



ECONOMIC RESEARCH CENTER
at **THE BUCKEYE INSTITUTE**

Review of Wyoming's Fiscal Health

February 9, 2017

By Orphe Divounguy, Ph.D., Rea S. Hederman, Jr., Tracy C. Miller, Ph.D., and Joe Nichols

Executive Summary

Since 2008, the Wyoming economy has been contracting even as the overall United States economy has been expanding. Job creation is stagnant and Wyomingites are leaving the labor force. State tax revenues are shrinking with the state economy. The sharp downturn in energy commodities is the main culprit behind Wyoming's downturn.

These economic and fiscal challenges are unlikely to abate. The state's largest source of revenue comes from mineral production, especially coal, oil, and gas. Unfortunately, the energy minerals market is not likely to recover in the near future. Federal government regulations, such as the Clean Power Plan, will have adverse effects on much of Wyoming's energy sector, and permanent technological changes have increased the US supply of oil and natural gas, which leads to lower prices. Thus, state budget revenues are going to remain low along with the price of energy commodities—unless fundamental changes are made.

Wyoming's fiscal situation is even worse than current data suggest, due to the increasing reliance on strong performance from equity markets. In the past few years, high earnings on state trust fund investments have helped bolster state revenues, and have offset the downturn in severance and sales taxes. However, the high fund earnings are the result of above-average stock market gains, which cannot be guaranteed in the future. Excluding those fund revenues, Wyoming's per capita general revenues are down almost 10 percent in real dollars over the last 10 years.

On a positive note, Wyoming revenue forecasts have usually been conservative, especially in the initial two-year period of each forecast. But, the forecasters have been too optimistic in predicting a recovery in the minerals market in the later years of the forecast. This reflects an unsubstantiated belief that better days are around the corner. After some large spending increases in the last decade, the state government has kept spending growth in check and accumulated sufficient savings to carry through cyclical downturns. However, policymakers now face revenue declines that are structural, not cyclical.

Legislators should not continue to rely on savings to fix the shortfall, because falling revenues mean that savings will not be replenished. The status quo of relative flat spending and decreasing tax revenues is not sustainable.

To maintain the health of the state's businesses, ranches, and families, policymakers need to resist anti-growth measures, such as raising taxes to cover shortfalls, which will only cause a vicious cycle of economic and fiscal decline. Policy makers should address the structural decline in revenues with a similar cut in government spending and maintain a pro-growth tax system.

Introduction

The purpose of this report is to analyze the Wyoming economy and fiscal balance. The data suggest that Wyoming's recent economic woes are not cyclical. Instead, persistent changes in energy markets have led to a decline in the value of the state's most important contributor to gross output. As a result, the state's tax collections have fallen. Since the economic environment is the most important factor influencing tax receipts, tax revenue forecasts that govern budget decisions should reflect changes in real economic output. In Wyoming, the Permanent Wyoming Mineral Trust Fund (PWMTF) is only masking a growing fiscal imbalance.

An Overview of the Wyoming Economy

While the rest of the nation has largely recovered from the Great Recession, Wyoming's economy has yet to rebound to pre-recession trends. In Wyoming, falling real gross state product (GSP) is largely due to a decline in the value of output in the mining and logging sector that began at the end of the Great Recession.

The Wyoming population is approximately 600,000, which represents 0.2 percent of the US population. Despite a low gross state product relative to the rest of US states, a small population affords Wyoming the 8th spot on the GSP per capita ranking.

The mining and logging sector plays a significant role in Wyoming's economy. In 2008, this sector made up an impressive 40 percent of the state's real GSP. Coal producers in Wyoming account for 40 percent of all coal mined in the US, with eight of the ten largest US coal mines located in Wyoming's Powder River basin. Wyoming also ranks among the top 10 natural gas- and crude oil-producing states.¹

Although becoming the top energy exporter to other US states has been a blessing for Wyoming in many respects, the state's heavy reliance on out-of-state demand for energy leaves it vulnerable to the notorious booms and busts of global energy markets.

After the recession, while job growth has returned to pre-crisis levels for most sectors, job creation has slowed in the mining and logging sector. By 2015, job growth in the sector had turned negative. As Wyoming's natural gas, coal, and oil output continued to decline in 2016, this has meant lower investment, fewer employment opportunities, and a decline in real household income.

The decline in economic activity is crippling tax collection, leaving the state government to rely mostly on savings and its mineral trust fund (PWMTF) to meet its obligations. Sales and use tax collections are down 20.9 percent in June 2016 relative to the same month in 2015, and severance tax revenues are also trailing last year by 34.2 percent.

Although Wyoming's government spending as a fraction of real gross state product has not increased, the state should enact spending cuts to reflect the state's new economic challenges.

Economic Activity and Tax Receipts

The economic environment is the most important factor influencing state tax receipts. Thus, tax revenue estimates should reflect changes in economic activity. Table 1 below reveals the strong relationships between Wyoming’s tax revenues,³ real GSP,⁴ mining and logging production,⁵ and total employment,⁶ using data from 1997-2014. Correlation measures association between variables. A zero-correlation coefficient indicates no association, while a positive coefficient between 0 and 1 indicates that the variables tend to increase or decrease together. The closer the correlation coefficient is to 1, the stronger the relationship between the variables.

Below, the bolded correlation coefficient of 0.972 (column 1, row 4) indicates a strong positive association between Wyoming’s real gross state product and total tax collections. The coefficient of 0.936 (column 2, row 3) suggests a strong relationship between production in the mining and logging sector and employment in the state of Wyoming. The coefficient of 0.991 (column 2, row 4) indicates an even stronger relationship between employment and tax revenues. This indicates that as the employed population increases, so does the total tax revenue collected.

Table 1. Relationships between real gross state product, employment, tax revenues, and mining and logging employment in Wyoming

Variable	RGSP	Employment	Mining and logging	Tax revenues
RGSP	1	--	--	--
Employment	0.983	1	--	--
Mining and logging	0.981	0.936	1	--
Tax revenues	0.972	0.991	0.929	1

The total tax revenue collected depends on economic activity which, in turn, depends on how individuals respond to current and future tax policy.

Tax Policy in Wyoming

Wyoming is one of a few states in the US that does not levy a personal income tax. Wyoming also does not levy a capital gains tax.

Wyoming generates the bulk of its tax revenue by levying a sales tax as well as other miscellaneous taxes, including severance taxes. In 2015, Wyoming’s sales tax rate was 4 percent. The average local tax was about 1.47 percent, thus the average combined sales tax was about 5.47 percent. This places Wyoming at 43rd in the rank of state and local sales tax rates in the US, meaning that in addition to having no income tax, Wyoming has one of the ten lowest sales tax burdens in the country.⁷

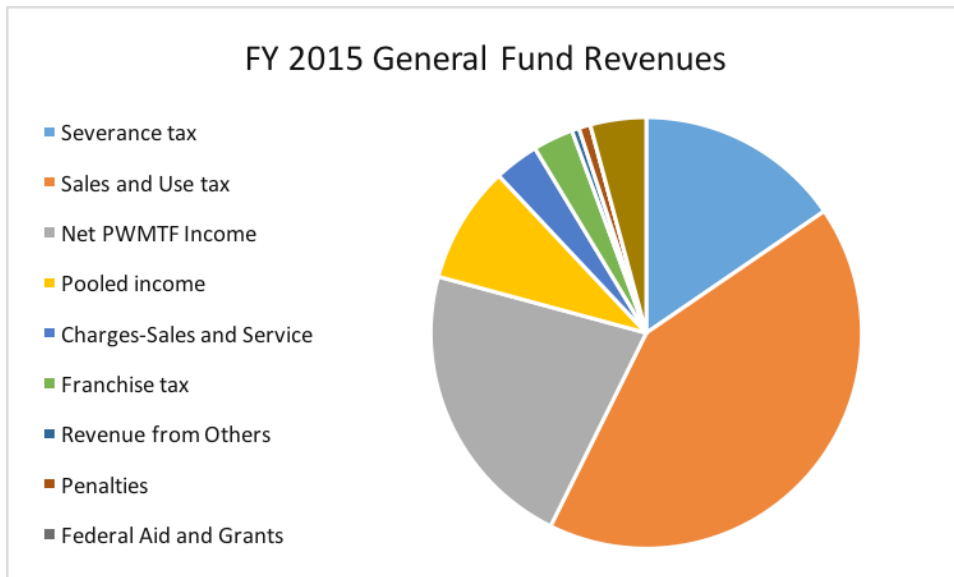
In September 2016, the Tax Foundation released a report evaluating business tax systems in the states as of July 1, 2016 (the beginning of fiscal year 2017). The Tax Foundation graded the states on corporate taxes, personal income taxes, sales taxes and property taxes. In fiscal year 2017, Wyoming’s business tax climate was ranked first in the nation.⁸

The absence of a personal income tax and a capital gains tax, along with a low sales tax, partly explains why Wyoming’s economy has consistently performed above the national average.

Wyoming’s Tax Structure

Like many states, the core of Wyoming’s budget—and the primary focus of the Consensus Revenue Estimating Group (CREG)—is the General Fund (GF), which policymakers use to allocate revenues for normal government operations, such as paying employees and funding public programs. In FY 2015, General Fund revenues in Wyoming were \$1.5 billion. The GF’s three main sources of tax revenues in FY 2015 were: severance taxes on mineral production, especially coal, oil, and natural gas (\$200.7 million); sales and use taxes (\$544.0 million); and franchise taxes on businesses (\$39.3 million). Earnings on investments in the Permanent Mineral Trust Fund (\$494.2 million) and Pooled Income fund (\$114.2 million) also contribute substantially to the General Fund. Taxes on cigarettes, other tobacco products, liquor, and inheritances contribute relatively small amounts of revenue. Wyoming has a property tax that does not contribute to the GF, but is used to help fund education and local governments. Chart 1 below presents a breakdown of these revenues for FY 2015, and the several sections that follow analyze each revenue category more closely.⁹

Chart 1. Fiscal year 2015 General Fund revenues by source

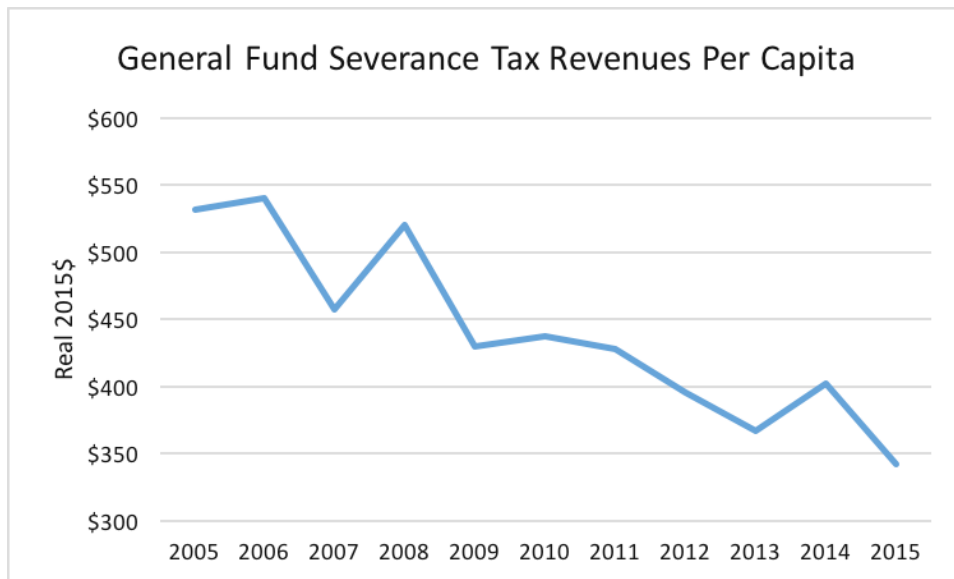


1. Severance Tax

Wyoming is the second-largest energy producer in the United States after Texas,¹⁰ and revenues from coal, oil, and gas production make up approximately 96 percent of the state’s severance tax collections.¹¹ The state’s severance tax revenues have generally been on the decline for the past decade and have fallen behind population growth (see chart 2). Other sources of state revenue include taxes on trona (an industrial mineral), uranium, and construction aggregates such as sand and gravel.

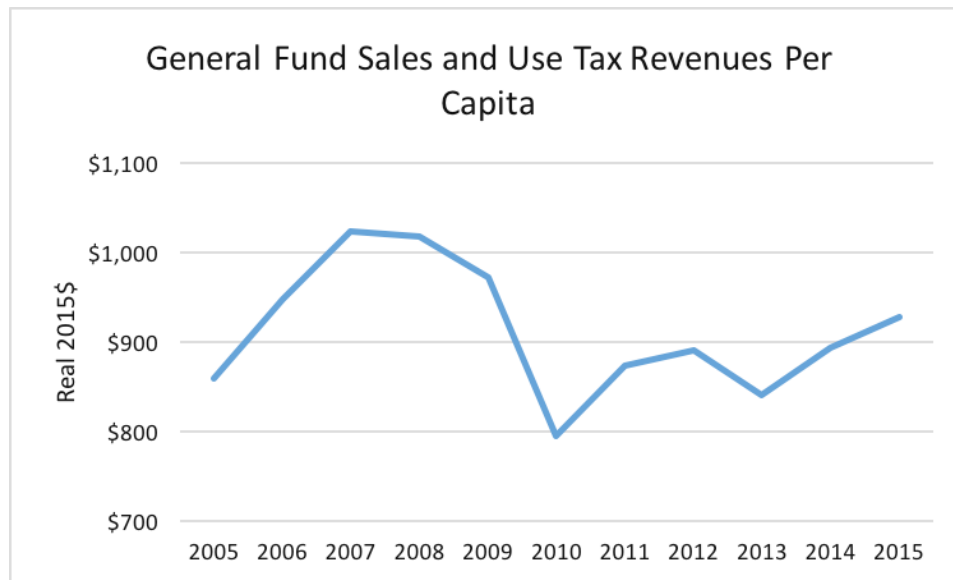
In fiscal year 2015, 44 percent of severance tax revenues went to the Permanent Wyoming Mineral Trust Fund, 26 percent went to the General Fund, and the remaining 30 percent was split between the Budget Reserve Account and various other funds, such as local government and highways.¹²

Chart 2. Severance tax revenues to the General Fund



2. Sales and Use Tax

The state sales and use tax is consistently the top revenue source for the General Fund and comprised 42 percent of GF revenues in FY 2015.¹³ Seventy percent of revenues go the General Fund while the rest goes to local governments.¹⁴ Adjusted for inflation, Wyoming’s state sales and use tax revenues have been largely flat over the last decade, as shown in chart 3.

Chart 3. Sales and use tax revenues to the General Fund

3. Trust Fund Earnings

The General Fund receives income from two major trust funds: The Permanent Wyoming Mineral Trust Fund (PWMTF) and the Pooled Income fund. In FY 2015, these trust funds contributed 33 percent and 8 percent of total GF revenues, respectively.

Mineral trust funds became more common in the 1970s during a period of high energy prices. States like Wyoming initiated trust funds to help alleviate the “boom and bust” cycle so common to the minerals sector. States added constitutional and statutory safeguards to prevent profligate spending during flush times, and the PWMTF is wisely structured with constitutional restrictions on fund expenditures.

The Permanent Mineral Trust Fund can help curb the government’s urge to spend all of the state’s tax revenues. It also provides some stability during down economic times and offers a counter-cyclical fiscal stabilizer. Indeed, other states, such as North Dakota, have followed Wyoming’s lead and set up similar trust funds.

The PWMTF does present two temptations, however. First, the state may rely too heavily on the revenue from the trust fund. This temptation is even riskier when relying on capital returns above historical averages. When those returns decline, interest groups may then propose investing the fund in riskier assets to chase higher yields. Second, the state will be tempted to hear the siren song of special interest groups that demand more earmarked funding. Although Wyoming transfers much of the PWMTF revenues to the General Fund, some of this fund’s revenue is used for specific spending purposes such as education. Unfortunately, these earmarks create constituencies that will support spending revenue from the Trust Fund, and ultimately endanger the Fund.¹⁶

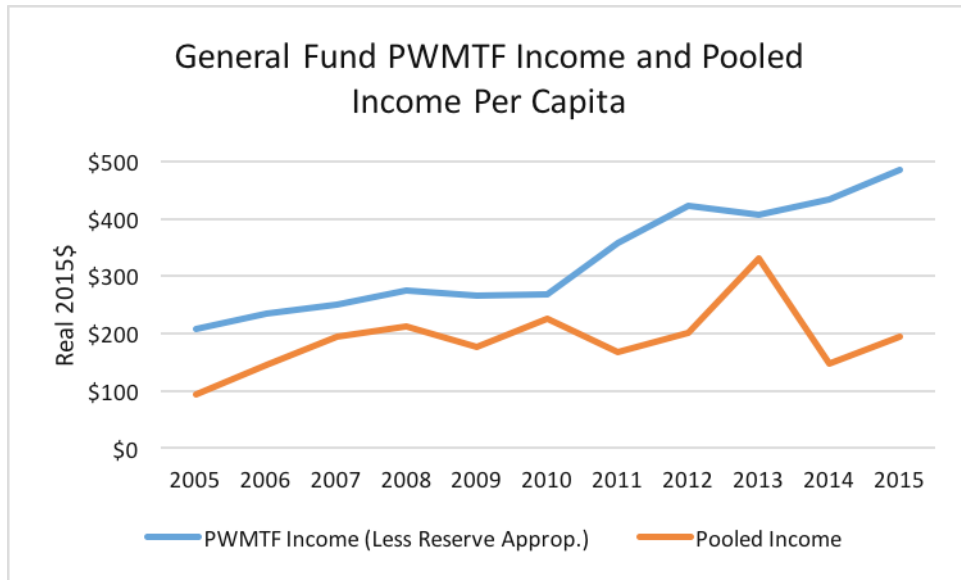
The PWMTF is funded by severance tax revenues and the state treasurer invests the principal balance in financial assets, such as stocks and bonds. Wyoming statute restricts the treasurer from investing more than 55 percent of the PWMTF in equities and the fund typically stays at or near this statutory limit.¹⁷ Because equity returns have been significantly above the historical average since the Great Recession, the Treasurer has been forced to sell equity holdings to keep the portfolio within the 55 percent limit. This forced “re-balancing” has greatly increased capital gains earnings.

The state Constitution protects the principle balance of the fund from being spent, but the investment earnings are deposited into the General Fund. However, policymakers may only spend 5 percent of the rolling five-year average value of the fund, not the entire amount of the investment earnings. Any income above this spending policy amount is automatically reverted to a PWMTF reserve account. Further, if the PWMTF reserve account value exceeds 90 percent of the spending policy amount, the difference is reverted to the PWMTF’s principle balance.¹⁸

In FY 2015, the spending policy amount was \$284.3 million, but investment income was \$494.2 million, of which 70.7 percent was capital gains and the rest was dividends and interest earnings. The difference between income and spending policy level, approximately \$210 million, was reverted to the reserve account. The balance of the reserve account after adding \$210 million was \$390.0 million, which exceeded 90 percent of the spending policy level or \$255.8 million. The difference, \$134.2 million, reverted to the principal balance of the trust fund. So although investment earnings transferred to the General Fund were \$494.2 million, policymakers were left with \$284.3 million to spend for FY 2015.¹⁹

The Pooled Income fund is an aggregation of land funds and endowments that are owned by various state agencies. Like the PWMTF, the funds are invested by the Treasurer and the earnings are deposited into the General Fund. In FY 2015 the Pooled Income fund contributed \$114.2 million to the GF.²⁰ Chart 4 shows the historic change in PWMTF revenues, after reserve account reversions, and Pooled Income revenues to the General Fund.

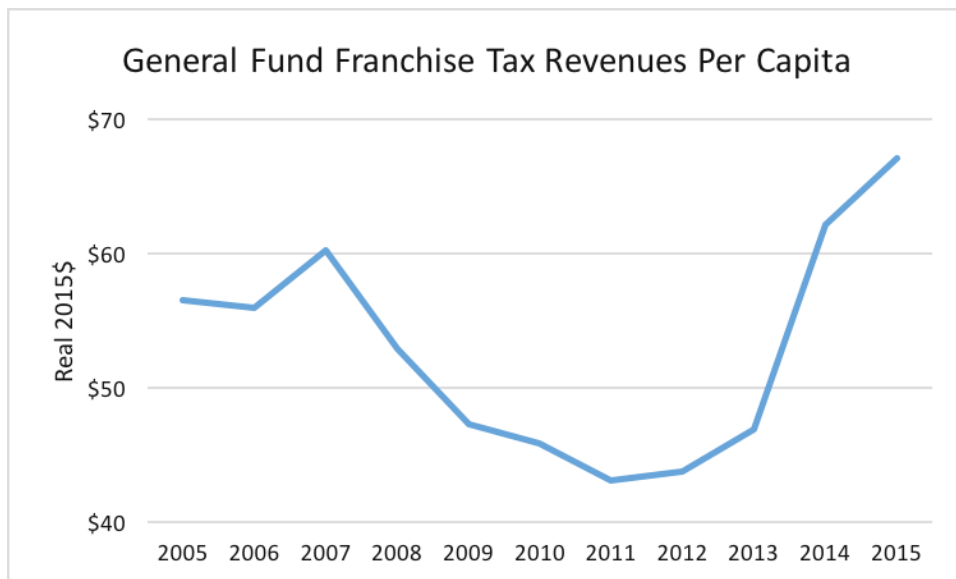
Chart 4. Permanent Wyoming Mineral Trust Fund and pooled income fund contributions to the General Fund²¹



4. Franchise Tax

The franchise tax is assessed on business licenses at \$50 per year or 0.02 percent of business assets (such as equipment and inventories), whichever is greater.²² The franchise tax contributed \$39.3 million to the General Fund in FY 2015. In real per capita terms franchise tax revenues have been largely flat over the decade, but have grown substantially over the past two biennia.

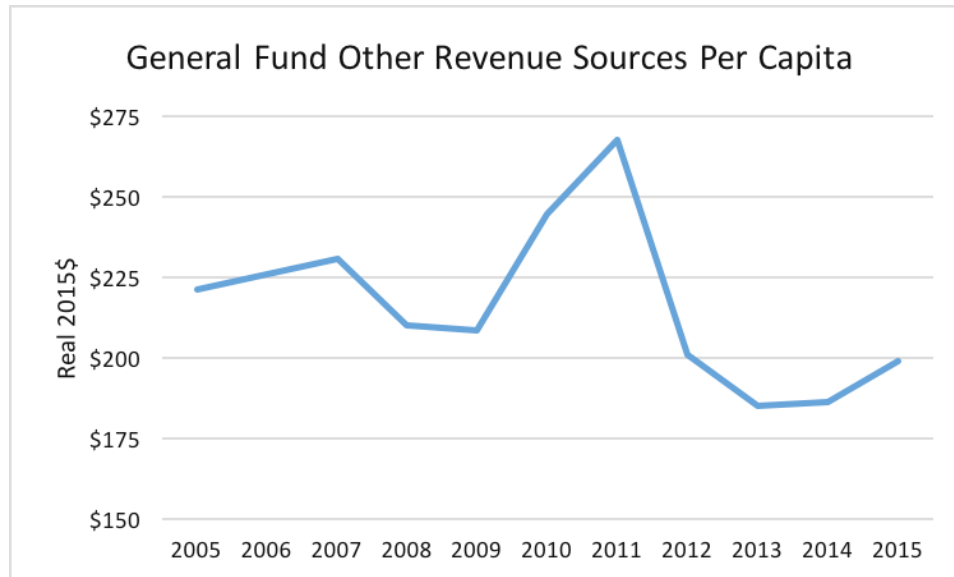
Chart 5. Franchise tax revenues to the General Fund



5. Other GF Revenue Sources

Other sources of General Fund revenue include charges for state sales and services, charges on penalties and interest, “revenue from others” (such as proceeds from oil and gas lease auctions), and “all other,” which includes the inheritance tax and various fees. These four categories combined for 8 percent of the FY 2015 General Fund revenues. Charges for sales and services and “all other” revenues have grown steadily over the past decade, while charges on penalties and interest and “revenue from others” have been mostly flat, but have witnessed some especially high years.

Chart 6. Other revenue sources’ contribution to the General Fund



6. Property Tax

Although property tax revenues do not go to the General Fund, the Consensus Revenue Estimating Group does forecast total state valuation of mineral property and other real property that forms the base of the property tax. Property taxes go directly to various state accounts that provide funding for education and local governments.

The Consensus Revenue Estimating Group

An intergovernmental agency known as the Consensus Revenue Estimating Group (CREG) is responsible for estimating tax revenues annually. The governor and the state legislature use CREG’s report to budget and make appropriations. CREG is co-chaired by the Director of the Department of Revenue and the Budget and Fiscal Manager from the Legislative Service Office. CREG also includes the directors of the Wyoming Oil and Gas Conservation Commission and the Wyoming Geological Survey, as well as representatives from the University of Wyoming’s Department of Economics, the State Auditor, the State Treasurer, the Division of Economic Analysis, and the departments of Administration and Information and Education.

CREG produces a preliminary report every October, updates key assumptions as necessary, and then files a final report every January. Although the final report provides a forecast of all sources of General Fund revenues, it primarily focuses on mineral prices and production because Wyoming depends on minerals revenue (from severance taxes, federal mineral royalties, and coal lease bonuses) more than any other revenue source.

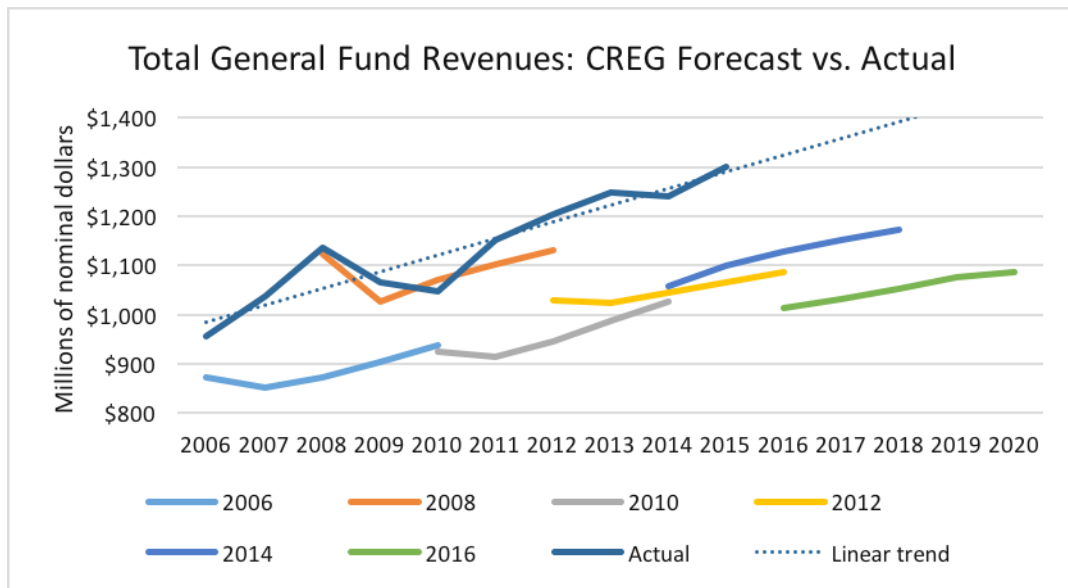
CREG Forecasts

The Consensus Revenue Estimating Group provides a report to the governor and legislature every January that forecasts revenues for the remainder of the current fiscal year (through June 30) and several additional fiscal years out. The forecast for the remainder of the current fiscal year is important because legislators sometimes make last-minute changes to appropriations based on these estimates. However, the most relevant forecasts for policymakers’ budgeting purposes are for the following two fiscal years—i.e., the most relevant forecasts in the January 2016 CREG report are for FY 2017 and 2018 because the legislature and governor use those estimates in the 2016 budget session to craft the biennial budget for FY 2017-18. Further, the even-numbered-calendar year reports are more significant than odd-numbered years because all biennial budget bills are crafted in even-numbered years.

Analysis of CREG Forecasts

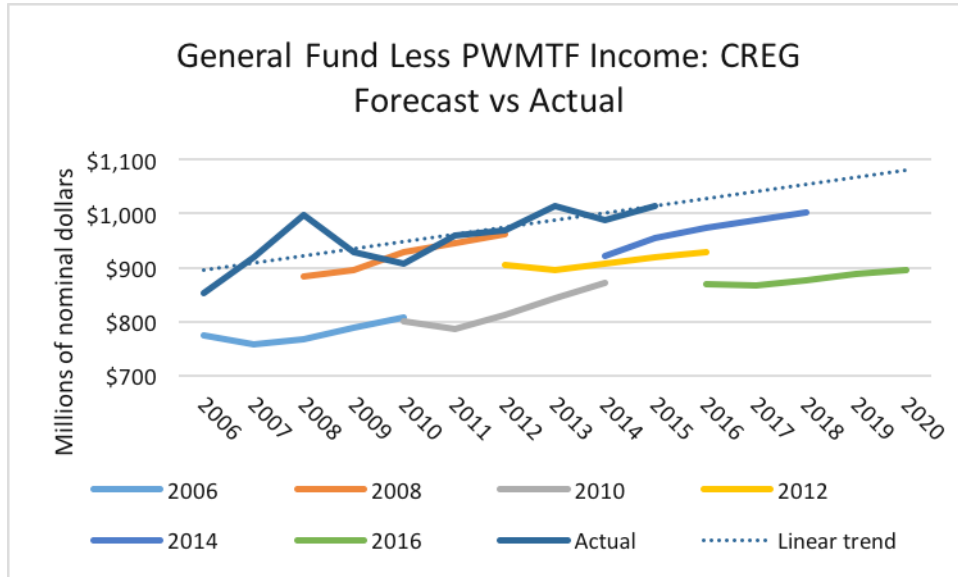
Each of CREG’s eve-numbered-year revenue forecasts have been below actual revenues since 2006, except for the 2008 estimate of FY 2010 revenues, which CREG overestimated by 2.3 percent (see chart 7). CREG also tends to estimate each General Fund revenue category conservatively.

Chart 7. Comparison of CREG General Fund revenue forecasts to actual revenues



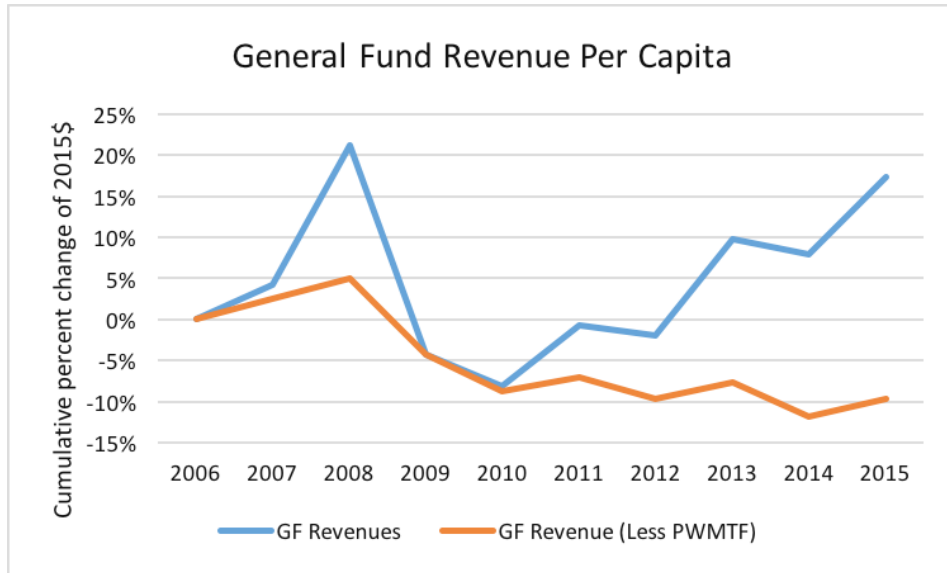
CREG’s 2016 forecast appears especially conservative, largely because CREG does not estimate realized capital gains that accrue to the General Fund from the PWMTF. Since PWMTF capital gains have been unusually high, CREG forecasts have been unusually low relative to actual revenues over the last few biennia. As chart 8 shows, removing PWMTF income from General Fund revenues altogether shows that CREG is still consistently conservative.

Chart 8. Comparison of General Fund revenue (less PWMTF income) CREG forecasts to actual revenues



Historically high PWMTF capital gains income is solely responsible for Wyoming’s total General Fund revenues increasing over time. As chart 9 shows, total General Fund revenues (including PWMTF spending policy reversions) increased 17.3 percent from 2006 to 2015, but less PWMTF income GF revenues have declined 9.7 percent. This signals a major revenue problem that will be best addressed with pro-growth structural spending reforms. Unfortunately, as of July 2016 the PWMTF is carrying a capital loss of \$9.4 million, and the Pooled Income fund is carrying a loss of \$4.4 million. Capital losses are carried forward to offset future capital gains rather than recognized at the end of the fiscal year.²³ Still, the losses mean that trust fund earnings will likely be lower in FY 2016 than in FY 2015.

Chart 9. General Fund revenues have declined absent earnings from the Permanent Wyoming Mineral Trust Fund



The Importance of Revenue Forecast Transparency

Policymakers need to understand how CREG arrives at its estimates in order to make responsible decisions and keep the group accountable. Although members of CREG have recourse to the Economic Analysis Division forecasts, the CREG methodology lacks transparency. It is unclear how CREG determines its estimates for mineral prices and production, which is the main component of the forecast. CREG also does not disclose methods for estimating other revenue sources.²⁴

Transparency produces trust, while allowing taxpayers to see clearly why and how public servants make budget decisions. Further, transparency gives citizens the ability to hold their elected officials accountable. In addition to making good ethical sense, it allows experts to contribute to the revenue estimating process, in order to improve the outcome.

To balance budgets, states must have an accurate forecast of revenue they can expect to collect. The forecast may depend on economic trends that cannot be foreseen. Thus the taxing authority should spell out the assumptions it is making when forecasting tax revenue. If legislators know what assumptions are used in estimating tax revenue, they can better hold the revenue forecasting body accountable for making unrealistically optimistic forecasts.

The revenue estimating body should also provide a range of estimates rather than a single best guess. Government revenue tends to rise and fall with the economy, but economic booms and busts are not foreseeable. For that reason, tax revenue estimates should reflect the unpredictable nature of business cycles. The state should aim to accumulate sufficient reserves during good years so it can pay for deficits in years when revenue is less than anticipated.

Analyzing the Long-run Growth Trend of the Wyoming Economy

The Hodrick and Prescott filter (HP filter) is a useful economic tool to analyze the long-run growth of Wyoming’s economy relative to the US.²⁵ The HP filter “smooths out” historical data sets to separate cyclical fluctuations from the long-run trend. Despite its critics, the HP filter has withstood the test of time and remains an accepted method for examining historical trends.²⁶

The HP filter shows whether Wyoming’s declining economic activity is a symptom of changes in the minerals market that have a permanent effect on potential GSP or the cyclical behavior of the overall economy. We then compare our GSP decomposition for the state of Wyoming with the rest of the US economy.

Charts 10 and 11 below represent real Wyoming GSP per capita between 1997 and 2014, and reveal the differences between Wyoming’s recovery and that of the rest of the nation.

Chart 10. Wyoming gross state product decomposed with HP filter (long-run trend on left, cyclical component on right, all units are in logarithms of real 2015\$ per capita)

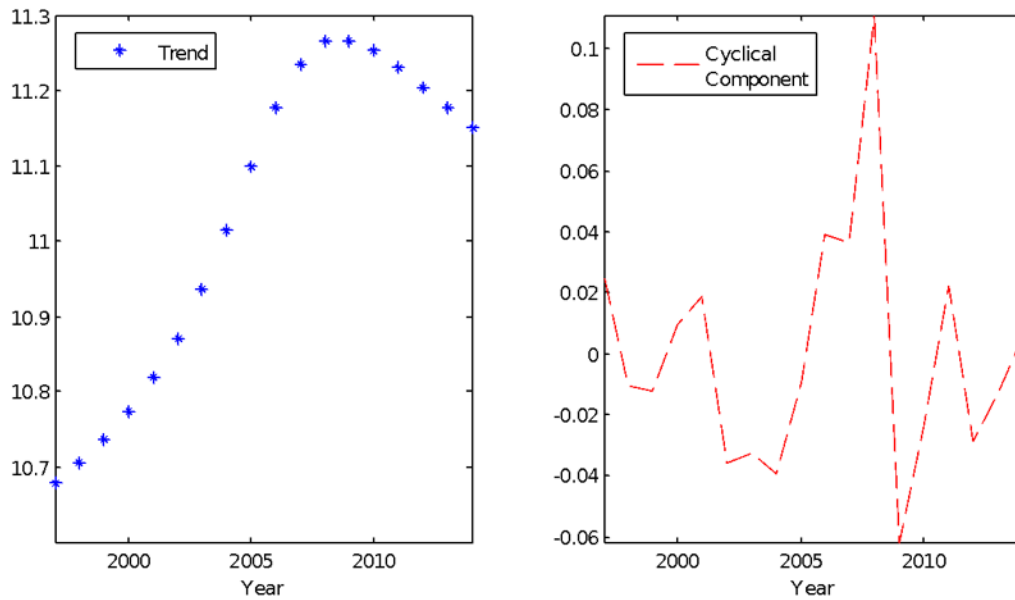
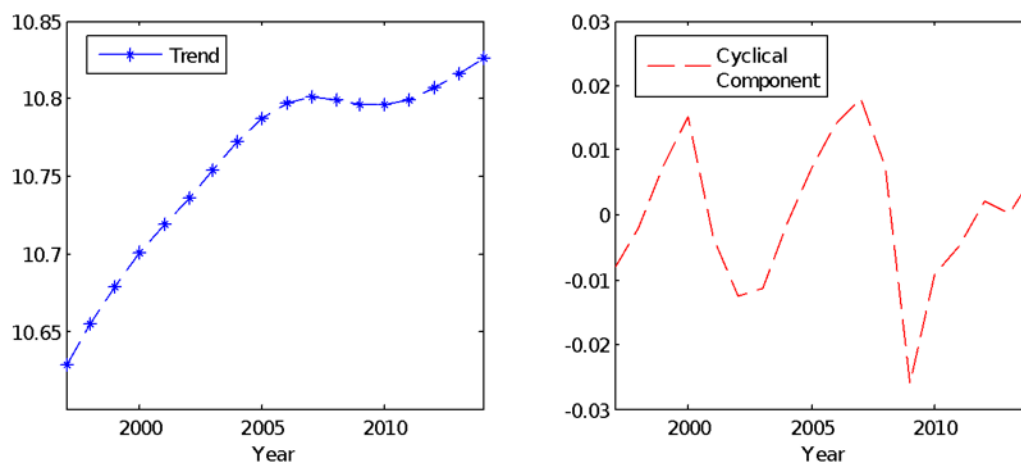


Chart 11. US gross domestic product decomposed with HP filter (long-run trend on left, cyclical component on right, all units are in logarithms of real 2015\$ per capita)

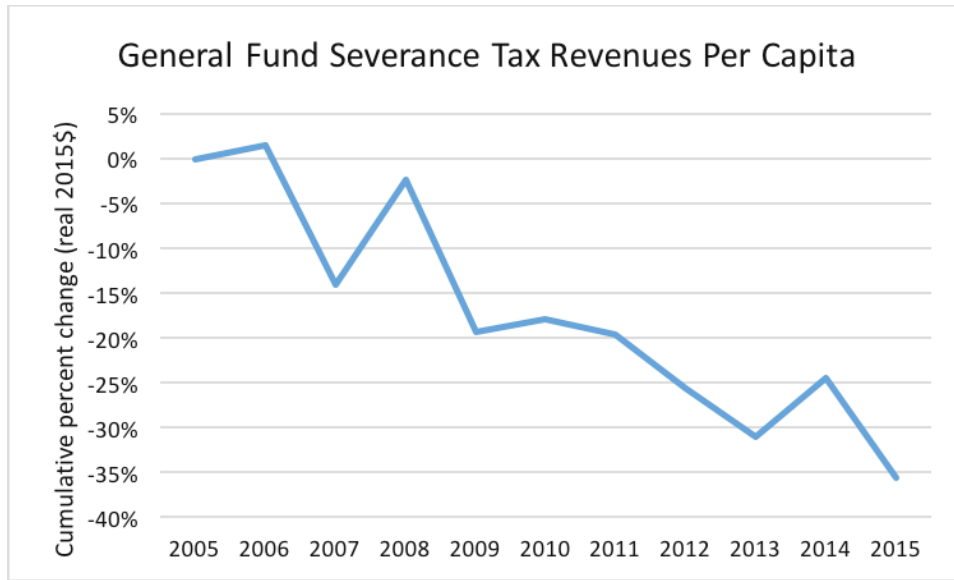


Analysis of CREG Severance Tax Revenue Forecasts

Declining General Fund revenues over the past decade are principally attributable to volatile severance taxes that have shown a distinct downward trend over that time. Overall, CREG has done a reasonably good job of making conservative revenue estimates in the near term, only missing the mark substantially at times of major mineral price changes. Such misses are inevitable given the volatility of globally-traded commodities. However, CREG is generally overly optimistic about the long-run, and though the group has generally tempered that long-run optimism in its 2016 forecast, the 2016 forecast of the 2019-2020 biennium is still too rosy.

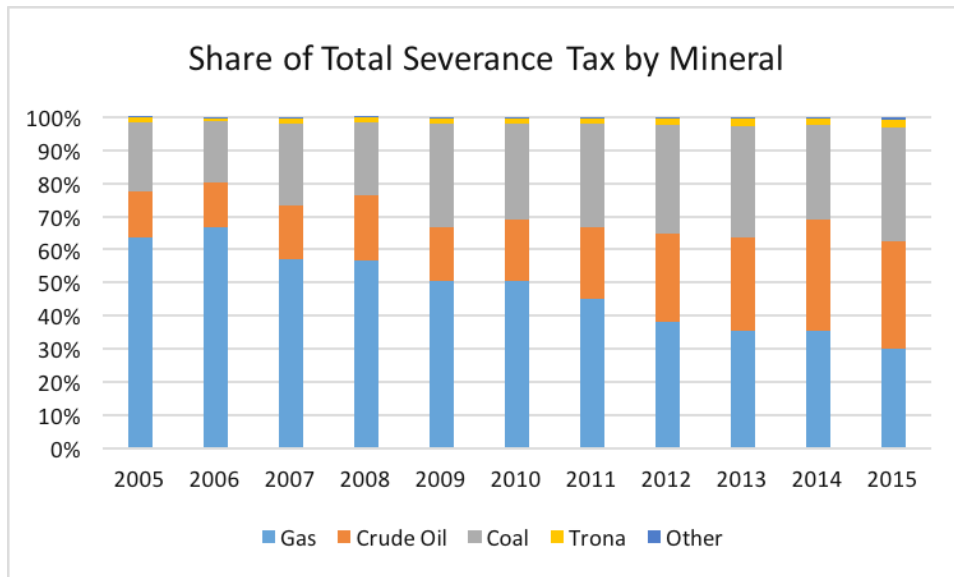
In real per-capita terms, severance tax revenues to the General Fund were 36 percent lower in 2015 than in 2005. This marked decline, shown below in chart 12, has continued into the current fiscal year—collections through June 2016 are 11 percent lower than the January 2016 CREG report projected.²⁷ As a share of total GF revenues, severance taxes have fallen from 27 percent in FY 2005 to 13 percent in FY 2015.

Chart 12. Severance tax revenues to the General Fund



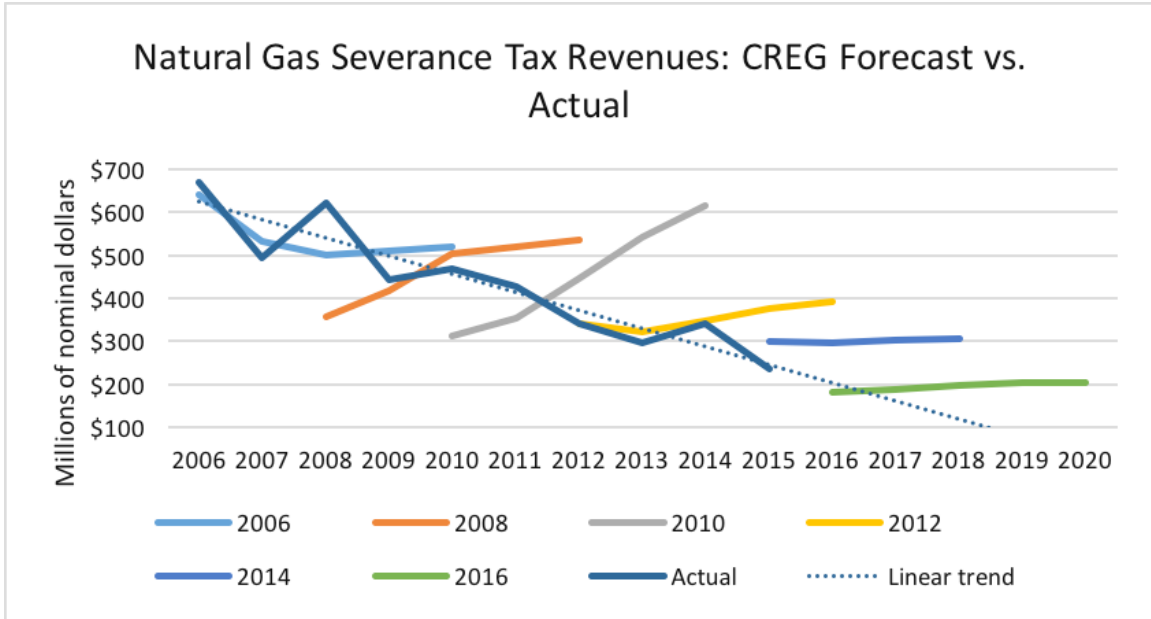
Natural gas is the primary driver of falling severance tax revenues. Historically, natural gas provided the most severance tax revenues, but gas revenues have fallen over the past decade and are now approximately equal to both coal and oil revenues as a share of total severance taxes (as shown below in chart 13)

Chart 13. Mineral shares of total severance tax revenues



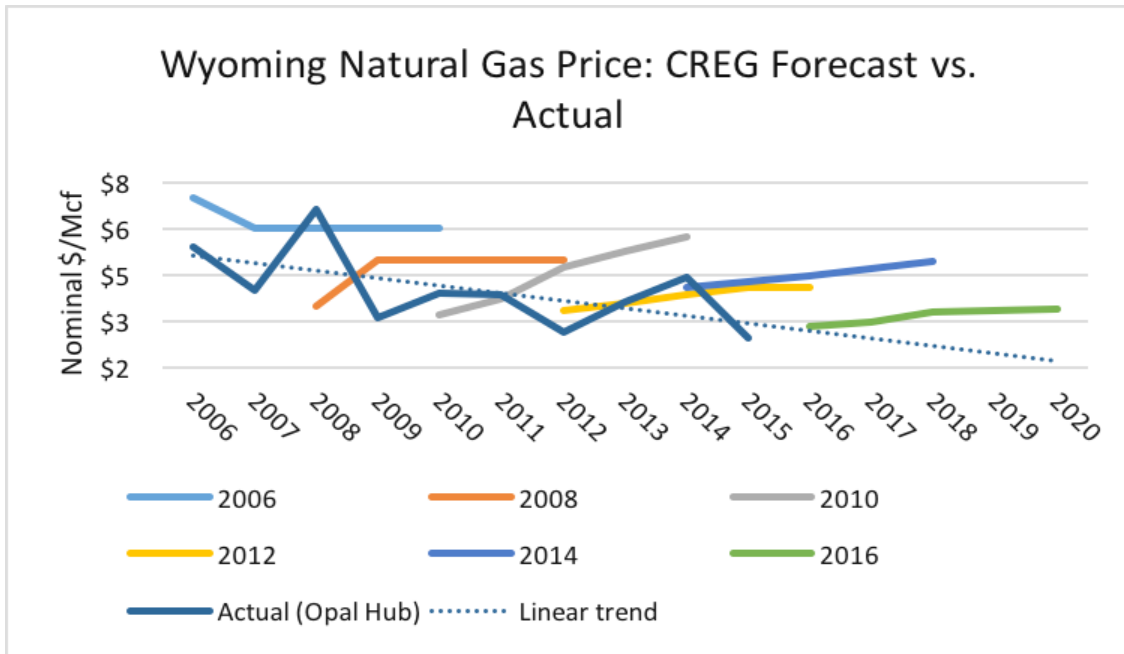
Natural gas revenues fell 65 percent in nominal terms from 2006 to 2015. Chart 14 shows that CREG has typically underestimated or been near to actual revenues in the first two fiscal years of each forecast. However, CREG has consistently been overly optimistic about the path that future gas revenues would take—including the 2016 forecast of nearly-flat revenues.²⁸

Chart 14. Comparison of historical natural gas severance tax revenues to CREG forecasts



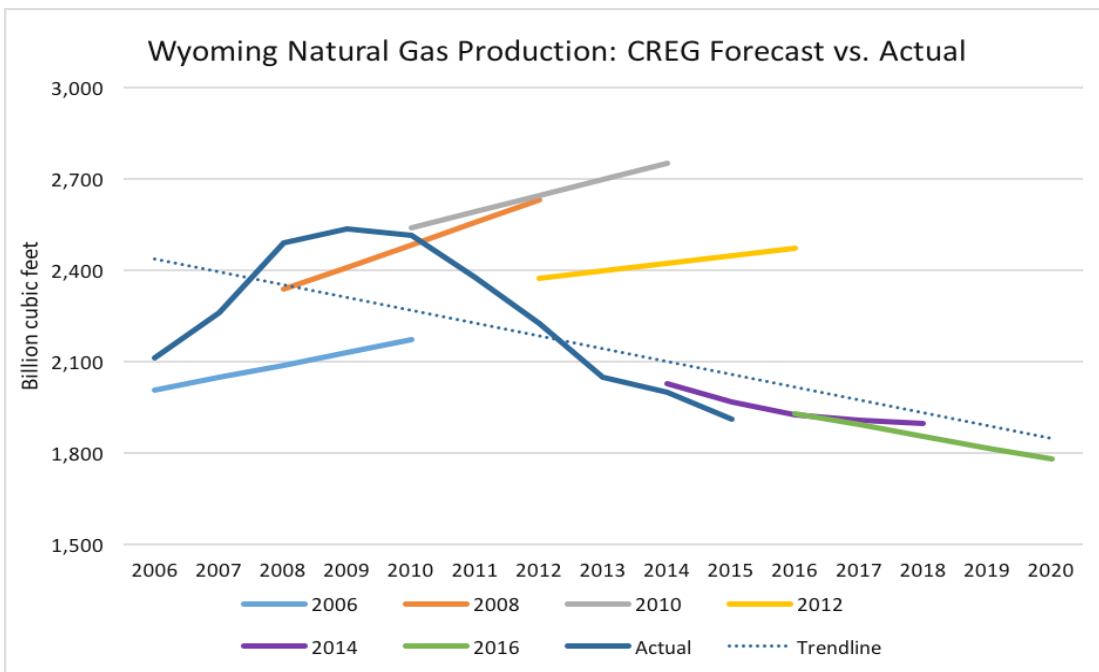
This decline in natural gas revenues in Wyoming is largely attributable to the increase of worldwide gas supplies, which caused a fall in natural gas prices. Nominal prices at the Opal Hub have fallen 54 percent from 2006 to 2015.²⁹ CREG’s 2016 forecast also appears to be optimistic relative to the downward trend, as chart 15 demonstrates. Prices have been on an unmistakable downward trend since at least 2006, but CREG consistently projected that prices would bounce back sharply by the end of the forecast period. There is insufficient evidence to support forecasting a rebound in natural gas prices during the 2016 forecast period. In fact, calendar year-to-date prices have averaged \$2.12 per thousand cubic feet (Mcf) at the Opal Hub through September 2016, falling from the 2015 average of \$2.48.³⁰ This is a decline of 15 percent in less than a year.

Chart 15. Comparison of historical natural gas prices to CREG forecasts



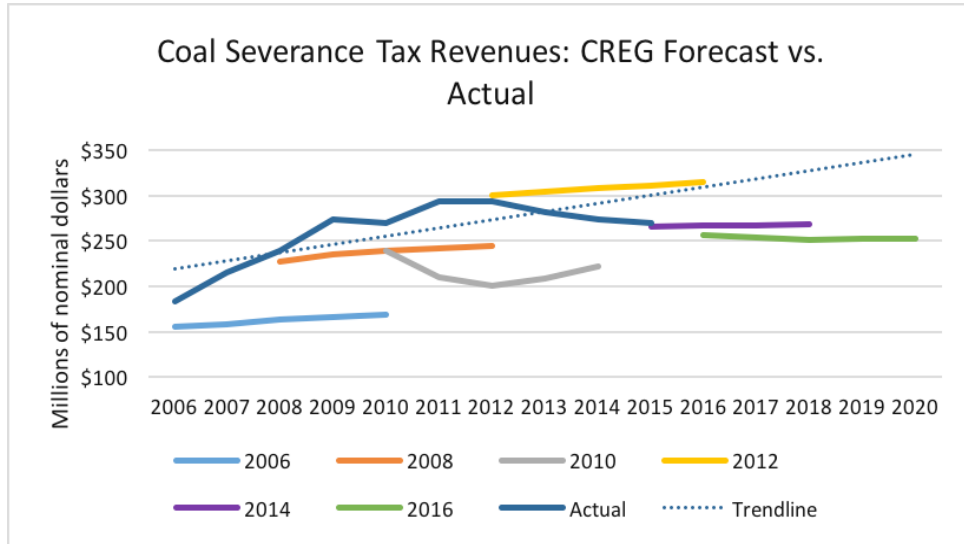
Natural gas production peaked in 2009 and has fallen 25 percent since then. As chart 16 shows, CREG overshot its production estimate substantially in 2010 and 2012 and did not sufficiently temper its 2016 forecast. Gas production through the first half of 2016 is down 6 percent compared to the first half of 2015, but CREG predicted a 1 percent increase.³¹

Chart 16. Comparison of historical natural gas production to CREG forecasts



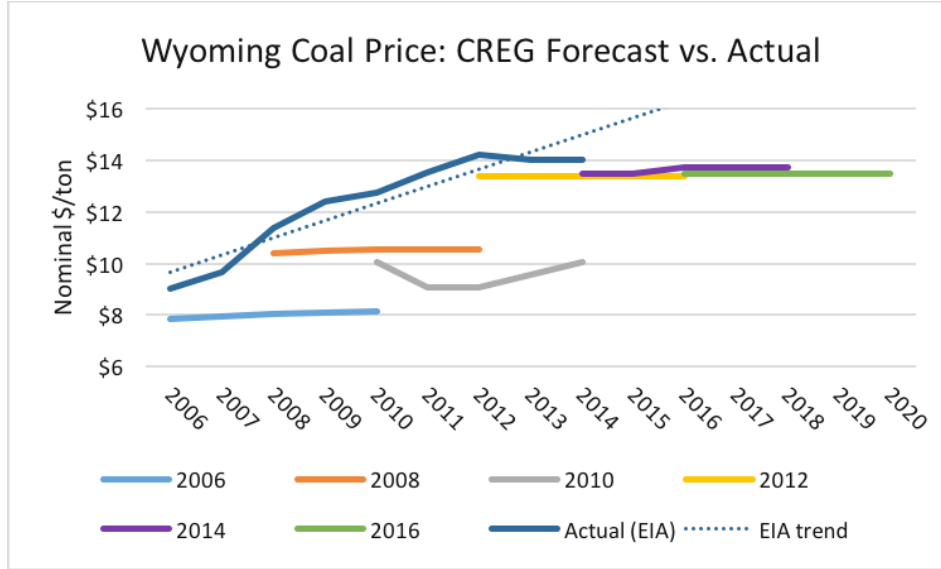
Coal and oil severance tax revenues have generally increased as natural gas severance tax revenues declined, but not enough to make up for the loss in natural gas severance tax revenues. Coal severance tax revenues grew from 2005 to 2011 but fell from 2012 to 2015 (see chart 17), although in nominal terms they are still 47 percent above 2006 levels.³²

Chart 17. Comparison of historical coal severance tax revenues to CREG forecasts



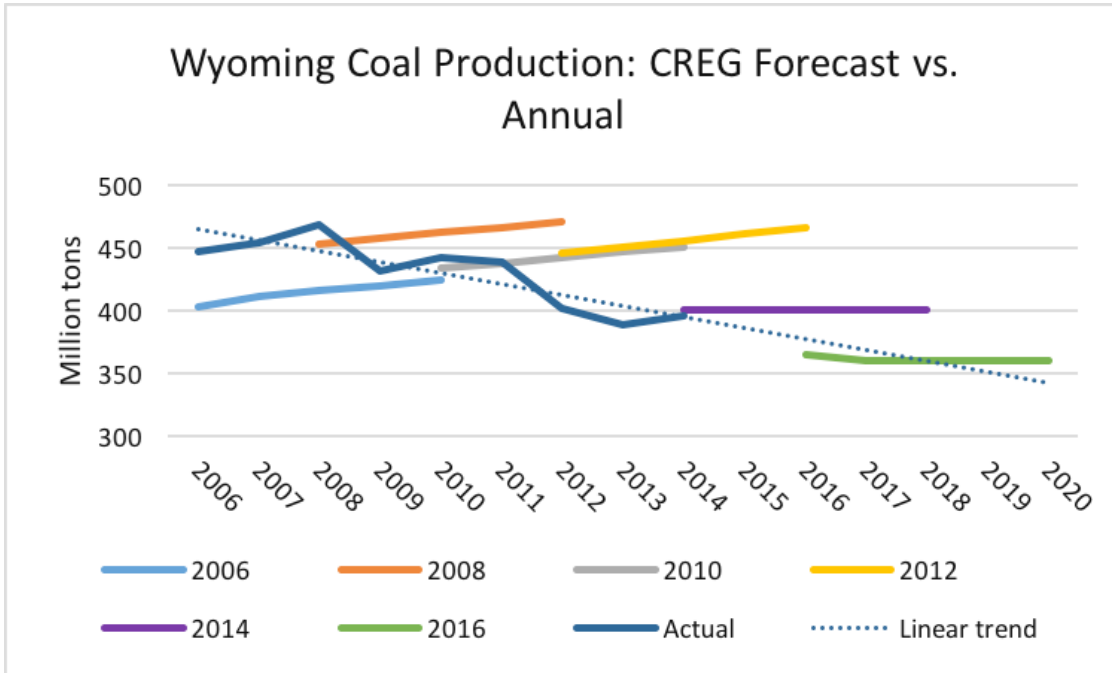
As chart 18 displays, coal prices have been stagnant to moderately declining for the past three years.³³ Wyoming coal sold for \$11.50 per ton, on average, during 2015. Year-to-date through September 2016 the average coal price is down to \$9.17 per ton.³⁴ CREG’s 2014 forecast projected that coal prices would be \$13.50 in 2015, and its 2016 forecast also projected that prices would remain at \$13.50 from 2015-2020.

Chart 18. Comparison of historical coal prices to CREG forecasts



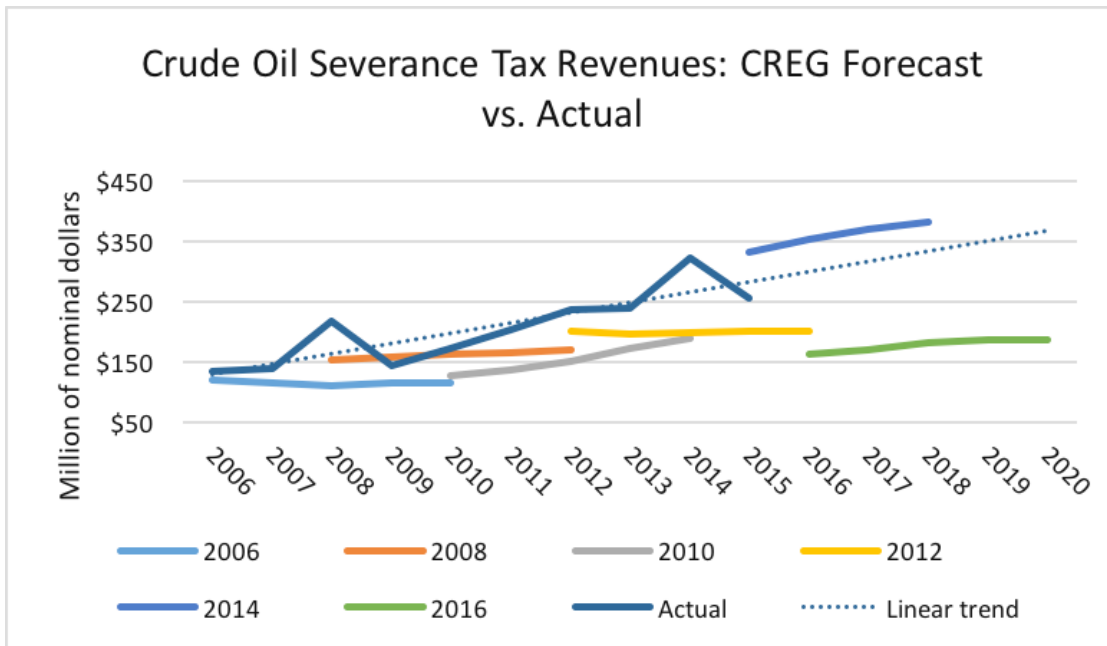
Coal production has declined over the last decade, falling 11.4 percent from 2006 to 2014.³⁵ This trend has continued into 2016—according to EIA, coal production through the first half of 2016 is 26 percent lower than the first half of 2015.³⁶ At the current rate of production, through the first three quarters of 2016, production for the year will be approximately 275 million tons. This would be 25 percent less than CREG’s estimate of 365 million tons and well below historic levels. CREG believes coal production will level out through 2020 rather than continue falling (see chart 19). This estimate is actually conservative relative to EIA’s prediction that output of Western coal will grow slightly over the next five years.³⁷

Chart 19. Comparison of historical coal production to CREG forecasts



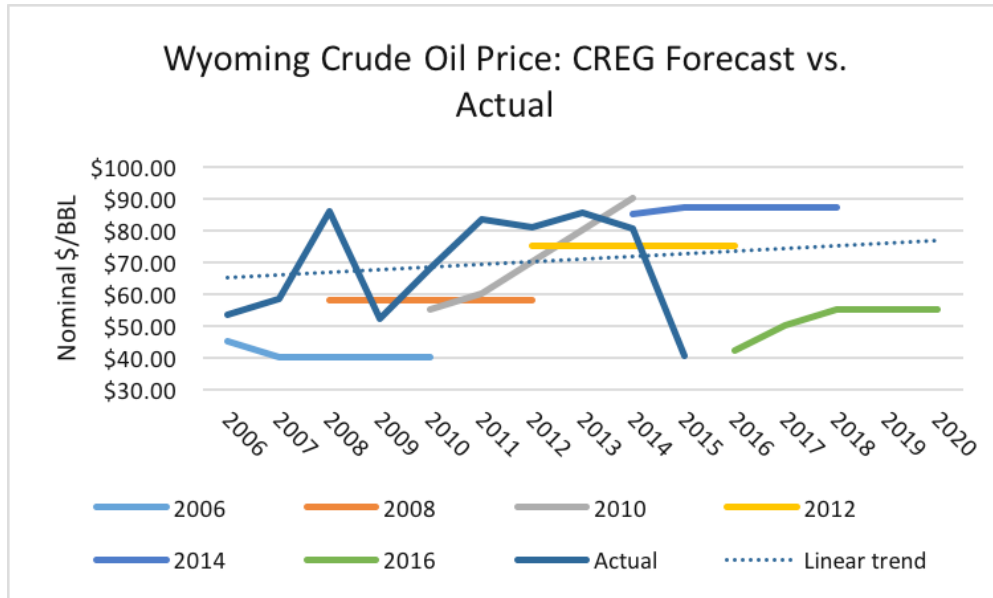
Oil severance taxes have generally increased sharply over the last decade, as chart 20 shows.³⁸ Revenues grew by nearly 150 percent from 2005 to 2015, offsetting approximately 30 percent of the fall in natural gas revenues during that time.

Chart 20. Comparison of historical crude oil severance tax revenues to CREG forecasts



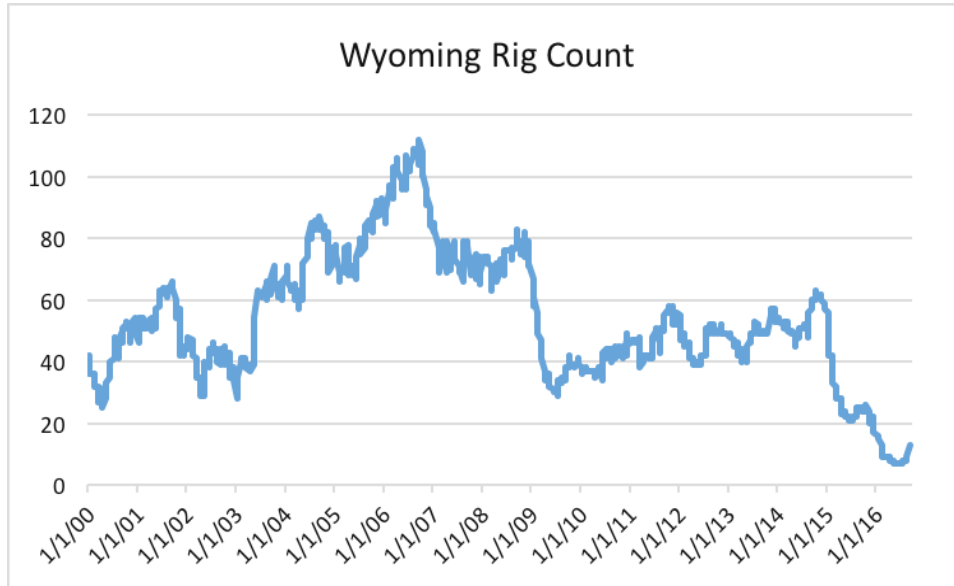
Oil prices in Wyoming are consistently lower than the West Texas Intermediate benchmark price and changes in the average Wyoming price track closely to changes in the WTI. The average sales price per barrel for Wyoming crude fell nearly 50 percent from 2014 to 2015 (see chart 21).³⁹ The Wyoming state budget will face severe pressure if oil prices stay this low for a sustained period because oil provides the state’s best prospect for future severance tax revenue support. Unfortunately, EIA’s average monthly Wyoming oil price through July 2016 is \$39.06 per barrel, 7 percent below CREG’s 2016 estimate of \$42 per barrel.⁴⁰

Chart 21. Comparison of historical crude oil price to CREG forecasts



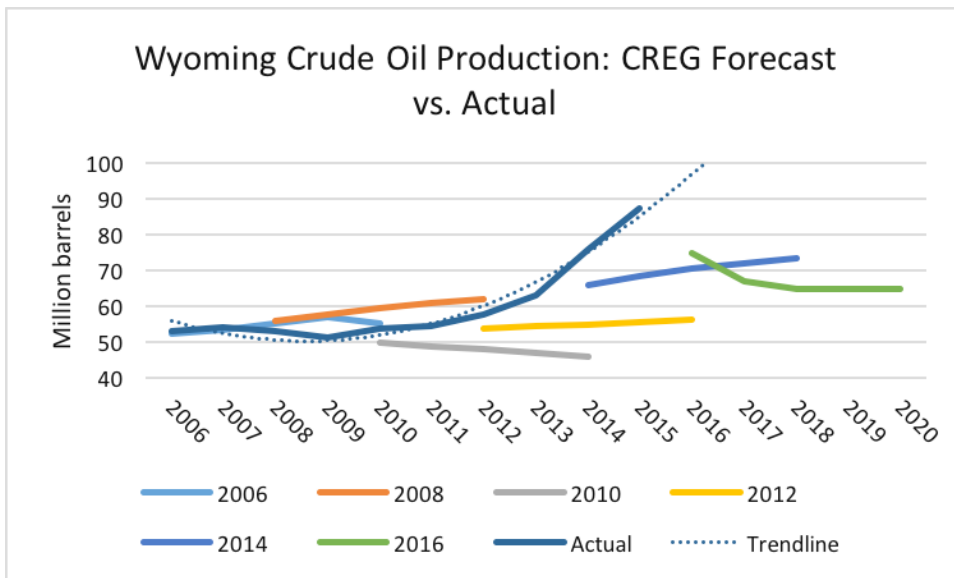
These lower prices have corresponded with a steep decline, since the beginning of 2015, in the number of new oil and gas wells in Wyoming (as shown in chart 22).⁴¹ Although energy companies have become more efficient in the face of low commodity prices, these efficiencies are unlikely to make up for the lack of new wells. Further compounding the issue, well output typically declines dramatically within two years of production.

Chart 22. Historical count of oil and gas rigs actively drilling in Wyoming



Wyoming oil production skyrocketed 62 percent from 2010 to 2015,⁴² but oil production through the first half of 2016 is 17 percent lower than the first half of 2015.⁴³ Fortunately, CREG projected oil supply to fall to 75 million barrels in 2016 (see chart 23) and actual oil production is on track to hit 74.9 million barrels. Wyoming oil supply could fall further in the next two fiscal years due to declining production from existing wells and a lack of new investment.

Chart 23. Comparison of historical oil production to CREG forecasts



Wyoming Policymakers Should Not Count on Minerals Markets to Rebound

Horizontal drilling and hydraulic fracturing (fracking) technology have made oil and gas wells far more productive, which has increased domestic gas and oil supplies, and driven down prices. US shale gas production increased 535 percent from 2008 to 2015,⁴⁴ while the Henry Hub natural gas spot price declined 70 percent.⁴⁵ The oil market has mirrored the natural gas market. CREG and the EIA agree that energy commodity prices have bottomed out. However, it is likely that prices will trade within a narrow band for the foreseeable future. As prices increase, producers will complete wells that have already been drilled but are not yet producing (DUCs) and invest in new wells, causing production to rise and prices to again fall.⁴⁶

Meanwhile, the coal market faces substantial pressure from government regulations and from natural gas, which is taking market share for electric power generation. Neither of these factors – regulation and competition – will change in the near future.

In sum, prices and production for all commodities are weaker so far in 2016 than in 2015. Thus, it is imprudent to expect that any source of severance tax revenue will bounce back substantially any time soon.

Worst-case Scenarios in Wyoming's Future

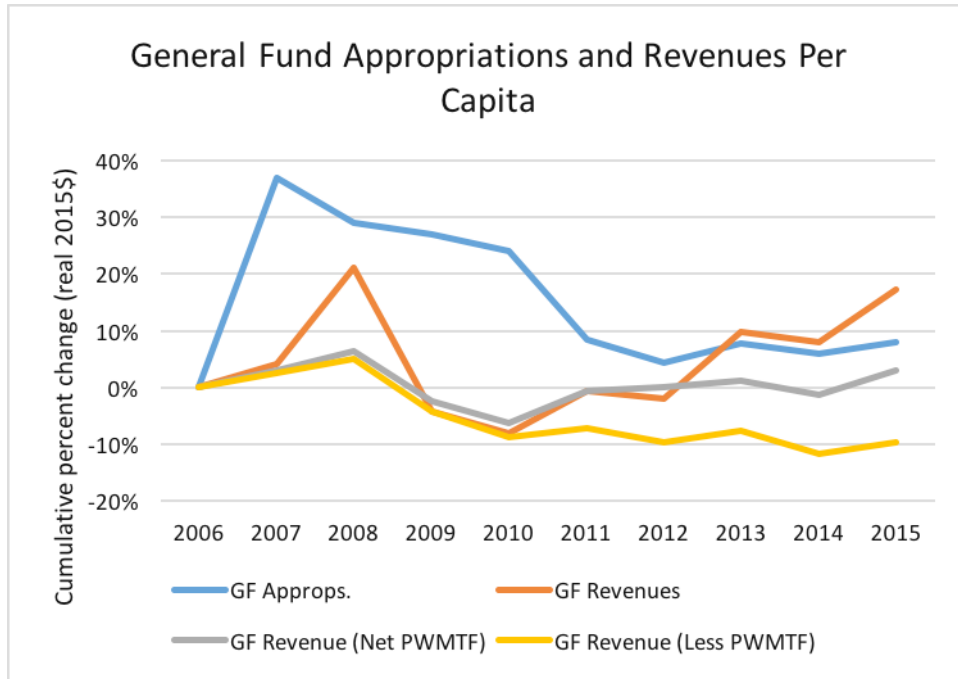
In reviewing the Wyoming tax structure, it is clear that two main problems plague state revenues. First, revenue growth is totally dependent on Permanent Wyoming Mineral Trust Fund gains. Second, severance taxes, which have historically been the backbone of revenue collections, are in a major and ongoing decline. Policymakers must find a way to adjust spending and taxation towards pro-growth policies that will balance the budget and grow revenues without raising taxes.

Mineral Trust Fund Earnings Are Unsustainable

While the decline in mineral severance taxes has put stress on the Wyoming budget, the investment income from the Wyoming Permanent Mineral Trust Fund has helped fill the budget gap. This income is the only revenue source that is growing on a real per-capita basis. This source of revenue has increased by 134 percent over the past decade, but such a high level of income is unlikely to be sustainable. Wyoming has prudently constructed the Trust Fund, but the state's increasing reliance on Trust Fund income jeopardizes the state's fiscal future insofar as it appears unlikely that equity returns will remain at current levels.

Again, investment income from the Permanent Wyoming Mineral Trust Fund is the sole revenue source that is growing General Fund revenues on a real per-capita basis. This fact bodes poorly for Wyoming especially because the high growth in capital gains income is unlikely to continue. Wyoming policymakers should use this opportunity to build up savings and enact pro-growth spending reform to bring appropriations in line with revenues before PWMTF income drops off and leaves a large hole in the budget. Chart 24 displays the growing gap between General Fund revenues less PWMTF earnings and General Fund appropriations.

Chart 24. Comparison of General Fund appropriations, total revenues, revenues with net PWMTF income, and revenues less PWMTF income



The Clean Power Plan May Sharply Reduce Domestic Coal Demand

The Clean Power Plan (CPP) is a federal regulation to reduce carbon dioxide emissions from power plants. The regulation is currently being reviewed by the US Court of Appeals for the DC Circuit. If it is upheld, the CPP is expected to force many coal-fired power plants to close prematurely and reduce the output of remaining coal plants.⁴⁷ The decline in national coal generation would reduce demand for Wyoming coal and cause a permanent decrease in coal severance tax revenues.

At the same time, demand for natural gas is expected to increase slightly as gas plants fill the void left by coal plant shutdowns. Oil markets should not be affected. On balance, the Clean Power Plan would be a net harm for Wyoming if it goes into effect

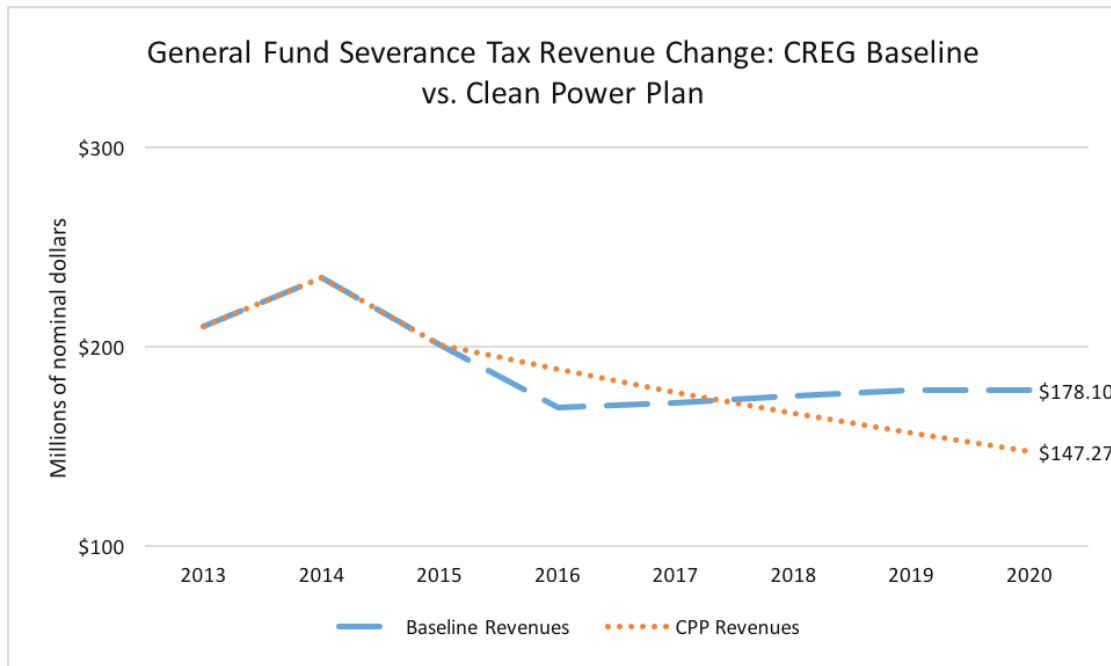
The Center for Energy Economics and Public Policy at the University of Wyoming, in conjunction with the Rhodium Group, analyzed how the CPP would change Wyoming oil and gas production in 2020 relative to a baseline forecast.⁴⁸ Table 2 below shows an estimate of the CPP’s impact on severance tax revenues to the Wyoming General Fund using that report’s estimates of 2020 production and CREG’s 2016 forecast of 2020 prices.

Table 2. Estimate of the CPP’s impact on Wyoming severance tax revenue

2020 Severance Tax Revenue Impact – CPP Regional Compliance with Energy Efficiency					
		Baseline		CPP	
	Price	Production	Revenue	Production	Revenue
Coal	\$13.50	271,703,704	\$256,760,000	173,890,371	\$164,326,400
Natural gas	\$3.40	991,882,353	\$202,344,000	1,055,362,824	\$215,294,016
Total	--	--	\$459,104,000	--	\$379,620,416
Difference	--	--	--	--	-\$79,483,584
Percent change	--	--	--	--	-17.31

Using these assumptions, the CPP reduces net severance tax revenues by more than 17 percent in 2020. If the Plan is implemented, then Wyoming’s total severance tax collections would be \$30.8 million lower in 2020 relative to CREG’s 2016 forecast (see chart 25).

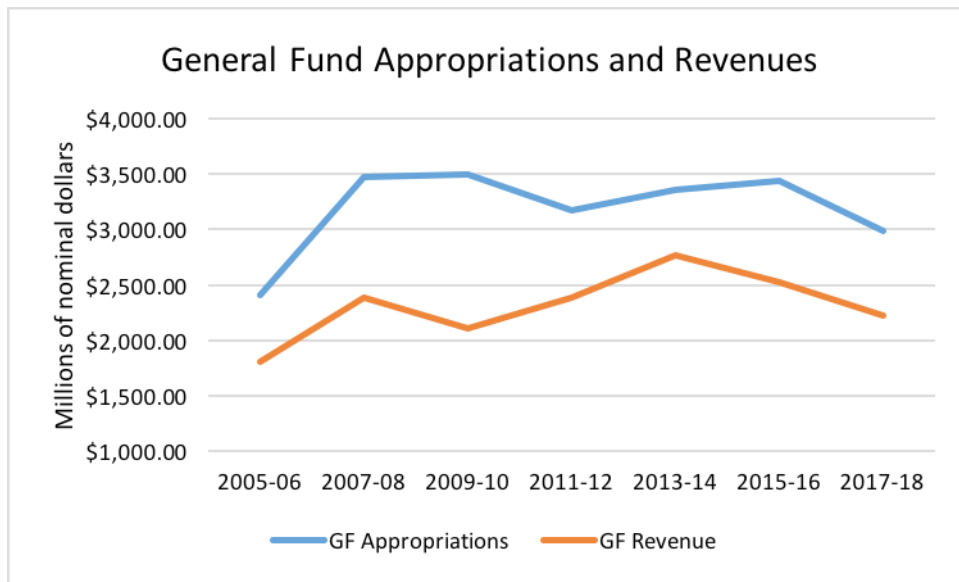
Chart 25. Estimated impact of CPP on Wyoming General Fund severance tax revenue in 2020



Government Spending in Wyoming

As chart 26 shows, Wyoming typically spends more than its General Fund revenues. However, the state uses the Budget Reserve Account (BRA), which receives its own revenues plus funds left over in the General Fund at the end of the year, to cover the difference between GF revenues and spending. The state also has a rainy day fund, the Legislative Stabilization Reserve Account (LSRA), that can also make up for budgetary shortfalls. General Fund spending has been relatively flat for the past 7 budget cycles.⁴⁹

Chart 26. Comparison of General Fund appropriations to revenues



In the 2015-16 biennium, General Fund revenue fell short of appropriations by 32 percent. Despite this difference, the ending General Fund balance was estimated to be positive at \$104.19 million, mostly due to spending of \$922.5 million in Budget Reserve Account revenues. However, Wyoming statute mandates that 5 percent of General Fund revenues be left in the account, meaning that by law the ending balance should have been at least \$109.86 million. Taking into account the state’s failure to meet this reserve mandate, the state carried over a deficit of \$5.67 million over the biennium.⁵⁰

As table 3 highlights, the deficit would have been larger save for agency budget cuts of \$108.1 million imposed by the Governor and a cancellation of \$184.4 million that was originally set-aside for LSRA savings. If it were not for these measures, the ending balance would have been \$298.1 million short of the statutory 5 percent reserve.⁵¹

Table 3. Analysis of FY 2015-16 General Fund and Budget Reserve Account

	2015-16 Biennium
GF revenues (Less PWMTF reversion)	\$2,370,426,553
GF appropriations (From 2014, 2015, and 2016 budget bills)	\$(3,471,974,263)
Difference	\$(1,101,547,710)
BRA Revenues	\$922,524,390
Agency budget reductions	\$108,094,208
Cancellation of LSRA savings	\$184,353,888
Net effect of other changes	\$(9,235,073)
Ending balance	\$104,189,703
Statutory reserve	\$109,860,000
Difference	\$(5,670,297)

Wyoming’s fiscal profile, published by the Legislative Service Office, gives a detailed breakdown of where the state’s “traditional funds” will likely be at the end of the 2017-18 biennium. As Table 4 shows, the total change over that time is an alarming \$662.61 million spend-down of reserve accounts that is not sustainable.⁵² When reserve accounts are emptied, the state will have to balance revenue and spending in the same year.

Table 4. Analysis of traditional funds balances at fiscal year-end 2018

Appropriations of Traditional Funds Over 2015-16 and 2017-18 Budgets			
	Beginning	Ending	Change
General Fund	\$0.00	\$0.00	\$0.00
Budget Reserve Account	\$104.35	\$104.55	\$0.20
Legislative Stabilization Reserve Account	\$1,811.87	\$1,590.87	-\$221.00
Strategic Investments and Projects Account	\$135.00	\$0.00	-\$135.00
School Foundation Program Reserve Account	\$0.00	\$100.00	\$100.00
School Foundation Program	\$100.00	\$100.00	\$0.00
School Capital Construction Account	\$0.00	\$0.00	\$0.00
PLF Holding Account	\$475.00	\$68.19	-\$406.81
Total	\$2,626.22	\$1,963.61	-\$662.61

Among programmatic budget categories, spending increases have been greatest for higher education, health, and general government over the past 5 budgets. At the same time, the category that saw the biggest cuts was long-term savings, such as the LSRA rainy day fund—and the largest cut was in FY 2015-16.⁵³

Table 5. Major spending changes over past five budgets

Biennium	Higher education	Health	General government	Long-term savings
2007-08	\$143.15	\$202.10	\$367.62	\$216.98
2009-10	-\$15.07	-\$56.78	-\$10.55	\$183.31
2011-12	-\$43.31	-\$43.31	-\$233.56	-\$91.72
2013-14	\$134.99	\$134.99	-\$22.42	\$49.47
2015-16	-\$4.45	-\$4.45	\$99.28	-\$554.04
Total change	\$215.31	\$232.55	\$200.38	-\$195.99

Overall, the state has kept spending to reasonable levels. However, given the stagnation in total revenues, the structural declines in the minerals markets, and the low probability of continued windfalls from the PWMTF earnings, policymakers need to make hard choices now about how to bring spending in line with future revenues. Most importantly, the state needs to avoid honeypots like Medicaid expansion, which promise short-term budget gains but long-term fiscal and economic damage.

Conclusion

Wyoming is in a precarious situation. The state economy has been contracting for several years, even as the US economy has improved, post-recession. Wyoming tax revenues are falling behind its spending patterns.

Unfortunately for policymakers, the situation is likely to worsen.

Coal, oil, and natural gas production have historically provided a stable base for employment, economic growth, and tax revenues in the state. However, these energy markets have faced severe and structural difficulties in recent years that are unlikely to improve meaningfully anytime soon. Policymakers should not count on energy companies to bounce back and start laying golden tax-revenue eggs again.

Even worse, the state is highly vulnerable to the next economic downturn.

All states struggle during recessions because revenues typically fall and demand for government services, such as welfare programs, increases. Wyoming revenues are already stagnant to declining, and the only bright spot has been high earnings from the Permanent Wyoming Mineral Trust Fund. But, PWMTF earnings are only increasing because of abnormally high stock market gains. Because stocks tend to fall with recessions, PWMTF earnings will fall during the next economic downturn. In that case, Wyoming policymakers will be forced to satisfy higher demand for state spending with savings. The result would likely be disastrous.

Although Wyoming policymakers generally take a responsible approach to budgeting and do well to set-aside savings, these habits will not likely suffice during the next recession. Policymakers should make pro-growth changes now so that when the next downturn happens, the state can stay solvent and make a strong recovery.

About the Authors



Orphe Divounguy is an Economist with The Buckeye Institute's Economic Research Center. In this role at Buckeye, Divounguy analyzes the impact of federal and state government policy on economic outcomes in Ohio.

Divounguy joined The Buckeye Institute after earning his Ph.D. from England's University of Southampton, where he also obtained his master's degree. After receiving his Ph.D., Divounguy served as a teaching and research fellow. He also worked as an international economic consultant. His research focused on labor policy, migration policy, and economic development.

Before his time in higher education, Divounguy interned at the United Nations Department of Economic and Social Affairs in New York, and Cato Institute in Washington, D.C. Divounguy lives in downtown Columbus, Ohio with his wife.



Rea S. Hederman Jr. is Executive Vice President and Chief Operating Officer of The Buckeye Institute. At Buckeye, Hederman manages the organization's team, operations, research, and policy output. He also oversees the Economic Research Center.

Prior to that, he was a Director of the Center for Data Analysis (CDA) at The Heritage Foundation, where he served as the organization's top "number cruncher." After joining Heritage in 1995, he was a founding member of the CDA, in 1997, when it was created to provide state-of-the-art economic modeling, database products, and original studies. Hederman oversaw Heritage's technical research on taxes, healthcare, income and poverty, entitlements, energy, education, and employment,

among other policy and economic issues, and was responsible for managing its legislative statistical analysis and econometric modeling for Heritage policy initiatives.

In 2014, Hederman was admitted into the prestigious Cosmos Club as a recognition of his scholarship. He graduated from Georgetown Public Policy Institute with a Master of Public Policy degree and holds a Bachelor of Arts degree in history and foreign affairs from the University of Virginia. Hederman resides with his wife, Caryn, who is an attorney, and their three sons in Powell, Ohio.



Tracy C. Miller is a visiting fellow at The Buckeye Institute and a Senior Policy Research Editor at the Mercatus Center at George Mason University. Previously, he was associate professor of economics and fellow for the center for Vision and Values at Grove City College. His recent research has included articles on transportation policy, state employee pensions, and health care policy.

He received his Ph.D. in economics from the University of Chicago. He also holds a Master's Degree in agricultural economics from Michigan State University and a B.S. in forestry from Virginia Polytechnic Institute and State University.



Joe Nichols is the Policy Analyst at The Buckeye Institute's Economic Research Center. Nichols' primary role is to analyze energy policies and their effect on the economy. He also is responsible for tracking employment data to assess the health of the labor market and find solutions for increasing the number of jobs in Ohio.

Prior to his position at Buckeye, Nichols obtained his Bachelor of Arts in Economics from Denison University in Granville, Ohio. During college, Nichols worked for a law firm, the Denison Admissions Office, and a local farm. He lives in Newark, Ohio, with his wife, two young sons, and dog.

Appendix A: State Tax and Spending Fundamentals

Taxes affect state and local economies. By creating financial incentives and disincentives, taxes influence earnings, employment decisions, productivity, corporate hiring, individual spending, and ultimately a state's economic health. Ideally, a state tax system should be easy to enforce, with a broad tax base designed to keep tax rates flat and low in order to minimize taxation's distorting effects on how people work, save, invest, and spend.

Income Taxes: Personal and Corporate

By taxing personal income, states inevitably influence incentives for earning that income. The less income that an earner is permitted to keep, the less incentive she has to earn it. Income taxes are often progressive, meaning that the more one earns the higher the tax rate on those marginal earnings.⁵² Taxing labor income, or wages, creates incentives for workers to substitute leisure for labor, whereas lower income tax rates create incentives to work, earn, and keep more. The Organization for Economic Cooperation and Development (OECD), for example, found that a 10 percent reduction in the marginal income-tax rate increased the employment rate in the average OECD country by 3.7 percentage points.⁵³ Similarly, progressive taxes on savings and investments create disincentives to save and invest. The less that people earn and the less that they save and invest, the lower their standard of living. Thus, the incentives and disincentives created by state income tax policies can have profound effects on state and local economies.⁵⁴

Corporate income taxes, or taxes on corporate profits, create similar incentives for businesses, but their effects extend beyond the corporation itself and will ultimately be felt employees, shareholders, and local economies. Businesses can choose where to incorporate and where to locate. They can seek out states and communities with low or no corporate taxes, and will often avoid locating in states with higher corporate tax rates. Thus, states with higher corporate taxes will see less corporate investment and fewer employers. Fewer employers offering fewer jobs and lower investments mean less production and less employment, which will, in turn, mean the state's economy will grow more slowly.⁵⁵ In fact, research shows that the corporate income-tax rate is the most significant, harmful tax affecting economic growth.⁵⁶

Corporate taxes do not merely influence where businesses locate. The burden of corporate taxes ultimately falls on employees and consumers. Corporate taxes affect employee wages and earning potential. Money that businesses pay in taxes cannot be spent on wages or other capital investments and improvements that might otherwise benefit employees and shareholders. Capital investment has been shown to affect employment growth, wages, and productivity. Harden and Hoyt, in a study of state tax systems, conclude that corporate income taxes negatively impact employment growth rates.⁵⁷ Less capital investment means fewer hires, which reduces the demand for labor and thus lowers wages. Conversely, lower corporate tax rates tend to improve productivity, which then improves profitability and employee wages.⁵⁸

Consumption and Severance Taxes

Unlike income taxes, consumption or sales taxes are almost never progressive. Instead, sales taxes are typically “flat taxes” that charge the same rate to every consumer regardless of the amount purchased or used. This makes sales taxes some of the easiest taxes to administer.⁵⁹

Sales taxes boast important advantages over personal and corporate income taxes. First, whereas income taxes apply to all income, including savings and investments, consumption taxes only tax money when it is spent. Thus, sales taxes do not discourage earning, saving, or investing—the key ingredients to economic growth.⁶⁰ Second, consumption taxes are relatively inexpensive to collect and enforce, particularly when the rate is the same for many goods and services. Progressive income taxes, by contrast, can be complicated and time-consuming for both the taxpayers and state administrators. Third, sales taxes have flexibility to be spread across broader tax bases in order to reach additional goods and services while maintaining a low overall tax rate. The broader the tax base to which a consumption tax applies, the lower the tax rate needed to collect a given amount of revenue. Broadening the tax base and keeping the rate low allows states to raise additional revenue when needed without significantly increasing enforcement and administrative costs, and without doing further damage to earning and investment incentives. Tax research has shown that consumption taxes have a smaller negative effect on economic growth than do personal or corporate income taxes.⁶¹

To be sure, all taxes affect behavior, and consumption taxes influence consumers by creating incentives and disincentives for purchasing certain goods and services. Higher sales taxes on particular products discourages consumers from purchasing them. Many states, for example, have high tax rates on cigarettes in order to discourage smoking. Similarly, some states have sales taxes that apply to narrow bands of goods while excluding most services. When goods but not services are taxed, there is an incentive to purchase services over goods.⁶² But with the exception of high sales taxes on business equipment,⁶³ such incentives do not tend to have the same adverse effects that income taxes have on broad economic growth, investment, job creation, and earning power.

Limiting the effect of consumption taxes, however, depends on states taxing only the final sales of goods and services, and avoiding the temptation to tax gross receipts or business-to-business transactions. Taxes on gross receipts and business-to-business transactions can quickly pyramid and distort markets for goods that require several production stages. As those business-to-business taxes compound through the production process, the final sales price grows increasingly expensive.

Severance taxes offer resource rich states—like Wyoming—another potential revenue stream. Such revenues, however, are less consistent than with most other tax bases and are subject to their own supply and demand incentives. States may raise severance tax rates on land without good alternative uses without affecting too heavily the incentive to extract resources. But when land enjoys a number of alternative uses, the landowners’ bargaining power limits the flexibility of severance taxes. The higher the severance tax on mining and drilling firms extracting resources, the less those firms will be willing to offer landowners—and thus, the less incentive

for landowners to agree to drill or mine. Lower levels of resource extraction lower the severance tax revenues for the state. States that rely heavily on severance taxes and taxes on resource extraction can afford to provide more government services with relatively low tax burdens on most of the state when commodity prices are booming. But when commodity prices drop, states often will have to cut public spending or raise taxes to maintain financial balance.

Property Taxes

Taxes on real property offer states an additional source of tax revenue. Although harder to avoid than income or consumption taxes, real property taxes do create incentives and influence behavior. How states assess property values and levy taxes may discourage property development and improvement. Property taxes, like corporate income taxes, may factor significantly in business location decisions, especially for small businesses.⁶⁴ Tax rates on commercial property often exceed those on comparable residential property, and may therefore discourage business formation.⁶⁵

Public-sector Spending v. Private-sector Spending

Increasing government spending to hire additional workers will not spur a state's slowing economy. In order for state governments to spend more, they must raise taxes. Those taxes are paid by businesses and individuals that will then have less money to spend on other goods and services. With less money spent on goods and services, demand decreases—prompting production, wages, and employment eventually to decline. Thus, increases in public-sector employment—requiring more government spending—will be offset ultimately by reductions in private-sector employment⁶⁶ and economic growth.⁶⁷

By contrast, limiting taxing and spending allows individuals and corporations to keep more of their earnings and profits—creating incentives to work harder, earn more, and increase profitability. Individuals prefer to spend their earnings on goods and services of their own choosing, not the government's. Likewise, businesses with lower tax burdens are free to spend more of their capital and profits on investments and resources designed to increase profits, maximize production, and expand capacity. State taxes discourage such investments and make expansion more difficult, reducing productivity and curtailing employment opportunities.

Endnotes

1. US Department of Energy, Energy Information Administration, *Wyoming State Profile and Energy Estimates*, updated December 17, 2015, <http://www.eia.gov/state/analysis.cfm?sid=WY>.
2. Wyoming Department of Administration and Information, Consensus Revenue Estimating Group, *Wyoming State Government Revenue Forecast: Fiscal Year 2016 – Fiscal Year 2020*, January 2016, http://eadiv.state.wy.us/creg/GreenCREG_Jan16.pdf.
3. All real dollar figures in this paper are inflation-adjusted to 2015 dollars using the CPI-U. See US Department of Labor, Bureau of Labor Statistics, “Table 24. Historical Consumer Price Index for All Urban Consumers (CPI-U): U. S. city average, all items,” *CPI Detailed Report—August 2016*, pp. 70-73, <http://www.bls.gov/cpi/cpid1608.pdf>.
4. Total output and mining and logging output data from “Gross Domestic Product (GDP) by State (millions of current dollars),” US Department of Commerce, Bureau of Economic Analysis, updated June 14, 2016, <http://bea.gov/itable/iTable.cfm?ReqID=70&step=1#reqid=70&step=4&isuri=1&7003=200&7001=1200&7002=1&7090=70>.
5. “State and Area Employment, Hours, and Earnings – Seasonal,” US Department of Labor, Bureau of Labor Statistics, accessed August 21, 2016, <http://data.bls.gov/cgi-bin/dsrv?sm>.
6. Scott Drenkard and Jared Walczak, “State and Local Sales Tax Rates in 2015,” *Tax Foundation Fiscal Fact No. 461*, April 2015, http://taxfoundation.org/sites/taxfoundation.org/files/docs/TaxFoundation_FF461.pdf.
7. Jared Walczak, Scott Drenkard, and Joe Henchman, *2017 State Business Tax Climate Index*, Tax Foundation, September 28, 2016, <https://drive.google.com/file/d/0B6586UGJDFOLNU9XbGtVejJxZkU/view>.
8. CREG, *January 2016 Forecast*.
9. EIA, *Wyoming State Profile*.
10. CREG, *January 2016 Forecast*, “Table 6: Mineral Severance Taxes to All Accounts, Fiscal Year Distribution by Mineral.”
11. CREG, *January 2016 Forecast*, “Table 4: Mineral Severance Taxes, Fiscal Year Distribution by Account.”
12. CREG, *January 2016 Forecast*, “Table 1: General Fund Revenues, Fiscal Year Collections by Source.”
13. Wyoming Legislative Service Office, *2015 Budget Fiscal Data Book*, December 2014, <http://legisweb.state.wy.us/budget/2015databook.pdf>.
14. Barry G. Rabe and Rachel Hamilton, “Trusting in the Future: The Re-Emergence of State Trust Funds in the Shale Era,” Center for Local, State and Urban Policy at the University of Michigan, Closup Working Paper Series no. 38 (August 2015).
15. Wyoming State Treasurer, *Annual Report for the Period July 1, 2014 Through June 30, 2015*, revised February 8, 2016, <https://statetreasurer.wyo.gov/assets/reports/Treasurer's-Annual-Report-r-02-08-16%20.pdf>.
16. *Ibid.*
17. *Ibid.*
18. *Ibid.*
19. Unless otherwise stated all of the charts and analysis in this paper consider only the spending policy portion of General Fund revenues from the PWMTF, not the total PWMTF income that includes earnings earmarked for the PWMTF reserve account.

20. Wyoming Secretary of State, *Annual Report and License Tax Rules*, <http://soswy.state.wy.us/Business/docs/SOSTaxWorksheetRules.pdf>.
21. Wyoming Department of Administration and Information, Consensus Revenue Estimating Group, *Quarterly Revenue Update*, July 25, 2016, http://eadiv.state.wy.us/creg/Revenue_Update_July2016.pdf.
22. Wyoming Department of Administration and Information, Consensus Revenue Estimating Group, *A Brief Description of CREG*, <http://eadiv.state.wy.us/creg/CregWebPage.pdf>.
23. Robert J Hodrick and Edward C Prescott, "Post-war US Business Cycles: An Empirical Investigation," *Journal of Money, Credit, and Banking* 29, no. 1 (1997): 1-16.
24. See Fabio Canova, "Does Detrending Matter for the Determination of the Reference Cycle and the Selection of Turning Points?," *Economic Journal of the Royal Economic Society* 109, no. 452 (1999): 126-150; Timothy Cogley and James M Nason, "Output Dynamics in Real-Business-Cycle Models," *American Economic Review* 85, no. 3 (June 1995): 492-511; Harvey and Jaeger, "Detrending, Stylized Facts and the Business Cycle," *Journal of Applied Econometrics* 8, no. 3 (1993): 231-247; Robert G King and Sergio T Rebelo, "Low frequency filtering and real business cycles," *Journal of Economic Dynamics and Control* 17, no. 1-2 (1993): 207-231.
25. CREG, *July 2016 Update*.
26. Source is all even-numbered-year reports from FY 2006 to FY 2016 at Wyoming Department of Administration and Information, Consensus Revenue Estimating Group, "Wyoming State Government Revenue Forecast," accessed August 15, 2016, <http://eadiv.state.wy.us/creg/creg.html>.
27. Wyoming Department of Administration and Information, Economic Analysis Division, *Wyoming Insight*, December 2005-September 2016, <http://pluto.wyo.gov/awweb/main.jsp?nid=-368408/368408>.
28. *Ibid.*
29. US Department of Energy, Energy Information Administration, "Table 6: Gross withdrawals of natural gas in selected states and the Federal Gulf of Mexico, 2011-2016," *Natural Gas Monthly*, August 2016, http://www.eia.gov/naturalgas/monthly/pdf/ngm_all.pdf.
30. CREG, "FY 2006-2016 Forecasts."
31. Annual reports from 2005 to 2014 at US Department of Energy, Energy Information Administration, "Table 28: Average Sales Price of Coal by State and Mine Type," *Annual Coal Report*, accessed August 25, 2016, <http://www.eia.gov/coal/annual/>.
32. EAD, *Wyoming Insight*.
33. Annual reports from 2005 to 2014 at US Department of Energy, Energy Information Administration, "Table 1: Coal Production and Number of Mines by State and Mine Type," *Annual Coal Report*, accessed August 25, 2016, <http://www.eia.gov/coal/annual/>.
34. US Department of Energy, Energy Information Administration, "Table 1: US Coal Production, 2010-2016," *Quarterly Coal Report: April-June 2016*, <http://www.eia.gov/coal/production/quarterly/pdf/t1p01p1.pdf>.
35. US Department of Energy, Energy Information Administration, "Table 15: Coal Supply, Disposition, and Price," *Annual Energy Outlook 2016*, September 15, 2016, http://www.eia.gov/forecasts/aeo/data/browser/#/?id=15-AEO2016&cases=ref2016~ref_no_cpp&sourcekey=0.
36. CREG, "FY 2006-2016 Forecasts."
37. "Wyoming Crude Oil First Purchase Price," US Department of Energy, Energy Information Administration, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=F004056__3&f=A.

38. *Ibid.*
39. “Rigs by State – Current and Historical,” Baker Hughes, <http://phx.corporate-ir.net/phoenix.zhtml?c=79687&p=irol-reportsother>.
40. “Wyoming Field Production of Crude Oil,” US Department of Energy, Energy Information Administration, <http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRFPWY1&f=A>.
41. Data from August 2015 and August 2016 reports at US Department of Energy, Energy Information Administration, “Table 26: Production of Crude Oil by PAD District and State,” *Petroleum Supply Monthly*, accessed August 25, 2016, <http://www.eia.gov/petroleum/supply/monthly/archive/>.
42. “Shale Gas Production,” US Department of Energy, Energy Information Administration, http://www.eia.gov/dnav/ng/ng_prod_shalegas_s1_a.htm.
43. “Henry Hub Natural Gas Spot Price,” US Department of Energy, Energy Information Administration, <http://www.eia.gov/dnav/ng/hist/rngwhhdA.htm>.
44. IHS, “Oil and Gas Operators with Significant Inventory of Drilled but Uncompleted Wells in Major US Plays to Benefit from Capital Efficiency Gains in 2016,” May 10, 2016, <http://press.ihs.com/press-release/ducs/oil-and-gas-operators-significant-inventory-drilled-uncompleted-wells-major-us-pl>.
45. NERA Economic Consulting, *Energy and Consumer Impacts of US EPA’s Clean Power Plan*, November 7, 2015, <http://www.americaspower.org/wp-content/uploads/2015/11/NERA-CPP-Final-Nov-7.pdf>.
46. Robert Godby, Roger Coupal, David Taylor, and Tim Considine, “The Impact of the Coal Economy on Wyoming,” Center for Energy Economics and Public Policy at the University of Wyoming, February 2015, https://www.uwyo.edu/cee/_files/docs/wia_coal_full-report.pdf.
47. LSO, *2015 Budget Book*.
48. Wyoming Legislative Service Office, *Fiscal Profile*, March 21, 2016, <https://legisweb.state.wy.us/budget/fiscal/profile.pdf>.
49. *Ibid.*
50. *Ibid.*
51. LSO, *2015 Budget Book*.
52. Organization for Economic Cooperation and Development, “Tax Policy Reform and Economic Growth,” (Paris: OECD Publishing, 2010), <http://dx.doi.org/10.1787/9789264091085-en>.
53. Andrea Bassanini and Romain Duval, “Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions,” *OECD Social, Employment and Migration Working Papers* 35 (2006), <https://www.oecd.org/employment/emp/36888714.pdf>.
54. When an income tax is compared with a hypothetical lump sum tax, which would require all taxpayers to pay the same amount in taxes, income taxes motivate people to work and save less. When analyzing the effect of an income tax compared to no tax, the net effect on hours of work and saving is unclear, because some people may choose to work or save more to replace the lost income due to the tax, offsetting the incentive to substitute leisure for work.
55. Jens Arnold, “Do Tax Structures Affect Aggregate Economic Growth? Empirical Evidence from a Panel of OECD Countries,” *OECD Economics Department Working Paper* 643 (2008), <http://dx.doi.org/10.1787/236001777843>.

56. Asa Johansson, Christopher Heady, Jens Arnold, Bert Brys, and Laura Vartia, “Tax and Economic Growth,” *OECD Economics Department Working Paper 620* (July 2008), <https://www.oecd.org/tax/tax-policy/41000592.pdf>.
57. J. William Harden and William H. Hoyt, “Do States Choose Their Mix of Taxes to Minimize Employment Losses?,” *National Tax Journal* 56 (March 2003): 7-26.
58. Cyrille Schwellnus and Jens Arnold, “Do Corporate Taxes Reduce Productivity and Investment at the Firm Level?: Cross-Country Evidence from the Amadeus Dataset,” *OECD Economic Department Working Paper 641* (2008), <http://dx.doi.org/10.1787/236246774048>.
59. Harvey S. Rosen and Ted Gayer, *Public Finance*, 8th ed. (Singapore: McGraw-Hill, 2008), 307.
60. OECD, “Tax Policy Reform and Economic Growth.”
61. In comparing the effect of property taxes, consumption taxes, personal income taxes, and corporate income taxes, Arnold (2008) finds that corporate income taxes have the biggest negative effect on economic growth.
62. The incentive effect of sales taxes is most evident near state borders if one state has a lower sales tax than neighboring states. For example, outlet malls in Pennsylvania, which has no sales tax on clothing, attract shoppers from nearby states and from Canada.
63. Timothy Bartik, “Small Business Start-Ups in the United States: Estimates of the Effects of Characteristics of States,” *Southern Economic Journal* 55 (April 1989): 1004-1018.
64. *Ibid.*
65. Tax Foundation, *2017 State Business Tax Index*.
66. Ramey summarizes research on government stimulus spending, noting that most studies find a spending multiplier of between 0.8 and 1.5, meaning that each dollar spent by the government increases total income by between 80 cents and \$1.50. Most of the studies she summarizes involve deficit-financed spending; the multiplier for tax financed spending is likely lower. See Valerie Ramey, “Can government purchases stimulate the economy?,” *Journal of Economic Literature* 49 (2011): 673-685.
67. One study found that states that increased their tax effort over a 10-year period experienced lower overall employment growth and lower growth in employment in retail trade, manufacturing and services. See Michael Wasylenko and Therese McGuire, “Jobs and Taxes: The Effect of Business Climate on States’ Employment Growth Rates,” *National Tax Journal* 38 (1985): 497-511. Arnold (2008) presents evidence that a higher overall level of taxes impedes growth.

Founded in 1989, The Buckeye Institute is an independent research and educational institution—a think tank—whose mission is to advance free-market public policy in the states.