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Author(s): Ed Porter and Lee Huskey
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The Regional Economic Effect of Federal OCS Leasing: The Case of Alaska

Ed Porter and Lee Huskey

I. INTRODUCTION

Acceleration of federal leasing of Outer Continental Shelf acreage during recent years has generally provoked hostile reactions from the affected coastal states. This opposition contrasts sharply to the often enthusiastic local support enjoyed historically by more traditional federal projects. One explanation offered for this reversal is that OCS development is characterized by institutional features which disperse the bulk of net benefits nationally, while leaving a disproportionate share of costs to be borne locally, reversing the traditional "pork barrel" pattern of locally concentrated benefits and nationally dispersed costs.[1] This "reverse pork barrel" characteristic, if it exists, has two consequences. First, there is a transfer of income from the residents of coastal states to the nation as a whole. Second, any disproportionate representation of local interests in the OCS decision-making processes may lead to serious inefficiencies in the rate and/or order of OCS sales. Unlike the traditional pork barrel, in which this inefficiency takes the form of oversupply, reverse pork barrel developments will be undersupplied as otherwise efficient projects are delayed or halted by local interests.

This paper investigates the hypothesis that OCS development exhibits "reverse pork barrel" characteristics and imposes a net economic burden on affected states. We test the hypothesis by measuring the size of local net economic benefits from federal OCS developments in the State of Alaska. Because of several special features of the Alaskan case, these results are not directly generalizable to other coastal states. Nonetheless, the Alaskan case is important in its own right, insofar as nearly 60% of undiscovered recoverable oil and 40% of undiscovered recoverable gas resources in the OCS are expected to be found in Alaskan waters,[2] and nearly 56% of the acreage scheduled for leasing in the next five years is in Alaska.[3]

Part II of this paper develops a general conceptual framework for the measurement of local impacts from resource development in an open economy such as Alaska. Part III then applies this framework empirically to the Alaskan case. Finally, part IV summarizes our conclusions and the major policy implications of such conclusions.

Harvard University and the University of Alaska Institute of Social and Economic Research, respectively. The authors would like to thank David Kresge, Scott Goldsmith, and two anonymous referees for helpful comments. Errors and interpretations are, of course, solely the authors'.

[1] This reversal has been suggested by W. Moffat (1977).

[2] Geological Survey, U.S. Department of the Interior (1974).

[3] Bureau of Land Management, U.S. Department of the Interior (1979).

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II. FRAMEWORK FOR LOCAL IMPACT EVALUATION

A central feature of any resource development in an open economy such as Alaska is that the welfare consequences of any such development are dispersed among several groups: the owners of the resource, consumers of the resource, migrants attracted to the region by economic opportunities associated with the development, and the original residents of the region at the time of development. There is a fundamental distinction between the first three and the fourth of these groups.[4]

Any effects borne by the first three groups are borne voluntarily, as a result of contractual commitments; and as a consequence, may be assumed a priori to represent welfare gains, while the effects on original residents are often involuntary and, thus, could conceivably involve welfare losses.

Nonetheless, it is usually argued that such losses will be limited to fairly special circumstances. Consider the case of a competitive open regional economy in which output is just exhausted by factor payments,[5] so that

$$Q = wL + rK + qR \qquad [1]$$

where,
Q = regional output
L = regional labor
K = regional capital
R = regional resources
w = return to labor
r = return to capital
q = return to resources

Of course, not all factor payments accrue to regional residents. The portion of income from this output accruing to regional residents may be written

$$Y = wL + \theta_K rK + \theta_R qR \qquad [2]$$

where,
θ_K = proportion of regional capital owned by residents
θ_R = proportion of regional resources owned by residents

Natural resource development in the region is likely to raise the levels of all three productive factors, so that after development, regional output and generated income may be written

$$\begin{aligned} Q + \Delta Q = {} & (wL + rK + qR) \\ & + (L\Delta W + K\Delta r + R\Delta q) \\ & + [(w + \Delta w)\Delta L + (r + \Delta r)\Delta K \\ & + (q + \Delta q)\Delta R] \end{aligned} \qquad [3]$$

These factor incomes are distributed between residents, nonresidents, original and incremental factors as shown in Table 1.

In the simplest case, in which all original factors are owned by original residents ($\theta_K = \theta_R = 1$) and all incremental factors are owned by migrants and/or nonresidents ($\theta'_K = \theta'_R = 0$), expression [3] has a straightforward interpretation.

The first term is simply the original residents' predevelopment income. The second term is the impact of development on that income. The final term is the income to outsiders (migrants and nonresidents) generated by the development.

The second term, the impact of development on the incomes of original residents (which we will call M_1), can be approximated by

$$M_1 = L\Delta w + K\Delta r + R\Delta q \simeq - \frac{1}{2}(\Delta L\Delta w + \Delta K\Delta r + \Delta R\Delta q) \qquad [4]$$

[4] See van der Muelen and Paanamen (1977).
[5] Assuming perfect markets and zero economic profits at the margin.

TABLE 1
DISTRIBUTION OF INDUCED INCOME

	Resident	Migrant and/or Nonresident	Total
Original Factors L, K, R	$L\Delta w + \Theta_K K\Delta r + \Theta_R R\Delta q$	$(1-\Theta_K)K\Delta r + (1-\Theta_R)R\Delta q$	$L\Delta w + K\Delta r + R\Delta q$
New Factors $\Delta L, \Delta K, \Delta R$	$\Theta'_K(r + \Delta r)\Delta K + \Theta'_R(q + \Delta q)\Delta R$	$(w + \Delta w)\Delta L + (1-\Theta'_K)(r + \Delta r)\Delta K + (1-\Theta'_R)(q + \Delta q)\Delta R$	$(w + \Delta w)\Delta L + (r + \Delta r)\Delta K + (q + \Delta q)\Delta R$

Θ'_K = Portion of incremental capital owned by residents.
Θ'_R = Portion of incremental resources owned by residents.

which will normally be nonnegative.[6] Thus, it can be argued that the increased regional factor endowment, to the extent that it has any effect whatsoever on the incomes of original residents, can be expected to be beneficial.[7]

This conclusion, however, cannot be expected to hold in all cases. Three exceptions have been noted in the literature.

First, the literature on rapid energy development commonly cites a variety of external costs borne by the original residents of remote areas.[8] Rapid development may generate bottlenecks, local inflation, environmental damage, or strains on public services, which at least partially offset any private income gains from the development.

Second, net leakage of income to nonresident owners of original factors could conceivably more than offset any income gains to original residents. In the general case, the impact of development on original resident income is written

$$M_2 = M_1 - M_3 \qquad [5]$$

where M_3 is the net leakage of induced income from the region, or

$$M_3 = [(1 - \theta_K)K\Delta r + (1 - \theta_R)R\Delta q] - [\theta'_K(r + \Delta r)\Delta K + \theta'_R(q + \Delta q)\Delta R] \qquad [6]$$

Conceivably, a sufficiently large M_3 could more than offset a nonnegative M_1, leaving the net effect on original resident income negative even in the absence of the adverse external affects discussed earlier. This result will occur only when labor flows into the region in significant numbers, relative to other factors, to lower the real wage. This case is unimportant for the resource development case examined in this paper when increases in other factors lead to the change in income.

A third exception, and the one on which this paper focuses, occurs when a portion of the original or incremental factors are publicly owned.[9] Each resident acquires a share in government-

[6] For any production function having convex isoquants. Equation [3] can be derived by expanding $Q + \Delta Q$ using a Taylor series expansion and ignoring third and higher order terms.

[7] This discussion is largely based on Berry and Soligo (1969, pp. 779–794).

[8] See S. Murdock and L. Leistritz (1979).

[9] See Usher (1977, pp. 1001–1020).

owned factors.[10] Consequently, in addition to the private income effects captured by $M_1 - M_3$, a regional resource development will have two additional effects. First, migrants will dilute the claims of original residents to returns from such factors by an amount

$$M_4 = -\{\theta_{KG}(r + \Delta r)K_G + \theta_{RG}(q + \Delta q)R_G\}\Delta N \quad [7]$$

where,

K_G = government-owned capital
R_G = government-owned resources
θ_{KG} = per capita share of ownership in public capital of migrants
θ_{RG} = per capita share of ownership in public resources of migrants
ΔN = migrant population

Second, original residents may gain a share in claims to new incomes generated by the incremental public factors equal to

$$M_5 = \{\theta'_{KG}(r + \Delta r)\Delta K_G + \theta'_{RG}(q + \Delta q)\Delta R_G\}N \quad [8]$$

where,

θ'_{KG} = per capita share of ownership in incremental public capital of residents
θ'_{RG} = per capita share of ownership in incremental public resources of residents
N = original population

The "net dilution" of public incomes of original residents by migrants may then be written as

$$M_6 = M_4 - M_5 \quad [9]$$

and the total impact on private and public income will then be

$$M = M_2 \text{ (private income effects)} - M_6 \text{ (net dilution)} \quad [10]$$

Thus, even if M_2, the pure private income effects on the original residents, is positive, a sufficiently large dilution of claims to public incomes may more than fully offset private income gains to original residents. Thus, at least in principle, original residents might suffer net economic losses as a consequence of development, even in the absence of either adverse externalities or perverse leakages to nonresident-owned factors.

III. APPLICATION TO THE ALASKA CASE

The above framework provides a point of departure for an analysis of the economic impacts of federal OCS development in Alaska. The OCS resource is wholly federally owned,[11] with no revenue sharing provisions; the capital employed directly in the development will be largely nonAlaskan; and virtually none of the production from the OCS is likely to be either refined or consumed in Alaska. The effect on Alaska resource and capital incomes of OCS development should be insignificant.

The primary private income effect on the original residents of the region will be through changes in wages, $L\Delta w$. That, as the new capital influx is likely to increase the demand for labor, particularly for the specialized occupations re-

[10] When residency is the only determinant of the claim on public factors, each resident's share of the government-owned factors will equal the inverse of the population of the jurisdiction. Other rules for allocating these claims may be imposed, such as the use of length of residency to allocate shares. It is also important to note that claims will vary greatly between state and federally owned factors, because of the variation in the size of the population.

[11] Federal jurisdiction over all resources beyond three miles from shore is provided by the Submerged Lands Act of 1953.

quired in oil-field drilling and production operations, but also for labor in the support sectors of the economy. This may raise wage rates, at least temporarily, and at least part of this increase will be realized by original residents.

The second major effect on the original residents of the state is the net dilution of shares of returns to publicly owned resources induced by the migrants. Virtually all of the current oil and gas reserves in the state are owned by the state government.[12] This, combined with the extremely small state population, leads to both a very large initial claim on public income by original residents, as well as to a sizable dilution of that share by even a small migrant population. On the other hand, the OCS resource, being both federally owned and small relative to the existing Prudhoe resource, produces an incremental public claim to the original resident at least two orders of magnitude less than the dilution effect.[13] Consequently, the net dilution effect is unambiguously negative.

The size of the competing private and public income effects will be measured empirically by comparing a statewide economic forecast (through the year 2000), which includes federal OCS developments with an alternative base case from which OCS developments have been excluded. These forecasts were developed using an econometric model of the State of Alaska[14] in combination with a set of federal OCS development scenarios used in the U.S. Department of the Interior's Alaska OCS Studies Program.[15]

In the base case, future Alaskan growth is governed by two major factors: the occurrence of new exogenous resource developments and the fiscal policies of state government. A base case scenario was developed consisting of a plausible set of assumptions concerning these projects and fiscal policies.[16] Under these assumptions, state population, employment, and real per capita disposable income expand by 56%, 81%, and 51%, respectively, by the end of the period. Because state government revenues are dominated by royalties and production taxes, such revenues rise rapidly to a peak of $5 billion[17] annually in 1991, then begin to fall with the depletion of Prudhoe Bay resources. Expenditures rise continuously to over $4.2 billion by the end of the period, representing about a 3.3% average annual growth in real per

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[12] Except for some onshore federally owned resources in the Upper Cook Inlet/Kenai area.

[13] This may be seen as follows. The incremental OCS resource is about 20% of the current state-owned resources. In the middle of the forecast period, state population is 485,000, while U.S. population may be about 250 million. Thus,

$$R_G/\Delta R_G = 5 \text{ and } \theta_{RG}/\theta'_{RG} = 500$$

The change in Alaska population is approximately 4% of the base population. Assuming no public capital develops the OCS resource, so $\Delta K_G = 0$, then

$$|M4/M5| = \frac{\theta_{KG}(r + \Delta r)\, K_G * .04}{\theta'_{RG}(q + \Delta q)\Delta R_G} + (500)(5)(.04)$$

The second term alone is over 100, and the first term is positive and likely to be of similar magnitude. Thus, the magnitude of the dilution effect is likely to be at least 100 times greater than the competing $M5$ effect.

[14] The econometric model was developed by the University of Alaska Institute of Social and Economic Research and the Harvard-M.I.T. Joint Center for Urban Studies. For a more detailed description of the models, see Kresge and Seiver (1978, pp. 99–104).

[15] E. Porter (1980) for a description of methodology used in the scenario development.

[16] Major resource developments assumed in the base case include: development of the Kuparuk reservoir west of Prudhoe Bay, construction of a gas pipeline from Prudhoe through Canada, construction of a refinery/petrochemical complex in Valdez, a LNG facility on the Kenai Peninsula, and several major hydroelectric projects. Major fiscal policy assumptions are that the current revenue structure remains intact throughout the forecast period and that expenditures grow at a constant nominal rate somewhat higher than its historical trend.

[17] All dollar amounts are expressed in 1979 dollars.

TABLE 2
SUMMARY OF BASE CASE FORECAST, 1980–2000

Year	Population (thousands)	Employment (thousands)	Real Disposable Income Per Capita (1979 $)	State Government Revenues (Millions of 1979$)	State Government Expenditures (Millions of 1979$)	State Government Fund Balance (Millions of 1979$)
1980	401.6	193.4	9,054	1,563	1,439	1,009
1985	457.8	225.1	9,864	3,997	1,870	9,035
1990	485.1	249.5	11,174	4,874	2,436	18,568
1995	540.5	290.3	12,401	4,250	3,217	23,008
2000	627.3	350.8	13,658	3,560	4,236	19,636

capita expenditures. Under such a fiscal policy, the state realizes its current goal of accumulating a "permanent fund"[18] from resource revenues. This fund would peak at $23 billion by the mid-1990s, but resource depletion combined with expenditure growth results in its being drawn down to approximately $20 billion by the end of the forecast period. Table 2 summarizes the base case forecast under the above assumptions.

The "net burden" hypothesis will be tested by examining the economic effects of the development of four lease sale areas in the Gulf of Alaska region.[19] These areas were chosen for the analysis because they are among the first sales scheduled and development scenarios had been constructed by the Alaska OCS Office as part of its Socioeconomic Studies and Environmental Assessment Programs. Furthermore, the pattern of impacts associated with the Gulf of Alaska sales is likely to typify that associated with the majority of prospective OCS developments in Alaska.[20]

As in the base case, growth during the forecast period depends on exogenous resource developments and state fiscal policy. Exogenous resource developments include all the items assumed in the base case in addition to development of the four Gulf of Alaska OCS sale areas. It is assumed that these sales, occurring between 1978 and 1981, result in the discovery of 1.7 billion barrels of oil and 7.7 trillion cubic feet of gas. State government expenditures in the OCS development case are assumed to increase by a sufficient amount to maintain per capita public services at their base case levels.

Exploration, development, and production of these resources have two direct effects: they generate employment and provide revenues to the state. Direct employment peaks at about 2,850 in

[18] Currently the state is bound by the Constitution to accumulate a minimum of 25% of nonrenewable resource revenues.

[19] Specifically, we include the following proposed sales: Lower Cook Inlet (Sale CI) in 1978, Kodiak and the Eastern Gulf of Alaska (Sales 46 and 55) in 1980, and a second Lower Cook Inlet sale (Sale 60) in 1981).

[20] The only notably different type of sale would be the recent joint federal/state sale in the Beaufort Sea. Because as much as 50% of the Beaufort lease area is in state waters, the state will share in bonuses, royalties, and production taxes, unlike other solely federal sales.

TABLE 3
SUMMARY OF OCS IMPACTS, 1980–2000

	Direct Effects		Total Effects (measured as the change from the base case levels)					
Year	Employment	Revenue*	Population	Employment	Real Disposable Income*	State Govt. Revenues*	State Govt. Expenditure*	State Govt. Fund Balance*
1980	304	0	541	674	13.4	1.6	0.3	2.6
1985	2,257	13.4	9,767	6,364	189.6	32.0	39.3	4.1
1990	2,523	17.1	17,962	9,611	228.6	60.7	89.4	8.0
1995	2,224	10.6	19,435	9,370	237.9	37.0	114.6	−185.7
2000	2,187	5.6	21,409	10,115	272.7	14.9	143.2	−522.4

* Millions of 1979 dollars.

1989, before stabilizing at about 2,200 by 1992. Since OCS development occurs outside of the state's taxable jurisdiction, direct revenues are limited to state property taxes on certain categories of onshore and nearshore facilities. At their peak, they amount to $18.5 million.

The impact of OCS development extends beyond these direct effects. Expenditure of incomes earned in such activity generates further activity in the support sectors of the economy. Taxation of both direct and this induced income generates new revenues for the state government. Increased economic activity increases government expenditures as services are provided to new residents. The effects of OCS development are summarized in Table 3. By the end of the forecast period, state population is 3.4% higher as a consequence of OCS development, employment is 2.9% higher, and disposable personal income is 3.2% higher.

The indirect, or induced, effects comprise a growing share of total impacts, rising from 55% of total employment impact in 1980 to 78% of the total by 2000. The reasons for this are two-fold. First, the impact of OCS incomes in the regional economy grows over time, due to both the growth in real wage rates in the petroleum sector relative to other sectors of the economy, as well as to the shifting composition of OCS employment from a transient labor force in the exploration and development phases to a resident labor force (with a higher propensity to spend within the region) during the production phase of operations. Second, the growth of real per capita state government expenditures over time implies that a more potent fiscal response is elicited in later years to maintain new migrants at the base case levels of public services.

These impacts are distributed among both the original residents (the base case population—those who would have been in the state in the absence of OCS development) and the new migrants attracted by OCS development. In order to test the "net burden" hypothesis, it is necessary to isolate the net benefits accruing to original residents as a consequence of OCS development. These net benefits consist of two components—

changes in private disposable income and changes in claims on "public income."

Changes in per capita private disposable income accruing to original residents are given by

$$M_2(\alpha,i) = \alpha \sum_{t=1979}^{2000} \left(\frac{Y' - Y}{P}\right)_t \Big/ (1 + i)^t \quad [11]$$

where

α = share of induced present value of private disposable income going to original residents
Y' = real disposable personal income with OCS development (in 1979 dollars)
Y = real disposable personal income in base case (in 1979 dollars)
P = base case population
i = discount rate

The share of the increase in private disposable incomes which accrues to original residents as a result of OCS development depends on several factors. These factors include the match between skill requirements and trained, available Alaska residents; the general demand for labor in the state at the time of OCS development; and the wage rates in OCS jobs relative to other employment opportunities. Although the simulation model is not sufficiently detailed to directly estimate α, it is possible to speculate on the plausible range over which α might vary. Insofar as $M_2(\alpha,i)$ represents an empirical estimate of the first term of equation [4], we can expect that the private incomes of the original residents will at least be as high with OCS development as without it, $\alpha > 0$. A *very* liberal upper bound on α (α max) could then be established by calculating that share of induced present value of disposable income which would accrue to original residents if all migrants earned a subsistence level of income.

Such an α max, however, is implausibly high, insofar as few persons are likely to be induced to migrate to Alaska for purposes of earning a subsistence level of income. A more plausible expectation for the potential migrant might be that of earning the average nonnative income.[21] If such expectations are realized, then the share of induced present value of disposable income accruing to original residents is given by

$$\hat{\alpha}(i) = \frac{\sum_{t=1979}^{2000} [Y' - Y - \bar{y}(P' - P)]_t \Big/ (1 + i)^t}{\sum_{t=1979}^{2000} (Y' - Y)_t \Big/ (1 + i)^t} \quad [12]$$

where $\bar{y}$ = average nonnative per capita disposable income. As shown in Table 4, if migrants earn only an average nonnative income in Alaska, then one impact of Gulf of Alaska OCS development will be to raise the present value of the private incomes of original residents by approximately $300.

The second major impact that we consider is the effect on "public incomes." Public income consists of two components—current public services and the claim on the current account surplus of state government. This latter component may be understood as representing potential new public services or potential tax reductions. As discussed earlier, we assume unchanged per capita public service levels between the two cases. Therefore, the effect of OCS development on the "public incomes" of original residents shows up entirely as the change in their share of the current account surplus after services are maintained at their base case levels. Assuming that all residents, old and new, have

[21] Because of their location in rural areas where there is little economic activity, Alaska natives (Indians, Eskimos, and Aleuts) generally have lower average incomes than the nonnative population.

TABLE 4
OCS IMPACT ON PRESENT VALUE OF PRIVATE DISPOSABLE INCOME

i	α max	$\hat{\alpha}$	$M_2(\hat{\alpha})$
.02	.79	.04	250.8
.05	.80	.07	313.8
.08	.80	.11	363.6

equal claim to this surplus, the effect on the average original resident may be written

$$M_6(i) = \sum_{t=1979}^{2000} \left(\frac{S'}{P'} - \frac{S}{P}\right)_t \Big/ (1+i)^t \qquad [13]$$

where
S' = current account surplus in OCS case
S = current account surplus in base case
P' = state population in OCS case

As shown in Table 5, $M_6(i)$ is both sizable and unambiguously negative. In order to gain some insight into this impact, we can break down the current account surplus into three components, that is,

$$S = R_1 + R_2 + (R_3 - E) \qquad [14]$$

where
R_1 = petroleum-related revenues
R_2 = interest earnings on accumulated balances
R_3 = endogenous revenues
E = state government expenditures

Under current institutional arrangements, petroleum revenues, R_1, are largely unaffected by federal OCS development. Consequently, the effect on the claims of original residents to R_1 is limited almost entirely to the dilution of such claims by the new migrants attracted by OCS activity. As shown in Table 5, this dilution effect is of a sizable magnitude, amounting to over $1,000 per capita for a 5% discount rate.

The second term, R_2, represents interest earnings on accumulated balances of state government. The claims of original residents to such earnings are affected in two ways by OCS development. First, to the extent that such development adds less to state revenues than to expenditures, such balances will be drawn down, thus diminishing the quantity of such earnings. Second, to the extent that such development attracts new migrants to the state, the claims of original residents to such earnings are diluted. Again, the two effects combine to reduce the claims of original residents by a sizable amount,

TABLE 5
OCS IMPACT ON PER CAPITA PUBLIC INCOMES

i	Effect on Petroleum Revenue Claim	Effect on Interest Earning Claim	Effect on Net Endogenous Revenue Claim	$M_6(i)$
.02	− 1,412	− 1,358	+ 211	− 2,559
.05	− 1,045	− 896	+ 155	− 1,786
.08	− 791	− 607	+ 117	− 1,281

nearly $900 per capita for a 5% discount rate.

The effect of OCS development on the claims of original resident net endogenous revenue, $(R_3 - E)$ or endogenous revenues less expenditures, is actually positive. Since a major share of state expenditures is financed from R_1 and R_2, this third term is always negative. Thus, although OCS development increases the absolute size of this deficit term, it also spreads claims to it over a larger population. On balance, the claims of an original resident to this deficit term fall as a consequence of OCS development, although not by a sufficient magnitude to significantly offset the diminished claims on the first two terms.

On balance, as shown in Table 5, the total public claims of original residents are reduced by about $1,800 per capita for a 5% discount rate.

We now have all of the ingredients to test the hypothesis that federal OCS development imposes a net burden on the State of Alaska. As stated earlier, total net benefits consist of both private income effects and "public income" effects. Consequently, total net benefits, M, may be written

$$M(\alpha,i) = M_2(\alpha,i) + M_6(i) \qquad [15]$$

This net benefit function is plotted in Figure 1. As shown, unless the share of induced private incomes accruing to original residents exceeds approximately 40%, such residents do indeed suffer a net economic burden as a consequence of OCS development. The "break-even" condition is virtually unaltered by the choice of discount rate. However, unless new migrants entering the state as a consequence of OCS development typically earn substantially less than an average Alaskan income, the share of new income accruing to original residents will fall substantially below this 40% level. As an example, if migrants earn just an average Alaska income, only between 4–11% of new income accrues to original residents. As shown in Table 6, this implies a net burden of between $917 and $2,309 to the original residents as a consequence of the federal development.

Of course, such a measurement is subject to considerable error. However, the measure is extremely insensitive to our major arbitrary assumption, namely the base case expenditure pattern of state government. In Figure 1, the two dotted lines bracket the net benefit measure for a 5% discount rate between base case annual expenditure growth of 9% and 17%. While this range more than spans the plausible range of expenditure growth, since 9% implies a fund balance by the year 2000 over $14.8 billion and 17% implies a bankrupt state government by that time, the benefit measure is quite insensitive to our 13% growth assumption. Furthermore, the case examined here has been constructed so as to be able to anticipate the direction in which each of the major sources of error biases our result. Generally, the net benefits estimated by the measure described here are biased upwards, for several reasons.

First, the negative public claims effects dominate the positive income effects consistently after the peak of development. The negative public claim effect will continue even with outmigration associated with the completion of OCS production, since part of the negative public claim results from drawing down the fund balance which reduces interest earned on the fund. Truncation of the impacts at the year 2000 thus introduces an upward bias to our net benefit measure.

Second, one cause of migration into

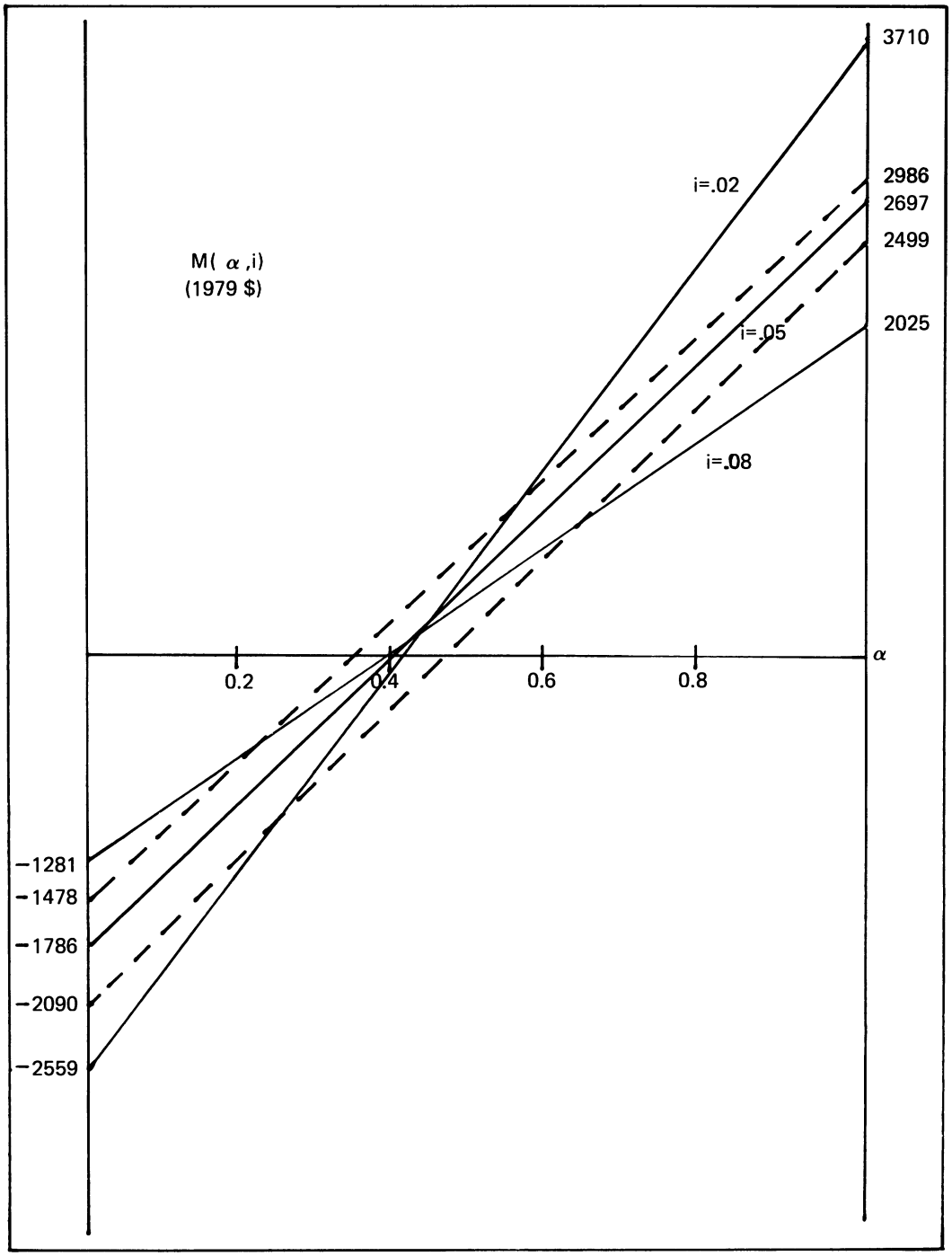

FIGURE 1
THE NET ECONOMIC EFFECT
OF OCS DEVELOPMENT ON ALASKA

TABLE 6
THE NET ECONOMIC EFFECT OF OCS DEVELOPMENT ON ALASKA

i	$M_2(\hat{\alpha},i)$	$M_6(i)$	$M(\hat{\alpha},i)$
.02	250.8	− 2,559.3	− 2,308.5
.05	313.8	− 1,786.3	− 1,472.5
.08	363.6	− 1,281.0	− 917.4

Alaska is likely to be a shortage of skilled labor in the existing labor force, so the majority of these positions may go to migrants. Such workers are quite likely to have systematically *higher* than average incomes, and the true α in $M_2(\alpha,i)$ may be substantially lower than $\hat{\alpha}$.

Third, our estimates of petroleum revenues have been made extremely conservative, assuming that the price of crude oil remains constant in real terms throughout the forecast period. As a consequence, the size of the dilution effect associated with R_1 and R_2 in equation [9] may be substantially understated, thus introducing a further upward bias into our measure of net benefits.

Fourth, we have assumed that it is possible to keep public service levels unchanged by maintaining real per capita expenditures by state government at their base case levels. This implies a certain amount of excess capacity in the existing stock of public capital (schools, highways, bridges, etc.), insofar as the maintenance of real per capita expenditures (both operating and capital) will be inadequate to prevent a reduction in the stock of public capital per capita. If such capacity does not exist, then we have neglected a further capital cost which may be necessary to maintain public service levels. This neglect biases our measure of net benefits even further upward.

Finally, and possibly most importantly, we have completely omitted any adverse environmental externalities associated with such activity, such as potential conflict with the fishing industry which could arise from accidental spills, blowouts, or chronic discharges.[22]

Despite these five potentially serious upward biases, our net benefit measure $M(\bar{\alpha},i)$ is still unambiguously negative, suggesting rather strongly the validity of the "net burden" effect in the Alaskan case.

IV. CONCLUSION

The analysis presented here raises serious doubts about the potential for local economic benefits offsetting any adverse external affects of federal OCS development in Alaska. In fact, under a plausible set of circumstances, such economic effects are themselves a net burden on the predevelopment population, so that the total effect of such development on such residents may well be unambiguously adverse. Alaska's small population, enormous existing wealth, and absence in-state of processing or consumption of the OCS resource, limit the ability to generalize these results to other states. However, since Alaska is the major site of new OCS leasing activity, it is a very important special case.

The conclusion does not suggest in any way that such federal developments are undesirable on either efficiency or distributional grounds. Indeed, from a national perspective, such leasing may have total benefits well in excess of total costs, both economic and environmental. Rather, the conclusion only suggests the inadequacy of existing private and public institutional arrangements as a compensatory device for Alaskan residents.

[22] See Rogers (1974, pp. 255–275).

At one level, this might be interpreted as a purely distributional problem, and the current wealth of the state might lead one to question the necessity of improving on such compensatory mechanisms. However, the failure of such compensatory mechanisms may, in fact, have efficiency consequences as state or local interests work to block, or at least hinder, what is from a national perspective a desirable development.

Also, one should not neglect the possibility of adaptive policy reactions by the state government. Local hiring policies may work to drive up the share of new income accruing to previous residents. New state tax structures and the incidence of expenditure benefits may be altered in ways that favor existing residents, although the state is restricted in such efforts by the equal protection features of the U.S. Constitution.[23] State leasing policy within the three-mile limit adjacent to OCS developments may, in the case of favorably situated nearshore discoveries, permit the state to unilaterally acquire jurisdiction over some share of offshore resources, thus counteracting the effects described here.

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[23] Recent state legislation has attempted to assign property rights to the state's wealth in relation to length of residency. State income tax legislation, which completely forgives state personal income taxes after three years of residency, was adopted by the state legislature but was found unconstitutional by the state supreme court. Dividends based on length of residency have also been adopted as a means of distributing a portion of the state's fund balance to residents. The constitutionality of this legislation is only beginning to be tested. Other techniques, such as the first-use tax adopted by the State of Louisiana in 1978, may be inappropriate for Alaska, since little if any in-state processing is required, and consequently, the only effect of such a tax may be to encourage offshore loading facilities.