

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECT FILES 8672

106 SCOMM 9: HOUSE SPEC. COMM. ON PERMANENT FUND 1977-78

In both cases local revenues increase substantially. The refinery pays a substantial property tax but a significant portion of the local revenue increase comes from secondary increases in property values. The increases in the fish hatcheries case come primarily from secondary increases in property values.

IV. What was the economic impact of the placement of \$100 million in time certificates of deposit with Alaskan banks by the State of Alaska between 1969 and 1971?

In terms of aggregate economic indicators it is difficult to identify any direct economic impact of this large increase in the amount of capital available to the banking system. Banking statistics for this period indicate a relative shift in portfolio holdings away from loans with a later return to the old ratio. This may be partially explained by four factors operating to limit the capacity of the banks to fully utilize these funds for instate loans:

1. the absorptive capacity of the system to such a large increase,
2. the short average term of these deposits,
3. state regulations requiring substantial collateral backing for state deposits, and
4. state usury laws.

In terms of equity effects the 6.25 percent return earned by the state on these loans was well below the average return on the remainder of their North Slope portfolio between 1969 and 1973 of 7.5 percent. The difference between these rates is an indication of the state's "opportunity cost"

for these certificates of deposits from the point of view of a profit maximizing objective.

On the other hand, there may or may not have been excess profits transferred to the banking sector. It is dependent upon whether the negotiated price was the result of arms length negotiations and the banks were bidding competitively. Discussions with individuals involved indicate this was the case. Aggregate profit statistics can neither verify nor refute this.

It is also not possible to determine whether any benefit in terms of lower loan rates reached the consumer because of the increasing interest rates nationally which affected Alaska conditions.

In terms of the efficient use of the resources of state government, it must be asked whether this method was the most efficient in terms of the stated objective of stimulating Alaskan economic growth.

PART I

THE PERMANENT FUND AND THE PATTERN OF STATE EXPENDITURES

A. Introduction

Using not unreasonable assumptions regarding the level of future petroleum related state revenues, the Alaska permanent fund will grow to \$1 billion in 1984, \$2 billion in 1988, and \$3 billion by 2000. If the dedication rate is raised from the present 25 percent level or if income generated by the fund is reinvested, the growth will be more rapid. The disposition of such a large pool of money would have significant impacts upon any economy; but because the economy of Alaska is small, the policies adopted regarding fund contributions and disbursements of earnings will in future years be of central importance to the course of growth of the Alaskan economy.

To illustrate the relative importance of the fund in the future Alaskan economy, it can be noted that in 1988 when the fund balance will exceed \$2 billion, total personal income in Alaska will be in the \$10 - \$12 billion range. The permanent fund might thus represent the equivalent of 20 percent of personal income in a single year.

Lest one assume that this will eliminate all future financial problems for the state of Alaska, it should be kept in mind that in 1969 when the state received a \$900 million bonus from the sale of leases around Prudhoe Bay, total state personal income was \$1.27 billion. The Prudhoe Bay lease money was equivalent to over 70 percent of personal income in Alaska for that year. Yet over a five-year period, the

bonus money had all been spent and many Alaskans were left wondering where the money had gone and what the return had been. In terms of the state budget, which in 1969 fiscal year was \$151 million, the lease bonus was six times larger. Assuming very moderate state budget growth in line with historical patterns in other states, in 1988 the state operating budget will be on the order of \$3 billion. A permanent fund of a size comparable to the 1969 lease bonus fund would at that time need to be \$18 billion, rather than its projected level of \$2 billion.

Thus, the fund will be substantial but not monumental if viewed in perspective, and its primary impacts on the economy may not be the result of what the fund can purchase or generate through investment activity but rather the result of both the fund operating to channel state revenues out of the normal state spending stream and also of a savings mentality growing out of the fund's existence.

The petroleum revenues which support to a large extent state government operations will probably not continue to do so in the future. The permanent fund is a device for saving some of the revenues received in the present so that they can be spent in the future, when petroleum revenue growth declines either relatively or absolutely. This act of saving, institutionalized in the permanent fund, serves two functions by removing money from the general fund. First, to the extent that it leads to a reduction in state government spending in the present, the growth of the economy is moderated and this, in turn,

leads to a moderation in the rate of increase in the demand for government services in the future.

Second, to the extent that the permanent fund monies are ultimately available for meeting the needs of the state government, the permanent fund serves as a device to focus thinking on the problem of long-run budget balancing over the complete cycle of petroleum revenue expansion and decline. It focuses attention on the question of how much expenditure in the state government sector in the present is feasible given reasonable expectations about long-run petroleum revenues and the necessity to maintain the state treasury in a positive cash position.

It is to these questions that this section of the study is ultimately addressed. It attempts to indicate the link which exists between the size of the permanent fund at any time and the size of the Alaskan economy. It also presents some preliminary analyses of permanent fund contribution and disposition policies which would help the state budget to remain balanced over the long run and at the same time maximize economic well-being for Alaskans.

In attempting to accomplish these tasks, much preliminary information must be presented regarding the likely size of the permanent fund under different assumptions, as well as its relative size and importance in the economy, and the size and growth of the Alaskan

economy in general. This information will be of general interest, and thus its presentation becomes another objective of this section of the study.

B. Structure of the Permanent Fund

An amendment to the Alaska Constitution was necessary to establish the Alaska permanent fund. This is because the Constitution specifically forbids the dedication of proceeds from taxes or licenses for any special purpose except in the case of joint federal/ state participation programs. The relevant section of the Constitution is Article IX, Section 15., which reads as follows:

SECTION 15. ALASKA PERMANENT FUND. At least twenty-five percent of all mineral lease rentals, royalties, royalty sale proceeds, federal mineral revenue sharing payments and bonuses received by the State shall be placed in a permanent fund, the principal of which shall be used only for those income-producing investments specifically designated by law as eligible for permanent fund investments. All income from the permanent fund shall be deposited in the general fund unless otherwise provided by law.

The letter of intent accompanying the proposed amendment from the governor included the following points of clarification:

- 1) The permanent fund would not include proceeds from petroleum exploration, production, and property taxes as listed under AS43.56.
- 2) The fund would exclude receipts from petroleum reserves and ad valorem taxes as indicated under AS43.58.
- 3) The monies dedicated to the fund would be used only for income producing investments.

4) The fund could not be utilized to finance the general operating expenditures or general capital improvements of the state.¹

Since the approval of the amendment by the electorate in November of 1976, interest has centered upon interpretation of some of the terms used in the amendment and upon the development of legislation to implement the fund. In particular, a workable definition of an investment which is "income-producing" must be developed. In terms of enabling legislation, the immediate question is that of the types of income-producing investments which should be specified by law as eligible for permanent fund investment. Questions of organization, management, and reporting must also be answered. Because these and other questions are only now being discussed, the analysis in this study must adopt a flexible approach to the modeling of fund behavior and administration.

Since the focus of the study is upon not only the relationship between the operation of the fund and the economy, but also upon the long-run adequacy of state government finances, the emphasis in this portion of the study will be upon the permanent fund as a "savings account." Other fund objectives are recognized, such as "community development" and "controlled economic diversification." These objectives are analyzed in detail in other studies and thus not directly addressed here.

¹State of Alaska, Department of Revenue, "Permanent Fund," Revenue Journal, Vol. 1, No. 2 (October 1976), pp. 4-5.

The fund proceeds will be placed in investments, some of which are within the state and some of which are outside the state. Clearly, investments made outside the state will have no direct impact on the private economy of Alaska. Investments made in Alaska may have an impact upon the aggregate Alaskan economy, or they may merely displace an investment which would otherwise have been made by the private sector--by either an Alaskan or a non-Alaskan. To the extent that capital markets operate smoothly and efficiently, then capital in Alaska will be fungible. That is, investors will be aware of all investment opportunities and the probable return on those investments. The Alaska permanent fund would be only one of many investors bidding for the right to make a particular investment.

Fungibility of capital may be lacking between Alaska and the rest of the world because of market imperfections in the form of imperfect knowledge of opportunities for investors or imperfect competition. There may be an apparent non-fungibility problem because of a premium required on a particular Alaskan investment because a higher level of risk is involved. Studies indicate that these problems are more likely to arise in small communities and in certain sub-markets of those desiring to obtain loans.

If an investment is a form of subsidy, either through a lower than market rate of return or loose loan repayment requirements, then there would more likely be a positive increase in overall economic activity as a result of the investment.

For simplicity in the analysis that follows, two assumptions are made concerning permanent fund investments. The capital market in Alaska is assumed to be operating satisfactorily so that capital is fungible, and no investments are made with the expectation of a lower than market rate of return. As a result, the level of the permanent fund at any time does not directly affect the private economy through any investment policy. Permanent fund instate investments merely "back out" an investment from another source.

It is recognized that this will not be the case in reality, particularly to the extent that the fund is used to finance investments in rural Alaska. However, these assumptions are made with the intent of highlighting the implications of the fund as a "savings account." To this end, the rate of return on the fund is set at 7 percent in all simulations.

At the same time, however, the notion of petroleum revenue proceeds being used to stimulate Alaskan economic activity has not been completely eliminated from the analysis. In addition to the permanent fund, there have been created by the legislature two renewable resources funds. According to AS 37.11, 5 percent of the proceeds of royalties and bonuses will go into a renewable resources development fund. These funds are to "guarantee the enhancement and development of the state's renewable resources" and appropriations from this fund shall provide "funding for capital and operating expenditures for the rehabilitation, enhancement, and development of renewable resource programs."

Monies paid into the fund, but not expended in that fiscal year, transfer to a renewable resources permanent fund. This fund balance is allowed to grow to \$250 million, at which point no additional monies are paid in. The permanent fund principal is inviolate, but the interest on the fund investments must be used for the same purposes as the renewable resources development fund monies.

The simulations in this report assume that half the annual proceeds to the renewable resources development fund are spent and half are channeled into the renewable resources permanent fund. In its peak year of 1986, \$50 million flows into the development fund. The permanent fund becomes completely capitalized in 1993, henceforth, earning over \$13 million annually at a 7 percent rate. The monies thus generated are assumed to stimulate activity in the agriculture, forestry, and fisheries sector of the economy. The resulting impact on the economy is significant in that sector which grows in employment much more rapidly as a result of this program; but overall, the impact is fairly small simply because agriculture, forestry, and fisheries is one of the smallest sectors of the economy.

In terms of contribution levels and the distribution of earnings, the analysis follows the requirements that are incorporated in the Constitutional amendment. The basic contribution rate is 25 percent, and all earnings of the fund are deposited in the general fund where they are treated like any other source of revenue.

Since these stipulations are subject to change by the legislature, the analysis will sometimes look at other assumptions concerning contributions and earnings than these, but such differences will always be noted.

The permanent fund amendment does not specify whether contributions to the fund over and above the minimum rate of 25 percent are subject to the same restrictions regarding type of investment and withdrawal as the basic permanent fund contributions. A likely interpretation of the amendment would be that any supplementary contributions to the fund would be "captured" and subject to the same restrictions as the basic contribution.

Thus, there would seem to be little incentive for the legislature to lock up permanently additional funds which may be surplus to present needs but required for current expenditures in a few years. On the other hand, leaving them in the general fund leaves them vulnerable for immediate spending. This is not a small problem. Even with very rapid growth of state expenditures, the balance in the general fund may well exceed \$2 billion in 1984, which is almost equal to the amount in the permanent fund at that time. Concentration on the permanent fund to the exclusion of the general fund thus overlooks a very important component of the state government financial situation.

In an explicit effort to take the existence of this probably very large general fund balance into account, a special fund account has been created in the model of state government in this analysis. It can be interpreted in either of two ways. First, it can be viewed as a supplementary account in the permanent fund, subject to the same investment restrictions but not to the restrictions on withdrawal to which the compulsory contribution is subject. Since there are no restrictions on either contribution or withdrawal levels and the only factor distinguishing this portion of the permanent fund from the general fund is the rate of earnings growth, this special fund account could be considered a part of the general fund. It would be that portion of the general fund portfolio which was specifically placed in longer term investments which are thus able to earn a somewhat higher return than general fund balances which may be needed in the current year.

A third possibility would be the actual establishment of a special account, either within the general or permanent fund which would specifically be the depository of excess government revenues which are neither needed in the general fund nor should be locked into a permanent fund.

Such an instrument, be it in the general fund, the permanent fund, or in a newly created interim fund, is necessary not only to distinguish investment classes which have different objectives, but

also to highlight the long-run cyclical nature of the economic expansion resulting from the Prudhoe Bay oil discovery. This account would contain the funds which the state has in reserve for a "rainy day" in contrast to its two other funds. The general fund is necessary to take care of the normal operations of state government on a regular basis, and the permanent fund is always available in a catastrophe but requires a Constitutional amendment to unlock.

In sum, the permanent fund is formulated as a savings account in this study following the outline of the Constitutional amendment. A separate renewable resources development fund functions as a generator of economic activity in the agriculture, forestry, and fisheries industrial sector, and wage and salary increments there flow through the economy to cause further expansion. A large general fund balance of nearly the same size as the permanent fund is noted, and it is argued that this large balance should be singled out and highlighted in the permanent fund analyses which follow.

C. The Permanent Fund in the Context of the Alaskan Economy

C.1. Introduction

In this section, the Alaskan economy is simulated from the present to the year 1999. The permanent fund, as conceived in the Constitutional amendment, is an integral part of the analysis. State expenditures are assumed to grow rapidly as they have in the recent past, and no conscious attempt is made to balance the long-term expenditures with expected long-term revenues.

The results of this basic simulation are then contrasted with those of two other simulation experiments. In the first, the level of contribution to the permanent fund is dramatically increased from its 25 percent minimum to a maximum 95 percent level. The contribution stops short of 100 percent because of the 5 percent required contribution to the renewable resources fund. The third case examines the implications of a significant change in expectations concerning the level of petroleum revenues received by the state. A significant increase in petroleum revenues is hypothesized.

Before describing the simulation experiments themselves, it is necessary to discuss the assumptions concerning petroleum revenues, state expenditures, state response to deficits on current account, and private economic activity as well as the model used in the simulations. The discussion thus first turns to a review of the assumptions of the analysis.

C.2. Assumptions

C.2.a. Petroleum revenues. In two respects, the assumptions regarding the level of future petroleum revenues are the most important to the whole analysis. First, direct revenues from petroleum-related activities in Alaska comprise the largest single source of revenue to the state. As recently as 1975, the proportion was 15 percent but in 1978, it is estimated that 50 percent of total state revenues will derive directly from petroleum and related activities.² Indications are that this percentage will continue to grow at least through the mid-1980s to over 60 percent. In terms of unrestricted state revenues, the ratio of petroleum related to total revenues is much higher since restricted revenues comprise about 25 percent of the total.

The implication of this is that the size of the state treasury, potential state expenditures, and long-run fiscal viability of the state are all dependent upon the level of petroleum revenues. It is unfortunate that this largest component of the state revenues is also the most difficult to accurately estimate.

The second reason that the petroleum revenue assumptions are critical to the analysis is that state government activity in Alaska is one of the most important growth industries in the state. Growth in state government generates growth in the Alaskan economy. The impact of state government growth on the Alaskan economy is particularly strong

²State of Alaska, Department of Revenue, Revenue Sources FY 1976-78. Juneau, January 1977.

because of the large amount of state (and local) government activity as a proportion of total economic activity. Since government is large in Alaska, growth in government naturally results in general economic growth.

Because changes in the size of the state government sector imply significant changes in the size of the state economy and the possibilities for state spending are limited by the size of petroleum revenues, the level of petroleum revenues and expectations concerning future levels are a significant factor in the determination of the level of economic activity in the state and future potential levels of activity. The uncertainty surrounding petroleum revenues so translates into uncertainty concerning the possible constraints to growth of the Alaskan economy.

The completion of the Alyeska pipeline earlier this year and the commencement of oil production from the oil fields at Prudhoe Bay has generated a large amount of interest in attempting to accurately predict the level of petroleum revenues accruing to the state in the present fiscal year, or in the next few fiscal years. Each time there is a change in one of the factors affecting price at the wellhead or throughput, the calculations must be redone to determine the immediate fiscal impact.

It is obviously important for the state to be aware of its financial position at all times and be able to effectively plan future expenditures. One of the goals of this study is to attempt to lay out

for analysis some of the implications of a long-run analysis of the state's fiscal position. However, much of the concern over the startup problems of the pipeline and of the determination of wellhead oil price seems to center upon the short run only. There is a feeling conveyed that the whole future of the state government hinges upon the ability of a small group of pipeline employees to keep the oil flowing on schedule.

The feeling is correct, but the concern is misplaced. The amount of oil which will flow through the pipeline in this fiscal year will determine whether the state government runs a surplus or deficit in this fiscal year. But if the throughput is low this year, there will be a compensatingly higher throughput in a future year. What is important is not the daily, weekly, or monthly revenue generated, but the long-term total amount. It is this amount which must be estimated as accurately as possible because in the "long run" of the next 20 years, the future of the state is inexorably related to the level of petroleum revenues. It should be remembered that short-term revenue shortfalls can be overcome as was done by the imposition of the reserves tax in 1975. As long as there is a secure future revenue source, short-term fluctuations are a normal occurrence. On the other hand, a revenue shortfall which will continue for a long period with no source of funds to fill in the gap cannot be handled as "business as usual."

For this reason, the specification of the assumptions concerning the level of petroleum production and petroleum pricing, although

detailed, do not include a range to take account of either uncertainty regarding short-range production levels or unresolved disputes concerning costs of various phases of petroleum transportation, which can be charged off against the price to obtain the wellhead price. What is developed is a fairly conservative scenario of petroleum activity and pricing, which forms the basis for all simulations.

The scenario is conservative in the sense that it contains no significant petroleum discoveries leading to production beyond what is currently producing.³ In addition, the most reasonable price assumptions available in the fall of 1977 were used to construct the wellhead values.

It is easier to envision a more optimistic, rather than a more pessimistic scenario. A more pessimistic scenario would require either a reduction in production rates from their already stated levels or a reduced wellhead value. A more optimistic scenario would result from either a price increase or cost reduction, an increased production rate from existing fields, or the discovery of new commercially recoverable deposits in Cook Inlet, Gulf of Alaska, on the North Slope, or elsewhere, or an increase in the severance tax rate.

³ A more detailed description of the petroleum scenario assumptions is presented in Appendix C. Many of the assumptions are adopted from work done by the staff of the Legislative Affairs Agency who were very helpful in providing assistance to develop the scenario.

Table I.1. shows the simulation values for both total expected petroleum-related revenues and the subset of petroleum revenues from which permanent fund contributions derive. Total petroleum-related revenues consist of state royalties and bonuses on petroleum and natural gas lands, production (severance) taxes, and the property tax on petroleum-related activities.⁴

This total petroleum revenue series is net of two major items which the state is obligated to pay. The first is the reserves tax paid to the state in fiscal years 1976 and 1977 by the holders of the Prudhoe Bay leases. These payments are netted out of production taxes for which the companies are liable at the rate of 50 percent of the liability until the \$500 million in reserves taxes has been repaid. This takes three fiscal years through 1980, at which time state production tax receipts essentially double.

The second item netted out of petroleum taxes is the state's liability under the Native Claims Settlement Act. Under that Act, the state is obligated to pay the Native corporations \$500 million. The funds are to come from state oil and gas royalties at the rate of 2 percent of the total value of production. This has the effect of reducing state royalty revenues by approximately 16 percent until such

⁴Federal royalties shared with the state and lease and rental income are small components of total petroleum-related revenues netted out for ease of calculation.

Table I.1

Aggregate Petroleum Revenue Assumptions

	RP9S	RP7S
1977	460.75	11.2
1978	462.14	240.
1979	799.32	492.64
1980	1116.65	567.73
1981	1260.02	620.27
1982	1447.84	716.38
1983	1670.62	820.85
1984	1977.71	913.75
1985	2113.23	984.82
1986	2138.19	1007.74
1987	1943.15	911.3
1988	1700.13	788.83
1989	1465.55	670.81
1990	1264.76	570.7
1991	1090.65	495.08
1992	941.39	412.96
1993	813.29	352.43
1994	700.86	300.37
1995	604.4	257.17
1996	509.41	216.52
1997	426.74	182.36
1998	354.45	153.66

RP9S - Total direct petroleum revenues (\$ million)

RP7S - Bonus and royalty revenue (\$ million)

time as the \$500 million obligation has been paid. In this study, the obligation is fully paid in 1983. The required Native Claims payments are included in the series on revenues from which permanent fund revenues derive.

Of total direct petroleum-related revenues, petroleum taxes on production and on property are the major categories which are not included in the base for calculating permanent fund contributions. Of these two taxes, the production tax results in the larger revenue, yielding about 4 times the revenues of the property tax in peak production years. The production tax is based upon a complicated formula, taking into consideration actual individual well output and the decline of the productivity of the individual well over time. For simplicity, a 12 percent average tax rate was applied to the value of production to arrive at an estimate of the production tax.

The property tax is levied at the rate of 20 mills on certain categories of oil and gas property in the state. Since the determination of the methodology to use in assessing the value of the Alyeska pipeline over time as the Prudhoe Bay field becomes depleted is an unsettled matter, it is difficult to be precise in estimating property tax revenues. It is assumed that upon completion, facilities decline in value at the rate of 5 percent annually.

Royalty and bonus revenue is the major contributor of money into the permanent fund. At 12.5 percent of the value of production, this

revenue source comprises roughly 50 percent of total petroleum-related revenues over the period 1977 to 1999. At a 25 percent contribution rate, the resulting permanent fund contributions, balance, and interest earnings grow rapidly in the 1980s but then begin to taper off in the 1990s (Table I.2).

Corporate taxes paid by corporations engaged in petroleum production may be a significant revenue source during the 1980s when production rates are high, but this is largely dependent upon the outcome of recent proposals before the state legislature to modify the existing methods by which the corporate income tax assigns income of multistate firms among its states of operation. Corporate taxes are assumed to rise to approximately \$60 million in a peak year of 1986 and then to decline fairly rapidly. Corporate income tax receipts of the petroleum sector of the economy are not included as a component of direct petroleum-related taxes in Table I.1., because such receipts are not the result of a tax specifically on the petroleum industry.

The fields which are assumed to be producing oil and gas are only those which do so presently--Cook Inlet and Prudhoe Bay. In this respect, the assumptions are conservative but consistent with a necessarily conservative outlook on the part of state government.

Oil production from Prudhoe Bay is based upon an 8 billion barrel field capacity resulting in a maximum pipeline throughput of 1.7 million barrels per day in 1984 and 1985. Gas production from Prudhoe Bay peaks

Table I.2

The Basic Permanent Fund Case

	RPFS1	PFBAL	IPF1
1977	0.	2.4	0.
1978	60.	62.4	0.168
1979	123.16	185.56	4.368
1980	141.932	327.492	12.989
1981	155.068	482.56	22.924
1982	179.095	661.655	33.779
1983	205.213	866.067	46.316
1984	228.437	1095.3	60.681
1985	246.205	1341.51	76.671
1986	251.935	1593.44	93.906
1987	227.825	1821.27	111.541
1988	197.208	2018.48	127.489
1989	167.703	2186.18	141.293
1990	142.675	2328.85	153.033
1991	121.27	2450.12	163.02
1992	103.24	2553.36	171.509
1993	88.107	2641.47	178.735
1994	75.093	2716.56	184.903
1995	64.292	2780.86	190.159
1996	54.13	2834.99	194.66
1997	45.59	2880.58	198.449
1998	38.415	2918.99	201.64

RPFS1 - Permanent fund additions (million \$)
PFBAL - Permanent fund balance (million \$)
IPF1 - Permanent fund earnings (million \$)

in the latter half of the 1980s at about 2.4 billion cubic feet per day. This output is sustained through the early 1990s and then begins to fall off. Prudhoe Bay gas is transported to market through a pipeline along the Alcan route.

The bulk of petroleum revenues derive from existing Prudhoe Bay operations, but Cook Inlet oil and gas production contribute a declining absolute amount of taxes and royalties. Since gas production is not projected to peak until the mid-1980s, but oil production is already declining, the two tend to counterbalance one another in early years, and the decline in overall Cook Inlet contributions from its present level of approximately \$40 million is very gradual for about 10 years.

No additional fields are assumed to produce petroleum, although there is significant exploratory activity carried out in the 1980s. Of importance to the state from a revenue standpoint is a bonus lease sale in the Beaufort Sea area in 1979 which yields \$100 million in revenues. Exploratory activity contributes to employment in the following areas: Beaufort Sea, Lower Cook Inlet, Gulf of Alaska; but none leads to production which provides revenues to the state.

The most significant variable in the determination of state petroleum revenues is the wellhead price of oil at Prudhoe Bay, because this is the base upon which both royalties and production taxes are calculated. The wellhead price is determined by taking the delivered refinery price and subtracting from it all allowable costs involved in transportation

from the wellhead to the refinery. This calculation involves a number of significant issues, some of which have yet to be decided and which necessarily result in estimates which are subject to a large amount of variability in future years.

The refinery price is dependent upon its location as well as future OPEC pricing strategies and federal petroleum pricing policies. Transportation costs are in three categories. The largest is the Alyeska pipeline tariff, which is yet to be agreed upon although it will probably differ by company. The cost of transportation from Valdez to refinery is most dependent upon refinery location with cost rising as the refinery to which the oil is delivered moves eastward. Finally, there are apparently charges involved in the transfer of oil from the field at Prudhoe Bay to the pipeline itself.

The initial values for the wellhead price of Prudhoe Bay oil used in this study were taken from studies done by Legislative Affairs Agency.⁵ Independent assumptions regarding each component of the equation determining wellhead price were calculated in that study based upon the best information available at that time. The 1978 wellhead price used is \$7.35 and this rises to \$11.95 in 1985, representing an average rise in price of 7 percent annually. This is predicated upon a 5 percent annual increase in the delivered refinery price of the oil and constant nominal prices for transportation of the oil. After 1985, the wellhead price

⁵ Legislative Affairs Agency, memo on Underlying Data for Revenue and Permanent Fund Forecasts, and Updated Revenue Impacts of Pump Station #8 Explosion, 1977.

continues to rise but at a rate which declines to 6 percent by the final year of the revenue estimate in 1999. The nominal price of Prudhoe Bay oil has risen to \$17.30/barrel in 1990 and to \$30.91/barrel in 1999.

The explosion at Pump Station 8 in the fall of 1977 caused a temporary reduction in throughput of the Alyeska pipeline, which is reflected in the revenue projections.

In sum, the petroleum revenue projections are generally predicated upon a conservative set of assumptions concerning future events. Prudhoe Bay reserves are estimated at 8 billion barrels, and no new discoveries of petroleum are assumed. The delivered price of crude oil rises at 5 percent annually, which is equivalent to a constant real price after accounting for inflation. The initial wellhead price of Prudhoe Bay oil may be somewhat optimistic based upon the latest information available concerning decisions about transportation cost levels. Since these costs have not been finally decided upon, however, the correct level to assign to this component of the wellhead price equation is somewhat speculative.

C.2.b. State spending. State government spending, as well as that of other levels of government, tends to be highly correlated with increases in population, the level of prices, and personal income of the population. For a variety of reasons, discussed in Appendix A, the growth rate in state spending may well exceed that of these three factors combined. For example, increases in efficiency of delivery of services may lag

those in the economy generally such that prices of state services rise more rapidly than private goods. Also, people may desire to purchase public goods with an increasing percentage of increases in their personal incomes.

The pattern of expenditure growth in the state of Alaska has not followed a smooth curve related to these factors because of the great variation over the short period since 1960 of its supply of funds with which to purchase public expenditures. In most states, the pattern of growth of revenues is also fairly smooth and can be correlated to increases in population, prices, and personal income. As a result, the supply of funds for state expenditures grows in close conjunction with growth in demand for state expenditures.

The most significant fiscal event in Alaska since statehood has been the Prudhoe Bay lease sale. Before that time, real state expenditures per capita had increased from 8 percent of personal income per capita to 12 percent over approximately 10 years. That meant that as real personal income per capita rose over that period by approximately \$1,000, or 33 percent, real state expenditures per capita rose more rapidly and, in fact, doubled from \$235 to \$487. This indicates that the "income elasticity" of public expenditures greatly exceeded unity for this period (Table I.3).

Total operating expenditures rose much more rapidly than this, of course, because of increases in both population and prices over this period.

Table I.3

State of Alaska OperatingExpenditures Analysis

<u>Year</u>	<u>Real Expendi. Per Capita (Constant \$)</u>	<u>Real Personal Income Per Capita (Constant \$)</u>	<u>Ex/Income Real Per Capita (%)</u>	<u>Total Operating Expenditures (Million \$)</u>	<u>Population (Thousand)</u>	<u>Expendi. Per Capita (\$)</u>	<u>Real Personal Income (Million Constant \$)</u>	<u>Anchorage Consumer Price Index 1967=100</u>
1960	-	-	-	36.6	226.2	162	-	-
1961	235	2981	8	51.4	236.7	217	705.6	92.3
1962	281	3024	9	63.2	242.8	260	734.2	92.5
1963	345	3053	11	80.3	249.9	321	762.9	93.1
1964	247	3372	10	82.1	253.2	324	853.8	93.4
1965	354	3459	10	88.4	265.2	333	917.3	94.2
1966	378	3515	11	100.5	271.5	370	954.3	97.9
1967	409	3750	11	113.6	277.9	409	1042.2	100.0
1968	443	3853	11	129.3	284.9	454	1097.8	102.6
1969	467	4058	12	152.1	294.6	516	1195.4	105.9
1970	600	4352	14	199	302.4	658	1316.3	109.6
1971	894	4459	20	315.8	312.9	1009	1395.2	112.9
1972	973	4620	21	366.5	324.8	1128	1500.5	115.9
1973	1063	5051	21	421.8	330.6	1276	1670.0	120.0
1974	1025	5108	20	482.3	351.2	1373	1793.9	133.9
1975	970	5394	18	597.6	404.6	1477	2182.5	152.3
1976	1149	5618	20	778.9	413.3	1885	2321.8	164.1
1977est.	-	-	-	892.6	-	-	-	-
Rate of Increase 1961-76	11.16	4.32	-	19.87	3.79	15.5	8.26	3.91

After 1969, there are tremendous increases in all the entries of Table I.3, except that of real personal income per capita which can be traced to the increased revenues from the Prudhoe Bay lease sale. In a period of only two years, state expenditures as a percentage of real income per capita increased from 12 percent to 20 percent, and it has remained in the 20 percent range throughout the 1970s. Viewed slightly differently, what this means is that during the period 1969 to 1976 when real personal income per capita in Alaska was increasing by 38 percent, real state expenditures per capita increased by 136 percent. The majority of that increase occurred between 1969 and 1972 when real expenditures per capita doubled.

Looking at total operating expenditures over the same period after Prudhoe Bay, an increase of over four times is noted. Most significant, however, is the increase between 1972 and 1975 from \$366 million to \$598 million--63 percent. Over that period, real expenditures per capita actually fell in spite of the increase in spending because of large increases in the interim in both population and prices.

Because of this abrupt shift in the pattern of growth in state expenditures since statehood, it is difficult to use past average rates of increase to project future levels of spending by developing some rule which might emerge from the past experience. In the early years of statehood, growth in real per capita expenditures was strong and steady; then it took an abrupt jump to a much higher level or plateau in a very

short time. Since that time, it has remained within a fairly close range as a percentage of personal income per capita, although it has continued to grow in this time. The income elasticity during these three periods has ranged from one in recent years to three in early years of statehood to approximately ten in the immediate post Prudhoe Bay years. One fact does emerge clearly, of course, and that is that expenditures have been dependent upon available revenues as well as upon demand factors such as population.

Thus, to project state expenditure growth in the future based upon historical experience becomes a difficult task. Clearly, the available supply of revenues should be included as a variable in determining the spending level, as should the demand factors of population and personal income. Expenditures would then rise with population and income but also with increases in available state revenues. The resulting increases in state expenditures would be large because of the large projected increases in revenues. Following the experience of the early 1970s, if funds are available for spending, they will eventually be spent. Money deposited in the permanent fund is, of course, not subject to the temptation to be spent because of the Constitutional restrictions. Balances in the general fund, however, are available to spend.

If increases in state government expenditures continue in the historical pattern, there will come a time when revenues will no longer be sufficient to pay for the desired level of expenditures. Since there

is no historical precedent for such a case (the reserves tax being merely a solution to a cash flow problem), it is difficult to say how such a situation would be treated by the state. The three possible avenues of relief would be tax increases, service reductions, and Constitutionally mandated withdrawals from the permanent fund. Some combination of the first two alternatives would be the likely solution to the problem.

It is impossible to know either what types of taxes would be raised in such a situation or what types of services would be curtailed. Also, it is not possible to know how quickly the state would respond with corrective measures to a perceived long-run deficit. For simplicity in this particular analysis, it is assumed that tax increases are not a viable option. In addition, use of the permanent fund remains impossible. Cutbacks in state government services then become necessary, not only in the operating expenditures but also in the capital account and in transfers to local government. Cutbacks in expenditures from the originally desired level occur when the general fund balance is falling or at a very low level relative to the level of expenditures. The actual level of the cutback in spending is dependent upon the current account balance of the state in the previous fiscal year. The larger the deficit on current account in the preceding year, the larger the reduction in expenditures in the current year from the desired level.

In sum, determination of the rate of increase in government expenditures is difficult to do based upon an historical pattern, because there

is no well-defined historical pattern for Alaskan expenditures. Both supply and demand factors are obviously important and are included in the determining equations.

Since past patterns of expenditures need not necessarily constrain future expenditure behavior, latter sections of this analysis will look at alternative spending patterns not derived from historical relationships. Such patterns may be designed to achieve certain long-run growth goals or be aimed at balancing the budget in the long run, or some combination of the two.

C.2.c. MAP model and private economy. Detailed descriptions of the MAP econometric model and its various components are available in a variety of papers and publications.⁶ Thus, only a very brief description of the basic model is presented here.

The model is composed of four submodels. The petroleum scenario model determines petroleum-related employment and state revenues from a set of files containing detailed information on each petroleum province in the state. As the information available and the circumstances surrounding each province change, this file is updated to reflect that fact.

⁶ See David T. Kresge, "Alaska's Growth to 1990," Alaska Review of Business and Economic Conditions, January 1976; Daniel A. Seiver, "Alaskan Economic Growth: A Regional Model with Induced Migration," Anchorage, 1975; Scott Goldsmith, "Fiscal Options and the Growth of the Alaskan Economy," Anchorage, 1977; and David T. Kresge, et al, Issues in Alaska Development, forthcoming 1978.

Petroleum and construction employment figures from the scenario model are input into the economic model. This model employs a set of equations, econometrically derived using historical Alaskan data, to determine employment, wages and salaries, wage rates, and output in all sectors of the economy. Personal income and the Alaskan price level are also determined.

The fiscal model takes as input the revenue projections of the scenario model and develops estimates of all components of state and local revenues and expenditures. Certain revenues reduce disposable personal income in the economic model, and different types of expenditures positively impact the economic model through wage and salary payments and demands placed upon particular sectors, such as the private construction industry.

The demographic model determines an age-sex distribution for the population. It includes not only birth and death rates but also a migratory response to relative economic conditions in Alaska and the rest of the nation.

Economic activity in some sectors of the Alaskan economy is determined largely by forces outside the state. This is reflected in the model in the fact that the activity in federal government; agriculture, forestry, and fisheries; manufacturing; and petroleum is largely determined outside the model. Growth in activity is projected in all of these areas except for the federal government. The strongest growth

is projected in the agriculture, forestry, and fisheries sector because of the expenditures of the renewable resources development fund.

Economic activity in other sectors of the economy is determined by demand within the Alaskan economy and the MAP model reflects this in the fact that in these areas, the level of activity is determined simultaneously with demand, which is measured by the level of disposable personal income.

No major projects with the exception of the gas pipeline to transport Prudhoe Bay gas along the Alcan route have been projected in these analyses except as noted.

C.3. A Simulation of the Alaskan Economy

Using the basic assumptions outlined above which include a 25 percent contribution rate to the permanent fund, a conservative estimate of future state petroleum-related revenues, and expansive state expenditure behavior reflecting the historical growth in expenditures, a basic simulation of the Alaskan economy to the year 1999 can be done. The results can best be presented in four sections. Respectively, they deal with indicators of aggregate economic activity, indicators of the state government fiscal position, indicators of individual economic well-being, and indicators of local government fiscal activity.

C.3.a. Aggregate indicators. Three basic indicators of aggregate economic activity--population, employment, and personal income--are

presented in Table I.4. Population growth is strong throughout the period, averaging approximately 4 percent annually. The natural increase is augmented by net immigration to the state such that the total increase between 1978 and 1998 is 581 thousand, which is significantly larger than the present population. In the decade of 1978 to 1988, the state experiences a population increase of about 150 thousand.

Much of the population increase can be attributed to people moving into Alaska to fill new jobs created over the period. Employment does grow by 286 thousand between 1978 and 1998 from less than 200 thousand workers to more than 477 thousand. The growth rate in employment slightly exceeds that of population, indicating that new employees will continue to have relatively small numbers of dependents.

A major cause of the growth in employment will be the increase in personal income which, when spent in the Alaskan economy, will create a demand for products and services. In nominal dollars which are not corrected for inflation, total personal income grows by almost a factor of ten between 1978 and 1998. It increases from its present range of \$3.5 billion to approximately \$30 billion.

By all of these aggregate indicators, the economy appears to be strong and growing smoothly.

Table I.4

Base Case Aggregate Economic Variables

	POP	EM99	PI
1977	398.119	187.209	3285.73
1978	408.062	191.888	3596.81
1979	424.062	200.283	4026.79
1980	442.78	224.712	4985.68
1981	491.785	238.31	5673.73
1982	503.883	238.916	5955.3
1983	522.713	245.693	6485.98
1984	548.771	258.315	7277.32
1985	578.034	272.908	8217.38
1986	607.547	287.054	9218.44
1987	637.625	301.211	10301.5
1988	655.748	306.01	11032.8
1989	673.067	311.021	11808.2
1990	690.893	317.016	12674.2
1991	709.392	323.982	13646.1
1992	717.546	323.525	14256.
1993	757.177	347.974	16369.4
1994	774.579	353.958	17526.3
1995	831.701	390.574	20691.5
1996	862.406	404.375	22546.5
1997	942.288	455.239	27259.4
1998	989.263	477.972	30198.7

POP - Population (thousand)
EM99 - Employment (thousand)
PI - Personal income (million \$)

C.3.b. State fiscal indicators. The more important categories of state revenues are presented in Table I.5. Total petroleum-related revenues rise rapidly during the mid-1980s to a peak of \$2.138 billion in 1986 and then begin to decline until they are \$35 million in 1998. Non-petroleum tax revenues show a continuously rising trend which reflects a healthy annual average growth rate close to 11 percent. This is, however, slightly less than the growth rate of personal incomes which indicates that in the long run, the existing Alaska tax structure may be income inelastic and may lag increase in incomes.

The personal income tax is the largest revenue generator of the non-petroleum taxes. Presently, the personal income tax contributes more than 50 percent of non-petroleum taxes and that percentage is expected to continue to grow because of the progressiveness which is built into the tax schedule. As individual incomes rise, the marginal tax rate which they face also increases. The increase in personal income tax receipts is projected to be approximately ten times in the next 20 years, a rate of increase in excess of the increase in personal income. In the 1990s, the personal income tax will account for perhaps 75 percent of total non-petroleum tax receipts. And since petroleum tax receipts will be declining absolutely, the personal income tax will also comprise a larger percentage of total tax receipts than in earlier years.

Earnings on the permanent fund are deposited in the general fund where they are treated as ordinary revenues. Since the rate of earnings

Table I.5

Base Case State Revenues

	RP9S	RT98	RTIS	IPF1	RINS	RGF99S1
1977	460.75	242.323	120.229	0.	28.376	1096.04
1978	462.14	237.225	116.828	0.168	34.157	1051.79
1979	799.32	268.763	139.074	4.368	27.596	1349.68
1980	1116.65	313.855	175.067	12.989	33.701	1735.39
1981	1260.02	375.011	216.522	22.924	46.918	2008.02
1982	1447.84	402.359	231.099	33.779	58.514	2253.56
1983	1670.62	419.635	244.343	46.316	71.809	2520.9
1984	1977.71	463.223	279.34	60.681	89.479	2918.2
1985	2113.23	518.478	321.569	76.671	113.237	3179.88
1986	2138.19	559.571	370.413	93.906	132.453	3334.23
1987	1943.15	611.677	422.287	111.541	139.775	3308.47
1988	1700.13	658.646	463.517	127.489	125.559	3211.28
1989	1445.55	692.578	494.706	141.293	101.996	3090.5
1990	1264.76	732.366	528.885	153.033	71.805	2998.4
1991	1090.65	782.228	570.053	163.02	36.257	2936.86
1992	941.39	825.16	603.003	171.509	0.	2884.6
1993	813.29	905.355	678.298	178.735	0.	2940.98
1994	700.86	1030.83	775.642	124.903	0.	3090.39
1995	604.4	1160.04	891.527	196.159	0.	3256.21
1996	509.41	1357.37	1042.13	194.66	0.	3518.94
1997	426.74	1569.17	1228.07	198.449	0.	3827.84
1998	354.45	1879.21	1465.4	201.64	0.	4288.46

RP9S - Total direct petroleum revenues (million \$)
 RT98 - Total taxes (million \$)
 RTIS - Personal income tax (million \$)
 IPF1 - Permanent fund earnings (million \$)
 RINS - General fund earnings (million \$)
 RGF99S1 - Total general fund revenues (million \$)

is constant, the growth in earnings coincides with the growth in the size of the permanent fund. During the 1980s, the fund increases rapidly and interest revenue increases from almost nothing to more than \$100 million. In the next ten years, however, the level of earnings does not double and has barely surpassed \$200 million by 1998.

In contrast, earnings on the general fund balance show an interesting rising and falling pattern. For several years, earnings hover near \$30 million. In the early 1980s, they rise very rapidly to nearly \$140 million, higher than permanent fund earnings at this point, but then fall precipitously and ominously to zero in 1992.

Total general fund revenues reflect the long, significant decline projected for petroleum revenues in late 1980s. In early years, growth is strong and revenues peak in 1986 at \$3.334 billion but then a hiatus is experienced during which total revenues actually decline to a nadir in 1992 of less than \$2.9 billion. Only in 1996, a full ten years later, is the earlier peak surpassed, but this time in much deflated dollars. At that point, the impact of the decline in petroleum revenues has been absorbed in terms of total revenues.

State expenditures grow rapidly through 1987 at an average rate over the ten-year period in excess of 13 percent (Table I.6). This is considerably less than the average growth rate in state expenditures over the historical period since statehood, which was almost 20 percent, and also less than

Table I.6

Base Case State Expenditure Analysis

	E99S	SAVS	GFBAL	EXCAP	EXCUR
1977	1099.65	0.	569.319	290.	809.647
1978	1271.17	0.	459.936	330.	941.17
1979	1357.89	0.	561.685	359.864	1008.02
1980	1647.18	0.	781.963	396.226	1250.96
1981	1969.55	0.	975.231	464.391	1505.16
1982	2206.67	0.	1196.82	524.122	1682.55
1983	2414.42	0.	1491.32	564.053	1850.37
1984	2728.13	0.	1887.28	617.679	2110.45
1985	3068.81	0.	2207.55	687.635	2401.18
1986	3468.5	0.	2529.59	768.958	2699.54
1987	3831.13	0.	2892.65	857.138	2973.99
1988	3895.14	242.886	1699.94	878.324	3016.81
1989	3862.5	423.55	1196.74	920.133	3042.35
1990	3819.25	564.315	604.453	711.826	3107.43
1991	3758.95	686.081	-45.786	557.542	3201.41
1992	3439.03	769.736	-498.753	369.458	3069.58
1993	3861.41	509.205	-1360.17	272.898	3588.52
1994	3717.23	1095.55	-1987.	88.528	3628.7
1995	4428.69	729.633	-3159.49	0.	4428.69
1996	4569.42	1562.25	-4209.96	0.	4569.42
1997	5628.67	1336.16	-6010.79	0.	5628.67
1998	5925.32	2614.52	-7647.65	0.	5925.32

E99S - Total State expenditures (million \$)

SAVS - Reduction from desired expenditure level (million \$)

GFBAL - General fund balance (million \$)

EXCAP - Capital expenditures (million \$)

EXCUR - Current expenditures (million \$)

the rate between 1971 and 1977, which was almost 19 percent. However, it is rapid enough so that real state expenditures per capita increase by 42 percent. After 1987, however, this rate of increase cannot be sustained and actual expenditures must be reduced, signaled by a fall in the general fund balance which, until this time, had been steadily increasing.

At this point, total expenditures have reached a plateau from which they do not move for several years. Cutbacks from the desired level of expenditures become larger each year as the general fund balance continues to decline. Because the loss of petroleum revenues has not been anticipated, the fall in the general fund balance is precipitous as it is drawn down in an attempt to maintain the desired expenditure growth path as long as possible. Non-petroleum revenues do not increase rapidly enough to compensate for the loss in petroleum revenues, however, and the general fund balance quickly becomes negative and continues to fall. By 1998 it is negative by over \$7.5 billion, and the deficit is increasing at the rate of \$1.6 billion annually. This represents the amount of revenues which would need to be raised to maintain the fiscal integrity of the state through that period of time even though expenditures have been significantly curtailed and in 1998 are \$2.6 billion less than they would have been if there had been no deficit in the general fund.

This absolute reduction in state government expenditures must somehow be shared by all those functions which receive funding out of the

general fund. In this case, the cutback is shared by both the state and the local governments because a large percentage of local revenues are actually state transfers. Because only a portion of local revenues come from the state, local government expenditures will be somewhat insulated from this cutback. Since they do not derive such a large proportion of their revenues directly from petroleum activities, they will need to reduce expenditures to a much lesser degree than the state.

To illustrate the severity of the reduction required at the state level, a large portion of the required cutback has been channeled into capital expenditures. Surprisingly, the capital expenditure program, which in 1988 is nearly \$880 million, must be completely eliminated by 1995. In spite of this, current expenditure growth remains sluggish and does not increase significantly for about a five-year period. In real per capita terms, it falls substantially.

Several other statistics can help to put the revenue shortfall problem and permanent fund into perspective in this scenario. CRUNCH is simply the percentage which desired expenditures must be cut back to try to maintain some balance. From the point in time that expenditures must be cut back, the gap rises steadily until in 1998 it is 44 percent (Table I.7).

Table I.7

Base Case Indicators of State Financial Strength

	CRUNCH	REVRAT	PFCON
1977	0.	1.027	0.
1978	0.	0.903	0.
1979	0.	1.124	0.
1980	0.	1.183	0.
1981	0.	1.138	0.015
1982	0.	1.143	0.02
1983	0.	1.17	0.025
1984	0.	1.193	0.029
1985	0.	1.147	0.032
1986	0.	1.07	0.035
1987	0.	0.956	0.038
1988	0.067	0.908	0.042
1989	0.118	0.877	0.046
1990	0.157	0.857	0.049
1991	0.191	0.85	0.051
1992	0.231	0.91	0.056
1993	0.133	0.823	0.05
1994	0.292	0.89	0.051
1995	0.145	0.785	0.043
1996	0.342	0.82	0.043
1997	0.236	0.722	0.035
1998	0.441	0.767	0.034

CRUNCH - Reduction from desired expenditures level (%)

REVRAT - Revenues/expenditures (%)

PFCON - Permanent fund earnings/total expenditures (%)

REVRAT is the ratio of total revenues to total expenditures. It is an indication of when the state is running a surplus or a deficit on current account. Between 1977 and 1987, the state runs a surplus almost each year. In 1987, however, there is a turning point and from that time forward, expenditures exceed revenues in each year.

Finally, PFCON represents the percentage of current state operating expenditures which is financed out of earnings on the permanent fund. This percentage increases during the years when the permanent fund is increasing rapidly. It peaks in 1992 at less than 6 percent of current expenditures. From that point forward, it declines steadily in spite of the fact that there is a significant brake being applied to expenditures. In 1998, it is 3.4 percent. This is a small relative amount but, nevertheless, not insignificant.

From the point of view of the average Alaskan individual, several variables are important. Table I.8 indicates that real disposable personal income per capita increases quite steadily over the next 20-year period. This is essentially that component of personal income which is left after federal and state personal income taxes have been netted out. Real state expenditures per capita do not follow the same smooth, upward path but rather, because of the reduction in state expenditures in the late 1980s, fall off substantially after 1988 from a peak value of \$1,681 (1967US = 100 is the deflator for these real units). In 1977 the level is \$1,187 and after the rise to 1988, it falls to a low of \$1,044 in

Table I.8

Base Case Per Capita Variables

	DIRPA	E99SRPC	R99SRPC	PFBLRPC
1977	2894.88	1186.79	1219.32	2.59
1978	2997.71	1280.2	1156.26	62.843
1979	3096.88	1272.4	1429.64	172.606
1980	3325.01	1323.62	1565.94	263.161
1981	3373.41	1423.89	1620.93	348.868
1982	3332.58	1509.34	1724.54	452.564
1983	3379.06	1534.1	1794.43	550.801
1984	3466.34	1582.43	1887.59	635.324
1985	3553.81	1627.79	1867.17	706.966
1986	3625.6	1666.4	1782.84	765.552
1987	3497.29	1681.4	1607.76	799.318
1988	3706.18	1606.29	1458.71	832.385
1989	3735.17	1499.65	1315.55	848.801
1990	3772.94	1394.99	1195.81	850.617
1991	3816.46	1290.18	1096.66	840.956
1992	3817.56	1132.41	1030.77	840.772
1993	3975.64	1148.34	944.826	785.542
1994	3997.76	1043.93	929.422	762.911
1995	4190.94	1100.86	864.018	691.249
1996	4227.1	1058.14	867.849	656.5
1997	4437.07	1128.43	814.775	577.493
1998	4477.77	1089.23	835.719	536.586

DIRPA - Per capita disposable personal income (constant \$)
E99SRPC - Per capita State expenditures (constant \$)
R99SRPC - Per capita State revenues (constant \$)
PFBLRPC - Per capita permanent fund balance (constant \$)

1994, a value which is less than 90 percent of the starting value. This occurs while real disposable personal income per capita has increased by about 40 percent.

The constant per capita value of total state revenues also follows the pattern of petroleum revenues over time. However, the peak in real per capita terms occurs in 1984 at \$1,888 and is a form of "leading indicator" of the problem which is developing in state finances but which has not yet surfaced. Total nominal revenues will continue to increase for another two years. By the end of the projection period, per capita revenues in constant dollars are far below the level of the late 1970s. The decline corresponds however to a rise in the tax burden on individuals since the personal income tax has a graduated schedule.

The permanent fund balance can be viewed in real or constant dollar terms, also. In constant dollars, the total in the fund, divided by the total population, reaches a maximum in 1990 at \$851. After that time, however, increments to the fund cannot keep pace with the combined effects of population growth and inflation, and the constant dollar per capita value of the fund falls gradually. By 1998, its constant dollar per capita value is \$537.

This basic simulation, employing fairly conservative state revenue and expenditure assumptions, has resulted in a very unhealthy situation for the state in the late 1980s and 1990s. A massive general fund deficit

rapidly develops in spite of quite significant "bolt tightening" to reduce state expenditures. It is natural to next investigate how the situation would be altered if there were a significant increase in the state's petroleum revenues. To this question, the next section is addressed.

C.4. Sensitivity of Basic Case to Increase in Petroleum Revenues

Any of a number of factors could result in petroleum revenues being much larger than projected in the base case. Higher production from existing fields, discovery of new fields, higher wellhead value, or higher tax rates would all result in larger state revenues. It is difficult to place a probability on any of these occurrences. Therefore, a second simulation of the economy was done in which the only change made was to increase the level of petroleum revenues received by the state by 25 percent beginning in 1983 (Table I.9). It is further assumed that the increase occurs in such a way that royalty and bonus income is unchanged and thus the level of contributions to the permanent fund is unchanged. Petroleum revenues increase approximately \$500 million in each year in the mid-1980s.

In the aggregate, this allows slightly more rapid growth of the economy as reflected by the increase in population over the base simulation. The increase grows to 46 thousand people in 1992 and then begins to taper off. This reflects the fact that higher levels of government spending, made possible by the additional revenue, have generated jobs and incomes in the private sector of the economy.

Table I.9

Impact of An Increase in Petroleum Revenues
(Measured as the Change From The Base Case)

	RP8S	POP	E99S	SAVS	R99S
1977	0.	0.001	0.	0.	0.
1978	0.	0.001	0.	0.	0.
1979	0.	0.001	0.002	0.	0.
1980	0.	0.001	0.002	0.	0.002
1981	0.	0.001	0.005	0.	0.002
1982	0.	0.001	0.005	0.	0.
1983	417.38	4.937	98.344	0.	424.394
1984	494.29	8.081	157.535	0.	534.646
1985	528.77	10.793	205.361	0.	600.495
1986	534.61	13.446	251.791	0.	639.244
1987	485.85	15.905	293.775	0.	622.835
1988	424.87	31.639	645.182	-242.886	615.943
1989	366.45	29.541	607.274	-15.892	594.321
1990	316.24	33.092	661.963	-57.242	537.377
1991	272.35	30.66	583.879	71.411	493.461
1992	235.61	45.977	912.825	27.365	477.103
1993	203.71	27.174	392.491	506.219	398.336
1994	175.14	36.585	533.583	-45.525	267.445
1995	151.6	11.667	-56.297	376.275	220.957
1996	127.59	39.418	524.754	-458.925	177.728
1997	106.26	4.739	-184.879	562.759	190.185
1998	88.55	50.991	726.195	-708.106	151.676

RP8S - Increment to petroleum revenues (million \$)

POP - Population change (thousand)

E99S - Expenditure change (million \$)

SAVS - Reduction from desired expenditure level change (million \$)

R99S - Total State revenues change (million \$)

State government expenditures, partially determined by the level of available revenues, are considerably larger in the late 1980s and early 1990s than in the base case. The expenditure increase over the base case reaches a high of \$913 million in 1992. After that, it falls rapidly and approaches the base case.⁷

The intended level of expenditures in this case need not be cut back as sharply as in the basic case, although the difference is not nearly as large as the increased tax revenues. The population increase has resulted in an increase in the desired level of state expenditures, and this has eroded a large percent of the gains to the state treasury from the additional petroleum revenues.

This occurs in spite of the fact that total state revenues increase by a multiple of the increase in petroleum revenues. For example in 1989, total revenues have increased by about \$234 million over and above the increase in petroleum revenues, about 64 percent more than the revenue increase. The percentage by which the total revenue increment exceeds the petroleum increment continues to increase, but the total increment falls in later years.

In terms of two measures of personal well-being, there are slight improvements over the base case (Table I.10). Real disposable income

⁷The difference shows large variation in later years because of the method by which expenditures are reduced from the targeted value. This method gives rise to some oscillatory behavior.

Table I.10

Impact of An Increase in Petroleum Revenues on Per Capita Variables

(Measured as the Change From The Base Case)

	DIRPA	E99SRPC
1977	-0.013	-0.002
1978	-0.01	-0.004
1979	-0.007	-0.004
1980	-0.01	-0.005
1981	-0.003	-0.001
1982	-0.016	-0.002
1983	25.78	41.748
1984	23.953	58.452
1985	22.633	65.85
1986	29.465	70.109
1987	27.857	71.66
1988	36.999	151.773
1989	43.272	141.417
1990	42.358	145.715
1991	17.708	122.769
1992	75.345	182.158
1993	-32.564	65.006
1994	11.261	83.472
1995	-95.707	-26.382
1996	26.457	57.524
1997	-109.652	-37.101
1998	54.219	57.474

DIRPA - Per capita disposable personal income change (constant \$)
E99SRPC - Per capita State expenditure change (constant \$)

per capita rises slightly as the average wage rate inches up in the 1980s because of a slightly higher percentage of higher than average paid employees find work. At the same time, state expenditures per capita in constant dollars show an increase temporarily as increases in expenditures occur faster than population growth. This advantage is eliminated in the late 1990s as expenditure levels must be cut back as in the base case.

Finally, one can compare the long-term fiscal position of state government in the base case with the case in which petroleum expenditures are 25 percent higher than expected. The 25 percent increase has a beneficial impact on balances in the short run; but in the long run, the cases are nearly indistinguishable. This result occurs because of the additional population growth generated by the additional state expenditures. In 1998 the state is in approximately the same position financially, but the population is considerably larger and revenue growth has not kept pace with expenditure growth.

To illustrate, in Table I.11. the ratio of total revenues to total expenditures is in this case observed to remain positive for exactly the same number of years as the base case. In fact, its pattern closely follows that of the base case. The permanent fund is able to contribute slightly less in this instance to total state revenues. In its year of maximum contribution, it provides 4.5 percent of revenues. The general fund balance is in a better position, however. In the base case, it

Table I.11

Impact of An Increase in Petroleum Revenues
on Indicators of State Financial Strength
(Measured as the Change From The Base Case)

	REVRAT	PFCON	GFBAL
1977	0.	0.	-0.001
1978	0.	0.	-0.
1979	-0.	0.	-0.002
1980	0.	0.	-0.002
1981	-0.	-0.	-0.005
1982	-0.	-0.	-0.01
1983	0.123	-0.001	326.038
1984	0.12	-0.002	705.368
1985	0.111	-0.002	1104.24
1986	0.099	-0.003	1496.85
1987	0.083	-0.003	1832.58
1988	0.007	-0.006	1839.22
1989	0.014	-0.006	1874.48
1990	-0.007	-0.007	1806.4
1991	-0.001	-0.006	1770.26
1992	-0.081	-0.011	1389.13
1993	0.018	-0.005	1398.31
1994	-0.049	-0.006	1128.19
1995	0.061	0.001	1399.64
1996	-0.05	-0.004	1050.64
1997	0.059	0.001	1417.73
1998	-0.061	-0.004	842.242

REVRAT - Revenues/expenditures (change) (%)

PFCON - Permanent fund earnings/expenditures (change) (%)

GFBAL - General fund balance change (million \$)

becomes negative in 1991. In the revised simulation, it remains positive until 1994. By the last year of the simulation, it shows \$842 million less of a deficit than the base case, but it also appears to be declining at a more rapid rate.

To summarize this case in which petroleum revenues are unexpectedly 25 percent higher than originally assumed, the state's fiscal position improves. The improvement is surprisingly small, however, and in the long run, the state faces essentially the same deficit problem. It is aggravated, however, because in the interim, population growth has been more rapid. This introduces the possibility that it would be advantageous to increase the contribution rate to the permanent fund. To that case, the analysis now turns.

C.5. Sensitivity of Base Case to Increased Contribution Rate to the Permanent Fund

In the base case run, state expenditures are determined not only by population and income-related demands but also by the supply of funds available through the flow of revenues and the general fund balance. Since money deposited in the permanent fund could not be spent on the normal operation of state government, there was no direct link between the level of state spending and the permanent fund balance.

There is an indirect link, however, which must be investigated. To the extent that money is placed into the permanent fund, it reduces the level of the general fund. This, in turn, reduces the level of state

expenditures. It is interesting to speculate about the impact on both the economy and the state's fiscal position of an increase in the permanent fund contribution rate.

A simulation was done to trace those impacts. All assumptions were identical to the base case with the exception that the contribution rate to the permanent fund was set at a maximum rate of 95 percent of bonuses and royalties. This allowed for a continued 5 percent contribution to the renewable resources development fund.

Two effects could be expected from this change. First, the aggregate growth of the economy would be reduced as a result of reduced government expenditures. Secondly, one would expect a change in the state fiscal position as a result. The permanent fund balance will obviously be much larger, but the current account of the state might either improve or deteriorate.

In Table I.12, the new larger permanent fund balance is shown. The balance in this case exceeds \$5 billion by 1985 and \$10 billion by 1993. Growth trails off in the 1990s as before. State expenditures reflect this siphoning off of general fund monies to the permanent fund. Throughout the 1980s, expenditures are lower in each year in this case. Surprisingly, however, in the 1990s state expenditures are higher in this case. This must be attributed to the much larger level of permanent fund earnings which is being generated and distributed to the general fund. These

Table I.12

Impact of 95% Permanent Fund ContributionsRate on Selected Variables

(Measured as the Change From The Base Case)

	PFBAL	E99S	POP
1977	0.	0.	0.
1978	158.	0.	0.058
1979	512.848	-118.297	-6.978
1980	910.259	-355.021	-20.859
1981	1344.45	-293.331	-17.286
1982	1845.91	-301.534	-18.205
1983	2420.51	-331.336	-20.242
1984	3060.13	-367.077	-22.411
1985	3749.51	-408.708	-24.675
1986	4454.92	-452.835	-26.895
1987	5092.83	-579.501	-32.725
1988	5645.01	-577.542	-32.476
1989	6114.58	-595.238	-33.763
1990	6514.07	-280.663	-21.968
1991	6853.62	-167.771	-20.162
1992	7142.69	404.897	3.729
1993	7389.39	79.436	-8.924
1994	7599.64	619.993	16.435
1995	7779.66	160.141	-1.951
1996	7931.22	801.758	31.19
1997	8058.87	277.402	7.551
1998	8166.43	1229.54	58.139

PFBAL - Permanent fund balance change (in million \$)

E99S - State expenditures change (million \$)

POP - Population change (thousands)

additional revenues in the 1990s more than offset the increased level of withdrawals into the permanent fund by that time.

Aggregate growth of the economy as measured by the difference in population from the base case has slowed considerably because of the reduction in state expenditures. By 1989 the level is nearly 34 thousand less. Then, however, the situation rapidly reverses itself and population growth becomes more rapid, reflecting the increase in the level of state expenditures occurring in the 1990s.

In personal terms, this forced saving has had two distinct effects (Table I.13). The level of per capita real disposable personal income has declined during the years of the most stringent forced saving during the 1980s. This reflects the fact that the average wage rate of the foregone employment exceeds that of the average employee in the state. After the period of maximum forced savings, the situation reverses itself and disposable personal incomes are actually higher than in the base case.

The level of real state expenditures per capita follows a pattern of divergence from the base case which is similar to that of disposable personal income. During the period of maximum saving, the reduction in expenditures exceeds the reduction in the rate of population increase, so that there is a significant real decline from the growth observed in the base case. As with disposable personal income, however, the trend is reversed in the 1990s. Although expenditures are not at their

Table I.13

Impact of 95% Permanent Fund ContributionsRate on Per Capita Variables

(Measured as the Change From The Base Case)

	DIRPA	E99SRPC
1977	0.	0.
1978	0.357	-0.251
1979	-43.73	-82.857
1980	-97.84	-217.342
1981	-29.917	-154.047
1982	-31.256	-142.762
1983	-29.052	-141.755
1984	-24.911	-138.27
1985	-21.457	-135.209
1986	-18.719	-132.479
1987	-33.807	-155.451
1988	-15.972	-148.025
1989	-13.072	-146.661
1990	51.689	-53.353
1991	44.554	-23.245
1992	141.345	115.848
1993	40.483	37.861
1994	140.067	134.461
1995	21.82	41.601
1996	135.668	124.494
1997	8.211	43.816
1998	147.812	127.814

DIRPA - Per capita disposable income change (constant \$)
 E99SRPC - Per capita State expenditures change (constant \$)

desired level in this case as they are not in the basic case, the expenditure level per capita is considerably higher.

What has essentially happened is that the decreased rate of spending brought about by increased permanent fund contributions has caused aggregate growth to moderate, but has also allowed a much larger balance to develop in the permanent fund. Some sacrifice in the current level of expenditures has been traded off against a somewhat higher expenditure level in the future and attendant higher aggregate growth rate.

In terms of the fiscal position of the state, the ratio of revenues to expenditures appears considerably more healthy in the long run. Rather than falling less than 1.0 in 1987 as in the base case, it remains greater than one until 1992. It does, as in the base case, continue to fall but the ratio over the period is higher than in the base year. The percentage of revenues contributed by the interest generated by the permanent fund is considerable. From 1989 to 1991, it exceeds 20 percent. However, this high contribution rate is not sustainable in the long run as the percentage falls to 10 percent by 1998, its approximate value in 1982.

Unfortunately, the position of the general fund balance is worse in this case. It never rises much above a bare minimum level in the 1980s, goes negative in 1988 as opposed to 1991 in the base case, and by the end of the simulation period has a negative value exceeding the base case by about \$1.6 billion.

Table I.14

Impact of 95% Permanent Fund Contributions
Rate on Indicators of State Financial Strength
 (Measured as the Change From the Base Case)

	REVRAT	PFCON	GFBAL
1977	0.	0.	0.
1978	0.	0.	-167.94
1979	0.092	0.	-412.211
1980	0.28	0.	-533.058
1981	0.189	0.052	-718.08
1982	0.197	0.067	-935.013
1983	0.2	0.084	-1179.96
1984	0.206	0.096	-1438.37
1985	0.201	0.106	-1687.13
1986	0.192	0.115	-1887.73
1987	0.207	0.128	-1886.07
1988	0.203	0.141	-1777.97
1989	0.221	0.158	-1510.61
1990	0.148	0.15	-1373.04
1991	0.152	0.153	-1145.85
1992	0.033	0.135	-1315.56
1993	0.124	0.136	-1079.57
1994	0.005	0.117	-1320.32
1995	0.11	0.115	-1031.09
1996	-0.003	0.095	-1340.04
1997	0.09	0.092	-1022.04
1998	-0.025	0.073	-1593.57

REVRAT - revenues/expenditures (change) (%)

PFCON - Permanent fund earnings/expenditures (change) (%)

GFBAL - General fund balance change (million \$)

C.6. Conclusions

In each of the three simulations, the general fund balance becomes negative in the 1990s. This occurs in spite of a fairly moderate growth rate of state expenditures. Attempts to relieve the situation by a fortunate increase in petroleum expenditures or by an increase in the contribution rate to the permanent fund do not eliminate the basic problem but rather only change its dimensions. In the long run, the state is facing a substantial deficit.

Changing the level of expenditures in the present affects not only how much revenue will be available directly but also indirectly, as expenditures generate increased demand for expenditures through population increase. Recognition of this basic fact naturally leads to the concept of planning the present level of expenditures not only to satisfy present needs, but also in anticipation of future needs and with the idea of attempting to develop a superior spending strategy not only from the point of view of the present fiscal year but also from the point of view of future years.

With this in mind, the next section analyzes the case where a more active approach to the management of state expenditures and the permanent fund is employed in an attempt to maximize benefits of state government in the long run.

D. Target Expenditure Growth Rates

The simulations examined under section C are clearly not feasible because of the large, negative general fund balances which are generated in spite of significant cutbacks from desired levels of expenditures. Allowing expenditures to grow in an unplanned manner leads to an untenable situation. A more reasonable approach to simulating the future of the economy would be to impose the constraint that, in the long term, the budget for state government should balance. This being the case, a more specific expenditure target may be established as a goal.

Since the demand for state expenditures is closely correlated with growth in population, the level of prices, and personal income, a reasonable target for expenditure growth would be to link it to increases in these factors. Thus, if long-run population growth is 3 percent annually, inflation is 5 percent, and the growth in personal income is 1 percent, then the rate of increase in state expenditures would need to be 9 percent. If this were the expenditure growth rate, then real state expenditures per capita would increase 1 percent and the income elasticity of state expenditures would be unity. In general, the income elasticity of state government expenditures in most states has historically been near unity or slightly above.⁸ As noted previously, the average income elasticity in Alaska has exceeded unity since statehood.

⁸The price elasticity might have been greater than -1 also.

A set of simulations was performed under the assumption of unitary income elasticity of state expenditures. Because of population and employment increases, the rate of growth of total expenditures was on the average 10.5 percent for the decade 1979-1989.⁹ The two simulations differed in their treatment of tight fiscal situations.

The basic result in both instances was that the state stayed within its long-run fiscal constraint and in the final simulation year was still registering a positive general fund balance. In fact, in each case supplementary contributions were made during the simulation period to the permanent fund, and some of this money in the "interim" fund remains in each case.

However, in order to obtain these results, it is necessary to pull back from the target level of expenditure growth in each case--gradually in the former and precipitously in the latter. The pattern of expenditure growth in the two cases is compared in Table I.15. On the left is a case

⁹ When attempting to target growth in expenditures, it is important to keep in mind that the rate of population increase and perhaps price increase is not, in Alaska, independent of the growth rate in expenditures itself. This is most pronounced regarding population. For example, if one is attempting to target growth to be unitary elastic with respect to personal income per capita, estimates of population growth and inflation are necessary. If one assumes 2 percent, 5 percent, and 1 percent as the growth rates in population, prices, and income, respectively, then an increase of 8 percent in total expenditures would be targeted. However, if actual population growth were 4 percent because of migration to the state induced by growth in state expenditures, then the actual change in real per capita expenditures would be negative and would be equivalent to a 1 percent reduction per capita in real expenditures.

Table I.15

State Expenditures Growth Under Two Forms of
The Unitary Income Elasticity Target

	PRT.1.1	PFD.8.1
1977	1099.65	1099.65
1978	1271.17	1271.17
1979	1385.2	1385.2
1980	1550.86	1550.86
1981	1839.38	1839.37
1982	2067.21	2067.2
1983	2164.9	2164.87
1984	2307.23	2307.17
1985	2508.6	2508.56
1986	2762.11	2762.07
1987	3046.73	3046.78
1988	3377.95	3377.94
1989	3762.7	3762.69
1990	4218.49	4061.85
1991	4739.22	4004.61
1992	5337.26	3795.62
1993	6018.99	3669.65
1994	3576.13	3696.35
1995	3052.87	3842.31
1996	3144.33	4010.37
1997	3456.16	4197.45
1998	3888.96	4451.29
1999	4422.32	4791.29

PRT.1.1 - Target growth - no anticipation of revenue shortfall

PFD.8.1 - Target growth - shortfall in revenue anticipation

where growth at the targeted rate continues as long as possible. In 1994 the state suddenly realizes that the target rate cannot be sustained and a severe downward adjustment in expenditures occurs in that year. Expenditures are \$3.250 billion less than targeted in that year and fall from \$6.018 to \$3.576 billion. From that point forward, expenditures resume their growth but at a much reduced level. In the other case, the collapse is anticipated somewhat by a decline in the current account surplus and the balance in the general fund, so that there is a somewhat smoother transition to the period of lower revenues. Expenditure growth falls off for a few years in a gradual manner and then resumes increasing, but it never regains the target level.

In both of these cases, the more moderate rate of increase in expenditures also has a moderating influence on the increase in aggregate economic activity which operates throughout the simulation period. This makes the target level of expenditures defined in per capita terms easier to reach.

The reduction in the rate of growth of expenditures in these simulations causes a reduction in real state expenditures per capita from the base case previously analyzed (Table I.16). A comparison of the base case with the case in which the downturn is anticipated indicates that the latter peaks at a level about \$180 less than the former. From that time forward, the relationship between the two is not predictable because of the way in which the two are responding to necessary cuts in

Table I.16

Real Per Capita State Expenditures in Three Simulations

	PRF.5.1	PF.D.8.1	PRT.1.1
1977	1186.79	1185.25	1185.25
1978	1280.2	1279.2	1279.2
1979	1272.4	1282.35	1282.35
1980	1323.62	1265.61	1265.61
1981	1423.89	1358.48	1358.48
1982	1509.34	1447.27	1447.27
1983	1534.1	1427.93	1427.92
1984	1582.43	1418.23	1418.23
1985	1627.79	1425.39	1425.38
1986	1666.4	1448.33	1448.35
1987	1681.4	1468.23	1468.22
1988	1606.29	1490.01	1490.01
1989	1499.65	1510.81	1510.82
1990	1394.99	1497.01	1537.09
1991	1290.18	1389.44	1561.97
1992	1132.41	1254.58	1587.55
1993	1148.34	1146.15	1605.79
1994	1043.93	1077.05	1023.05
1995	1100.86	1038.16	846.97
1996	1058.14	1000.62	811.646
1997	1128.43	961.413	815.383
1998	1089.23	929.007	829.628
1999	1184.03	902.506	844.007

PRF.5.1 - Historical growth patterns (constant \$)

PF.D.8.1 - Target growth - shortfall in revenues anticipated (constant \$)

PRT.1.1 - Target growth - no anticipation of revenue shortfall (constant \$)

expenditures. The fall in state expenditures per capita in the case of the precipitous reduction of state expenditures is more severe.

The fiscal position of the case in which the downturn is anticipated is relatively healthy. The level of the permanent fund is the same as in the base case. The general fund is positive in all periods and, in addition, there is a large amount of money which is neither in the general or permanent fund but which is available to pay for future cash shortages which the state may incur (Table I.17). This has been built up rapidly in the early 1980s and is only beginning to be drawn down in 1998. Together with the general fund balance, this account is larger than the permanent fund until almost the end of the projection period. Given a strict target approach to expenditure growth, it becomes incumbent upon policy makers to consider how to treat the large amounts of money which will be accumulating outside of the permanent fund in the 1980s. The sums make those in the permanent fund seem relatively small by comparison.

The case of targeted growth where the downturn in revenues is anticipated and adjusted exhibits different behavior from the case where growth in expenditures continues blindly until a massive cutback is required. The differences between the anticipated downturn and the abrupt downturn are presented for certain variables in Table I.18. The difference in population is a clear reflection of the different expenditure patterns. Population expands more rapidly where the downturn is not anticipated, but then is abruptly lower after the readjustment of

Table I.17

Position of State Funds in Case of Targeted Growth With
Anticipation of Downturn

	PFBAL	GFBAL	PFSUPBL
1977	2.4	570.081	0.
1978	62.4	461.377	0.
1979	185.56	547.732	0.
1980	327.492	861.622	0.
1981	482.56	1177.55	0.
1982	661.655	1535.35	0.
1983	1268.8	1669.32	401.932
1984	2096.97	1869.23	1001.66
1985	3003.44	2089.32	1661.93
1986	3969.3	2293.96	2275.85
1987	4097.12	2855.01	2275.85
1988	4294.33	3076.17	2275.85
1989	4462.03	2920.22	2275.85
1990	4604.7	2475.66	2275.85
1991	4725.97	2040.77	2275.85
1992	4829.21	1738.54	2275.85
1993	4917.31	1528.68	2275.85
1994	4992.4	1353.67	2275.85
1995	5056.69	1148.99	2275.85
1996	5110.82	927.995	2275.85
1997	5156.41	722.345	2275.85
1998	5005.91	722.337	2086.94
1999	4869.16	722.328	1917.8

PFBAL - Permanent fund balance (million \$)
GFBAL - General fund balance (million \$)
PFSUPBL - Supplemental fund balance (million \$)

Table I.18

Differences Between Targeted Growth Without
Foresight and With Anticipation of Downturn

(Measured as the Difference From the No Foresight Case)

	POP	GFBAL	PFBAL	E99SRPC
1977	-0.	0.	0.	0.001
1978	-0.	0.167	0.	0.002
1979	-0.	-86.188	90.733	0.001
1980	0.	-400.08	418.789	0.002
1981	0.001	-706.006	730.018	0.004
1982	0.002	-1053.81	1086.55	-0.002
1983	0.007	-1177.78	1223.33	-0.008
1984	0.01	-1367.69	1428.16	0.003
1985	-0.009	-1577.78	1656.14	-0.01
1986	0.	-1772.42	1872.01	0.016
1987	-0.002	-2323.47	2447.78	-0.016
1988	-0.001	-2534.63	2690.88	0.003
1989	-0.002	-2378.68	2571.2	0.009
1990	5.617	-1934.13	2036.59	40.081
1991	26.563	-1499.25	1048.45	172.526
1992	57.174	-1197.02	-442.039	332.97
1993	90.118	-1200.35	-2275.86	459.64
1994	12.974	-1095.21	-2275.85	-54.004
1995	-12.225	-880.529	-2132.61	-191.191
1996	-18.388	-649.533	-1958.26	-188.973
1997	-17.966	-433.884	-1841.87	-146.03
1998	-15.155	-423.877	-1629.72	-99.378
1999	-10.924	-423.882	-1528.11	-58.499

POP - Population change (thousands)

GFBAL - General fund balance change (million \$)

PFBAL - Permanent fund balance change (million \$)

E99SRPC - Per capita expenditure change (constant \$)

expenditures. It appears to be gradually approaching the level of population in the anticipation case as the simulation ends. The general fund balance must be combined with the permanent fund balance which now includes some supplementary contributions in order to obtain an idea of which expenditure pattern gives the state a larger balance at the end of the period. The two strategies give almost identical results in early years;¹⁰ but after about 1990, the case with the abrupt drop is clearly second best in terms of funds left in reserve for any kind of financial emergency.

Finally, the pattern regarding real state expenditures per capita shows neither case to be clearly superior. For a few years when state spending is being gradually reduced in the one case, expenditures per capita increase relatively in the other case. When the massive cutback comes, however, the situations are rapidly reversed. In the extremely long run, the differences appear to be mitigating.

These two simulations, with growth targeted so that the increase in state expenditures follows a path of unitary income elasticity, are interesting in identifying the rather severe constraints upon the continued expansion of the public sector existing in the long run. Since at the end of the simulation period, there was some money still available for spending in the state treasury, it is interesting to look at the case

¹⁰There are minor differences introduced by the fact that the different fund mix in the two cases results in slightly differing overall earnings rates on government investments.

of a slightly more rapid growth than unitary elasticity. To accommodate this, a simulation was performed in which state expenditures grew at a unitary income elasticity rate plus 1 percent (independently set). This analysis was applied to the base case where the impending revenue shortfall was anticipated and thus somewhat smoothed out.

The most striking implication of the examination of this case in relation to the unitary income elasticity case is that the cumulative effect of a small increment to the growth rate has a very substantial effect after a few years. In the long run, the level of aggregate activity in these two cases is nearly identical with both recording a population in 1998 of approximately 897 thousand (Table I.19). In the interim, the case with the 1 percent increment to state expenditure growth has a slightly higher level of population which at one point exceeds 21 thousand. Comparison of real per capita state expenditures shows clearly the more rapid growth rate in the 1 percent increment case until the time when prudence requires that expenditure levels be cut back in both cases. Then the high growth case is cut back more rapidly than the other and in later years, per capita expenditures lag those of the slower growth case. This indicates less of a need for continuous cutbacks in the latter case. Interestingly, after ten years of growth at a rate of 1 percent higher than the base case, total state expenditures have risen to 12 percent higher in the rapid growth case. The target increase has been compounded by other factors--primarily population growth.

Table I.19

Differences Between Greater Than Unitary IncomeElasticity Growth Case and Unitary IncomeElasticity Growth Case

(Measured as the Difference From The Unitary

Elasticity Case)

	POP	E99SRPC	E99S	FFBAL
1977	-0.	0.001	0.	0.
1978	-0.	0.002	0.	0.
1979	0.556	6.188	9.223	0.
1980	1.463	14.312	24.413	0.
1981	2.725	23.49	46.077	0.
1982	4.321	34.274	73.795	0.
1983	6.159	45.389	104.846	-401.932
1984	8.241	56.082	141.136	-504.135
1985	10.722	66.632	185.304	-640.084
1986	13.739	77.299	239.821	-1254.01
1987	17.323	88.469	307.118	-1254.01
1988	21.58	99.876	390.01	-1254.01
1989	20.454	64.694	317.471	-1254.
1990	7.851	-44.283	-73.328	-1254.
1991	-0.934	-100.6	-309.976	-1254.
1992	-1.537	-91.267	-296.193	-1254.
1993	0.445	-65.755	-214.272	-1254.
1994	1.426	-52.506	-176.092	-1253.99
1995	1.116	-50.772	-184.772	-1495.49
1996	0.322	-52.445	-211.32	-1746.58
1997	-0.407	-53.542	-238.721	-1977.06
1998	-0.799	-53.172	-261.465	-2001.23
1999	-0.676	-49.841	-269.824	-1917.78

POP - Population change (thousands)

E99SRPC - Per capita expenditure change (constant \$)

E99S - Expenditure change (million \$)

FFBAL - Permanent fund balance change (million \$)

The final general fund balances in both cases are nearly identical, but this is not true of other fund balances. The more rapid growth case exhausts any balances that were saved for a financial problem by the end of the simulation period, and the state is left with zero balances except for the nearly \$3 billion in the permanent fund. This is in contrast to the \$2 billion available for emergencies in the base case, in addition to the \$3 billion in the permanent fund in that case.

A small increase in the rate of expenditure growth can thus have a quite substantial impact on the state fiscal balance of the state in the long run. Earlier, it was shown what the impact of a significant increase in petroleum revenues would be on the economy in the case of a state spending program that was not targeted to demand growth. Much of the increase in revenues was devoured by population increase when the state tried to take advantage of the money.

To see what would be the case if the increase in revenues were instead used to extend further into the future the day at which state expenditures would need to be reduced from their target level, a final simulation was done using the unitary elasticity target. The only difference in this case was that as in an earlier simulation, petroleum revenues were increased by 25 percent in 1983 and for every succeeding year.

There are two primary impacts of this change. The first is that the state need not fall back from its target growth rate in 1994. It

can continue its program for an additional three years until 1997 (Table I.20). Thus, the "day of reckoning" is indeed extended a considerable distance into the future by a combination of increased revenues and conservative expenditures.

Unfortunately, when the required reduction in expenditures comes, it is more than twice as severe. In the base case, expenditures must be reduced from target by \$3.250 billion while in the expanded revenue case, the one time reduction required is \$6.666 billion, a mere three years later. This underscores the importance of anticipation of downturn in revenues in order to help smooth out economic fluctuations caused by massive swings in the level of state expenditure. It also raises the possibility of more sophisticated methods for both anticipating revenue "busts" and adjusting to them. The final section of this part of the study investigates that idea.

Table I.20
Targeted State Expenditures in Cases of
Different Levels of Petroleum Revenues
(Million \$)

	PRT.1.1	PRT.1.2
1977	1099.65	1099.65
1978	1271.17	1271.17
1979	1385.2	1385.2
1980	1550.84	1550.84
1981	1839.38	1839.38
1982	2067.21	2067.21
1983	2154.9	2154.9
1984	2307.23	2307.23
1985	2508.6	2508.6
1986	2762.11	2762.11
1987	3046.73	3046.73
1988	3377.95	3377.95
1989	3762.7	3762.7
1990	4218.49	4218.49
1991	4739.22	4739.22
1992	5337.26	5337.26
1993	6018.99	6018.99
1994	6576.13	6831.1
1995	7052.87	7824.02
1996	7444.33	9022.14
1997	7956.16	10882.37
1998	8688.76	12881.43
1999	9422.32	15888.72

PRT.1.1 - Targeted growth

PRT.1.2 - Targeted growth with additional revenues

E. Targets Which Take the Supply of Revenues into Account

The simulation experiments which have been reported thus far have included consideration of the long-run availability of revenues only very generally, if at all. The first series was predicated on the assumption that revenues would be spent more or less when they became available. The second series ignored the short-run level of revenues available for the state to spend and assumed that policy makers would attempt to hit a target rate of expenditure growth. When the target was no longer feasible, a fairly arbitrary downward adjustment in expenditure growth and expectations occurred.

Reexamining that series of simulations, it becomes clear that there exist a variety of growth patterns of state expenditures (and through linkages, the total economy) which will result in the state's finances as well as the private economy being in essentially equivalent positions after a number of years. Recognizing this fact, the question arises whether there is one path of growth, for example between the years 1977 and 1999, which among those paths that reach an equivalent point in 1999, which is to be preferred. For example, there are many growth paths which will just eliminate the general fund balance in the year 1999. Some subset of those paths will reach 1999 with essentially the same population, employment, and personal income. The question is--among that set is one to be preferred above all others? One path, for example, would

be that of targeting expenditure growth as long as possible and then backing off.¹¹

In this section, three simulations are compared which assume different types of response by the state government to the recognized long-term pattern of state revenues. The initial case is similar to the target growth rate case introduced in the previous section. As before, expenditures are targeted to grow according to the rule of unitary elasticity of income. In this case, the growth continues as long as possible and then a sudden downward adjustment is necessary in expenditures. The adjustment results in a negative general fund balance which exceeds \$2 billion in 1999 (Table I.21). The negative balance is not increasing very fast by that time though, indicating the finances of the state are beginning to stabilize at this lower level. Over a five-year period, an alternative source of revenues might be found to eliminate this deficit.

¹¹ It is not possible to sustain a target growth rate which results in a constant percentage of expenditures being financed by permanent fund earnings. Such a result is possible in the short run but not the long run, if increments to the permanent fund base decline as projected in this paper. To provide a constant percentage of expenditures, the following equality would need to hold between the growth rate of the permanent fund and the growth rate of state expenditures (assuming desired expenditure growth followed the unitary income elasticity rule):

annual increase in permanent fund base = annual rate of population increase + annual rate of price increase + annual rate of personal income per capita.

Table I.21

Targeted Growth With Maximum Use of Supplemental Fund

	GFBAL	PFSUPBL	PFSUP	WPFSUP	EXPPPER
1977	570.081	0.	0.	0.	0.
1978	461.544	0.	0.	0.	0.25
1979	461.543	90.733	90.733	0.	0.434
1980	461.542	418.789	328.056	0.	0.828
1981	471.542	730.018	311.229	0.	0.752
1982	481.541	1086.55	356.532	0.	0.748
1983	471.541	1625.27	538.715	0.	0.906
1984	501.54	2429.83	804.56	0.	1.131
1985	511.54	3318.07	988.24	0.	1.182
1986	521.539	4147.86	829.799	0.	1.073
1987	531.538	4723.64	575.776	0.	0.862
1988	541.538	4966.74	243.103	0.	0.558
1989	541.537	4847.05	0.	119.68	0.25
1990	541.534	4312.44	0.	534.61	0.25
1991	541.525	3324.3	0.	988.141	0.25
1992	541.517	1833.82	0.	1490.48	0.25
1993	328.33	0.	0.	1833.92	0.25
1994	-981.752	0.	0.	0.	0.25
1995	-1591.	0.	0.	0.	0.25
1996	-1880.4	0.	0.	0.	0.25
1997	-2071.08	0.	0.	0.	0.25
1998	-2260.83	0.	0.	0.	0.25
1999	-2466.92	0.	0.	0.	0.25

GFBAL - General fund balance (million \$)

PFSUPBL - Supplemental fund balance (million \$)

PFSUP - Additions to supplemental fund (million \$)

WPFSUP - Withdrawals from supplemental fund (million \$)

EXPPPER - Permanent and supplemental fund contribution rate (%)

This unitary elasticity case differs from those done previously in the assumption that the general fund balance is kept to a minimum level necessary to maintain short-term fiscal solvency. Everything over and above that amount, net of what is deposited into the permanent fund, goes into a fund which may be, and indeed is in all simulations, drawn down when revenues in excess of current receipts are required. Assuming that the contributions to this fund are derived from the same base of royalties and bonuses as the permanent fund, the combined contribution rate to the permanent fund and this interim fund can be calculated. It is simply the amount which is left over from revenues in any year after expenditures and after maintenance of the level of the general fund. Since a contribution rate to the permanent fund of 25 percent is assumed, this combined contribution rate cannot fall below 25 percent. For a period of 14 years, this interim fund is in existence. During its first ten years, from 1979 to 1989, contributions are being made into the fund, and its balance is increasing. During the next four years, the increasing needs of the state drive the balance to zero.

During its existence, this fund is much larger than the permanent fund and thus potentially much more important in the short run as an instrument of state policy. In 1989 when it reaches its peak level of \$4.967 billion, the permanent fund contains \$2.081--approximately 40 percent as much. The fund is, in a sense, like the investment fund established after the receipt of the Prudhoe Bay bonus sale revenues. The funds may not be immediately necessary but will be in the long run.

The pattern by which the fund rises strongly and steadily for ten years and then falls precipitously is indicative of the fact that to maintain a target expenditure level early, those funds will not be needed; but when they become necessary, their existence and availability are critical. When their sustaining power is rapidly depleted, state expenditures fall rapidly.

In contrast to this base case are two simulations which explicitly take into account the cyclical nature of state revenues during all time periods. In each of these cases, there is a lower targeted growth rate. Expenditures in real terms per capita should not decline. Thus, expenditure increases are linked directly to both increases in population and increases in prices.

Expenditure increases are not linked to changes in personal income levels. Rather they are tied into changes in state revenue prospects in terms of petroleum revenues. In one case, expenditures are programmed to rise faster when the level in the permanent fund balance is rising faster. This expenditure growth responds to a measure of how rapidly the state is accumulating revenues. In the other simulation, expenditures rise more rapidly when the level of expected future petroleum-related revenues increases. Since non-petroleum-related revenue growth follows the growth of state personal income in a fairly smooth manner, it is not necessary to include that component of revenue. It is the petroleum revenues where the greater future uncertainty lies and, thus,

changes in the rate of expenditure growth should respond to changes in expectations regarding this highly variable component of income.

To show why one only need consider the variability in petroleum income, reference is made to Table I.22, where the relationship between state non-petroleum revenues and Alaska personal income is shown. The ratio of taxes to personal income has remained fairly constant since statehood, falling near 13-14 percent in most years. In a crude way, it could be said that this is the underlying long-run constraint on state expenditures. Without direct petroleum revenues, they must remain no greater than 14 percent of personal income. Petroleum revenues let the 14 percent constraint be ignored, but only as long as petroleum revenues remain. When they disappear, the underlying relationship between revenues and personal income resurfaces and reasserts itself. Thus, changes in the rate of expenditure growth can be made in relation to changes in expected or received petroleum revenues because of the underlying consistent growth of other revenues.

It is interesting to note in Table I.22 that the constant ratio between revenues and personal income implies unitary income elasticity of non-petroleum state revenues. Net of petroleum revenues or some other large exogenous revenue source, the state is not approaching a position where state revenues represent the equivalent of 20 percent of personal income. Recall from Table I.3 that state expenditures approach that percentage. The economy is not "taking off" in the

Table I.22

Non Petroleum Related RevenuesAndAlaskan Personal Income

	<u>Alaska Non Petroleum Related Revenues 1 (million \$)</u>	<u>Alaska Personal Income (million \$)</u>	<u>Ratio (percent)</u>
1961	69.86	651	10.7
1962	93.21	679	13.7
1963	80.77	710	11.4
1964	119.22	797	15.0
1965	137.46	864	15.9
1966	131.45	934	14.1
1967	150.87	1071	14.5
1968	140.51	1126	12.5
1969	162.63	1266	12.8
1970	182.95	1443	12.7
1971	225.33	1575	14.3
1972	248.48	1739	14.3
1973	290.83	2004	14.5
1974	311.95	2402	13.0
1975	444.07	3324	13.4
1976	581.51	3810	15.3
Average			13.6

-
- 1 Total revenues minus general fund interest (primarily from Prudhoe Bay lease sale proceeds) production, property, and reserves tax, leases, bonuses, royalties, and federal shared royalties.

sense of automatically channeling a larger percentage of income into state revenues as its size increases.

Linking the growth in real expenditures per capita in the state to a long-run measure of "non-recurrent" revenues, rather than personal income growth, produces somewhat different total expenditure growth patterns from the base case. Table I.23 contrasts state expenditures in the base case of unitary income elasticity of expenditures with the two modified expenditure strategies.

In the case where expenditures are linked to expected future revenues (actually the present value of the expected revenues over a ten-year period), growth in early years exceeds the base case because large future revenues are anticipated. As the revenues are actually received and the production in the field declines, so do expectations of further revenues and thus, expenditure growth. As the growth rate falls, total expenditures lag the base case. Eventually, they recover to end the simulation period at a level almost identical with the base case.

In the other simulation where the option was to increase expenditure growth only when revenues are received, the pattern is just the opposite. In early years, expenditure growth is slow as the level of revenues channeled into the permanent fund is low. Later with a large balance in the permanent fund, it is possible to make larger expenditures over the preceding years. This policy, however, can only be applied until

Table I.23

State Expenditures in Three Modified Target Cases

(Million \$)

	PRT.2.1	PRT.2.2	PRT.2.4
1977	1099.65	1099.65	1099.65
1978	1271.17	1271.17	1271.17
1979	1385.2	1406.23	1360.44
1980	1550.84	1579.94	1476.51
1981	1839.38	1837.03	1675.57
1982	2067.21	2067.35	1959.9
1983	2164.9	2230.94	2001.62
1984	2307.23	2433.	2207.55
1985	2508.6	2669.95	2486.27
1986	2762.11	2934.58	2840.75
1987	3046.73	3212.77	3264.29
1988	3377.95	3515.96	3766.46
1989	3762.7	3846.7	4344.32
1990	4218.49	4216.24	4998.36
1991	4739.22	4619.46	5710.03
1992	5357.26	5063.42	6469.13
1993	6018.99	5547.88	5143.04
1994	5121.05	4738.36	4184.22
1995	4200.83	4146.41	3882.68
1996	3833.58	3943.47	3695.25
1997	3879.9	3978.74	4050.57
1998	4160.94	4161.51	4300.56
1999	4570.73	4450.03	4632.91

PRT.2.1 - Smooth growth

PRT.2.2 - Growth linked to expected revenues

PRT.2.4 - Growth linked to present fund balance