

TAXATION OF NATURAL GAS: A COMPARATIVE ANALYSIS

Severance Tax Review

Marshall University Center for Business and Economic Research (CBER)
December 13, 2011

Introduction

Following its November 15, 2011 presentation to the Joint Interim Finance Subcommittee B titled "Taxation of Natural Gas: A Comparative Analysis," the Subcommittee requested that the Center for Business and Economic Research (CBER) conduct a follow-up review of state natural gas tax collections with a focus on the variation between severance taxes collected on natural gas. This review considers the 19 states studied in the original CBER report and includes Montana and North Dakota at the Subcommittee's request.

While the 21 states are considered not all are included in this report. Those states which do not levy a severance tax, determine the tax at the local level or could only provide oil and gas severance tax collections are not included. The six states excluded are:

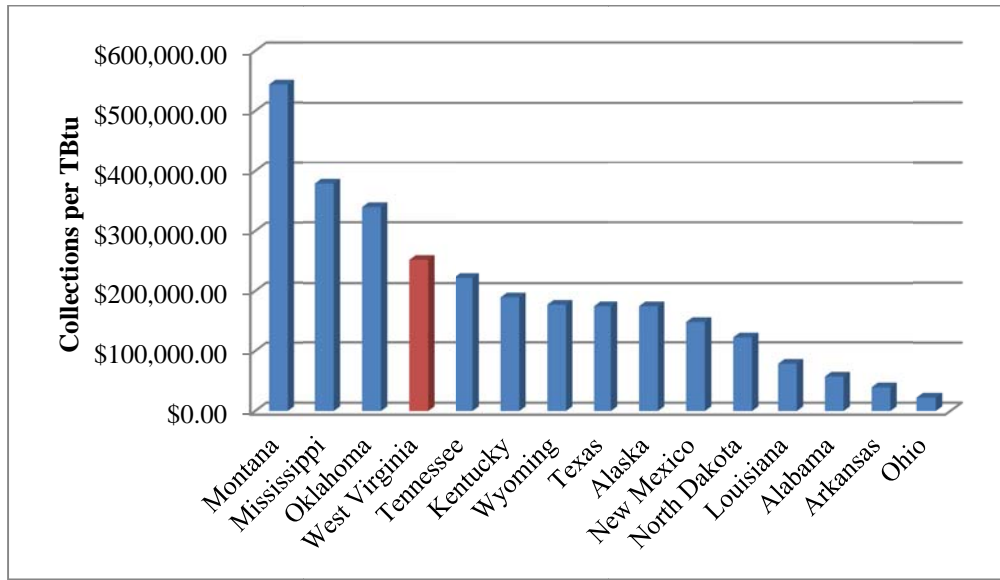
- Colorado
- Maryland
- New York
- Pennsylvania
- Utah
- Virginia.

The remaining 15 states will be examined in detail in the following sections. CBER focuses specifically on severance tax collections in this analysis.

Synopsis of the Prior Review

The November 15 review provided property taxes, severance taxes and permit fees collected per Trillion British Thermal Units (TBtu). Of most notable concern was the difference in severance taxes collected per TBtu in West Virginia (\$252,408) and Alaska (\$174,268). A graphical representation of these figures is provided in Figure 1.

Figure 1 Severance Tax Collections per TBtu in 2009



To further investigate the disparity in severance taxes collected per TBtu between West Virginia and Alaska relative to 2009 production and severance tax collections, CBER calculates collections per Million Cubic Feet (MMcf) and the effective severance tax rate on natural gas.

Methodology

CBER calculates the severance taxes collected per MMcf of natural gas for comparison with the previous review’s collections per TBtu. In order to most accurately account for effective tax rates, only the taxes levied on natural gas are included. Effective tax rates calculated using coal, oil and other minerals present a distorted picture.

Because 15¹ of the states with state-level collections were able to provide severance tax revenue on natural gas exclusively, the prior TBtu comparison will be recalculated to tax collections per MMcf. In every possible case, tax collections are reported for Calendar Year 2009. However, due to availability, some tax figures included may represent a different calendar or fiscal year. Such distinctions are noted in the table. Tax collections per MMcf are provided in Table 1.

¹ In addition to the 14 states which provided natural gas figures, Alabama provided an estimate of at least 90 percent of collections related to natural gas extraction. For this reason, this estimate is included in this study.

Table 1 Severance Tax Collections per Million Cubic Feet for Calendar Year 2009

State	Severance Taxes Collected	Production (MMcf)	Taxes Collected per MMcf
West Virginia	\$75,948,588.59	264,436	\$287.21
Alabama	\$28,466,510.24 ^{*†}	415,049	\$68.59
Alaska	\$77,141,000.00 [‡]	397,077	\$194.27
Arkansas	\$27,468,970.21 [†]	679,952	\$40.40
Kentucky	\$23,056,125.00 [#]	113,300	\$203.50
Louisiana	\$282,430,592.09 [†]	3,332,956	\$84.74
Mississippi	\$44,481,240.00 [†]	88,157	\$504.57
Montana	\$55,527,882.00	98,245	\$565.20
New Mexico	\$230,267,536.00	1,383,004	\$166.50
North Dakota	\$9,811,808.26	59,369	\$165.27
Ohio	\$2,069,704.00 [†]	88,824	\$23.30
Oklahoma	\$707,296,658.00 [†]	1,857,777	\$380.72
Tennessee	\$1,252,875.55 [†]	5,478	\$228.71
Texas	\$1,407,739,109.00	7,284,520	\$193.25
Wyoming	\$449,899,561.00	2,335,328	\$192.65

* Estimate of natural gas severance taxes collected.

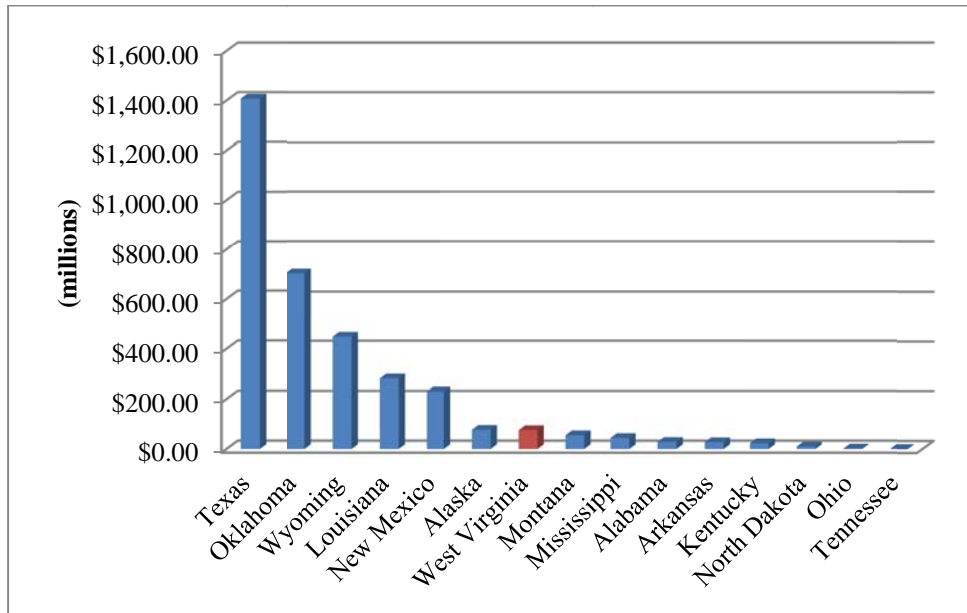
† Fiscal Year 2009.

Fiscal Year 2010.

‡ Calendar Year 2008.

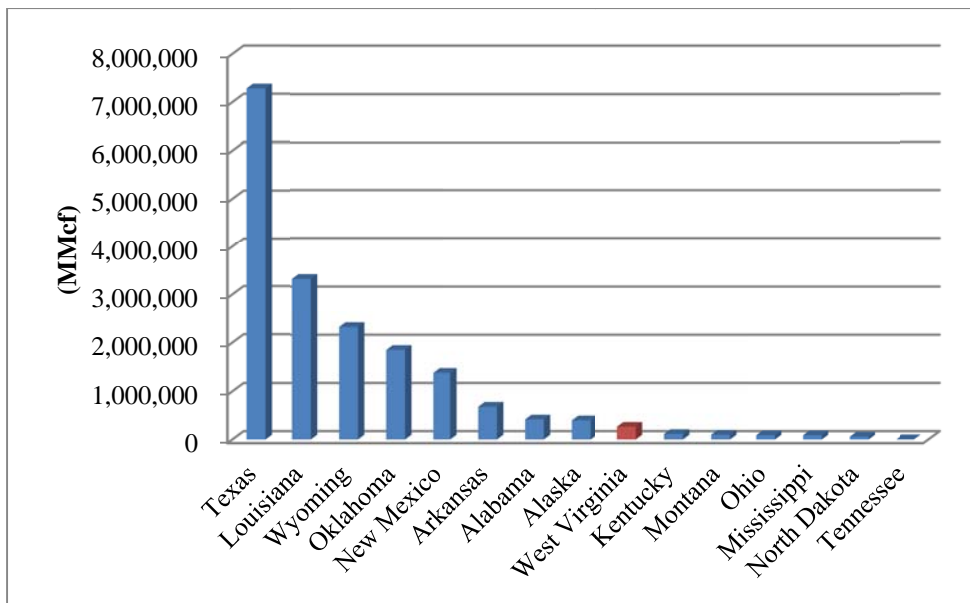
Graphical representations of severance taxes collected, volume of natural gas produced and taxes collected per MMcf are provided in Figures 2, 3 and 4. While Texas had the largest amount of severance taxes collected and the most production in 2009, its ranking for taxes collected per MMcf fell to eighth place. West Virginia, on the other hand, had one of the lowest values of severance tax revenue and state production but was the fourth highest when comparing taxes collected per MMcf.

Figure 2 Severance Tax Collections in 2009



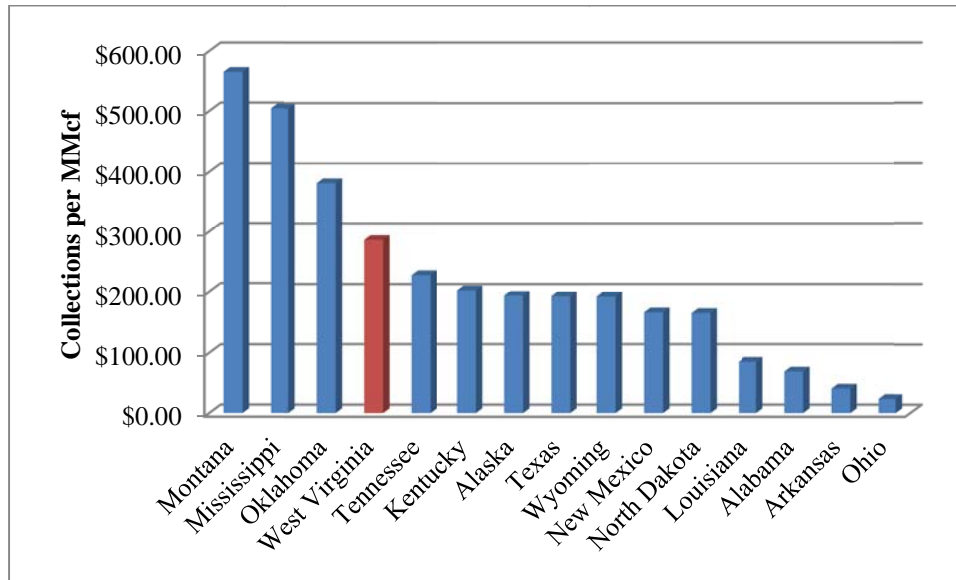
State tax departments (see References).

Figure 3 Natural Gas Production in 2009



Energy Information Administration, State Energy Data System.

Figure 4 Severance Tax Collections per MMcf in 2009



Calculation of the Effective Tax Rate

The following explains the calculation of the effective tax rate for natural gas severance taxes. The value of production at the wellhead is determined for each state. This value is dependent on the average wellhead price (in dollars per Thousand Cubic Feet (Mcf)) and marketed production (in MMcf). These values were obtained from the U.S. Energy Information Administration (EIA).

Most of the wellhead prices were available in the EIA’s “Natural Gas Annual 2009” except for five states (EIA 2010):

- Kentucky
- Maryland
- Pennsylvania
- Virginia
- West Virginia.

Because the average wellhead price in these states was not provided, the value of production calculated using the 2009 national average of \$3.67 per Mcf. The wellhead value of production is then divided into severance taxes collected to determine the effective rate for natural gas severance taxes in each state. Average wellhead prices, marketed production, value of production at the wellhead and the computed effective rates are provided in Table 2

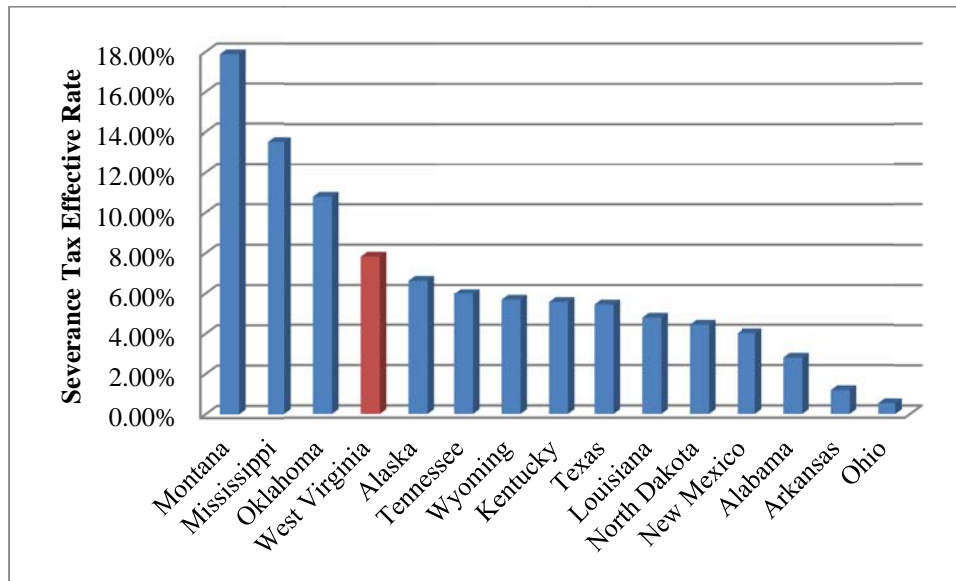
Table 2 Calculation of Imputed Wellhead Value of Production

State	Average Wellhead Price (\$ per Mcf)	Marketed Production (MMcf)	Imputed Wellhead Value of Production (thousands)	Effective Rate
West Virginia	3.67	264,436	\$970,480	7.83%
Alabama	4.32	236,029	\$1,020,599	2.79%
Alaska	2.93	397,077	\$1,163,554	6.63%
Arkansas	3.43	679,952	\$2,330,692	1.18%
Kentucky	3.67	113,300	\$415,811	5.54%
Louisiana	3.82	1,548,607	\$5,920,233	4.77%
Mississippi	3.73	88,157	\$328,695	13.53%
Montana	3.16	98,245	\$310,455	17.89%
New Mexico	4.17	1,383,004	\$5,762,136	4.00%
North Dakota	3.74	59,369	\$221,776	4.42%
Ohio	4.36	88,824	\$387,274	0.53%
Oklahoma	3.53	1,857,777	\$6,550,059	10.80%
Tennessee	3.83	5,478	\$21,000	5.97%
Texas	3.81	6,818,973	\$25,956,558	5.42%
Wyoming	3.4	2,335,328	\$7,946,889	5.66%

Energy Information Administration.

Figure 5 illustrates the calculated natural gas severance tax effective rate by state as provided in Table 2.

Figure 5 Natural Gas Severance Tax Effective Rates by State



Montana has the largest severance tax effective rate on natural gas at 17.89 percent. Ohio had the lowest rate at only 0.53 percent and West Virginia had the fourth highest rate at approximately 7.83 percent, nearly half the rate of Montana. Alaska's effective rate is 6.63 percent, 1.2 percent points less than West Virginia.

Severance Taxes and Drilling Activity

CBER also examines the difference in the number of producing natural gas wells in West Virginia and Pennsylvania at the request of the Subcommittee. Over the past five years (2004 to 2009), the number of producing wells in Pennsylvania has increased by 13,129 (from 44,227 to 57,356), a 30 percent increase (EIA 2011). By comparison, the number of producing wells in West Virginia increased by only 3,485 (from 47,117 to 50,602), a 7 percent increase. The observed variance in the number of producing wells may be influenced by factors such as consumer demand for natural gas and the geographical density of those consumers. However, it is posited that the lack of a severance tax or a property tax on natural gas reserves in Pennsylvania may positively influence drilling and/or operation of wells (as opposed to West Virginia, where both are in place).

Discussion

The calculation of the effective tax rate, using exclusively natural gas data, provides an explanation for the differences noted in severance tax collections and calculated collections per TBtu or MMcf in West Virginia and Alaska. However, other less substantiated facts may also provide partial explanation for this difference.

One such explanation could be found in the Btu content of the gas being produced. The United Nation's Conference on Trade and Development (UNCTAD) provides further detail on the variation in heat content of natural gas:

“The amount of energy that is obtained from the burning of a volume of natural gas is measured in British thermal units (Btu). The value of natural gas is calculated by its Btu content. One Btu is the quantity of heat required to raise the temperature of one pound of water of 1 degree Fahrenheit at atmospheric pressure. A cubic foot of natural gas on the average gives off 1,000 Btu, but the range of values is between 500 and 1,500 Btu.

Energy content of natural gas is variable and depends on its accumulations which are influenced by the amount and types of energy gases they contain: the more non-combustible gases in a natural gas, the lower the Btu value. In addition, the volumic mass of energy gases which are present in a natural gas accumulation also influences the Btu value of natural gas. The more carbon atoms in a hydrocarbon gas, the higher its Btu value.

The composition of natural gas varies depending on the field, formation or reservoir from which it is extracted. Depending on its content of heavy components, natural gas can be considered as rich (five or six gallons or more of

recoverable hydrocarbons per cubic feet) or lean (less than one gallon of recoverable hydrocarbons per cubic feet).

Normally, natural gas as it is when extracted is not suitable for pipeline transportation or commercial use before being processed. Natural gas for commercial distribution is composed almost entirely of methane and ethane, while moisture and other components have been removed. Pipelines set their specifications for the quality of natural gas. In any case, natural gas must be processed in order to remove unwanted water vapour, solids or other contaminants and to get those hydrocarbons that have a higher value as separate products” (UNCTAD 2011).

Deductions allowed in the calculation of the Alaska severance tax compared to West Virginia could provide additional explanation as well. In Alaska, costs of refining and transporting the gas, as well as royalty payouts, are deductible (Marks 2011). This is not the case in West Virginia.² Also, in contrast to West Virginia, Alaska does not levy a property tax on natural gas reserves.

Conclusion

The calculation of severance taxes collected per MMcf provided little differentiation compared to collections per TBtu. In both calculations, West Virginia remained the fourth largest with \$287 per MMcf and \$252,408 per TBtu. Montana and Ohio were the highest and lowest states respectively in terms of collections per MMcf and TBtu. Alaska, Texas and Wyoming were the only three states to change ranking between the two comparisons, while the remaining 12 states maintained the same rank in both calculations.

Calculating the effective rate exclusively for natural gas provides further insight compared to effective rates which consider multiple fuel types. Similar to the collections per MMcf or TBtu, Montana and Ohio had highest and lowest computed effective rate for natural gas severance taxes (17.89 percent and 0.53 percent, respectively). West Virginia had the fourth highest effective rate (7.83 percent). Texas, the largest natural gas producing state, had the ninth highest rate (5.42 percent). The only other bordering state to West Virginia included in this analysis, Kentucky, was ranked in eighth place with a rate of 5.54 percent.

² West Virginia Code §11-13A-4(c).

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