



HEADWATERS  
ECONOMICS

## Do Tax Subsidies Influence Domestic Oil Production? *Geology, Technology, and Price Drive Industry;* *By Comparison Production and Drilling Tax Incentives Have Little Impact*

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### Introduction

The location and pace of domestic oil production is largely driven by geology, technology, and price. Some argue that tax incentives and deductions also must be retained, or drilling activity will move to neighboring states or to international competitors.<sup>i</sup> Despite these warnings, the academic literature has explained several reasons for why taxes are largely irrelevant to total oil production.<sup>ii</sup>

When exploring the possibly effectiveness of federal tax subsidies, the competition between states for drilling rigs and increased production provides a good test of the efficiency of tax deductions, tax incentives, and subsidies at inducing additional domestic oil production. This brief illustrates the experience of several Western states, each competing for a larger share of drilling activity and production through a variety of tax incentives and deductions on drilling and production of oil and natural gas.

We focus mainly on a comparison of Montana and North Dakota who each sit atop portions of the oil-rich Bakken shale. The first successful horizontally drilled and “fracked” oil wells were completed in Montana, but despite an effective tax rate half of its neighbors for new wells, most drilling activity today is in North Dakota where production has grown significantly while Montana’s has declined in recent years.

The experience of state fiscal and energy policy suggest that production and drilling tax deductions and incentives are ineffective at changing the location of production. Despite dramatically different tax structures, tax rates, and incentives, states have been unable to overcome geology in determining the location of production, or the influence of technology and price in changing the pace of development. The main outcome of tax deductions and incentives is lower tax revenue that makes it more challenging for communities to facilitate and mitigate the impacts of an oil boom.

### Summary Findings

1. State competition through tax incentives has not increased oil production. Since the end of 2009, oil production has more than doubled in North Dakota where the oil resource is best while Montana’s production, where the tax rate is roughly half, has declined by 14 percent (see Figure 1).
2. The main outcome of tax subsidies is lower tax collections. Montana will collect \$800,000 less over the first three years of production from an average new Bakken oil well compared to North Dakota, leaving communities without the resources needed to pay for the energy boom. Montana’s tax holiday incentive also delays local revenue for two years after drilling impacts occur (see Figure 2).
3. Once resources are proven (a combination of geology and technology) price is the main driver of domestic oil production. Rising crude oil prices and declining natural gas prices after the national recession have driven a major shift in drilling rigs away from natural gas plays to oil plays both within states and across state lines with little regard for varying tax policies (see Figure 3).
4. The same drivers (geology, technology, and price) determine the timing and amount of domestic oil production at the national scale. Federal tax deductions result chiefly in lower tax revenue.

## What are the Outcomes of Production and Drilling Tax Deductions and Incentives?

This brief illustrates in three graphs the experience of several Western states, each competing for a larger share of drilling activity and oil production through a variety of tax incentives and tax deductions. We focus mainly on a comparison of Montana and North Dakota's tax policies as they relate to the oil boom in the Bakken that lies beneath both states.<sup>iii</sup>

Figure 1 shows oil production trends in Montana and North Dakota to illustrate the ineffectiveness of tax incentives.

Figure 2 shows cumulative tax collections in each state from an average Bakken oil well to illustrate how Montana gives up significant tax revenue that could be used to mitigate community impacts.

Figure 3 shows a trend in drilling rigs drilling for oil vs. natural gas before and after the national recession to illustrate the role of price in driving production trends.

The main lesson is that despite Montana's more favorable tax policies relative to North Dakota and the first successful application of horizontal drilling and fracking technology in the Bakken occurring in Montana, the state has not been able to overcome geology. Most drilling and production remains in North Dakota where the oil resource is better. The two-state comparison is representative of the ineffectiveness of efforts in states across the West to change the location of production, and is supported by academic studies that have enumerated the reasons for why taxes are weak drivers of production.<sup>iv</sup>

Chiefly, the oil industry is resource dependent, and cannot move its location of production, like a textile mill or auto manufacturer, to seek out lower labor costs or to win greater tax concessions. According to the American Petroleum Institute, explaining why the industry must accept high effective federal tax rates compared to other industries "U.S. based oil and gas companies must structure their operations and invest substantial capital where the resources is found rather than where the best tax regime is located."<sup>v</sup>

Production and income tax incentives also come too late in the business cycle to effectively induce additional production. Production and drilling incentives kick in only after companies know where the oil is located (exploration), has perfected the technology to extract the oil (proving reserves), and have secured leases and begun drilling and producing oil from wells (production phase). Once reserves are proven, price is the largest driver of drilling activity and production.<sup>vi</sup>

The inability of states to effectively capture production through fiscal competition with their peers raises questions about the federal government's ability to engage in a similar competition among nations to increase domestic production by extending tax deductions and subsidies for domestic production.

The main outcome of drilling and production tax deductions and incentives is to reduce and delay tax revenue collections. The current oil boom in the Bakken comes with significant impacts on infrastructure, services, housing and labor markets, and the environment. How states tax and distribute revenue has a huge influence on community's ability to mitigate impacts.<sup>vii</sup>

# Montana's Tax Holiday Has Not Increased Oil Production Relative to North Dakota

Figure 1: Monthly Crude Oil Production in Montana and North Dakota (thousands of barrels)

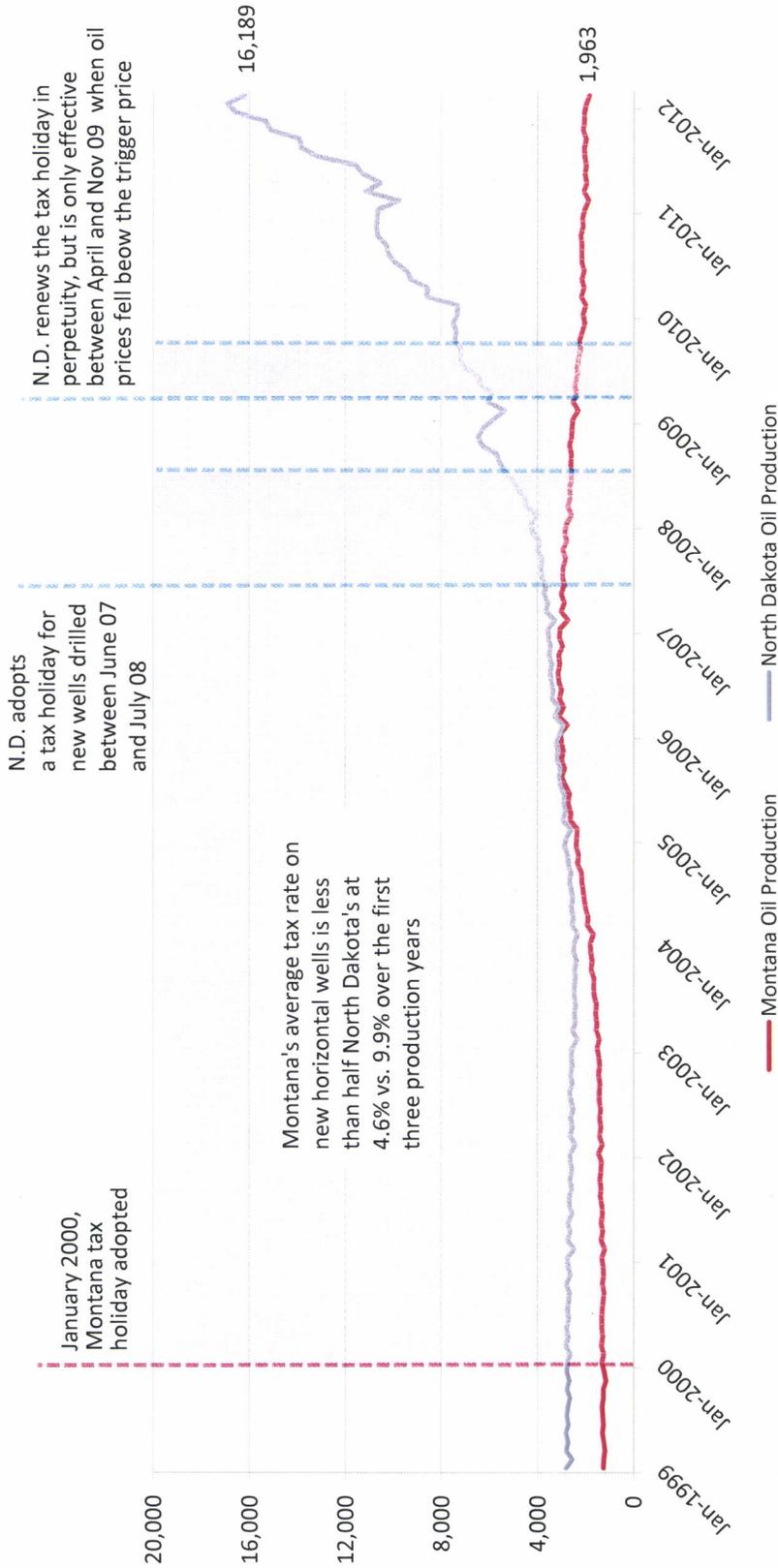
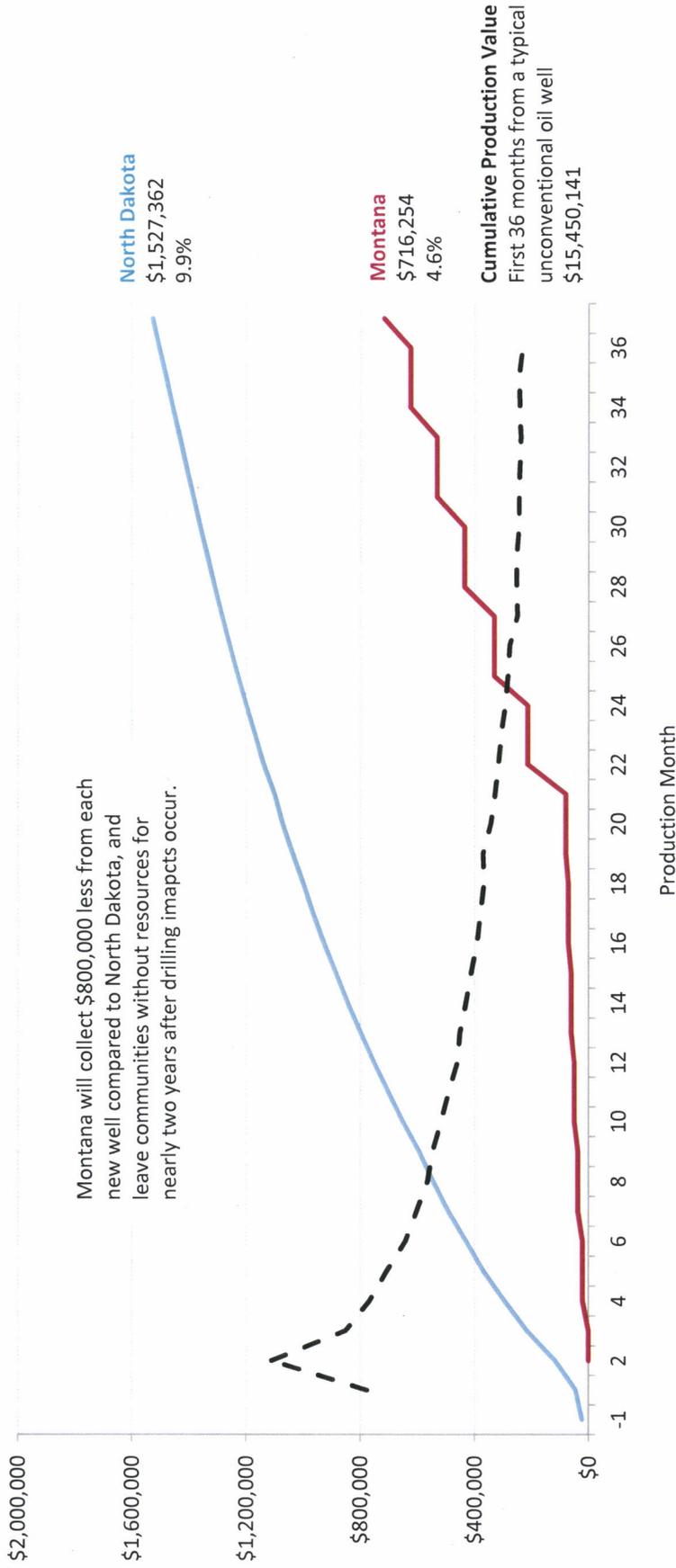


Figure One illustrates how North Dakota's oil production has increased rapidly since the end of the national recession when oil prices recovered and the application of horizontal drilling and fracking technology had been perfected in the Bakken. Despite Montana's more favorable tax rate, the state cannot overcome the reality that the Bakken's geology has favored production in North Dakota.

Montana's tax holiday incentive reduced the production tax rate on new production from 9.76 to 0.76 percent for 18 months for horizontally completed wells.<sup>viii</sup> North Dakota adopted a tax holiday similar to Montana's, except that it includes a "price trigger" that removes the incentive when oil prices rise above a threshold price (currently around \$60 per barrel).<sup>ix</sup> After the price trigger was surpassed in November 2009, production in North Dakota more than doubled by February 2012 (monthly production rose from 7.4 to 16.2 million barrels<sup>x</sup>) while Montana's production, which retains the tax holiday dropped by 14 percent over the same period (monthly production declined from 2.1 to 1.8 million barrels<sup>xi</sup>).

## Tax Incentives Reduce and Delay Tax Collections that Could Be Used to Mitigate Community Impacts

Figure 2: Cumulative Revenue and Average Tax Rate on the First 3 Years of Production from an Average Bakken Oil Well



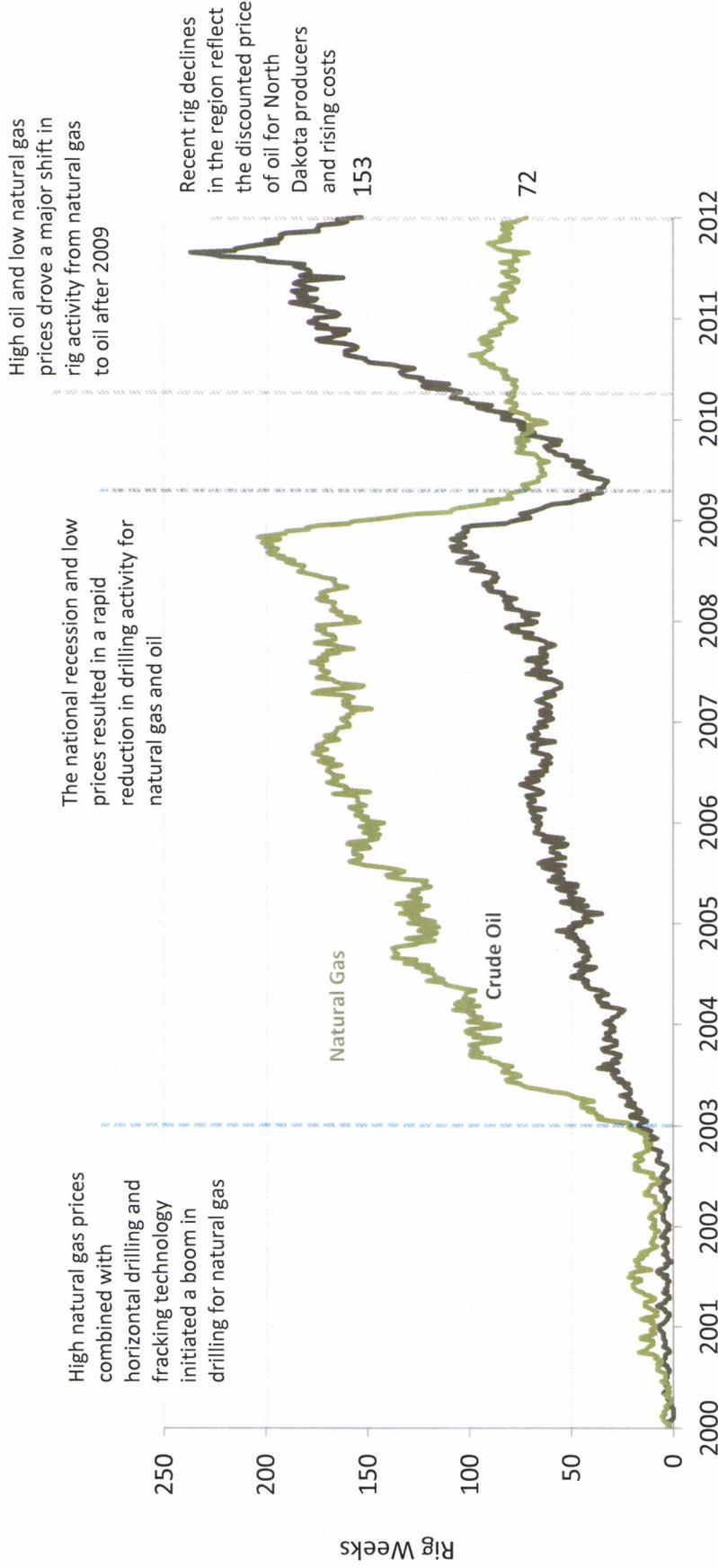
Source: geOLOGIC Data Center (<http://www.geologic.com/solutions/data/index.htm>). Calculation and visualization from VISAGE (<http://www.visageinfo.com/>).

Figure Two shows the difference in cumulative tax collections by applying each state's tax rate and incentives to an average horizontally completed Bakken oil well.<sup>xii</sup> Montana's 18 month incentive tax rate on newly completed wells (the "tax holiday") results in the state collecting more than \$800,000 less in cumulative revenue over the first 36 months of production when compared to North Dakota. The policy also results in a delay of nearly two years between when drilling occurs and when communities have resources to provide infrastructure and services. With no tax holiday in effect at high prices, North Dakota's cumulative tax collection curve shows how monthly collections at the full base tax rate collects higher revenue more quickly.

The main outcome in Montana of lower revenue and an extended time lag is to exacerbate the struggles communities have in keeping pace with infrastructure and service demands. Despite North Dakota's superior tax collection policy, the state's distribution policy delivers less revenue as a percent of total collections back to local governments relative to Montana and other Western states.<sup>xiii</sup>

# Price is the Main Driver of Drilling Rig Activity in Four Western States<sup>xiv</sup>

Figure 3: Rig Weeks for Oil and Natural Gas Drilling in Colorado, Montana, North Dakota, and



\*One rig week is defined as the presence of one rig for one week.

Figure Three shows how companies were able to quickly shift drilling rigs and resources from natural gas to oil production after the national recession when the price of natural gas stagnated and oil prices soared. After resources are proven (a combination of geology and technology), price is the most important driver of industry investment decisions. The strength of oil prices and low prices for natural gas explain why oil drilling has helped lead strong job growth in the industry since the end of the national recession in 2009. Continued drilling activity and economic growth will depend on oil prices remaining high. For example, the decline in rig activity in January 2012 in North Dakota is due to rising costs and a discounted price due to transportation challenges.<sup>xv</sup>

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## About Headwaters Economics

Headwaters Economics is an independent, nonprofit research group that blends innovative research techniques and extensive on-the-ground experience working with a range of partners across the West for more than 20 years. The organization's mission is to improve community development and land management decisions in the West.

## Endnotes

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<sup>i</sup> See for example comments from industry leaders in: Nick Snow, Feb. 14, 2011, *Obama keeps pledge to end oil tax incentives in 2012 budget request*. Oil and Gas Journal online. Accessed on 2-14-2011.. Responding to a bill introduced into Montana's legislature to remove a production tax incentive, the Montana Petroleum Institute warned that companies would quickly look elsewhere to drill new wells, resulting in job losses and higher property taxes for those left behind.<sup>1</sup> The same warning is levied in North Dakota where the main message of the "FixTheTax" campaign was one of competitiveness with neighboring states, offering first-hand accounts of industry fleeing the state to avoid high taxes.<sup>1</sup> Jack N. Gerard, president of the American Petroleum Institute, warns that any cut in subsidies will cost jobs due to the same tax competition between nations for production. "These companies evaluate costs, risks and opportunities across the globe," he said. "So if the U.S. makes changes in the tax code that discourage drilling in gulf waters, they will go elsewhere and take their jobs with them." NY Times [http://www.nytimes.com/2010/07/04/business/04bptax.html?\\_r=2](http://www.nytimes.com/2010/07/04/business/04bptax.html?_r=2).

<sup>ii</sup> Ujjayant Chakravorty, University of Alberta, Shelby Gerking, University of Central Florida, and Andrew Leach, University of Alberta: *State Tax Policy and Oil Production: The Role of the Severance Tax and Credits for Drilling Expenses*. Paper presented at the American Tax Policy Institute Energy Taxes Conference organized by Gilbert E. Metcalf, Tufts University. Held October 2009. Papers to be published by Cambridge University Press. <http://www.americantaxpolicyinstitute.org/research.html>; S. Gerking, W. Morgan, M. Kunce, and J. Kerkvliet, *Mineral Tax Incentives, Mineral Production and the Wyoming Economy*, report prepared for the Mineral Tax Incentives Subcommittee, Wyoming State Legislature, 2000, <http://eadiv.state.wy.us/mtim/StateReport.pdf> and, M. Kunce, S. Gerking, W. Morgan, and R. Maddux, *State Taxation, Exploration, and Production in the U.S. Oil Industry*, report prepared for the Wyoming State Legislature, 2001, <http://legisweb.state.wy.us/2001/interim/app/reports/oiltaxpaper%2011-26-01.pdf>; Allaire, J and S. Brown. 2009. *Eliminating Subsidies for Fossil Fuel Production: Implications for U.S. Oil and Natural Gas Markets*, Resources for the Future Issue Brief 09-10; Metcalf, G.E. 2007. "Federal Tax Policy Toward Energy. *Tax Policy and the Economy*," Vol. 21, pp. 145-184.; Headwaters Economics. 2008. *Energy Revenue in the Intermountain West: State and Local Government Taxes and Royalties from Oil, Natural Gas, and Coal*. Bozeman, MT.

<sup>iii</sup> U.S. Geological Survey, 2008. Assessment of Undiscovered Oil Resources in the Devonian-Mississippian Bakken Formation, Williston Basin Province, Montana and North Dakota. Washington, D.C. [http://pubs.usgs.gov/fs/2008/3021/pdf/FS08-3021\\_508.pdf](http://pubs.usgs.gov/fs/2008/3021/pdf/FS08-3021_508.pdf).

<sup>iv</sup> See note ii.

<sup>v</sup> American Petroleum Industry. 2012. *Putting Earnings into Perspective: Facts for Addressing Energy Policy*. [www.api.org/statistics/earnings/upload/earnings\\_perspective.pdf](http://www.api.org/statistics/earnings/upload/earnings_perspective.pdf) (accessed 5/15/2012).

<sup>vi</sup> Headwaters Economics. 2011. *Drilling Rig Activity Nears Twenty-Year High: Price and Technology Remain Key Drivers of Oil and Gas Drilling Activity*. Bozeman, MT.

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<sup>vii</sup> Headwaters Economics. 2012. *Benefiting from Unconventional Oil: State Fiscal Policy is Unprepared for the Heightened Community Impacts of Unconventional Oil Plays*. Bozeman, MT.

<sup>viii</sup> State of Montana Office of Budget and Program Planning. Fiscal Year 2013 Biennium Budget, Section 4. Natural Resource Taxes Revenue Estimates. [http://budget.mt.gov/content/execbudgets/2013\\_Budget/2013B\\_Docs/Section\\_04.pdf](http://budget.mt.gov/content/execbudgets/2013_Budget/2013B_Docs/Section_04.pdf). (accessed 5/18/2012).

<sup>ix</sup> North Dakota adapted a similar incentive rate for wells drilled between June 2008 and July 2009 to encourage horizontal drilling for oil in the Bakken formation that lowered the base tax rate from 11.5 percent to 7 percent. The tax incentive was subsequently extended permanently during the 2009 legislative session, including a price trigger that makes the incentive effective only when the price of crude oil drops below a threshold price. State of North Dakota, Office of State Tax Commissioner. 2007. Oil Extraction Tax Incentive. <http://www.nd.gov/tax/oilgas/pubs/bakkennewwells.pdf>. State of North Dakota, Office of State Tax Commissioner. Oil Extraction Tax incentive Becomes Ineffective November 1, 2009. <https://www.nd.gov/tax/oilgas/pubs/horizontalnewwellmemo.pdf>.

<sup>x</sup> U.S. Energy Information Administration. North Dakota Field Production of Crude Oil (Thousand Barrels). [http://www.eia.gov/dnav/pet/pet\\_crd\\_crpdn\\_adc\\_mbb1\\_m.htm](http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbb1_m.htm) (accessed 5/17/2012).

<sup>xi</sup> U.S. Energy Information Administration. Montana Field Production of Crude Oil (Thousand Barrels). [http://www.eia.gov/dnav/pet/pet\\_crd\\_crpdn\\_adc\\_mbb1\\_m.htm](http://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbb1_m.htm) (accessed 5/17/2012).

<sup>xii</sup> The type curve of the typical Bakken horizontally drilled oil well is from data by geoLOGIC Data Center (<http://www.geologic.com/solutions/data/index.htm>) with calculation and visualization from VISAGE (<http://www.visageinfo.com/>). For a full description of the type curve, see Headwaters Economics, *Benefiting from Unconventional Oil* (note vii).

<sup>xiii</sup> Headwaters Economics, *Benefiting from Unconventional Oil* (note vii).

<sup>xiv</sup> One rig week is defined as the presence of one rig for one week.

<sup>xv</sup> Associated Press. March, 1, 2012. *ND oil drillers taking steep discounts for crude*. CBS News, Bismarck, ND. [http://www.cbsnews.com/8301-505245\\_162-57388806/nd-oil-drillers-taking-steep-discounts-for-crude/](http://www.cbsnews.com/8301-505245_162-57388806/nd-oil-drillers-taking-steep-discounts-for-crude/) (accessed 5/18/2012); Gebrekidan, Selam. May 17, 2012. *Insight: Peak, pause or plummet? Shale oil costs at crossroads*, Reuters, New York. <http://www.reuters.com/article/2012/05/17/us-usa-shale-costs-idUSBRE84G06620120517> (accessed 5/18/2012).