MINERAL TAX INCENTIVES, MINERAL PRODUCTION AND THE WYOMING ECONOMY

Shelby Gerking*
William Morgan
Mitch Kunce
Joe Kerkvliet

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Executive Summary

*University of Wyoming email contact: sgerking@uwyo.edu

EXECUTIVE SUMMARY

The minerals industry accounts for a substantial share of tax revenues to the State and to local governments in Wyoming. In FY98, taxes directly paid by the minerals industry totaled $542 million and represented about 42% of State and local tax collections (Tax Reform 2000 Committee 1999). These revenues were obtained primarily from severance and property taxes levied against the value of production of oil, natural gas, coal, trona, uranium, and other minerals. Periodically, since 1983, the Wyoming Legislature has granted tax incentives (see Appendix A) to the minerals industries for the purpose of stimulating production, tax collections, and job creation across the State. Wyoming is not unusual in this regard: Other mineral producing states also grant a myriad of tax exemptions and incentives (usually discounts against existing tax liabilities) for special situations faced by operators. In 1999, the Wyoming Legislature appropriated funds for an econometric study of the effects of mineral tax incentives granted under current law (1999 Wyoming Session Laws, Chapter 168, Section 3). This report summarizes results of this study for the oil, gas, and coal industries.

By statute, and by agreement with the Legislative Subcommittee overseeing this project, this report must address two questions. First, to what extent do mineral taxes, tax incentives and environmental regulations increase or decrease tax collections to Wyoming entities as compared with amounts that would be collected in their absence? Second, to what extent do taxes, tax incentives and environmental regulations alter employment and other economic activity in Wyoming as compared with what would occur in their absence? These questions are interpreted broadly; for example, the term "Wyoming entities" refers to state government, political subdivisions (such as cities, towns, counties, and school districts), and other special districts. Employment and other economic activity in Wyoming refers to all sectors of the State's economy, not just those closely related to mineral extraction. Finally, and perhaps most importantly, the study not only evaluates existing incentives and regulations, it also develops a framework that can be used to support future decision-making on State tax policy.

Chapter 2 presents background by looking at the economic effects of all major types of taxes and royalties levied on the oil and gas industry by federal, state, and local governments in the United States. This background is important for three reasons. First, it provides the perspective needed to evaluate the incidence or ultimate burden of an increase in taxes or elimination of tax incentives. In the case of Wyoming oil and gas, taxes are shifted backward entirely to operators and resource owners. Wyoming oil and gas production represents only a tiny fraction of the world market for petroleum products and, therefore, producers in Wyoming are price-takers, not price-makers. Second, the review introduces the concept of an effective tax rate. Effective tax rates are particularly useful in accounting for effects of tax incentives, such as those that have been granted to oil and gas producers in Wyoming. For example, an effective severance tax rate on Wyoming oil production can be computed by dividing total oil severance tax payments by the value of oil production. Because this calculation focuses on actual tax payments, it fully accounts for all applicable tax incentives. All of the analyses presented in this report are based on effective rates of taxation so that tax incentives can be appropriately modeled.

Third, the review underscores the fact that different types of taxes have different economic effects. Important taxes levied on the oil and gas industry can be grouped into three broad categories; production (severance and *ad valorem*), property and income. Production taxes are levied on the value (or volume) of the oil and gas as it is extracted from the ground or at the point of first sale. This type of tax is seen by producers as an increase in production costs and tends to lower output by causing marginal wells to be shut-in at earlier dates than they would be in the absence of the tax. Conversely, a change in a property tax rate levied on reserves in the ground, or equipment, tends to increase the rate of current production as producers have an incentive to "mine out from under the tax." Finally, a state or federal corporation income tax levied on the accounting profits of the oil and gas firm (the difference between total revenue and total costs) would be predicted to have no effect on current production. The objective of the firm is to maximize profits, and therefore, a tax on net revenue should not alter the rate of output.

Reliance on these three types of taxes differs substantially between the eight states responsible for about 73% of U.S. oil and 83% of U.S. gas production (Alaska, California, Kansas, Louisiana, New Mexico, Oklahoma, Texas, and Wyoming). All states except California levy production taxes against the gross value of output. Most states do not levy property taxes on the value of reserves in the ground (Texas and California do). Most states treat royalty payments (computed as a percentage of gross value of production) for production on public land as deductible items in computing severance tax liabilities (Louisiana and Kansas do not). Most states levy a corporate income tax on income that applies to oil and gas operators (Wyoming and Texas do not). Louisiana permits federal corporate income tax payments to be deducted against its state corporate income tax liabilities, but this feature is not currently available in the other five states that levy state corporate income taxes. All states define tax bases differently and levy taxes at different rates. Within states, counties apply their own mill levies to compute property taxes on above-ground and down-hole equipment at different rates. Tables 2.1 and 2.2 summarize differences in tax rates in selected years for the eight major oil and gas producing states. These comparisons use effective tax rates in order to account for differences in tax incentives between states. This report primarily analyzes changes in production taxes and production tax incentives. Wyoming relies heavily on production taxes at the state and local level to support public services. Also, tax incentives for oil and gas producers (see Appendix A) are discounts from production (severance) tax liabilities.

Chapter 3 develops an empirical framework that can be used to show how changes in taxes, tax incentives, and environmental regulations alter the timing of exploration and production by firms in the oil and gas industry in Wyoming and in other states. This framework embeds econometric estimates into Pindyck's (1978) widely cited dynamic model of exhaustible resource supply. The model is estimated using published data on drilling, production, reserves, and costs from industry sources including the American Petroleum Institute and from government sources including the U.S. Department of Energy. Federal, state, and local effective tax rates also are built into the model. Federal tax data also were obtained from published sources; however, state and local oil and gas tax data were mostly obtained from state government sources.

The model has seven advantages. First, it can be applied to any of 21 U.S. states (including Wyoming) that produce significant quantities of oil and gas. Second, the model can be used to assess the impact on drilling and production of a change in any tax or tax incentive that currently exists in any of these states. Third, the model accounts for interactions between taxes and tax incentives levied or offered by federal, state, or local governments. Fourth, the model can be used to compute the effects on drilling and production of any environmental regulation that affects oil and gas operations and interactions between regulations, taxes, and tax incentives are fully accounted for. Fifth, the model is based on a widely accepted theoretical framework that links exploration to development to extraction. Sixth, the model accounts for differences in the quality of oil and gas produced between states as well as differences in transportation costs by adjusting the wellhead price to reflect these aspects. Seventh, the model runs in Microsoft Excel and is therefore quite simple to use. For these reasons, the model is arguably superior to and more comprehensive than previous efforts to develop econometric and/or simulation models of taxation and regulation of natural resource exploration and production.

The model also has three limitations that ought to be recognized. First, data used to implement the model certainly are not perfect. Data on oil and gas extraction costs are particularly weak. However, the best quality public data available have been used to develop the model. Second, the model does not envision interactions between states that arise from changes in tax or regulatory policy. In other words, the model shows that a tax incentive offered in Wyoming may increase oil and gas drilling and production there, but does not indicate the source of these additional investment dollars. Correspondingly, the model shows that a tax incentive offered in, say, Oklahoma might affect exploration and production there, but does not allow for the fact that a portion of the effect might spill over into Wyoming. Simplifications must be made in the development of any model and these particular simplifications are made for two reasons. (1) Accounting for interstate effects would result in only minor changes in results presented. (2) A fully interactive analysis of oil and gas activity in different states would be quite complex and more difficult to develop. Third, the model does not account for deviations from a strict dollars and cents, profit-maximizing point of view of investment decisions. Business decisions in certain situations may have broader motivations than pure profit maximization; yet, profit maximization is probably the best single rule that can be used to predict how these decisions will be made. None of these limitations, however, are serious enough to invalidate the general conclusions presented in the report.

Chapter 4 uses the model to simulate the effects of changes in tax policy in Wyoming and in five additional oil and gas producing states. Effects of tax changes in Wyoming are heavily emphasized in the discussion, and results are reported for other states mainly for purposes of comparison. Four of these tax change scenarios deal with actual Wyoming production tax incentives and results are shown in Table ES.1. All of these scenarios assume that oil and gas prices will be maintained at current levels in real terms in perpetuity. Chapter 4 considers other possible future price trajectories, but these alterations have little or no effect on the results presented below.

One scenario considered envisions a once-and-for-all 2 percentage-point reduction in the state severance tax on Wyoming oil production. According to the model, this tax change results in only a small stimulus to production and drilling. Output of oil and gas would rise by a total of 50 million barrels of oil equivalent (BOE) (0.7%) over the next 60 years as compared with a base case in which taxes do not change. Regarding drilling, the effect of the tax change is somewhat greater. Over the 60-year life of the program, the tax cut contemplated would result in additional drilling of 1119 wells. This figure represents a 2.3% increase in total wells drilled as compared to the base case in which taxes do not change. This scenario would reduce the present value (at a 4% discount rate) of oil severance tax collections by 17% over the 60-year time considered, but would result in increased sales tax collections by about 2.3% because of the increase in drilling. A variant of this scenario also is considered in Chapter 4 that envisions a 2 percentage-point severance tax reduction on oil for one year and an elimination of this tax incentive after that time. This tax incentive results in a tiny increase in drilling activity over 60 years (13 wells) and virtually no change in production activity.

In a second scenario, the severance tax is reduced in perpetuity on all new oil and natural gas production by 4 percentage points. This tax incentive results in an increase in drilling by 5.6% and a 1.7% increase in natural gas output over a 60-year time horizon. However, this incentive results in a loss in present value (again using a 4% discount factor) of severance tax revenue of about 43%. This large reduction in severance tax revenue occurs because as time goes by, new production accounts for an increasing percentage of total production. Again, severance tax losses are partially offset by increased sales tax collections (due to increased drilling), but the overall story is one of a substantial net loss in tax revenue. Table ES.1 also shows results of additional simulations for a perpetual 2 percentage-point reduction in the severance tax on tertiary production and a perpetual 4 percentage-point severance tax reduction on well workovers and recompletions. As shown in the table, production, drilling, and tax consequences of these two incentives are smaller than for the previous incentives considered.

A key question regarding these simulation results is: Why is the response of oil and gas output so small when production taxes are changed or tax incentives are applied? There are four reasons why this is so. First, a reduction in production taxes (or an increase in tax incentives) offers no *direct* stimulus for exploration. This point is discussed more fully below. Second, production taxes and tax incentives are deductible against federal corporate income tax liabilities. Thus, when production tax rates fall (or production tax incentives are increased) federal corporate income tax liabilities rise and vice-versa. In fact, taxes or tax incentives should not be analyzed independently without reference to the entire tax structure applied by all levels of government; for example, a tax incentive granted at one level may be partially offset by increased liabilities at another level. Therefore, operators do not receive the full value of tax incentives that may be granted by Wyoming and other states. Third, and in a related vein, a reduction in production tax rates by, say, 2 percentage points has only a small impact on the net-of-tax price received by operators. For example, suppose that the wellhead price of oil is $25/bbl. and that the Wyoming oil severance tax rate declines by 2 percentage points. Based on tax data reported in Chapter 4, this tax reduction would increase the net-of-tax wellhead price seen by operators from $17.52 to $17.92, an increase of only $0.40/bbl. after all federal, state, and local taxes, tax incentives, and royalties are accounted for. Such a small increase in the net-of-tax price per barrel of oil is unlikely to have much impact on production.

Fourth, and most importantly, production of (as contrasted with exploration for) oil and gas is driven mainly by reserves, not by prices, production tax rates, or production tax incentives. This is a basic fact of geology and petroleum engineering and is easily illustrated by Wyoming's own history of oil production. For example, since 1970, Wyoming oil reserves steadily declined from 1 billion barrels to 627 million barrels in 1997. In other words, despite much exploration over the past 30 years, production has drawn down reserves faster than new discoveries have added to them, a trend that is likely to continue in the future. Also, during the past 30 years, oil production declined from 160 million barrels in 1970 to 70 million barrels in 1997. In fact, oil production continued to decline during the late 1970s and early 1980s even though oil prices rose by a factor of more than 10, from about $3/bbl. to more than $30/bbl.! Thus, even comparatively large price increases or tax reductions are not expected to call forth much additional output.

Another type of incentive that could be designed might be aimed at reducing drilling cost. For example, consider a hypothetical incentive that would reduce drilling cost by 5%. An example of such an incentive might involve state support for an applied research program leading to technological advance in exploration methods. If drilling costs were reduced by 5%, total wells drilled would rise by 9.3% and production would rise by 2.6% over the assumed 60-year life of the program. Notice that increasing incentives to explore for oil and develop oil reserves *directly* stimulate drilling through which new reserves can be identified. Increases in drilling activity, in turn, lead to production increases because production is largely driven by reserves. In general, "upstream" incentives given at the beginning of the exploration-development-production process provide a greater stimulus to production than "downstream" incentives given at the end of the process. Whereas an incentive for drilling directly stimulates that activity, a discount from the severance tax does nothing to directly stimulate drilling—operators get the benefit of this tax incentive only if they drill *and only if they are successful*.

The contrast between a tax incentive for drilling and a discount from the severance tax can be illustrated by considering changes in production tax collections resulting from each. As shown in Table ES.1, a once-and-for-all 2 percentage-point reduction in state oil severance taxes, assuming a 4 percent discount rate, results in a decline in the present value of Wyoming state severance tax collections by $562 million (from $3242 million to

$2680 million), a decline of over 17 percent. On the other hand, a tax incentive resulting in a 5% reduction in drilling costs results in additional severance tax collections of $58 million. Also, local *ad valorem* taxes would rise because of the incentive on drilling by $68 million because of the associated increase in output. Of course, a tax incentive for drilling would have to be paid for and if the state simply subsidized the cost of drilling each new well by 5% over the next 60 years, the present value of the resulting subsidy would be $616 million. This figure far exceeds the additional severance and *ad valorem* taxes that would be collected. However, if the "incentive" was designed to directly support for an applied research program, the return in production tax revenue may exceed the cost of the program. Of course, not all applied research programs are effective and this report takes no position regarding whether such a program should be initiated. Nevertheless, this type of program at least offers the prospect of leveraging the state's resources to provide program support, whereas, discounts from the severance tax hold out no such possibility.

As previously mentioned, it is important to recognize that changes in severance tax payments by oil and gas producers alter tax liabilities at the federal level because severance taxes are deductible in computing federal corporate income tax liabilities. If producers face a marginal federal corporate income tax rate of 35%, then a $1 reduction in severance tax payments results in a $0.35 increase in federal corporate income tax liabilities. Thus, a decline in state severance tax collections $562 million (as was the case with a permanent 2 percentage point reduction in the severance tax on oil) results in an increase in federal tax collections of about $197 million, holding everything else constant. A key conclusion here is that reduced severance tax rates shift public funds from the state to the federal government. Of course, when Wyoming is able to choose a tax incentive that increases tax collections, the transfer of public funds goes on the opposite direction, from the federal government to the State of Wyoming. Additionally, any production stimulus obtained from a tax incentive granted at the state level benefits local governments as *ad valorem* taxes rise.

Chapter 5 shows how oil and gas exploration and production decisions have been altered due to differences in stringency of application of environmental and land use policies on private and federal property. An important part of the analysis is a cost function estimated from 1390 wells drilled in the Wyoming Checkerboard over the period 1987-98. Estimates presented suggest that environmental and land use policies result in drilling costs that are at least 10% higher on federal property, thus retarding current development of oil and gas resources there as compared with costs that might be expected on private property. Implications of this result for future exploration and extraction of oil and gas then are developed by inserting these estimates into the model developed in Chapter 3. An advantage of this approach is that it accounts for the extent to which increased costs arising from regulation are deductible against tax liabilities faced by the industry.

The resulting model then is simulated to obtain effects of more stringent application of environmental regulations prevailing on federal property. Similar to the simulations for tax changes presented in Chapter 4, attention is directed to exploration and production. Two states are considered, Wyoming and New Mexico. These states were chosen because a comparatively large percentage of their oil and gas reserves are beneath federal property. The simulations show that environmental regulations have the effect of retarding exploration and production and shifting drilling to the future. Thus, a more stringent application of environmental regulations on federal land promotes removing only the best quality reserves and leaves more oil and gas in the ground at the end of the extraction program. Because environmental and land use regulations apply largely to drilling activity, they have sizeable effects on future drilling and production. In fact, reducing stringency of environmental and land use regulations would have similar effects to an improvement in technology that applies to drilling. Reducing stringency of application of environmental and land use regulations on federal property in Wyoming to the level of that found on private property would increase state and local production tax collections by 3.5% over the next 60 years.

Chapter 6 provides an overview of effects of changes in taxes and environmental regulations on the Wyoming coal industry. General industry trends considered include the rapid rate of industry growth, generally falling mine-mouth prices since the mid 1980s, the shift away from sales of coal on long-term contracts and towards sales in the spot market instead, and the penetration of new and more distant markets. Transportation issues also are discussed and focus here is on the behavior of railroads in the 1980s and 1990s after passage of the Staggers Act largely freed them from price regulation. Coal producing areas of Wyoming currently are served by at most two railroads; in consequence, an important issue concerns the possibility that lack of competition has led railroads serving Wyoming to hold considerable market power over both mines and utilities. Data from the Energy Information Administration (USDOE) indicates that coal transportation rates declined and typical shipment distances increased over the period 1980-93, yet the possibility of non-competitive freight rates for coal remains a possibility. This chapter also provides a brief discussion of the 1990 Clean Air Act amendments pertaining to coal-fired power plants, as well as an explanation of state and local taxation of this industry in Wyoming.

Chapter 7 builds on the descriptive information presented in Chapter 6 and develops a conceptual model showing how Wyoming's production of coal is affected by a change in production tax rates and by the imposition of a ton/mile tax on coal tonnage hauled by railroads. The model focuses on interrelationships between three important agents in the market for coal, mines, railroads, and electric utilities. Mines, of course, are the suppliers of coal and utilities are the main end users who use coal as an input in the generation of electricity. Railroads, which provide transportation of coal, are included in the model because freight costs may represent as much as 80% of delivered coal prices. Key aspects of the model are that coal mining is treated as a competitive industry, and railroads are assumed to exercise market power in setting transportation rates faced by utilities. This characterization may seem surprising because the exercise of market power by all players in the coal market has been a dominant theme in previous research; yet numerous changes in the industry in recent years (outlined in both Chapters 6 and 7) suggest that the framework adopted here captures the main features of the problem to be analyzed.

The conceptual model then is implemented by inserting empirical estimates of key parameters. These estimates are obtained using two confidential data sets, one on costs of surface coal mining in the Powder River Basin and the other on costs of hauling coal from various points in Wyoming to 244 electric power generation plants. Also, estimates of demand for Wyoming coal, obtained from publicly available data from the Federal Energy

Regulatory Commission, allow the economic market area for Wyoming coal to change with changes in the delivered price. For example, these estimates allow for an expansion of the "economic reach" of Wyoming coal as delivered prices fall. Using these estimates jointly with the conceptual model developed, numerical predictions are provided of effects of two tax changes, a 2 percentage-point reduction in the coal severance tax and the imposition of a $0.0001 per ton/mile tax on railroads hauling coal.

The effect of reducing the Wyoming severance tax by 2-percentage points from 7% to 5% of the value of coal produced causes output of coal to rise by 1.42 MMST (0.47%) and causes the mine-mouth price of coal to fall by about $0.12. Also, the average delivered price of coal falls by about $.02, so that the freight rate per ton of coal hauled along a route of average length rises by about $0.10 or 0.77%. Thus, the tax reduction has the effect of reducing mine-mouth prices seen by the coal industry, but the market power of railroads to set freight rates means that delivered prices seen by utilities change little. As a result, the increase in quantity of coal demanded by utilities is relatively small. On the other hand, the tax rate reduction would drive down coal severance tax collections by about 27%. The general conclusion, therefore, is that a 2 percentage-point coal severance tax rate reduction would result in a comparatively small increase in coal production and a comparatively large reduction in coal severance tax collections.

Also, the $0.0001 per ton/mile tax on railroads hauling coal leads to a 0.30 MMST reduction in the quantity of coal produced, a percentage decline of about 0.10%, while the mine-mouth price coal, its the delivered price, and the railroad freight rate are left virtually unchanged. The very low rate of tax explains why these effects are so small. However, higher ton/mile tax rates would lead to greater reductions in coal output and, perhaps more importantly, would lead to reductions in mine-mouth coal prices and increases in the delivered price of coal to utilities. Thus, railroad freight rates rise because their market power over both mines and utilities enables them to drive a deeper wedge between mine-mouth prices of coal and delivered prices of coal seen by utilities. In any case, an approximation to the total revenue to be collected from this tax (as adopted by the Wyoming Legislature) can be calculated by applying the effective rate of tax per ton to the quantity of coal produced in 1998. This calculation yields a value of total tax collection of $7.63 million. (Note that this figure is a bit too high because some Wyoming coal is burned in mine-mouth, coal-fired electric power plants and a small percentage is trucked out of state.) However, because imposition of this tax will cause (small) reductions in coal production and mine-mouth prices, severance tax collections (in millions of dollars) will fall by about $0.136 million. So, net of the decline in severance tax revenue, imposition of the ton-mile tax on railroads would produce an additional $7.49 million in tax collections.

Current environmental issues facing the coal industry are treated in Chapter 8. The acid rain program created by Title IV of the Clean Air Act Amendments (CAAA) of 1990 introduces a sulfur dioxide (SO2) emissions permit market for the electric utility sector. In Phase I (1995-99), EPA began controlling aggregate annual emissions from the 263 dirtiest generating units in the US by issuing a fixed number of SO2 emissions permits. For every ton of SO2 it emits annually, a plant must surrender an emissions permit to the EPA. Each plant is provided an annual endowment of permits, at no charge, based on 2.5 pounds of SO2 per MMBTU's burned during a base period in the 1980's. Over time, the number of permits issued by the EPA will decline. Moreover, in Phase II

(2000 and beyond), virtually all existing and new fossil-fueled electric generating units in the US become subject to similar, but tighter, SO2 regulation. In Phase II, plants will be issued smaller annual permit endowments, based on 1.2 pounds of SO2/MMBTU.

The 1990 CAAA presents both opportunity and challenge for the Wyoming coal industry. As the overall emissions of SO2 are progressively restricted, Wyoming low sulfur coal is likely to be favored. However, increasing use of Wyoming coal is not certain for three reasons. First, compared to prior SO2 regulation, CAAA 1990 provides utilities with additional options in responding to SO2 emissions regulation, most notably switching to lower sulfur coal from other regions, installing fuel gas desulfurization equipment, and reallocating SO2 emissions over time. Depending on the relative costs of these options, plants may or may not decide to purchase more Wyoming coal in any given year. Second, besides Wyoming there are other important sources of low sulfur coal, including Colorado, Utah, and the central Appalachian region. For many plants, especially those distant from Wyoming, these other coals may have a price advantage. Several authors have suggested that greater SO2 emissions reductions by Phase I plants have resulted from the use of lower sulfur coal from other regions than from the use of Powder river Basin coal. Third, even if Wyoming coal can be delivered to a plant at a lower price than low sulfur coal from other regions, the plant may encounter substantial costs in retrofitting their boilers and coal processing facilities to accommodate the use of Wyoming coal.

This chapter implements an empirical model of power plants' choices about SO2 emissions, permit trading, and permit savings as well as their fuel choices. Holding power generation constant, there are three basic ways to comply with SO2 regulations: (1) The plant may engage in fuel switching by purchasing coal lower in sulfur, blending high and low sulfur coal, or cofiring with natural gas. (2) The plant may obtain additional permits from other plants owned by the same utility, or purchase permits on the open market or at EPA auctions. (3) The plant may install flue gas desulfurization equipment or retrofit existing equipment. The model allows for each of these possibilities and finds that in Phase II, Wyoming coal production may experience a 6.2% increase in output in current Phase I plants. Extending this prediction to all Phase II plants suggests that the demand for Wyoming coal will increase by about 7 –10%.

In Chapter 9, the 172-sector version of a model for Wyoming furnished by Regional Economic Models, Inc. (REMI) is used to estimate statewide economic effects of several tax incentives (see Table 9.2). For example, focusing first on a permanent 2 percentage-point severance tax cut on oil production, total employment in 2000 would rise by 313 persons and this employment increase steadily declines until 2035, when the tax reduction means that 123 additional persons would be employed. Income effects of the tax reduction are also are quite small. Real personal disposable income (in $1997) would be about $8 million larger in 2000 and about $5.8 million larger in 2035. Thus, in 2000, real personal disposable income per employee added to the state's economy would be $25,559 ($8 million/313) and the corresponding value for 2035 would be $47,154 ($5.8 million/123). This last calculation is of interest as it shows how the model accounts for expected real wage and salary increases due to productivity changes and related factors over the next 35 years. The model suggests that as employment and real incomes rise, Wyoming's population will rise as well. In 2000, the population increase resulting from the tax change would be 246 persons. By 2010, the Wyoming population would be 380 persons larger than without the severance tax reduction. These estimates reflect the fact that the effects of the tax change on population do not all occur in one year and instead accumulate over time as people's decisions to move into the state often require more than a year to be implemented. However, by the year 2035, the state population increase associated with the tax change is only 178 persons.

As a second example, a permanent 2 percentage-point reduction in the severance tax on coal would increase total employment in 2000 by 61 jobs, and contribute a total of about $2.5 million to the state's economy. Population would increase by about 70 persons. So, overall, the economic benefits to Wyoming's economy as a whole from a coal severance tax cut of this magnitude would be quite small. Other estimates from the REMI model show effects on employment, personal income, and population from the remaining tax changes and tax incentives considered in this report (see Table 9.2).

The overall story of the distinct, yet moderate economic effects should be expected for two reasons. First, the drilling incentive directly impacts exploration and the prospect of adding reserves, thus the more prominent effect. Second, the oil, gas and coal industries are not labor intensive. For example, based on data from the REMI model, the ratio of the change in output from the oil and gas production and field services sectors to the employment change in those two sectors is about $220,000. On the other hand, the increase in wage and salary distribution in the oil and gas and field services sectors, relative to the employment change there, is only about $27,000. Thus, at the margin each employee in those two sectors is associated with additional output valued at $220,000, but receives only $27,000, so labor's share of the additional output is a little more than 12%. Returns to owners of other factors of production such as capital and the reserves themselves account for the remaining 88%. Whereas workers employed in the Wyoming oil and gas industry are likely to live in the state, capital and reserve owners can live anywhere and therefore may not spend their increased incomes in Wyoming. As a result, changes in oil and gas activity do not benefit the Wyoming economy as much as they would if labor intensity were higher. Corresponding calculations for the coal industry yield similar conclusions. Therefore, income, employment, and population changes, resulting from tax incentives directed to the oil, gas, coal industries, are expected to be moderate as well.

Table ES.1

Simulated Tax Incentive Scenarios, Changes from the Base Case

	Change in Total Production MMBOE (%)	***Change in Total Drilling Wells (%)***	***Change in PV State Severance Tax Collections $Millions (%)***	***Change in PV Sales Tax Collections $Millions (%)***
1. Reduce Severance Tax on Oil by 2 % points	50.2 (0.68%)	1119 (2.28%)	-562.4 (-17.35%)	12.4 (2.29%)
2. Reduce Severance Tax on all New Well Production by 4 % points	122.3 (1.66%)	2768 (5.64%)	-1389 (-42.84%)	30.6 (5.65%)
3. Reduce Severance Tax on Tertiary Production by 2 % points	5.0 (0.07%)	99 (0.20%)	-55.9 (-1.72%)	1.2 (0.22%)
4. Reduce Severance Tax on Production resulting from Workovers and Recompletions by 4 % points	12.3 (0.17%)	239 (0.49%)	-136.9 (-4.22%)	3.0 (0.51%)