The impact of energy price changes on New Mexico state revenue: Handling price volatility in a shale boom

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Keywords: crude oil, natural gas, price impact, revenue, tax

DEPARTMENT OF
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Executive Summary

Public finance in New Mexico (NM) is highly dependent on revenues collected from the oil and gas sector. Thus, it is important to systematically investigate how changing, and sometimes volatile, market conditions can affect collected revenues. The objective of this analysis is to examines the impact of crude oil and natural gas price changes on NM state revenue that is related to oil and gas production. Using times series data for the 2006 to 2024 period, a variety of multivariate econometric methods are employed, including a lagged vector autoregression (VAR) framework. Key findings include:

- For the revenue that is directly related to the oil and gas production, such as royalties and severance taxes:
    - A 1% increase in the monthly average crude oil futures price leads to a cumulative 0.63% - 0.52% increase in NM oil and gas royalty and tax revenue over the 1 to 12-month horizon.
    - A 1% increase in the monthly average natural gas futures price leads to a cumulative 0.70% - 0.43% increase in NM oil and gas royalty and tax revenue over the same horizon.
    - These cumulative impacts lose statistical significance after six months for both crude oil and natural gas.
- For the taxes that are indirectly related to oil and gas production:
    - Gross receipts tax revenue shows a positive cumulative impact from crude oil prices that becomes statistically significant after six months, while no significant effect is found for natural gas prices.
    - Personal income tax revenue related to oil and gas payments generally does not exhibit a statistically significant relationship with commodity price changes.

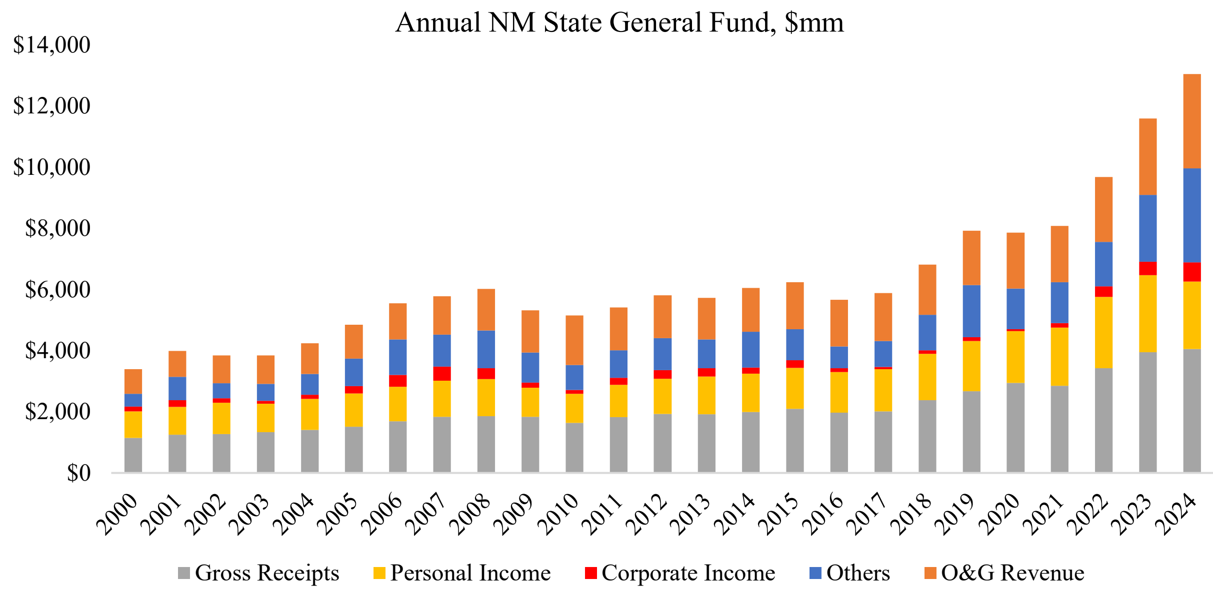
In conclusion, unlike prior studies that focused on long-term projections of energy production and economic outcomes, the adoption of a time-series approach using monthly aggregate data allows the capture of short- to medium-term effects (i.e. less than 2 years). Result indicate that such effects can be significant for about six months in the direct taxes, while the crude oil price impact becomes more significant after six months in the gross receipts tax. These findings offer valuable guidance for refined revenue forecasting.

1. Introduction

Following the shale oil revolution, New Mexico (NM) has emerged as one of the leading producers of crude oil and natural gas in the United States (US). According to the US Energy Information Agency, in 2023, New Mexico ranked second in crude oil production and fifth in marketed natural gas production among all states. The rise of US shale oil and natural gas production is relatively recent, beginning around 2008 with the rapid adoption of hydraulic fracturing and horizontal drilling technology in tight oil formations (Kilian 2016). The production growth in NM has been especially substantial with the crude oil production volume increasing more than elevenfold from 2006 to 2024, and natural gas production also increasing by 78% over the same period.

Driven by this rapid expansion of crude oil and natural gas production, NM has received substantial economic benefits, particularly in state fiscal revenue. Although at the US national level, the boost to economy from shale oil is estimated to be around only 1% (Çakır Melek et al. 2021), the impact on NM has been much greater. The tax and royalty revenues from the oil and gas sector have become an increasingly important part of income for NM public finance. According to Faubion (2024), in fiscal year 2023, crude oil and natural gas production has contributed $11.5 billion to NM state revenue, a 333% increase compared to five years ago in 2018. The contribution of oil and gas revenue to the state general fund also significantly rises from $1.6 billion in 2018 to $3.1 billion in 2024, as shown in Figure 1.

Figure 1. Composition of State General Fund



Source: NM Legislative Finance Committee.

As NM is becoming more reliant on oil and natural gas revenue, a lurking risk is the volatile nature of oil and gas prices. The crude oil and natural gas markets are characterized by both cycles of price variations in the medium-to-long run as well as abrupt short-term price changes, leading to periods of price surge or even negative prices (Ronn 2022; Fernandez-Perez et al. 2023). These price changes may influence production activity and eventually lead to fiscal shocks to the state. Over the last decade (since 2015), the risk has largely remained latent primarily because the industry has been going through the expansion phase. After a decade of rapid expansion, many stakeholders anticipate that the oil and gas industry in NM is reaching a stage of slowdown and plateauing.[1,2] The underlying concern is that when the oil and gas sector transitions out of its expansion phase, NM fiscal revenue may become more vulnerable to the risk of price volatility and the production responses.

The impact of energy price volatility on state public finance, particularly the revenue side is still an emerging area of research. Following the 2014-2015 energy price decline, Belu Mănescu and Nuño (2015) found that price shocks could have profound impact on US oil and gas production, which further translated into the instability of tax revenues. More recently, Prest et al. (2025) use well-level data to model how oil and gas production and government revenues in five western US states respond to high- and low-price scenarios driven by alternative climate policies. Their long-term projections through 2040 show that while government revenue generally follows production trends, it declines more sharply under low-price scenarios. Peach and Popp (2014) created a long-run annual projection for NM oil and gas industry using the REMI model, which is an input-output general equilibrium model for long-term regional economic analysis.[3] In the simulation they incorporate both oil price volatility and the hypothesis that oil production may reach a peak. They show that the tax revenue of NM will be significantly affected under different scenarios of oil production, given assumptions in oil price volatility and output peak patterns. However, because of the long-run nature of the REMI model, their analysis cannot yield detailed implications on how the oil price volatility affects production and tax revenue, particularly in the short term.

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[1] States Newsroom, 2023. https://sourcenm.com/2023/12/12/slowdowns-in-oil-and-gas-means-smaller-growth-in-n-m-revenues/

[2] McKinsey and Company, 2024. "An outlook on oil." https://www.mckinsey.com/featured-insights/sustainable-inclusive-growth/chart-of-the-day/an-outlook-on-oil

[3] For more information on the REMI model, please refer to https://www.remi.com/ by Regional Economic Models, Inc.

Relatively abundant prior research has focused on the distribution side of the natural resource benefits. Newell and Raimi (2018a; 2018b) document how oil and gas revenues influence state government expenditure patterns and distribution mechanisms. Kelsey et al. (2016) provide a normative discussion on the optimal allocation of oil and gas tax revenues at both the national and local levels. In the context of NM, existing studies have explored several related issues. Sarkar (2023) has examined the effects of environmental regulations on oil and gas activity, the impact of resource-related revenues on state expenditure distribution, and the safety implications of extraction activities. The study finds that imposing methane emission restrictions reduces the oil production by about 1% in NM. Despite its meaningful insights, the prices of crude oil and natural gas are not the focus in this analysis. Wang (2020) study the economic impact of oil and gas production in the NM Permian basin. They find the boosts in employment and income are significant not only in counties in the Permian basin, but also exhibit spillover effects to other regions as well.

The objective of this investigation is to estimate the dynamic impact of crude oil and natural gas price shocks on the NM state revenue. Unlike prior studies that focus on long-term projections of energy production and economic outcomes, this analysis adopts a time-series approach using monthly aggregate data to capture the short- to medium-term effects. Specifically, using multivariate times series data for the 2006-2024 period, this analysis derives a finite distributed lag model from a vector autoregression (VAR) framework to examine how a 1% monthly change in energy prices affects state revenue over a one- to two-year horizon, mapping out the pass-through pattern of price impacts. The results offer insights into the sensitivity of NM fiscal revenue to fluctuations in energy prices and contribute to a more informed revenue forecasting.

2. Background

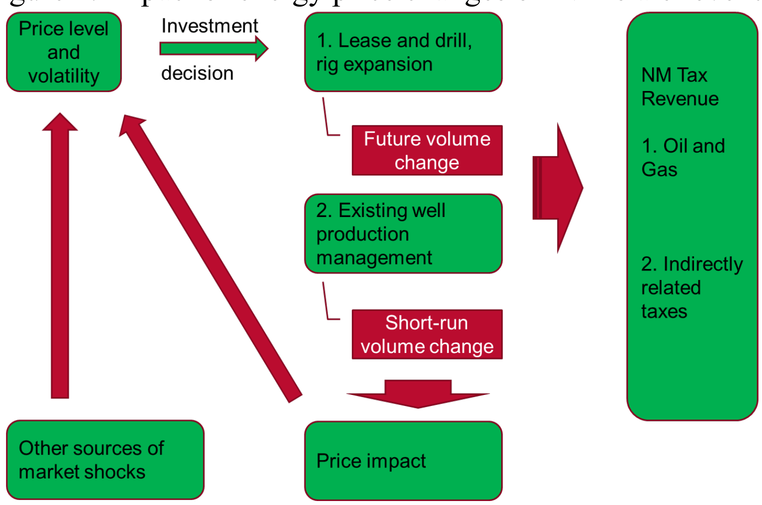
Shale oil and natural gas production have transformed the U.S. energy landscape over the past two decades, driven by advances in hydraulic fracturing and horizontal drilling. The Permian Basin that spans western Texas and southeastern NM, dominates national shale oil output. Other major basins include the Eagle Ford in Texas, Bakken in North Dakota, and Niobrara in Colorado and Wyoming. These formations collectively account for the vast majority of US shale oil and gas supply, which has made the country one of the top global energy producers. Among all producing states, NM experienced the fastest growth, with production more than doubling over the past five years, producing over 2 million barrels per day as of 2024, about 15% of national total. The state's portion of the Permian Basin, known for its geological richness and high-yield wells, continues to attract significant investment and development, making NM a key driver in the future of US shale oil and gas production.

During the process, NM also has experienced significant growth in state revenue from the oil and gas production activity. This revenue can be categorized into two main components: (i) direct revenues; and (ii) indirect revenues. Indirect revenues arise from the broader economic activity associated with oil and gas development, such as gross receipts and income taxes generated through increased employment and investment. However, the link between energy prices and these indirect tax sources is often less clear and harder to quantify. On the other hand, the direct revenues are more closely tied to the monthly oil and gas production values. These collections are based on a percentage of the monthly production value, such as severance taxes and royalties. A detailed breakdown of NM oil and gas revenue structure is provided in the Appendix A, with major categories summarized in Table A.1.

The royalties on state land range between 12.5% to 25% of the production value. The federal land royalty was traditionally 12.5% but raised to 16.67% by the Inflation Reduction Act of 2022, with an option to go as high as 18.75% on new leases. NM taxes on oil and gas production are mostly assessed on the value of monthly extracted products by a fixed percentage, after allowable deductions such as royalties, transportation, and processing costs. The major taxes include the emergency school tax (3.15% for crude oil and 4.00% for natural gas), severance tax (3.75%), conservation tax (0.19% for natural gas and 0.19% - 0.24% for crude oil) and ad valorem production tax (150% of assessed value times local tax rate averaging 1.3%). Beyond production taxes, NM imposes two additional taxes. One is an annually adjustable natural gas processors tax ($0.0096 per MMBtu in 2017) on the natural gas processed. The other is the production equipment ad valorem tax, an annual tax on the value of equipment used at production units, which is basically a property tax on this equipment. Overall, about 94% of the revenues are assessed as a percentage from the monthly production value of crude oil and natural gas (Faubion 2024).

Given this heavily value-based revenue assessment structure combined with relatively stable tax and royalty rates, the two primary determinants of state revenue are the production volume and commodity prices of oil and gas. While current prices directly determine the value of monthly production, price changes are also known to have *lagged* effects on future production, as illustrated in Figure 2. The price changes can influence future oil and gas production investments, such as the development of new drilling rigs. Short run impacts on existing well operations may also occur, though such effects are typically intertwined with broader economic or inventory shocks, since the short-run supply elasticity of oil is generally considered to be near zero (Kilian 2022; Kilian and Murphy 2014; Zhou 2020). In addition, price fluctuations may also affect the indirectly related tax revenues, such as the gross receipts tax, due to their connection with overall economic activity in the state.

Figure 2. Impact of energy price changes on NM state revenue



3. Methodology

In this section, I develop the empirical strategy to estimate the impact of price shocks on NM state revenue from oil and gas extraction. The approach builds on existing literature examining the interactive relationship between price changes and production activities (Ansari and Kaufmann 2019; Baumeister and Hamilton 2019; Dossani and Elder 2024; Khalifa et al. 2017; Kilian and Murphy 2014; Ringlund et al. 2008; Shakya et al. 2022). To address the question of how long it takes for oil and gas price effects to transmit into both direct and indirect tax revenues, I derive a finite distributed lag model based on a VAR framework, which captures both the magnitude and timing of the shock transmission. In a VAR model, each variable is modeled as a linear function of its own past values as well as the past values of all other variables in the system, making it particularly suitable for analyzing interdependent economic indicators. The lag structure allows to study how shocks to one variable propagate through a system over time, which is useful for understanding causality and forecasting.

Both production volume and price variables exhibit time dependence individually and interactively. For this reason, the volume and price series have often been modeled under a VAR framework in econometric literature. To identify the structural effects of supply and demand shocks on monthly volume and price observations, restrictions can be applied to the VAR to produce orthogonalized error terms and impulse response functions (Baumeister and Hamilton 2019; Kilian 2022a). For the practical purpose of examining how price changes affect tax revenue, I adopt a finite distributed lag model derived from the following reduced-form VAR system of double-log equations, with *k* monthly lags as:

$$\log(volume_t) = a_0 + \sum_{j=1}^{k} a_{1j} \log(volume_{t-j}) + \sum_{j=1}^{k} a_{2j} \log(price_{t-j}) + e_{1t}, \quad (1)$$

$$\log(price_t) = b_0 + \sum_{j=1}^{k} b_{1j} \log(volume_{t-j}) + \sum_{j=1}^{k} b_{2j} \log(price_{t-j}) + e_{2t}. \quad (2)$$

Summing up the two equations leads to:

$$\log(volume_t \times price_t) = c_0 + \sum_{j=1}^{k} c_{1j} \log(volume_{t-j}) + \sum_{j=1}^{k} c_{2j} \log(price_{t-j}) + e_t. \quad (3)$$

The revenue from oil or natural gas production in month *t* can be expressed as the product of monthly production volume, the wellhead price, and the applicable combined tax and royalty rate, as follows:

$$revenue_t = rate \times volume_t \times price_t. \quad (4)$$

Because the tax and royalty rates are largely fixed, fluctuations in monthly revenue are primarily driven by changes in production volume and commodity prices. As by definition $\log(volume_t \times price_t) = \log(tax_t) - \log(rate)$. With this identity, equation (3) can be expressed as:

$$\log(revenue_t) = c_0 + \log(rate) + \sum_{j=1}^{k} c_{1j} \log(volume_{t-j}) + \sum_{j=1}^{k} c_{2j} \log(price_{t-j}) + e_t, (5)$$

which becomes a finite lag distribution model that forms the basis of the analysis. Because both the price and volume series are typically nonstationary, I take the first differences of both sides of equation (5) for estimation, yielding the following specification:

$$\Delta\log(revenue_t) = \sum_{j=1}^{k} c_{1j}\Delta\log(volume_{t-j}) + \sum_{j=1}^{k} c_{2j}\,\Delta\log(price_{t-j}) + u_t. \qquad (6)$$

The resulting model interprets monthly changes in revenue as being driven by historical changes in oil and gas production volumes and prices. The j^{th} step impact of a 1% price change is the coefficient c_{2j}. The cumulative impact to the k^{th} month is $\sum_{j=1}^{k} c_{2j}$, with a standard deviation measured as $\sqrt{\sum_{i,j=1}^{k} \delta_{2ij}^{2}}$, where δ_{2ij}^{2} is the estimated covariance between c_{2j} and c_{2i}, $i,j \leq k$.

Notably, in the reduced VAR specification of the relationship between production volume and price, price changes also influence production volume. To isolate the effect of price on revenue more cleanly, I first regress differenced production volume on lagged price changes as:

$$\Delta\log(volume_t) = \gamma_0 + \sum_{j=1}^{k} \gamma_j\,\Delta\log(price_{t-j}) + ev_t \qquad (7)$$

and use the resulting residuals ev_t in the revenue regression specified in equation (6). This approach partials out the influence of price on volume. The regression lag order is set to 24 months following Kilian and Murphy (2014), who argue that enough lag length is needed to capture the responses in oil markets.

For the indirectly related taxes such as gross receipts and income taxes, I adopt a similar lagged regression structure as:

$$\log(Itax_t) = d_0 + \sum_{j=1}^{l} d_{1j}\log(Itax_{t-j}) + \sum_{j=1}^{k} d_{2j}\log(revenue_{t-j}) + e_t. \qquad (8)$$

$Itax_t$ is separately either the gross receipts tax or income tax. However, for the indirect taxes I do not specify a VAR system that includes an equation explaining oil and gas revenue as a function of indirect taxes. This is because that the oil and gas production is relatively exogenous and independent from broader economic activity. Therefore, fluctuations in indirect tax revenues, which is driven by general economic conditions, are unlikely to significantly influence changes in energy extraction revenues.

By decomposing the lagged revenue term $revenue_{t-j}$ in equation (8) into the product of crude oil and natural gas prices and production volume as in equation (3), I proceed with a regression specification that includes lagged oil and gas prices and volumes, along with autoregressive lags of the indirect tax variable as:

$$\log(Itax_t) = d_0 + \sum_{j=1}^{l} d_{1j} \log\left(Itax_{t-j}\right) + \sum_{j=1}^{k} d_{2j} \log\left(volume_{t-j}^{crude\ oil}\right) + \sum_{j=1}^{k} d_{3j} \log\left(volume_{t-j}^{natural\ gas}\right) + \sum_{j=1}^{k} d_{4j} \log\left(price_{t-j}^{crude\ oil}\right) + \sum_{j=1}^{k} d_{5j} \log\left(price_{t-j}^{natural\ gas}\right) + e_t. \quad (9)$$

To determine the appropriate number of autoregressive lags l of $Itax_t$, I rely on the partial autocorrelation function, which is commonly used to identify the optimal lag length in autoregressive processes. For the lag order k of oil and gas variables, I reduce it to 12 months. This shorter horizon is chosen because indirectly related taxes are not expected to influence changes in production capacity, and therefore do not require longer lag structures. The regression is estimated in first order differences, consistent with equation (6), to address the nonstationarity of the underlying time series.

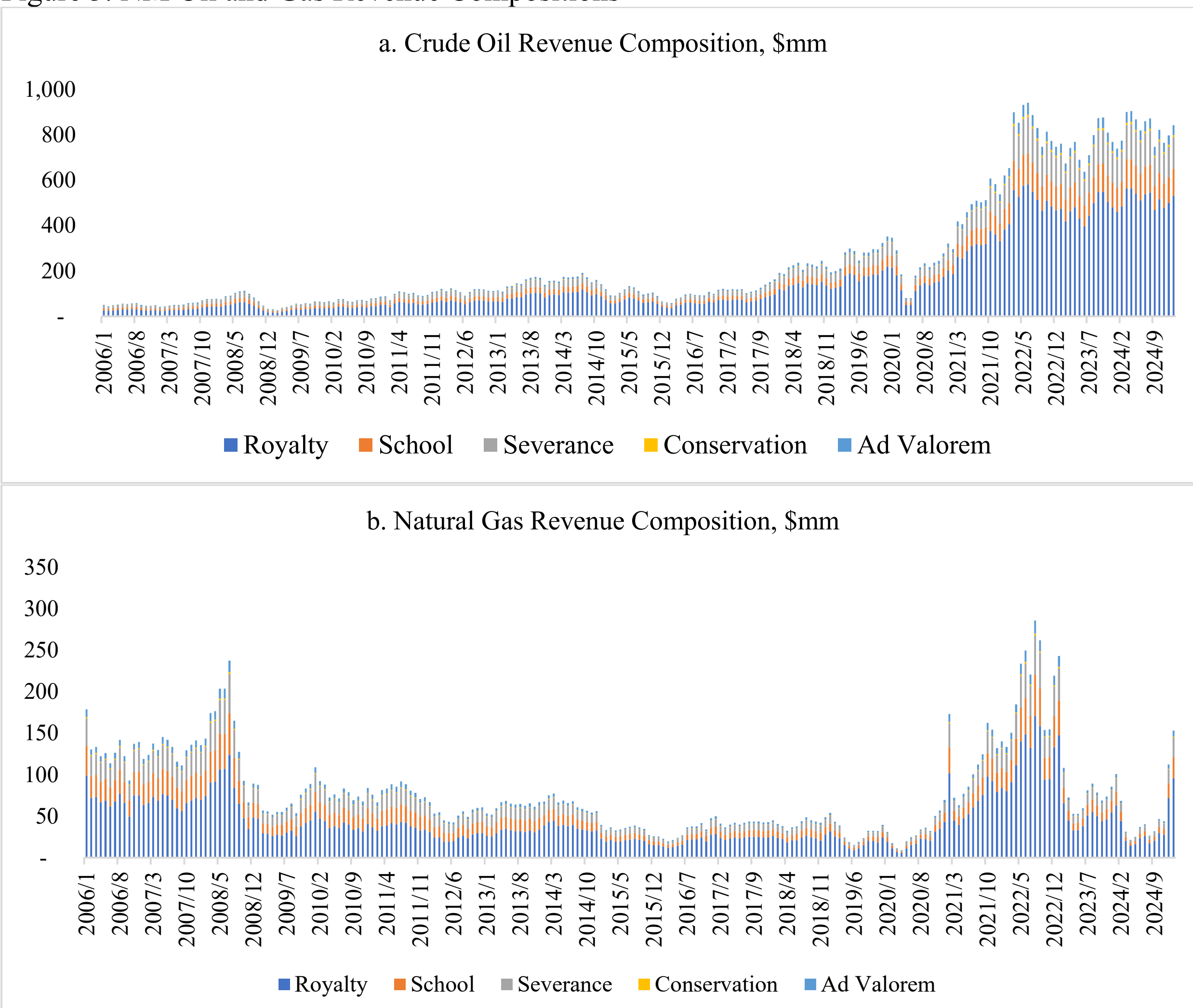
4. Data

The data used in this analysis cover the period from 2006 to 2024, which marks the onset and full development of shale oil and gas production in NM. The monthly crude oil and natural gas production and revenue data are obtained from the New Mexico Taxation and Revenue Department (NM TRD), which provides detailed aggregate tax filing records by reporting month, categorized by land type, county, and basin of origin.[4] For the tax data, I aggregate four key taxes as described in section 2: the severance tax, conservation tax, ad valorem production tax, and emergency school tax. These are then combined with royalty payments to construct the total monthly oil and gas revenue received by the state. Although it is possible to estimate revenues based on production volumes and statutory tax rates, I use the reported revenue data as they reflect actual collections. The production equipment ad valorem tax is excluded from the analysis due to its small magnitude (approximately 0.14%) and its annual assessment basis (Faubion 2024). Figure

[4] The historical data are accessible at https://www.tax.newmexico.gov/all-nm-taxes/oil-natural-gas-mineral-extraction-taxes/.

3 displays the monthly revenue composition, showing that royalties account for about 60% of total revenues. As all these five royalty and tax categories are calculated as a percentage of production value and exhibit similar movement patterns, I use their sum as the dependent variable in the regression analysis.

Figure 3. NM Oil and Gas Revenue Compositions



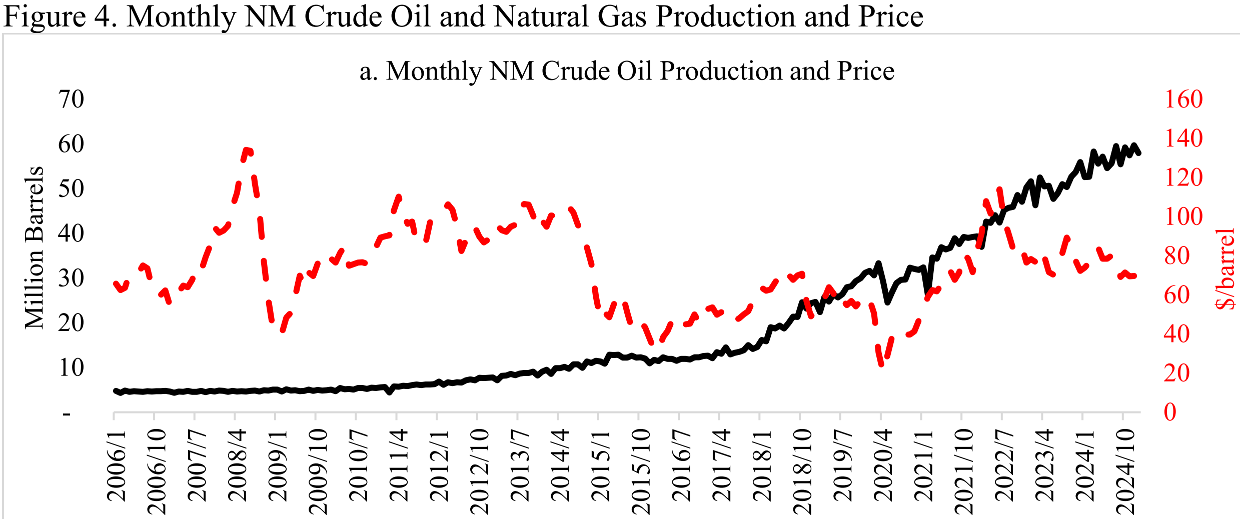
Source: NM TRD

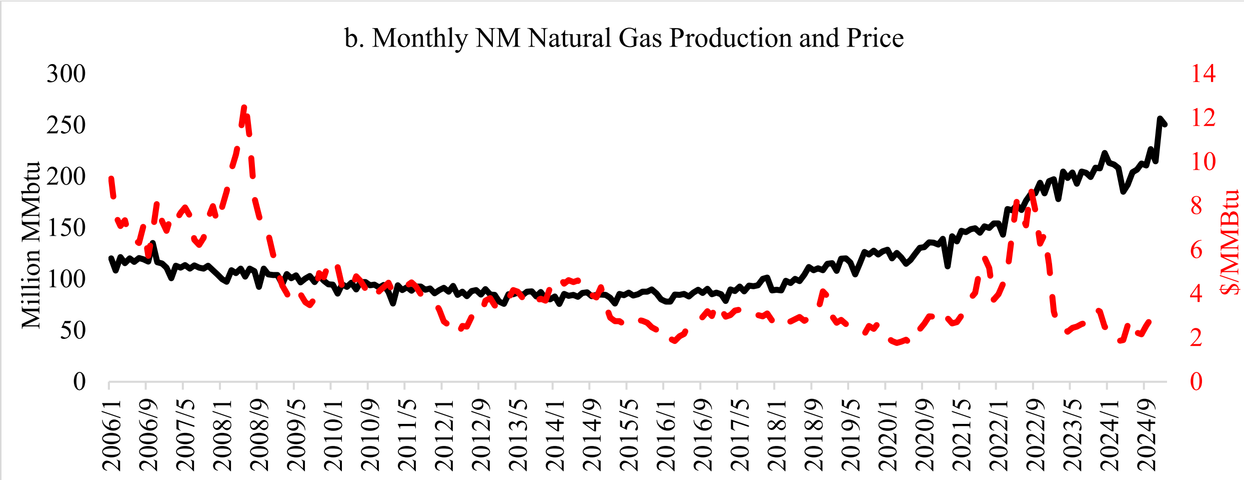
For production volume data, I calculate the total monthly crude oil and natural gas output in NM. For natural gas, both processed and unprocessed volumes are included, as they do not overlap and exhibit similar price patterns.

Both crude oil and natural gas prices are represented by the monthly average of nearby futures contracts. This approach reflects the index-based pricing system widely used in these markets, where local wellhead prices are typically benchmarked against standardized futures prices. Specifically, crude oil prices are linked to the West Texas Intermediate (WTI) futures contract, and natural gas prices are tied to the futures contract delivered to the Henry Hub. Both contracts are listed on the CME Group and are connected to local prices through basis contracts in the US (Fattouh 2011). Futures prices better represent the price signals received by producers. In Appendix B, I compare the NM wellhead and futures prices for both commodities and find that they generally move in tandem. Their basis is relatively stable except during periods of major disruption such as the COVID-19 pandemic in 2020. Notably, NM wellhead prices are more volatile and generally lower than benchmark futures prices, primarily due to transportation costs to the Cushing delivery hub for WTI and the Henry Hub for natural gas futures.

Figure 4 presents the monthly NM crude oil and natural gas production alongside their respective prices. The solid black lines represent the monthly production volume corresponding to the left y-axis and the dotted red lines represent the monthly average price corresponding to the right y-axis. Price data represent the monthly averages of the nearby WTI crude oil and Henry Hub natural gas futures contracts. The natural gas production includes both processed and unprocessed volumes. While both crude oil and natural gas production exhibit a steady upward trend albeit with occasional disruptions, their prices are notably more volatile. Crude oil prices fluctuate within a range of approximately \$21 to \$134 per barrel, while natural gas prices range from \$2 to \$13 per MMBtu.

Figure 4. Monthly NM Crude Oil and Natural Gas Production and Price



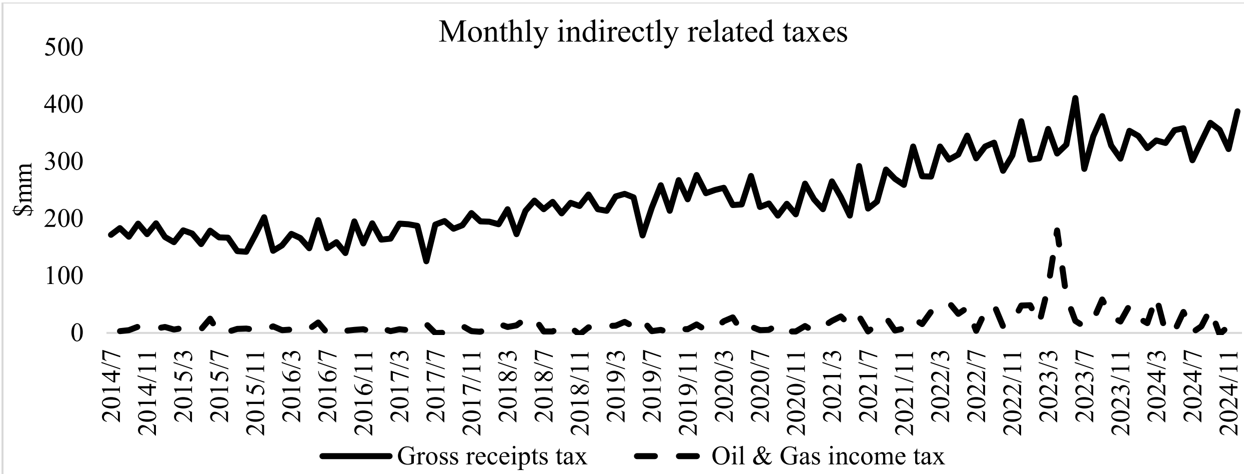


Source: NM TRD. The solid black lines are the monthly production volume corresponding to the left y-axis and the dotted red lines represent the monthly average price corresponding to the right y-axis.

For the indirectly related taxes, I focus on the gross receipts tax and the personal income tax derived from oil and gas sector payments. The gross receipts tax serves as a broad measure of overall economic activity within NM, while the income tax from oil and gas-related payments represents a more targeted indicator of the industry's impact on state residents. These two taxes are also of particular interest to the NM state economic analysis team. The data cover the period from July 2014 to December 2024. Figure 5 displays the monthly time series for both tax categories, each exhibiting a generally upward trend along with visible seasonal fluctuations. To address the seasonality, I apply a monthly dummy variable regression to remove recurring seasonal effects.

To control for inflation effects, the prices, taxes, and revenues are deflated using the Consumer Price Index, adjusting them to real terms based on the price level of December 2024. Augmented Dickey-Fuller tests confirm that the volume, tax, revenue, and price series are non-stationary in level but become stationary after first differencing. These results support the estimation approach using first-order differencing transformation to the data, as specified in equation (6).

Figure 5. Taxes indirectly related to oil and gas production



Source: NM Legislative Finance Committee.

5. Results

The detailed regression outputs are reported in Table C.1 of Appendix C. We derive the cumulative impacts based on these estimated coefficients and covariance matrices.

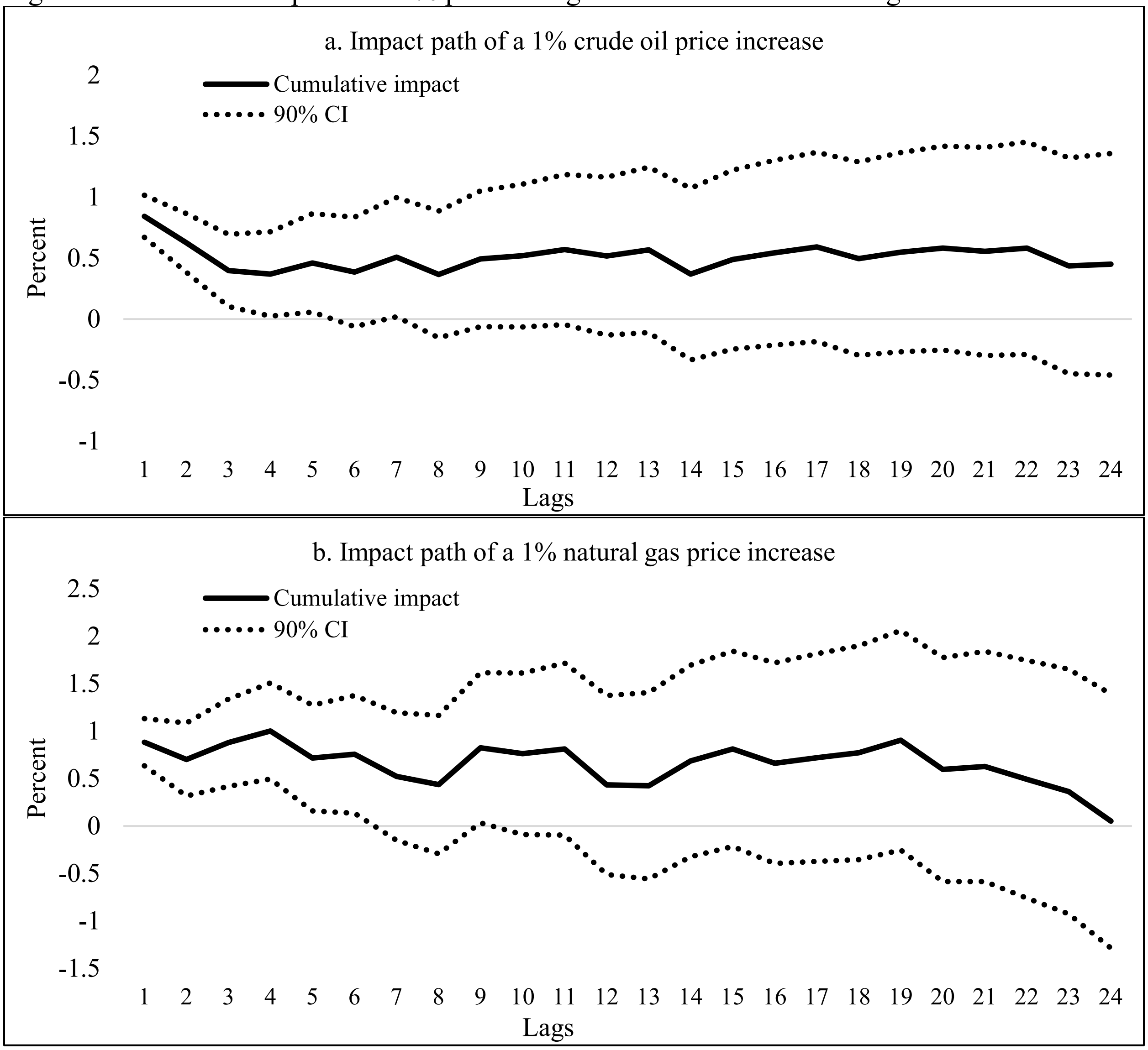
5.1. Impact of crude oil and natural gas price changes on direct revenues

The regression analysis is conducted separately for crude oil and natural gas revenues. In both cases, the lagged price variables are jointly significant at the 1% level, as indicated by the F-test statistics. Figure 6 illustrates the cumulative impact of a 1% increase in commodity prices on state revenue. Panel (a) displays the effect for crude oil revenue, where the response is positive as anticipated that higher crude oil prices lead to increased state revenue. The strongest effect occurs in the first month, with an estimated impact of 0.63%. The influence gradually declines, reaching approximately 0.4% by month 3 and fluctuating between 0.37% and 0.57% in the following months. However, the cumulative effect becomes statistically insignificant after month 6, as the lower bound of the 90% confidence interval falls below zero.

Figure 6 (b) presents the cumulative effect of a 1% increase in natural gas prices on state revenue. Similar to crude oil, the response is positive over the two-year horizon, though the magnitude is slightly greater. The immediate impact is 0.70% in the first month and peaks at approximately 1.00% by month 3. As with crude oil, the statistical significance of the cumulative effect fades after the sixth month, indicating diminishing reliability of the estimated response. Over the final six months of impact horizon, the cumulative impact declines rapidly, approaching zero.

The pattern of fading statistical significance indicates that accumulated uncertainty eventually offsets the initial impact of the price shock. This attenuation may arise from offsetting price movements in subsequent months or adjustments in production behavior. Overall, the results suggest that while crude oil and natural gas prices exert a meaningful short-term influence on state revenue, the persistence of this effect is limited.

Figure 6. Cumulative impact of a 1% price change on crude oil and natural gas revenue



5.2. Impact of crude oil and natural gas price changes on indirectly related taxes

In both the gross receipts and oil and gas income tax regressions, the partial autocorrelation function is significant at the first three lags, which supports an autoregressive lag order of three.

Figure 7 presents the cumulative impact of a 1% increase in crude oil and natural gas prices on gross receipts tax. The F-test indicates that the 12 monthly lags of crude oil prices are jointly significant at the 5% level, while the lags of natural gas prices are not. Panel (a) shows the effect of crude oil price shocks. The response is positive as expected because more revenue from oil can increase the income and consumption related economic activity. The impact has an almost monotonic increasing pattern through its 12 months lag. The impact starts at 0.18% in the first month and reaching 1.25% by month 12. Although the cumulative effect is not statistically significant at the 5% level in months 4 to 6, it becomes significant again in months 7 through 12. In contrast, Panel (b) shows that natural gas price shocks do not yield statistically significant effects across any lags. This difference likely reflects the comparatively smaller economic footprint of natural gas, which typically contributes less than 10% of the revenue generated by crude oil in NM.

Figure 7. Cumulative impact of a 1% price change on gross receipts tax

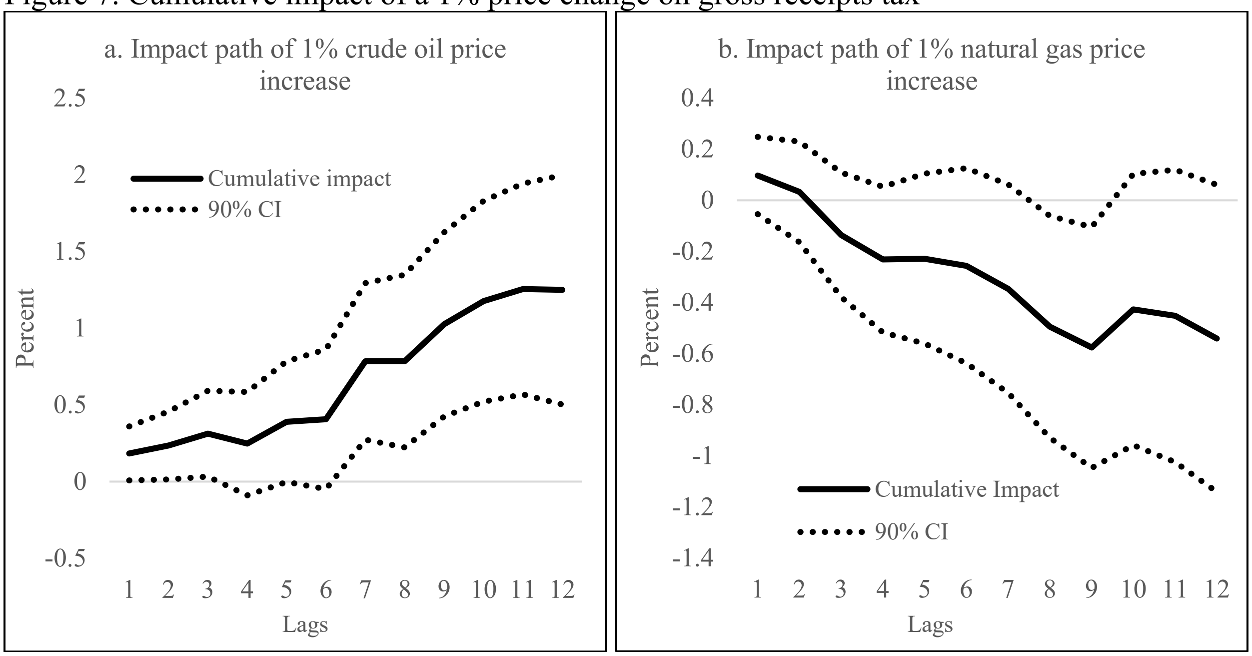
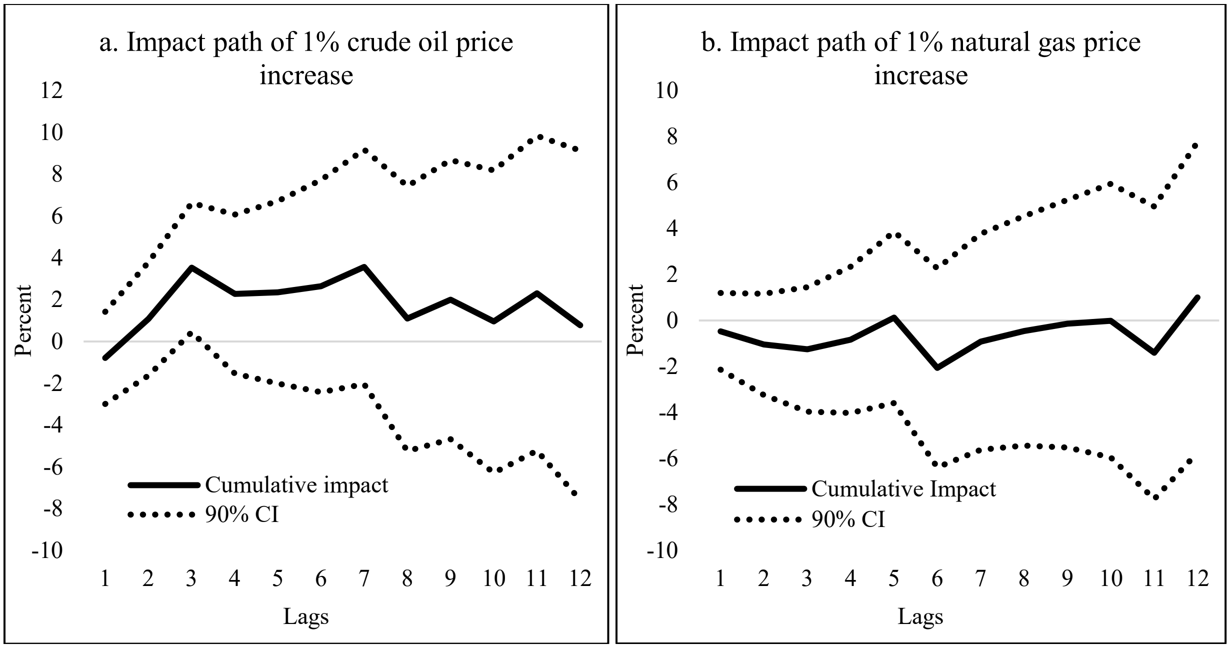


Figure 8 presents the cumulative impact of a 1% price increase in crude oil and natural gas on personal income tax derived from oil and gas sources. The F-tests indicate that lagged prices of both commodities fail to be jointly significant at the 5% level. Across the 12-month lags, most individual effects are also statistically insignificant. The sole exception is the third-month lag of crude oil prices, which shows a significantly positive impact of 3.54% at the 5% level. This isolated effect may reflect timing in income recognition or tax filing practices related to oil and gas earnings.

Figure 8. Cumulative impact of a 1% price change on personal income tax from oil and gas



5.3. Illustrative applications of the results

A key takeaway point is that the estimated elasticities can be used to refine revenue forecasts. In this section, I illustrate how the findings can be applied to forecasting NM oil and gas revenue. The team of state government economists regularly updates revenue forecasts based on anticipated market conditions. Suppose we are forecasting revenue for the period July 2025 to June 2026. Based on futures market term structure as of the end of June 2025, the average expected crude oil price is $63 per barrel, and the natural gas price is $4 per MMBtu for the forecasting period. In 2024, the average effective revenue collection rate was 19% for crude oil and 16% for natural gas. Production volumes are projected linearly using the simple growth trend from the past three years. Crude oil production increased from 531 million barrels in 2022 to 678 million barrels in 2024, and natural gas production rose from 2.09 to 2.54 billion MMBtu. Using this trend, the projected 2025–2026 production volumes are 750 million barrels of crude oil and 2.75 billion MMBtu of natural gas. Table 1 summarizes the key assumptions and projected outcomes.

Suppose there is a 3% increase in the monthly average futures prices of both crude oil and natural gas. Based on the estimated elasticities, the immediate impact on the following month's revenue is 1.89% for crude oil and 2.1% for natural gas, translating to approximately $14 million and $3 million increase, respectively. Over a six-month horizon, the cumulative impact becomes 1.17% for crude oil and 2.28% for natural gas, or about $53 million and $20 million, respectively.

For the full-year projection, the cumulative effect is estimated at 1.56% and 1.29%, corresponding to $140 million and $23 million increases, respectively in total revenue (totaling $163million).

These results can also be used to assess the impact of changes in tax or royalty rates. For instance, a 6% reduction in the federal royalty rate can be economically decomposed into a continued 6% price increase and a decline in the revenue collection rate on federal land. Thus, the corresponding revenue impact can be inferred from the elasticity estimates with more information on the production by land type.

Table 1. An illustration on state revenue forecast

	Crude oil	*Natural Gas*
Baseline volume	750 million barrels	2.75 billion MMBtu
Baseline price	$63/barrel	$4/MMBtu
Revenue rate	19%	16%
Baseline revenue	$8.98 billion	$1.76 billion
Price change	+3%	+3%
Impact horizon		
1 month	+3×0.63%=1.89%	+3×0.70%=2.1%
	$8.98/12×1.89%=$0.014 billion	$1.76/12×2.1%=$0.003 billion
6 months	+3×0.39%=1.17%	+3×0.76%=2.28%
	$8.98/2×1.17%=$0.053 billion	$1.76/2×2.28%=$0.020 billion
12 months	+3×0.52%=1.56%	+3×0.43%=1.29%
	$8.98×1.56%=$0.140 billion	$1.76×1.29%=$0.023 billion

6. Conclusion and Discussion

This study analyzes the impact of crude oil and natural gas price changes on NM state revenue, focusing on two types of revenue sources: (i) those directly tied to production (royalties and production-related taxes); and (ii) those indirectly linked (gross receipts and personal income taxes). Econometric results indicate that a 1% increase in crude oil prices leads to a 0.63% rise in royalty and tax revenue in the following month, with a cumulative effect stabilizing around 0.5% over a two-year horizon, though statistical significance fades after six months. For natural gas, the initial impact of a 1% price increase leads to a 0.7% rise in royalty and tax revenue in the following month, with significance also dissipating after six months.

In the indirectly related revenues, gross receipts tax responds positively to oil prices, with the cumulative effects of a 1% price increase becoming higher and more significant after six months and reaching 1.25% by month 12. Natural gas prices show no significant effect. In the case of personal income tax related to oil and gas, neither commodity price shows a statistically significant effect, except for a 3rd-month crude oil price lag, which barely reaches the 5% significance level. The study concludes with an illustrative application showing how the estimated elasticities can be used to update state revenue forecasts based on monthly price changes. Specifically, the application shows that assuming a 3% increase in both oil and natural gas prices, it would result in a $163 million fiscal impact on state revenues for the ensuing year.

In closing, unlike prior studies that focused on long-term projections of energy production and economic outcomes, the adoption of a time-series approach using monthly aggregate data allows the capture of short- to medium-term effects (i.e.., less than 2 years). Result indicate that such effects can be significant, where oil and gas price fluctuations have a lagged impact on state revenue, offering valuable guidance for refined revenue budgeting and forecasting. Building on these findings, future work can extend the analysis to evaluate the effects of various policy changes or price shock scenarios. For example, subsidy programs targeting less productive wells, or the implementation of natural gas flaring regulations could be analyzed for their fiscal implications (Rao 2018; Agerton et al. 2023). The findings can be further enhanced using system dynamics modeling, calibrated with the parameter estimates obtained in this study.

Appendix A. New Mexico revenue structure from oil and gas production

New Mexico generates substantial revenue from royalties on oil and gas production, primarily from state trust lands managed by the State Land Office. These royalties typically ranging from 12.5% to 25% of the gross value of production under the Senate Bill 23. In addition, New Mexico receives 50% of federal royalty revenues collected from oil and gas extraction on federal lands within the state. The standard federal royalty rate was traditionally 12.5%, but the Inflation Reduction Act of 2022 raised the minimum to 16.67%, with the option to go as high as 18.75% on new leases.

New Mexico taxes on oil and gas production fall into two main groups: (1) those based on the value of oil and gas extracted and sold, and (2) those based on the value of processed products or production equipment. The structure also includes various credits, deductions, incentive rates, and revenue distributions.

New Mexico levies four primary value-based taxes on oil and gas production. These taxes are assessed monthly and are based on the value of the extracted products after allowable deductions such as royalties, transportation, and processing costs. The Oil and Gas Severance Tax applies to the taxable value of oil, natural gas, liquid hydrocarbons, and carbon dioxide severed from the soil and sold. The standard tax rate is 3.75%, although reduced rates apply under certain conditions—such as for stripper wells, enhanced oil recovery projects, or well workovers—depending on market prices. Revenue from this tax is allocated to the Severance Tax Bonding Fund, which supports infrastructure and capital outlay projects in the state.

The Oil and Gas Conservation Tax is assessed at a base rate of 0.19%, increasing to 0.24% when the average price of West Texas Intermediate (WTI) crude exceeds $70 per barrel. This tax funds environmental reclamation and contributes to the general fund, supporting the regulation and oversight of oil and gas activities.

The Oil and Gas Emergency School Tax supports the state's general fund and is charged at 3.15% for oil and related gases, and 4% for natural gas. As with the severance tax, incentive rates apply for low-value production, such as stripper wells, to support marginal operations and extend the economic life of smaller fields.

The Oil and Gas Ad Valorem Production Tax is based on the assessed value of production, calculated as 150% of net value (after deducting royalties and trucking costs). The tax rate is tied to local property tax rates and the revenue is distributed to local governments, including school districts, municipalities, and community colleges to support local services and infrastructure.

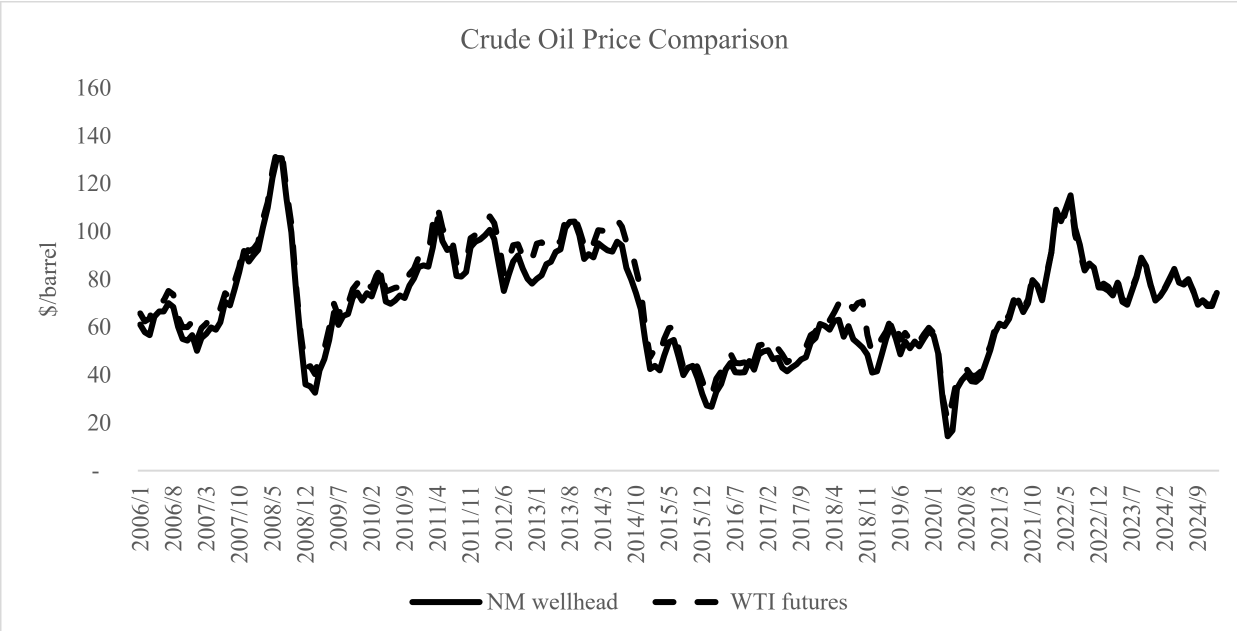
Beyond production taxes, New Mexico imposes two other oil and gas–related taxes. The Natural Gas Processors Tax is levied on the heating content of natural gas processed (measured in MMBtu). The tax rate is adjusted annually, and for fiscal year 2017, it was $0.0096 per MMBtu. Revenues from this tax are directed to the state's general fund. The Oil and Gas Production Equipment Ad Valorem Tax is an annual tax on the value of equipment used at production units, replacing traditional property taxes on this equipment. The taxable value is calculated as 27% of prior-year production value, assessed at a one-third ratio, and is distributed to local taxing districts where the equipment is located.

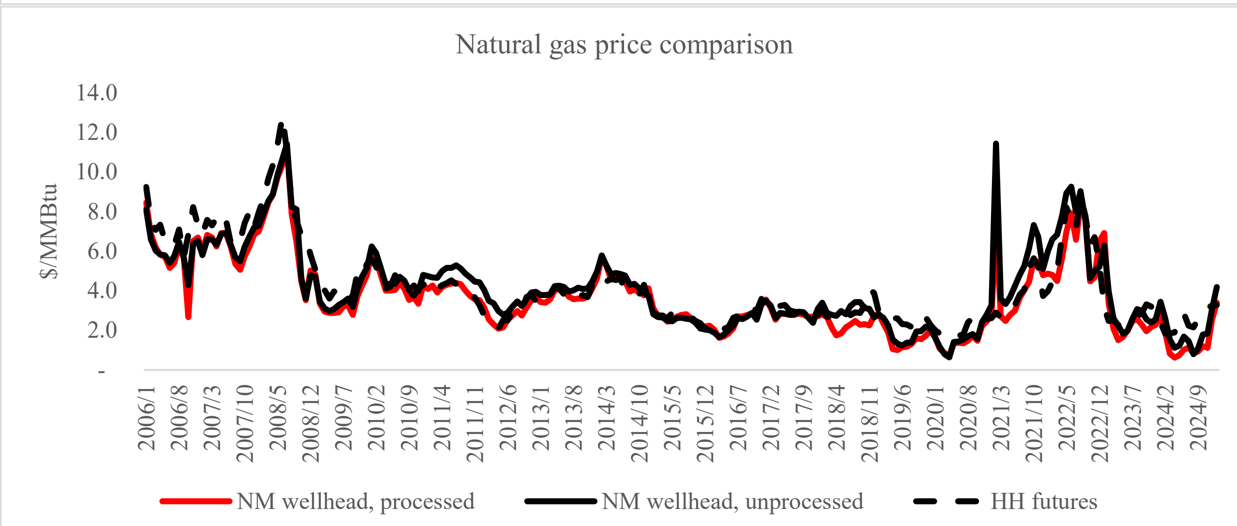
An important feature across these major oil and gas taxes is the intergovernmental tax credit for production on tribal lands. This credit equals 75% of the lesser of the state tax or the tribal tax paid, helping to prevent double taxation and supporting sovereign tribal revenue systems.

Table A.1. Major crude oil and natural gas royalty and tax categories in New Mexico

Name	***Base***	***Rate(s)***	***Key Deductions/Credits***	***Revenue Distribution***
Royalty	State land	12.5%–25%		
	Federal land	12.5% → 16.67–18.75%		50% split to NM
Oil and Gas Severance Tax	Taxable value (net of deductions)	3.75% base; lower for incentives	Royalties, transport, processing; tribal tax credit	Severance Tax Bonding Fund
Oil and Gas Conservation Tax	Taxable value	0.19% or 0.24% (if WTI > $70)	Same as above	General Fund & Reclamation Fund
Oil and Gas Emergency School Tax	Taxable value	3.15% oil; 4.0% gas; reduced for low-value	Tribal credit for Jicarilla production	General Fund
Ad Valorem Production Tax	150% of assessed value	Local property tax rate (avg ~1.3%)	Royalties, transport	Local governments, schools, colleges
Natural Gas Processors Tax	MMBtu of inlet gas	$0.0096/MMBtu (FY17), varies annually	Gas flared, lost, reused, or returned	General Fund
Production Equipment Ad Valorem Tax	Assessed value of production equipment	Local property tax rate	Tribal tax credit	Local taxing districts

Appendix B. Comparison of prices





Appendix C. Regression outputs

Table C.1. Regression outputs for the revenues related to crude oil and natural gas

	Direct Revenue			
Equations:	Crude Oil		Natural Gas	
	Coef.	s.e.	Coef.	s.e.
Intercept	0.016*	(0.008)	0.000	(0.015)
Lag variables				
Price				
1	0.842***	(0.105)	0.883***	(0.151)
2	-0.218*	(0.111)	-0.181	(0.151)
3	-0.225**	(0.113)	0.176	(0.149)
4	-0.029	(0.113)	0.123	(0.148)
5	0.091	(0.113)	-0.284*	(0.145)
6	-0.074	(0.112)	0.038	(0.145)
7	0.121	(0.110)	-0.234	(0.147)
8	-0.141	(0.109)	-0.085	(0.147)
9	0.128	(0.110)	0.389***	(0.148)
10	0.026	(0.108)	-0.064	(0.148)
11	0.049	(0.104)	0.050	(0.149)
12	-0.054	(0.103)	-0.379**	(0.154)
13	0.051	(0.100)	-0.008	(0.152)
14	-0.198**	(0.100)	0.261*	(0.154)
15	0.119	(0.099)	0.127	(0.152)
16	0.057	(0.100)	-0.151	(0.152)
17	0.047	(0.099)	0.059	(0.153)
18	-0.097	(0.099)	0.052	(0.152)
19	0.054	(0.099)	0.132	(0.148)
20	0.034	(0.097)	-0.309**	(0.147)
21	-0.028	(0.097)	0.031	(0.149)
22	0.026	(0.098)	-0.136	(0.152)
23	-0.144	(0.098)	-0.128	(0.154)
24	0.012	(0.091)	-0.311**	(0.150)
Production				
1	-0.701***	(0.223)	0.608	(0.435)
2	-0.265	(0.235)	-0.124	(0.465)
3	-0.274	(0.236)	-0.260	(0.474)
4	-0.231	(0.238)	-0.195	(0.489)
5	-0.424*	(0.238)	-0.316	(0.497)
6	0.251	(0.241)	-0.697	(0.503)

	Indirect Taxes			
	Gross Receipts		Income	
	Coef.	s.e.	Coef.	s.e.
	0.012	(0.011)	-0.150	(0.144)
Lag variables				
Autoregressive				
1	-1.108***	(0.111)	-0.503***	(0.128)
2	-0.931***	(0.130)	-0.356***	(0.133)
3	-0.469***	(0.110)	-0.159	(0.129)
Oil price				
1	0.183*	(0.107)	-0.787	(1.346)
2	0.052	(0.115)	1.877	(1.356)
3	0.078	(0.112)	2.447*	(1.264)
4	-0.066	(0.115)	-1.265	(1.414)
5	0.143	(0.112)	0.083	(1.296)
6	0.017	(0.114)	0.296	(1.421)
7	0.377***	(0.113)	0.918	(1.437)
8	0.002	(0.116)	-2.468*	(1.428)
9	0.241**	(0.114)	0.904	(1.385)
10	0.150	(0.117)	-1.047	(1.346)
11	0.079	(0.111)	1.349	(1.219)
12	-0.006	(0.111)	-1.527	(1.213)
Natural gas price				
1	0.097	(0.092)	-0.471	(1.017)
2	-0.064	(0.085)	-0.566	(0.903)
3	-0.169**	(0.084)	-0.222	(0.890)
4	-0.096	(0.085)	0.421	(0.882)
5	0.003	(0.087)	0.971	(0.934)
6	-0.027	(0.088)	-2.197**	(0.955)
7	-0.090	(0.087)	1.139	(0.976)
8	-0.149*	(0.085)	0.472	(1.039)
9	-0.081	(0.090)	0.314	(1.104)
10	0.149	(0.094)	0.131	(1.127)
11	-0.025	(0.089)	-1.396	(1.025)
12	-0.088	(0.084)	2.408**	(0.943)

7	-0.158	(0.241)	-0.649	(0.504)
8	-0.413*	(0.240)	-0.519	(0.504)
9	-0.212	(0.241)	-0.430	(0.503)
10	0.162	(0.244)	0.897*	(0.501)
11	0.235	(0.246)	-0.488	(0.502)
12	0.128	(0.245)	-0.166	(0.502)
13	-0.014	(0.245)	0.287	(0.512)
14	0.495**	(0.246)	0.391	(0.516)
15	-0.087	(0.247)	1.159**	(0.518)
16	-0.027	(0.246)	0.709	(0.507)
17	-0.080	(0.246)	0.455	(0.504)
18	-0.070	(0.246)	0.194	(0.510)
19	0.129	(0.245)	-0.169	(0.513)
20	0.188	(0.246)	-0.214	(0.518)
21	-0.220	(0.246)	0.141	(0.514)
22	0.142	(0.243)	0.660	(0.516)
23	-0.066	(0.242)	-0.628	(0.495)
24	-0.207	(0.233)	0.569	(0.471)
F test				
All price lags	4.39***		3.98***	
Adj. R-square	0.314		0.338	
Obs.	181		181	

Oil production				
1	-0.478*	(0.276)	-3.088	(3.388)
2	-0.317	(0.279)	-2.516	(3.101)
3	0.271	(0.265)	2.347	(3.180)
4	0.298	(0.267)	0.298	(3.162)
5	0.318	(0.280)	3.802	(3.554)
6	-0.012	(0.279)	2.760	(3.182)
7	-0.247	(0.285)	3.708	(3.323)
8	-0.646**	(0.296)	-0.574	(3.512)
9	-0.152	(0.309)	-4.828	(3.630)
10	0.381	(0.297)	-2.352	(3.625)
11	-0.048	(0.308)	-4.448	(3.890)
12	0.113	(0.316)	3.630	(3.864)
Natural gas production				
1	0.313	(0.305)	-0.429	(3.307)
2	0.131	(0.333)	-5.252	(3.495)
3	0.092	(0.328)	0.764	(3.735)
4	-0.222	(0.324)	-3.790	(3.734)
5	-0.307	(0.324)	-8.362**	(3.389)
6	-0.023	(0.342)	-4.114	(4.207)
7	-0.315	(0.332)	-5.667	(4.647)
8	-0.030	(0.336)	5.963	(4.811)
9	-0.329	(0.329)	0.860	(4.228)
10	-0.630*	(0.353)	2.283	(4.208)
11	-0.458	(0.373)	12.296**	(5.330)
12	-0.375	(0.353)	-3.735	(4.746)
F test				
Oil price lags	1.94**			1.33
Natural gas price lags	1.22			1.23
Adj. R-square	0.522			0.402
Obs.	122			122

Notes: ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels. Coef and s.e. columns are the estimated coefficients and corresponding standard errors.

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