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FISCAL OPTIONS AND THE GROWTH OF THE ALASKAN ECONOMY

(Preliminary Alaska Fiscal Modeling Results)

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The state of Alaska is about to enter a period of unprecedented abundance resulting from the revenues generated by that portion of Prudhoe Bay oil production owned by the state. The resultant doubling of annual revenues creates an unusual opportunity and responsibility for the state to make wise use of these funds.

This paper is a preliminary report of an effort to model the fiscal component of the Alaskan economy to provide insight into possible future growth paths of the state. Previous work has concentrated on econometric modeling of the economy and demographic patterns, and the present work is an attempt to expand these modeling capabilities to include the ability to do detailed state government policy analysis. It is felt that in the areas of state revenue and expenditure policies, Alaska can have the most impact on its future growth path.

The paper begins with a short section providing some background for the analysis. There follows a description of the components of the model, with emphasis on the fiscal section. Then a set of base

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case economic simulations is presented. Against this background, four policy alternatives are analyzed which involve different methods of expending the significant state budget surplus which will accumulate during the period of Prudhoe Bay oil production. The paper ends with a brief discussion of policy implications and suggestions for further research. The appendices include selected simulation output and the fiscal model listing.

I. Background

Alaska is experiencing significant growing pains. Impacts on population size and composition, economic activity, and level of state government which have resulted from the discovery of oil at Prudhoe Bay and the subsequent construction of the trans-Alaska pipeline are only the first aspects of change which will continue into the future. The rising demand for petroleum will insure high levels of exploratory and development activity in Alaska. This, in turn, will result in more population and economic growth generated, as historically, by forces outside the direct control of the citizens of Alaska.

In contrast to the historic pattern of boom-bust economic cycles endemic to Alaska caused by exploitation of natural resources and federal government activity are two factors accompanying the present petroleum boom. One is a new self-awareness by Alaskans about their state coupled with a realization that management of the petroleum boom within the limits available might result in an increase in welfare for Alaskans. Evidence of this is the Governor's Public Forum Program in which all citizens are invited to meet with their neighbors and discuss such issues as what the Alaska of the future ought to be like and how that future might be realized.

The second is more important. It is the ability to do something to affect growth and to direct it in directions which Alaskans

see as desirable. The instrument for this is provided by the revenues which will begin flowing into the state treasury when the pipeline becomes operational. The size of the revenues will quickly double total state revenues and have a significant impact on state purchasing power. If annual revenues from Prudhoe Bay are $1 billion, the per capita revenue will be $2,500 annually for Alaska's 400 thousand citizens. Viewed from a different perspective, since total state personal income is approximately $3 billion, the addition of $1 billion would significantly increase the capacity of state government to direct growth.

There are many options potentially available to the state to affect the pattern of economic growth. Undertaking a significant program of government expenditures is only one option, but an important one. The impacts of such a program would affect all sectors of the economy and cause change which could only be traced out using a model which described the links between economic sectors accurately.

II. Model Structure

The basic structure of the long run state model is depicted in simplified form in Figure 1. Its four components are the scenario model, the economic model, the demographic model, and the fiscal model.[1] The simultaneous links between model components are indicated by arrows. The model is presently set up to provide simulations on an annual basis through the year 1990.

The scenario component drives the model by providing information on the level and timing of petroleum exploration and development activity in the state. It is assumed that variations in the level of petroleum activity will continue to be the most significant exogenous factor affecting the composition of growth of the Alaskan economy.

The non-stochastic scenario model is a set of files, one for each petroleum province in the state, which includes information and assumptions regarding ownership, recoverable reserves, leasing and producing schedules, and direct employment generated by development and production of the reserve. This information on individual provinces is aggregated by the model into different petroleum development scenarios corresponding to different development patterns.

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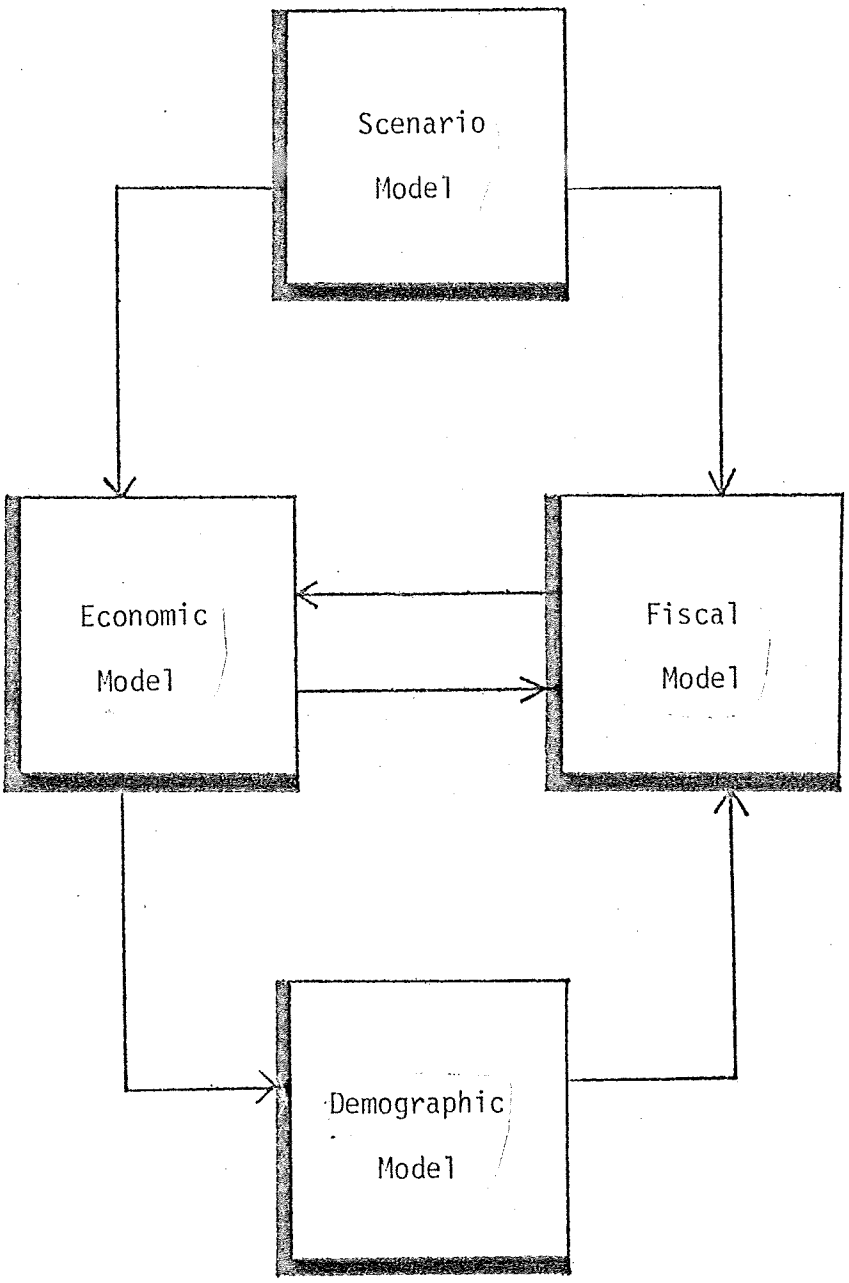
[1] All model components have been built using the TROLL (Time-Shared Reactive On-Line Laboratory) computer system, specially designed for quantitative research in economics.

Figure 1.

Alaska Model Components



The scenario model calculates state government revenue from petroleum based on wellhead price, production, ownership of fields, and the structure of taxes and other revenue. This revenue information is annually input to the fiscal model while employment information becomes input to the economic model.

The economic model has been econometrically developed using time series data going back to 1961.[2] It is essentially an income model in which, in the endogenous sectors, output is a function of disposable personal income. In the export sectors, either output or employment is entered exogenously. From output, employment is calculated and this, together with the wage rate determined by relationships of local to national rates, yields wages and salaries. The aggregate of wages and salaries together with non-wage and salary income yields personal income. Thus, the economic model is simultaneous internally. The level of economic activity reflected in the economic model feeds into both the fiscal and demographic models.

The demographic model provides calculations not only of total population but also of its age-sex distribution.[3] The keystone of

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[2]A more detailed description of the economic model is in David Kresge, "Alaska's Growth to 1990," Alaska Review of Business and Economic Conditions, Vol. xiii, No. 1 (Jan. 1976).

[3]Daniel Seiver, "Alaskan Economic Growth: A Regional Model with Induced Migration," paper presented at the Regional Science Association annual meeting, Cambridge, Massachusetts, Nov. 1975.

the demographic model is the stochastic equation relating the level of net migration into the state to changes in employment and a measure of Alaska relative income. Net migration is a larger component of change of population size than natural increase and is sensitive to the level of economic activity within the state. This relationship plays an important part in the whole model.

A detailed diagram of the structure of the state government component of the fiscal model is presented in Figure 2.[4] The fiscal model, as noted above, receives input from the scenario and economic models, and also from the demographic model and is itself linked directly to the economic model. It has been econometrically developed using time series data of varied lengths depending upon availability. (The model equations are presented in Appendix B.)

Revenues derive from petroleum via the scenario model, from endogenous economic activity as taxes and charges for government services, and from federal government transfers. Most are deposited in the state general fund with a significant portion of revenues from state-owned petroleum resources placed in a permanent fund earmarked for investment in profit producing activities. The balances in these funds generate considerable amounts of interest which are deposited in the general fund.

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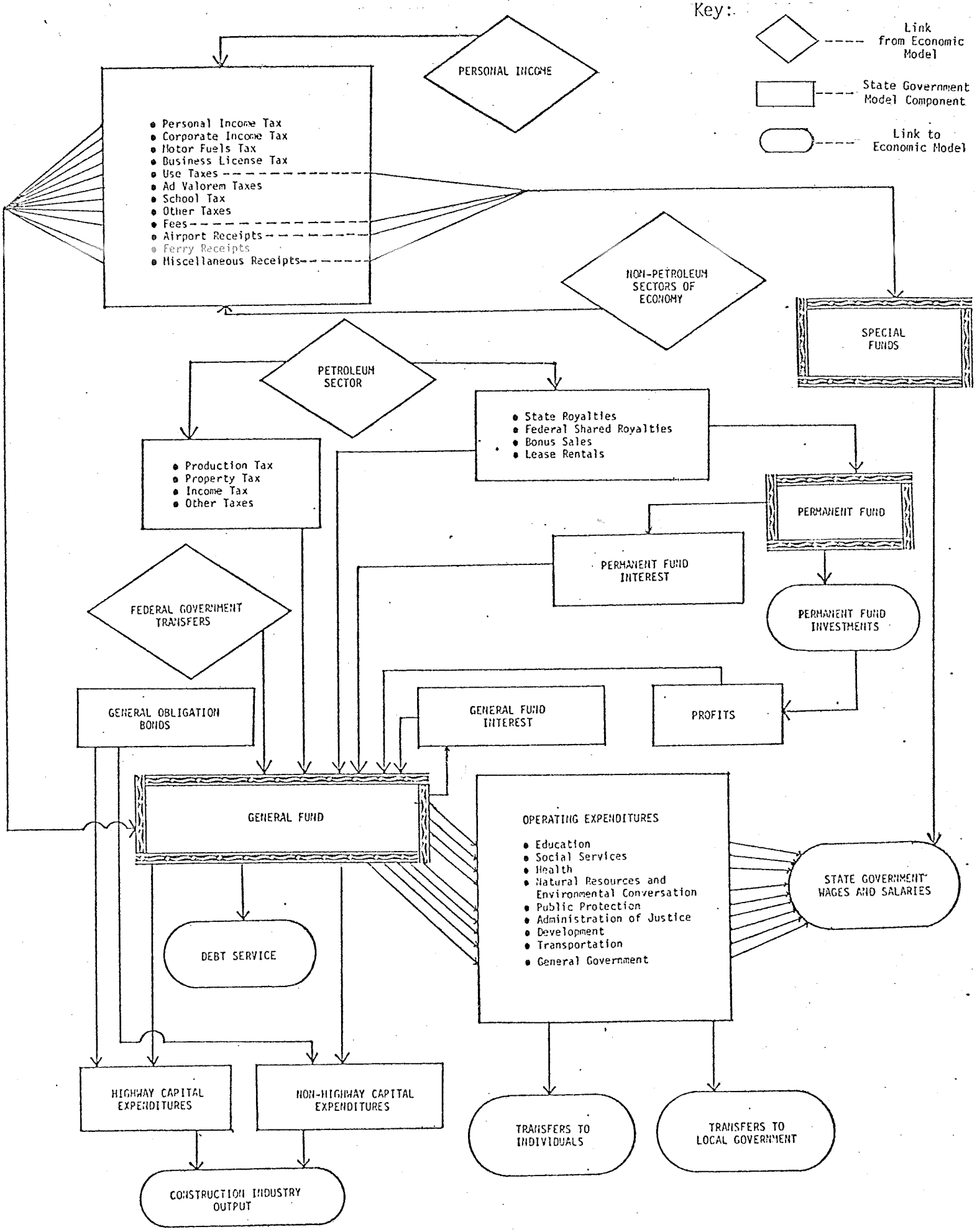
[4] A more detailed description of the fiscal model is Scott Goldsmith, "A Fiscal Model for Alaska: Structure and Policy Application," paper to be presented at the Western Economic Association annual meeting, Anaheim, California, June 1977.

Figure 2. MAP STATE GOVERNMENT MODEL STRUCTURE



Capital and operating expenditures are separately determined by functional category. These expenditures form the basic links to the economic model. Capital expenditures generate demand in the construction industry, while operating expenditures directly add to personal income through wages and salaries. In addition, changes in tax levels and direct state government transfers to individuals provide another link through the level of disposable income. Finally, a significant amount of state expenditures are transfer payments to local government.

III. Economic Simulations

A base case of the model is first simulated to provide a point of reference for the analysis of policy alternatives. This case is named Accelerated 7 after the particular version of the scenario model which is used to drive the simulation. The level of petroleum development assumed in the scenario includes significant OCS, state, and private activity beyond present developments and a $7/barrel wellhead oil price. In addition, the Arctic Gas line through Canada is constructed in the early 1980's.

In the fiscal sector, the tax structure is assumed unchanged except for a gradual increase in the severance tax rate. Twenty-five percent of eligible petroleum revenues are placed in the permanent fund and thus not available for general expenditures. This fund is assumed to have no significant growth impact except through interest earned. Government expenditures increase over time, consistent with the historic relationship between expenditures and available revenues and personal income.

The variables reflecting aggregate economic activity indicate a continuation of the significant growth experienced in recent years using the Accelerated 7 scenario assumptions. (Detailed results appear in Appendix A.) Between 1977 and 1990, both employment and population increase at an average annual rate of 5 percent and personal income at 11 percent.

State government growth is rapid, responding to the increased revenues as well as population and income growth. As seen in Table 1, non-petroleum tax revenues increase at an annual rate of 13 percent to $840 million in 1990, while petroleum revenues increase 16 percent annually to $3,243 million. Already in 1977, petroleum revenues are the largest component of revenues and their dominance continues to grow. In 1990, they provide 61 percent of revenues. General fund revenues reach nearly $5 billion by 1990, but most growth has occurred by the mid-1980's. This reflects the fact that the development of Prudhoe Bay will be the most significant state revenue producer, and other fields will not produce commensurate levels of direct revenue. The permanent fund grows to $2.8 billion by 1990.

The general fund balance builds up in the early 1980's, peaking in 1987 at about $4.7 billion before beginning a rather rapid decline, as shown in Table 2. Rapid growth in state government operating expenditures of 17 percent annually accounts for the eventual decline in the general fund balance.[5]

The significant population growth does not dilute the growth of per capita personal income. Table 3 shows that real disposable income per capita reaches a high in 1981 and from that point does

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[5]Between 1961 and 1976, the average annual growth rate of total state expenditures was 18 percent.

Table 1. Base Case State Revenues

GOLDA7

	RT98	RP9S	RGF99S	PFBAL
1977	174.739	450.658	972.244	50.005
1978	223.948	873.008	1338.53	176.591
1979	260.434	1111.6	1636.43	327.64
1980	299.043	1337.28	1976.65	468.471
1981	369.048	1842.71	2516.4	719.451
1982	445.526	1918.38	2839.14	906.207
1983	501.671	2092.63	3186.9	1072.8
1984	550.398	2369.05	3563.91	1262.02
1985	572.19	2628.18	3882.41	1474.75
1986	609.836	2839.97	4174.9	1710.92
1987	658.234	3013.67	4444.37	1965.46
1988	718.375	3150.47	4684.25	2238.12
1989	785.912	3218.54	4856.44	2521.65
1990	839.879	3243.14	4956.82	2810.3

RT98 = non-petroleum tax revenues (10^6)
RP9S = petroleum revenues (10^6)
RGF99S = general fund revenues (10^6)
PFBAL = permanent fund balance (10^6)

Table 2. Base Case General Fund Balance and State Expenditures

GOLDA7

	GFBAL	E99S
1977	633.565	968.457
1978	972.572	1109.53
1979	1429.5	1298.51
1980	1952.19	1585.97
1981	2531.43	2081.91
1982	3164.83	2374.2
1983	3594.26	2945.27
1984	3977.43	3380.61
1985	4336.91	3737.02
1986	4591.4	4150.
1987	4671.79	4611.85
1988	4509.39	5114.34
1989	4081.47	5571.67
1990	3435.04	5908.68

GFBAL = general fund balance (10^6)
E99S = total state expenditures (10^6)

Table 3. Base Case Real Per Capita Indicators

GOLDA7

	DIRPA	E99SRPC	R99SRPC	E99LRPC
1977	2753.29	1089.41	1145.93	477.934
1978	2835.64	1162.41	1572.5	452.918
1979	2925.54	1255.51	1765.95	466.956
1980	3056.87	1378.93	1878.02	476.927
1981	3364.49	1647.51	2227.06	527.353
1982	3221.84	1607.48	2083.64	524.566
1983	3269.15	1784.27	2066.89	552.878
1984	3218.39	1922.4	2171.12	592.554
1985	3208.76	1981.61	2208.59	598.387
1986	3207.77	2049.59	2215.94	609.373
1987	3229.94	2106.65	2183.95	618.496
1988	3250.21	2159.95	2131.29	631.745
1989	3260.93	2189.65	2058.41	646.895
1990	3252.1	2182.56	1976.81	661.752

DIRPA = real disposable income per capita
E99SRPC = real state expenditures per capita
R99SRPC = real state revenues per capita
E99LRPC = real local expenditures per capita

not vary more than a few dollars from year to year. Real total state government expenditures per capita more than double over the period and peak in 1989. Real per capita revenues peak earlier, in 1986, and begin a fairly rapid decline after that point. Real local government expenditures per capita grow much more slowly than state expenditures.

These figures indicate some areas of potential imbalance in the composition of economic growth. For example, the lag in the growth of disposable personal income might be offset with a tax credit. A transfer of funds to local government from the state would stimulate expansion of their services.

Before examining the economic implications of these and other policies changes, it is useful to look at the sensitivity of economic growth to those factors exogenous to the Alaskan economy which are summarized in the scenario model. This provides some perspective on the range of impact which expenditure policies might have on growth relative to that of outside forces.

An increase in the wellhead price of oil from $7 to $9, other things held constant, will have a significant positive impact on the growth of the economy through the increase in state revenues from sources tied to the price. Since state government expenditures increase with the supply of revenues available, growth is stimulated

through the wages and salary component of state expenditures which becomes personal income that in turn generates new demand for goods and services.

A decrease in the projected level of petroleum development activity to include little more than is presently leased will both reduce the level of petroleum revenues and the level of direct petroleum related employment. Given the base case assumptions, the petroleum revenue impact of reduced activity is less than the impact of a price change until the mid-1980's.

Both of these changes in the scenario model have a significant impact on economic growth. Table 4 compares the employment levels under the three alternative scenarios. (Appendix A includes comparisons for more variables.) A higher wellhead price stimulates aggregate growth without a direct employment impact. The combination of a revenue and employment impact in this particular case has a larger negative effect in the limited scenario.

The effect on state government might be summarized by the general fund balance, shown in Table 5. An increase in the wellhead oil price significantly increases the general fund balance in spite of the additional government spending generated. On the other hand, a reduction in petroleum activity does not significantly affect the level of the general fund balance until the mid-1980's, when it begins to taper off rapidly.

Table 4. Total Employment with Various Scenarios (10^3)

EM99 = ENDOGENOUS

	GOLDL7	GOLDA7	GOLDA9
1977	181.804	181.804	181.804
1978	186.623	188.626	190.054
1979	197.968	200.429	204.066
1980	212.01	221.058	226.947
1981	225.798	254.215	263.357
1982	225.941	271.775	283.544
1983	242.875	295.062	310.506
1984	253.674	296.321	315.001
1985	262.146	302.236	323.789
1986	269.87	309.842	334.276
1987	277.566	321.939	349.459
1988	284.011	334.891	365.698
1989	289.586	344.939	378.781
1990	292.87	349.893	385.772

Table 5. General Fund Balance with Various Scenarios (10^6)

GFBAL = ENDOGENOUS

	GOLDL7	GOLDA7	GOLDA9
1977	633.565	633.565	633.565
1978	974.875	972.572	1123.7
1979	1435.38	1429.5	1754.28
1980	1970.13	1952.19	2499.35
1981	2346.57	2531.43	3353.31
1982	3003.41	3164.83	4260.77
1983	3537.83	3594.26	4930.89
1984	3935.64	3977.43	5499.83
1985	4187.47	4336.91	6023.33
1986	4255.84	4591.4	6402.38
1987	4138.64	4671.79	6541.73
1988	3840.53	4509.39	6354.47
1989	3361.56	4081.47	5797.15
1990	2745.61	3435.04	4926.86

GOLDL7 = limited petroleum development
GOLDA7 = base case
GOLDA9 = $9 wellhead oil price

In this case, the lower revenues are accompanied by fewer new employees, so demands for government services are reduced.

On a per capita basis, there is a very minor positive impact on real disposable income as the level of petroleum activity and revenues rises. Since the state benefits from increased revenues, state real revenues and expenditures per capita do show significant increases as activity increases. Table 6 shows the comparative figures for per capita real expenditures.

These simulation results show that factors exogenous to the state will have a significant impact on the future growth of Alaska. The state is not powerless, however, in guiding its economic growth. The next section looks at some possible alternatives.

Table 6. Real Per Capita State Expenditures with Various Scenarios

E99SRPC - DEFINITION

	GOLDL7	GOLDA7	GOLDA9
1977	1089.41	1089.41	1089.41
1978	1165.01	1162.41	1183.73
1979	1253.93	1255.51	1320.16
1980	1382.	1378.93	1474.44
1981	1613.94	1647.51	1781.71
1982	1539.06	1607.48	1760.67
1983	1688.05	1784.27	1964.69
1984	1798.23	1922.4	2128.6
1985	1876.96	1981.61	2207.32
1986	1931.78	2049.59	2292.81
1987	1969.32	2106.65	2363.97
1988	1992.91	2159.95	2430.38
1989	1990.8	2189.65	2469.3
1990	1966.46	2182.56	2465.83

GOLDL7 = limited petroleum development
GOLDA7 = base case
GOLDA9 = $9 wellhead oil price

IV. Expenditure Policy Analysis

Four policy experiments were performed using the model with the Accelerated 7 scenario. Each involved an exogenous increase in a different component of state government expenditures. The categories were capital expenditures, operating expenditures, transfers to local government, and transfers to individuals. The amount of the increase is the same for each experiment and increases annually from $120 million in 1979 to $425 million in 1990.

Upon completion of the simulations, it was discovered that this exogenous increase depleted the general fund balance in each case either in 1989 or 1990. Thus, the expenditure programs are the maximum the state could undertake without incurring a budget deficit before 1990.

Each alternative has an expansionary effect on the economy when first instituted in 1979. Capital expenditures has the least initial aggregate impact, while the transfer to individuals has the largest. This ranking corresponds directly to the percentage of the exogenous change which finds its way into wages and salaries. Increased operating expenditures is more expansionary than local government transfers because a portion of the latter is channeled into capital construction expenditures. These relationships are reflected in Table 7, which displays the absolute difference in employment from the base case generated by each policy change.

Table 7. Employment Effect of Fiscal Policy Changes (10^3)

EM99 - ENDOGENOUS

	GOLDCON_ER	GOLDLOC_ER	GOLDOP_ER	GOLDTX_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	2.95674	7.12895	7.56839	8.47131
1980	3.18396	9.28026	10.0144	11.1054
1981	3.7059	11.5255	12.5963	14.5846
1982	3.34863	12.9106	14.2744	17.3223
1983	2.80493	13.7817	15.467	19.5466
1984	2.30566	14.0916	16.0786	20.673
1985	2.31055	14.2808	16.5364	22.1775
1986	2.02002	14.2769	16.7922	23.3533
1987	1.67505	14.2749	17.0796	24.7993
1988	1.03906	14.1587	17.2908	26.3025
1989	0.192627	13.5625	17.043	27.2085
1990	-0.936279	12.2568	16.0627	27.0867

GOLDCON = capital construction
GOLDLOC = local transfers
GOLDOP = operating expenditures
GOLDTX = individual transfers

The exogenous change in each case is coupled with the assumption that state spending will continue as though the money to fund the expansionary program is not reducing the balance in the general fund. Thus, reductions in the general fund balance from the base case do not affect spending, but changes in the level of interest income which are a significant portion of non-petroleum revenues do affect the spending level. This, in conjunction with the fact that tax revenues generated by the expansion (Table 8) record very little rise, results in a moderating of the expansion over time. This is most pronounced in the capital construction case where by 1990, employment is actually less than in the base case.

This impact on aggregate growth has two interpretations. If maximum aggregate growth is desirable, a tax cut seems to provide the most, while a capital construction program the least. Since the exogenous expenditure is growing annually, it is clear that a capital construction program would cost the most in terms of state funds to maintain any plateau of increased employment. On the other hand, if minimum growth is the objective and yet a spending program is desired, a capital construction program appears to have the least long-run aggregate impact on employment.

As indicated in Table 8, non-petroleum tax revenue impacts of the spending programs differ. The tax credit, because it generates the largest population growth, causes the largest increase in revenues

Table 8. Tax Effect of Fiscal Policy Changes (10^6)

RT98 - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDOP_ER	GOLDTX_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	1.72412	3.7832	4.01758	4.14258
1980	4.5791	10.8662	11.6313	14.0125
1981	5.4563	15.0876	16.387	19.7847
1982	6.20996	19.5371	21.4746	27.0642
1983	5.76782	22.8965	25.4966	33.3169
1984	5.09277	25.415	28.7432	38.5786
1985	4.75537	27.001	31.0303	42.4329
1986	4.79248	28.6328	33.4106	46.8955
1987	4.36304	30.22	35.845	51.8789
1988	3.52222	31.8384	38.479	57.7871
1989	1.95215	32.9631	40.8015	63.7842
1990	-0.449951	32.3628	41.4534	67.5488

GOLDCON = capital construction
GOLDLOC = local transfers
GOLDOP = operating expenditures
GOLDTX = individual transfers

since they are functions of population and income. By 1983, however, even this alternative is generating less total general fund revenues than the base case because of the continued and increasing drain on the general fund balance. This drain reduces general fund interest much more rapidly than the growth stimulates other revenues.

Total state expenditures depicted in Table 9 increase initially in all cases. The change exceeds the exogenous amount of $120 million because of the feedback effects of aggregate economic change on government revenues and expenditures.[6] Over time, the levels rise to a peak and then begin to fall as revenues necessary to sustain the higher expenditure levels do not keep pace. The transfer to individuals results in increased state expenditures indirectly through increased population; but by 1990, the reduced level of revenues has more than offset this effect, and state expenditures are less than in the base case.

All variables can be examined in real per capita terms to illustrate another dimension of the impact of these policy alternatives. The sum of the impact on disposable personal income and total state and local government expenditures is in some sense the benefit of each alternative. The cost is the depletion of the general fund which occurs in each case by 1990.

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[6] State expenditures are defined to include transfers to local government.

Table 9. Effect on State Expenditures of Different Fiscal Policies (10^6)

E99S - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDOP_ER	GOLDTX_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	147.327	155.786	136.536	35.8767
1980	174.642	202.937	185.852	64.4048
1981	214.622	257.723	241.241	89.1118
1982	235.695	295.62	281.566	114.576
1983	245.24	322.431	313.953	133.809
1984	250.226	340.659	338.447	144.033
1985	260.37	355.369	357.959	144.946
1986	268.129	363.129	371.312	139.594
1987	274.199	366.891	380.934	126.23
1988	277.082	363.977	384.973	101.266
1989	268.336	342.027	371.473	53.3164
1990	248.332	294.992	333.379	-24.582

GOLDCON = capital construction
GOLDLOC = local transfers
GOLDOP = operating expenditures
GOLDTX = individual transfers

In all cases, real disposable income per capita initially increases. The increase, as indicated in Table 10, is greatest when there is a transfer directly to individuals. Increases in other cases occur because of the increased incomes generated by economic stimulation which initially have a stronger effect than population increase. Except for the transfer to individuals, the increase does not exceed $40 per capita and in all cases, declines after the first year. Except for the income transfer to individuals, the impact turns negative in all cases before 1990. This occurs because of population growth combined with the progressive state personal income tax which receives a larger percentage of each additional dollar of income.

Combined state and local expenditures in real per capita terms are shown in Table 11. The income transfer alternative, of course, results in a negative impact in all years, while spending in the cases of operating programs expansion and local transfers rises initially and then falls as population growth overtakes expenditure growth. The positive impact of the capital expenditure program is the strongest and remains at a fairly high positive plateau for a longer period than the other programs.

Combining the two previous tables results in Table 12, which shows the combined impact on real per capita disposable income and government expenditures of the fiscal policies. In all cases, this

Table 10. Effect on Real Disposable Income Per Capita of Different Fiscal Policies

DIRPA - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDOP_ER	GOLDTX_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	19.5034	37.355	39.606	148.823
1980	13.446	33.772	36.522	135.911
1981	8.93042	23.625	26.1077	126.873
1982	5.31616	23.8923	26.877	119.532
1983	0.746094	17.1614	20.095	103.045
1984	-1.43555	14.6414	18.0229	96.8982
1985	-1.53247	10.5583	13.9836	89.8481
1986	-3.05493	6.09497	9.46191	81.6401
1987	-4.50464	1.52905	4.73511	74.1372
1988	-6.66406	-2.68823	0.428711	68.1702
1989	-8.94067	-7.11401	-3.94678	61.7385
1990	-11.7185	-12.3186	-9.01611	54.6543

Table 11. Effect on Combined State and Local Expenditures of Different Fiscal Policies

GEXPRPC - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDOP_ER	GOLDTX_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	127.783	115.622	95.2141	-4.02417
1980	137.29	132.982	115.677	1.86279
1981	148.66	138.931	122.022	-17.5562
1982	141.944	134.079	120.397	-19.3296
1983	131.559	119.694	108.891	-37.467
1984	125.584	108.429	99.6938	-58.6877
1985	120.53	98.5457	91.1208	-78.4492
1986	116.019	85.8594	79.7395	-100.57
1987	110.359	72.0217	66.9922	-124.28
1988	105.175	57.1721	53.2747	-150.43
1989	97.6357	39.9412	37.4475	-179.084
1990	89.2722	20.439	19.5356	-209.704

GOLDCON = capital construction
GOLDLOC = local transfers
GOLDOP = operating expenditures
GOLDTX = individual transfers

Table 12. Combined Real Per Capita Disposable Income and Government Expenditure Effects of Different Fiscal Policies

	Capital Construction	Local Transfers	Operating Expenditures	Individual Transfers
1977	0	0	0	0
78	0	0	0	0
79	148	153	135	145
80	150	167	153	134
81	158	163	148	109
82	147	158	147	101
83	133	137	129	66
84	125	123	118	38
85	119	110	105	12
86	113	92	89	- 19
87	105	74	72	- 50
88	98	54	53	- 82
89	89	33	33	- 117
90	77	8	11	- 155

Table 12 formed by adding together Tables 10 and 11.

measure of individual economic well-being shows a significant increase as the policy is initiated only to be gradually eroded away as population rises. The erosion is slowest in the case of the capital construction expenditures because the least amount of new population is drawn into the state. At the other extreme, by 1986, the measure is negative in the case of the transfer to individuals and by 1990, the negative value of - $155 exceeds its initial positive value. This is primarily the result of government revenues not keeping pace with the population growth generated by the spending out of the increased disposable personal income. Between these extreme cases, local transfers and operating expenditures reflect a similar pattern of positive values which approach zero in 1990.

V. Conclusions

No state government expenditure policy decision should be made only on the basis of its impact on economic growth. On the other hand, decisions about major expenditure programs should not be made without careful analysis of the ramifications of those programs for the growth of the economy.

This paper has attempted to sketch out the broad implications of a set of expenditure policies in terms of objective economic measures relating to aggregate economic impact, fiscal impact, and individual impact. The variables describe the effects of actions but do not, in themselves, denote the benefit or the cost of a particular alternative. Rather, the variables must be analyzed in terms of the objectives of policy which in the political context are multidimensional.

Actual policy would never conform to the alternatives analyzed in this paper. In all cases, the depletion of the general fund balance by 1990 leaves the state in a very vulnerable fiscal position. At that point, expenditures are rising while revenues are falling, and this would necessitate a significant reduction in spending by government in 1990 to balance future budgets. The simulations reflect the maximum impact of expansionary expenditure programs.

It is clear that different types of expenditures affect economic growth differently, and large programs have far reaching effects. Still, exogenous factors reflected in the scenario model could have a larger impact.

Whenever a government expenditure occurs, a portion of that becomes disposable personal income which generates demands for goods and services. This, in turn, causes economic growth. The largest amount of aggregate growth occurs as a result of directly increasing disposable incomes through income transfers such as tax rebates, while the least results from capital expenditure programs. Individual economic growth is most pronounced by capital expenditures and least by income transfers.

This analysis points out clearly the nature of the dilemma facing the state. Revenue increases will make the state relatively wealthy. When the wealth is spent to improve the welfare of the citizens, population growth occurs which tends to dissipate that wealth and economic welfare. This is because the revenue generated by each new migrant is far less than the average level of revenues available to citizens prior to the migration. In the long run, the capital expenditure program seems to be the best method to put the general fund to work for the state and yet not dissipate the wealth. The base case alternative, however, (saving a significant portion of the general fund) minimizes aggregate growth but maximizes per capita wealth of the community.

The results presented here represent the first attempts to use the fiscal model for policy analysis. The results must be interpreted qualitatively rather than quantitatively because many of the relationships will require further refinements. For example, more work needs to be done on the specification of the operating expenditure equations and the sensitivity of simulation results to different specifications. The links between state and local government must be built into the model in a more detailed way in anticipation of a greatly expanded program of state-local transfers to share petroleum revenues with local government. The local government sector itself must be modeled in more detail than it has up to now. More work must be done to present the simulation results in a form whereby the benefits and costs of policies can be easily displayed. These areas and others will receive attention in the next modeling phase.

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Appendix A

Selected Variables from Simulation Analysis

These results are preliminary in the sense that the fiscal model has been built on a version of the state model which has since been superceded because of the availability of new data. The fiscal model has not yet been apended to that model. This does not detract from the impact analyses presented in the paper, but does mean that the base case is not based upon the current version of the model.

A.1 Base Case Simulation

GOLDA7

	RTIS	RTBS	RTCS	RTMF	RTVS	RTAS
1977	101.263	12.8682	16.334	19.1655	7.50346	7.75378
1978	104.35	11.4436	63.9394	20.6199	7.02295	6.91698
1979	120.578	13.481	77.938	23.0192	7.98038	7.3416
1980	142.492	15.3633	85.7685	27.3534	9.19423	7.94601
1981	175.82	20.0232	108.34	32.6022	11.1263	8.97206
1982	212.561	25.9274	127.975	41.0815	14.1643	10.5749
1983	245.872	29.1705	136.017	48.4921	16.3438	11.4619
1984	274.136	33.1469	145.718	50.8578	19.1757	12.604
1985	291.22	32.8072	145.653	54.4301	20.3721	12.7322
1986	317.879	33.8878	148.762	58.5642	22.1794	13.1299
1987	350.896	35.4711	153.88	64.1673	24.2664	13.5993
1988	390.353	38.1856	161.502	70.4138	27.032	14.3029
1989	433.276	41.4797	172.705	76.0655	30.1027	15.0394
1990	473.242	43.4917	176.534	80.2276	33.124	15.6551

	RTCIS	RTSS	RTOTS	RT98	RP9S	RINS
1977	4.31193	2.23906	3.3	174.739	450.658	37.0844
1978	3.96755	2.3878	3.3	223.948	873.008	44.3495
1979	4.14363	2.65254	3.3	260.434	1111.6	68.08
1980	4.38959	3.13682	3.4	299.043	1337.28	100.065
1981	4.79587	3.96966	3.4	369.048	1842.71	136.653
1982	5.40627	4.43638	3.4	445.526	1918.38	177.2
1983	5.73314	5.08128	3.5	501.671	2092.63	221.538
1984	6.14412	5.11697	3.5	550.398	2369.05	251.598
1985	6.18962	5.28576	3.5	572.19	2628.18	278.42
1986	6.32995	5.50543	3.6	609.836	2839.97	303.584
1987	6.4941	5.86088	3.6	658.234	3013.67	321.398
1988	6.73734	6.24953	3.6	718.375	3150.47	327.025
1989	6.98844	6.55673	3.7	785.912	3218.54	315.657
1990	7.19584	6.70994	3.7	839.879	3243.14	285.703

NOTE: See end of table for variable identification.

	RIFF	RGF99S	RPFS	RSFS	EXCAF	EXCUR
1977	2.58534	972.244	13.0716	33.3858	290.	678.457
1978	3.50035	1338.53	126.587	35.8407	330.	779.526
1979	12.3614	1636.43	151.049	38.9491	336.792	961.715
1980	22.9348	1976.65	140.831	42.5163	372.979	1212.99
1981	32.793	2516.4	250.98	46.888	418.208	1663.7
1982	50.3616	2839.14	186.756	51.5975	470.478	1903.73
1983	63.4345	3186.9	166.591	58.3021	515.853	2429.42
1984	75.0959	3563.91	189.222	64.857	550.022	2830.59
1985	88.3414	3882.41	212.725	69.9332	584.165	3152.85
1986	103.232	4174.9	236.171	75.7595	618.554	3531.45
1987	119.764	4444.37	254.545	82.1596	655.677	3956.18
1988	137.582	4684.25	272.663	89.5782	693.156	4421.19
1989	156.669	4856.44	283.531	97.7497	726.344	4845.33
1990	176.516	4956.82	288.645	106.211	753.078	5155.6

	WSGS	GFBAL	PFBAL	PIPC	DIRPA	E99SRPC
1977	350.4	633.565	50.005	7916.37	2753.29	1089.41
1978	399.908	972.572	176.591	8575.66	2835.64	1162.41
1979	477.619	1429.5	327.64	9263.37	2925.54	1255.51
1980	581.366	1952.19	468.471	10121.3	3056.87	1378.93
1981	761.712	2531.43	719.451	11661.7	3364.49	1647.51
1982	855.19	3164.83	906.207	11723.4	3221.84	1607.48
1983	1058.87	3594.26	1072.8	12420.9	3269.15	1784.27
1984	1212.85	3977.43	1262.02	12781.1	3218.39	1922.4
1985	1332.35	4336.91	1474.75	13314.9	3208.76	1981.61
1986	1471.36	4591.4	1710.92	13931.	3207.77	2049.59
1987	1626.29	4671.79	1965.46	14667.	3229.94	2106.65
1988	1797.09	4509.39	2238.12	15459.4	3250.21	2159.95
1989	1956.92	4081.47	2521.65	16227.	3260.93	2189.65
1990	2082.03	3435.04	2810.3	16955.2	3252.1	2182.56

NOTE: See end of table for variable identification.

A.1 Base Simulation (continued)

	R99SRPC	POP	PI	EM99
1977	1145.93	387.361	3066.5	181.804
1978	1572.5	397.334	3407.41	188.626
1979	1765.95	414.245	3837.3	200.429
1980	1878.02	443.384	4487.64	221.058
1981	2227.06	468.713	5465.98	254.215
1982	2083.64	527.167	6180.21	271.775
1983	2066.89	567.052	7043.3	295.062
1984	2171.12	581.393	7430.84	296.321
1985	2208.59	599.9	7987.62	302.236
1986	2215.94	619.821	8634.73	309.842
1987	2183.95	644.853	9458.04	321.939
1988	2131.29	671.17	10375.9	334.891
1989	2058.41	694.157	11264.1	344.939
1990	1976.81	710.749	12050.9	349.893

RTIS	Personal Income Tax
RTBS	Business License Tax
RTCS	Corporate Income Tax
RTNSF	Motor Fuel Tax
RTVS	Ad Valorem Taxes
RTAS	Alcohol Tax
RTCIS	Cigarette Tax
RTSS	School Tax
RTOTS	Miscellaneous Taxes
RT98	Sum of Non-petroleum Taxes
RP9S	Petroleum Revenues
RINS	General Fund Interest
RIPF	Permanent Fund Interest
RGF99S	Total General Fund Revenues
RPFS	Permanent Fund Revenues
RSFS	Special Fund Revenues
EXCAP	Capital Expenditures
EXCUR	Current Expenditures
WSGS	State Government Wages and Salaries
GFBAL	General Fund Balance
PFBAL	Permanent Fund Balance
PIPC	Personal Income Per Capita ($)
DIRPA	Real Disposable Personal Income Per Capita ($)
E99SRPC	Real State Expenditures Per Capita ($)
R99SRPC	Real State Revenues Per Capita ($)
POP	Population (10^3)
PI	Personal Income
EM99	Employment (10^3)

A.2 Sensitivity Analysis Runs

POP - ENDOGENOUS

GOLDL7	GOLDA7	GOLDA9		
387.361	387.361	387.361	1977	
394.859	397.334	399.099	1978	
410.779	414.245	418.978	1979	
431.351	443.384	451.461	1980	
431.171	468.713	481.598	1981	
463.805	527.167	544.314	1982	
489.356	567.052	590.	1983	
509.178	581.393	609.866	1984	
526.664	599.9	633.722	1985	
543.36	619.821	659.184	1986	
560.017	644.853	690.16	1987	
575.165	671.17	722.803	1988	
589.058	694.157	751.941	1989	
599.884	710.749	773.561	1990	

EM99 - ENDOGENOUS

GOLDL7	GOLDA7	GOLDA9
181.804	181.804	181.804
186.623	188.626	190.054
197.968	200.429	204.066
212.01	221.058	226.947
225.798	254.215	263.357
225.941	271.775	283.544
242.875	295.062	310.506
253.674	296.321	315.001
262.146	302.236	323.789
269.87	309.842	334.276
277.566	321.939	349.459
284.011	334.891	365.698
289.586	344.939	378.781
292.87	349.893	385.772

PI - ENDOGENOUS

GOLDL7	GOLDA7	GOLDA9		
3066.5	3066.5	3066.5	1977	
3365.75	3407.41	3432.35	1978	
3785.19	3837.3	3904.92	1979	
4284.87	4487.64	4602.57	1980	
4818.27	5465.98	5653.22	1981	
5097.41	6180.21	6433.86	1982	
5767.18	7043.3	7393.33	1983	
6347.1	7430.84	7877.77	1984	
6917.41	7987.62	8531.61	1985	
7515.29	8634.73	9285.2	1986	
8154.48	9458.04	10229.7	1987	
8806.08	10375.9	11285.9	1988	
9473.7	11264.1	12317.3	1989	
10113.3	12050.9	13228.7	1990	

RT98 - DEFINITION

GOLDL7	GOLDA7	GOLDA9
174.739	174.739	174.739
222.75	223.948	224.652
253.966	260.434	263.412
287.381	299.043	305.273
324.127	369.048	379.799
354.332	445.526	462.102
380.268	501.671	524.674
421.764	550.398	581.146
455.447	572.19	610.217
493.079	609.836	655.723
532.583	658.234	713.041
573.615	718.375	783.568
616.806	785.912	862.632
657.796	839.879	927.18

GOLDA7 = base case
POP = population (10^3)
PI = personal income (10^6)

GOLDA9 = increased oil price
EM99 = employment (10^3)
RT98 = non-petroleum tax revenues (10^6)

GOLDL7 = decreased petroleum activity

RP9S - DEFINITION

GOLDL7	GOLDA7	GOLDA9
450.658	450.658	450.658
873.008	873.008	1080.75
1111.6	1111.6	1388.43
1329.61	1337.28	1699.98
1406.81	1842.71	2352.37
1705.3	1918.38	2454.22
1877.71	2092.63	2674.51
1986.04	2369.05	2979.84
2076.08	2628.18	3306.67
2113.55	2839.97	3581.16
2151.37	3013.67	3803.02
2188.16	3150.47	3987.69
2185.73	3218.54	4079.85
2182.03	3243.14	4116.14

RPFS - DEFINITION

GOLDL7		GOLDA7	GOLDA9
	1977	13.0716	13.0716
	1978	126.587	159.206
	1979	151.049	190.844
	1980	140.831	181.069
	1981	149.92	322.689
	1982	152.892	241.194
	1983	160.944	218.147
	1984	171.916	243.484
	1985	181.338	273.504
	1986	186.952	303.648
	1987	192.652	327.272
	1988	198.096	350.567
	1989	199.61	364.54
	1990	200.805	371.115

RGF99S - ENDOGENOUS

GOLDL7	GOLDA7	GOLDA9
972.244	972.244	972.244
1336.39	1338.53	1515.03
1627.76	1636.43	1891.75
1951.78	1976.65	2338.02
2118.2	2516.4	3019.4
2506.98	2839.14	3419.5
2775.17	3186.9	3850.17
2990.34	3563.91	4287.06
3169.41	3882.41	4696.11
3293.87	4174.9	5073.77
3409.18	4444.37	5414.63
3513.65	4684.25	5723.8
3572.99	4856.44	5939.94
3616.38	4956.82	6065.23

E99S - DEFINITION

GOLDL7		GOLDA7	GOLDA9
	1977	968.457	968.457
	1978	1105.08	1109.53
	1979	1286.02	1298.51
	1980	1546.36	1585.97
	1981	1876.13	2081.91
	1982	1999.94	2374.2
	1983	2404.65	2945.27
	1984	2769.47	3380.61
	1985	3107.55	3737.02
	1986	3428.93	4150.
	1987	3744.02	4611.85
	1988	4043.83	5114.34
	1989	4298.7	5571.67
	1990	4493.25	5908.68

RP9S = petroleum revenues (10^6)
RGF99S = total general fund revenues (10^6)

RPFS = permanent fund revenues (10^6)
E99S = total state expenditures (10^6)

WSGS - ENDOGENOUS

GOLDL7	GOLDA7	GOLDA9
350.4	350.4	350.4 — 1977
397.98	399.908	410.507 — 1978
472.863	477.619	504.24 — 1979
567.615	581.366	626.557 — 1980
694.783	761.712	834.476 — 1981
727.318	855.19	952.939 — 1982
871.742	1058.87	1192.66 — 1983
1000.41	1212.85	1382.8 — 1984
1118.42	1332.35	1536.6 — 1985
1230.69	1471.36	1713.13 — 1986
1341.27	1626.29	1909.03 — 1987
1448.32	1797.09	2125.92 — 1988
1542.62	1956.92	2331.67 — 1989
1620.18	2082.03	2495.76 — 1990

PFBAL - ENDOGENOUS

GOLDL7	GOLDA7	GOLDA9
50.005	50.005	50.005
176.591	176.591	209.211
327.64	327.64	400.055
468.471	468.471	581.124
618.391	719.451	903.812
771.283	906.207	1145.01
932.227	1072.8	1363.15
1104.14	1262.02	1606.64
1285.48	1474.75	1880.14
1472.43	1710.92	2183.79
1665.08	1965.46	2511.06
1863.18	2238.12	2861.63
2062.79	2521.65	3226.17
2263.6	2810.3	3597.28

GFBAL - ENDOGENOUS

GOLDL7	GOLDA7	GOLDA9
633.565	633.565	633.565 — 1977
974.875	972.572	1123.7 — 1978
1435.38	1429.5	1754.28 — 1979
1970.13	1952.19	2499.35 — 1980
2346.57	2531.43	3353.31 — 1981
3003.41	3164.83	4260.77 — 1982
3537.83	3594.26	4930.89 — 1983
3935.64	3977.43	5499.83 — 1984
4187.47	4336.91	6023.33 — 1985
4255.84	4591.4	6402.38 — 1986
4138.64	4671.79	6541.73 — 1987
3840.53	4509.39	6354.47 — 1988
3361.56	4081.47	5797.15 — 1989
2745.61	3435.04	4926.86 — 1990

PIPC - DEFINITION

GOLDL7	GOLDA7	GOLDA9
7916.37	7916.37	7916.37
8523.93	8575.66	8600.23
9214.65	9263.37	9320.11
9933.59	10121.3	10194.8
11174.8	11661.7	11738.5
10990.4	11723.4	11820.1
11785.2	12420.9	12531.1
12465.4	12781.1	12917.2
13134.4	13314.9	13462.7
13831.1	13931.	14085.9
14561.1	14667.	14822.2
15310.5	15459.4	15614.1
16082.8	16227.	16380.7
16858.7	16955.2	17101.1

WSGS = state wages & salaries (10^6)
GFBAL = general fund balance (10^6)

PFBAL = permanent fund balance (10^6)
PIPC = personal income per capita

DIRPA - DEFINITION

	GOLDL7	GOLDA7	GOLDA9	
1977	2753.29	2753.29	2753.29	1977
1978	2819.04	2835.64	2843.77	1978
1979	2911.13	2925.54	2943.21	1979
1980	3002.26	3056.87	3078.57	1980
1981	3229.5	3364.49	3386.04	1981
1982	3028.34	3221.84	3248.06	1982
1983	3111.97	3269.15	3297.67	1983
1984	3147.43	3218.39	3252.06	1984
1985	3170.77	3208.76	3243.54	1985
1986	3188.96	3207.77	3242.54	1986
1987	3209.99	3229.94	3263.24	1987
1988	3222.26	3250.21	3281.93	1988
1989	3235.43	3260.93	3291.07	1989
1990	3236.97	3252.1	3279.36	1990

E99SRPC - DEFINITION

GOLDL7	GOLDA7	GOLDA9
1089.41	1089.41	1089.41
1165.01	1162.41	1183.73
1253.93	1255.51	1320.16
1382.	1378.93	1474.44
1613.94	1647.51	1781.71
1539.06	1607.48	1760.67
1688.05	1784.27	1964.69
1798.23	1922.4	2128.6
1876.96	1981.61	2207.32
1931.78	2049.59	2292.81
1969.32	2106.65	2363.97
1992.91	2159.95	2430.38
1990.8	2189.65	2469.3
1966.46	2182.56	2465.83

R99SRPC - DEFINITION

GOLDL7	GOLDA7	GOLDA9	
1145.93	1145.93	1145.93	1977
1580.1	1572.5	1783.66	1978
1772.3	1765.95	2028.19	1979
1908.06	1878.02	2187.53	1980
1991.	2227.06	2610.4	1981
2085.2	2083.64	2434.71	1982
2099.45	2066.89	2403.38	1983
2092.04	2171.12	2492.18	1984
2063.05	2208.59	2530.88	1985
2000.62	2215.94	2533.8	1986
1934.54	2183.95	2487.38	1987
1869.81	2131.29	2419.19	1988
1788.31	2058.41	2324.93	1989
1712.53	1976.81	2222.99	1990

DIRPA = disposable real income per capita (1967 US = 100)

R99SRPC = real state revenues per capita (1967 US = 100)

E99SRPC = real state expenditures per capita (1967 US = 100)

POP - ENDOGENOUS

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	3.65454	8.81128	10.4705	9.35449
1980	4.47388	12.6064	16.8149	13.5828
1981	5.57837	16.6147	24.2639	18.106
1982	5.55859	19.5493	30.9561	21.52
1983	5.21606	21.9238	37.1191	24.4373
1984	4.80566	23.5227	42.0664	26.5713
1985	4.93774	24.9143	46.9678	28.4839
1986	4.69385	25.9778	51.6663	30.0703
1987	4.32959	26.9314	56.6177	31.5962
1988	3.55127	27.6304	61.5789	32.9253
1989	2.42749	27.6208	65.7627	33.5874
1990	0.855713	26.5862	68.5852	33.2119

PI - ENDOGENOUS

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	60.1299	131.539	143.617	139.643
1980	66.5195	180.09	198.465	194.332
1981	80.957	235.09	273.43	256.918
1982	76.4023	277.551	342.148	306.852
1983	67.1953	311.914	405.859	350.012
1984	58.6016	336.836	456.355	384.293
1985	62.2969	360.152	508.887	416.992
1986	57.5391	379.902	562.355	446.789
1987	50.4687	400.234	625.527	478.797
1988	33.5938	418.367	694.535	510.848
1989	8.17187	422.359	750.785	530.676
1990	-29.5508	402.746	779.039	527.727

GOLDCON = capital construction
GOLDTX = transfer to individual
POP = population (10^3)

GOLDLOC = transfer to local government
GOLDOP = operating budget
PI = personal income (10^6)

EM99 - ENDOGENOUS

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	2.95674	7.12895	8.47131	7.56839
1980	3.18396	9.28026	11.1054	10.0144
1981	3.7059	11.5255	14.5846	12.5963
1982	3.34863	12.9106	17.3223	14.2744
1983	2.80493	13.7817	19.5466	15.467
1984	2.30566	14.0916	20.873	16.0786
1985	2.31055	14.2808	22.1775	16.5364
1986	2.02002	14.2769	23.3533	16.7922
1987	1.67505	14.2749	24.7993	17.0796
1988	1.03906	14.1587	26.3025	17.2908
1989	0.192627	13.5625	27.2085	17.043
1990	-0.936279	12.2568	27.0867	16.0627

RT98 - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	1.72412	3.7832	4.14258	4.01758
1980	4.5791	10.8662	14.0125	11.6313
1981	5.4563	15.0876	19.7847	16.387
1982	6.20996	19.5371	27.0642	21.4746
1983	5.76782	22.8965	33.3169	25.4966
1984	5.09277	25.415	38.5786	28.7432
1985	4.75537	27.001	42.4329	31.0303
1986	4.79248	28.6328	46.8955	33.4106
1987	4.36304	30.22	51.8789	35.845
1988	3.52222	31.8384	57.7871	38.479
1989	1.95215	32.9631	63.7842	40.8015
1990	-0.449951	32.3628	67.5488	41.4534

EM99 = employment (10^3)

RT98 = non-petroleum tax revenues (10^6)

A.3 Policy Simulations (cont.)

RGF99S - ENDOGENOUS

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	3.12012	7.14917	8.14233	7.59106
1980	-2.18799	8.90771	14.0586	11.6489
1981	-12.9036	2.86792	11.6118	7.92969
1982	-27.4631	-7.21558	6.94946	0.445557
1983	-46.2988	-21.9854	-2.33887	-11.6228
1984	-67.5649	-40.9526	-16.3503	-27.9609
1985	-90.2004	-64.0154	-35.4858	-48.6694
1986	-114.522	-89.7239	-56.8594	-72.1172
1987	-141.855	-117.891	-80.1758	-98.082
1988	-172.168	-148.211	-104.641	-126.176
1989	-206.	-181.203	-131.191	-156.969
1990	-242.926	-217.57	-160.812	-191.426

E99S - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	147.327	155.786	35.8767	136.536
1980	174.642	202.937	64.4048	185.852
1981	214.622	257.723	89.1118	241.241
1982	235.695	295.62	114.576	281.566
1983	245.24	322.431	133.809	313.953
1984	250.226	340.659	144.033	338.447
1985	260.37	355.369	144.946	357.959
1986	268.129	363.129	139.594	371.312
1987	274.199	366.891	126.23	380.934
1988	277.082	363.977	101.266	384.973
1989	268.336	342.027	53.3164	371.473
1990	248.332	294.992	-24.582	333.379

RGF99S = general fund revenues (10^6)

E99S = state government expenditures (10^6)

All

A.3 Policy Simulations (cont.)

SLGEXP - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	147.344	155.925	35.8965	136.582
1980	178.718	211.457	74.4646	195.474
1981	219.34	268.897	103.885	255.083
1982	241.675	310.24	135.823	300.519
1983	251.105	339.479	161.423	337.144
1984	255.656	359.859	178.086	365.723
1985	265.387	376.289	184.945	388.906
1986	273.648	385.648	186.145	406.023
1987	279.609	390.605	179.895	419.402
1988	282.199	388.73	163.363	427.602
1989	272.336	367.699	124.996	418.523
1990	250.441	320.578	56.4258	384.121

PIPC - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	62.875	117.988	109.777	125.09
1980	47.4219	115.125	61.4414	124.422
1981	33.5312	85.168	-19.3281	94.0234
1982	21.0938	88.4648	-37.2031	99.4414
1983	4.20703	67.2383	-91.3516	78.582
1984	-4.80859	59.8281	-130.398	73.4961
1985	-5.69922	45.4883	-180.074	60.0469
1986	-12.5703	27.8789	-234.418	42.8984
1987	-20.0742	7.78906	-292.074	22.7305
1988	-31.5781	-12.5664	-351.332	2.61719
1989	-44.8164	-35.8086	-416.293	-19.7148
1990	-61.9141	-65.1367	-492.52	-47.5664

SLGEXP = combined state and local government expenditures (10^6)
PIPC = personal income per capita

DIRPA - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	19.5034	37.355	148.823	39.606
1980	13.446	33.772	135.911	36.522
1981	8.93042	23.625	126.873	26.1077
1982	5.31616	23.8923	119.532	26.877
1983	0.746094	17.1614	103.045	20.095
1984	-1.43555	14.6414	96.8982	18.0229
1985	-1.53247	10.5583	89.8481	13.9836
1986	-3.05493	6.09497	81.6401	9.46191
1987	-4.50464	1.52905	74.1372	4.73511
1988	-6.66406	-2.68823	68.1702	0.428711
1989	-8.94067	-7.11401	61.7385	-3.94678
1990	-11.7185	-12.3186	54.6543	-9.01611

R99SRPC - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOP_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	-12.4521	-30.0115	-35.8567	-31.8201
1980	-20.5085	-44.0723	-56.4023	-45.658
1981	-36.1194	-73.5889	-100.212	-76.2927
1982	-39.946	-78.6389	-110.235	-80.8027
1983	-46.4121	-88.989	-127.055	-91.2944
1984	-55.6824	-105.863	-153.527	-109.041
1985	-65.2688	-119.665	-176.	-123.627
1986	-72.583	-130.619	-194.41	-135.301
1987	-78.7368	-138.159	-207.747	-143.461
1988	-83.3684	-143.258	-217.17	-149.132
1989	-87.6985	-146.075	-222.553	-152.43
1990	-91.9006	-147.551	-225.249	-154.345

DIRPA = disposable real income (1967 US = 100)

R99SRPC = real state revenues per capita (1967 US = 100)

E99SRPC - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOF_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	130.224	121.341	2.88184	101.375
1980	136.552	133.445	3.56738	115.8
1981	148.467	140.566	-14.0413	122.532
1982	141.141	135.515	-15.886	120.113
1983	130.951	121.644	-33.5393	106.621
1984	125.365	111.429	-53.3308	100.028
1985	120.761	101.911	-72.6013	91.3857
1986	116.022	89.6812	-94.0637	80.0635
1987	110.366	76.4192	-117.027	67.48
1988	105.037	62.2366	-142.345	53.9788
1989	97.4575	45.4792	-170.35	38.1924
1990	88.9941	26.3386	-200.358	20.2122

GEXPRPC - DEFINITION

	GOLDCON_ER	GOLDLOC_ER	GOLDTX_ER	GOLDOF_ER
1977	0.	0.	0.	0.
1978	0.	0.	0.	0.
1979	127.783	115.622	-4.02417	95.2141
1980	137.29	132.982	1.86279	115.677
1981	148.66	138.931	-17.5562	122.022
1982	141.944	134.079	-19.3296	120.397
1983	131.559	119.694	-37.467	108.891
1984	125.584	108.429	-58.6877	99.6938
1985	120.53	98.5457	-78.4492	91.1208
1986	116.019	85.8594	-100.57	79.7395
1987	110.359	72.0217	-124.28	66.9922
1988	105.175	57.1721	-150.43	53.2747
1989	97.6357	39.9412	-179.084	37.4475
1990	89.2722	20.439	-209.704	19.5356

E99SRPC = real state expenditures per capita (1967 US = 100)
GEXPRPC = combined state and local government expenditures (1967 US = 100)

Appendix B

State Fiscal Model Variables and Equations*

All expressions beginning with C are coefficients of stochastic equations except those listed below.

All expressions ending in X are an exogenous component of an expression unless listed below.

All variables in millions of dollars unless noted. (Per capita variables in dollars.)

A numeral at the end of an expression indicates a sub-total of the variable unless listed below.

AEX - exemptions (number)
AGI - Alaska adjusted gross income
AHG - average highway gallons of fuel consumed (10^3)
ANCSA - native claims payments
ATD - tax deductions

ATDCH - change in tax deductions
ATI - taxable income
ATIA - taxable income per tax return
BL - business licenses (number)
BTRATE - initial business license fee

CAPEXPF - capital expenditures from the permanent fund
COLA - federal cost of living adjustment
COLART - federal cost of living (%)
CRF - capital recovery factor on bonds
DEBTP76 - post 1976 debt

DIVPF - permanent fund dividends
DPI - disposable personal income
DPIR - real disposable personal income (1967US=100)
ECDS - commerce and economic development operating expenditures
ECPS - bond fund capital expenditures

ECPSHY - bond highway capital expenditures
ECPSNY - bond non-highway capital expenditures
EEDS - education operating expenditures
EGGS - general government operating expenditures
EHES - health operating expenditures

*Regression results available from author on request.

EHWS - health and social services operating expenditures
EJUS - justice operating expenditures
EMGF - federal government employment (10^3)
EMGM - military employment (10^3)
EMSS - miscellaneous operating expenditures

EM99 - total employment
ENRS - natural resource operating expenditures
EPPS - public protection operating expenditures
ESSS - social service operating expenditures
E98S - state government expenditures net of capital expenditures and debt service

E99S - total state government expenditures
ETRS - transportation operating expenditures
EXCAP - capital expenditures
EXCAPFER - capital expenditures on ferries
EXCUR - state current expenditures from funds

EXDSS - debt service on general obligation bonds
EXHYCAP - highway capital expenditures
EXNHYCAP - non-highway capital expenditures
EXOPS - state operating expenditures as sum of functional expenditures
FAGI - federal adjusted gross income

GFBAL - general fund balance
GFCAP - general fund capital expenditures
GFCAPHY - general fund highway capital expenditures
GFCAPNHY - general fund non-highway capital expenditures
GFER - growth rate of ferry revenues

GIA - growth rate of international airport revenues
GR - gross receipts
GTR - gross taxable receipts
LOANPF - permanent fund loans
MILEMPC - percent of federal employment that is military

NTCOM - non-taxable component of gross receipts of individual business
PDCON - price deflator in construction (1958=100)
PERCDS - personnel expenditures in commerce and economic development
PEREDS98 - personnel expenditures in education net of U of Alaska
PERGGS - personnel expenditures in general government

PERHES - personnel expenditures in health
PERJUS - personnel expenditures in justice
PERNRS - personnel expenditures in natural resources
PERPPS - personnel expenditures in public protection
PERSSS - personnel expenditures in social services

PERTRS - personnel expenditures in transportation
PERUA - personnel expenditures University of Alaska
PFBAL - permenent fund balance
PFPER - percent of eligible petroleum revenues channeled into permanent fund
PI - personal income

PIRPC - real personal income per capita (1967US=100)
POP - population (10^3)
POPC - civilian population (10^3)
PTTRANS - percentage of local property tax reduction picked up by state
QREVQ - difference per taxpayer in personal income tax liability before and after change in tax policy

RATIO1 - equilibrating ratio in savings routine
RES - local government component of difference between personal income and disposable personal income
RFAS - vehicle related fees
RFDPER - percent of cost of living increase "built in" to federal transfers
RFDSN - federal-state transfers

RFDSNPC - federal-state transfers per capita (10^3)
RFERS - ferry revenues
RFOS - non-vehicle related fees
RFTS - total fee and license revenues
RGF99S - total general fund revenues

RIAS - international airport revenues
RINS - general fund interest revenue
RIPF - permanent fund interest income
RMIS - miscellaneous revenues
ROR - rate of return on general fund balance

RORPF - rate of return on permanent fund
RPBS - bonus petroleum revenues
RPFS - permanent fund revenues
RPI - relative price index (1967US=100)
RP7S - petroleum revenues eligible to be channeled into permanent fund

RP8S - recurrent petroleum revenues
RP9S - petroleum revenues
RSFFS - fee revenues channeled to special fund
RSFS - special fund revenues
RTAS - alcohol tax revenues

RTBS - business license tax revenues
RTCIS - cigarette tax revenues
RTCS - corporate income tax revenues
RTIS - fiscal year personal income tax revenue
RTISC - calendar year personal income tax revenue

RTISCA - personal income tax revenues
RTISOLD - personal tax revenues per taxpayer without policy changes
RTMF - motor fuel tax revenues
RTOTS - miscellaneous tax revenues
RTPIF - federal income tax revenue

RTPL - state-local transfers
RTSS - school tax revenues
RTVS - ad valorem tax revenues
RT98 - non-petroleum tax revenues
R99S - total revenues

SAVS - amount withheld from operating expenditures after initial determination of spending level
THG - total highway gallons of fuel consumed (10^3)
TPPF - transfers from permanent fund to individuals
TPTV - total highway vehicles (10^3)
TT - tax returns

TXCR - personal income tax credit lump sum
TXCRPC - personal income tax credit as percent of liability
VACAP - real value added in capital expenditures (1958=100)
VAEX - value of an exemption (units)
VAEXCH - change in value of exemption (units)

VAHYCON - value added in highway construction
VANHYCON - value added in non-highway construction
WSCDS - wages and salaries in commerce and economic development
WSEDS - wages and salaries in education
WSGC - federal civilian wages and salaries

WSGGS - wages and salaries in general government
WSGM - military wages and salaries
WSGS - wages and salaries paid in state government
WSHES - wages and salaries in health
WSJUS - wages and salaries in justice

WSNRS - wages and salaries in natural resources
WSPPS - wages and salaries in public protection
WSSSS - wages and salaries in social services
WSTRS - wages and salaries in transport
WS99 - total wages and salaries (1967US=100)

XXA9 - agriculture sector state product (1958=100)
XXP9 - mining (petroleum) sector state product (1958=100)
XX99 - gross state product (1958=100)

```
LOG(FAGI) = CRITSA+CRITSB*LOG(PI)
COLA = (1-1/(1+COLART))*WSOC
AGI = FAGI+COLA-WSOM
LOG(TT) = CRITSC+CRITSD*LOG(EM99)
LOG(AEX) = CRITSO+CRITSP*LOG(POPC)
LOG(ATD/TT) = CRATD1+CRATD2*LOG(AGI/TT)
ATI = AGI-AEX*(VAEX+VAEXCH)-ATD-ATDCH
ATIA = ATI/TT
LOG(RTISCA1) = CRITSF-CRITSFCH+(1-CHPITRT)*CRITSG*LOG(ATIA)
RTISCA = RTISCA1-TXCR-TXCRPC*RTISCA1
RTISC = RTISCA*TT
RTIS = CRITSH*RTISC(-1)+CRITSJ*RTISC
LOG(RTPIF/TT) = CRFTA+CRFTB*LOG(FAGI/TT)
LOG(RES/POP) = CRITSL+CRITSM*LOG(PI(-1)*1000/POP(-1))
DPI1 = PI-CNC1*ANCSA-RTISC-RES-RTPIF+TPPF
LOG(BL) = CRTBSA+CRTBSB*LOG(XX99)
LOG(GR) = CRTBSC+CRTBSD*LOG(XX99-XXP9-XXA9)
RTBS1 == (BL+BL(-1))/2*BTRATE
GTR = GR-BL(-1)*NTCOM
LOG(RTBS2/BL(-1)) = CRTBSE+CRTBSF*LOG(GTR(-1)/BL(-1))
RTBS == RTBS1+RTBS2
LOG(RTCS1) = CRTCSA+CRTCSB*LOG(XX99(-1)-WS99(-1)/RPI(-1))
RTCS = RTCS1+RTCSPX
LOG(TPTV) = CRMVA+CRMVB*LOG(POP)
LOG(AHG) = CRMVC+CRMVD*LOG(PIRPC)
THG == AHG*TPTV
LOG(RTMF) = CRMVE+CRMVF*LOG(THG)
LOG(RTVS) = CRTOA+CRTOB*LOG(DPI(-1))
LOG(RTAS) = CRTOC+CRTOD*LOG(DPIR(-1))
```

```
34:     LOG(RTCIS) = CRTOG+CRTOH*LOG(DPIR(-1))
35:     EMON = MILEMPC*EMOF
36:     LOG(RTSS) = CRTOE+CRTOF*LOG(EM99-EMGM)
37:     RT98 == RTIS+RTCS+RTBS+RTMF+RTAS+RTCIS+RTVS+RTSS+RTOTS
38:     RF9S == RF8S+RFBS
39:     RIAS = RIAS(-1)*(1+GIA)
40:     RIPF = PFBAL(-1)*RORPF
41:     RFERS = RFERS(-1)*(1+GFER)
42:     RINS == ROR*GFBAL(-1)
43:     LOG(RFAS) = CRMVG+CRMVH*LOG(TPTV(-1))
44:     LOG(RFOS) = CRNC+CRND*LOG(PI(-1))
45:     LOG(RSFFS) = CRNG+CRNH*LOG(POP(-1))
46:     RFTS == RFAS+RFOS
47:     LOG(RMIS) = CRNE+CRNF*LOG(PI(-1))
48:     RFDSNPC = 0.382+82.9*(1/POP)
49:     RFDSN = RFDSNPC*POP+(RFDSN(-1)-RFDSNX(-1))*(CPI/CPI(-1)-1)*RFDPER+RFDSNX
50:     RGF99S = RF9S-PFPER*RP7S+RT98-0.625*RTCIS+RFTS-RSFFS+RFERS+RINS+RFDSN+RMIS+RF9X+RIPF-PTTRANS*RTPL
51:     RSFS == RIAS+0.625*RTCIS+RSFFS+RSFSX
52:     RPFS == PFPER*RP7S+DIVPF
53:     R99S = RGF99S+RSFS+RPFS
54:     LOG(RTISOLD) = CRITSF+CRITSG*LOG(ATIA+(AEX*VAEXCH+ATDCH)/TT)
55:     QREVQ = RTISOLD-RTISCA
56:     SAVS == SAVX-TAXCHPC*TT*QREVQ
57:     GFCAPHY = IF YR LT 1979 THEN GFCAPHYX ELSE 0.55*RFDSN+0.5*NEWCAPX
58:     ECPSHY = IF YR LT 1979 THEN ECPSHYX ELSE ECPSHY(-1)*(POP/POP(-1)*RPI/RPI(-1)-1)
59:     GFCAPNHY = IF YR LT 1979 THEN GFCPNHYX ELSE 0.05*RGF99S+0.5*NEWCAPX
60:     ECPSNHY = IF YR LT 1979 THEN ECPSNHYX ELSE ECPSNHY(-1)*(POP/POP(-1)+RPI/RPI(-1)-1)
61:     EXHYCAP == GFCAPHY+ECPSHY
62:     EXNHYCAP == GFCAPNHY+ECPSNHY
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63:     VAHYCON = CCX1A+CCX1B*EXHYCAP
64:     VANHYCON = CCX2A+CCX2B*(EXNHYCAP-EXCAPFER(-1))
65:     PDCON = CCX3A+CCX3B*WSCN(-1)
66:     VACAP == (VAHYCON+VANHYCON)/(PDCON/100)
67:     GFCAP == GFCAPHY+GFCAPNHY
68:     ECPS == ECPSHY+ECPSNHY
69:     EXCAP == GFCAP+ECPS
70:     DEBTP76 = DEBTP76(-1)+ECPS
71:     EXDSS = EXDSSX+CRF*DEBTP76
72:     LOG(EEDS1/POP(-1)) = EX1A+EX1B*LOG(RGF99S-RFDSN-EXDSS+PTTRANS*RTPL)+(+EX1D)*LOG(PI/POP)+EX1E*LOG(
        GFBAL(-1))
73:     LOG(ESSS1/POP(-1)) = EX2A+EX2B*LOG(RGF99S-RFDSN-EXDSS+PTTRANS*RTPL)+(+EX2D)*LOG(PI/POP)+EX2E*LOG(
        GFBAL(-1))
74:     LOG(EHES1/POP(-1)) = EX3A+EX3B*LOG(RGF99S-RFDSN-EXDSS+PTTRANS*RTPL)+(+EX3D)*LOG(PI/POP)+EX3E*LOG(
        GFBAL(-1))
75:     LOG(ENRS1/POP(-1)) = EX4A+EX4B*LOG(RGF99S-RFDSN-EXDSS+PTTRANS*RTPL)+(+EX4D)*LOG(PI/POP)+EX4E*LOG(
        GFBAL(-1))
76:     LOG(EPPS1/POP(-1)) = EX5A+EX5B*LOG(RGF99S-RFDSN-EXDSS+PTTRANS*RTPL)+(+EX5D)*LOG(PI/POP)+EX5E*LOG(
        GFBAL(-1))
77:     LOG(EJUS1/POP(-1)) = EX6A+EX6B*LOG(RGF99S-RFDSN-EXDSS+PTTRANS*RTPL)+(+EX6D)*LOG(PI/POP)+EX6E*LOG(
        GFBAL(-1))
78:     LOG(ECDS1/POP(-1)) = EX7A+EX7B*LOG(RGF99S-RFDSN-EXDSS+PTTRANS*RTPL)+(+EX7D)*LOG(PI/POP)+EX7E*LOG(
        GFBAL(-1))
79:     LOG(EGGS1/POP(-1)) = EX8A+EX8B*LOG(RGF99S-RFDSN-EXDSS+PTTRANS*RTPL)+(+EX8D)*LOG(PI/POP)+EX8E*LOG(
        GFBAL(-1))
80:     LOG(ETRS1/POP(-1)) = EX9A+EX9B*LOG(RGF99S-RFDSN-EXDSS+PTTRANS*RTPL)+EX9D*LOG(PI/POP)+EX9E*LOG(GFBAL(
        -1))
81:     EEDS28 = EX1B*SAVS
82:     ESSS28 = EX2B*SAVS
83:     EHES28 = EX3B*SAVS
84:     ENRS28 = EX4B*SAVS
85:     EPPS28 = EX5B*SAVS
86:     EJUS28 = EX6B*SAVS
```

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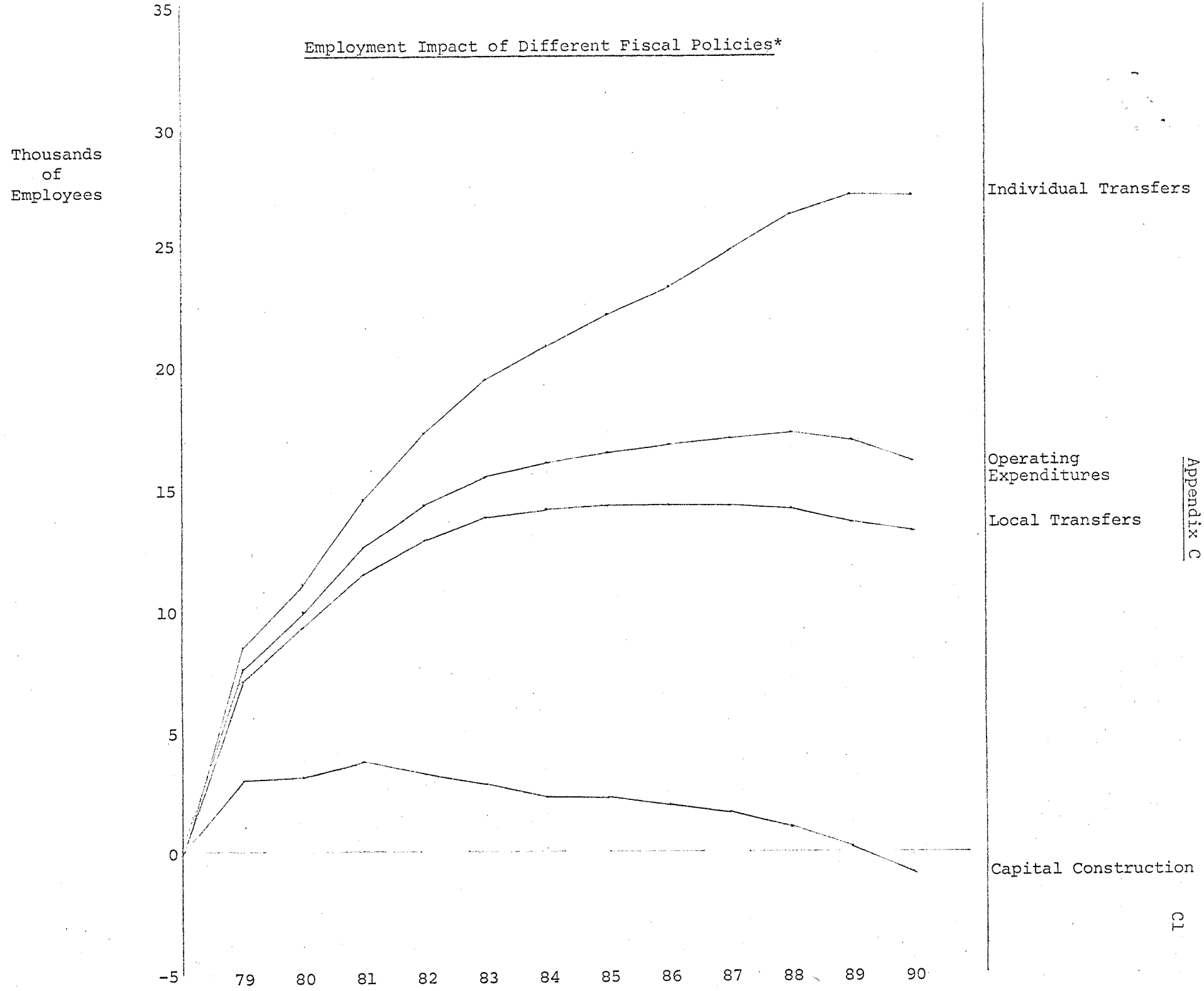
87:     ECDS28 = EX7B*SAVS
88:     EGGS28 = EX8B*SAVS
89:     ETRS28 = EX9B*SAVS
90:     RATIO1 == (EEDS28+ESSS28+EHES28+ENRS28+EPPS28+EJUS28+ECDS28+EGGS28+ETRS28)/SAVS
91:     EEDS2 == EEDS28*RATIO1
92:     ESSS2 == ESSS28*RATIO1
93:     EHES2 == EHES28*RATIO1
94:     ENRS2 == ENRS28*RATIO1
95:     EPPS2 == EPPS28*RATIO1
96:     EJUS2 == EJUS28*RATIO1
97:     ECDS2 == ECDS28*RATIO1
98:     EGGS2 == EGGS28*RATIO1
99:     ETRS2 == ETRS28*RATIO1
100:    EEDS == EEDS1+EEDSX-EEDS2
101:    ESSS == ESSS1+ESSSX-ESSS2
102:    EHES == EHES1+EHESX-EHES2
103:    ENRS == ENRS1+ENRSX-ENRS2
104:    EPPS == EPPS1+EPPSX-EPPS2
105:    EJUS == EJUS1+EJUSX-EJUS2
106:    ECDS == ECDS1+ECDSX-ECDS2
107:    EGGS == EGGS1+EGGSX-EGGS2
108:    ETRS == ETRS1+ETRSX-ETRS2
109:    EHWS == EHES+ESSS
110:    EMSS == ENRS+EPPS+EJUS+EGGS
111:    PEREDS98 = PE1A+PE1B*EEDS
112:    PERSSS = PE2A+PE2B*ESSS
113:    PERHES = PE3A+PE3B*EHES
114:    PERNRS = PE4A+PE4B*ENRS
```

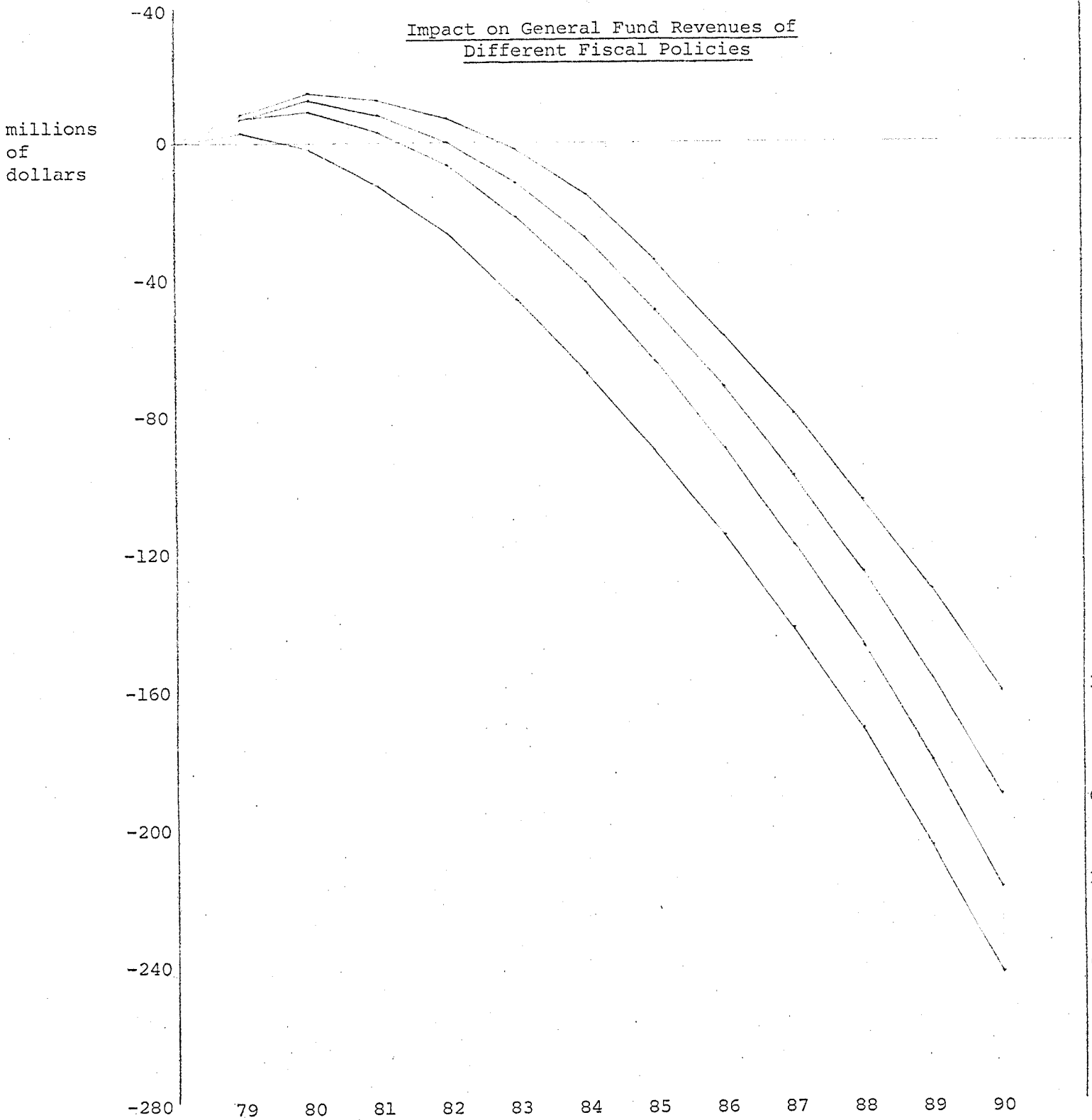
```
115:    PERPPS = PE5A+PE5B*EPPS
116:    PERCDS == CEDC*ECDS
117:    PERGGS = PE8A+PE8B*EGGS
118:    PERJUS = PE6A+PE6B*EJUS
119:    PERTRS = PE9A+PE9B*ETRS
120:    PERUA == CEUA*EUA
121:    WSEDS == PEREDS98*CWS1+PERUA*CWS2
122:    WSSSS == PERSSS*CWS1
123:    WSHES == PERHES*CWS1
124:    WSNRS == PERNRS*CWS1
125:    WSPPS == PERPPS*CWS1
126:    WSJUS == PERJUS*CWS1
127:    WSCDS == PERCDS*CWS1
128:    WSGGS == PERGGS*CWS1
129:    WSTRS == PERTRS*CWS1
130:    WSGSFY == WSEDS+WSSSS+WSHES+WSNRS+WSPPS+WSJUS+WSCDS+WSTRS+WSGGS
131:    WSGS = COWS1+COWS2*WSGSFY
132:    EXOPS == EEDS1+ESSS1+EHES1+ENRS1+EPPS1+EJUS1+ECDS1+EGGS1+ETRS1
133:    EXCUR = CEX1+CEX2*EXOPS
134:    E99S == EXCUR+EXCAP
135:    E98S == E99S-EXDSS-EXCAP
136:    GFBAL = IF GFBAL(-1)+RGF99S-E99S+ECPS LT 0 THEN 1 ELSE GFBAL(-1)+RGF99S-E99S+ECPS
137:    PFBAL = PFBAL(-1)+RPFS-TPPF-CAPEXPF-LOANPF
```

Employment Impact of Different Fiscal Policies*



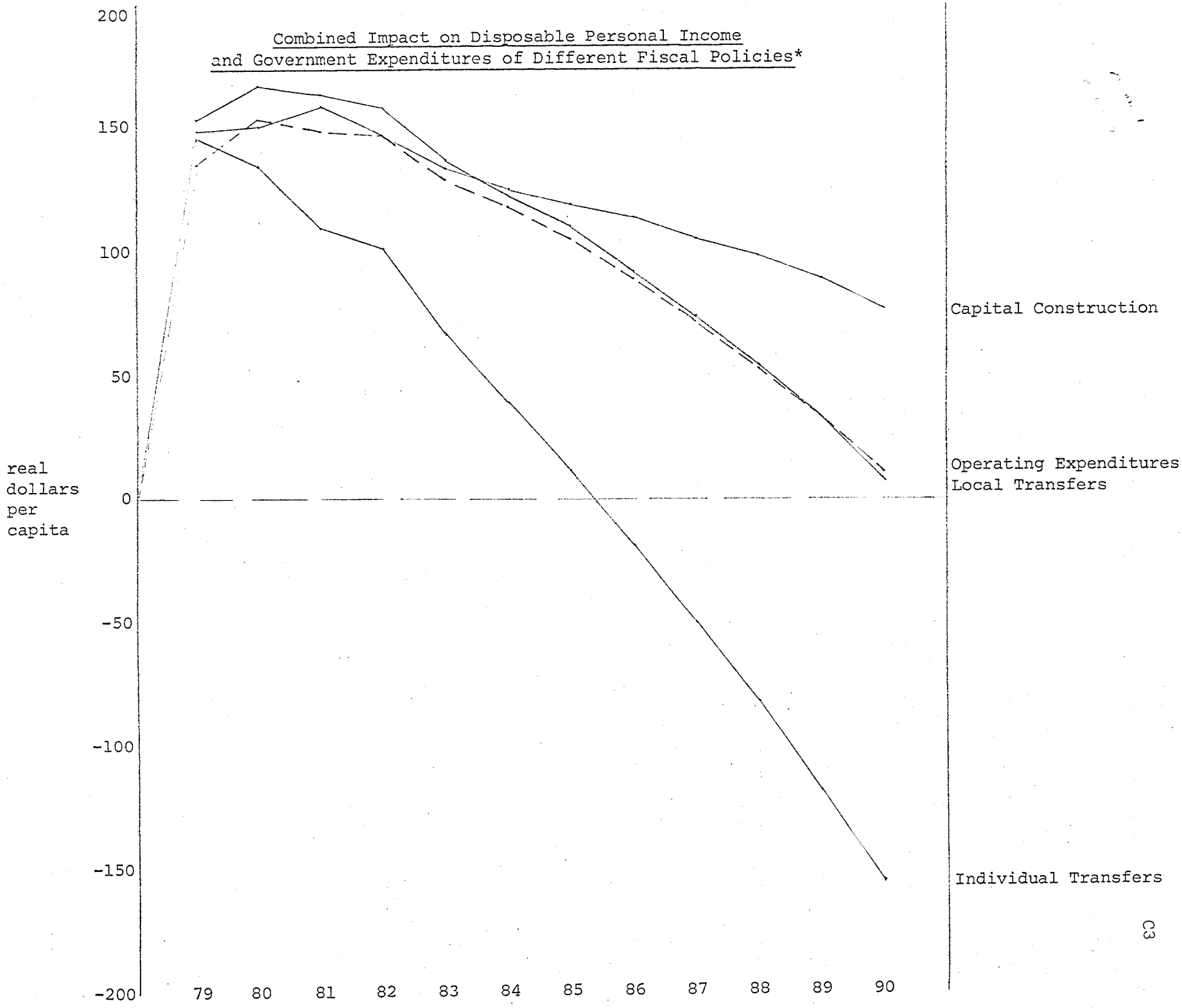
*From Table 7

Impact on General Fund Revenues of Different Fiscal Policies



C2

Combined Impact on Disposable Personal Income and Government Expenditures of Different Fiscal Policies*



*From Table 12