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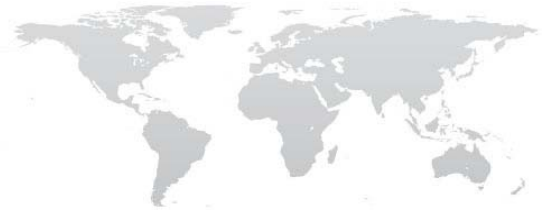

Eliminating Subsidies for Fossil Fuel Production: Implications for U.S. Oil and Natural Gas Markets

Maura Allaire and Stephen Brown[1]

Introduction

At their Pittsburgh Summit in September 2009, the G-20 countries agreed to phase out and rationalize fossil fuel subsidies with the aim of reducing greenhouse gas emissions (G-20 2009).[2] Earlier in the year, the Obama administration proposed the elimination of tax preferences for U.S. oil and natural gas production in its FY2010 budget. Both the G-20 agreement and the Obama administration's FY2010 budget proposal raise questions about the effects that such policy changes may have on the U.S. oil and natural gas industry, consumer prices, energy security, and the pace and composition of U.S. economic activity.

For many countries outside the Organisation for Economic Co-operation and Development (OECD), removing fossil fuel subsidies may be significant. Fossil fuel subsidies in the 20 largest non-OECD countries are mostly directed at consumer fuel prices and amounted to about $310 billion in 2007 (IEA 2008). U.S. fossil fuel subsidies totaled about $5.5 billion in 2007, of which the majority was in the form of tax breaks for producers (EIA 2007). Eliminating fossil fuel subsidies by 2020 in developing countries could reduce global greenhouse gas emissions by 10 percent by 2050 compared to baseline (OECD 2009).

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[2] These 20 countries include Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, and the United States.

In comparison to some G-20 countries, U.S. subsidies for oil and gas are relatively small. The oil and gas company tax preferences the administration proposes to eliminate represent less than one percent of the oil and gas industry's projected revenue. For the nine-year period from 2011 to 2019 used for budget estimation, the Obama administration projects an increase in U.S. government tax revenue of $31.5 billion (Table 1).[3] Over that same time period, calculations based on recent projections by the U.S. Energy Information Administration (EIA) indicate domestic oil and gas production will yield revenues of about $3.4 trillion (in constant 2007 dollars).[4]

Despite the relatively small changes in U.S. taxation of oil and gas production that seem to be called for by the G-20 agreement, there is divergent opinion about how the elimination of such subsidies would affect U.S. oil and natural gas markets. Using recent assessments of the administration's proposal to eliminate oil and gas company tax preferences, this issue brief seeks to provide an understanding about how fossil fuel subsidies fit into the overall U.S. tax system, how eliminating the subsidies will affect U.S. oil and natural gas markets, and how changes in energy markets will affect U.S. energy security and economic activity.[5]

Table 1. Estimated Tax Revenue from Elimination of Oil and Gas Tax Preferences

	Total Deficit Decrease (billions of dollars)	
Provision	**2010–2014**	**2010–2019**
Repeal manufacturing tax deduction for oil and natural gas companies	$ 4.92	$ 13.29
Repeal percentage depletion for oil and natural gas	$ 2.95	$ 8.25
Levy excise tax on Gulf of Mexico oil and gas (limits excess royalty relief)	$ 2.27	$ 5.28
Repeal expensing of intangible drilling costs	$ 1.86	$ 3.35
Increase geological and geophysical amortization period for independent producers to seven years	$ 0.67	$ 1.19
Repeal enhanced oil recovery credit	*Estimated to have zero receipt effect under current projections for energy prices*	
Repeal marginal well tax credit	*Estimated to have zero receipt effect under current projections for energy prices*	
Repeal deduction for tertiary injectants	$ 0.03	$ 0.06
Repeal passive loss exception for working interests in oil and natural gas properties	$ 0.02	$ 0.05
Total	**$ 12.73**	**$ 31.48**

Source: Office of Management and Budget 2009.

[3] See Office of Management and Budget (2009) and U.S. Department of Treasury 2009.

[4] See EIA 2009.

[5] The implications of removing other fossil fuel tax deductions, such as those for coal, are beyond the scope of the present inquiry because the majority of coal subsidies, granted under the Alternative Fuel Production Credit, are not expected to be extended beyond 2009 (EIA 2007).

Tax Neutrality, Stability, and the Oil and Gas Industry

The provision of services requires the government to generate revenue. It is generally recognized that the government claim on resources prevents their use in the private sector, so economists have often suggested that the productivity of resources used in the public sector ought to equal that in the private sector. What may not be well understood outside the economics profession is that the means of taxation reshapes economic activity in the private sector in such a way that the potential loss in the value of private sector output is greater than the simple transfer of resources to the public sector.[6]

To promote economic well-being, tax policy must be directed at minimizing the undesired interference with the private sector. Such a goal is generally furthered through broadly applied taxes that treat all economic activity on an equal footing.[7] Such taxation has a neutral effect on the composition of the economy. Deviations from neutral taxation can alter the composition of economic activity and reduce economic well-being. Echoing these principles in recent testimony to the U.S. Senate, oil and gas industry representatives supported the general principle that U.S. firms producing oil and natural gas ought to face tax rates similar to those in other industries (U.S. Senate Committee on Finance 2009).

In addition, taxation should be stable. If the tax system is unstable, the business environment will have more uncertainty and firms will avoid making investments that might be appropriated by future changes in tax policy.

TAX PREFERENCES

Exceptions to tax neutrality arise when policymakers use taxes to redirect private economic activity toward socially desirable goals or away from socially undesirable outcomes, as examined by Schultze (1977). Therefore, tax preferences are instruments of economic policy, and their value should be assessed in light of current market conditions and policy objectives.

Unless tax preferences are an instrument of policy, they can be harmful to economic activity. Tax preferences shift the overall mix of economic activity from that determined in a free market. Moreover, the foregone revenue necessitates higher taxes on other activities to close the budgetary gap, and those tax gains further shift the mix of economic activity away from that determined in a free market.

As seen from the perspective of policy, tax preferences for domestic oil and gas production could be justified on the basis of promoting more U.S. oil and gas production than would be provided in a free market—perhaps to sustain the domestic industry and promote energy security when energy prices are unusually low. When energy prices are high, as they have been in recent years and are projected to be in coming years, such tax preferences may not be needed to support a strong domestic energy industry, and do relatively little to enhance energy security.

[6] The provision of government services also can be inefficient. See Brown and Saving 2002.

[7] See Musgrave and Musgrave 1989.

Some argue that incentives should be adjusted according to the maturity of the technology—with new technologies subsidized and mature technologies taxed (Book 2009). The idea is that increased use of the technology enhances technological change—with the most potential for technological improvement occurring in new technologies. This perspective may suggest that mature technologies such as those for fossil fuels should be subsidized less than those for renewable energy sources.

TAXATION OF THE OIL AND GAS INDUSTRY

A rough measure of the equality of taxation can be obtained by comparing tax rates across industries. Is oil and gas production taxed more lightly or more heavily than other industries? What difference will eliminating oil and gas tax preferences make?

Estimates of the relative tax rates across industries depend on the measure. According to analysis of the Congressional Budget Office (2005), the effective marginal tax rate on investment in oil and gas structures in 2005 was 9.2 percent, which was significantly lower than the effective marginal tax rate for all assets, 26.3 percent. In contrast, industry sources maintain that oil and gas companies may face higher tax rates than found in the manufacturing sector (Nichols 2009). In spoken testimony representing the American Petroleum Institute, Larry Nichols stated that over the past five years, an effective tax rate of 28 to 33 percent on revenue had been typical for large independent oil and gas firms (U.S. Senate Committee on Finance 2009). From 2005 through 2007, "the major energy producing companies paid or incurred more than $242 billion of income tax expense" (Nichols 2009).[8]

The manufacturing tax deduction applies to oil and gas firms as well as to manufacturing companies. Nichols finds the rates of return are comparable across these industries, with the oil and gas industry earning 5.7 cents for every dollar of sales in 2008 and U.S. manufacturing industries earning an average of 4.5 cents for every dollar of sales, or 6.0 cents excluding the auto industry. Brown (2009) estimates the additional government revenue raised by the elimination of oil and gas tax preferences would add just less than one cent for every dollar of projected U.S. oil and gas production. Of course, comparability in earnings may indicate relatively little about the comparability of taxation.

Academic studies provide another perspective about the taxation of the U.S. oil and gas industry. Metcalf (2009) estimates that the percentage depletion and the favorable tax treatment for intangible drilling costs (only available for nonintegrated firms and individuals) reduce the effective marginal tax rate for oil drilling investment to –13.5 percent for nonintegrated oil and gas firms, compared to 15.2 percent for integrated oil and gas firms. Johnson (2009) finds that a combination of four tax preferences results in a negative tax (or subsidy) of 42 percent of real income. These four tax preferences are expensing of intangible drilling and development costs (IDCs), pool of capital doctrine, percentage depletion allowance, and domestic manufacturing deduction.

Evaluating subsidies by the maturity of technology provides yet another perspective. Over the 2002 to 2008 period, Adeyeye et al. (2009) find direct U.S. subsidies for mature fossil fuels were higher than those for

[8] Estimated tax rates can vary year to year due to fluctuating oil and natural gas prices.

emerging energy technologies. They estimate subsidies for mature fossil fuels at $72 billion and those for renewable fuels at $29 billion.

STABILITY OF OIL AND NATURAL GAS TAXATION

Some of the tax preferences have a long-standing history, such as the percentage depletion deduction and expensing of IDCs.[9] Such tax preferences are intended to attract capital to a risky and capital-intensive industry (Kleemeier 2009). Percentage depletion for oil and gas has existed since 1926 and allows independent producers and royalty owners to recover capital costs of wells. Current percentage depletion deduction provisions allow tax subsidies to increase as oil and gas prices increase and can allow cost recovery deductions to exceed a taxpayer's basis (U.S. Department of Treasury 2009). Another preference, expensing of IDCs, has existed since 1913 and allows operators to expense costs that have no salvage value and are necessary for the drilling of wells and preparing the wells for production. The Obama administration is proposing to require IDCs to be capitalized rather than expensed.

Some of the tax preferences are newer and were adopted when depressed energy prices imperiled the industry. The Obama administration is proposing to levy a new 13 percent surtax on production from Central Gulf of Mexico leases sold between 1998 and 1999 (Book 2009). This new tax is intended to correct royalty relief measures for deepwater leases obtained in the 1990s, when oil and gas prices were low, that did not include price mechanisms. Another recent oil and gas tax preference is the Section 199 Domestic Production Activities Deduction. Section 199 was passed into law in the American Jobs Creation Act of 2004 in order to retain domestic manufacturing operations and jobs. The Obama administration is proposing to repeal this manufacturing deduction for refining and producing oil and natural gas.

The Obama administration argues that tax incentives like these are not needed at this time to encourage oil and gas production (Krueger 2009). Similarly, Brown (2009) finds that the near-record-high prices will provide sufficient encouragement for the development of domestic oil and natural gas resources.

Nonetheless, eliminating oil and gas tax preferences when energy prices are high lends instability to U.S. taxation. The creation of such preferences during depressed market conditions also contributes to unstable tax policy. Stability in tax policy could be achieved by developing tax rules that phase in tax advantages when prices are low and phase out such preferences when prices are high.

Effects on U.S. Oil and Natural Gas Markets

A wide range of opinion exists about the effects of eliminating the oil and gas company tax preferences. The Obama administration and other analysts expect relatively small effects. In contrast, industry representatives believe significant price and quantity effects could occur in both oil and natural gas markets.

Moreover, some industry experts maintain that the proposals could have an immediate impact because the industry heavily reinvests its earnings and because long lead times are required for investments in

[9] While the FY2010 budget proposals are significant, many fossil fuel subsidies will remain, as listed in the appendix.

exploration and development of oil and natural gas. Between 1996 and 2007, the U.S. oil and gas industry invested more than $1.2 trillion in long-term energy initiatives, compared to net income of $974 billion (Nichols 2009). Kleemeier (2009) offers anecdotal evidence that some small independent oil and gas producers could reduce drilling budgets by half. If such drastic drilling budget cuts occurred industrywide, new U.S. production might not offset natural production decline from existing wells (Kleemeier 2009).

EFFECTS ON U.S. OIL MARKETS

The estimated effects on U.S. oil production differ. Energy industry representatives describe the potential for large reductions in U.S. oil production without providing specific estimates (Kleemeier 2009; Nichols 2009). In contrast, the U.S. Treasury estimates that domestic oil production would be reduced by less than 0.5 percent in the short and long run, which would reduce world oil production by less than 0.1 percent (Krueger 2009). Similarly, Brown (2009) estimates that U.S. production would be reduced by an average of 26,000 barrels per day—less than 0.4 percent of projected U.S. production and less than 0.2 percent of U.S. consumption.

A range of opinion also exists over the expected response of oil prices. Industry representatives believe that sizable price increases are possible, but they have not provided specific estimates (Nichols 2009). The U.S. Treasury and others predict that repealing the oil and gas tax preferences will result in a very small increase in consumer energy prices (Krueger 2009; Brown 2009; Johnson 2009). As they see it, U.S. oil production accounts for about 10 percent of annual world production and 2 percent of world proved crude oil reserves. With oil prices determined on a world market, domestic oil producers would be unable to pass the full cost of the tax increase to consumers. Therefore, a small change in U.S. production will have little effect on world supply and little effect on world price. Brown (2009) estimates the world oil price would increase by about 6 cents per barrel from 2011 to 2019.

The U.S. Treasury's analysis and other studies suggest that the increases in consumer prices would be slight. The U.S. Treasury estimates that the price of petroleum products would rise by less than one cent per gallon, even if the full cost of the tax increase is passed forward to consumers (Krueger 2009). Brown (2009) estimates that consumer prices would increase less than 0.2 cents per gallon for gasoline, diesel, and home heating oil, but U.S. producers would receive about 84 cents less per barrel of oil. According to Brown's figures, the average U.S. consumer would pay a total of 60 cents more per year for petroleum products.

EFFECTS ON U.S. NATURAL GAS MARKETS

Eliminating oil and gas company tax preferences seems likely to have bigger effects on U.S. natural gas markets than oil markets. Nearly all of the natural gas consumed in the United States is domestically produced, and world trade of natural gas has little effect on U.S. natural gas prices. That means that the effects of changes in U.S. tax policy will not be moderated nearly as much by participation in an international market.

The tax increase amounts to just under one percent of the average total revenue for natural gas over the last two years. Nonetheless, industry representatives describe the potential for substantial reductions in U.S. natural gas production without offering specific estimates (Kleemeier 2009; Nichols 2009). In contrast,

the U.S. Treasury expects U.S. natural gas consumption and production to decrease by 0.5 percent, at most, over the long term (Krueger 2009). Brown (2009) estimates that U.S. natural gas consumption will be reduced by about 0.25 percent and domestic production by about 0.02 percent, with imports increasing by 0.03 percent of consumption.

Opinion is also divided over the price effects. Industry representatives argue that significant price effects are possible, but do not provide specific estimates (Nichols 2009). In contrast, the U.S. Treasury estimates that natural gas prices would rise one percent at most (Krueger 2009), which is small in comparison to normal price fluctuations for natural gas. Since 2000, prices for residential natural gas have changed an average of plus or minus 6 percent per month (Krueger 2009). Brown (2009) estimates the increase in the market price of natural gas at 2.4 cents per million Btu, with the after-tax price received by U.S. producers falling by 2.7 cents per million Btu. According to Brown's figures, the average U.S. consumer would pay a total of 82 cents more per year for natural gas.

OTHER EFFECTS ON THE U.S. OIL AND GAS INDUSTRY

A wide range of expert opinion suggests that elimination of oil and gas tax preferences will shift domestic oil and gas production away from small independent operators toward large integrated firms. The U.S. Treasury defines small independent oil and gas producers as having annual sales of less than $5 million (Krueger 2009). Such companies receive almost all their revenue from wellhead production. Taken together, large and small independent producers account for 90 percent of U.S. oil and gas wells, 65 percent of U.S. oil production, and more than 80 percent of U.S. natural gas production (Kleemeier 2009). Marginal wells account for 20 percent of U.S. oil production and 12 percent of U.S. natural gas production.

Marginal producers are the most susceptible to changes in tax preferences. The percentage depletion allowance, which would be eliminated under the Obama administration proposal, applies only to small independent producers. Small producers' operating costs are typically high without these tax benefits because they produce on the least desirable leases. Consequently, most of the reduction in U.S. production that results from elimination of the oil and gas company tax preferences will likely result from accelerated closure of marginal wells (EPRINC 2009). Independent producers would especially be affected by repealing IDC and percentage depletion deductions (Book 2009).

Citing analysis by Raymond James, Kleemeier (2009) reports that repealing IDC deductions could cause independent producers to reduce capital drilling budgets by 25 to 30 percent. Similarly, Book (2009) finds that bankruptcy among independent companies could lead to further industry consolidation. Krueger (2009) states that the tax preferences that favor small, nonintegrated firms lead to distortions within the oil and gas industry and that elimination of these preferences could shift production from domestic independent producers to integrated domestic or foreign producers. Moreover, the U.S. Treasury estimates that repealing the particular tax preferences that favor small nonintegrated oil and gas companies will raise $10.3 billion in tax revenues from 2010 to 2019 (Krueger 2009).

QUANTIFYING THE EFFECTS ON U.S. OIL AND NATURAL GAS MARKETS

We use a small simulation model of the international oil and U.S. natural gas markets to estimate the effects on these markets of eliminating U.S. oil and gas company tax preferences. Following Brown and Yücel (2008) and Huntington (2007), oil prices are determined on an international market in which natural gas prices have little effect. U.S. natural gas prices are determined in a North American market in which oil prices play an important role.

For evaluation of increased taxation on oil and natural gas production, the model uses as its baseline the projected domestic and international oil market conditions and domestic natural gas conditions reported in the *Updated Annual Energy Outlook 2009* (EIA 2009b). This April update incorporates revised expectations for overall economic activity and the provisions of the American Recovery and Reinvestment Act that were enacted in mid-February 2009. The EIA outlooks assume no new policy initiatives and are widely available, well documented, frequently compared with other major energy outlooks, and often evaluated for their ability to track the historical record. Specific estimates depend on the baseline assumptions and model parameters, but the qualitative findings do not.

Elasticities of supply and demand are an important consideration in such calculations, and there is considerable uncertainty about these elasticities. We use a range of such elasticities found in the economics literature.[10] The range allows for a considerable variation in market response, but it may not completely capture the perspective taken by some industry representatives that small increases in oil and gas company taxation will have outsized effects on U.S. oil and natural gas production. Such outsized effects are beyond the range suggested by the economics literature.

Oil Market Effects

The estimated effects on U.S. oil markets of eliminating tax advantages for U.S. oil and natural gas production are quite small—primarily because the oil and gas company tax advantages that would be eliminated are relatively small in comparison to the projected world oil prices. At some projected world oil prices in excess of $100 per barrel, the additional tax revenue is less than one dollar per barrel.

Our best estimate is that eliminating these tax preferences would boost the world oil price by an amount that escalates from $0.063 above the baseline in 2011 to $0.104 in 2030. Two factors contribute to the relatively small impact on consumer prices: the changes in taxes are small, and oil prices are determined on an international market in which the United States' production accounts for a relatively small share. The increase in world oil prices translates into increases in refined product prices that escalate from $0.0018 per gallon above the baseline in 2011 to $0.0029 in 2030. As a result of price increases and changes in consumption, the average U.S. consumer would spend an estimated $2.17 more on total petroleum product consumption each year.

[10] We used the following supply elasticities: low at 0.2 (Considine and Larson 2001); best estimate at 0.4; and high at 1.27 (Dahl and Duggan 1996).

With the international market dulling the impact on U.S. consumers, much of the tax is borne by U.S. oil producers. Our mean estimates show that eliminating oil and gas company tax preferences would reduce the after-tax price received by domestic oil producers by $0.56 below the baseline in 2011 and $1.14 in 2030. Against the EIA's projected world oil prices of $65 per barrel in 2011 and $131 per barrel in 2030, however, the projected effects on domestic oil prices are small.

The small changes in oil prices would yield correspondingly small changes in U.S. oil consumption, production, and imports. The increase in consumer prices would reduce domestic oil consumption by about 200 barrels per day above the baseline in 2011. Interaction with natural gas prices produces a possibly unexpected effect. Higher U.S. natural gas prices contribute upward pressure on U.S. oil consumption. By 2013, we estimate U.S. oil consumption is 400 barrels per day above the baseline. For 2030, the figure is 2,500 barrels per day.

Because domestic oil production is relatively sensitive to after-tax prices, it will fall by an estimated 5,100 barrels per day below the baseline in 2011 and 31,000 barrels per day in 2030. The latter figure is about 0.4 percent of the EIA's projection of 9 million barrels per day in U.S. oil production in 2030. Filling the gap, U.S. oil imports would be about 4,900 barrels per day higher in 2011 and 34,000 barrels per day higher in 2030.

If U.S. oil and natural gas production are less sensitive to prices (with supply elasticities at the lower end in the economics literature), then the estimated effects on world oil prices will be lessened. At the lower end, we estimate increases in the world oil price at $0.047 above the baseline in 2011 and $0.071 in 2030, which means that the average U.S. consumer would spend an additional $1.44 on total petroleum product consumption each year. With consumers paying less of the tax, more is shifted to the producers. At the high end, we estimate that the prices received by U.S. oil producers would fall by $0.57 below the baseline in 2011 and $1.17 in 2030.

With reduced price sensitivity of U.S. oil and natural gas production, we estimate these price changes would reduce U.S. oil consumption by 300 barrels per day below the baseline in 2011. Taking into account the effects of increased natural gas prices, we find U.S. oil consumption increased by 900 barrels per day above the baseline projections for 2030. U.S. oil production would fall by 2,600 barrels per day below the baseline in 2011 and 16,200 barrels in 2030. The latter figure is about 0.2 percent of projected U.S. oil production in 2030. Filling the gap, U.S. oil imports would be about 4,900 barrels per day above the baseline in 2011 and 17,100 barrels per day higher in 2030.

If U.S. oil and natural gas production is more sensitive to prices (with supply elasticities at the upper end of estimates in the economics literature), then the estimated effects on world oil prices will be enhanced. At the upper end, we estimate increases in the world oil price of $0.160 above the baseline in 2011 and $0.262 in 2030, which means the average U.S. consumer would spend an additional $4.41 on total petroleum product consumption each year. With consumers paying more of the tax, less is shifted to the producers. At the low end, we estimate that the prices received by U.S. producers would fall by $0.46 below the baseline in 2011 and $0.98 in 2030.

With increased price sensitivity of U.S. oil and natural gas, we estimate these price changes reduce U.S. oil consumption by 1,300 barrels per day below the baseline in 2011 and 5,400 barrels per day in 2030.[11] U.S. oil production would fall by 13,300 barrels per day below the baseline in 2011 and 85,900 barrels in 2030. The latter figure is about one percent of projected U.S. oil production in 2030. Filling the gap, U.S. oil imports would be about 12,100 barrels per day above the baseline in 2011 and 80,400 barrels per day higher in 2030.

Natural Gas Market Effects

Our best estimate is that eliminating oil and gas company tax preferences would boost the U.S. natural gas price by 2.0 cents per million Btu above the baseline in 2011 and 4.1 cents in 2030. Domestic natural gas producers would see price reductions of 3.2 cents below the baseline in 2011 and 4.3 cents in 2030. These changes are small in comparison to the EIA projected trajectory of prices from $5.48 per million Btu at Henry Hub in 2011 to $8.83 per million Btu in 2030.[12] As a result of higher prices, the average U.S. consumer would spend an estimated $1.37 more on total natural gas consumption each year.

The changes in natural gas prices will yield correspondingly small changes in U.S. natural gas consumption, production, and imports. We estimate U.S. natural gas consumption would be reduced by 3 billion cubic feet below the baseline in 2011 and 49 billion cubic feet in 2030, with the latter about 0.2 percent of the projected U.S. consumption for that year. Domestic natural gas production will fall by an estimated 11 billion cubic feet below baseline in 2011 and 51 billion cubic feet in 2030. Net natural gas imports will rise by an estimated 7 billion cubic feet per year above baseline in 2011 and 2 billion cubic feet in 2030.

If U.S. oil and natural gas production is less sensitive to prices, the estimated effects on U.S. natural gas prices will be lessened. At the lower end, we estimate increases in the consumer price as 1.1 cents per million Btu above the baseline in 2011 and 3.0 cents in 2030. As a result of higher prices, the average U.S. consumer would spend an estimated $0.85 more on total natural gas consumption each year. With consumers paying less of the tax, more is shifted to the producers. At the high end, we estimate that the prices received by U.S. natural gas producers would fall by 4.1 cents per million Btu below the baseline in 2011 and 5.9 cents in 2030.

With reduced price sensitivity of U.S. oil and natural gas production, we estimate U.S. natural gas consumption would be reduced by 2 billion cubic feet below the baseline in 2011 and 30 billion cubic feet in 2030, with the latter about 0.1 percent of the projected U.S. consumption for that year. Domestic natural gas production will fall by an estimated 5 billion cubic feet below baseline in 2011 and 31 billion cubic feet in 2030. Net natural gas imports will rise by an estimated 3 billion cubic feet per year above baseline in 2011 and 1 billion cubic feet in 2030.

If U.S. oil and natural gas production is more sensitive to prices, the estimated effects on U.S. natural gas prices will be enhanced. At the higher end, we estimate increases in the consumer price as 1.1 cents per

[11] In this case, the effects of higher oil prices on oil consumption dominate those of higher natural gas prices.

[12] Henry Hub is the principal trading hub for natural gas in the United States, and the price at this location is used as a standard reference for U.S. natural gas pricing.

million Btu above the baseline in 2011 and 3.0 cents in 2030. As a result of higher prices, the average U.S. consumer would spend an estimated $2.19 more on total natural gas consumption each year. With consumers paying more of the tax, less is shifted to the producers. At the low end, we estimate that the prices received by U.S. natural gas producers would fall by 1.9 cents per million Btu below the baseline in 2011 and 2.2 cents in 2030.

With increased price sensitivity of U.S. oil and natural gas production, we estimate U.S. natural gas consumption would be reduced by 5 billion cubic feet below the baseline in 2011 and 69 billion cubic feet in 2030, with the latter about 0.3 percent of the projected U.S. consumption for that year. Domestic natural gas production will fall by an estimated 17 billion cubic feet below baseline in 2011 and 72 billion cubic feet in 2030. Net natural gas imports will rise by an estimated 12 billion cubic feet per year above baseline in 2011 and 3 billion cubic feet in 2030.

Energy Security

Changes in oil consumption and oil imports raise issues about energy security. Practical experience and a long-established economics literature—assessed by Brown and Yücel (2002), Jones et al. (2004), Kilian (2008), and Hamilton (2009)—have found that oil supply shocks can lead to sharply rising oil prices and weakened U.S. economic activity. In fact, sharply rising oil prices have preceded all but one of the eleven U.S. recessions since World War II.[13] Because the U.S. economy is vulnerable to oil supply shocks, reducing the potential size or economic consequences of such shocks is at the heart of energy security.[14]

Because oil is fungible and its transportation costs are relatively low, its prices are determined on an integrated world oil market in which market forces transmit oil supply shocks to oil prices worldwide. The oil price shocks experienced in the United States depend neither on the extent of its oil imports nor on the specific countries from which it imports oil. U.S. oil consumption plays an important role in national energy security because oil consumption determines the extent to which economic activity is exposed to internationally transmitted oil price shocks.[15]

According to Brown and Huntington (2009a), U.S. oil imports play a role in energy security only to the extent that they affect the expected size of future supply shocks by changing how much potentially unstable producers contribute to the world oil supply. Because historically unstable producers adjust their production to world oil market conditions, they are among the marginal sources of world oil—even though more stable producers have higher costs. These actions by unstable producers means that they are likely to adjust production to changes in U.S. oil imports. Consequently, small reductions in U.S. oil consumption will slightly enhance the nation's energy security, while small increases in U.S. oil imports will reduce energy security slightly.

Deutch and Schlesinger (2006) take a slightly different perspective on the security of U.S. oil imports. They conclude that the possibility of significant interruption in oil supply will have adverse political and economic

[13] See Hamilton 1983 and Balke et al. 2008.
[14] See Leiby 2007.
[15] See Brown and Huntington 2009a.

consequences in the United States and other importing countries. They contend that high prices and seemingly scarce supplies create fears that the current system of open markets is unable to ensure a secure oil supply; control over oil revenues gives exporting countries the flexibility to adopt policies that oppose U.S. interests and values; oil import dependence causes global political realignments that limit the ability of the United States to form alliances and partnerships to achieve common objectives; and revenues from oil and gas exports can undermine local governance and create instability. Deutch and Schlesinger also contend that if the United States reduced its dependence on imported oil, it would not have as great an interest in the Middle East and could reduce its military presence there.

Brown (2009) estimates reduced U.S. oil production would slightly improve energy security by reducing U.S. exposure to oil price shocks. At the same time, he finds small increases in oil imports would slightly increase the market share of unstable oil-producing countries. The net effect is a slight increase in exposure of the U.S. economy to oil supply disruptions (Brown 2009). Considering these economic effects only, Brown estimates the increased security costs at $7.9 million per year.

In contrast, Kleemeier (2009) estimates the social cost of imported oil at about $15 per barrel above that for domestically produced oil. Given Kleemeier's projections of large reductions in U.S. oil production and substantial gains in imports, his analysis suggests much higher security costs than Brown estimates.

The difference between the Brown (2009) and Kleemeier (2009) estimates is due to several factors. Brown estimates smaller changes in U.S. oil market conditions than Kleemeier describes. In addition, Brown utilizes a Brown and Huntington (2009b) estimate that the median value of the oil security premium is $2.81 per barrel for the consumption of domestically produced oil and $4.98 per barrel for the consumption of imported oil. That means that Brown finds substituting a barrel of imported oil for a barrel of domestic oil has an expected security cost of $2.17. Kleemeier cites an oil import premium of $15 per barrel, which reflects the external cost of substituting imported oil for domestically produced oil. Kleemeier's estimate is consistent with analysis by Leiby (2007) that estimates the premium on imported oil at $14.90 per barrel. The Leiby estimate also includes changes in the terms of trade that occur under stable market conditions, which Brown and Huntington contend is not a security issue.

The story is quite different for natural gas. High transportation costs limit international arbitrage of world natural gas prices.[16] Thus, a very small gain in U.S. natural gas imports is of relatively little concern from the perspective of security because domestic sources are projected to supply more than 90 percent of U.S. natural gas consumption—even after tax preferences for domestic oil and natural gas production are eliminated.

QUANTIFYING THE EFFECTS ON ENERGY SECURITY

Changes in energy security costs due to changes in oil imports can be estimated with oil security premiums. Oil security costs depend on a number of factors, including total level of oil consumption, an economy's oil intensity, the flexibility of oil supply and consumption, and level of imports.

[16] See Brown and Yücel 2009.

Brown and Huntington (2009b) estimate a security premium on increased consumption of imported oil at $4.98 per barrel in a range of $1.10 to $14.35. They estimate a security premium for substituting imported oil for domestically produced oil at $2.17 per barrel in a range of $0.91 to $5.65. Using the Brown and Huntington estimates and our projected changes in oil market conditions—including increased oil consumption and imports—we find that eliminating the oil and gas tax preferences will increase estimated oil security costs by $22.5 million dollars in a range of $4.4 million to $115.6 million per year. These estimates exclude any adverse political consequences of increased reliance on oil imports.

Effects on U.S. Economic Activity

The magnitude of potential effects on economic activity will depend on the scale of energy price changes. Large increases in energy prices can yield sizable reductions in gross domestic product (GDP) (Crane et al. 2009). If the price changes are as small as the U.S. Treasury estimates, however, the effects on economic activity will likely be slight. The U.S. Treasury finds that the effects on GDP would be too small to measure (Krueger 2009). Furthermore, they argue that eliminating inefficient oil and gas subsidies may have a positive impact of increasing economic efficiency over the long term. National output and GDP would increase due to more efficient allocation of capital across sectors of the economy.

The effects on U.S. employment are also of concern. Including multiplier effects, the oil and natural gas industry supports about 9.2 million U.S. jobs and in 2007 supported economic activity that amounted to 7.5 percent of U.S. GDP (PricewaterhouseCoopers 2009).

According to the U.S. Treasury, the direct effects on oil and gas industry employment are likely to be minor. Because the oil and gas industry is capital intensive, small changes in production will likely have small employment effects in the industry. If U.S. employment in the oil and gas sector responds about the same as domestic oil and natural gas production, the U.S. Treasury estimates the direct employment loss at less than 0.5 percent (Krueger 2009). Because the oil and gas industry is roughly 10 times more capital intensive than the U.S. economy as a whole, Krueger argues that subsidizing oil production is not an effective strategy for creating jobs.

OUR ASSESSMENT

The U.S. economy tends toward full employment, so eliminating oil and gas company tax preferences is unlikely to have a significant effect on overall U.S. GDP or employment in the long run. If it has any effect, the elimination of distortionary tax preferences should stimulate overall economic activity.[17] With higher output, wages will be higher and employment will rise. One concern is that instability of the tax system may add to uncertainty and slow investment activity.

Given the relatively small changes in oil and natural gas markets, the primary economic effects will be to slightly shift activity away from those regions of the United States that either produce or heavily consume oil and natural gas toward the rest of the nation. Against a backdrop of rising oil and natural gas prices,

[17] If, however, the elimination of oil and gas tax preferences results in the unequal treatment of industries, overall economic activity would be weakened.

these shifts in economic activity would occur relatively smoothly. Although firms do look ahead, the slight reductions in energy industry employment and shifts in regional economic activity would mostly come from prospective growth rather than current employment. Even after losing their tax preferences, the industry would benefit from rising oil and natural gas prices as the world economy recovers.

Against a backdrop of weakened natural gas prices, however, the elimination of oil and gas company tax preferences could reduce current employment—not just prospective gains in employment. Moreover, because capital-intensive industries have larger multiplier effects than labor-intensive industries, spillovers to the rest of the economy could be noticeable in the short run. In the long run, however, such effects will be dominated by gains in overall economic activity that result from the elimination of distortionary tax preferences.

Conclusions

In comparison to some other G-20 countries, the apparent U.S. subsidies for oil and gas are relatively small. The oil and gas company tax preferences the FY2010 budget proposes to eliminate represent less than one percent of the oil and gas industry's projected revenue. Despite the relatively small changes in U.S. taxation of oil and gas production, there is divergent opinion about the effects of such subsidies.

Our analysis indicates that the proposed elimination of oil and gas subsidies will have slight effects on U.S. oil and natural gas markets, energy security, and economic activity. We estimate a 0.5 percent decrease in U.S. oil production below baseline for 2030 in a range of 0.2 to 1.0 percent. U.S. oil consumption will see substantially smaller effects. For natural gas, we estimate a 0.2 percent decrease in U.S. production below baseline for 2030 in a range of 0.1 to 0.3 percent. With the United States projected to be mostly self-sufficient in natural gas by 2030, the effects on U.S. natural gas consumption are similar. These estimates provide a range that captures U.S. Treasury projections and those made by Brown (2009), but they may not reflect anecdotal evidence presented by the energy industry that outsized effects should be expected.

The net effect of changes in U.S. oil consumption and imports will be to increase the exposure of the U.S. economy to oil supply disruptions. We estimate the increased security costs of potential oil supply disruptions at $22.5 million dollars in a range of $4.4 million to $115.6 million per year.

To the extent that the tax preferences are distortionary, their elimination should stimulate overall economic activity. At the same time, however, economic activity would shift slightly away from those regions of the U.S. that either produce or heavily consume oil and natural gas toward the rest of the nation. In addition, U.S. oil and natural gas could slightly shift from domestic independent producers to integrated producers. With the industry generally benefitting from rising oil and natural gas prices as the world economy recovers, the effects of eliminating the oil and gas tax preferences are likely to be reduced growth rather than declines in activity.

While the proposed FY2010 budget aims to eliminate many fossil fuel subsidies, a number of tax credits listed in the appendix will remain in place. These include a fossil fuel foreign tax credit, tax relief from the alternative minimum tax, and treatment of natural gas pipelines as 15-year property. In order to fully comply with the G-20 agreement, the United States may need to address repealing these subsidies as well.

References

Adeyeye, Adenike, James Barrett, Jordan Diamond, Lisa Goldman, John Pendergrass, and Daniel Schramm. 2009. *Estimating U.S. Government Subsidies to Energy Sources: 2002–2008*. Washington, DC: Environmental Law Institute.

Balke, Nathan S., Stephen P.A. Brown, and Mine K. Yücel. 2008. An International Perspective on Oil Price Shocks and U.S. Economic Activity. Globalization and Monetary Policy Institute Working Paper No. 20. Dallas, TX: Federal Reserve Bank of Dallas.

Book, Kevin. 2009. Testimony of Kevin Book, Managing Director, Research Clearview

Energy Partners, LLC. U.S. Senate Finance Subcommittee on Energy, Natural Resources and Infrastructure. September 10.

Brown, Stephen P.A. 2009. An Economic Assessment of Eliminating Oil and Gas Company Tax Preferences. Testimony Prepared for the U.S. Senate Finance Subcommittee on Energy, Natural Resources and Infrastructure. Washington, DC: Resources for the Future. September 10.

Brown, Stephen P.A., and Hillard G. Huntington. 2009a. Reassessing the Oil Security Premium. Resources for the Future and Stanford University. Forthcoming.

———. 2009b. Estimating Oil Security Premiums. Stanford, CA: Stanford Energy Modeling Forum.

Brown, Stephen P.A., and Jason L. Saving. 2002. Government Power and Organization. *Economic Inquiry* 40(3): 439–449.

Brown, Stephen P.A., and Mine K. Yücel. 2002. Energy Prices and Aggregate Economic Activity: An Interpretative Survey. *Quarterly Review of Economics and Finance* 42(2): 193–208.

———. 2008. What Drives Natural Gas Prices? *The Energy Journal* 29(2): 45–60.

———. 2009. Market Arbitrage: European and North American Natural Gas Prices. *The Energy Journal* 30: 167–186.

Congressional Budget Office. 2005. *Taxing Capital Income: Effective Rates and Approaches to Reform*. Washington, DC: CBO. October.

Considine, T.J., and D.F. Larson. 2001. Risk Premiums on Inventory Assets: The Case of Crude Oil and Natural Gas. *Journal of Futures Markets* 21(2): 109–126.

Crane, K., A. Goldthau, M. Toman, T. Light, S. Johnson, A. Nader, A. Rabasa, and H. Dogo. 2009. *Imported Oil and U.S. National Security*. Washington, DC: RAND.

Dahl, Carol A., and Thomas Duggan. 1996. U.S. Energy Product Supply Elasticities: A Survey and Application to the U.S. Oil Market. *Resources and Energy Economics* 18: 243–263.

Deutch, John, and James Schlesinger. 2006. *National Security Consequences of U.S. Oil Dependency*. Washington, DC: Council on Foreign Relations.

Earth Track. 2009. Detailed Data on Interventions. http://earthtrack.net/.

EIA. 2007. *Federal Financial Interventions and Subsidies in Energy Markets*. Washington, DC: U.S. Department of Energy, Energy Information Administration.

———. 2009. *Updated Annual Energy Outlook 2009.* Washington, DC: U.S. Department of Energy, Energy Information Administration.

EPRINC. 2009. *Do Higher Oil and Gas Taxes Pose a Threat to U.S. Energy Security?* Washington, DC: Energy Policy Research Foundation, Inc.

GAO. 2008. *Oil and Gas Royalties: The Federal System for Collecting Oil and Gas Revenues Needs Comprehensive Reassessment*. GAO-08-691. Washington, DC: Government Accountability Office.

G-20. 2009. Group Statement on Pittsburgh G-20 Summit. Leaders' Statement. The Pittsburgh Summit. September 24–25, 2009. http://thepage.time.com/group-statement-on-pittsburgh-g-20-summit/ (accessed November 19, 2009).

Hamilton, James D. 1983. Oil and the Macroeconomy since World War II. *Journal of Political Economy* 91(2): 228–48.

———. 2009. Causes and Consequences of the Oil Shock 2007–2008. *Brookings Papers on Economic Activity*. Washington, DC: The Brookings Institution.

Huntington, Hillard G. 2007. Industrial Natural Gas Consumption in the United States: An Empirical Model for Evaluating Future Trends, *Energy Economics* 29(4): 743-759.

IEA. 2008. *World Energy Outlook 2008*. Paris, France: International Energy Agency.

Johnson, Calvin. 2009. Honest and Accurate Tax Accounting for Oil & Gas. U.S. Senate Finance Subcommittee on Energy, Natural Resources and Infrastructure. September 10.

Jones, Donald W., Paul N. Leiby, and Inja K. Paik. 2004. Oil Price Shocks and the Macroeconomy: What Has Been Learned Since 1996? *The Energy Journal* 25(2): 1–32.

Kilian, Lutz. 2008. The Economic Effects of Energy Price Shocks. *Journal of Economic Literature* 46(4): 871–909.

Kleemeier, Buddy. 2009. Testimony of Buddy Kleemeier on Behalf of the Independent Petroleum Association of America. U.S. Senate Finance Subcommittee on Energy, Natural Resources and Infrastructure. September 10.

Krueger, Alan B. 2009. Statement of Alan B. Krueger, Assistant Secretary for Economic Policy and Chief Economist, U.S. Department of Treasury. U.S. Senate Finance Subcommittee on Energy, Natural Resources and Infrastructure. September 10.

Leiby, Paul N. 2007. *Estimating the Energy Security Benefits of Reduced U.S. Oil Imports*. Report ORNL/TM-2007/028; revised July 23, 2007. Oak Ridge, TN: Oak Ridge National Laboratory.

Metcalf, Gilbert E. 2009. Taxing Energy in the United States: Which Fuels Does the Tax Code Favor? New York, NY: Manhattan Institute.

Musgrave, Richard A., and Peggy B. Musgrave. 1989. *Public Finance in Theory and Practice.* 5th ed. New York: McGraw-Hill.

Nichols, J. Larry. 2009. Statement of API Chairman J. Larry Nichols on Behalf of the American Petroleum Institute. U.S. Senate Finance Subcommittee on Energy, Natural Resources and Infrastructure. September 10.

Office of Management and Budget. 2009. *A New Era of Responsibility: Renewing America's Promise.* Washington, DC: Executive Office of the President of the United States.

OECD. 2009. *The Economics of Climate Change Mitigation: Policies and Options for Global Action beyond 2012*. Paris, France: Organisation for Economic Co-operation and Development.

PricewaterhouseCoopers. 2009. *The Economic Impacts of the Oil and Natural Gas Industry on the U.S. Economy: Employment, Labor Income and Value Added*. Prepared for the American Petroleum Institute.

U.S. Department of Treasury. 2009. *General Explanations of the Administration's Fiscal Year 2010 Revenue Proposals*. Washington, DC: U.S. Department of Treasury.

U.S. Senate Committee on Finance. 2009. Oil and Gas Tax Provisions: A Consideration of the President's FY2010 Budget Proposal. Hearing Transcript. Washington, DC: U.S. Senate Committee on Finance. September 10.

Schultze, Charles L. 1977. *The Public Use of Private Interest.* Washington, DC: The Brookings Institution.

Wynn, Gerard, and Alister Doyle. 2009. G20 Fossil Fuel Subsidy Push May Aid Climate Talks. Reuters. September 25. http://www.reuters.com/article/environmentNews/idUSTRE58O3RN20090925 (accessed November 19, 2009).

Appendix. U.S. Fossil Fuel Preferences

Millions of 2007 Dollars	1999	2007	2012 (Forecast)
Coal	**$ 79**	**$ 290**	**$ 462**
Credit for investment in clean coal facilities	0	$ 30	$ 275
Capital gains treatment of royalties in coal	$ 79	$ 170	$ 143
Exclusion of special benefits for disabled coal miners	0	$ 50	$ 44
Partial expensing for advanced mine safety equipment	0	$ 10	0
84-Month amortization of pollution- control equipment	0	$ 30	0
Refined Coal	**0**	**$ 2,370**	**0**
Alternative fuel production credit	0	$ 2,370	0
Natural Gas + Oil	**$ 1,878**	**$ 2,090**	**$ 1,204**
Preferences Proposed to be Eliminated in FY2010 Budget			
Excess of percentage over cost depletion	$ 321	$ 790	$ 813
Expensing of exploration and development costs	-$ 97	$ 860	$ 340
Amortization of all geological and geophysical expenditures over two years	0	$ 60	$ 11
Exception from passive loss limitation	$ 36	$ 30	$ 33
Enhanced oil recovery	$ 273	0	0
Expensing tertiary injectants	0	0	0
Preferences Not Mentioned in FY2010 Budget			
Natural gas pipelines treated as 15-year property	0	$ 50	$ 132
Temporary 50% expensing for refining equipment	0	$ 30	-$ 55
Credit and deduction for clean vehicles	$ 103	$ 260	-$ 70
Expensing of capital costs (for complying with EPA sulfur regulations)	0	$ 10	0
Alternative fuel production credit	$ 1,242	0	0
Other Preferences Not Mentioned in FY2010 Budget			
Royalty relief for heavy oil and deep offshore wells (oil)			
Relief from alternative minimum tax (oil)			
Net operating loss exemptions for Alaska Native corporations (oil and gas)			
U.S. Geological Survey geologic mapping and energy resource surveys (all fossil fuel)			
Foreign tax credit (all fossil fuel)			
Deferral of income from controlled foreign corporations (all fossil fuel)			

Source: EIA 2007; Earth Track 2009.