

Is Alaskan North Slope Oil Commercially Recoverable? The Petroleum Product Chain at Work

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Working paper

A persistent and contentious debate in American energy policy throughout the last two decades has centered on petroleum development in a section of the Alaskan North Slope (ANS) encompassing 1.55 million acres of the coastal plain of the Arctic National Wildlife Refuge - often called the 1002 lands² - together with some adjacent near-shore areas in the Beaufort Sea (see Figure 1). The ANWR is owned and managed by the U.S. federal government; the near-shore areas adjacent to the ANWR are subject to the management authority of the State of Alaska.³ Although they are widely regarded as encompassing the most promising undeveloped petroleum province in North America, the 1002 lands are also prized by environmentalists as crown jewels in the extensive system of national interest lands in Alaska, created under the terms of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980 (PL 96-487). Largely for these reasons, the federal government maintains an unusually tight rein on oil development in the ANWR. Section 1003 of ANILCA, for example, states explicitly that "Production of oil and gas from the Arctic National Wildlife Refuge is prohibited and no leasing or other development leading to production of oil and gas from the range shall be undertaken until authorized by an Act of Congress" (US Congress 1980).

Figure 1 about here

What is at stake here, and what factors can be expected to play a role in determining the fate of oil development in this area? Much of the public debate has centered on arguments about the probable environmental impacts of exploration and development in the ANWR, and there is no question about the significance of this concern. But the issues raised by this case extend well beyond the matter of environmental impacts as such. This essay addresses these broader concerns by situating ANS oil in the larger setting of the petroleum product

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². The phrase 1002 lands derives from the fact that these lands are singled out for special treatment in Section 1002 of the Alaska National Interest Lands Conservation Act of 1980 (PL 96-487).

³. Exceptions are enclaves in the ANWR totaling about 92,000 acres on which the Arctic Slope Regional Corporation (ASRC) holds mineral rights.

chain running from exploratory work through production to the marketing of refined petroleum products.⁴ It argues that this product chain involves a complex mix of private initiatives and public policies that will determine the fate of oil located on the Alaskan North Slope. The most significant conclusion to emerge from the analysis is that the set of public policies applicable to the production and marketing of petroleum products will constitute a critical determinant of the commercial recoverability of ANS oil. As a result, we cannot simply assume that the major companies involved, such as BP-Amoco-ARCO and Exxon-Mobil, will move promptly to produce ANS oil, even in the event that the relevant public authorities decide to open parts of the ANWR and adjacent areas for development and that the recoverable reserves located in these areas turn out to be substantial in purely physical terms.

The Political Economy of Petroleum

Although there is a global market for crude oil, petroleum comes in a variety of types and grades and varies in environmentally significant characteristics, such as sulfur content. These differences are reflected in market prices, so that it is not possible to specify a single market price for oil that every producer can treat as a basis for making calculations about the profitability of pumping oil from recoverable reserves under its control and bringing this oil to market. Even so, most participants in the industry recognize a benchmark price for oil that provides producers with a point of departure for purposes of assessing the profitability of extracting oil and bringing it to market. In the past, Arabian Light delivered to Europe or the east coast of North America served as the "marker crude" for purposes of such calculations (Hartshorn 1993). More recently, the industry has selected other types of crude oil, such as Brent blend from the North Sea and West Texas Intermediate (WTI) from the United States, to serve as marker crudes.

The global oil market exhibits a number of distinct features that have far-reaching implications for petroleum development in frontier regions such as the ANWR and adjacent areas of the ANS (Tetreault 1985, Yergin 1991). Market prices for oil are highly volatile, due in considerable part to the impact of political forces. In response to OPEC embargoes, oil prices rose from \$3.50 a barrel in 1973 to \$13.50 in 1974 and again from \$13.50 a barrel in 1979 to \$34.50 in 1980. During 1986, on the other hand, the price of oil collapsed, reaching bottom at \$11 a barrel, before recovering gradually in the ensuing years. Prices dropped again during 1998; Brent blend sold for \$10-11 a barrel on the London

⁴ As Konrad von Moltke observes, product chains can be defined in terms of "... actors and their objectives, the structure of markets, the strategies or instruments that actors use to influence this structure, and, finally, by the product itself, as different product chains may display different characteristics" (von Moltke et al. 1998, 30).

market at the end of 1998 or approximately 50% below its price a year earlier (Solman 1998). Since the beginning of 1999, however, the major producers have taken steps to cut production, and there is clear evidence of a response to this initiative in market prices (Jehl 1999). The consequences of this volatility are heightened by the fact that petroleum development - especially in frontier areas - involves long lead times, requires large initial investments, and features extended amortization schedules. It is normal for ten years or more to elapse between the decision to develop a field and the first deliveries of oil from that field to markets. Amortization of initial investments ordinarily occurs over the life of a field which may stretch over fifteen to twenty years.

Although there are world market prices for various types of oil, the costs involved in producing oil and transporting it to appropriate markets vary greatly. In most cases, frontier oil is comparatively expensive both to produce and to transport. This is particularly true of areas, such as the ANS, where conditions are harsh, restricting development to certain seasons of the year and requiring the use of advanced technologies to ensure success. Because transportation costs are largely fixed, at least over the short to medium term, volatility is high in the wellhead value of frontier oil or, in other words, the market price minus transportation costs. This has the effect of heightening the sensitivity of calculations about the commercial recoverability of oil reserves located in an area like the ANWR to fluctuations in world market prices (Flanders n.d.). When market prices are low, the wellhead value may sink below the level of production costs. In a recent assessment covering the whole ANS, for instance, the U.S. Geological Survey (USGS) concluded that ANS oil would not be commercially recoverable at west coast crude-oil prices below \$15 a barrel (USGS 1998). It is perfectly possible, under the circumstances, that a congressional decision to open parts of the ANWR would not lead to oil production in the area, although the volatility of market prices makes it risky to infer from such calculations that ANWR oil will be deemed too expensive to produce at some future time.

These economic considerations heighten the significance of another prominent feature of oil markets, the central role of governments and the policies they adopt in establishing the terms of trade for this commodity. In many parts of the world, governments own or manage oil-bearing lands. They can and often do make decisions about opening areas for exploration and eventual development on the basis of considerations that go well beyond narrow economic calculations. In some countries - including western countries such as Canada, Great Britain, Mexico, and Norway - governments have established state owned and operated oil companies to handle the production or the marketing of oil produced in areas under their jurisdiction (Dam 1976). But even in the absence of such direct public control of petroleum development,

governments regularly adopt policies that affect the calculations of private companies regarding the attractions of any given area.

Several distinct levels of government have stakes in any petroleum development that may occur on the ANS, and the interests of these political entities are far from identical. In the case of the ANWR and adjacent areas, the relevant governments include: the North Slope Borough (NSB), the State of Alaska, and the U.S. federal government. The NSB derives about 70% of its income from petroleum development within its jurisdiction, largely in the form of property taxes levied on industrial infrastructure. Revenues derived from the production of oil, mainly in the form of royalties combined with production or severance taxes and corporate income taxes, account for "... approximately 50 percent of the revenue received by Alaska state government" (Reaume 1999:35).⁵ Whereas the borough government has a strong interest in seeing petroleum production continue as long as possible regardless of production rates, the state government needs a relatively high level of production at any given time to generate sufficient income to cover its current expenses (Tussing 1984).⁶ For its part, the federal government does not depend heavily on petroleum development as a source of income. But it has larger, political interests that can lead to the adoption of policies having major consequences for petroleum development on the ANS.

Although the opening of the ANWR and adjacent areas to hydrocarbon development would constitute a major policy shift in its own right, the role of government actions as determinants of the commercial recoverability of ANS petroleum extends well beyond this gatekeeping function (Dugger 1984). For purposes of this discussion, we can group these actions into five major clusters: direct market interventions, policies relating to returns and rents on oil owned by the state or subject to management on the part of public authorities, tax and subsidy regimes, environmental and social regulations, and antitrust policies. Actions of governments in any one of these realms can affect significantly the profitability of producing oil, especially in frontier areas like the ANS where production and transportation costs are high and profit margins are typically narrow. Taken together, the impact of these actions on the commercial recoverability of ANS petroleum may prove decisive.

⁵. Today, the state derives substantial income from the Permanent Fund, a long-term investment portfolio built up with revenue derived from the production of Prudhoe Bay oil and held in trust for the people of Alaska. But the use of this income is highly restricted.

⁶. Oil income has allowed Alaska to remain one of two states in the United States to operate without statewide sales or income taxes.

Direct Markets Interventions

Governments have long been in the habit of intervening directly in oil markets. National governments especially are likely to engage in actions of this sort based on broad political considerations, such as the desire to maximize national security. Despite its general commitment to free enterprise and unregulated markets, the U.S. federal government is no exception (Nester 1997). One prominent type of intervention involves the use of import restrictions and export bans motivated by arguments pertaining to energy security. During the height of the Cold War in the 1950s, for instance, the U.S. federal government imposed import restrictions in an effort to lower America's dependence on foreign oil. The effect of this policy was to raise the price of domestically produced oil, thereby encouraging exploration and development even in older fields and high-cost fields located in frontier areas. Although this policy was roundly criticized and has since been discarded, the federal government does maintain an export ban that effectively prohibits the shipment of oil produced in Alaska to markets in other countries and especially to large Asian consumers like Japan. One effect of this policy is to increase the risk of oil gluts on the US west coast, which can depress crude oil prices and generally lower incentives to produce oil in high-cost areas such as the ANS. A related market intervention arises from the provisions of the Merchant Marine Act of 1920 (PL 66-261) which requires products shipped from one American port to another to travel on American vessels. The effect of this requirement is to raise the spectre of a glut of relatively high-priced oil on the US west coast, a condition that would give consumers an incentive to turn to alternative energy sources.

Even more direct are explicit price controls or policies under which government agencies administer prices that energy producers can charge in the interests of achieving various public or national interests. Although the U.S. federal government has been less active in controlling oil prices than natural gas prices, there is a long and substantial history of administered oil prices in the United States. Generally, price controls have been motivated by a desire to maintain low oil and gas prices, on the assumption that cheap energy is one of the major conditions conducive to sustained growth in the American economy. But such policies may also arise in conjunction with efforts to deal with specific crises, as in the case of the Emergency Petroleum Allocation Act of 1973 (PL 93-159) passed by Congress in the wake of the Yom Kippur War and the ensuing Arab oil embargo and intended to mitigate dislocations arising from oil shortages. The general trend toward deregulation in the United States beginning in the late 1970s and accelerating during the 1980s brought about a dismantling of price controls for crude oil, just as it led to deregulation of airlines and other major consumers of petroleum products. Today, price controls on oil (but not natural gas) are a thing of the past in the United States, and it is unlikely that they will be reintroduced during the foreseeable future.

Beyond this, both federal and state governments often adopt policies that have substantial impacts on the demand for petroleum products. To begin with, governments regularly subsidize both the development of alternative energy sources (e.g., hydroelectric power, solar power, wind power) and initiatives intended to encourage energy conservation on the part of consumers (e.g., retrofitting homes to reduce energy consumption). To the extent that they are successful, such policies lower the demand for oil by reducing energy consumption or encouraging the development of substitutes for oil that are competitive in terms of price. Similarly, some public policies seek to alter consumption patterns by levying taxes on energy consumption (e.g., gasoline taxes), mandating efficiency standards (e.g., fuel efficiency standards for automobiles), and imposing charges on the use of petroleum products (e.g., charges on emissions of carbon dioxide resulting from the burning of fossil fuels). All these measures are likely to play some role in reducing the demand for oil, thereby lowering incentives to develop high-cost oil in frontier areas such as the ANS. Yet other government policies have the opposite affect, increasing the demand for oil or lowering production costs. During the Carter Administration, for instance, the US federal government competed with other buyers by purchasing crude oil in order to create the Strategic Petroleum Reserve. Other government programs, such as the construction of the Interstate Highway System starting in the 1950s, have played less direct but nevertheless important roles in ensuring that the demand for oil on the part of private consumers remains high.

Factor Returns and Rents

Some oil reserves belong to private owners who may decide at their own discretion whether and when to produce their oil and how to ship it to market. But on the North Slope of Alaska, private ownership of oil is the exception. The only significant private player is the Arctic Slope Regional Corporation (ASRC), a for-profit Native regional corporation created under the terms of the Alaska Native Claims Settlement Act of 1971 (PL 92-203), which holds title to the subsurface estate of some oil-bearing lands on the ANS.⁷ Otherwise, oil reserves in this area are either owned or managed by the State of Alaska or the U.S. federal government. To be more specific, there are four distinct cases. The State of Alaska owns outright large blocks of land on the North Slope, including the land on which the Prudhoe Bay oil field is located; it also exercises management authority over near-shore lands from the high water mark out to the three-mile

⁷ The Alaska Native Claims Settlement Act created both regional and village corporations to serve as recipients of the land and cash compensation awarded to Alaska Natives in return for the extinguishment of any remaining claims. Rights to the subsurface estate of all the lands involved were allocated to the regional corporations.

limit.⁸ For its part, the federal government owns outright the land on the North Slope included in the ANWR and in National Petroleum Reserve - Alaska (NPR-A); it has jurisdiction over offshore lands beyond the three-mile limit.⁹ Because the management regimes applicable to these different categories of land and seabed areas are by no means identical, it is important to bear these distinctions in mind in thinking about oil development on the ANS.

Government managers - especially those at the federal level - responsible for decisions about oil development normally consider a variety of factors over and above market prices in arriving at conclusions about whether to open specific areas for exploration and development (Ikenberry 1988). Managers may seek to stimulate domestic production as a means of increasing security by limiting American dependence on foreign oil. Alternatively, they may prefer to discourage domestic production in order to save American reserves for use during future crises. In other cases, government decisionmakers may give some weight to external factors, such as the opposition of Canada to petroleum development in the ANWR. Some policymakers are motivated as well by much larger ideas concerning the pros and cons of public ownership/control of land and natural resources. During the Reagan years, for instance, the Secretary of the Interior sought to lease huge tracts of the outer continental shelf for hydrocarbon exploration as a means of putting decisionmaking authority into the hands of private sector actors (Mead et al. 1985). Beyond this, public decisionmakers may act to separate decisions about exploratory work on areas owned or managed by the government from decisions about actual oil production. One argument often made in this connection is that the public is likely to obtain greater returns on publicly owned resources if substantial information about the existence and scale of recoverable reserves is available before specific areas are leased for oil development (Devanney 1975).

Once a decision is made to offer publicly owned or managed areas for petroleum development, a suite of questions pertaining to factor returns and economic rents come into focus. Like other raw materials, oil is a factor of production. Just as those using other factors of production, such as labor or capital, expect to pay fair market value for their services, corporate decisionmakers must anticipate paying for the use of raw materials regardless of their ownership. These payments are factor returns. When production generates income in excess of the fair market value for the factors of production consumed,

⁸, Under the terms of the Alaska Statehood Act of 1958 (PL 85-508), the state received title to 104 million acres of land previously owned by the federal government.

⁹. NPR-A is one of a number of petroleum reserves set aside during the 1920s for potential use by the U.S. Navy. The federal government has recently decided to open this 23 million acre tract in the western part of the ANS to oil development (Knickerbocker 1998).

the result is a flow of what are generally called economic rents (Mishan 1980).¹⁰ This in turn raises questions regarding the legitimacy of rents accruing to the owners or suppliers of the various factors of production whose use has generated them. In some cases, rents arising from the production and marketing of oil have become extremely large. When the world market price of oil quadrupled in response to the oil embargo of 1973-1974 with no appreciable increase in production or transportation costs, for instance, major companies were able to reap large "windfall" profits, an occurrence that led to actions on the part of governments designed to capture some of these rents through the imposition of windfall-profits taxes.

Historically, governments have experienced difficulties in seeking to capture rents associated with the use of publicly owned natural resources. In many cases, they have not even obtained fair market returns for the use of these resources. When this happens with respect to oil, it encourages producers to develop marginal fields or to go on producing from old fields beyond the point where it would become unprofitable to do so if there were no rents accruing from such activities. Considerable time and energy has been expended over the last several decades to avoid or minimize this problem with regard to the development of oil belonging to the U.S. federal government and to the State of Alaska. There is some debate about the results of these measures, but this effort can hardly be described as an unqualified success.

Current practice involves a combination of (1) lease sales in which companies acquire the right to engage in exploratory work in designated areas to ascertain the existence, size, and character of recoverable reserves and (2) production agreements covering royalties along with various regulatory provisions applying to oil production in specific areas. Both the federal government and the government of the State of Alaska have the legal authority to use any of a variety of systems in the conduct of lease sales (Dam 1976, Dryzek 1983). A common procedure, especially on the part of the federal government, has been to conduct lease sales in which companies compete with one another by making "bonus bids" or offers of up-front payments in return for leases according them exclusive rights to search for oil on specific tracts of land or the seabed. Although the winning bids are sometimes large - hundreds of millions of dollars are not uncommon - most analysts believe this system works to the advantage of the oil companies and encourages sizable investments in areas of doubtful potential. An alternative system known as "net-profit share bidding" requires companies to commit themselves in advance to sharing a percentage of their ultimate profits with the government as the owner of a key factor of production. This system has the effect of spreading risks between the oil

¹⁰. The growing recognition of the role that rents play in many markets has given rise to a sizable literature on rent seeking behavior (Tullock 1989).

producers and the government. Although some observers believe it would increase the ability of governments to capture rents arising from oil production on areas under public ownership or management, others have argued that governments are poorly equipped to deal with corporate efforts to manipulate calculations of net profits in order to minimize income accruing to governments.

Many systems feature a separation between the exploration stage and the production stage with regard to factor returns. Normally, companies that have located recoverable reserves during the exploration stage are granted exclusive rights to produce oil in the relevant area. The usual procedure - followed by both the federal government and the State of Alaska - is to require producers to turn over a percentage of the oil produced to the government as a royalty or, in other words, a return to oil as a factor of production. In recent American practice, royalty oil has varied from about 12.5 to 16.5 percent of the oil produced. In practical terms, this usually means that companies sell all the oil they produce and turn over the stipulated percentage of the proceeds or what is known as the well-head value to the relevant public agency. Under this system, governments are not required to get into the business of marketing oil. They also share economic risks with the companies, gaining revenue when oil prices go up and losing revenue when prices go down. Obviously, the higher the royalty rates, the less attractive it will become for private companies to produce and market oil from any given area. At some point, therefore, royalties would become self-defeating in the sense of deterring corporations from making decisions to initiate production. The profitability of high-cost oil, such as most oil produced on the ANS, will be particularly sensitive to the levels at which royalties are set.

Combining the distinctions between returns and rents and between the exploration stage and the development stage yields a 2x2 table that helps to organize thinking about public policies arising from the roles governments play as owners or managers of ANS petroleum (see Table 1). The resultant categories of policies are not mutually exclusive; governments can and do endeavor to develop effective combinations of policies dealing with returns and rents. At any given juncture, however, one or another of these categories of policies is apt to be the primary focus of attention.

Table 1-- Economic Returns/Rents

	<u>returns</u>	<u>rents</u>
<u>Exploration</u>	bonus bid	net profit sharing
<u>Production</u>	royalty regime	windfall profit tax

Questions arise as well about the disposition of income that governments derive from lease sales, royalties, net profit share arrangements, or windfall profits taxes. The simplest procedure is to allow this income to accrue to the general fund. For the most part, the State of Alaska follows this procedure (although a portion oil revenue is required by law to go into Alaska's Permanent Fund). The U.S. federal government has adopted a more complex procedure. Federal policy features a system of dividing the income derived from oil between the U.S. treasury and the government of the state where the development takes place on the grounds that oil development will impose additional costs on state governments. The general practice has been to split this income equally between the federal government and the relevant state. In the case of Alaska, however, the federal government has generally agreed to a 90-10 split, with the state receiving the larger share on the grounds that it is a frontier area with special needs (Protasel 1999). This matter should not affect the calculations of the oil companies, since they will pay the same amount in bonus bids and royalties regardless of how these funds are divided. But the nature of the split may affect political incentives and put pressures on government agencies to open various areas for oil development in the first place. In the case of Alaska, for example, the 90-10 split gives the state government an obvious incentive to push hard to persuade the federal government to open the 1002 lands for oil development.

Tax and Subsidy Regimes

The production of oil is subject to a variety of taxes and subsidies that, taken together, can affect significantly the commercial recoverability of oil located in the ANWR and adjacent areas (Garrett 1984). Although many of these taxes are generic in the sense that they apply uniformly to all industries, some taxes and subsidies are specific to the oil industry. Relevant taxes are imposed at the local, state, and federal levels so that any comprehensive assessment of the incentives of the petroleum industry to produce oil from ANS reserves must take into account the full spectrum of taxes. In general, public authorities have an incentive to set tax rates high enough to generate a substantial flow of revenue but not so high as to lead oil companies to cancel their development plans. There are other, more effective policy instruments available to public authorities seeking to prohibit oil development altogether in any given area.

Any new production facilities constructed in conjunction with oil development in the ANWR and adjacent areas will be subject to property taxes levied by the North Slope Borough (NSB). The NSB is a regional government founded in 1972 that has jurisdiction over the entire North Slope and that operates under the relevant provisions of the Alaska state constitution. At the time of the development of the Prudhoe Bay field, a dispute arose over the borough's taxing authority which was resolved ultimately by a court decision in

favor of the borough. The resultant arrangement allows the NSB to levy and property taxes on production facilities and associated infrastructure (e.g., pumping stations, accommodations for workers, airfields) located within its jurisdiction. Given these arrangements, the borough stands to gain from actions that prolong ANS petroleum production over time, regardless of the actual level of production at any given time. Improvements in technology occurring over the last two decades should make it possible to reduce substantially the footprint of any new oil development on the North Slope. Some operations envisioned in scenarios for ANS oil production might even occur outside the boundaries of the borough's jurisdiction. Nevertheless, the tax base associated with any new production facilities on the ANS will be sizable. NSB property taxes are limited under Alaska state law to a mill rate of eighteen. Yet it is possible to imagine the occurrence of changes in the borough's tax policy, and there is much to be said for examining the sensitivity of ANS oil production to changes in local taxes.

Oil companies, like other businesses, are subject to corporate income taxes. Currently, both the State of Alaska and the federal government levy income taxes on oil companies operating on the North Slope. Revenues derived from oil production, including royalties as well as production and income taxes, account for a large - though declining - share of the annual income accruing to the state government and make it possible for Alaska to operate without statewide taxes, such as a sales tax or a tax on individual incomes of the sort common to most other states.¹¹ Accordingly, the state of Alaska has a distinct incentive to keep oil-related taxes relatively high. At the same time, the dependence of the state government on revenue derived from the production of oil makes the well-being of this industry a major concern for the state. Under the circumstances, the interests of the state are served by a combination of high levels of production from existing fields and a continuous effort to identify new fields. This explains why support for the proposal to open the coastal plain of the ANWR for oil development constitutes one of the rare instances in Alaskan politics in which members of both major political parties have lined up on the same side.

With regard to corporate income taxes levied by the federal government, on the other hand, the picture is significantly different, though no less complex. Understandably, the incidence of such taxes on the specific operations of oil companies in Alaska is not a critical factor in the larger battles over corporate income taxes in the United States. Yet it is worth noting here that the issue of corporate income taxes has been a focal point of intense and recurrent battles at the federal level between conservatives who argue that it is essential to avoid suppressing the innovative energies of corporations and liberals who maintain

¹¹. Fears about declining oil revenues have stimulated some consideration of the introduction of a statewide income tax in Alaska. But public opposition to such an initiative is strong.

that corporate incomes are sufficiently large to support income taxes without impairing economic initiatives. At present, the federal corporate income tax rate is set at 40% of retained profits, although the complexities of accounting procedures make it important to treat this formula with caution. Yet it is easy to imagine circumstances that could lead to significant alterations in this rate, so that it seems important to consider the probable impacts of such changes on the incentives of oil companies interested in the recoverable reserves of ANS oil.

There are as well a number of taxes and subsidies that pertain specifically to the activities of industries engaged in the extraction of nonrenewable resources and, in some instances, the production of oil in particular. Perhaps the most important tax of this sort is generally characterized as a production or severance tax. Usually levied at the state level, the idea behind the severance tax is that extractive industries are using up wasting assets. To the extent that the resources are consumed today, they will not be available for use in the future. In effect, then, a severance tax is a payment that current users of nonrenewable resources make to future users who will be unable to use the resources themselves. Alaska levies a severance tax on oil production which is variable but can reach 15 percent, a level that is high by overall American standards. By contrast, a key subsidy takes the form of depletion allowances, which are based on a rationale that is nearly the opposite of that underlying severance taxes. Because oil reserves constitute a wasting asset, producers must reckon with the depletion of this factor of production over time either by seeking out new reserves or by shifting their processes to alternative energy sources (e.g., coal, natural gas, solar energy). Under the circumstances, some have argued that producers should receive a tax break to compensate them for the burden associated with the need to engage in a constant search for new resources. Usually mandated at the federal level, depletion allowances constitute a subsidy that can have a significant impact on the decisions of producers regarding both the order in which to tap various reserves and the rate of production from specific reserves. Although they have been important in the past, both severance taxes and depletion allowances have become increasingly unpopular in recent years. Nonetheless, it is perfectly possible that the popularity of severance taxes or depletion allowances will rise again in the future with significant consequences for the attractions of producing high-cost oil in frontier areas like the ANS.

So far, this section has focused on taxes and subsidies aimed at the production of oil or the infrastructure associated with oil production, and these supply side policies certainly constitute the main concern in any account of tax and subsidy regimes associated with the petroleum product chain. Yet it is worth noting that public authorities sometimes employ demand side measures, such as taxes or subsidies directed toward the consumption of oil or, more often, products derived from petroleum like gasoline. For the most part, consumption

taxes are motivated by policy concerns that center on efforts to internalize unintended side effects arising from the consumption of oil (e.g., photochemical smog or carbon dioxide emissions caused by the burning of gasoline or fuel oil). Similar observations are in order with regard to subsidies intended to change the relative cost to consumers of different energy sources (e.g., inducements to encourage the use of natural gas for home heating).

The effects of such demand side measures may be reflected in significant shifts in market prices for petroleum products and subsequently in the decisions oil companies make about the production of high-cost reserves.

Table 2 Tax/Subsidy Regimes

	<u>local</u>	<u>state</u>	<u>federal</u>
<u>Property tax</u>	x		
<u>Income tax</u>		x	x
<u>Severance taxes</u>		x	
<u>Depletion allowances</u>			x
<u>Consumption taxes</u>		x	x
<u>Alternative energy subsidies</u>			x

Yet it is dangerous to rely on simple assumptions in this realm. The impact of a gasoline tax on patterns of consumption, for instance, will be determined by the elasticity of demand for gasoline as a function of price. As the experiences of the 1970s demonstrates, the elasticity of demand may be quite low, at least over the short to medium run. Automobile owners are typically locked into their current choices over the short run, and the size of the initial investment required to shift to most forms of mass transit is extremely high. Of course, oil companies normally make decisions about the development of major new fields using a ten to thirty year planning horizon and considering likely trends in the overall world market. Most likely, the status quo **with regard to taxes and subsidies affecting the consumption of petroleum products** will remain in place. But it would be instructive in this connection to give some thought to the probable impacts of plausible initiatives on the part of the U.S. federal government, such as a \$0.50 per gallon increase in gasoline taxes over the expected life of oil reserves in the ANWR and adjacent areas or a sizable tax levied only on imported oil and justified in the name of energy security.

Table 2 provides a qualitative overview of this complex system of tax and subsidy regimes. As the table indicates, all levels of government have stakes in

such arrangements. But the combinations of tax and subsidy regimes become more complex as we move upward to the level of the federal government.

Environmental and Social Regulations

In principle, environmental and social regulations are meant to spell out the terms under which oil development is allowed to proceed rather than to affect the calculations of the oil companies about whether to go forward at all. Nonetheless, it is easy to see that the specific provisions of the regulatory regime under which oil development takes place can have a major impact on costs and through them on the profitability of proceeding with development at all. The battle over the opening of the coastal plain of the ANWR for oil development has been a top priority for the environmental community ever since the passage of the ANILCA in 1980. Losing this battle would be a bitter pill for a sizable number of environmental groups. Should a decision be made to open the 1002 lands, the environmental community would undoubtedly fight hard for the imposition of stringent regulations on any exploration or oil development that does take place in the area. It is reasonable to assume, under the circumstances, that petroleum development in the ANWR would be subject to strict environmental regulations and that conformance on the part of the industry would be monitored closely. Somewhat similar observations are in order regarding the social impacts of oil development on the ANS. These impacts - encompassing matters of health, education and welfare as well as employment and business opportunities - are of particular concern both to North Slope communities, such as Kaktovik, whose residents have a distinct interest in employment and business opportunities associated with the production of ANWR oil and to communities located south of the Brooks Range in Alaska and to the east in Canada, such as Arctic Village and Old Crow, whose residents are concerned primarily about the impact of oil development on the population dynamics of caribou and consequently on the availability of caribou for consumptive use. Overall, it is safe to assume that oil development in the ANWR and adjacent areas will be as closely watched by those concerned with environmental and social impacts as oil development anywhere in the world.

Two dichotomies will help to organize thinking about the effects of environmental and social regulations on the development of ANS oil. One distinction separates regulations that focus on field design and management on the one hand and transportation systems on the other. At the same time, we can distinguish between regulations that are largely procedural in nature and those that have more substantive content. Taken together, these distinctions form a 2x2 table (see Table 3).

Table 3 Environmental/Social Regulations

	<u>substantive</u>	<u>procedural</u>
<u>Oil Fields</u>	Wells/drill pads	Permitting processes
<u>Transportation Systems</u>	Pipelines/haul roads	EISs

Technological advances since the development of the Prudhoe Bay field during the 1970s have made it possible to minimize the footprint of new oil fields (US Congress 1989, Haley 1997). It is widely assumed that this will make it possible to produce oil in the ANWR and adjacent areas in a manner that meets regulatory requirements without undue complications or expense. Even so, some scenarios for ANS oil development envision significant road development within the ANWR as well as the construction of an airfield capable of handling jet aircraft in the vicinity of Kaktovik. Depending upon the ultimate configuration of the oil field(s), there may also be issues pertaining to the construction of gravel islands and causeways in the shallow coastal waters of the adjacent Beaufort Sea. Given the intensity of concern about possible impacts on caribou during the summer months when they are resident on the coastal plain, moreover, it is reasonable to anticipate that federal regulators will require those operating the field(s) to go to considerable lengths to minimize adverse impacts on caribou. Similar concerns have been raised regarding possible impacts on other animals (e.g., polar bears) and various species of birds. Actions required to meet some of the resultant regulatory measures may be expensive, though it seems unlikely that they will affect production costs in any drastic fashion..

As to transportation, the usual assumption is that any oil produced on the ANS will flow to market via the Trans-Alaska Pipeline System (TAPS) running from Prudhoe Bay to Valdez and from there by tanker to the west coast or the Gulf Coast of the United States. All that will be required in the way of new facilities are modest feeder lines from actual production sites to move ANWR oil to the northern terminus of TAPS at Deadhorse. The original battle over the construction of TAPS during the 1970s was intense. Congress finally resolved it by acting to exempt the pipeline from some of the requirements of the National Environmental Policy Act (NEPA) of 1969 (PL 91-190) during the height of the 1973 oil crisis (Berry 1975). More recently, contentious debates have arisen over claims that corrosion is leading to a deterioration in the condition of the pipeline and that federal regulators should act to require the Alyeska Pipeline Consortium, the operator of the pipeline, to undertake costly repairs. Most likely, the use **of the pipeline to transport ANWR oil to the marine terminal at Valdez would not raise issues regarding the operation of the pipeline that involve major new costs.** Yet it is important to consider alternatives to this assumption. If the use of the pipeline to transport ANWR oil were to give rise to requirements for costly renovations, it would certainly be appropriate to assign at least some of the resultant transportation costs to the production of oil from

the ANWR and adjacent areas. Beyond this lies the possibility that solifluction and other largescale physical processes resulting from climate change could raise more fundamental issues regarding the use of TAPS to transport ANS oil to southern markets.

Substantive regulations spell out requirements and prohibitions that developers must comply with in the course of establishing and operating an oil field. Many of these regulations make it necessary to obtain permits and to comply with the terms of these permits once they are granted (Flanders et al. 1998). Section 404 of the Clean Water Act of 1972 as amended (PL 92-500), for instance, spells out requirements pertaining to the excavation of gravel needed for the construction of drill pads, roads, causeways, and airfields. Administered by the U.S. Army Corps of Engineers, these regulations cover both the extraction of gravel - usually from rivers and adjacent gravel bars - and the condition of the site following extractive operations. By the same token, substantive regulations may deal with socioeconomic matters, such as living arrangements for oil field workers and the granting of preference to small businesses that compete for service contracts covering a variety of matters pertaining to the operation of the oil fields from security to plumbing and heating. **The content of these regulations as they pertain to the development of ANWR oil is not likely to differ materially from the provisions currently in place with regard to other parts of the Alaskan North Slope.** A potential exception to this assumption might involve special measures designed to minimize any impacts on caribou or other animals in the development zone. Yet it seems unlikely that measures designed to protect animals will add materially to the costs of producing ANWR oil.

The consequences may be different, however, when it comes to the impact of procedural regulations. Oil development in the ANWR and adjacent areas would certainly be deemed a "significant federal action" under the provisions of National Environmental Policy Act (NEPA). This means that oil development in the area would trigger the Act's procedural requirements pertaining to the preparation of Environmental Impact Statements (EISs) and the provision of opportunities for public participation in the EIS process. In formal terms, the NEPA process is almost entirely procedural. The information developed in an EIS does not dictate the ultimate choices that public authorities must make regarding oil development. But experience has shown that the NEPA process can have the effect of delaying development, sometimes over relatively long periods of time. In the case of TAPS, the NEPA process was cut short in 1973 when Congress acted in the heat of the oil crisis to exempt the pipeline from further NEPA procedures. In other cases, however, the NEPA process has led to the filing of lawsuits - usually by environmental groups opposed to the development in question - alleging that impact assessments are not adequate to meet the requirements of NEPA. Although such challenges seem less dramatic

today than they did during the 1970s and the 1980s, it is nonetheless clear that these procedural measures can impose costly delays on the development of petroleum reserves and generate high-profile political pressures to respond to public concerns by imposing new and potentially costly substantive regulations on particularly controversial development plans.

It is hard to predict the likelihood **that the development of ANWR oil will be subject to protracted and costly delays arising from procedural challenges.** But given the facts that the environmental community regards the ANWR as one of the crown jewels of the entire system of national interest lands in Alaska and that the opening of the ANWR for oil development would be seen by many environmentalists as a particularly humiliating defeat, it would be risky to assume that such delays will not occur. The consequences of procedural challenges are difficult to project both in terms of their duration and in terms of the alterations of development plans that may be required to defuse them. At a minimum, however, the prospect of procedural delays will be viewed by developers as a form of uncertainty that raises questions about the accuracy of the benefit/cost calculations on which decisions about petroleum development on the ANS rest.

Antitrust Policies

The U.S. federal government has sought actively to encourage competition and to break up monopolies or arrangements leading to significant restraints on trade throughout much of the twentieth century. Perhaps the most celebrated antitrust action in American history is the breakup of the Standard Oil Company as ordered by the Supreme Court in its 1911 ruling in *Standard Oil v. the United States* and the creation of a number of smaller successor companies (e.g. Amoco, Exxon, Mobil, Sohio) in the aftermath of this federally mandated breakup (Yergin 1991). Today, by contrast, we are witnessing a series of mergers in the oil industry involving companies that are major players in the production of ANS oil. British Petroleum (BP) absorbed Sohio some years ago and Amoco more recently; BP-Amoco is now in the process of absorbing ARCO (Salpukas 1999). Exxon has just taken control of Mobil. There is speculation about possible links between Chevron and Royal Dutch/Shell or Texaco.

Are these developments significant with respect to the prospects for oil development in the ANWR and adjacent areas? If so, how are the antitrust policies of the U.S. federal government likely to affect such developments during the foreseeable future? The general assumption is that the growth of competition should operate in any industry to reduce or eliminate rents, in contrast to normal returns to factors of production. With regard to oil in particular, increased competition could lead to a decline in market prices and eventually to a loss of interest in producing high-cost oil in frontier areas like the ANS. To the extent

that antitrust policies succeed in increasing competition, therefore, government actions should have the effect of reducing the likelihood that recoverable reserves located in the ANWR and adjacent areas will look attractive to producers during the foreseeable future. Yet several factors serve to offset this logic in the particular case under consideration here. Although the ability of OPEC to control world market prices has declined dramatically, it remains the case that the governments of major oil-producing states can be expected to take steps to prevent competition from lowering world market prices for oil to the point of eliminating all economic rents in this industry. For its part, the U.S. federal government shows no signs of opposing developments, such as the merger of Exxon and Mobil, that are leading to a situation in which three or four integrated companies dominate the industry.

What is more, there is considerable debate among analysts about the probable effects of concentration on market prices for oil and petroleum-based products. Some observers see gains in efficiency more than offsetting any effects arising from a decline in competition associated with this development. Others argue that concentration could actually intensify competition in the industry. With regard to the production of oil in areas like the ANS, which involve long lead times and substantial risks, there are grounds for anticipating that concentration within the industry will increase the probability of production. Large companies are better placed than smaller competitors to finance new developments from their own resources, to spread risks by undertaking projects in a number of different parts of the world at the same time, and to cope with long amortization schedules. Under the circumstances, the growth of Exxon-Mobil and BP-Amoco-ARCO - the leading players in the production of ANS oil - should make the recovery of reserves in this area more attractive. Because the terms under which mergers like Exxon-Mobil and BP-Amoco-ARCO are allowed to proceed are determined in considerable measure by the antitrust policies of the U.S. federal government, it seems reasonable to conclude that this is another area in which government actions may emerge as a significant determinant of the course of petroleum development in the ANWR and adjacent areas. It seems unlikely **that** the federal government will **seek to bloc the merger of Exxon and Mobil** or act to deter the **takeover** of ARCO by BP-Amoco. But it would be useful to explore other potential developments in the area of antitrust policy that could affect the behavior of the oil companies in an area like the ANS.

Conclusion

Unlike many other countries, including a number of advanced industrial countries, the United States does not have a national oil company. Even if the federal government decides to open the coastal plain of the ANWR for oil development and the State of Alaska takes similar action with regard to near-shore areas of the Beaufort Sea adjacent to the ANWR, therefore, oil production

in this sector of the ANS will proceed only to the extent that private oil companies conclude they can develop these reserves profitably. The decisions of the key companies will be determined, first and foremost, by their expectations regarding the probable trajectory of market prices over the next ten to thirty years as well as the expected cost of producing and transporting ANS oil to market. Thus, the logic of the market will constitute a key determinant of the course of oil development in the ANWR and adjacent areas.

Nonetheless, the actions of several sets of public authorities are likely to have significant - quite possibly dramatic - impacts on the dynamics of this product chain. Public policies can influence market prices through direct interventions in such forms as export bans, import quotas, and even outright price controls. Similarly, public policies can affect production costs through rules and regulations governing returns and rents, tax and subsidy regimes, environmental regulations, and antitrust policies. Where the gap between market prices and production costs is large, governments can increase royalties, raise taxes, and impose more stringent environmental regulations without materially affecting the decisions oil companies make about proceeding with the development of recoverable reserves. In extreme cases, like the windfall profits accruing to the companies from the quadrupling of prices in the wake of the 1973-74 oil embargo, governments may take steps to capture a share of these exceptional rents by imposing special windfall-profits taxes. Where the difference between market prices and production costs is narrower, on the other hand, government actions may play a critical role in influencing the development decisions of the companies. Oil produced in frontier areas, like the ANS, is typically high-cost oil. As a result, it is not safe to assume that ANS oil will inevitably be produced even if a decision is taken to open the coastal plain of the ANWR to development. What is more, the policies of the federal government and the State of Alaska can be expected to loom large as factors influencing the choices of the major companies and, therefore, as determinants of the commercial recoverability of ANS oil.

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