assumed that 0.332 billion barrels of oil and 0.581 trillion cubic feet of gas are discovered on acreage leased in the scheduled 1983 sale. Employment peaks at nearly 500 in 1989 before falling to a long-term level of about 430, as shown in Table B-15.

In the moderate case, exploration following the scheduled 1983 sale results in no commercial discoveries. Exploration employment peaks at nearly 300 in 1985, before the tracts are abandoned in 1988, as shown in Table B-16.

In the low case, no North Aleutian Shelf sale is held.

TABLE B-13. DIRECT EMPLOYMENT REQUIREMENTS, KODIAK[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.038	0.028	0.009	0.	0.075
1985	0.083	0.	0.025	0.	0.108
1986	0.09	0.	0.033	0.	0.123
1987	0.076	0.048	0.017	0.	0.141
1988	0.143	0.15	0.166	0.	0.459
1989	0.218	0.061	0.217	0.	0.496
1990	0.238	0.	0.217	0.	0.455
1991	0.25	0.	0.217	0.	0.467
1992	0.182	0.	0.226	0.	0.408
1993	0.25	0.	0.178	0.	0.428
1994	0.25	0.	0.178	0.	0.428
1995	0.25	0.	0.178	0.	0.428
1996	0.25	0.	0.178	0.	0.428
1997	0.25	0.	0.178	0.	0.428
1998	0.25	0.	0.178	0.	0.428
1999	0.25	0.	0.178	0.	0.428
2000	0.25	0.	0.178	0.	0.428

See Table B-1 for key to variables.

[1]Assumes a single lease sale held in 1983, resulting in commercial discovery of 0.332 BBO and 0.581 TCFG. Environmental conditions assumed to be similar to Lower Cook Inlet. Employment estimates adapted from Low Find Scenario used in Lower Cook Inlet Statewide and Regional Population and Economic Systems Impact Analysis.

TABLE B-14. DIRECT EMPLOYMENT REQUIREMENTS, KODIAK[1]

MODERATE CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.042	0.	0.008	0.	0.05
1984	0.09	0.	0.037	0.	0.127
1985	0.117	0.	0.176	0.	0.293
1986	0.084	0.	0.029	0.	0.113
1987	0.042	0.	0.008	0.	0.05
1988	0.	0.	0.	0.	0.
1989	0.	0.	0.	0.	0.
1990	0.	0.	0.	0.	0.
1991	0.	0.	0.	0.	0.
1992	0.	0.	0.	0.	0.
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

See Table B-1 for key to variables.

[1] Assumes a single lease sale held in 1983, resulting in no commercial discoveries. Employment estimates are exploration employment estimates used by Alaska OCS Office in study of Kodiak Sale 46.

TABLE B-15. DIRECT EMPLOYMENT REQUIREMENTS, NORTH ALEUTIAN SHELF[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.038	0.028	0.009	0.	0.075
1985	0.083	0.	0.025	0.	0.108
1986	0.09	0.	0.033	0.	0.123
1987	0.076	0.048	0.017	0.	0.141
1988	0.143	0.15	0.166	0.	0.459
1989	0.218	0.061	0.217	0.	0.496
1990	0.238	0.	0.217	0.	0.455
1991	0.25	0.	0.217	0.	0.467
1992	0.182	0.	0.226	0.	0.408
1993	0.25	0.	0.178	0.	0.428
1994	0.25	0.	0.178	0.	0.428
1995	0.25	0.	0.178	0.	0.428
1996	0.25	0.	0.178	0.	0.428
1997	0.25	0.	0.178	0.	0.428
1998	0.25	0.	0.178	0.	0.428
1999	0.25	0.	0.178	0.	0.428
2000	0.25	0.	0.178	0.	0.428

See Table B-1 for key to variables.

[1] Assumes a single lease sale held in 1983, resulting in commercial discoveries of 0.332 BBO and 0.581 TCFG. Employment estimates adapted from scenario used in study of Lower Cook Inlet Sale 60, presented in Lower Cook Inlet Statewide and Regional Population and Economic Systems Impact Analysis.

TABLE B-16. DIRECT EMPLOYMENT REQUIREMENTS, NORTH ALEUTIAN SHELF[1]

MODERATE CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.042	0.	0.008	0.	0.05
1984	0.09	0.	0.037	0.	0.127
1985	0.117	0.	0.176	0.	0.293
1986	0.084	0.	0.029	0.	0.113
1987	0.042	0.	0.008	0.	0.05
1988	0.	0.	0.	0.	0.
1989	0.	0.	0.	0.	0.
1990	0.	0.	0.	0.	0.
1991	0.	0.	0.	0.	0.
1992	0.	0.	0.	0.	0.
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

See Table B-1 for key to variables.

[1] Assumes a single lease sale held in 1983, resulting in no commercial discoveries. Employment consists of exploration activity only, on a scale similar to that estimated by Alaska OCS Office for study of Kodiak Sale 46.

H. Navarin Basin

In the high scenario, it is assumed that three sales--in 1984, 1987, and 1989--result in discoveries totaling 4.32 billion barrels of oil and 12.24 trillion cubic feet of gas, half on acreage leased in 1984 and half on acreage leased in 1987. The 1989 sale results in no commercial discoveries. Employment peaks at over 4,200 in 1994, before falling to a long-term level of about 3,200, as shown in Table B-17.

In the moderate scenario, 2.16 billion barrels of oil and 6.12 trillion cubic feet of gas are discovered on acreage leased in the scheduled 1984 sale. A second sale is held in 1988, followed by exploration but no further commercial discoveries. Employment peaks at nearly 2,700 in 1991, before falling to a long-term level of about 1,600, as shown in Table B-18.

In the low case, the scheduled 1984 sale is held, but the subsequent exploration effort yields no commercial discoveries. Exploration employment reaches over 100 persons until the tracts are abandoned in 1990, as shown in Table B-19.

TABLE B-17. DIRECT EMPLOYMENT REQUIREMENTS, NAVARIN BASIN[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.
1985	0.084	0.018	0.057	0.	0.159
1986	0.118	0.055	0.091	0.	0.264
1987	0.136	0.172	0.162	0.	0.47
1988	0.206	0.208	0.311	0.	0.725
1989	0.362	1.22	0.454	0.	2.036
1990	0.449	1.247	0.801	0.	2.497
1991	1.012	1.063	1.171	0.	3.246
1992	1.175	1.784	1.12	0.	4.079
1993	1.171	1.075	1.366	0.	3.612
1994	1.761	0.873	1.599	0.	4.233
1995	1.81	0.619	1.422	0.	3.851
1996	1.754	0.	1.422	0.	3.176
1997	1.762	0.	1.422	0.	3.184
1998	1.784	0.	1.422	0.	3.206
1999	1.802	0.	1.422	0.	3.224
2000	1.822	0.	1.422	0.	3.244

See Table B-1 for key to variables.

[1]Assumes three lease sales--in 1984, 1987, and 1989--resulting in commercial discoveries totaling 4.32 BBO and 12.24 TCFG. Environmental conditions are assumed to be similar to those in the St. George Basin. The first and second sale each results in discovery of 2.16 BBO and 6.12 TCFG. Employment estimates for these sales are adapted from estimates used by the Alaska OCS Office in the study of OCS Sale 70, St. George Basin, Moderate Find Scenario. Estimates of employment for the third sale, which results in no commercial discoveries, include exploration employment from the Low Find Scenario used in the Sale 70 study.

TABLE B-18. DIRECT EMPLOYMENT REQUIREMENTS, NAVARIN BASIN[1]

MODERATE CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.
1985	0.084	0.018	0.057	0.	0.159
1986	0.118	0.055	0.091	0.	0.264
1987	0.136	0.172	0.162	0.	0.47
1988	0.122	0.19	0.254	0.	0.566
1989	0.294	1.165	0.386	0.	1.845
1990	0.327	1.075	0.653	0.	2.055
1991	0.898	0.873	0.926	0.	2.697
1992	0.924	0.619	0.75	0.	2.293
1993	0.887	0.	0.719	0.	1.606
1994	0.891	0.	0.711	0.	1.602
1995	0.951	0.	0.711	0.	1.662
1996	0.911	0.	0.711	0.	1.622
1997	0.871	0.	0.711	0.	1.582
1998	0.833	0.	0.711	0.	1.544
1999	0.891	0.	0.711	0.	1.602
2000	0.951	0.	0.711	0.	1.662

See Table B-1 for key to variables.

[1]Assumes two lease sales, one in 1984 and the second in 1988. The first results in discovery of 2.16 BBO and 6.12 TCFG, while the second results in no commercial discoveries. Environmental conditions are assumed to be similar to the St. George Basin. Employment estimates for the first sale are adapted from estimates used by the Alaska OCS Office for analysis of Moderate Find Scenario for the study of OCS Sale 70, St. George Basin. Estimates for the second sale include exploration employment from the Low Find Scenario used in the same study.

TABLE B-19. DIRECT EMPLOYMENT REQUIREMENTS, NAVARIN BASIN[1]

LOW CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.
1985	0.05	0.	0.023	0.	0.073
1986	0.064	0.	0.037	0.	0.101
1987	0.072	0.	0.046	0.	0.118
1988	0.065	0.	0.039	0.	0.104
1989	0.044	0.	0.008	0.	0.052
1990	0.	0.	0.	0.	0.
1991	0.	0.	0.	0.	0.
1992	0.	0.	0.	0.	0.
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

See Table B-1 for key to variables.

[1]Assumes a single lease sale held in 1984, followed by exploration but no commercial discoveries. Exploration employment estimates based on scenario developed by Alaska OCS Office for OCS Sale 70 in the St. George Basin.

I. Chukchi Sea

In the high scenario, it is assumed that 5.7 billion barrels of oil and 14.25 trillion cubic feet of gas are discovered, divided equally between acreage leased in 1985, 1988, and 1990. Employment peaks at nearly 4,300 in 1997, falling to about 3,400 by the year 2000, as shown in Table B-20.

In the moderate scenario, 2.1 billion barrels of oil and 4.85 trillion cubic feet of gas are discovered. Of this, 1.3 billion barrels of oil and 3.25 trillion cubic feet of gas are discovered on acreage leased in the scheduled 1985 sale, the remainder is discovered on acreage leased in a 1989 sale. Employment peaks at over 2,200 in 1997, falling to less than 2,000 by the end of the forecast period, as shown in Table B-21.

In the low case, the 1985 sale is followed by an unsuccessful exploration program. Exploration employment peaks at nearly 400 by 1988, but all tracts are abandoned by 1993, as shown in Table B-22.

TABLE B-20. DIRECT EMPLOYMENT REQUIREMENTS, CHUKCHI SEA[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.
1985	0.066	0.	0.	0.	0.066
1986	0.119	0.06	0.	0.	0.179
1987	0.103	0.018	0.	0.	0.121
1988	0.11	0.086	0.	0.	0.196
1989	0.163	0.146	0.	0.	0.309
1990	0.213	0.117	0.	0.	0.33
1991	0.19	0.386	0.	0.	0.576
1992	0.338	1.772	0.	0.	2.11
1993	0.388	1.607	0.	0.	1.995
1994	1.286	0.331	0.	0.	1.617
1995	1.45	1.772	0.	0.	3.222
1996	1.542	1.667	0.	0.	3.209
1997	2.621	1.678	0.	0.	4.299
1998	2.61	1.432	0.	0.	4.042
1999	3.485	0.015	0.	0.	3.5
2000	3.38	0.015	0.	0.	3.395

See Table B-1 for key to variables.

[1]Assumes three lease sales--in 1985, 1988, and 1990--resulting in total discoveries of 5.7 BBO and 14.25 TCFG. Environmental factors assumed similar to the Beaufort Sea. Each sale results in equal discoveries of 1.9 BBO and 4.75 TCFG. Employment associated with each sale is taken from Alaska OCS Studies Technical Report 18, Beaufort Sea Petroleum Development Scenarios: Economic and Demographic Impacts, High Find Scenario, Table 3.2, p. 80.

TABLE B-21. DIRECT EMPLOYMENT REQUIREMENTS, CHUKCHI SEA[1]

MODERATE CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.
1985	0.	0.	0.	0.	0.
1986	0.	0.	0.	0.	0.
1987	0.	0.	0.	0.	0.
1988	0.084	0.012	0.	0.	0.096
1989	0.101	0.052	0.	0.	0.153
1990	0.185	0.03	0.	0.	0.215
1991	0.179	0.122	0.	0.	0.301
1992	0.163	0.242	0.	0.	0.405
1993	0.104	0.735	0.	0.	0.839
1994	0.165	1.286	0.	0.	1.451
1995	0.341	0.821	0.	0.	1.162
1996	0.792	0.828	0.	0.	1.62
1997	1.082	1.158	0.	0.	2.24
1998	1.41	0.675	0.	0.	2.085
1999	1.74	0.264	0.	0.	2.004
2000	1.74	0.166	0.	0.	1.906

See Table B-1 for key to variables.

[1]Assumes two lease sales, in 1985 and 1989, resulting in discovery of 2.1 BBO and 4.85 TCFG. Of this, 1.3 BBO and 3.25 TCFG are discovered on acreage leased in 1985. Environmental conditions are assumed similar to the Beaufort Sea, and employment estimates for the 1985 sale are taken from Alaska OCS Studies Technical Report 18, Beaufort Sea Petroleum Development Scenarios, Economic and Demographic Impacts, Moderate Find Scenario, Table 3.8, p. 89. The 1989 sale results in discovery of an additional 0.8 BBO and 1.6 TCFG. Employment estimates adapted from Low Find Scenario in Alaska OCS Studies Technical Report 18, Table 3.6, p. 86.

TABLE B-22. DIRECT EMPLOYMENT REQUIREMENTS, CHUKCHI SEA[1]

LOW CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.
1985	0.	0.	0.	0.	0.
1986	0.	0.	0.	0.	0.
1987	0.066	0.062	0.	0.	0.128
1988	0.197	0.188	0.	0.	0.385
1989	0.197	0.135	0.	0.	0.332
1990	0.23	0.25	0.	0.	0.48
1991	0.066	0.15	0.	0.	0.216
1992	0.033	0.15	0.	0.	0.183
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

See Table B-1 for key to variables.

[1] Assumes a single lease sale in 1985, followed by exploration with no commercial discoveries. Environmental conditions likely to be similar to those in the Beaufort Sea. Employment estimates adapted from exploration phase employment in Beaufort Sea Draft EIS, Table III.C.2-3.

J. Hope Basin

In the high case, it is assumed that 0.5 billion barrels of oil and 0.37 trillion cubic feet of gas are discovered on acreage leased in the proposed 1985 sale. Employment peaks at nearly 460 in 1996 before falling to about 400 in the year 2000, as shown in Table B-23.

In the moderate case, exploration following the proposed 1985 sale results in no commercial discoveries. Exploration employment reaches over 90 persons in 1987 (see Table B-24), but tracts are abandoned by 1989.

In the low case, no sale occurs in the Hope Basin.

TABLE B-23. DIRECT EMPLOYMENT REQUIREMENTS, HOPE BASIN[1]

HIGH CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.
1985	0.	0.	0.	0.	0.
1986	0.	0.037	0.	0.	0.037
1987	0.032	0.	0.007	0.	0.039
1988	0.035	0.	0.011	0.	0.046
1989	0.035	0.	0.011	0.	0.046
1990	0.017	0.	0.011	0.	0.028
1991	0.	0.	0.006	0.	0.006
1992	0.	0.064	0.	0.	0.064
1993	0.349	0.064	0.	0.	0.413
1994	0.354	0.	0.058	0.	0.412
1995	0.33	0.	0.116	0.	0.446
1996	0.295	0.	0.162	0.	0.457
1997	0.231	0.	0.162	0.	0.393
1998	0.239	0.	0.162	0.	0.401
1999	0.239	0.	0.162	0.	0.401
2000	0.236	0.	0.162	0.	0.398

See Table B-1 for key to variables.

[1] Assumes discovery of 0.5 BBO and 0.37 TCFG from acreage leased in 1985. Employment estimates taken from scenario used in examining effects of Beaufort Sea Sale 71, Low Case, as estimated by the Alaska OCS Office. Environmental conditions in the Hope Basin are likely to be similar to those in the western portion of the Beaufort Sea.

TABLE B-24. DIRECT EMPLOYMENT REQUIREMENTS, HOPE BASIN[1]

MODERATE CASE

(thousands of persons)

	EMP9	ECONX	EMT9X	EMMX	TOTAL
1980	0.	0.	0.	0.	0.
1981	0.	0.	0.	0.	0.
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.
1985	0.	0.	0.	0.	0.
1986	0.026	0.	0.015	0.	0.041
1987	0.056	0.005	0.031	0.	0.092
1988	0.03	0.005	0.016	0.	0.051
1989	0.	0.	0.	0.	0.
1990	0.	0.	0.	0.	0.
1991	0.	0.	0.	0.	0.
1992	0.	0.	0.	0.	0.
1993	0.	0.	0.	0.	0.
1994	0.	0.	0.	0.	0.
1995	0.	0.	0.	0.	0.
1996	0.	0.	0.	0.	0.
1997	0.	0.	0.	0.	0.
1998	0.	0.	0.	0.	0.
1999	0.	0.	0.	0.	0.
2000	0.	0.	0.	0.	0.

See Table B-1 for key to variables.

[1]Assumes a single lease sale in 1985, resulting in no commercial discoveries of oil or gas. Exploration technology assumed similar to that used in the Norton Basin. Employment estimates adapted from "Exploration Only" Scenario in Porter, Bering-Norton Petroleum Development Scenarios: Economic and Demographic Analysis, Table 23, p. 139.

IV. Summary

The levels of resource development assumed in each of the three OCS development scenarios may be summarized as follows:

Area	Oil (BBO) Low	Oil (BBO) Moderate	Oil (BBO) High	Gas (TCFG) Low	Gas (TCFG) Moderate	Gas (TCFG) High
Gulf of Alaska	0	0	.45	0	0	1.25
Cook Inlet	0	.332	.67	0	.581	1.173
Beaufort Sea	1.0	2.1	4.0	1.75	4.85	9.6
Norton Basin	0	0	.38	0	0	1.2
St. George Basin	0	0	2.16	0	0	6.12
Kodiak	0	0	.332	0	0	.581
N. Aleutian Shelf	0	0	.332	0	0	.581
Navarin Basin	0	2.16	4.32	0	6.12	12.24
Chukchi Sea	0	2.1	5.7	0	4.85	14.25
Hope Basin	0	0	.5	0	0	.37
Total	1.0	6.692	18.844	1.75	16.401	47.365

In the high case, employment reaches nearly 15,100 persons at its peak in 1997, falling to 14,100 by the end of the forecast period, as shown in Table B-25. By the year 2000, over 77 percent of the employment is occurring in four of the ten areas: the Beaufort Sea (19 percent), the St. George Basin (11 percent), the Navarin Basin (23 percent), and the Chukchi Sea (24 percent).

In the moderate case, direct employment reaches nearly 6,000 at its peak in 1997, falling only to about 5,500 by the end of the period, as shown in Table B-26. This employment is even more concentrated, with over 92 percent of the activity by the year 2000 occurring in three areas: the

TABLE B-25. DIRECT OCS EMPLOYMENT, ALL AREAS

HIGH CASE

Year	Construction	Mining	Transportation	Manufacturing
1980	60	209	33	
1981	18	223	34	
1982	217	255	69	
1983	104	361	159	
1984	253	494	217	
1985	501	717	404	
1986	2,425	1,190	840	
1987	3,208	1,645	1,127	
1988	1,926	2,981	1,919	
1989	2,637	4,120	2,435	
1990	2,308	5,193	2,620	80
1991	2,189	5,775	2,877	80
1992	4,892	5,571	2,773	80
1993	3,752	6,117	2,923	80
1994	2,645	8,033	3,214	
1995	3,291	8,533	3,095	
1996	2,019	9,019	3,141	
1997	1,766	10,107	3,141	
1998	1,603	10,193	3,141	
1999	163	11,018	3,141	
2000	103	10,789	3,141	80

TABLE B-26. DIRECT OCS EMPLOYMENT, ALL AREAS

MODERATE CASE

Year	Construction	Mining	Transportation
1980	0	90	33
1981	0	224	99
1982	40	309	100
1983	52	458	141
1984	35	596	192
1985	193	675	488
1986	447	683	369
1987	973	642	434
1988	1,493	639	487
1989	2,038	986	603
1990	1,933	1,486	879
1991	2,153	2,409	1,104
1992	1,536	2,747	928
1993	999	2,981	897
1994	1,452	3,046	889
1995	1,017	3,255	889
1996	858	3,564	889
1997	1,324	3,767	889
1998	685	4,091	889
1999	274	4,419	889
2000	176	4,419	889

Beaufort Sea (27 percent), the Navarin Basin (30 percent), and the Chukchi Sea (35 percent).

In the low case, total direct employment peaks at nearly 1,600 in 1988, as shown in Table B-27. By 1993, all of this activity is limited to the Beaufort Sea.

TABLE B-27. DIRECT OCS EMPLOYMENT, ALL AREAS

LOW CASE

Year	Construction	Mining	Transportation
1980	0	90	33
1981	62	290	99
1982	216	422	100
1983	135	394	88
1984	250	341	50
1985	212	257	40
1986	470	369	46
1987	479	458	46
1988	833	720	39
1989	680	652	8
1990	664	687	0
1991	564	623	0
1992	611	649	
1993	527	700	
1994	264	720	
1995	191	768	
1996	84	721	
1997	132	687	
1998	132	663	
1999	59	661	
2000	18	658	0

Appendix C

DESCRIPTION OF THE HOUSEHOLD FORMATION MODEL

I. Model Description

The primary unit on which projections of residential energy consumption are based is the household. A household is a living unit of one of two types: a family or an individual or group of individuals, not related, who are living as a unit.

The population projections determine the number of households in the state. The number of households is a function of both the level of population and its age-sex distribution. The age-sex distribution of the population is important because the rate at which people form households differs across age-sex cohorts. The model described below accounts for both of these influences of population on household formation.

The household formation model is an accounting model which depends on a set of assumptions about the age-sex cohort-specific rates of household formation and changes in those rates. The model is based on the assumption that the social, economic, and life-cycle factors which determine the formation of households can be described by a set of household formation rates. Household formation rates describe the probability that a person in a particular cohort is a household head.

The model requires input from the MAP population model in the form of the projected size and age-sex distribution of the population. The total number of households in the state (HH) is equal to the number of households summed across age and sex cohorts.

(1) $$HH = \sum_{ij}\sum HH_{ij}$$

The total number of households in sex cohort i and age cohort j (HH_{ij}) describes the number of households with household head or primary individual in the ith sex and jth age cohort. This total is, in turn, composed of three components: the number of civilian non-Native households in cohort ij (CHH_{ij}), the number of Native households in cohort ij (NHH_{ij}), and the number of military households in cohort ij (MHH_{ij}).

(2) $$HH_{ij} = CHH_{ij} + NHH_{ij} + MHH_{ij}$$

The number of civilian and Native households in each cohort is a function of the population and household formation rate for the cohort. The number of households in any cohort equals the cohort-specific household formation rate (HHR_{ij} for civilian non-Natives and $NHHR_{ij}$ for Natives) multiplied by the cohort population ($CNNP_{ij}$ for civilian non-Natives and $NATP_{ij}$ for Natives) net of the proportion of the population in group quarters ($CPGQ_{ij}$ for civilian non-Natives and $NPGQ_{ij}$ for Natives).

(3) $$CHH_{ij} = (CNNP_{ij} * (1 - CPGQ_{ij}) * HHR_{ij}$$

(4) $$NHH_{ij} = (NATP_{ij} * (1 - NPGQ_{ij}) * NHHR_{ij}$$

The cohort distribution of military households is assumed to remain constant throughout the projection period. The number of military households (MHH_{ij}) equals the number in 1970 (MHH_{ij}^{1970}) times the percentage of 1970 military population in the state (MILPCT).

(5) $$MHH_{ij} = MHH_{ij}^{1970} * MILPCT$$

The household formation rates have changed historically and are expected to continue to vary. The household formation rates are assumed to change at a constant yearly rate ($CHHR_{ij}$ for civilian non-Natives and $NCHHR_{ij}$ for Natives). Thus, the household formation rate in any year equals the rate in the previous year times the rate of change.

(6) $$HHR_{ij} = HHR_{ij}\ (-1) * CHHR_{ij}$$

(7) $$NHHR_{ij} = NHHR_{ij}\ (-1) * NCHHR_{ij}$$

The model also calculates Native and civilian non-Native and total population in group quarters, as well as average household size for Natives, civilian non-Natives, military population, and total population.

(8) $$NPGQ = = \sum_{ij}\sum (NPGQ_{ij} * NATP_{ij})$$

(9) $$CPGQ = = \sum_{ij}\sum (CNNP_{ij} * CPGQ_{ij})$$

(10) $POPGQ = = NPGQ + CPGQ + MILPCT * MPGQ$

(11) $HHSIZEN = = (NATTOT - NPGQ) / \sum_{i}\sum_{j} NHH_{ij}$

(12) $HHSIZEC = = (CNNTOT - CPGQ) / \sum_{i}\sum_{j} CHH_{ij}$

(13) $HHSIZEM = = (MILPCT * [AFTOT + MDTOT - MPGQ]) / \sum_{i}\sum_{j} MHH_{ij}$

(14) $HHSIZE = = (POP - POPGQ) / HH$

II. Model Parameter Assumptions

The model was initially calibrated using the 1970 Census as a benchmark. The civilian non-Native and Native household formation rates were calculated from the statewide census data after netting out population in group quarters. These parameter values are shown in Table C.1.

The civilian non-Native and Native population proportions in group quarters, also derived from the census, are assumed to remain a constant proportion of each cohort over the projection period. These are shown in Table C.2.

Military households are taken directly from the 1970 Census and are shown in Table C.3. The age-sex distribution of military households is assumed to remain constant over time and to increase or decrease proportionately as total military population changes. The proportion in group quarters also remains the same constant proportion of total military as it was in 1970.

The parameters determining the rates of change of household formation rates are discussed in the next section.

The appearance of the 1980 Census provided an opportunity to recalibrate the model. At the time of this writing, this has not been possible because only the population count is available. On the assumption that

TABLE C.1. 1970 ALASKA CIVILIAN POPULATION HOUSEHOLD FORMATION RATES (HHR_{ij})

	NON-NATIVE		NATIVE	
	Male	Female	Male	Female
0 - 1	0	0	0	0
1 - 5	0	0	0	0
5 - 9	0	0	0	0
10 - 14	.001	.001	.003	0
15 - 19	.040	.018	.017	.006
20 - 24	.583	.107	.238	.069
25 - 29	.900	.109	.576	.082
30 - 34	.933	.117	.746	.095
35 - 39	.955	.126	.881	.119
40 - 44	.962	.133	.894	.120
45 - 49	.963	.148	.907	.139
50 - 54	.964	.164	.922	.149
55 - 59	.956	.207	.947	.296
60 - 64	.956	.245	.926	.313
65 +	.885	.320	.816	.385
Average	.537	.079	.326	.064
	.197		.315	
Statewide Average	.288			
Item: U.S. Average	.322			

SOURCE: Bureau of the Census, 1970 Census of Population Detailed Characteristics: Alaska, 1972, Table 153.

TABLE C.2. ALASKA CIVILIAN POPULATION IN GROUP QUARTERS, 1970

Age	Non-Native				Native			
	Male		Female		Male		Female	
	Number	Percent[a]	Number	Percent	Number	Percent	Number	Percent
Less than 1	0	0	0	0	0	0	0	0
1-4	98	.0082	52	.0045	58	.0171	37	.0110
5-9	73	.0058	45	.0037	101	.0253	105	.0273
10-14	73	.0064	45	.0041	101	.0257	105	.0283
15-19	325	.0291	244	.0026	157	.0419	99	.0275
20-24	655	.0488	214	.0182	329	.1013	69	.0211
25-29	290	.0159	39	.0026	130	.0503	8	.0030
30-34	174	.0111	20	.0014	67	.0333	24	.0114
35-39	210	.0186	7	.0007	68	.0413	53	.0318
40-44	218	.0247	19	.0023	69	.0492	19	.0137
45-49	194	.0262	40	.0059	62	.0513	15	.0129
50-54	115	.0177	19	.0033	36	.0353	16	.0229
55-59	84	.0150	10	.0020	34	.0400	21	.0258
60-64	93	.0211	22	.0026	28	.0412	19	.0279
65 +	184	.0278	123	.0196	31	.0177	42	.0269
Total	2,786	-	899	-	1,271	-	632	-

[a]Equals percent of total population in corresponding age group.

Item: Total 1970 military population in barracks was 16,711, of which 16,257 were male and 454 were female.

SOURCE: U.S. Department of Commerce, Bureau of the Census, "Census of the Population, 1970, Detailed Characteristics, Alaska," Series PC(1) - 03, June 1972.

TABLE C.3. MILITARY HOUSEHOLDS IN 1970

Age of Head	Male	Female
0 - 14	0	0
15 - 19	202	8
20 - 24	4,132	48
25 - 29	3,059	29
30 - 34	2,430	33
35 - 39	2,558	31
40 - 44	1,090	17
45 - 49	408	5
50 - 54	237	6
55 - 59	36	2
60 - 64	5	3
65 +	13	0
Total	14,170	182

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

the percent change in the average household size has been the same in Alaska as in the United States, however, a 1980 estimate of aggregate average household size for Alaska of approximately 3.06 can be calculated.[1]

This downward adjustment of average household size for 1980 can be converted into an aggregate household formation rate for the population and the individual household formation rates adjusted upward proportionately to provide a calibration based upon an estimate of 1980 average household size. The household formation rates after this adjustment are shown in Table C.4. These values result in an estimate of 1980 households which does not differ greatly from that obtained using the 1970 values adjusted by the assumed 1970-to-1980 growth rates in the original model. The adjusted household formation rates differ very little from those used previously. Thus, most of the change in the aggregate household formation rate in Alaska between 1970 and 1980 is attributed to a shift in the age-sex-race composition of the population toward groups with relatively higher individual household formation rates.

[1](2.78/3.14) * 3.50 = 3.10 for 1979 and by extrapolation 3.06 for 1980. See Tables C.5 and C.8 of text. Since average household size is the reciprocal of household formation rate, the 1980 average household formation rate is 1/3.06 = .327.

TABLE C.4. ESTIMATED 1980 ALASKA CIVILIAN POPULATION HOUSEHOLD FORMATION RATES (HHR_{ij})[a]

	Non-Native		Native	
	Male	Female	Male	Female
0 - 14	.001	.009	.003	0
15 - 19	.040	.026	.017	.018
20 - 24	.583	.117	.238	.081
25 - 29	.900	.121	.576	.092
30 - 34	.933	.129	.746	.103
35 - 39	.955	.135	.881	.126
40 - 44	.962	.140	.894	.126
45 - 49	.963	.154	.907	.144
50 - 54	.964	.169	.922	.153
55 - 59	.956	.213	.947	.302
60 - 64	.956	.250	.926	.318
65 +	.855	.328	.816	.393
Average	.586	.105	.351	.081
	.354		.216	
		.327		

[a]For calibration purposes, the upward adjustment of household formation rates was applied to female Native and non-Native households only. The household formation rates for Native and non-Native males are identical to those obtained from the 1970 Census. The male household formation rates were not recalibrated because their 1970 levels were relatively high and because national and statewide data suggest that during the 1970s, a large portion of the upward shift in the overall rate of household formation occurred in households with female heads.

III. Projecting Alaskan Households in the Future

III.A. National Trends

The relationship between population and the number of households does not remain constant over time. Table C.5 shows historical trends in the size and composition of households in the United States since 1940. Average household size has declined steadily since World War II, primarily as a result of the increase in the proportion of "primary individual" households. The average size of families actually increased after the war until the mid-1960s because of the "baby boom," but this was more than compensated for by the fact that the average household size of "primary individual" households has fallen dramatically from 1.94 to 1.19 in 1979.

Somewhat more detail on recent historical trends is provided by Table C.6 which focuses on the composition of households in the last ten years. Total households increased by 22 percent over that period in contrast to an increase in population of 7.6 percent. Family households increased by 11.7 percent while nonfamily households grew 66 percent.

Part of the decline in average household size for families can be attributed to the relative growth of one-parent households and families with no children less than 18 years of age. All categories of nonfamily households grew rapidly, but those with more than one member grew most rapidly at 140 percent. This category includes both couples living together and groups of unrelated individuals sharing households.

TABLE C.5. HISTORICAL ANALYSIS OF HOUSEHOLDS IN THE UNITED STATES

			Primary Families			Primary Individuals		
	Households	Average Household Size	Number	Average Family Size	Percent of Households	Number	Average Family Size	Percent of Households
1940		3.67		3.76				
50	43,554	3.37	38,838	3.54	89.2	4,716	1.94	10.8
55	47,874	3.33	41,732	3.59	87.2	6,142	1.61	12.8
60	52,799	3.33	44,905	3.67	85.0	7,895	1.40	15.0
65	57,436	3.29	47,838	3.70	83.3	9,598	1.28	16.7
70	63,401	3.14	51,456	3.58	81.2	11,945	1.25	18.8
75	71,120	2.94	55,563	3.42	78.1	15,557	1.23	21.9
79	77,330	2.78	57,498	3.34	74.4	19,831	1.19	25.6

Note: "Households," Primary Families "Number," and Primary Individuals "Number" are in thousands.

SOURCES: U.S. Department of Commerce, Bureau of the Census, Statistical Abstract, 1979.

U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Population Estimates and Projections, Series P-25, No. 805, May 1979.

U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Household and Family Characteristics: March 1979, Series P-20, No. 352, July 1980.

TABLE C.6. U.S. HOUSEHOLD COMPOSITION IN THE MOST RECENT DECADE

	1979		1970		
	Millions	Percent	Millions	Percent	Percent Growth 1970 to 1979
Total	77.33	100	63.401	100	22.0
Family Households	57.498	74.4	51.456	81.2	11.7
Married Couple	47.662	61.6	44.728	70.5	6.6
No children < 18	23.157	29.9	19.196	30.3	20.6
Children < 18	24.505	31.7	25.532	40.3	- 4.0
One-Parent Household	5.631	7.3	3.199	5.0	76.0
Lone Mother with Children	5.075	6.6	2.858	4.5	77.6
Lone Father with Children	.556	0.7	.341	0.5	63.0
Other Family Households	4.205	5.4	3.529	5.6	19.2
Nonfamily Households	19.831	25.6	11.945	18.8	66.0
Persons Living Alone	17.201	22.2	10.851	17.1	58.5
Men	6.464	8.4	3.532	5.6	83.0
Women	10.738	13.9	7.319	11.5	46.7
Other Nonfamily Households	2.630	3.4	1.094	1.7	140.4

SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Household and Family Characteristics: March 1979, Series P-20, No. 352, July 1980.

The dominant factors which underlie these trends are the increased life expectancy of people, which has increased the proportion of older-couple family households, and more importantly the aging of the post-war baby boom population which is now entering the primary household formation years both in and out of families.

These trends can be projected forward nationally to predict the number of households in the future under different sets of assumptions of population (I, II, III) and household formation rates (A, B, C, D). Table C.7 shows the most recent Department of Commerce projections using a detailed model which tracks present households into the future.

These projections all assume a continued reduction of average household size during the next fifteen years. A control projection, K, is presented to show the impact of declining household formation rates. The K projection assumes no change in household formation rates so that the increase in the number of households is entirely attributable to an increase in population.

For high rates of population growth (primarily due to natural increase), the average household size in 1995 would vary between 2.46 and 2.72. For low rates of population increase (fewer births and more deaths), average household size is projected to decline to between 2.21 and 2.44. Conversion of these trends in household size into annual rates of change yields a range of from -01.5 percent annually for the high population growth case to -.1 percent for the low population growth case.

TABLE C.7. PROJECTIONS OF HOUSEHOLDS AND HOUSEHOLD COMPOSITION IN 1995

Dept. of Commerce Projection Series[a]		Households	Average Household Size	Family Households	Percent	Nonfamily Households	Percent
		77,330	2.78	57,498	74.4	19,831	25.6
A	I	107,528	2.46	72,709	67.6	34,819	32.4
	II		2.31				
	III		2.21				
B	I	103,856	2.55	72,234	69.4	31,622	30.6
	II		2.39				
	III		2.28				
C	I	104,194	2.54	70,715	67.8	33,479	32.2
	II		2.38				
	III		2.28				
D	I	97,180	2.72	71,590	73.5	25,590	26.5
	II		2.55				
	III		2.44				
K		94,192		71,424	75.8	22,768	

[a]For definition of terms, see text.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Projection of the Number of Households and Families, 1979 to 1995, Series P-25, No. 805, May 1979.

III.B. Alaskan Trends

Turning to Alaska, the data is not so complete, but some trends can be identified. Table C.8 shows the growth in the number of households since 1950 and their composition. Several similarities and contrasts with the national trends are in evidence. Unfortunately, the 1976 data is based on a sample taken in an unrepresentative year. Briefly, they are as follows:

Similarities

- Average household size has fallen since 1970.
- Average family size has fallen.
- The importance of female family heads has increased dramatically.

Contrasts

- The proportion of family households has not declined. (The statistics for 1976 are from an unusual year and may not signify a trend.)
- The average household size for nonfamily households has not declined. (The statistics for 1976 are from an unusual year and may not signify a trend.)
- In 1950 the average household size was below the national average, but since 1960 it has exceeded the national average by a substantial amount.

Table C.9 further indicates that the post-war "baby boom" was felt in Alaska. The ratio of children to mothers grew from 1950 to 1960 and subsequently has fallen.

Average household size estimates from surveys conducted in Anchorage and Fairbanks in the mid-1970s confirm the declining trend in average household size. Estimates of 3.27 to 3.32 for Anchorage for 1975 and

TABLE C.8. ALASKA HISTORICAL HOUSEHOLD STATISTICS

	All Households[a]			Primary Family Households[a]						Primary Individual Households[a]				
	Households	Persons in HH	Average HH Size* (2) / (1)	Households (%)	Husband/ Wife	Male Head	Female Head	All Persons	Average HH Size* (9) / (5)	Households (%)	Male Head	Female Head	All Persons	Average HH Size* (15)/(12)
1950[b]	31,047	100,779	3.25	NA	21,788	NA	NA	NA	NA	NA	NA	NA	NA	NA
1960[b]	57,250	199,982	3.49	46,261 (80.8)	42,750	NA	NA	184,385	3.99	10,989 (19.2)	NA	NA	15,597	1.42
1960[c]	57,250	200,418	3.50	46,613 (81.4)	43,172	1,235	2,706	185,655	3.98	10,637 (18.6)	7,804	2,833	14,763	1.39
1970[d]	79,054	278,039	3.52	66,034 (83.5)	61,697		4,067	258,469	3.91	13,025 (16.5)	8,674	4,351	19,570	1.5
1970[c]	74,739	278,145	3.49	66,670 (83.6)	60,380	2,233	4,057	258,640	3.88	13,069 (16.4)	8,654	4,415	19,505	1.49
1976[e]	104,000	339,000	3.26	82,000 (78.8)	70,000	2,000	8,000	298,000	3.71	22,000 (21.2)	14,000	9,000	41,000	--
1977[f]	118,000													
1978[g]	119,000				79,000									

*Person per household

See following page for table notes.

Notes: Table C.8.

a. By definition, Primary Families (PF) and Primary Individuals (PI) sum to total households.

b. U. S. Census of Population, 1960, General Population Characteristics PC(1) 3B, Table 19, p. 3-26, May 1961.

c. U.S. Census of Population, Detailed Characteristics PC(1) D3, Alaska, Table 153, p. 3-246, June 1972.

d. U. S. Census of Population, General Characteristics PC(1) B3, Table 22, p. 3-43, September 1971.

e. Current Population Reports, Population Characteristics, Series P-20, No. 334, January 1979, Table 4, p. 24.

f. U. S. Department of Commerce, Current Population Reports, Population Estimates and Projections, P-25, No. 725.

g. U. S. Department of Commerce, Statistical Abstract, Table 65, p. 48, 1980.

TABLE C.9. HISTORICAL COMPOSITION OF ALASKAN FAMILIES

	1950	1960	1970	1976
Household Heads	--	46,261	66,670	82,000
Wife of Head	21,788	42,750	60,084	70,000
Own Child < 18	34,095*	82,256	112,821	122,000
Other Relative	9,303	13,118	19,065	24,000

*Own child < 20

SOURCE: 1950, 1960, 1970 from U.S. Census.

1976 from U.S. Department of Commerce, Bureau of the Census, Demographic, Social, and Economic Profile of the States: Spring 1976, Series P-20, No. 334, January 1979.

3.18 for 1977 have been published by the Anchorage Urban Observatory. An estimate of 2.9 for 1976 for Fairbanks has been published by ISER.

Further comparison of Alaska with other states reveals that in 1976 the average household size in Alaska of 3.26 was third highest in the nation after Hawaii (3.45) and Utah (3.27). Fourteen states had average household sizes in excess of 3.00. Those states with the smallest size were Washington, D.C. (2.55) and Florida (2.69).[2]

Finally, it is possible to compare the age-sex-specific household formation rates in Alaska with those in the United States as a whole. Table C.10 compares the civilian household formation rates in Alaska with those of the United States as a whole by age, sex, and race. As expected, the average household formation rate for Alaskan Natives is considerably less than that of the population as a whole. The average household formation rate for civilian non-Native males exceeded the national average while that for females was less than the national average.

Converting these to average household size yields Table C.11, which shows that in 1970 the average household size for civilian non-Native Alaskans was marginally above the U.S. average and that the large average household size for Natives brought the statewide average up to its high level.

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[2] U.S. Department of Commerce, BoC Demographic, Social and Economic Profile of the States: Spring 1976 Series P-20, No. 334, January 1979, p. 24.

TABLE C.10. COMPARISON OF 1970 ALASKA AND U.S. HOUSEHOLD FORMATION RATES

	Alaska		United States
	Natives	Civilian/Non-Natives	Total
Male			
< 5	0	0	0
5 - 9	0	0	0
10 - 14	.003	.001	.002
15 - 19	.017	.040	.038
20 - 24	.238	.583	.520
25 - 29	.576	.900	.828
30 - 34	.746	.933	.904
35 - 39	.881	.955	.926
40 - 44	.827	.962	.935
45 - 49	.879	.960	.944
50 - 54	.922	.964	.948
55 - 59	.947	.956	.951
60 - 64	.926	.956	.948
65 +	.816	.885	.908
Average	.326	.537	.527
Female			
< 5	0	0	0
5 - 9	0	0	0
10 - 14	0	.001	.001
15 - 19	.006	.018	.014
20 - 24	.069	.107	.098
25 - 29	.056	.109	.114
30 - 34	.095	.097	.118
35 - 39	.119	.093	.124
40 - 44	.120	.133	.136
45 - 49	.139	.148	.152
50 - 54	.149	.164	.184
55 - 59	.296	.207	.233
60 - 64	.313	.245	.302
65 +	.386	.320	.452
Average	.064	.079	.131

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

TABLE C.11. 1970 AVERAGE HOUSEHOLD SIZE

Alaska	
Native	5.08
Civilian Non-Native	3.18
Total Civilian	3.47
U.S. Average	3.14

SOURCE: Calculated from United States Department of Commerce, Bureau of the Census, 1970 Census of Population.

III.C. Projections

Although there are some apparent differences between the patterns of household formation in the United States overall and for civilian non-Native Alaskans in the aggregate, the rates are quite similar. There was, in 1970, a smaller proportion of nonfamily households in Alaska, but average household size exceeded the national average. The probability of being a household head was less for a civilian non-Native Alaska female than in the United States, but in contrast, somewhat higher for males. Alaska should differ from future national trends due to a smaller-than-average population of retired people, which should reduce the rate of household formation, and a growth in population because of in-migration (rather than births), which should increase the rate of household formation. (This does not necessarily imply, however, a reduction in average household size.)

We project that the differences in the levels of household formation rates in the United States and Alaska will remain but that both will trend upward. Consequently, the annual rates of change of the household formation rates for civilian non-Natives have been calculated to be consistent with the most recent projections compiled by the Bureau of the Census in Projection of the Number of Households and Families 1979 to 1995, published in 1979. The B series was chosen as the middle case.

Trends in the Native household formation rates are more difficult to project because of the rapid social and economic changes occurring in the Native community. We assume that urbanization of the Native community will continue and, with it, a trend in household formation rates similar to that in the nation as a whole. Thus, the same rate of change in household formation rates is applied to the Native population. The rates of change are shown in Table C.12.

TABLE C.12. YEARLY PERCENT CHANGE IN HOUSEHOLD FORMATION RATE ($CHHR_{ij}$)

	NON-NATIVE		NATIVE	
	Male	Female[a]	Male	Female[a]
0 - 1	0	0	0	0
1 - 5	0	0	0	0
5 - 9	0	0	0	0
10 - 14	1.002	1.045	1.002	1.045
15 - 19	1.002	1.045	1.002	1.045
20 - 24	1.002	1.045	1.002	1.045
25 - 29	1.000	1.055	1.000	1.055
30 - 34	1.001	1.050	1.001	1.050
35 - 39	1.000	1.037	1.000	1.037
40 - 44	1.000	1.037	1.000	1.037
45 - 49	1.001	1.022	1.001	1.022
50 - 54	1.001	1.022	1.001	1.022
55 - 59	1.001	1.000	1.001	1.000
60 - 64	1.001	1.000	1.001	1.000
65 +	1.001	1.000	1.001	1.000

[a] We have increased the estimates for females in age groups 25-29 through 50-54 by one percentage point from the previous analysis in Electric Power Requirements for the Railbelt to reflect the more rapid growth in female household formation in Alaska.

SOURCE: Bureau of the Census, Current Population Reports Series P-25, No. 805, Projections of the Number of Households and Families, 1979 to 1995, May 1979.

IV. Regionalization Procedure

The regionalization model produces a projection of total regional population since lack of data precludes generating an age-sex population distribution by region. The regional projection of households is based upon the regional share of population. It is adjusted, however, by the ratio of household size statewide to household size in the region of interest.

This ratio is derived from the data on average household sizes shown in Table C.13 and taken from the 1970 Census. For example, in 1970 average household sizes for railbelt and nonrailbelt divisions of the state were 3.39 and 3.80, respectively, while the statewide average was 3.50. Thus, the estimate of railbelt households is determined by the following equation:

$$\text{HH (railbelt)} = \text{HH (state)} * \frac{\text{POP (railbelt)}}{\text{POP (state)}} * \left[\frac{3.50}{3.39} \right]$$

TABLE C.13. ALASKA REGIONAL HOUSEHOLD SIZE DATA FOR 1970

Census Division	Population					Households					Average Household Size
	Total	In-Group Quarters		In Households		Total	Family		Non-Family		
		Number	Percent	Number	Percent		Number	Percent	Number	Percent	
Aleutian Islands	8,057	3,339	41	4,718	59	1,225	1,099	90	126	10	3.85
Anchorage	124,542	5,897	5	118,645	95	34,988	29,688	85	5,300	15	3.39
Angoon	503	8	2	495	98	134	89	66	45	34	3.69
Barrow	2,663	95	4	2,568	96	463	418	90	45	10	5.55
Bethel	7,579	108	1	7,471	99	1,435	1,258	88	177	12	5.21
Bristol Bay Br.	1,147	411	36	736	64	192	153	80	39	20	3.83
Bristol Bay Div.	3,485	50	1	3,435	99	724	616	85	108	15	4.74
Cordova-McCarthy	1,857	83	4	1,774	96	591	421	71	170	29	3.00
Fairbanks	45,864	6,761	15	39,103	85	11,590	9,877	85	1,713	15	3.37
Haines	1,504	35	2	1,469	98	424	366	86	58	14	3.46
Juneau	13,556	212	2	13,344	98	4,223	3,261	77	962	23	3.16
Kenai-Cook Inlet	14,250	396	3	13,854	97	3,889	3,298	85	591	15	3.56
Ketchikan	10,041	239	2	9,802	98	3,006	2,405	80	601	20	3.26
Kobuk	4,434	172	4	4,262	96	814	718	88	96	12	5.24
Kodiak	9,409	978	10	8,431	90	2,384	2,019	85	365	15	3.54
Kuskokwim	2,306	255	11	2,051	89	463	362	78	101	22	4.43
Matanuska-Susitna	6,509	255	4	6,254	96	1,841	1,469	80	372	20	3.40
Nome	5,749	215	4	5,534	96	1,209	999	83	210	17	4.58
Outer Ketchikan	1,676	53	3	1,623	97	391	339	87	52	13	4.15
Prince of Wales	2,106	159	8	1,947	92	560	423	76	137	24	3.48

TABLE C.13. ALASKA REGIONAL HOUSEHOLD SIZE DATA FOR 1970 (continued)

Census Division	Population					Households					Average Household Size
	Total	In-Group Quarters		In Households		Total	Family		Non-Family		
		Number	Percent	Number	Percent		Number	Percent	Number	Percent	
Seward	2,336	141	6	2,195	94	722	563	78	159	22	3.04
Sitka	6,109	266	4	5,843	96	1,767	1,349	76	418	24	3.31
Skagway-Yakutat	2,157	33	2	2,124	98	607	481	79	126	21	3.50
S.E. Fairbanks	4,179	621	15	3,558	85	1,027	908	88	119	12	3.46
Upper Yukon	1,684	384	23	1,300	77	338	244	72	94	28	3.85
Valdez-Chitina-Whittier	3,098	172	6	2,926	94	921	684	74	237	26	3.18
Wade Hampton	3,917	255	7	3,662	93	643	570	89	73	11	5.70
Wrangell-Petersburg	4,913	42	1	4,871	99	1,473	1,168	79	305	21	3.31
Yukon-Koyukuk	4,752	708	15	4,044	85	1,015	789	78	226	22	3.98

SOURCE: U.S. Department of Commerce, Bureau of the Census, 1970 Population PC(1)-B3.

V. Sensitivity Analysis

The most important set of parameters within the household model is the vector of rates of change of the household formation rates. For a given population distribution by age and sex, the household formation rates at any point in time determine the number of households. Thus, in the simplest sense, the number of households is very sensitive to how these rates of change vary, and a different vector of rates of change which increases the household formation rates by 10 percent would obviously increase the number of households by 10 percent also.

The historical trend and national projections all indicate that a continued reduction in average household size is the most reasonable assumption to adopt for the future. The question then becomes what are the practical limits of the range of household size. On the one hand, if the Native and non-Native proportion of the population remained unchanged, the average household size might not fall appreciably. At the other extreme, the average household size could not logically be expected to be less than the size required for there to be at least one employed person per household. In other words, the number of households must always be less than employment.

In reality, the number of households will likely always remain considerably below the level of employment if we assume that marriage is a viable institution, that the trend toward two working spouses in a family is not reversed, and that families continue to have children.

A hypothetical smallest average household size in 2005 might be as shown in Table C.14 if it is further assumed that Alaskan Native household formation rates were to become equivalent to civilian non-Natives. Table C.14 is not a projection, but rather a display of the implications, in terms of types of households, of a very low average household size. It also displays the implication of various average work force participants per household.

On the basis of Table C.14, reasonableness suggests that a lower bound on average household size would be no less than 2.25 and that for a given level of employment, the number of households could be no greater than 1/1.25 times employment.

Table C.15 shows the result of applying these upper and lower bounds to the projections done for the 1979 railbelt study.[3] There are two principal conclusions that can be drawn from Table C.15.

1. The possible variation in the number of households for a given population is considerable for a twenty-year projection. For the moderate case, the range of households in 2000 within the arbitrarily defined upper and lower bounds is from 228.9 thousand to 311.2 thousand. Assuming 137.8 thousand households in 1980, this implies an increase in the number of households of from 91.1 to 173.4 thousand or an annual growth rate between 2.6 and 4.2 percent.

2. The projected values are well within the range bracketed by the smallest possible household size and the continuation of the current household size.

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[3]Results using the revised model are not significantly different.

TABLE C.14. COMPOSITION OF THE SMALLEST FEASIBLE AVERAGE ALASKAN HOUSEHOLD SIZE IN 2005

Household Type	Proportion of Total (%)	Minimum Likely Average Household Size	Average Employees Per Household
Family	60	2.758	1.5
Married Couples	40	3	1.75
with children	20	4	1.75
no children	20	2	1.75
One-Parent & Other	20	2.275	1
mother & children	9	2.5	1
father & children	2	2.5	1
other families	9	2	1
Non-Family	40	1.25	1.25
persons alone	30	1	1
other	10	2	2
Total	100	2.155	1.4

TABLE C.15. IMPLICATIONS FOR NUMBER OF HOUSEHOLDS IN 2000 OF APPLYING LOWER AND UPPER REASONABLE BOUNDS

	Population	Employment	Households	Additional Households 1980-2000	Annual Growth Rate in Households
LOW PROJECTION	635.6	332.3			
Upper Bound 1			282.5	144.7	3.7
Upper Bound 2			265.8	128	3.3
Projected Value			234.7	96.9	2.7
Lower Bound			207.8	70	2.1
MODERATE PROJECTION	700.1	371.5			
Upper Bound 1			311.2	173.4	4.2
Upper Bound 2			297.2	159.4	3.9
Projected Value			260.5	122.7	3.2
Lower Bound			228.9	91.1	2.6
HIGH PROJECTION	831.0	454.6			
Upper Bound 1			369.3	231.5	5.1
Upper Bound 2			363.7	225.9	5.0
Projected Value			312.5	174.7	4.2
Lower Bound			271.7	133.9	3.5

Upper Bound 1 - based on household formation rate of 1/2.25

Upper Bound 2 - based on household-to-employment ratio of 1/1.25

Lower Bound - based on household formation rate in 1980 of 1/3.06 = .327

VI. Potential Further Development of the Household Formation Model

An ideal model for projecting households would involve the use of large amounts of microdata which is not available on a statewide or regional basis in Alaska. If it were available, a Markow model would be the appropriate form for the model.

The known number of households at the beginning of the projection period would be divided by important characteristics into separate categories. These characteristics would include both the type of household (family, nonfamily), composition of household (number of adults, number of children, etc.), social characteristics of head (age, sex), and economic characteristics of household (income, employment).

The probability of a household's changing size in any category or dissolving will differ for each category because of these different characteristics. Some of these changes will result in additions to the number of households. The Markow model would trace these changes over time, and total population would be the number of households multiplied by average household size in each category.

The probabilities of various events for a household which would change its size or affect its existence would be related to economic variables such as income and employment as well as to social trends. Migration will change the number of households in the different categories.

It is easy to see that such a model, although elegant and internally consistent, is not, in most cases, practical to implement on a regional basis.[4]

A second-best solution to the problem of incorporating economic variables in the determination of household formation rates would be to make the household formation rates for each age-sex-race cohort variables in the model rather than parameters. The household formation rates would be a function of a set of income and employment variables generated by the model. Because of the lack of any time series on household formation rates in Alaska, such an approach would require use of a national cross-sectional analysis to estimate the functional relationship between economic variables and household formation rates. Because it would be difficult to adequately control for the specific characteristics of Alaskan household formation, such as the impact of migration and the particular employment mix within Alaskan industries, such an approach would have limited value.[5]

Note that the household formation model is indirectly a function of economic characteristics because it is related to the age-sex structure of the population which is partially migration determined and which, in turn, is a function of economic variables.

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[4]For example, the ELFOR model developed by Battelle Columbus Labs for ERDA in April 1980 for electricity load forecasting employs the same technique as is used in the MAP model.

[5]For an attempt to do this, see S. Caldwell, W. Greene, T. Mount, and S. Saltzman, "Forecasting Regional Energy Demand with Linked Macro-Micro Models," Papers of the Regional Science Association #45.

Appendix D

MAP MODEL WAGE RATE SPECIFICATION

I. Introduction

One critical element of any economic model of the Alaskan economy is the determination of the level and growth rate of personal income. Personal income is a major determinant of aggregate economic activity because it determines the demand for locally consumed goods and services.

Wages and salaries is the largest component of personal income and, thus, the most important in its determination. In Alaska, the proportion of personal income which is wages and salaries is much higher than the national average, largely because of the young average age of the population. Younger people tend to have fewer income-earning assets than older people.

II. Wages and Salaries Determination in MAP Model

For each of the twelve industries in the MAP model, total wages and salaries is the product of the wage rate and the level of employment, both measured in average annual terms. For a given level of employment, the wage rate determines total wages and salaries.

The specification of the wage rate equations reflects the fact that wage rate levels are jointly determined by conditions in national labor markets and local labor markets. National labor markets are important because the labor supply is mobile and will migrate to where job opportunities are best. This has the tendency of equilibrating wage levels in different geographic regions (after taking account of cost of living differentials). This equilibrating process is not instantaneous, however; and, thus, excess labor demand in the short run can drive up wage rates in regions that are growing rapidly. The opposite can happen in regions with excess labor supply although a number of institutional constraints prevent wage rates from being as flexible on the down side.

The typical equation has the following specification:

$$LOG\ (WR^{**}/RPI) = a + b * LOG\ (WEUS/USCPI) + c * LOG\ (1+EXEMRAT) + d * LOG\ (1+EXEMRAT(-1)) + e * LOG\ (1+EXEMRAT(-2))$$

where WR** = average annual wage rate for industry **

RPI = Alaskan relative price index

WEUS = average weekly earnings of nonagricultural wage and salary employees in the United States

USCPI = U.S. consumer price index

EXEMRAT = the ratio of extraordinary employment to total employment in Alaska (extraordinary employment is large-project construction employment which significantly increases labor demand in the short run)

This equation says that the real wage rate in each industry in Alaska is a function of the real wage rate in the United States in all industries and of the tightness of the local labor market in the current year as well as in past years.

The coefficients have the following interpretations:

a is the basic level of the real wage in Alaska in industry ** independent of any significant variation in the real wage level in the United States or tightness in the local labor market. (The value of the national labor market term WEUS/USCPI is approximately one, which results in a logged value close to zero.)

b is the elasticity of the response of the local real wage in industry ** to a change in the average real wage (productivity level) in the United States. As such, it is a composite of three types of change as follows:

$$\frac{\Delta \text{ real Alaskan annual wage in industry **}}{\Delta \text{ real US average weekly wage across all industries}} =$$

$$\frac{\Delta \text{ real Alaskan annual wage in industry **}}{\Delta \text{ real US annual wage in industry **}} \times$$

$$\frac{\Delta \text{ real US annual wage in industry **}}{\Delta \text{ real US annual wage across all industries}} \times$$

$$\frac{\Delta \text{ real US annual wage across all industries}}{\Delta \text{ real US average weekly wage across all industries}}$$

The coefficient b would equal one only if all three components of change over time equaled one. This would imply that any changes in the average real wage in the United States would be represented by identical percentage increases in the real wage rates in all Alaskan industries.

c is the elasticity of the real wage rate to local labor market conditions reflected by the proportion of special skilled labor component of labor. The upward pressure on wages this reflects may operate with a lag and enter some of the equations with the current and two previous years' values. During periods when there is no unusual labor demand pressure, these terms become zero. A negative coefficient on a lagged value suggests that tight markets in successive years are rapidly self-correcting in some industries.

The wage rate in special projects construction is treated differently than that of regular construction employment. The regular construction wage is augmented by a fixed proportion to reflect the longer hours and higher proportion of overtime pay associated with such employment. This adjustment is less to take account of a labor market supply constraint than to adjust to the particular conditions associated with those types of construction jobs.

III. Historical Pattern of Wage Rate Growth in Alaska and the United States

Figure D-1 shows the historical relationship between the average annual Alaskan wage and the U.S. wage. The ratio is relatively constant throughout the 1960s and early 1970s. In the mid-1970s, there is a significant increase in the ratio, corresponding to the oil pipeline construction years. After pipeline construction, the ratio falls although it is still above the prepipeline construction level.

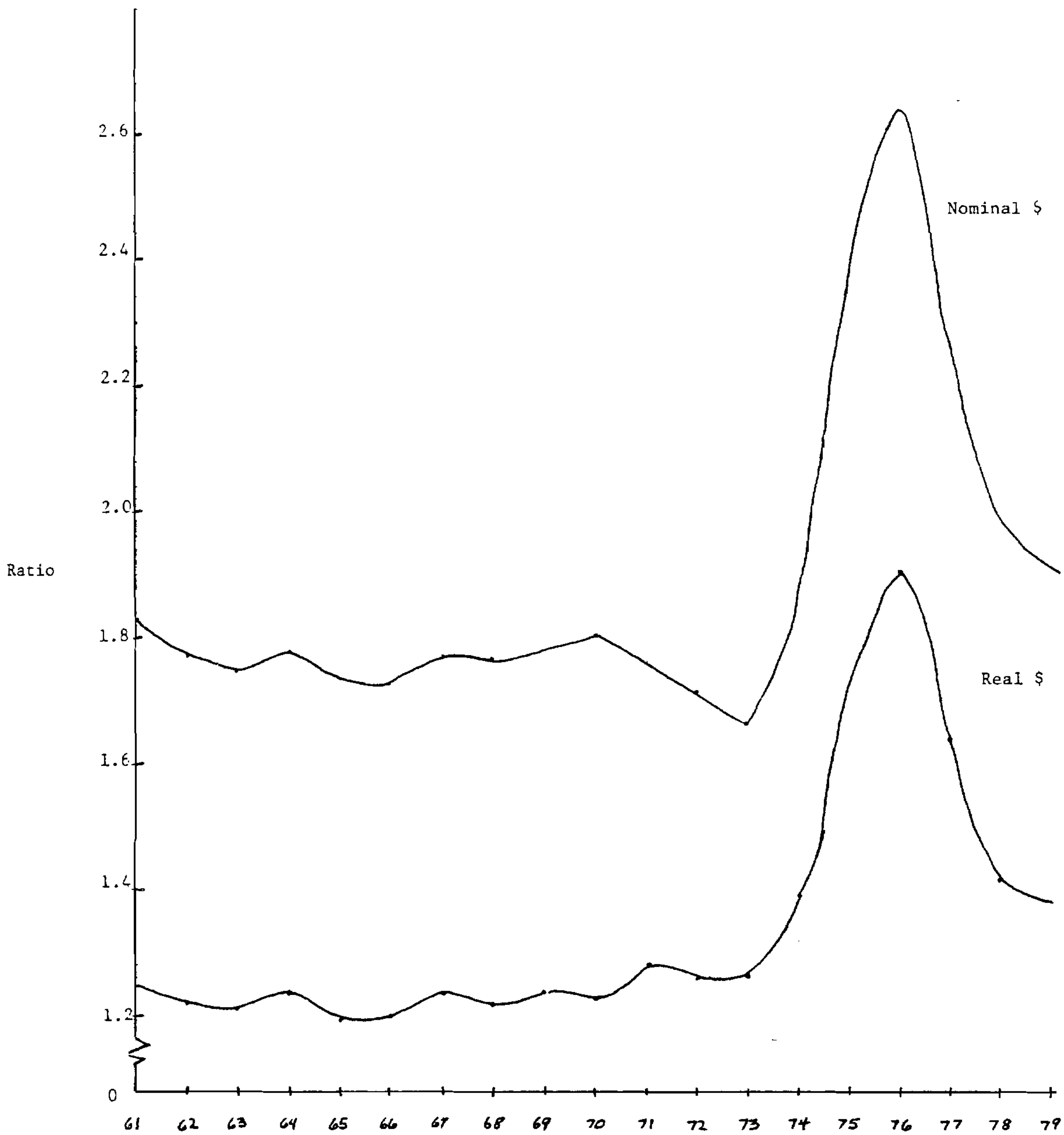
Figure D-1 also shows the ratio after adjusting for differential growth in the cost of living in Alaska and in the United States. An upward trend in the ratio is attributable to the fact that the cost of living in Alaska relative to the rest of the United States was increasing more slowly in the early 1970s, and this more than compensates for the decline in nominal relative wage rates.

If the change over time in the ratio of Alaskan-to-U.S. wage rate is estimated using regression analysis over this historical period, the average growth rate is 1.27 percent annually for the nominal ratio and 1.65 percent for the cost-of-living-adjusted ratio. This confirms that the annual wage rate in Alaska is growing more rapidly than in the United States although the positive effects of the pipeline construction period may be causing some upward bias in the calculated growth rates.

Figure D-2 confirms that the aggregate pattern also is reflected in individual industries. Some wage rates are more sensitive than others to local labor market conditions, and the pattern of response also varies by industry.

Table D-1 compares the growth in wage rates by industry with the growth in the wage rate in the aggregate. In the first column, the growth in the ratio of particular Alaskan industries to the U.S. average is calculated; and in the second column, the ratio of the

FIGURE D-1. RATIO OF ALASKAN TO U.S. AVERAGE ANNUAL WAGE RATE



Note: Ratio of Alaska average annual wage to U.S. average weekly wage x 50

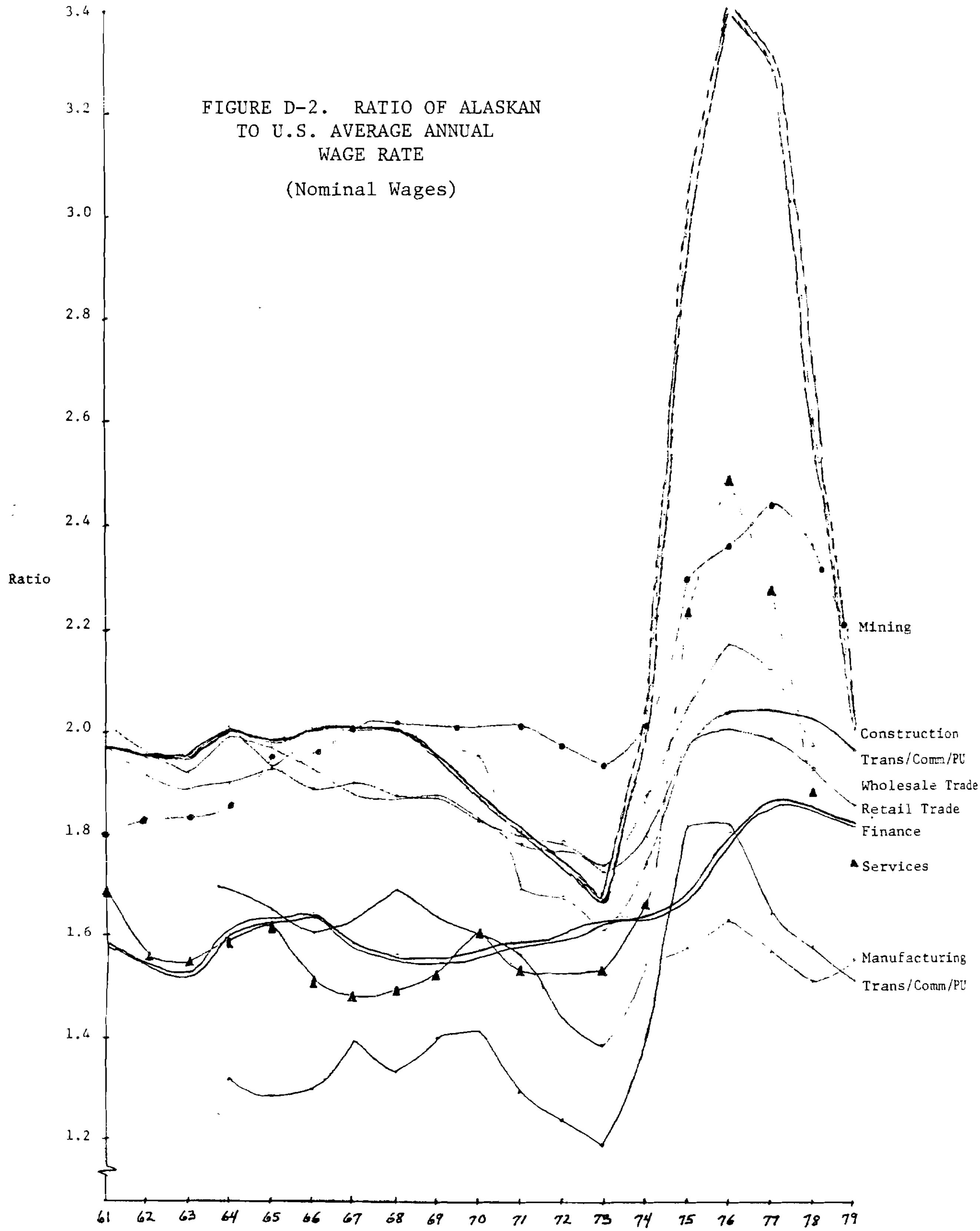


FIGURE D-2. RATIO OF ALASKAN TO U.S. AVERAGE ANNUAL WAGE RATE
(Nominal Wages)
Ratio
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
Mining
Construction
Trans/Comm/PU
Wholesale Trade
Retail Trade
Finance
Services
Manufacturing
Trans/Comm/PU

TABLE D-1. INDUSTRY GROWTH RATES RELATIVE TO THE AVERAGE FOR THE UNITED STATES

	Alaska[a]	United States[b]
Total	1.27	0
Mining	1.39	1.43
Construction	1.94	.32
Transportation	1.67	1.13
Communications/Public Utilities	- .29	
Services	1.68	.40
Finance/Insurance/Real Estate	.90	- .41
Retail Trade	- .07	- .70
Wholesale Trade	- .06	.04
Manufacturing	- .17	.43

[a] The growth rate of the ratio of average annual earnings in Alaska in industry ** to average weekly U.S. earnings in total (WR**/WEUS).

[b] The growth rate of the ratio of average weekly U.S. earnings in industry ** to average weekly U.S. earnings in total.

particular U.S. industries to the U.S. average is calculated. Thus, for example, the differential between the Alaskan wage in mining and the average U.S. wage grew at the rate of 1.39 percent per year. In the United States as a whole, it grew slightly more rapidly at 1.43 percent annually.

Table D-1 suggests that a large part of the differential growth rates among industries in Alaska can be attributed to differential growth rates nationally. Since the second column represents the relative growth rates of wage rates nationally, any differences between the two columns for an industry represent the differential Alaskan growth. This differential is the change in Alaskan industry wage rates independent of national trends in the industry. Factors which could account for this differential would include relative differences in the hours or weeks worked in Alaska, relative cost of living differences, changes in the mix of industry, or changes in average skill levels.

In all industries except finance/insurance/real estate, which in Alaska has grown more rapidly than its national counterpart, and manufacturing, which has grown more slowly than its national counterpart, a portion of the differential growth rate in the Alaskan wage appears to be the result of national trends in relative wage rates.

Construction and services are the two industries where growth in average wage rates has substantially exceeded the national average. The difference in construction can be largely attributed to the high wages paid to oil pipeline construction employees. Netting them out would reduce the observed growth rate. A similar phenomenon can be attributed to the service sector which, after construction, showed the most substantial increase in average wage rates relative to the U.S. average during the oil pipeline construction years. Like construction, the post-pipeline ratios (WR**/WEUS) have remained above the long-term trend, but the differential for services is less.

In finance/insurance/real estate, there has been a moderate post-pipeline bulge in wage rates which may or may not represent a real structural change in the industry. Manufacturing in Alaska is a relatively small group of activities not representative of the U.S. manufacturing as a whole, and thus it is not reasonable to compare wage rate growth of the two.

In conclusion, wage rates in different industries have grown at different rates historically. This is true both for Alaska and the United States. These growth rates can be related to the average for all industries and, thus, justify the use of the all-industry average for projection purposes. In general, Alaskan wage rate growth by industry follows the national pattern with exceptions that can be readily explained.

IV. Evaluation of Alaskan Wage Rate Equations

Details on the statistical properties of the wage rate equations appear in Appendix G. In general, the statistical properties of the equations are quite good. The corrected R^2 value ranges between .8 and .96; the F tests are all significant ($F(4/14) = 5.04$ for a 99 percent confidence interval); the standard errors of the regressions are small; and the T-tests are, with few exceptions, significant. For nineteen observations and three explanatory variables, the 95 percent confidence test of positive autocorrelation is a Durban-Watson value of .97 or less. The test is inconclusive if it is between .97 and 1.68. The COND(X) variable tests for multicollinearity which does not appear to be present in these equations.

The stability of the wage rate equations has been investigated by varying the time period over which the regression parameters were calculated. Table D-2 reports the results of this exercise. The intercept term (a) is generally unaffected by the historical period chosen for the regressions. The elasticity of local wage rates to changes in national rates (b) does exhibit some variation with the time frame chosen for the regressions. The elasticities appear to be declining as new data points become available. These elasticities should be stabilizing now that the majority of the effects of the oil pipeline on the economy have worked themselves out. The sensitivity of projections with respect to these elasticities, however, should be investigated.

TABLE D-2. SENSITIVITY OF WAGE RATE PARAMETER VALUES TO REGRESSION TIME PERIOD

	Parameter					
	Intercept			Elasticity to National Wage Rates		
Industry	62-77	61-78	61-79	62-77	61-78	61-79
Construction	4.63	4.63	4.63	1.90	1.85	1.80
Mining	4.51	4.51	4.51	2.97	2.82	2.70
Trade	3.95	3.95	3.94	.52	.51	.45
Finance/Insurance/ Real Estate	3.95	3.95	3.96	1.72	1.74	1.63
Transportation	4.11	4.11	4.11	1.66	1.57	1.47
Services	3.83	3.83	3.84	.98	1.01	.81
State and Local Government	4.03	4.03	4.04	2.40	2.29	2.20

To test the overall stability of the set of equations specifying the Alaskan wage rates, we first examined the simulated relationship between the Alaskan real wage and the U.S. real wage in a preliminary version of the model. The real wage in Alaska grows in the twenty-year period from 1980 to 2000 from $5,728 (1967 U.S. dollars is the base) to $7,661. This is an average annual growth rate of 1.4 percent. Over the same period, the U.S. average real wage is exogenously set at an average annual growth rate of .7 percent. Thus, the Alaska real wage grows at twice the rate for the United States in this scenario. This is attributable to the increasing proportion of employment in relatively fast wage rate growth industries. This differential growth rate does not destabilize the projections. Whereas, in 1980, the ratio of the Alaska-U.S. average real wage is 1.133, in 2000 it is 1.350. This is because, although the growth rates are appreciably different, they are both relatively small.

To test the sensitivity of projection results to changes in the coefficients measuring the elasticity of wage rates to changes in the U.S. average wage rate (b), a special simulation was done in which these coefficient values were reduced by one standard error. The result was a surprisingly small difference in the real wage rate and population after a twenty-year period. Table D-3 shows the results of this test in comparison to a base case. In 2000, population is 5.8 thousand lower in the test, and the real wage is 1.3 percent lower. The robustness of the model to this sensitivity test is reassuring, given the uncertainty about whether all the effects of oil pipeline construction on wage rates have shown up in the data.

A second sensitivity test was performed and is also reported in Table D-3. This test investigated the sensitivity of the model simulation results to the growth rate in the real wage in the United States. To test this, the projection growth rate for this variable was reduced from .7 to .5 percent annually (WEUS/USCPI). The resultant change in the 2000 population from the base case was 32 thousand, while the reduction in the real Alaskan wage rate was 5.2 percent. This test suggests that the projection value for the growth of the real wage rate in the United States should be chosen with care.

Historically, the growth of this variable, which is a measure of the productivity growth of the U.S. labor force, has not been smooth. The average annual growth rate over the past twenty years has been .5 percent, approximately equal to the value chosen for the sensitivity test. Within that twenty-year time frame, however, there was a decade of rapid growth in the 1960s when the average weekly wage adjusted for cost of living increases grew from $92 to $107. This was followed by a decade of stagnation during the 1970s, when the real wage fell. In 1979, it was $101. Thus, it is difficult to project with confidence a growth rate for the real wage rate in the United States based upon the historical data. This must remain as one of the components of the simulation process which is subject to irreducible uncertainty.

TABLE D-3. SENSITIVITY TESTS OF MAP WAGE RATE EQUATIONS

POPULATION	Base Case	Test of Elasticity Sensitivity	Test of U.S. Wage Rate Growth Sensitivity
1980	399.456	399.456	399.456
1981	408.131	408.613	408.131
1982	420.961	422.099	420.961
1983	448.902	450.425	448.902
1984	484.322	486.224	484.322
1985	485.173	487.214	485.085
1986	494.811	496.948	494.473
1987	505.152	507.159	504.172
1988	516.149	517.972	514.309
1989	522.99	524.551	520.041
1990	529.522	530.784	525.286
1991	542.48	543.367	536.629
1992	557.24	557.687	549.555
1993	574.865	574.771	564.955
1994	590.352	589.667	578.073
1995	605.396	604.03	590.452
1996	620.069	617.99	602.344
1997	634.501	631.632	613.702
1998	649.378	645.631	625.19
1999	665.283	660.563	637.365
2000	682.49	676.689	650.444

REAL WAGE RATE	Base Case	Test of Elasticity Sensitivity	Test of U.S. Wage Rate Growth Sensitivity
1980	5728.4	5758.87	5728.4
1981	5721.7	5761.74	5721.7
1982	6184.15	6223.34	6184.15
1983	6826.72	6863.57	6826.72
1984	7438.18	7470.91	7438.18
1985	6989.79	7009.69	6962.78
1986	6715.71	6725.09	6664.32
1987	6507.02	6508.79	6433.68
1988	6449.51	6444.04	6353.85
1989	6554.37	6541.49	6434.08
1990	6618.78	6598.6	6474.34
1991	6824.7	6796.55	6654.01
1992	6967.55	6931.27	6770.38
1993	7127.7	7082.98	6904.83
1994	7132.23	7079.94	6885.39
1995	7172.66	7113.04	6902.61
1996	7223.34	7156.07	6927.83
1997	7300.35	7225.46	6979.44
1998	7418.95	7336.02	7071.93
1999	7535.8	7444.7	7162.29
2000	7661.22	7561.81	7261.37

V. Conclusion

In general, the wage rate equations are well-specified and robust. They must continue to be monitored as new observations become available to see how the elasticities with respect to the U.S. wage rate change. This may also require fine tuning of the lag structure on the variable for tightness in the local labor market.

The growth rate of the real wage rate in the United States is an important variable in the determination of the growth of the Alaskan economy. This variable must be constantly monitored, and projections of its future value must continue to be critically evaluated.

Appendix E

MAP MODEL MIGRATION SPECIFICATION

I. Introduction

Population change is the sum of two components--natural increase and net migration. Natural increase is a relatively stable component of population change since it is a stable function of age-sex-race-specific fertility and mortality rates which may change over time, but only gradually.

Net migration is, in contrast, quite volatile and can change from a large, positive value to a large, negative value from year to year. For purposes of long-run projections, these year-to-year fluctuations are not as important as the overall trends in migratory flows. Between one-third and one-half of the population increase in the 1970s was the result of net positive migration.

Population is important because it is a factor in the demand for many goods and services such as state and local government and housing independent of the other major determinant of demand--personal income.

II. Specification of Net Migration in the MAP Model

Net migration is determined by the following equation:

$$MIGNET = a + b * [\Delta ECNN - \Delta ECONX1] + c * ECONX1 + d * YDNNRPC(-1) / DIRPU(-1)$$

where
- MIGNET = net migration
- ΔECNN = annual change in level of civilian non-Native employment
- ΔECONX1 = annual change in level of remote special project construction employment
- YDNNRPC(-1) = Alaska non-Native real disposable personal income per capita lagged one year
- DIRPU(-1) = real disposable personal income per capita in United States lagged one year

This specification of the net migration equation reflects the fact that the primary determinates of net migration are changing employment opportunities and regional variations in relative income.[1] Net migration is the sum of gross in-migration and gross out-migration. The composition of net migration is determined by allocating the total into the various age and sex cohorts of the population.

The coefficients in the net migration equation have the following interpretations:

a is the level of net migration which would occur in a year if there were no change in the number of jobs in the economy and if real per capita income in Alaska relative to the rest of the United States were not a variable in the determination of migration. This coefficient is negative, reflecting the fact that if there are no new jobs generated in the economy in a year, then because the labor force is increasing because of the effects of natural increase, some people in the labor force will migrate elsewhere to look for employment.

b is the marginal increase in the level of net migration from an increase in the number of jobs in the economy. This coefficient is positive and may have a value less than or greater than unity.

c is interpreted in the same way as b, except that it applies to jobs created on special large construction projects.

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[1]For a more detailed discussion of this, see Scott Goldsmith, "Important Economic Relationships in the Alaskan Macroeconomy," unpublished paper, 1978.

d is the increment to net migration which is the result of real per capita income differentials between Alaska and the rest of the U.S. regions. If there is no differential, then a + d can be interpreted as the level of net migration which would occur in a year when no new jobs were created in the economy. This coefficient is positive.

This specification is best understood by reference to Figure E-1 which depicts the form of the net migration equation currently in use in the MAP model. Net migration is represented along the vertical axis; and employment growth, along the horizontal axis. A different relationship exists between these variables for each level of real per capita disposable income in Alaska relative to the United States. Line A represents the relationship if the real per capita disposable personal income of Alaskan non-Natives is the same as in the rest of the United States. Line B represents the case where the Alaskan real disposable per capita non-Native income is 20 percent above the United States. Line A is representative of equilibrium conditions between Alaskan and U.S. labor markets, while line B is representative of boom conditions when wages and salaries in Alaska have been temporarily driven up by supply constraints in the labor market or because of high wages paid on certain construction projects.

The various lines represent the positive relationship between the growth of employment and net migration as well as the positive relationship between Alaskan real income and net in-migration. They also allow us to see the relationship between the <u>marginal</u> migration response and the <u>average</u> migration response.

Point X represents a situation in a year of income parity. Employment growth is 3 thousand; and net in-migration, about 1 thousand. The slope of the line is about one, indicating that the <u>marginal</u> net in-migration for each new job is one. On <u>average</u>, however, each job created has generated net in-migration of .33 persons. The migration effect of job creation could be decomposed into two

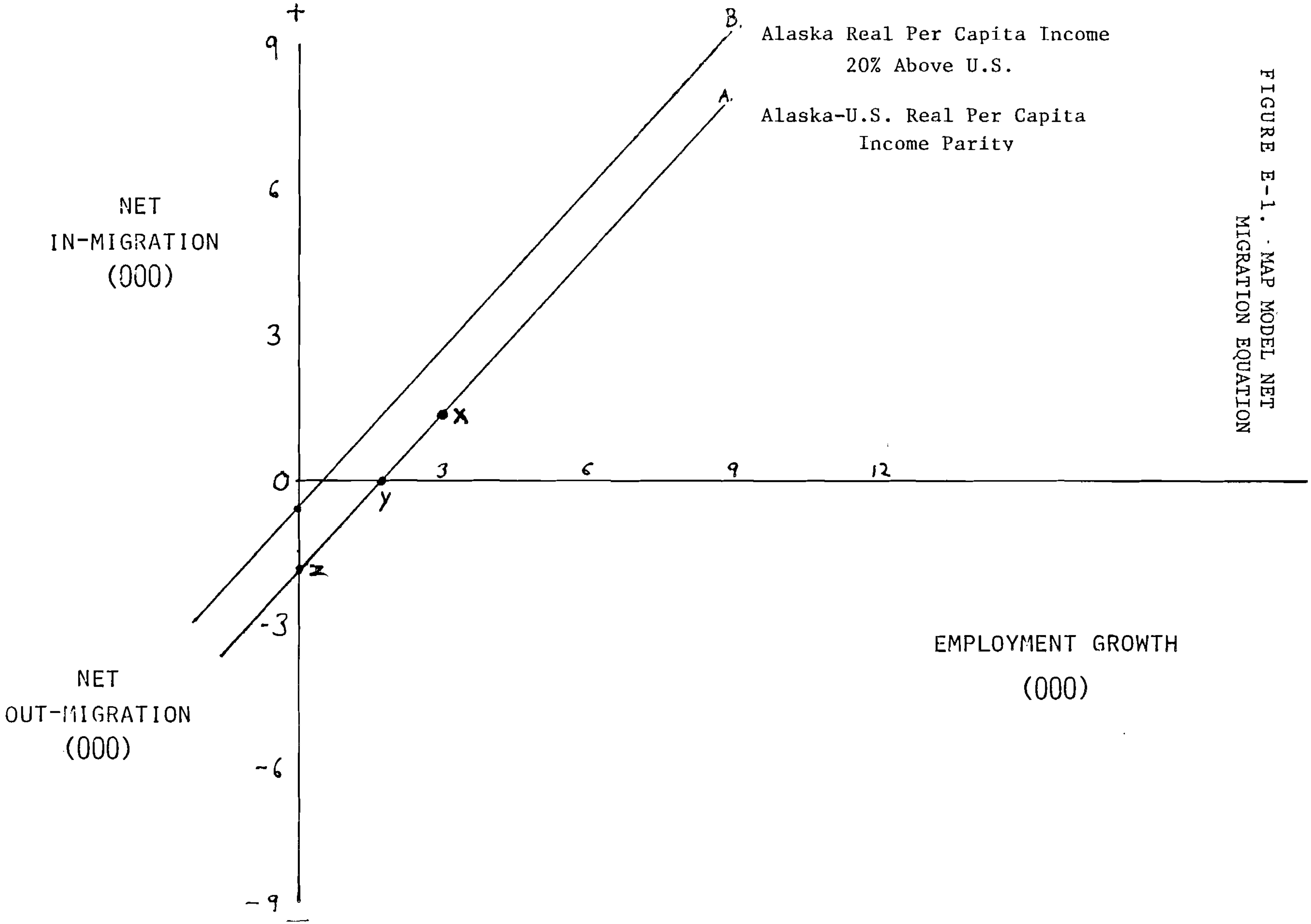

FIGURE E-1. MAP MODEL NET MIGRATION EQUATION separate parts. To the left of Y, new jobs are filled by current residents who, in the absence of the new employment opportunities, would have out-migrated to look elsewhere for jobs. Those new jobs to the right of Y are filled by new migrants.

If in a given year no new jobs are created, there would be net out-migration of about 2 thousand people (point Z). If Y new jobs were created, there would be neither in-migration nor out-migration. Growth in the resident labor force would take all the new jobs. Each new job in excess of Y generates in-migration of one person on average, including those who get jobs, their dependents, and those who are unemployed.

Another way to see the relationship between employment growth and migration in this equation is by means of Table E-1. It shows that at higher rates of job creation, the average net migration is higher. Also at low positive levels of job creation, there is out-migration.

TABLE E-1. THE RELATIONSHIP BETWEEN JOB CREATION AND NET MIGRATION IN THE MAP MODEL

(Hypothetical Example)

Job Creation in One Year (thousand)	Net Migration (thousand)	Net Migrants for Each Job Created
12	10	.83
9	7	.78
6	4	.67
3	1	.33
2	0	0
1	- 1	- 1
0	- 2	-
- 1	- 3	- 3
- 3	- 5	- 1.67
- 6	- 8	- 1.33

III. Evaluation of Migration Equation

The model currently uses the following equation:

$$1: \quad MIGT = A+B*(EMGRO-(ECONX(1)-ECONX(-1))) +C*RELINC+D*D.EQ+E*(ECONX(1)-ECONX(-1))$$

NOB = 17	NOVAR = 5		
RANGE =	1961 TO 1977		F(4/12) = 215.191
RSQ =	0.98625	CRSQ = 0.98167	DW(0) = 2.08
SER =	2.7241	SSR = 89.050	COND(X) = 25.95

COEF	VALUE	ST ER	T-STAT
A	-7.83466	6.13773	-1.27648
B	0.96122	0.17220	5.58211
C	5.24092	8.67252	0.60431
D	3.53277	1.92752	1.83280
E	1.86136	0.25082	7.42118

For simulation, the parameter values on the income and employment terms are adjusted to account for the fact that the historical data includes the Alaska Natives; whereas, the simulation data does not. In addition, the intercept is adjusted to improve its performance in simulation. The statistical tests for this equation are generally good except for the relative income term. This coefficient has the correct sign but is not statistically significant. The variables have been two period averaged in order to reduce the possibility of positive autocorrelation. The variable EQ is a dummy to account for the earthquake years.

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```
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          +C*RELINC+D*D.EQ+E*(ECONX(1)-ECONX(-1))
```

```
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Recent analysis of this equation has concentrated on the incorporation of new data points into parameter estimation and upon improvement of the specification. The current formulation of the net migration equation differs from the formulation reported in the MAP documentation prepared in 1979 in both the intercept and slope coefficient values as well as the fact that it separates employment change into two components.

The data series used in the equation is the subject of an ongoing analysis because of data revisions in the natural increase, personal income, and net migration series. No changes have been incorporated into the model yet based upon the revised data. At the same time, additional data points are being considered for addition to the parameter estimation. The preliminary results of this analysis show that with the addition of new data points, the positive significant relationship between employment and net migration does not change.

The historical series on migration between the 1970 and 1980 census years has come into question since the publication of the 1980 census population figure. Since this figure is lower than had previously been estimated, net migration figures for some years after 1970 were overestimated. It is likely that the majority of the error in the migration series occurred in 1978 and 1979, the years of slack economic activity after construction of the oil pipeline, although 1977 net migration may also be overestimated. Rather than utilizing obviously incorrect data in an updated migration equation, the current version of the model uses data only through 1977. When a corrected version of net migration becomes available, this equation will be updated.

It is interesting to note that the coefficient values on regular employment growth and project construction employment growth, although significant, change their relative sizes as more data points are added. As more of the post-pipeline data enters into the estimation of the equation, the net migration impact of a regular employee increases, and the impact of a special project construction employee decreases. The coefficient on regular employees approaches the value calculated before the inclusion of the pipeline years. However, because of the high correlation between changes in the level of regular and special construction project employment, the variation in the sizes of these coefficients largely cancel one another out in simulation and impact analysis.

The most important test for the net migration equation specification is how it performs in simulation. In a base case simulation similar to the moderate case in the electric power study, the performance of the net migration equation was monitored by tracking the relationship between employment and population. Table E-2 shows that as the population grows from 399 thousand in 1980 to 682 thousand in 2000, the employment rate rises from 51.6 percent of the population to 53.5 percent, an increase of almost 4 percent (the ratio of civilian employment to civilian population). This increase reflects either that the labor force participation rate is increasing over time or that the unemployment rate is declining, or both. This is the result of changes both within the economy and different characteristics of new migrants who are more likely to be employed than the resident population.

We can also calculate a variable similar to the labor force participation rate. The labor force participation rate is defined as civilian employed plus unemployed divided by the civilian population aged 16 and over. We have no projections of the unemployed, but a variable which should move similar to labor force participation is defined as total civilian jobs divided by the civilian population between the ages of 15 and 64 (EC/(ADULTS-POPM)). In this simulation, the 1980 work force proportion is 79.7 percent, and it grows to 81.7 percent in 2000.

Another important variable for monitoring the migration equation is the ratio between the average real per capita disposable personal

TABLE E-2. TRACKING TEST FOR NET MIGRATION

	Population	Employment/ Population	Non-Native Real Per Capita Disposal Personal Income Alaska/ United States
1980	399.456	0.516	1.075
1981	408.131	0.512	1.031
1982	420.961	0.509	1.145
1983	448.902	0.519	1.209
1984	484.322	0.534	1.302
1985	485.173	0.529	1.218
1986	494.811	0.532	1.161
1987	505.152	0.529	1.095
1988	516.149	0.528	1.058
1989	522.99	0.523	1.042
1990	529.522	0.52	1.024
1991	542.48	0.521	1.031
1992	557.24	0.523	1.032
1993	574.865	0.527	1.035
1994	590.352	0.529	1.015
1995	605.396	0.531	1.001
1996	620.069	0.531	0.985
1997	634.501	0.532	0.974
1998	649.378	0.532	0.966
1999	665.283	0.533	0.96
2000	682.49	0.535	0.954

income in Alaska and in the United States. This variable is also shown in Table E-2. This ratio remains relatively stable. It rises in the mid-1980s in response to gas pipeline construction employment and subsequently declines back toward one. In the latter years, it drops below one as it had been historically until 1975. This has a slight negative effect on the level of net migration. A lower population or higher employment-to-population ratio would bring this income ratio back to one through feedback effects in the model.

The results in Table E-2 indicate that the migration equation does not generate an unstable situation either in the labor market or with respect to relative income in Alaska. It is necessary, however, to compare the trends in the values for these indicators (employment rate and relative real income) generated by model simulation with historical trends and independently projected trends to ascertain whether the simulation results are, in fact, plausible as well as stable.

Nationally, the labor force participation rate has been increasing since World War II. Table E-3 shows that the participation rate has increased from 59.2 percent in 1960 to 62.7 percent in 1978. This is the combined result of a number of trends of which the most significant is an increase in the labor force participation rate for white females from 36 percent in 1960 to 48.8 percent in 1978. Counterbalancing this trend has been a decline in the rates for both white and nonwhite males. Some of the change in the aggregate participation rate is also due to the change in the demographic mix of the population over time.

This trend can be observed in the historical data on employment and population for Alaska. Civilian employment as a proportion of civilian population increased from 37.4 percent in 1970 to 47.2 percent in 1979. Part of the increase can be attributed to a demographic shift in the population, but it is primarily the result of an increase in labor force participation.

TABLE E-3. COMPOSITION OF THE NATIONAL LABOR FORCE

No. 645. Labor Force and Participation Rates, by Race, Sex, and Age: 1960 to 1978

[**Persons 16 years old and over.** Labor force data are annual averages of monthly figures. Includes Armed Forces. Rates are based on total population of each specified group as of July and represent proportion of each specified group in labor force. See also *Historical Statistics, Colonial Times to 1970,* series D 29-41]

RACE, SEX, AND AGE	TOTAL LABOR FORCE (millions)							PARTICIPATION RATES (percent)						
	1960	1965	1970	1975	1976	1977	1978	1960	1965	1970	1975	1976	1977	1978
Total	**72.1**	**77.2**	**85.9**	**94.8**	**96.9**	**99.5**	**102.5**	**59.2**	**58.8**	**60.3**	**60.9**	**61.2**	**61.8**	**62.7**
White	64.2	68.6	76.4	83.9	85.7	87.9	90.2	58.8	58.5	60.2	61.1	61.5	62.1	62.9
Male	44.1	45.9	48.8	51.6	52.2	53.1	53.9	82.6	80.4	79.7	78.1	77.9	78.0	78.0
Female	20.1	22.8	27.5	32.3	33.5	34.8	36.3	36.0	37.7	42.0	45.4	46.3	47.4	48.8
Black and other	7.9	8.6	9.5	10.9	11.3	11.7	12.4	63.0	62.1	61.1	58.8	59.1	59.5	61.2
Male	4.8	5.1	5.5	6.1	6.2	6.4	6.7	80.1	77.4	74.7	70.4	69.7	69.8	70.8
Female	3.1	3.5	4.0	4.8	5.1	5.3	5.7	47.2	48.1	48.9	48.7	49.7	50.5	52.8
Male	48.9	50.9	54.3	57.7	58.4	59.5	60.5	82.4	80.1	79.2	77.3	76.9	77.0	77.2
16-19 years	3.2	3.8	4.4	5.1	5.2	5.3	5.4	58.6	55.7	57.5	60.2	60.3	61.8	62.7
16-17 years	1.3	1.6	1.8	2.1	2.1	2.1	2.2	45.9	44.1	46.7	48.5	48.4	50.0	51.5
18-19 years	1.8	2.3	2.6	3.1	3.1	3.2	3.2	73.1	68.3	68.8	72.1	72.1	73.5	74.0
20-24 years	4.9	5.9	7.4	8.2	8.4	8.6	8.8	88.9	86.2	85.1	84.6	85.2	85.3	85.6
25-34 years	10.9	10.7	12.0	14.5	15.0	15.5	15.9	96.4	96.0	95.0	94.2	94.2	94.2	94.3
35-44 years	11.5	11.5	10.8	10.6	10.7	10.9	11.3	96.4	96.2	95.7	94.8	94.6	94.9	94.6
45-54 years	9.6	10.1	10.5	10.5	10.4	10.2	10.2	94.3	94.3	92.9	91.1	90.6	90.3	90.4
55-64 years	6.4	6.8	7.1	7.0	7.0	7.0	7.1	85.2	83.2	81.5	74.8	73.5	73.0	72.5
65 yr. and over	2.4	2.1	2.2	1.9	1.8	1.8	1.9	32.2	26.9	25.8	20.8	19.4	19.3	19.7
Female	23.2	26.2	31.6	37.1	38.5	40.1	42.0	37.1	38.8	42.8	43.7	46.8	47.8	49.3
16-19 years	2.1	2.5	3.3	4.1	4.2	4.3	4.5	39.1	37.7	43.7	49.0	49.8	51.3	53.8
16-17 years	.8	1.0	1.3	1.7	1.7	1.7	1.9	28.6	27.5	34.6	40.0	40.6	41.9	45.2
18-19 years	1.3	1.6	1.9	2.4	2.5	2.6	2.6	51.0	48.6	53.4	58.1	58.9	60.4	62.2
20-24 years	2.6	3.4	4.9	6.1	6.3	6.6	6.9	46.1	49.7	57.5	63.9	65.0	66.4	68.2
25-34 years	4.2	4.3	5.7	8.5	9.2	9.9	10.6	35.8	38.5	44.8	54.3	56.9	59.2	62.0
35-44 years	5.3	5.7	6.0	6.5	6.8	7.2	7.6	43.1	45.9	50.9	55.6	57.6	59.4	61.3
45-54 years	5.2	5.7	6.5	6.7	6.7	6.7	6.8	49.3	50.5	54.0	54.3	54.6	55.5	56.8
55-64 years	3.0	3.6	4.2	4.2	4.3	4.4	4.5	36.7	40.6	42.5	40.6	40.7	40.6	41.1
65 yr. and over	1.0	1.0	1.1	1.0	1.1	1.1	1.1	10.5	9.5	9.2	7.8	7.8	7.6	7.8

Source: U.S. Bureau of Labor Statistics, *Special Labor Force Reports.*

SOURCE: Statistical Abstract

The labor force participation rate in Alaska appears to be substantially above the national average. In 1978, for example, the aggregate labor force participation rate was 63.2 percent for the United States. The rate for males was 77.9 percent and 50.0 percent for females. The comparable figures for Alaska were 71.4, 81.1, and 62.4 percent.[2] The relatively high labor force participation rates in Alaska, in spite of low participation rates for Native Alaskans, is attributable partially to the age structure of the population and partially to the mix of employment opportunities in the state. As Table E-4 shows, 40 percent of total employees in 1977 were women, and they were heavily concentrated in government, services, finance/ insurance/real estate, and in retail trade. These are large industries in Alaska; thus, the opportunity exists in Alaska for a large labor force participation rate for females.

Because the Alaskan labor force participation rate is above the national average and has been rapidly increasing in recent years, it is unlikely that it will continue to increase substantially above what it is presently. Recall that in 1980 the ratio of civilian jobs to civilian popoulation between 15 and 64 years was 79.7 percent. Increasing integration of the Native community into the market economy will increase the Native labor force participation rate over time, but since the Native population is only a small component of total population, a large increase in the Native labor participation rate will have a relatively small impact on the aggregate participation rate. On the other hand, it is not likely that the participation rate will fall. An important factor operating to maintain a high participation rate is the age-sex structure of the population which will continue to be heavily weighted toward those cohorts with the highest participation rates.

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[2]Statistical Abstract, 1979, Table 646, Civilian Labor Force and Participation Rates.

TABLE E-4. WOMEN EMPLOYEES IN NON-AGRICULTURAL INDUSTRIES

No. 660. Women Employees in Nonagricultural Industries: 1970 to 1977

[Annual averages of monthly figures]

Industry group	1970			1976			1977		
	Number (1,000)	Percent of— Industry group	Percent of— Total employment	Number (1,000)	Percent of— Industry group	Percent of— Total employment	Number (1,000)	Percent of— Industry group	Percent of— Total employment
Total	**26,060**	**37**	**37**	**31,498**	**40**	**40**	**32,994**	**40**	**40**
Manufacturing	5,436	28	8	5,590	29	7	5,818	30	7
Durable goods	2,278	20	3	2,448	22	3	2,612	23	3
Nondurable goods	3,158	39	4	3,144	40	4	3,204	40	4
Mining	37	6	(Z)	58	7	(Z)	65	8	(Z)
Contract construction	177	5	(Z)	245	7	(Z)	268	7	(Z)
Transportation and public utilities	953	21	1	986	22	1	1,036	23	1
Wholesale trade	877	23	1	1,039	24	1	1,079	25	1
Retail trade	5,120	46	7	6,365	47	8	6,597	47	8
Finance, insurance, and real estate	1,907	52	3	2,377	55	3	2,523	56	3
Services	6,222	54	9	8,184	58	10	8,648	56	11
Government	5,331	42	8	6,656	45	8	6,961	46	8

Z Less than .5 percent.

Source: U.S. Bureau of Labor Statistics, *Employment and Earnings*, monthly.

SOURCE: Statistical Abstract, 1979, Table 660.

The ratio of Alaskan to U.S. real disposable personal income per capita has been rising historically. Part of the explanation for this is the relatively rapid growth of the civilian non-Native population, and part is attributable to growth of the employment rate of the population. The high incomes during the pipeline construction years caused a temporary distortion of the ratio. It seems reasonable to project that the ratio of real incomes will remain in the vicinity of one in future years.

The sensitivity of the net migration equation has been analyzed in two ways. First, the coefficient values for both regular employment and special project employment were reduced by 25 percent (considerably more than one standard error). This is a worst-case sensitivity analysis because although different model specifications yield different values for these coefficients, there is generally an inverse relationship between them. The results of this sensitivity analysis are shown in Table E-5 where a base-case value, sensitivity-case value, and difference are displayed for population and the ratio of employment-to-population. (The base case here is a relatively slow growth scenario.)

Reduction in the response of migration to population by 25 percent results in a change in the simulation value for population which is cumulative over time. The migration response is damped, and population growth slows. The difference by 1990 is only 11 thousand, but by 2000 it is 47 thousand.

Analysis of the employment-to-population ratio shows that the lower rate of population growth associated with the dampened-migration-response case may be inconsistent with the employment growth simultaneously occurring in the simulation. The employment-to-population ratio climbs to 56 percent from its value in 1980 of 50.9 percent. Given the already high ratio of employment to population in the state, it is not likely to grow another 10 percent in the next twenty years.

Thus, although the simulation results are sensitive to the coefficient values for the net migration equation, the plausibility of the results can be tested by observing the movement of the employment-to-population ratio over the simulation range.

A second sensitivity test was conducted to examine the effect on the simulation results of variation in the growth rate of real disposable per capita personal income in the United States. The exogenously projected growth rate was increased by 25 percent to 2.5 percent annually, which is the historical rate over the last twenty years.

The results are shown in Table E-6. Increasing the rate of growth of income in the United States reduces the relative attractiveness of Alaska and, thus, net in-migration, but the change is modest. The model proved to be insensitive to variation in this exogenous variable.

TABLE E-5. WORSE CASE SENSITIVITY ANALYSIS OF NET MIGRATION EQUATION TO PARAMETER VALUE CHANGES

POPULATION	Base Case	Sensitivity Case	Difference
1980	399.456	399.456	0.
1981	412.679	411.258	-1.421
1982	422.16	419.804	-2.356
1983	431.	427.413	-3.587
1984	430.974	427.833	-3.141
1985	437.58	433.661	-3.918
1986	445.297	440.12	-5.177
1987	451.758	445.632	-6.126
1988	458.341	451.167	-7.174
1989	466.727	457.922	-8.805
1990	475.979	465.211	-10.768
1991	486.142	473.087	-13.055
1992	497.179	481.512	-15.667
1993	508.874	490.334	-18.539
1994	521.312	499.618	-21.694
1995	534.571	509.411	-25.16
1996	548.617	519.688	-28.929
1997	563.491	530.473	-33.018
1998	579.036	541.648	-37.388
1999	595.552	553.422	-42.13
2000	612.834	565.634	-47.201
EMPLOYMENT/POPULATION			
1980	0.509	0.509	0.
1981	0.507	0.509	0.002
1982	0.498	0.501	0.003
1983	0.497	0.502	0.005
1984	0.495	0.499	0.004
1985	0.494	0.499	0.005
1986	0.494	0.5	0.006
1987	0.493	0.5	0.006
1988	0.493	0.5	0.007
1989	0.494	0.502	0.008
1990	0.496	0.506	0.01
1991	0.499	0.51	0.012
1992	0.502	0.515	0.013
1993	0.505	0.52	0.015
1994	0.508	0.525	0.017
1995	0.512	0.531	0.019
1996	0.516	0.537	0.021
1997	0.519	0.543	0.023
1998	0.523	0.548	0.026
1999	0.527	0.554	0.028
2000	0.53	0.56	0.03

Note: Coefficients on change in employment variables reduced 25 percent.

TABLE E-6. SENSITIVITY OF NET MIGRATION EQUATION TO INCREASE IN GROWTH RATE OF REAL INCOMES OUTSIDE ALASKA

POPULATION

	Base Case	Sensitivity Case	Difference
1977	411.38	411.38	0.
1978	416.593	416.593	0.
1979	402.931	402.931	0.
1980	399.456	399.456	0.
1981	412.679	412.679	0.
1982	422.16	422.16	0.
1983	431.	431.	0.
1984	430.974	430.974	0.
1985	437.58	437.562	-0.017
1986	445.297	445.215	-0.082
1987	451.758	451.578	-0.18
1988	458.341	458.025	-0.317
1989	466.727	466.236	-0.491
1990	475.979	475.274	-0.705
1991	486.142	485.179	-0.963
1992	497.179	495.916	-1.264
1993	508.874	507.264	-1.61
1994	521.312	519.312	-2.
1995	534.571	532.133	-2.438
1996	548.617	545.689	-2.928
1997	563.491	560.022	-3.469
1998	579.036	574.965	-4.071
1999	595.552	590.823	-4.729
2000	612.834	607.397	-5.437

TABLE E-6 (continued)

EMPLOYMENT/POPULATION

	Base Case	Sensitivity Case	Difference
1977	0.475	0.475	0.
1978	0.473	0.473	0.
1979	0.512	0.512	0.
1980	0.509	0.509	0.
1981	0.507	0.507	0.
1982	0.498	0.498	0.
1983	0.497	0.497	0.
1984	0.495	0.495	0.
1985	0.494	0.494	0.
1986	0.494	0.494	0.
1987	0.493	0.494	0.
1988	0.493	0.493	0.
1989	0.494	0.495	0.
1990	0.496	0.497	0.001
1991	0.499	0.5	0.001
1992	0.502	0.503	0.001
1993	0.505	0.506	0.001
1994	0.508	0.51	0.001
1995	0.512	0.514	0.002
1996	0.516	0.517	0.002
1997	0.519	0.521	0.002
1998	0.523	0.525	0.003
1999	0.527	0.529	0.003
2000	0.53	0.533	0.003

IV. Conclusion

Net migration is difficult to model accurately because the time series is calculated as a residual, and population itself is only an estimate in non-Census years. The approach taken in the MAP model is to try to use that portion of the historical data which is relatively accurate to econometrically specify a relationship between net migration, the growth of employment opportunities, and relative income. The current specification works reasonably well. Work continues on refining the model equation. This work centers on two areas. The first is analysis of the underlying data for accuracy. The second is equation respecification to explicitly treat the unemployment rate and the change in the size of the Alaskan potential labor force, and to define more accurately the relationship between large construction projects and net migration.

Appendix F

REGIONALIZATION MODEL

I. Introduction

This appendix presents in general outline form the structure of a new regional model being developed to replace the Man-in-the-Arctic Program (MAP) regional model in the Susitna Electric Power Study application.

In developing this model, several major objectives have been addressed. These objectives are the following:

- that the structure be simple and generalizable
- that the parameters be specified in terms with clear, intuitive meaning
- that the regions be disaggregated to census division levels
- that the model be sufficiently flexible to be tied easily to the MAP statewide model.

This appendix is organized as follows: Part II examines in detail the structure of the model. Part III presents estimates of the model parameters.

II. Structure of the Model

A. Overview

The model consists of two components as shown in Figure F-1. Given an exogenous estimate of statewide employment, by sector (provided from a corresponding state model run), and vectors of basic and government employment in each of the twenty regions shown in Figure F-2, the employment component of the model generates estimates of support and total employment in each of the twenty regions. The population component accepts these estimates along with exogenous

Figure F-1. SCHEMATIC REPRESENTATION OF REGIONAL MODEL CDMOD

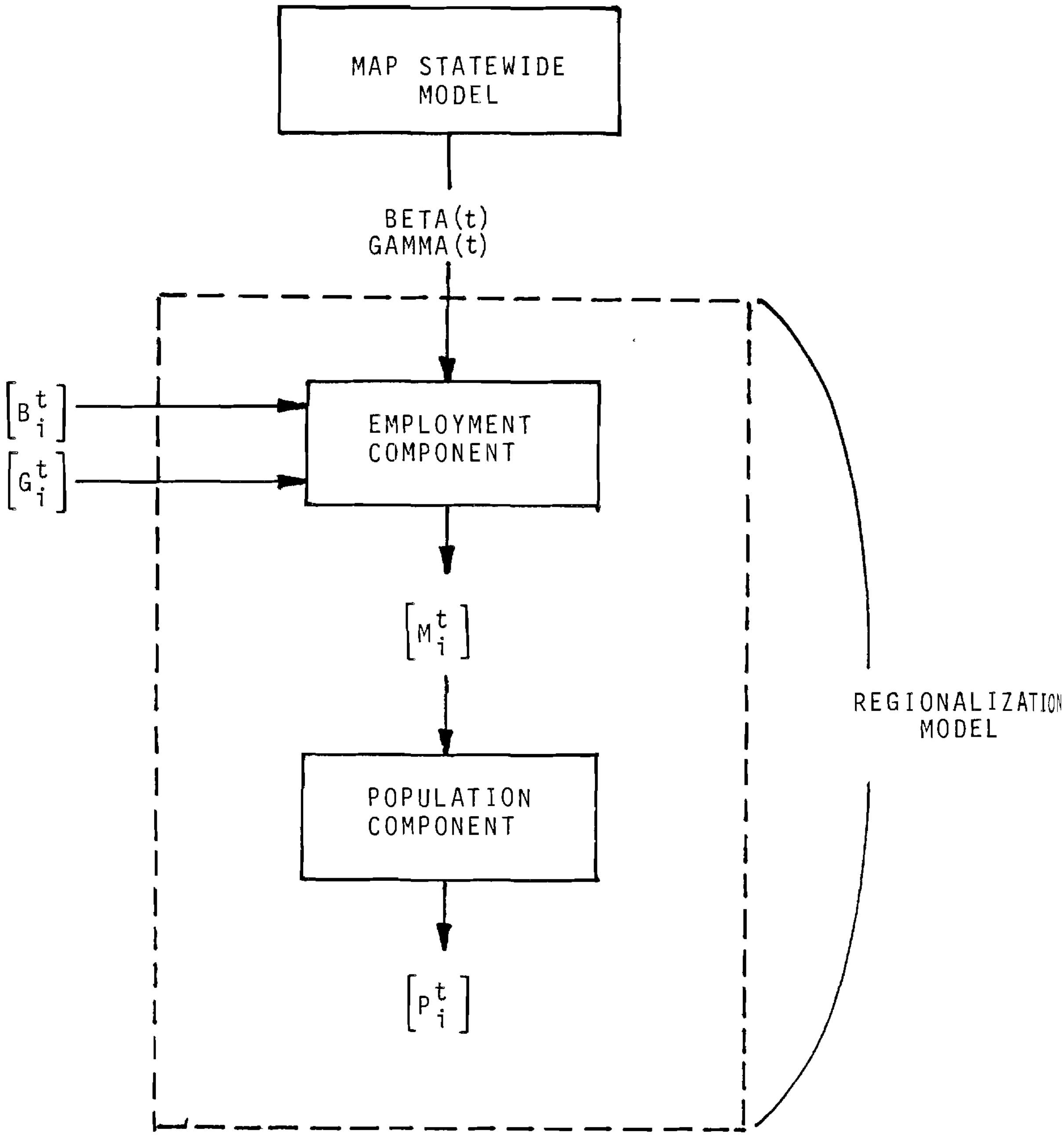
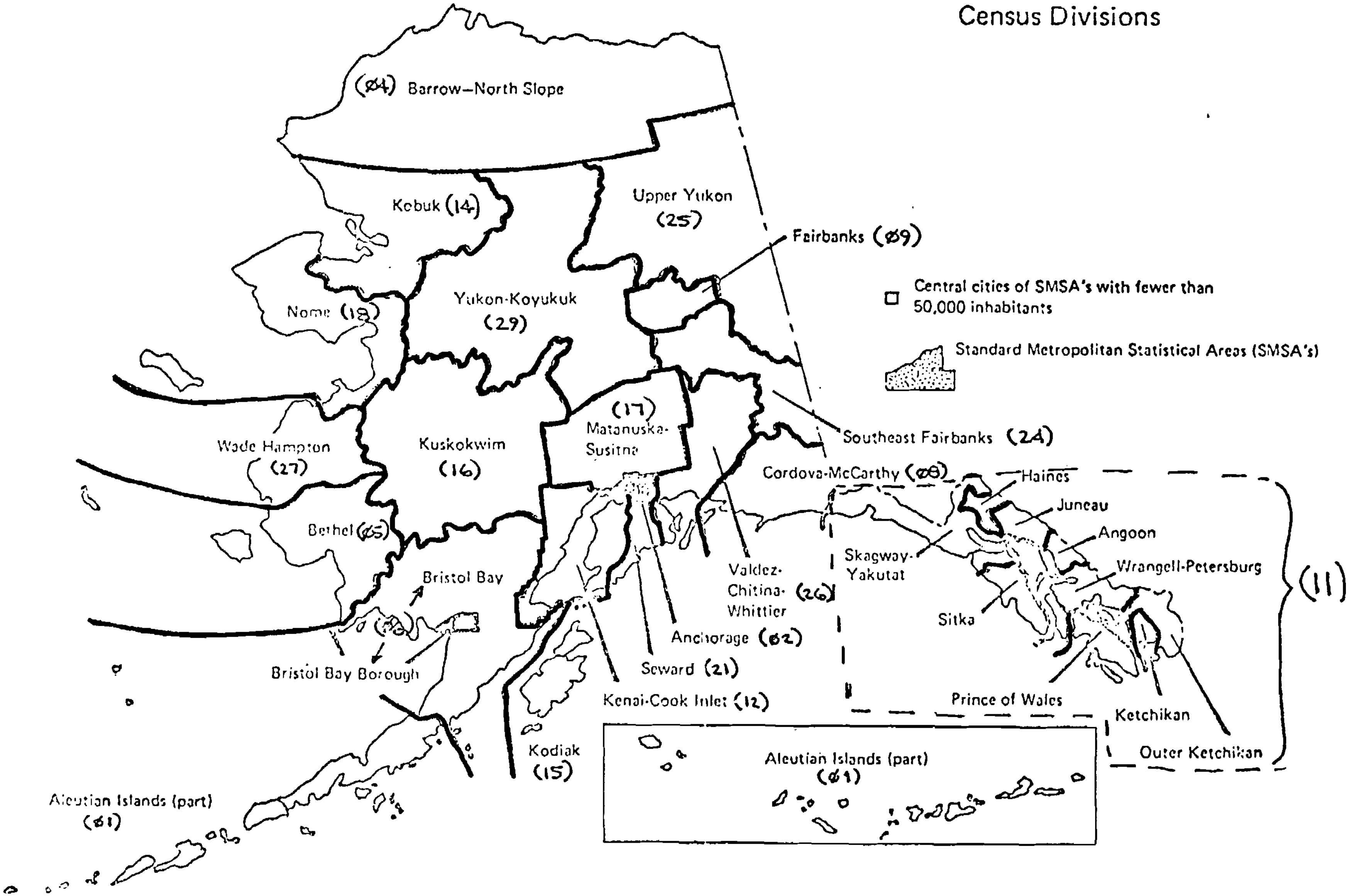


Figure F-2
Census Divisions



estimates of statewide population (also from the statewide model) to generate regional population estimates.

B. The Employment Component

Each of the twenty regions is disaggregated into three types of employment: basic, government, and support. Basic employment consists of all sectors or portions of sectors treated as exogenous in the state model: agriculture, forestry, fisheries, manufacturing, mining, construction, and a portion of transportation. Government consists of federal civilian and military employees as well as state and local employees. Support includes all other employment.

The structure of the employment model is as follows:

Define: S_{ij} = Support sector employment in region i serving region j

B_i = Basic sector employment in region i.

G_i = Government sector employment in region i.

M_i = Total employment in region i.

α_{ij} = Proportion of region j support requirements supplied by region i.

b_j = Support employment required per unit of total employment in region j.

Total employment in each of n regions is written:

$$
\begin{aligned}
&S_{11} + S_{12} + \ldots + S_{1n} + B_1 + G_1 = M_1 \\
(1)\qquad &S_{21} + S_{22} + \ldots + S_{2n} + B_2 + G_2 = M_2 \\
&\vdots \\
&S_{n1} + S_{n2} + \ldots + S_{nn} + B_n + G_n = M_n
\end{aligned}
$$

Total support sector requirements within each region may be written:

$$
(2)\qquad
\begin{array}{l}
S_{11} + S_{21} + \ . \ . \ . + S_{n1} = b_1M_1 \\
S_{12} + S_{22} + \ . \ . \ . + S_{n2} = b_2M_2 \\
\ \vdots \qquad \vdots \qquad\qquad\quad \vdots \qquad \vdots \\
S_{1n} + S_{2n} + \ . \ . \ . + S_{nn} = b_nM_n
\end{array}
$$

But $S_{ij} = \alpha_{ij}b_jM_j$, so that system (1) may be rewritten:

$$
(1')\qquad
\begin{array}{l}
\alpha_{11}b_1M_1 + \alpha_{12}b_2M_2 + \ . \ . \ . + \alpha_{1n}b_nM_n + B_1 + G_1 = M_1 \\
\alpha_{21}b_1M_1 + \alpha_{22}b_2M_2 + \ . \ . \ . + \alpha_{2n}b_nM_n + B_2 + G_2 = M_2 \\
\ \vdots \qquad\qquad \vdots \qquad\qquad\qquad\quad \vdots \qquad\quad \vdots \qquad \vdots \qquad \vdots \\
\alpha_{n1}b_1M_1 + \alpha_{n2}b_2M_2 + \ . \ . \ . + \alpha_{nn}b_nM_n + B_n + G_n = M_n
\end{array}
$$

or, in matrix notation,

$$
AM + B + G = M \qquad \text{where} \qquad
\begin{array}{l}
A = [\alpha_{ij}b_j] \\
M = [M_i] \\
B = [B_i] \\
G = [G_i]
\end{array}
$$

If the A matrix were known, then total employment is calculated as a linear function of basic and government employment, or

$$(3)\qquad M = [I - A]^{-1}\ [B + G]$$

Of course, we do not know A. By incorporating known regional data with a single simplifying assumption and a behavioral hypothesis describing the allocation of interregional support demands, however, it is possible to estimate A for a point in time, say 1979.

Known Regional Data. Regional employment for 1979 was available from the Alaska Department of Labor publications, specifically Statistical Quarterly and Alaska Economic Trends. The breakdown of such employment by basic, government, and support sectors is shown in Table F-1 for 1979.

A Simplifying Assumption. Since the major concern of the regional model is to capture the effect of support sector demands which are supplied in regions other than the one giving rise to such demands, rather than to examine the effects of differential support demands across regions, it seems plausible, or at least not overly restrictive, to impose the condition that

$$(4) \qquad b_1 = b_2 = . . . = b_n = b = (1 - \frac{B + G}{M})$$

That is, a unit of total employment, wherever it occurs in the state, is assumed to give rise to the same support sector requirements. The difference between regions, then, is solely the difference in the locations from which these demands will be supplied.

This assumption has the obvious disadvantage that it neglects real interregional differences in demand for support sector services. However, it also has several advantages which may more than compensate for this shortcoming. Most obviously, it reduces our estimation problem by n-1 parameters. More importantly, it is extremely valuable as a tool for maintaining consistency with the statewide MAP model, both in a static and a dynamic sense. Currently, a unit of basic sector employment in the state model has the same static employment impact regardless of its location in the state. Regionally varying b_j's would produce differing total statewide static impacts by location, thus being inconsistent with the state model. Furthermore, the introduction of b exogenously provides a valuable tool for maintaining dynamic consistency between the models. By letting b vary with time so as to reflect the corresponding state run, we both force the

TABLE F-1. EMPLOYMENT COMPOSITION, 1979

	Region	Support (S_i)	Basic[1] (B_i)	Government[2] (G_i)	Total (M_i
Ø1	Aleutian Islands	377	2,463	3,264	6,104
Ø2	Anchorage	45,404	13,828	34,009	93,241
Ø4	Barrow/North Slope	594	3,467	1,514	5,575
Ø5	Bethel	1,917	420	1,360	3,697
Ø6	Bristol Bay*	839	1,778	1,197	3,814
Ø8	Cordova/McCarthy	403	1,005	344	1,752
Ø9	Fairbanks	11,191	3,584	12,801	27,576
11	Southeast Alaska**	9,475	9,284	11,081	29,840
12	Kenai/Cook Inlet	2,819	3,564	1,481	7,864
14	Kobuk	402	114	935	1,451
15	Kodiak	1,644	3,631	2,051	7,326
16	Kuskokwim	123	13	435	571
17	Matanuska/Susitna	1,505	560	1,345	3,410
18	Nome	1,083	298	980	2,361
21	Seward	433	709	390	1,532
24	Southeast Fairbanks	240	149	1,636	2,025
25	Upper Yukon	99	25	302	426
26	Valdez/Chitina/Whittier	715	678	927	2,320
27	Wade Hampton	208	236	595	1,039
29	Yukon/Koyukuk	506	807	1,208	2,521
ST	Statewide	79,977	46,613	77,855	204,445

*Includes Bristol Bay and Bristol Bay Borough Census Divisions.

**Includes the following Census Divisions: Angoon, Haines, Juneau, Ketchikan, Outer Ketchikan, Prince of Wales, Sitka, Skagway-Yakutat, and Wrangell-Petersburg.

[1]Mining, manufacturing, construction, agriculture-forestry-fisheries, and miscellaneous.

[2]Federal, state, and local government.

A matrix to vary over time to reflect the same degree of structural change represented by the state model and force the employment totals to replicate the statewide results.

<u>A Behavioral Hypothesis</u>. The major reason that not all support sector requirements are supplied internally from that region is that it would be more costly to do so than to secure those services from a different region. It is only natural, then, that the cost of supply should be the major determining factor in deciding on which other regions to supply the requirements. Such costs as transportation, communication, etc. are generally expected to increase with distance and to decrease with the size of the support sector source of the region. Specifically, we will assume that such costs are:

(5) $$C_{ij} = k \frac{R_{ij}}{M_i}$$ where

C_{ij} = cost of supplying a unit of support service to region j from region i

R_{ij} = distance* between regions i and j

M_i = total employment of region i

k = an arbitrary constant

and are as presented in Table F-2 for k = 1000.

The total costs of interregional service provision are then:

(6) $$C = \sum_{j=1}^{n} \sum_{i=1}^{n} C_{ij} S_{ij}$$

We hypothesize that the S_{ij}'s actually chosen in any given time period are chosen in such a way as to minimize the costs of providing the required services observed in region j from each of the sources of such supply i.

---

*Air fares were used as a proxy for distance since straight line distances fail to capture the structure of statewide transportation and communications networks.

TABLE F-2. ASSUMED COSTS OF INTERREGIONAL SERVICE PROVISION

Supply Region \ Demand Region	Ø1	Ø2	Ø4	Ø5	Ø6	Ø8	Ø9	11	12	14	15	16	17	18	21	24	25	26	27	29
Ø1 Aleutian Islands	0	33	52	45	23	57	42	47	36	48	41	40	37	48	37	48	47	40	47	44
Ø2 Anchorage	2	0	1	1	1	*	1	1	*	1	1	*	*	1	*	1	1	*	1	1
Ø4 Barrow/North Slope	57	20	0	33	30	26	15	36	22	29	29	22	24	29	24	25	20	28	38	24
Ø5 Bethel	75	20	50	0	35	29	28	43	25	36	33	32	25	25	26	44	37	32	8	38
Ø6 Bristol Bay	37	15	45	34	0	23	28	37	19	39	13	26	20	39	20	38	37	26	36	33
Ø8 Cordova/McCarthy	199	18	83	61	50	0	47	38	29	70	46	43	30	70	31	68	66	13	64	57
Ø9 Fairbanks	9	2	3	4	4	3	0	4	3	3	3	2	3	3	3	2	1	3	5	2
11 Southeast Alaska	10	3	7	5	5	2	3	0	3	6	4	4	4	6	4	5	4	3	6	5
12 Kenai/Cook Inlet	28	2	16	12	9	6	9	13	0	14	8	8	5	14	5	13	13	8	13	11
14 Kobuk	203	63	112	92	101	85	57	122	75	0	96	76	76	28	78	97	79	93	72	34
15 Kodiak	34	7	22	17	7	11	11	18	9	19	0	13	9	19	10	19	18	13	20	16
16 Kuskokwim	433	77	215	207	175	133	74	228	109	194	161	0	112	123	116	177	131	154	256	49
17 Matanuska/Susitna	65	6	39	28	22	15	21	31	11	33	20	19	0	33	12	32	30	19	30	26
18 Nome	125	39	69	39	62	52	35	75	46	17	59	30	47	0	48	60	49	57	27	21
21 Seward	147	14	89	63	51	35	48	70	26	74	46	43	27	74	0	72	69	43	67	59
24 S.E. Fairbanks	144	43	69	80	71	59	29	79	52	70	67	50	53	70	54	0	45	65	83	54
25 Upper Yukon	674	197	268	319	329	272	77	315	239	270	310	176	244	270	249	216	0	300	385	197
26 Valdez/Chitina/Whittier	106	19	68	51	43	10	41	38	27	58	40	38	28	58	28	57	55	0	54	48
27 Wade Hampton	273	78	204	27	132	109	126	161	95	101	144	141	97	62	99	163	158	120	0	110
29 Yukon Koyukuk	107	27	52	56	49	40	20	61	34	20	46	11	35	20	36	44	33	44	45	0

* Indicates $C_{ij} < 0.5$.

Estimating the Interregional Interaction Matrix. The hypothesis of (c) and the condition of (b) imply that our observed 1979 data represented the solution to a constrained minimization problem of the form:

$$
\begin{aligned}
&\text{Min} \sum_{j=1}^{n} \sum_{i=1}^{n} C_{ij} S_{ij} \\
&\text{ST} \quad S_{11} + S_{12} + \ldots + S_{2n} = M_1^{79} - B_1^{79} - G_1^{79} \\
&\qquad S_{21} + S_{22} + \ldots + S_{2n} = M_2^{79} - B_2^{79} - G_2^{79} \\
&\qquad \vdots \\
&\qquad S_{n1} + S_{n2} + \ldots + S_{nn} = M_n^{79} - B_n^{79} - G_n^{79} \\
(7) \quad &\qquad S_{11} + S_{21} + \ldots + S_{n1} = b^{79} M_1^{79} \\
&\qquad S_{12} + S_{22} + \ldots + S_{n2} = b^{79} M_2^{79} \\
&\qquad \vdots \\
&\qquad S_{1n} + S_{2n} + \ldots + S_{nn} = b^{79} M_n^{79} \\
&\qquad S_{ij} \geq 0 \qquad \forall\, i,j
\end{aligned}
$$

Note that $S_{ij} = \alpha_{ij} b^{79} M_j^{79}$, so that problem (7) may be reformulated in terms of decision variables with a far more intuitive meaning than the S_{ij}'s, namely the α_{ij}'s. The reformulated problem is then:

$$\text{Min } b^{79} \sum_{j=1}^{n} \sum_{i=1}^{n} C_{ij}\ \alpha_{ij}\ M_j^{79}$$

$$\text{ST} \quad \alpha_{11} + \alpha_{12}\ M_2^{79}/M_1^{79} + \ldots\ \alpha_{1n}\ M_n^{79}/M_1^{79} = \frac{N_1^{79}}{M_1^{79}} / b^{79}$$

$$\alpha_{21}\ M_1^{79}/M_2^{79} + \alpha_{22} + \ldots\ \alpha_{2n}\ M_n^{79}/M_2^{79} = \frac{N_2^{79}}{M_2^{79}} / b^{79}$$

$$\vdots$$

$$\alpha_{n1}\ M_1^{79}/M_n^{79} + \alpha_{n2}\ M_2^{79}/M_n^{79} + \ldots\ \alpha_{nn} = \frac{N_n^{79}}{M_n^{79}} / b^{79} \tag{7'}$$

$$\alpha_{11} + \alpha_{21} + \ldots + \alpha_{n1} = 1$$

$$\alpha_{12} + \alpha_{22} + \ldots + \alpha_{n2} = 1$$

$$\vdots$$

$$\alpha_{1n} + \alpha_{2n} + \ldots + \alpha_{nn} = 1$$

$$\alpha_{ij} \geq 0 \qquad \forall\ i,j$$

where $N_i^{79} = M_i^{79} - B_i^{79} - G_i^{79}$

which, assuming that a feasible solution exists, can be solved using a standard linear programming routine.

The solution, a set of nxn α_{ij}'s, comprises a matrix which we will call the regional interaction matrix. Each entry, α_{ij}, represents the share of support requirements in region j supplied from region i. Each of the columns, therefore, must sum to unity. Thus, a quick glance down each column provides a subjective test of the plausibility of the matrix. A priori, one would expect nonzero entries in all of the diagonal elements and along the rows of the regional support centers (Bethel, Fairbanks, Nome,) and probably along the entire row corresponding to Anchorage, which is a statewide support center.

Summary. Once the regional interaction matrix has been determined for a single year, say 1979, then this together with b^{79} determines fully the A matrix which existed in 1979. For projections to a future period t, we will assume that the interregional interaction matrix remains stable, but that b changes in the regional model as it does in a corresponding run of the statewide model. Therefore, employment is estimated in year t as

$$M(t) = [I - A(t)]^{-1} \; [B(t) + G(t)] \tag{8}$$

where $A(t) = b(t)\ [\alpha_{ij}^{79}]$

3. The Population Component

Currently, the population model is specified as independent of the employment model. We can define:

R_{ij} = Residents from region i working in region j

β_{ij} = Proportion of employees working in region j residing in region i

R_i = Resident employment in region i

P_i = Population in region i

d_i = Dependents per employee in region i

Total resident employment in the regions may be written as:

$$
(9)\qquad
\begin{array}{l}
R_{11} + R_{12} + \ldots + R_{1n} = R_1 \\
R_{21} + R_{22} + \ldots + R_{2n} = R_2 \\
\vdots \\
R_{n1} + R_{n2} + \ldots + R_{nn} = R_n
\end{array}
$$

or, since $R_{ij} = \beta_{ij}M_j$, as

$$
(9')\qquad
\begin{array}{l}
\beta_{11}M_1 + \beta_{12}M_2 + \ldots + \beta_{1n}M_n = R_1 \\
\beta_{21}M_1 + \beta_{22}M_2 + \ldots + \beta_{2n}M_n = R_2 \\
\vdots \\
\beta_{n1}M_1 + \beta_{n2}M_2 + \ldots + \beta_{nn}M_n = R_n
\end{array}
$$

Total resident population may then be written:

$$
(10)\qquad
\begin{array}{l}
(1+d_1)\beta_{11}M_1 + (1+d_1)\beta_{12}M_2 + \ldots + (1+d_1)\beta_{1n}M_n = P_1 \\
(1+d_2)\beta_{21}M_1 + (1+d_2)\beta_{22}M_2 + \ldots + (1+d_2)\beta_{2n}M_n = P_2 \\
\vdots \\
(1+d_n)\beta_{n1}M_1 + (1+d_n)\beta_{n2}M_2 + \ldots + (1+d_n)\beta_{nn}M_n = P_n
\end{array}
$$

or in matrix notation

$$
(11)\qquad QM = P \qquad \text{where} \quad
\begin{array}{l}
Q = [(1+d_i)\beta_{ij}] \\
M = [M_i] \\
P = [P_i]
\end{array}
$$

Now, the interregional structure of nonresident employment is captured in the Q matrix, called the location matrix, which is unknown and must be estimated.

Generally, there are three properties which this matrix should ideally satisfy. First, it would be desirable that such a structure reflect differential dependency rates across regions ($d_i \neq d_j$). Second, it should reflect independence of extra-regional employment changes. That is, if employment does not change in region i, population should not change in region i. Third, it should be consistent with the state model. Unfortunately, it is impossible to satisfy all three properties simultaneously.

The first and second property may be satisfied by assuming that employees reside in the region of their employment. If such is the case, then the interregional location matrix, composed of the β_{ij}'s, is the identity matrix, and system (9) implies that

$$(12) \qquad d_i = \frac{P_i}{M_i} - 1 \qquad (i = 1, \ldots, n)$$

so that Q is a diagonal matrix which can be estimated using 1979 data. Unfortunately, this procedure cannot be made consistent with the statewide model since total population impacts of changes in the scenarios will be dependent on the location of employment as well as its magnitude, while it is currently independent of location in the statewide model.

By adjusting the d_i's over time, so that

$$(13) \qquad (1 + d_i^t) = (1 + d_i^{79}) * \left[\frac{\Sigma M_i^t}{\Sigma (1+d_1^{79}) M_1^t}\right] * \partial (t)$$

where $\partial(t)$ = statewide population-to-employment ratio, we can force consistency with the state model, but at a cost of giving up the independence of extra-regional employment change property. Now, a change in employment in region $j \neq i$ will change the adjustment factor in (13), thus changing total population in region i even if employment does not change in region i.

Consistency with the state model and independence of extra-regional employment changes may be achieved by requiring that all d_i's are equal to the statewide average, but this fails to satisfy the first property and is inconsistent with an identity location matrix. If we are willing to abandon the first property, the problem may be solved in much the same way as was the problem posed in estimating the parameters of the employment component, by solving the following linear programming problem:

$$\text{Min} \sum_{j=1}^{n} \sum_{i=1}^{n} C_{ij} R_{ij}$$

$$
\begin{aligned}
\text{ST} \quad & R_{11} + R_{12} + \ldots + R_{1n} = R_1^{79} \\
& R_{21} + R_{22} + \ldots + R_{nn} = R_2^{79} \\
& \vdots \\
& R_{n1} + R_{n2} + \ldots + R_{nn} = R_n^{79} \\
& R_{11} + R_{21} + \ldots + R_{n1} = (1+d^{79})\ M_1^{79} \\
& R_{12} + R_{22} + \ldots + R_{n2} = (1+d^{79})\ M_2^{79} \\
& \vdots \\
& R_{1n} + R_{2n} + \ldots + R_{nn} = (1+d^{79})\ M_n^{79}
\end{aligned}
\qquad (14)
$$

or alternately, since $R_{ij} = (1+d^{79})\ \beta_{ij}\ M_i^{79}$

$$\text{Min}\quad (1+d^{79}) \sum_{j=1}^{n} \sum_{i=1}^{n} C_{ij}\beta_{ij}M_j^{79}$$

$$\text{ST}\quad \beta_{11}M_1 + \beta_{12}M_2 + \ldots + \beta_{1n}M_n = P_1 \,/\, (1+d^{79})$$

$$\beta_{21}M_1 + \beta_{22}M_2 + \ldots + \beta_{2n}M_n = P_2 \,/\, (1+d^{79})$$

$$\vdots$$

$$(14')\qquad \beta_{n1}M_1 + \beta_{n2}M_2 + \ldots + \beta_{nn}M_n = P_n \,/\, (1+d^{79})$$

$$\beta_{11} + \beta_{21} + \ldots + \beta_{n1} = 1$$

$$\beta_{12} + \beta_{22} + \ldots + \beta_{n2} = 1$$

$$\vdots$$

$$\beta_{1n} + \beta_{2n} + \ldots + \beta_{nn} = 1$$

The current version of the model adopts the second of these three alternate procedures, using an identity location matrix and adjusting the d_i's over time as described by equation (13).

While such a procedure has the obvious advantage of simplicity, it has several serious drawbacks. First, as mentioned earlier, such a specification necessarily will produce population impacts in regions where no employment changes have occurred, as a consequence of the adjustment factor in equation (13). The operation of this factor gives the model the property that growing regions will attract population from (relatively) stagnant regions. However, within the constraints of the limited scope of this project, it was felt that such a drawback was less serious than those associated with the available alternatives. Furthermore, there are several reasons to believe that this effect is likely to not be a serious shortcoming of the model. First, the population drawn from stagnant regions is quite small and is generally offset by induced increases in government employment which are always more widely dispersed than initial changes in basic employment. More importantly, however, the direction of the effect will always be the same as a real effect--interregional migration, which has been neglected entirely. Thus, the drain may actually offset, at least in a small way, a known estimation error. Nonetheless, the population estimation procedure must be regarded as generally much weaker than the employment component described earlier, and it needs to be improved with further research.

III. Parameters of the Model

A. The Regional Employment Interaction Matrix

The 1979 $[\alpha_{ij}]$ matrix estimated by the linear programming routine for the problem described in Part II is presented in Table F-3. Note that the pattern is as would have been expected. All diagonal terms are nonzero, with the larger support centers being self-sufficient (having diagonal entries of 1). Anchorage and Fairbanks appear to be the only significant support centers, with Anchorage supplying most regions and Fairbanks supplying Kuskokwim, Upper Yukon, and Yukon-Koyukuk. Two local support centers emerge, with Bethel supporting Wade Hampton and Nome supporting Kobuk.

TABLE F-3. EMPLOYMENT INTERACTION MATRIX, 1979

Supply Region	Demand Region ∅1	∅2	∅4	∅5	∅6	∅8	∅9	11	12	14	15	16	17	18	21	24	25	26	27	29
∅1 Aleutian Islands	.16																			
∅2 Anchorage	.84	1.	.73		.44	.41		.19	.08	.01	.43				.28	.7			.21	.25
∅4 Barrow			.27																	
∅5 Bethel				1.															.49	
∅6 Bristol Bay					.56															
∅8 Cordova/McCarthy						.59														
∅9 Fairbanks							1.					.45					.41			.24
11 Southeast Alaska								.81												
12 Kenai/Cook Inlet									.92											
14 Kobuk										.71										
15 Kodiak											.57									
16 Kuskokwim												.55								
17 Matanuska/Susitna													1.							
18 Nome										.28				1.						
21 Seward															.72					
24 S.E. Fairbanks																.3				
25 Upper Yukon																	.59			
26 Valdez/Chitina/Whittier																		.79		
27 Wade Hampton																			.51	
29 Yukon Koyukuk																				.51

B. Employment Location Matrix

As discussed above in Part II, the regional employment location matrix will, in this application, be assumed to be the identity matrix.

C. Population/Employment Ratio Vector

The vector of population-to-employment ratios for 1979 is presented in Table F-4.

TABLE F-4. POPULATION/EMPLOYMENT RATIOS, 1979

	Region	Population	Employment	Population/ Employment
Ø1	Aleutian Islands	7,030	6,104	1.15
Ø2	Anchorage	177,981	93,241	1.91
Ø4	Barrow/North Slope	4,771	5,575	0.86
Ø5	Bethel	9,739	3,697	2.63
Ø6	Bristol Bay	5,204	3,814	1.36
Ø8	Cordova/McCarthy	2,475	1,752	1.41
Ø9	Fairbanks	54,000	27,576	1.96
11	Southeast Alaska	51,319	29,840	1.72
12	Kenai/Cook Inlet	23,244	7,864	2.96
14	Kobuk	4,695	1,451	3.24
15	Kodiak	9,956	7,326	1.36
16	Kuskokwim	2,941	571	5.15
17	Matanuska/Susitna	18,910	3,410	5.55
18	Nome	6,755	2,361	2.06
21	Seward	3,152	1,532	2.06
24	S.E. Fairbanks	5,507	2,025	2.72
25	Upper Yukon	1,482	426	3.48
26	Valdez/Chitina/Whittier	7,013	2,320	3.02
27	Wade Hampton	4,853	1,039	4.67
29	Yukon Koyukuk	5,325	2,521	2.11
ST	Statewide	406,352	204,445	1.99

IV. Railbelt/Nonrailbelt Interactions

By rearranging the rows and columns of the regional employment interaction matrix, it is possible to isolate the seven census divisions of the railbelt and examine its linkages to the rest of the state. The seven rows corresponding to the railbelt are presented in Table F-5.

Note from the table that the railbelt, taken as a whole, is self-sufficient (i.e., the column sums within the railbelt partition all equal 1). Therefore, the railbelt itself exerts no support sector demands on the rest of the state.

TABLE F-5. RAILBELT PARTITION OF THE $[\alpha_{ij}]$ MATRIX

	Demand Region						
Supply Region	Ø2	Ø9	12	17	21	24	26
Ø2 Anchorage	1.		.08		.28	.7	.21
Ø9 Fairbanks		1.					
12 Kenai/Cook Inlet			.92				
17 Matanuska/Susitna				1.			
21 Seward					.72		
24 S.E. Fairbanks						.3	
26 Valdez/Chitina/Whittier							.79

Thus, we might rewrite the regional employment interaction matrix, treating the railbelt partition as a single region, supplying all of its support sector demands but having demands put on it from the rest of the state as shown in Table F-6.

TABLE F-6. RAILBELT/NON-RAILBELT INTERACTIONS

Supply Region		Demand Region RB	Ø1	Ø4	Ø5	Ø6	Ø8	11	14	15	16	18	25	27	29
RB	Railbelt	1.	.86	.23		.44	.41	.19	.29	.43	.45		.41	.49	.49
Ø1	Aleutian Islands		.14												
Ø4	Barrow			.27											
Ø5	Bethel				1.										
Ø6	Bristol Bay					.56									
Ø8	Cordova/McCarthy						.59								
11	Southeast Alaska							.81							
14	Kobuk								.71						
15	Kodiak									.57					
16	Kuskokwim										.55				
18	Nome											1.			
25	Upper Yukon												.59		
27	Wade Hampton													.51	
29	Yukon Koyukuk														.51

The structure can then be summarized as follows: The railbelt is itself self-sufficient, imposing no support demands on the rest of the state and, furthermore, is the exclusive source of external supply to all nonrailbelt regions, except Bethel and Nome which appear self-sufficient.

Appendix G

STOCHASTIC EQUATION ESTIMATION RESULTS

1: LOG(R.C-1) = CRCA+CRCB*(EM991+EM991(-1))/2

NOB = 13 NOVAR = 2
RANGE = 1961 TO 1973
RSQ = 0.78306 CRSQ = 0.76334 F(1/11) = 39.705
SER = 0.0545 SSR = 3.269E-02 DW(0) = 0.90 COND(X) = 14.71

COEF	VALUE	ST ER	T-STAT
CRCA	-0.18087	0.11175	-1.61844
CRCB	-0.00636	0.00101	-6.30113

2: RCYCL = C2A+C2B*(DEL(1 : EM991)/EM991(-1))**2

NOB = 18 NOVAR = 2
RANGE = 1962 TO 1979
RSQ = 0.57085 CRSQ = 0.54402 F(1/16) = 21.283
SER = 0.0168 SSR = 4.515E-03 DW(0) = 2.55 COND(X) = 1.53

COEF	VALUE	ST ER	T-STAT
C2A	-0.00202	0.00433	-0.46799
C2B	1.73189	0.37541	4.61332

248: LOG(EMCM) = C69A+C69B*LOG(XXCM)

NOB = 19 NOVAR = 2
RANGE = 1961 TO 1979
RSQ = 0.93114 CRSQ = 0.92709 F(1/17) = 229.888
SER = 0.0839 SSR = 0.120 DW(0) = 0.69 COND(X) = 16.20

COEF	VALUE	ST ER	T-STAT
C69A	-1.45393	0.15641	-9.29584
C69B	0.51927	0.03425	15.16200

226: LOG(EMCN1) = C56A+C56B*LOG(XXCN1)

NOB = 19 NOVAR = 2
RANGE = 1961 TO 1979
RSQ = 0.99559 CRSQ = 0.99533 F(1/17) = 3838.850
SER = 0.0267 SSR = 1.215E-02 DW(0) = 0.97 COND(X) = 24.72

COEF	VALUE	ST ER	T-STAT
C56A	-2.68682	0.07593	-35.38530
C56B	1.16087	0.01874	61.95780

```
257:  LOG(EMDNT9) = C77A+C77B*LOG(XXDNT9)

NOB = 19       NOVAR = 2
RANGE =  1961 TO 1979
RSQ =    0.99773      CRSQ =    0.9976        F(1/17) =   7471.400
SER =    0.0224       SSR = 8.526E-03         DW(0) =   0.89      COND(X) =     18.93

COEF            VALUE           ST ER         T-STAT

C77A          -1.50795         0.04875      -30.92990
C77B           0.85624         0.00991       86.43610
```



```
260:  LOG(EMFI) = C81A+C81B*LOG(XXFI)

NOB = 19       NOVAR = 2
RANGE =  1961 TO 1979
RSQ =    0.99735      CRSQ =    0.99719       F(1/17) =   6397.350
SER =    0.0299       SSR = 1.523E-02         DW(0) =   1.44      COND(X) =     16.34

COEF            VALUE           ST ER         T-STAT

C81A          -3.24800         0.05631      -57.68220
C81B           0.98069         0.01226       79.98310
```

238: LOG(EMM91) = C61A+C61B*LOG(XXM91)+C61C*LOG(EMM91(-1))

NOB = 19 NOVAR = 3
RANGE = 1961 TO 1979
RSQ = 0.96838 CRSQ = 0.96443 F(2/16) = 244.996
SER = 0.0513 SSR = 4.213E-02 DW(0) = 1.81 COND(X) = 85.52

COEF	VALUE	ST ER	T-STAT
C61A	-0.50259	0.20072	-2.50397
C61B	0.24598	0.10047	2.44834
C61C	0.70080	0.15324	4.57314

300: LOG(EMPR01) = C100A+C100B*LOG(EM991)

NOB = 11 NOVAR = 2
RANGE = 1969 TO 1979
RSQ = 0.92787 CRSQ = 0.91985 F(1/9) = 115.769
SER = 0.0751 SSR = 5.079E-02 DW(0) = 0.79 COND(X) = 53.29

COEF	VALUE	ST ER	T-STAT
C100A	-4.74057	0.60377	-7.85159
C100B	1.28612	0.11953	10.75940

```
252:  LOG(EMPU) = C73A+C73C*PIPE(-1)+C73B*LOG(XXPU)

NOB = 19      NOVAR = 3
RANGE =  1961 TO 1979
RSQ =    0.98704      CRSQ =    0.98542     F(2/16) =   609.418
SER =    0.0441       SSR = 3.105E-02      DW(0) =   0.83     COND(X) =    15.94
```

COEF	VALUE	ST ER	T-STAT
C73A	-2.24459	0.07121	-31.51910
C73C	-0.11599	0.03411	-3.40081
C73B	0.57829	0.02096	27.58850

```
265:  LOG(EMSNT91) = C85A+C85C*PIPE(-1)+C85B*LOG(XXSNT91)

NOB = 19      NOVAR = 3
RANGE =  1961 TO 1979
RSQ =    0.99814      CRSQ =    0.99791     F(2/16) =  4294.240
SER =    0.0258       SSR = 1.066E-02      DW(0) =   0.60     COND(X) =    24.28
```

COEF	VALUE	ST ER	T-STAT
C85A	-1.80619	0.06422	-28.12310
C85C	-0.05218	0.02185	-2.38838
C85B	1.00778	0.01590	63.38740

243: LOG(EMTNT91) = C65A+C65B*LOG(XXTNT91)

NOB = 19   NOVAR = 2
RANGE = 1961 TO 1979
RSQ = 0.97321   CRSQ = 0.97163   F(1/17) = 617.465
SER = 0.0568   SSR = 5.494E-02   DW(0) = 0.68   COND(X) = 18.13

COEF	VALUE	ST ER	T-STAT
C65A	-1.11858	0.11858	-9.43288
C65B	0.66171	0.02663	24.84850

251: XXCM = C68A+C68B*DPI3R+C68C*DPI3R(-2)+C68D/T+C68E*DPIXR

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.98789 CRSQ = 0.98443 F(4/14) = 285.539
SER = 9.3045 SSR = 1212.030 DW(0) = 1.37 COND(X) = 49.19

COEF	VALUE	ST ER	T-STAT
C68A	-49.64820	11.74540	-4.22703
C68B	-0.15265	0.04845	-3.15082
C68C	0.35914	0.04151	8.65268
C68D	57.62300	12.31880	4.67763
C68E	0.30808	0.06639	4.64069

224: XXCN8 = C54A+C54B*DPI3R+C54C*DPIXR+C54D*DPIXR(-1)+C54E*D64.65

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.92929 CRSQ = 0.90909 F(4/14) = 46.001
SER = 5.2486 SSR = 385.663 DW(0) = 1.73 COND(X) = 9.23

COEF	VALUE	ST ER	T-STAT
C54A	11.78040	4.31158	2.73228
C54B	0.04029	0.00541	7.43995
C54C	0.02003	0.01769	1.13215
C54D	0.02258	0.02001	1.12846
C54E	5.76665	4.14525	1.39115

259: XXDNT9 = C76A+C76B*DPI3R+C76C*DPIXR+C76D*DPI3R(-1)+C76E*DPI3R(-2)

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.9972 CRSQ = 0.9964 F(4/14) = 1245.870
SER = 4.9025 SSR = 336.481 DW(0) = 1.35 COND(X) = 76.09

COEF	VALUE	ST.ER	T-STAT
C76A	-29.27810	4.77719	-6.12873
C76B	0.18117	0.03386	5.35069
C76C	0.12551	0.03473	3.61388
C76D	-0.11196	0.03742	-2.99210
C76E	0.15292	0.02651	5.76928

266: XXFI = C80A+C80B*DPI3R(-2)+C80C*DPIXR+C80D*DPIXR(-1)+C80E*DPIXR(-2)

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.99511 CRSQ = 0.99371 F(4/14) = 711.768
SER = 5.3583 SSR = 401.962 DW(0) = 1.50 COND(X) = 11.63

COEF	VALUE	ST ER	T-STAT
C80A	-22.43370	4.46849	-5.02043
C80B	0.17004	0.00720	23.61510
C80C	0.19616	0.02466	7.95573
C80D	-0.06807	0.02966	-2.29523
C80E	0.08615	0.03326	2.59039

255: XXPU = C72A+C72B*DPI3R(-1)+C72C*DPIXR+C72D*DPI3R(-2)

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.99556 CRSQ = 0.99467 F(3/15) = 1120.040
SER = 2.2694 SSR = 77.250 DW(0) = 1.26 COND(X) = 49.80

COEF	VALUE	ST ER	T-STAT
C72A	-21.84920	1.45963	-14.96900
C72B	0.01556	0.01238	1.25648
C72C	0.04433	0.00936	4.73861
C72D	0.07127	0.01212	5.87864

235: LOG(XXP9) = C52A+C52B*LOG(EMP9)

NOB = 19 NOVAR = 2
RANGE = 1961 TO 1979
RSQ = 0.81384 CRSQ = 0.80289 F(1/17) = 74.320
SER = 0.4278 SSR = 3.111 DW(0) = 0.25 COND(X) = 3.41

COEF	VALUE	ST ER	T-STAT
C52A	3.91605	0.18178	21.54230
C52B	1.54642	0.17938	8.62084

270: XXSNT91 = C84A+C84B*DPI3R+C84C*DPIXR+C84D*DPI3R(-1)+C84E*DPI3R(-2)+C84F*DPIXR(-2)

NOB = 19 NOVAR = 6
RANGE = 1961 TO 1979
RSQ = 0.99727 CRSQ = 0.99621 F(5/13) = 948.185
SER = 2.9717 SSR = 114.800 DW(0) = 2.66 COND(X) = 107.52

COEF	VALUE	ST ER	T-STAT
C84A	-12.30280	3.28574	-3.74430
C84B	0.06517	0.02428	2.68368
C84C	0.14450	0.02106	6.86179
C84D	-0.06513	0.03187	-2.04333
C84E	0.11070	0.01724	6.42020
C84F	0.05852	0.01724	3.39443

243: XXTNT91 = C64A+C64B*DPIXR+C64C*DPI3R+C64D*DPIXR(-1)

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.9756 CRSQ = 0.97072 F(3/15) = 199.937
SER = 8.1345 SSR = 992.544 DW(0) = 1.80 COND(X) = 8.65

COEF	VALUE	ST ER	T-STAT
C64A	-18.39780	6.17880	-2.97757
C64B	0.11155	0.02741	4.06908
C64C	0.13393	0.00805	16.63940
C64D	-0.11763	0.03087	-3.81049

206: LOG(PIPRO1/RPI) = C45A+C45B*LOG(EMPRO1)

NOB = 11 NOVAR = 2
RANGE = 1969 TO 1979
RSQ = 0.93327 CRSQ = 0.92586 F(1/9) = 125.877
SER = 0.0670 SSR = 4.039E-02 DW(0) = 1.61 COND(X) = 13.91

COEF	VALUE	ST ER	T-STAT
C45A	-2.10777	0.14125	-14.92200
C45B	0.89573	0.07984	11.21950

204: PI2 = C44A+C44E*D61.76+C44B*(WS99-ECONX1*WRCNP/1000)+C44C*(ECONX1*WRCNP/1000.)
+C44D*(ECONX1(-1)*WRCNP(-1)/1000.)

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.99999 CRSQ = 0.99998 F(4/14) = 2.43E+05
SER = 6.6186 SSR = 613.279 DW(0) = 2.08 COND(X) = 30.34

COEF	VALUE	ST ER	T-STAT
C44A	106.09600	19.01040	5.58093
C44E	-143.21000	14.77180	-9.69482
C44B	1.16482	0.00475	245.42600
C44C	1.08043	0.01755	61.57890
C44D	-0.01917	0.01236	-1.55041

133: INTREC = CEX1+CEX2*(EXOPS-RTSL)

NOB = 9 NOVAR = 2
RANGE = 1971 TO 1979
RSQ = 0.91348 CRSQ = 0.90112 F(1/7) = 73.903
SER = 6.8279 SSR = 326.345 DW(0) = 1.82 COND(X) = 4.96

COEF	VALUE	ST ER	T-STAT
CEX1	-2.17134	5.87385	-0.36966
CEX2	0.10716	0.01247	8.59669

32: LOG(RTCS1) = CRTCSA+CRTCSB*LOG(EM991)

NOB = 19 NOVAR = 2
RANGE = 1961 TO 1979
RSQ = 0.96114 CRSQ = 0.95885 F(1/17) = 420.429
SER = 0.2154 SSR = 0.789 DW(0) = 1.52 COND(X) = 36.76

COEF	VALUE	ST ER	T-STAT
CRTCSA	-16.80270	0.90895	-18.48570
CRTCSB	3.82653	0.18662	20.50430

```
15:  LOG(WSGS) = A+B*LOG(WSGSFY)+C*D75

NOB = 15      NOVAR = 3
RANGE =  1965 TO 1979
RSQ =    0.99765     CRSQ =    0.99726      F(2/12) =  2552.530
SER =    0.0338      SSR = 1.373E-02        DW(0) =  2.18      COND(X) =     16.24

COEF             VALUE            ST ER          T-STAT

A              0.19181          0.06876         2.78959
B              0.97365          0.01402        69.45630
C              0.04837          0.03586         1.34878
```

```
192:  EDBL = CEXL4A+CEXL4B*GOBONDL(-1)

NOB = 10       NOVAR = 2
RANGE =  1970 TO 1979
RSQ =    0.67677       CRSQ =    0.63636      F(1/8) =     16.750
SER =  19.5466         SSR =  3056.540        DW(0) =  1.04       COND(X) =       4.79

COEF              VALUE            ST ER          T-STAT

CEXL4A        -27.68660         15.46260        -1.79056
CEXL4B          0.18387          0.04493         4.09265
```

```
198:  EEDLCP = CEXL5A+CEXL5B*EEDL

NOB = 18       NOVAR = 2
RANGE =  1962 TO 1979
RSQ =    0.79584       CRSQ =    0.78308      F(1/16) =     62.371
SER =  10.1619         SSR =  1652.240        DW(0) =  1.23       COND(X) =       2.89

COEF              VALUE            ST ER          T-STAT

CEXL5A         -1.35367          3.87168        -0.34964
CEXL5B          0.20891          0.02645         7.89755
```

190: EEDL98 = CEXL1A+CEXL1B*PI3(-1)

NOB = 15 NOVAR = 2
RANGE = 1965 TO 1979
RSQ = 0.77962 CRSQ = 0.76266 F(1/13) = 45.988
SER = 14.6784 SSR = 2800.910 DW(0) = 2.28 COND(X) = 3.58

COEF	VALUE	ST ER	T-STAT
CEXL1A	-0.26526	7.31367	-0.03627
CEXL1B	0.02055	0.00303	6.78145

193: ENEL1/RPI(-1)/POP(-1) = CEXL6A+CEXL6B*D71.00+CEXL6C*DPI3R(-1)/POP(-1)

NOB = 18 NOVAR = 3
RANGE = 1962 TO 1979
RSQ = 0.93944 CRSQ = 0.93136 F(2/15) = 116.341
SER = 2.31E-04 SSR = 8.005E-07 DW(0) = 1.73 COND(X) = 18.30

COEF	VALUE	ST ER	T-STAT
CEXL6A	-0.00110	3.82333E-04	-2.87172
CEXL6B	7.29219E-04	1.94907E-04	3.74137
CEXL6C	9.38336E-04	1.81871E-04	5.15934

```
200: EPERSL = CEXL2A+CEXL2B*(E99L-EEDLCP-EDBL)

NOB = 18      NOVAR = 2
RANGE =  1962 TO 1979
RSQ =    0.99703      CRSQ =    0.99685      F(1/16) =  5374.960
SER =    5.2761       SSR =    445.398       DW(0) =  2.60     COND(X) =     2.71

COEF           VALUE          ST ER          T-STAT

CEXL2A         7.06056        1.91261        3.69159
CEXL2B         0.52056        0.00710        73.31410
```

```
201: WSGL = CEXL3A+CEXL3B*EPERSL

NOB = 18      NOVAR = 2
RANGE =  1962 TO 1979
RSQ =    0.98641      CRSQ =    0.98556      F(1/16) =  1161.190
SER =   14.5396       SSR =   3382.410      DW(0) =  1.55     COND(X) =     2.84

COEF           VALUE          ST ER          T-STAT

CEXL3A        -9.39110        5.47007       -1.71681
CEXL3B         1.27896        0.03753        34.07620
```

107: PERCDS = CPE7A+CPE7B*ECDSNT

NOB = 18 NOVAR = 2
RANGE = 1962 TO 1979
RSQ = 0.94771 CRSQ = 0.94444 F(1/16) = 289.987
SER = 0.4112 SSR = 2.706 DW(0) = 1.74 COND(X) = 2.78

COEF	VALUE	ST ER	T-STAT
CPE7A	0.00679	0.15223	0.04457
CPE7B	0.43295	0.02542	17.02900

109: PERGGS = CPE8A+CPE8B*(EGGS-EXTRNS)

NOB = 19 NOVAR = 2
RANGE = 1962 TO 1980
RSQ = 0.95333 CRSQ = 0.95059 F(1/17) = 347.290
SER = 3.4071 SSR = 197.344 DW(0) = 1.02 COND(X) = 2.77

COEF	VALUE	ST ER	T-STAT
CPE8A	0.60585	1.22352	0.49517
CPE8B	0.47715	0.02560	18.63570

104: PERHES = CPE3A+CPE3B*EHES

NOB = 19 NOVAR = 2
RANGE = 1962 TO 1980
RSQ = 0.97615 CRSQ = 0.97475 F(1/17) = 695.884
SER = 1.1992 SSR = 24.448 DW(0) = 0.92 COND(X) = 2.50

COEF	VALUE	ST ER	T-STAT
CPE3A	2.20966	0.39839	5.54653
CPE3B	0.27393	0.01038	26.37960

110: PERJUS = CPE6A+CPE6B*EJUS

NOB = 19 NOVAR = 2
RANGE = 1962 TO 1980
RSQ = 0.99733 CRSQ = 0.99717 F(1/17) = 6347.790
SER = 0.9818 SSR = 16.386 DW(0) = 0.71 COND(X) = 2.70

COEF	VALUE	ST ER	T-STAT
CPE6A	-0.59011	0.34536	-1.70869
CPE6B	0.64066	0.00804	79.67300

105: PERNRS = CPE4A+CPE4B*ENRS

NOB = 19 NOVAR = 2
RANGE = 1962 TO 1980
RSQ = 0.99414 CRSQ = 0.9938 F(1/17) = 2886.000
SER = 1.2766 SSR = 27.705 DW(0) = 0.80 COND(X) = 2.67

COEF	VALUE	ST ER	T-STAT
CPE4A	-1.48867	0.44589	-3.33862
CPE4B	0.66329	0.01235	53.72140

106: PERPPS = CPE5A+CPE5B*EPPS

NOB = 19 NOVAR = 2
RANGE = 1962 TO 1980
RSQ = 0.99348 CRSQ = 0.9931 F(1/17) = 2591.820
SER = 0.4995 SSR = 4.241 DW(0) = 1.55 COND(X) = 2.39

COEF	VALUE	ST ER	T-STAT
CPE5A	0.12810	0.16083	0.79644
CPE5B	0.59233	0.01163	50.90990

```
102:  PERSSS = CPE2A+CPE2B*ESSS


NOB = 19       NOVAR = 2
RANGE =   1962 TO 1980
RSQ =     0.98395      CRSQ =     0.98301      F(1/17) =   1042.280
SER =     1.6349       SSR =      45.439       DW(0) =   1.18      COND(X) =      2.68

COEF              VALUE           ST ER          T-STAT

CPE2A            0.93274         0.57271         1.62866
CPE2B            0.29151         0.00903        32.28430
```

```
111:  PERTRS = CPE9A+CPE9B*ETRS


NOB = 19       NOVAR = 2
RANGE =   1962 TO 1980
RSQ =     0.99787      CRSQ =     0.99774      F(1/17) =   7947.110
SER =     0.9822       SSR =      16.400       DW(0) =   0.84      COND(X) =      3.17

COEF              VALUE           ST ER          T-STAT

CPE9A           -0.74798         0.39292        -1.90364
CPE9B            0.55908         0.00627        89.14650
```

```
103:  PREDS98 = CPE1A+CPE1B*EEDSNT+CPE1C*D61:75

NOB = 15      NOVAR = 3
RANGE =  1965 TO 1979
RSQ =    0.89206      CRSQ =    0.87407      F(2/12) =     49.587
SER =    3.9666       SSR =    188.811       DW(0) =   1.60     COND(X) =     13.75

COEF             VALUE            ST ER           T-STAT

CPE1A          -48.21270         6.96266        -6.92446
CPE1B            0.36048         0.04209         8.56471
CPE1C           51.48700         5.18366         9.93256
```

253: LOG(WRCMPU/RPI) = C70A+C70B*LOG(WEUS/USCPI)+C70C*LOG(1+EXEMRAT(-2))+C70D*LOG(1+EXEMRAT(-1))

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.75322 CRSQ = 0.70387 F(3/15) = 15.261
SER = 0.0466 SSR = 3.253E-02 DW(0) = 1.51 COND(X) = 3.04

COEF	VALUE	ST ER	T-STAT
C70A	4.51730	0.01269	355.90300
C70B	0.48280	0.26182	1.84399
C70C	1.26569	0.57523	2.20032
C70D	1.47233	0.56650	2.59899

257: LOG(WRCMPU/RPI) = C74A+C74B*LOG(WEUS/USCPI)+C74C*LOG(1+EXEMRAT(-2))+C74D*LOG(1+EXEMRAT(-1))

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.75322 CRSQ = 0.70387 F(3/15) = 15.261
SER = 0.0466 SSR = 3.253E-02 DW(0) = 1.51 COND(X) = 3.04

COEF	VALUE	ST ER	T-STAT
C74A	4.51730	0.01269	355.90300
C74B	0.48280	0.26182	1.84399
C74C	1.26569	0.57523	2.20032
C74D	1.47233	0.56650	2.59899

231: LOG(WRCNNF/RPI) = C59A+C59B*LOG(WEUS/USCPI)+C59C*LOG(1+EXEMRAT)+C59D*LOG(1+EXEMRAT(-1))
+C59E*(1+EXEMRAT(-2))

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.94891 CRSQ = 0.93431 F(4/14) = 65.002
SER = 0.0375 SSR = 1.965E-02 DW(0) = 1.59 COND(X) = 6.04

COEF	VALUE	ST ER	T-STAT
C59A	4.62823	0.01068	433.22300
C59B	1.77752	0.21149	8.40489
C59C	2.43671	0.59168	4.11828
C59D	1.24035	0.80960	1.53205
C59E	1.33650	0.60050	2.22564

261: LOG(WRD9/RPI) = C78A+C78B*LOG(WEUS/USCPI)+C78C*LOG(1+EXEMRAT)+C78D*LOG(1+EXEMRAT(-1))
+C78E*LOG(1+EXEMRAT(-2))

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.81884 CRSQ = 0.76708 F(4/14) = 15.820
SER = 0.0199 SSR = 5.528E-03 DW(0) = 2.03 COND(X) = 6.04

COEF	VALUE	ST ER	T-STAT
C78A	3.94738	0.00567	696.53900
C78B	0.40565	0.11219	3.61588
C78C	0.48987	0.31387	1.56074
C78D	1.03877	0.42947	2.41872
C78E	-0.58403	0.31855	-1.83340

268: LOG(WRFI/RPI) = C82A+C82B*LOG(WEUS/USCPI)+C82D*LOG(1+EXEMRAT)+C82C*LOG(1+EXEMRAT(-1))

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.94126 CRSQ = 0.92951 F(3/15) = 80.123
SER = 0.0226 SSR = 7.672E-03 DW(0) = 1.31 COND(X) = 3.00

COEF	VALUE	ST ER	T-STAT
C82A	3.95693	0.00623	635.05600
C82B	1.65819	0.12528	13.23620
C82D	0.43634	0.27524	1.58534
C82C	0.93845	0.27707	3.38700

280: LOG(WRGC) = C89A+C89B*LOG(WEUS/USCPI)+C89C*LOG(RPI)

NOB = 19 NOVAR = 3
RANGE = 1961 TO 1979
RSQ = 0.98695 CRSQ = 0.98532 F(2/16) = 605.048
SER = 0.0438 SSR = 3.063E-02 DW(0) = 1.36 COND(X) = 49.85

COEF	VALUE	ST ER	T-STAT
C89A	3.09947	0.23076	13.43150
C89B	1.42506	0.28429	5.01266
C89C	1.19617	0.04533	26.39080

290: LOG(WRGL/RPI) = C992A+C992D*D61.69+C992C*LOG(1+EXEMRAT)+C992B*LOG(WEUS/USCPI)

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.94326 CRSQ = 0.93191 F(3/15) = 83.117
SER = 0.0339 SSR = 1.723E-02 DW(0) = 1.95 COND(X) = 4.85

COEF	VALUE	ST ER	T-STAT
C992A	4.07368	0.01948	209.16300
C992D	-0.08074	0.02388	-3.38089
C992C	1.70483	0.34662	4.91845
C992B	1.79078	0.25894	6.91590

288: LOG(WRGS/RPI) = C92A+C92B*LOG(WEUS/USCPI)+C92C*D61.73

NOB = 19 NOVAR = 3
RANGE = 1961 TO 1979
RSQ = 0.93006 CRSQ = 0.92132 F(2/16) = 106.382
SER = 0.0474 SSR = 3.598E-02 DW(0) = 1.19 COND(X) = 3.79

COEF	VALUE	ST ER	T-STAT
C92A	4.26844	0.02177	196.08200
C92B	2.17777	0.26953	8.07990
C92C	-0.23316	0.02424	-9.61945

240: LOG(WRM9A9/RPI) = C62A+C62B*LOG(WEUS/USCPI)+C62C*LOG(1+EXEMRAT)+C62D*LOG(1+EXEMRAT(-1))

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.8213 CRSQ = 0.78557 F(3/15) = 22.981
SER = 0.0368 SSR = 2.033E-02 DW(0) = 1.23 COND(X) = 3.00

COEF	VALUE	ST ER	T-STAT
C62A	4.12388	0.01014	406.58300
C62B	1.29847	0.20393	6.36723
C62C	0.72114	0.44804	1.60954
C62D	0.89457	0.45103	1.98340

291: LOG(WRM9A9/RPI) = C95A+C95B*LOG(WEUS/USCPI)+C95C*LOG(1+EXEMRAT)+C95D*LOG(1+EXEMRAT(-1))

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.8213 CRSQ = 0.78557 F(3/15) = 22.981
SER = 0.0368 SSR = 2.033E-02 DW(0) = 1.23 COND(X) = 3.00

COEF	VALUE	ST ER	T-STAT
C95A	4.12388	0.01014	406.58300
C95B	1.29847	0.20393	6.36723
C95C	0.72114	0.44804	1.60954
C95D	0.89457	0.45103	1.98340

236: LOG(WRP9/RPI) = C53A+C53D*D61.76+C53B*LOG(WEUS/USCPI)+C53C*LOG(1+EXEMRAT)

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.96136 CRSQ = 0.95363 F(3/15) = 124.386
SER = 0.0456 SSR = 3.118E-02 DW(0) = 1.51 COND(X) = 5.80

COEF	VALUE	ST ER	T-STAT
C53A	4.78486	0.02894	165.36500
C53D	-0.27971	0.02961	-9.44531
C53B	2.80945	0.25871	10.85930
C53C	3.78888	0.40181	9.42957

272: LOG(WRS9/RPI) = C86A+C86B*LOG(WEUS/USCPI)+C86C*LOG(1+EXEMRAT)+C86D*LOG(1+EXEMRAT(-1))

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.95015 CRSQ = 0.94017 F(3/15) = 95.292
SER = 0.0405 SSR = 2.456E-02 DW(0) = 1.21 COND(X) = 3.00

COEF	VALUE	ST ER	T-STAT
C86A	3.83691	0.01115	344.16100
C86B	0.88686	0.22415	3.95650
C86C	3.33666	0.49247	6.77535
C86D	2.86360	0.49576	5.77622

249: LOG(WRT9/RPI) = C66A+C66D*D61.76+C66B*LOG(WEUS/USCPI)+C66C*LOG(1+EXEMRAT)+C66E*LOG(1+EXEMRAT(-1))

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.97119 CRSQ = 0.96296 F(4/14) = 117.985
SER = 0.0360 SSR = 1.819E-02 DW(0) = 2.20 COND(X) = 8.69

COEF	VALUE	ST ER	T-STAT
C66A	4.36346	0.02986	146.11900
C66D	-0.25474	0.03087	-8.25133
C66B	1.55294	0.20484	7.58105
C66C	5.58641	0.51819	10.78070
C66E	-0.71910	0.58233	-1.23487

84: LOG(ECDS4) = C6DA+C6DB*LOG(EXOPS)

NOB = 19 NOVAR = 2
RANGE = 1962 TO 1980
RSQ = 0.98538 CRSQ = 0.98452 F(1/17) = 1145.670
SER = 0.1419 SSR = 0.342 DW(0) = 1.58 COND(X) = 12.58

COEF	VALUE	ST ER	T-STAT
C6DA	-4.39375	0.20606	-21.32240
C6DB	1.21926	0.03602	33.84780

83: LOG(EEDS4) = C19A+C19B*LOG(EXOPS)

NOB = 19 NOVAR = 2
RANGE = 1962 TO 1980
RSQ = 0.99487 CRSQ = 0.99456 F(1/17) = 3294.000
SER = 0.0719 SSR = 8.778E-02 DW(0) = 1.19 COND(X) = 12.58

COEF	VALUE	ST ER	T-STAT
C19A	-1.22819	0.10432	-11.77320
C19B	1.04664	0.01824	57.39280

86: LOG(EGGS4) = C2GA+C2GB*LOG(EXOPS)

```
NOB = 19      NOVAR = 2
RANGE =  1962 TO 1980
RSQ =    0.9019       CRSQ =    0.89613     F(1/17) =   156.300
SER =    0.2560       SSR =      1.114      DW(0) =  1.70      COND(X) =     12.58
```

COEF	VALUE	ST ER	T-STAT
C2GA	-1.28983	0.37171	-3.47000
C2GB	0.81236	0.06498	12.50200

81: LOG(EHES4) = C14HA+C14HB*LOG(EXOPS)

```
NOB = 19      NOVAR = 2
RANGE =  1962 TO 1980
RSQ =    0.97277      CRSQ =    0.97117     F(1/17) =   607.315
SER =    0.1587       SSR =      0.428      DW(0) =  0.48      COND(X) =     12.58
```

COEF	VALUE	ST ER	T-STAT
C14HA	-2.70907	0.23043	-11.75660
C14HB	0.99269	0.04028	24.64370

78: LOG(EJUS4) = C20AA+C20AB*LOG(EXOPS)

NOB = 19 NOVAR = 2
RANGE = 1962 TO 1980
RSQ = 0.99606 CRSQ = 0.99583 F(1/17) = 4299.120
SER = 0.0621 SSR = 6.556E-02 DW(0) = 1.54 COND(X) = 12.58

COEF	VALUE	ST ER	T-STAT
C20AA	-2.76583	0.09016	-30.67770
C20AB	1.03338	0.01576	65.56760

80: LOG(ENRS4) = C10NA+C10NB*LOG(EXOPS)

NOB = 19 NOVAR = 2
RANGE = 1962 TO 1980
RSQ = 0.98923 CRSQ = 0.98859 F(1/17) = 1560.860
SER = 0.0958 SSR = 0.156 DW(0) = 0.82 COND(X) = 12.58

COEF	VALUE	ST ER	T-STAT
C10NA	-2.49842	0.13909	-17.96300
C10NB	0.96058	0.02431	39.50770

```
79:  LOG(EPPS4) = C6PA+C6PB*LOG(EXOPS)

NOB = 19      NOVAR = 2
RANGE =  1962 TO 1980
RSQ =    0.98445      CRSQ =    0.98353      F(1/17) =  1076.120
SER =    0.1530       SSR =      0.398       DW(0) =  1.25      COND(X) =    12.58

COEF             VALUE            ST ER          T-STAT

C6PA          -5.52610          0.22207       -24.88450
C6PB           1.27346          0.03882        32.80420
```

```
82:  LOG(ESSS4) = C7SA+C7SB*LOG(EXOPS)

NOB = 19      NOVAR = 2
RANGE =  1962 TO 1980
RSQ =    0.99059      CRSQ =    0.99004      F(1/17) =  1789.410
SER =    0.1056       SSR =      0.190       DW(0) =  1.30      COND(X) =    12.58

COEF             VALUE            ST ER          T-STAT

C7SA          -3.00272          0.15337       -19.57840
C7SB           1.13412          0.02681        42.30140
```

```
85:  LOG(ETRS4) = C14TA+C14TB*LOG(EXOPS)

NOB = 19        NOVAR = 2
RANGE =  1962 TO 1980
RSQ =    0.99722      CRSQ =    0.99706      F(1/17) =  6101.980
SER =    0.0418       SSR = 2.969E-02        DW(0) =  1.22      COND(X) =    12.58
```

COEF	VALUE	ST ER	T-STAT
C14TA	-1.00812	0.06067	-16.61610
C14TB	0.82848	0.01061	78.11410