



THE SCHOOL OF PUBLIC POLICY

MASTER OF PUBLIC POLICY CAPSTONE PROJECT

**Alberta 2007 Royalty Review: The Negative Impact on Labour Compensation
and Investment**

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Executive Summary

The question to whether the 2007 royalty review in Alberta achieved its intended goal is one that was already answered by the government's decision to make adjustments to its response to the 2007 Panel's recommendations. However, the 2010 review did not show the areas and amount of loss Albertans incurred as a result of the 2007 royalty increase. This study, focusing on the oil and sector, gives an estimate of the amount of wastes the 2007 royalty rate changes caused in the province through its impact on the oil and gas sector. The 2007 royalty increase caused a significant reduction in total workers' compensation and investment in the oil and gas sector.

Introduction

During the 2015 election campaign, the New Democratic Party (NDP) promised to launch a review of Alberta's royalty framework if elected. The review will be to address the concerns and questions regarding the existing royalty framework by many Albertans. The NDP came out victorious in the election, and in fulfillment of its campaign promise, the newly elected NDP government set up a royalty review panel headed by David Mowat, President of ATB Financial.¹

According to an article² released by the Royalty Review Panel 2015, Albertans were unsure if they have been deriving maximum benefits from the development of their resources. Some raised the concern whether the province had received maximum value in the past when prices were high. Others point out that as industry costs climb higher, the oil and gas business becomes more competitive with increased investment and economic activity in the sector. In light of these concerns, the province needs to maintain a competitive fiscal system to continue to attract investment. With the decline in world oil prices, some suggest that the province would need to maintain activity in the energy industry to continue to support Alberta's economy through the current downturn in prices. Clearly, there is a huge difference between opinions that need to be addressed.

These concerns by Albertans point to the fact that the current royalty regime is lacking in some major aspects and thus inadequate. Despite the concerns expressed by Albertans regarding the existing royalty framework, the recently announced royalty review panel by the government generated mixed reactions, especially due to the declining global oil prices. While the

¹ Alberta Energy. <http://www.energy.alberta.ca/Org/pdfs/RRmandate.pdf>

² Ibid.

government is determined to address the common concerns of all stakeholders (Albertans, who own the resources, and the oil companies who explore these resources) some parties have constantly reminded the panel of the failures of previous reviews, especially the 2007 review. Barry Rodgers, oil and gas consultant, cautions the panel against repeating mistake of the 2007 royalty review panel by going too far in its rate increase.³ Tim McMillan, president of Canadian Association of Petroleum Producers (CAPP) expressed concern over the proposal to review the existing royalty regime and offered recommendations that would address some of the potential negative consequences that may result from the royalty review.⁴

The four member panel began work immediately after being inaugurated in September and is expected to submit its report before the end of the first quarter of 2016. The Panel's mandate is to:

- Understand and assess the current Alberta royalty framework for each of the three distinct sectors in the province's oil and gas industry within the context of capital flows, available economic rent, employment, profitability, product competition for the attraction of capital, and government revenue;
- Understand and assess how government revenue is generated from oil and gas land sales; understand and assess how a royalty regime can generate diversification opportunities, such as value-added processing, innovation or other forms of investment;

Understand and assess how Alberta's royalty framework compares with other jurisdictions;
- Understand and assess the trends that are likely to affect the future (short- and long-term) for the three distinct sectors in the province's oil and gas industry, and their implications for government revenue; develop criteria for assessing the effectiveness of the royalty framework on an ongoing basis.⁵

³ Barry Rodgers, "Royalty Mandate Missing the Point: Opinion." Edmonton Journal, September 28, 2015. <http://edmontonjournal.com/opinion/columnists/royalty-mandate-missing-the-point-opinion>

⁴ Canadian Association of Petroleum Producers, <http://www.capp.ca/media/news-releases/capp-4-point-royalty-plan-for-a-competitive-alberta>

⁵ Alberta Energy. <http://www.energy.alberta.ca/Org/pdfs/RRmandate.pdf>

Given that the current royalty review by the NDP government is not the first ever review in Alberta's history, it would be helpful to understand the impact of an upward review of the royalty rate based on the last review and rate increase that was announced in 2007.⁶

This paper studies and analyzes the impact of the 2007 Alberta Royalty Review Panel's recommendations along with its implementation on total workers' compensation and investment by the oil and gas sector and the support activities industry for oil and gas. The findings of the paper show that the 2007 royalty review and the subsequent royalty changes adopted by the Alberta government caused a substantial reduction in the total workers' compensation in these sectors. Investment also declined significantly after 2007. Based on these findings, the 2007 Alberta royalty review and the announced changes to the royalty regime negatively affected total workers' compensation and investment by the oil and gas and support industries. The decline in workers' compensation represented a net loss to the province in terms of lost income and forgone tax revenue. Together with reduction in investment, Albertans were not better off after the royalty changes, which suggests that the changes to the royalty rates announced in 2007 did not accomplish the overall goal of the review. The overall goal of the review was to ensure that the government derive more benefit from natural resource development and increase government overall revenue through increased royalty revenue.

The cost of raising additional revenue from a royalty increase – which is the forgone private sector income due to companies' decisions to decrease their activities in response to the rate - could be very high and a royalty increase would be unjustifiable if total tax and royalty revenue declines with an increase in royalty rates. To assess the cost of raising additional revenue through royalty rate increase, we have to measure the harm (loss of income generating

⁶ Alberta Energy, http://www.energy.alberta.ca/Org/pdfs/RoyaltyReviewPanelfinal_report.pdf

opportunities) to the private sector as a result of the increase in royalty rate. This study looks at the impact of the increase in royalty rates announced by the government in 2007 and its subsequent implementation in the years that followed on wages and salaries, using total labour compensation as the proxy, and level of investment.

Literature Review

The impact of royalty increment on the oil and gas sector has not received as much attention by researchers in the past as one would expect. A study by Busby, et al. which was a commentary published in 2011 is the only major study that was exclusively focused on the impact of the royalty rate changes in Alberta. The study examined the effect of royalty rate increase in Alberta on bonus bid values.⁷ Using bonus bids data for Alberta, British Columbia and Saskatchewan within 50 or 100 kilometres of their borders, the authors applied a difference-in-difference regression technique to analyze the effects of the increase in royalty rates in Alberta on bonus bid. This technique allows for the control of factors such as geographical and geological differences. A key finding of the study was that Alberta government's revenue receipt from bonus bid decreased as much as the projected increase in revenue from royalties.

According to the findings of the study, the average value of oil and gas bonus bids declined by 57 percent in Alberta during the period of high royalty rates spanning between October 2007 and March 2010. To isolate other factors that could have influenced the result, and identify the true effect of the increase in royalty rates, the authors compared bonus bids within 100 km of the Alberta borders. By restricting the comparison within 100km of Alberta borders,

⁷ Colin Busby et al., *Rethinking Royalty Rates: Why There is a Better Way to Tax Oil and Gas Development*. C.D. Howe Institute, 2011. https://www.cdhowe.org/pdf/commentary_333.pdf

major differences amongst the provinces that could influence the result were drastically reduced. The new result that stemmed from the new approach, showed that Alberta's royalty increase reduced bonus bids by 42 percent, when both the geological zone and geographic factors are held constant across all bonus bids.

Similar result was also found for the number of bids. The authors counted the number of bids within concentric bands of land measuring one kilometre in width and extending east and west from the Alberta borders with Saskatchewan and British Columbia. They found that, in response to the royalty increase, the number of bids in each of these one-kilometre-wide bands, in Alberta, declined relative to otherwise similar bands in adjacent provinces, and in Alberta before the royalty change, by 27 percent.

This paper attempts a similar analysis but with a focus on labour compensation and level of investment.

A study by the Fraser Institute, based on survey of top executives in the oil and gas sector, analyzed how the opinions of these top executives about the investment attractiveness of the provinces changes with the royalty rate increase in the period between 2007 and 2010. According to the study, most of the top executives surveyed agree that the investment attractiveness of the province was made worse by the 2007 royalty rate changes. Given that opinions actually form the basis for eventual decisions, we can conclude from the study that royalty rate increase affects investment choice in different organizations.

David Mowat, chair of the royalty review panel, acknowledged the many different challenges that a royalty review would encounter.⁸ A poorly done royalty review would have negative effects on investments, with several other indirect consequences that could cost the

province huge amount of money through lost tax revenues. Mowat believes the best possible review would be such that satisfies the expectations of the relevant stakeholders. His goal as the panel chair is “to create a believable common ground for the people of Alberta, for the politicians, for the department of energy, for the companies that invest here.” The panels approach, according to Mowat, “is to get as complete a set of information and find our best way to use it.”

Royalty Regime for the Conventional Oil and Gas Industry

The oil and gas sector in Canada is subject to a tax system that differs from the usual corporate income tax system. The conventional oil and gas sector and the oil sands are subject to different royalty regimes. For the conventional oil and gas industry, Alberta employs a different rate structure but has the same two elements used for the oil sands: an auction payment, known as a bonus bid, and royalties, which depend on the prices of oil and gas and the production level of the wells.⁹ An auction payment is a payment made by firms to the government for the right to explore and drill for government-owned resources for a specified period of time, while royalties apply to the value of resources extracted.¹⁰ Government levy these resource taxes – over and above other taxes on corporate income – to capture a share of the economic rents earned from the extraction and sale of natural resource.¹¹

Alberta, like British Columbia and Saskatchewan, calculates royalties for conventional oil and gas on a well-by-well basis. The structures, thresholds, and rates vary widely amongst the three provinces. However, the royalty regimes are similar in certain major aspects. The

⁹ Alberta Energy, http://www.energy.alberta.ca/About_Us/Royalty.asp

¹⁰ Colin Busby et al., *Rethinking Royalty Rates: Why There is a Better Way to Tax Oil and Gas Development*. C.D. Howe Institute, 2011. https://www.cdhowe.org/pdf/commentary_333.pdf

¹¹ Ibid.

amount of royalties charged on oil and gas is usually estimated and adjusted based on the following criteria: the age of the well; the volume produced; a factor that adjusts for changing market prices; and the density or cost of processing the oil or gas.¹² Before the 2007 royalty rates changes, the maximum total royalty rate was applied at natural gas prices above \$3.70 per gigajoule (GJ) of gas.¹³ Similarly, oil production from new wells had a maximum total royalty rate of 30 percent of the gross value of produced oil, which began to apply at oil prices above \$30 per barrel.

Royalty Regime for Oil Sands Projects

Alberta applies a different royalty structure for the oil sands projects from that of the conventional oil and gas. Since 1997, royalties for the oil sands have been applied in two stages of the life cycle of a specific oil sands project. The first stage is the period before cumulative total revenues from the sales of a project's product exceed the cumulative operating and capital costs of the facility – that is, the period before the project makes any profit – which is commonly known as the pre-payout period.¹⁴ In the second stage, which is known as the post payout period,¹⁵ when a project's cumulative revenues exceed its cumulative operating and capital expenditures, the firm pays a tax on its cash flow (the difference between revenues and operating and capital expenditures).

This form of cash-flow taxation is intended to capture economic rent and reduce disincentives to investment in the oil sands sector, where large, up-front capital expenditures are required. When the first commercial oil sands projects were executed in the 1960s, development

¹² Ibid., pp. 4-5

¹³ Ibid., 5

¹⁴ Ibid.

¹⁵ Ibid., pp. 7-8

was a very costly and high-risk process. At the time, oil sands technology and engineering for extracting bitumen were just in their formative stage and developers faced formidable challenges in extracting bitumen.¹⁶ To encourage the development of oil sands industry, the government of Alberta adopted a royalty regime in which the government shared the risk by taking a minimum royalty until an oil sands project began to make profit.¹⁷ Royalty terms for major oil sands projects were negotiated on a project-by-project basis and written into individual agreements with the government.¹⁸ Minimum royalty rates on gross revenue ranged between 1% and 5%, while rates on net revenues (post-payout) ranged between 25% and 50%.¹⁹

As oil sands development progressed, research and technological innovations led to the development of new tools and processes that reduced production costs. With the subsequent increase in prices of oil, more companies got involved in oil sands development leading to a growing oil sands sector and the need for different approach to oil sands royalty.²⁰

To address the need for a different approach to royalty administration in the expanding oil sands sector, the Alberta Chamber of Resources in 1993 commissioned the joint industry–government National Task Force on Oil Sands Strategies “to assess the technical, socioeconomic, environmental and marketing aspects of oil sands development and recommend strategies to address these issues.”²¹ The task force identified Alberta’s ad hoc, project-specific royalty structure as a barrier to oil sands development. The ad hoc structure, according to the task force created uncertainties about what royalty terms would apply to future investments, because a Crown agreement establishing royalty terms had to be negotiated for each new oil sands

¹⁶ Alberta Energy, http://www.energy.alberta.ca/OilSands/pdfs/Royalty_Guidelines.pdf

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ Alberta Energy, http://www.energy.alberta.ca/OilSands/pdfs/Royalty_Guidelines.pdf

²⁰ Ibid

²¹ Ibid.

development. In addition, since the royalty structure was not transparent, it was difficult for developers to evaluate investment plans.

Based on its findings, the task force in its report in 1995 outlined a comprehensive new approach for Alberta's oil sands industry. A key recommendation was that,

Oil sands royalty should be established through legislation rather than individual Crown agreements. That is, the royalty regime should be generic: the same rules should apply in the same situations and the same standardized royalty terms should apply to all new OSR Projects. This generic approach to oil sands royalty would place all new OSR Projects on an equal footing. Standard royalty terms would create fiscal certainty and stability, and encourage oil sands investment.²²

The Government of Alberta accepted the recommendation of the task force and began working towards developing a generic oil sands royalty regime, which incorporated many of the Task Force's recommendations. Alberta's current generic oil sands royalty regime dates back to July 1, 1997, when the Oil Sands Royalty Regulation 1997 (OSRR'97) came into being. Effective January 1, 2009, to implement the New Royalty Framework, the OSRR'97 was replaced by the new OSRR'09, Oil Sands Allowed Cost (OSAC) Regulation and Bitumen Valuation Methodology Regulation (BVM).²³ Under the pre-2009 regime, the royalty paid was 1 percent of gross revenues during the pre-payout period and greater of 1 percent of gross revenues or 25 percent of net revenues during the post-payout period.²⁴

Royalty Review Panel's Report and Recommendations

In 2007, the government of Alberta announced a panel to review the royalty rates for the province.²⁵ The 2007 Royalty Review Panel was created to review whether Albertans were receiving a

²² Ibid.

²³ Alberta Energy, http://www.energy.alberta.ca/OilSands/pdfs/Royalty_Guidelines.pdf.

²⁴ Ibid.

²⁵ Alberta Energy, http://www.energy.alberta.ca/About_Us/Royalty.asp

fair share from energy development through royalties, taxes and fees. The seven-member panel, which was chaired by William M. Hunter, comprised of both academic and industry experts.²⁶ The mandate of the Panel was “to review whether Albertans are receiving a fair share from energy development through royalties, taxes and fees.”²⁷ The report of the panel, called Our Fair Share, was released on September 18th 2007.

The Panel concluded that Albertans did not receive the right compensation from energy development. According to the panel, royalty rates and formulas had not kept pace with changes in the resource base, world energy markets and conditions in other energy-rich jurisdictions. Therefore, it advised the government to rebalance the royalty and tax system to ensure a fair share was collected both currently and as circumstances change.

The Panel recommended that

The government of Alberta must implement means to gather and assess the workings of all aspects of revenue policy and collection associated with energy resources in the province. This must be done on behalf of the citizens of Alberta, and its findings must be made public and have the highest degree of credibility. It must not be a confidential exercise internal to the government.²⁸

Some specific recommendations of the Panel were that Rate caps on price be raised for natural gas to Cdn\$17.50/MMBtu and for conventional oil to Cdn\$120/per barrel; increase the “post-payment” net royalty rate from 25 to 33 percent for the oil sands; reclassify existing future primary oil sands wells as conventional heavy oil wells.

In October 2007, following the recommendations of the panel, though with some adjustments, the Government of Alberta announced a change to the royalty regime that promised an increased in natural gas and conventional oil royalties, with a new maximum rate applied to

²⁶ Ibid.

²⁷ Ibid.

²⁸ Alberta Energy, http://www.energy.alberta.ca/About_Us/Royalty.asp

both conventional oil and natural gas of 50 percent of gross revenue.²⁹ The changes announced in October 2007 were to be effective on all production as of January 1, 2009. The newly announced changes to the royalty saw several royalty programs eliminated, including differential royalty rates by pool discovery date.³⁰ The maximum royalty rate was applied at oil prices above \$120 per barrel and at natural gas prices above \$16.59 per GJ.

The new Oil Sands Royalty announced in October 2007, which took effect on January 1, 2009 maintained the cash-flow model but raised the rates. The pre-payout royalty rate was placed on a sliding scale based on oil prices, starting at one percent of gross revenues and increasing to 9 percent of gross revenues at oil prices above \$120 WTI per barrel. The post-payout royalty rate on net revenues varies between 25 to 40 percent. The firm pays the greater of the net royalty or the royalty on gross revenues of 1 to 9 percent, again depending on the price of oil. Based on the recommended changes and government's response, royalty revenue was projected to increase by \$1.4 billion dollars, and increase of about 20 percent.³¹

Notable Shocks Post 2007 Announcement

A discussion of events following the royalty review would add some context to the study and serve as a background to the economic circumstances during the period that followed the rate hike.

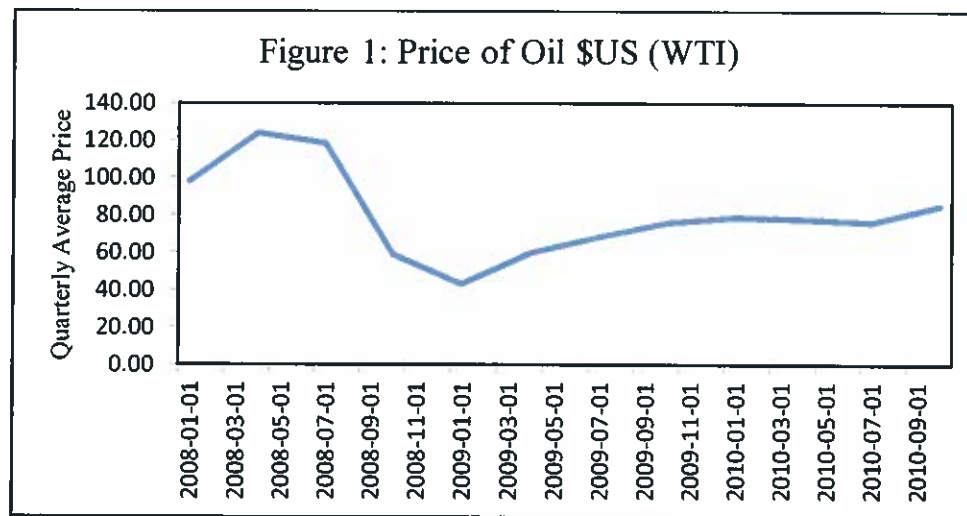
After the announcement of royalty rate changes by the government in 2007, the global economy experienced shocks that spilled over to Canada and Alberta making the announcement wrongly timed. Although some of these changes were as a result of shocks from the 2008

²⁹ Alberta Energy. The New Royalty Framework October 25, 2007.
http://www.energy.alberta.ca/Org/Publications/royalty_Oct25.pdf

³⁰ Ibid., p. 7

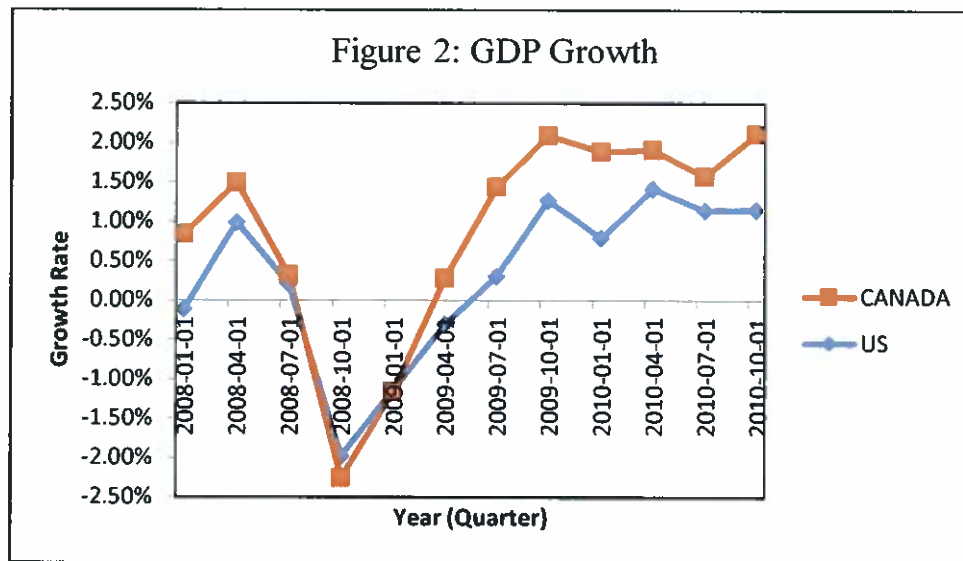
³¹ Ibid.

financial crisis, opponents of the royalty rate increase blamed it on the royalty rate increase. The period after the announcement the province witnessed a decline in investment in oil and gas and reduction in production. Also, during this period, oil prices drastically declined, which could be part of the reason for decline in production and investment. It would be quite accurate to say that the announcement of the changes could not be wrongly timed as the sweeping impact of the global financial crisis meant that countries around the globe, especially the US which is Alberta's main export market. Although, less impacted compared to the US, Canada was not immune from the global economic slowdown. All the major economies of the world were dealt a blow by the crisis. To drive home these points, the following set of graphs are used to show these changes:

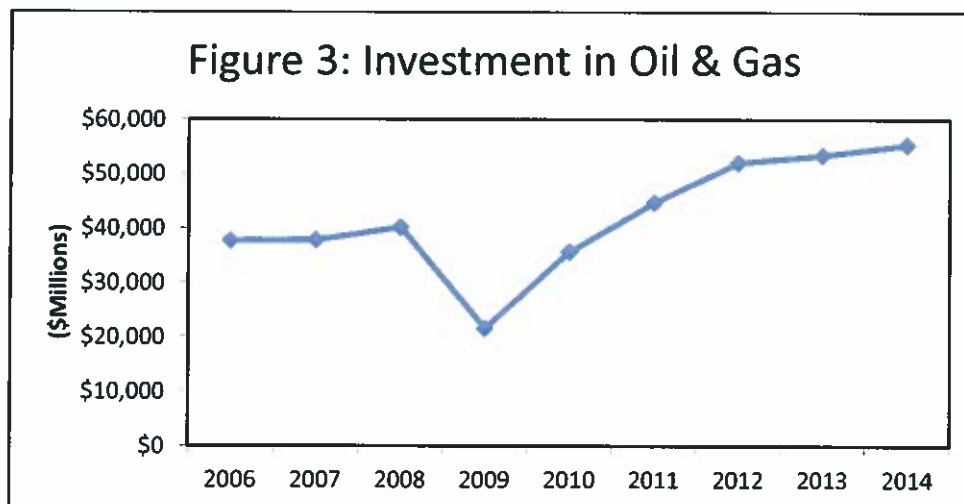


As shown in Figure 1, oil price went from a high of over \$120 to a low of about \$40, just when the announcement was expected to take effect. Although oil price began to recover from late 2009, it was nowhere near the pre-crisis period. Obviously, when the panel made its recommendations it did not anticipate the event that unfolded in the next three years following the announcement. This alone has the potential to derail a lot of government policies, which was exactly what happened to a lot of government policies around the world. And of course, Alberta

was not an exception.



Economic growth, measured by growth in GDP, decline from a high of more than 1 percent to a low of -2 percent for Canada, and even lower for the United States. Of course, Alberta is not immuned to these shocks. For example, economic performance of the United States is a strong predictor of economic performance in Alberta because the United States is the biggest market for Alberta exports. To further show the impact of these negative shocks, figure 3 plots investment in the oil and gas extraction industry in Alberta.

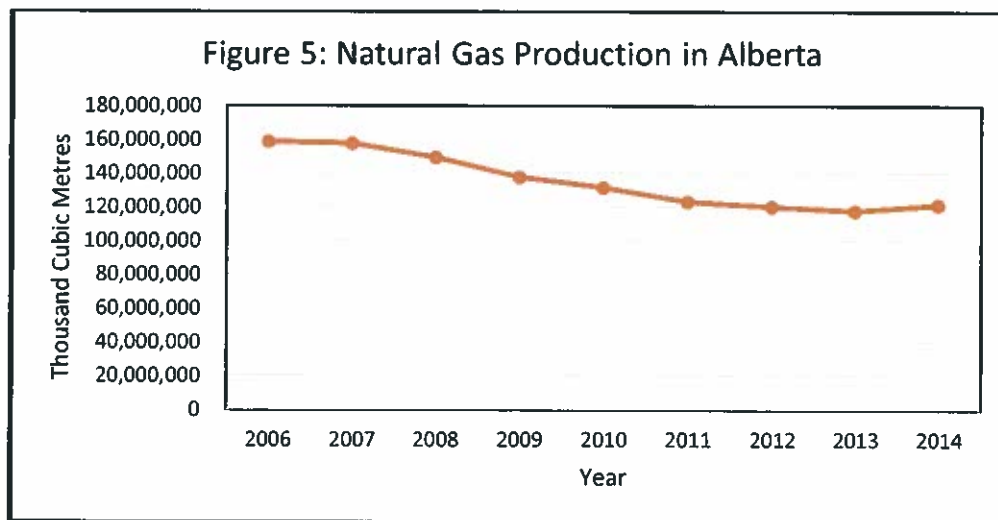
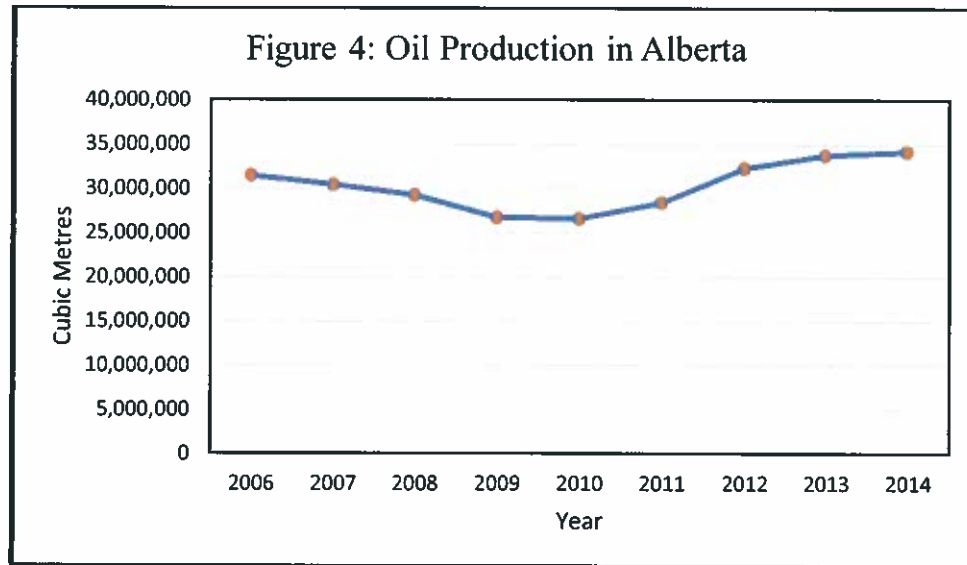


Investment declined drastically during the same time period that the economy of the United States, Canada, and the rest of the world declined. During this period, oil and natural gas production were reduced in Alberta. This means that the projections on both price and production by the royalty review panel were off mark. Therefore, the intended revenue increase from royalty rate increase was never achieved. Figures 4 & 5 are graphs of oil and natural gas production in Alberta. In both cases, production declined during the period.

In 2008, after the announcement of the changes to the royalty regime, the global financial crisis struck, which made it very difficult for the government to realize the full benefit of the royalty review. With increased royalty rates blamed for the worsening economic situation in the period in Alberta, the government undertook another royalty review in 2010 to address the issues that resulted from the 2007 review.

In March 2010, the provincial government announced that, beginning from January 1, 2011, the maximum oil and gas royalty rates would be reverted back to rates that were closer to those that prevailed before the October 2007 announcement; however, the more progressive rate structure was maintained with regard to resource prices and well production levels.³² This announcement followed the decline in global commodity prices, especially crude oil prices as a result of the 2008 global financial crisis. The oil and gas industry was hit by the decline in oil prices, which means lower royalty revenues for the government.

³² Ibid.



Methodology and Analysis

Determining the impact of the royalty increase as announced in 2007 on labour compensation in Alberta's oil and gas industry means that we need to isolate as much as possible the impact of the announced royalty increase from the shocks of the decline in global oil prices, the downturn in the US economy and the financial market turmoil that occurred during this

period. To isolate the impact of the royalty increases from the effects of the oil price and other global shocks, we use an econometric model to predict labour compensation in the oil and gas sector in Alberta for the years 2008 to 2013 based on trends in these variables in the neighbouring provinces of British Columbia and Saskatchewan. The rationale for this approach is that all three provinces were exposed to the same external shocks, but royalty rate increase only occurred in Alberta. In other words, the trends in British Columbia and Saskatchewan reflect the external shocks, but not the effect of the royalty review and royalty increases in Alberta.

The data for labour compensation is found in CANSIM Table 383-0031. These observations are from the year 1997 to 2013 and it is an annual data with 17 observations. The limited number of observation is the main limitation of the entire study. Thus, inference based on the result from the data set must be done with caution. Similarly, the data for investment is contained in CANSIM Table 029-0005 and it is an annual data. The observation is from 1991 to 2013, which is subject to similar shortfall as the data set for compensation.

There is a strong relationship in the trends in labour compensation in the three provinces, which makes the projects based on trends in British Columbia and Saskatchewan good predictors for the level of labour compensation in Alberta in the absence of the royalty increases. This procedure however has its limitations, but is better than attributing all of the downturn in oil and gas activity in Alberta in the 2008-10 period to either the royalty increase or the world-wide oil price shock. A simple linear equation with the relevant variable for Alberta as the dependent variable and the corresponding variables for British Columbia and Saskatchewan as the independent variables is used.

Model Specification

Regression Estimate for Total Labour Compensation

The regression estimate for total labour compensation is a simple linear equation with the following specification:

$$Y_{IABt} = \alpha + \beta_1 Y_{IBCt} + \beta_2 Y_{ISKt} + \varepsilon_t$$

Y_{IABt} is the total compensation in Alberta in the oil and gas extraction industry or support activities for the oil and gas extraction industry at time t . Y_{IBCt} and Y_{ISKt} are the labour compensation for the same industries in British Columbia and Saskatchewan respectively; α is the intercept term while β_1 and β_2 are the coefficients; ε_t is the error term.

The regression equation was estimated based on the data obtained from 1991 to 2007 while the predictions are for the years 2008 to 2013.

Figure 6 shows indices of total labour compensation in the oil and gas extraction sector with 2007, as the base year, equal to 100. The figure indicates that total compensation in the sector increased in Alberta throughout the 2008-2013 period, but grew more slowly than in Saskatchewan in the 2007 to 2010 period. The figure also shows a long-term decline in total compensation in the oil and gas extraction sector in British Columbia.

Figure 6
Trends in Total Labour Compensation in the
Oil and Gas Extraction Sector

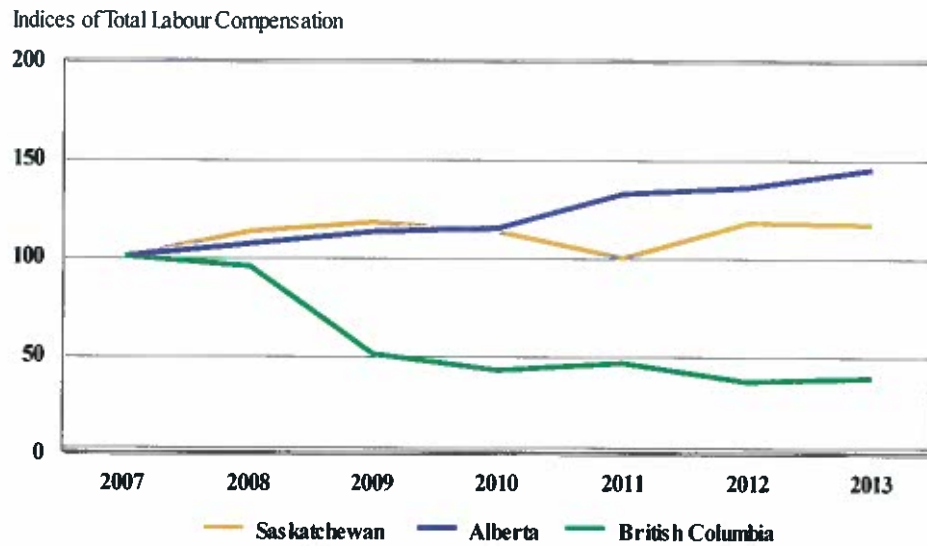


Figure 7
Trends in Total Labour Compensation in the
Support Activities for Mining and Oil and Gas Extraction Sector

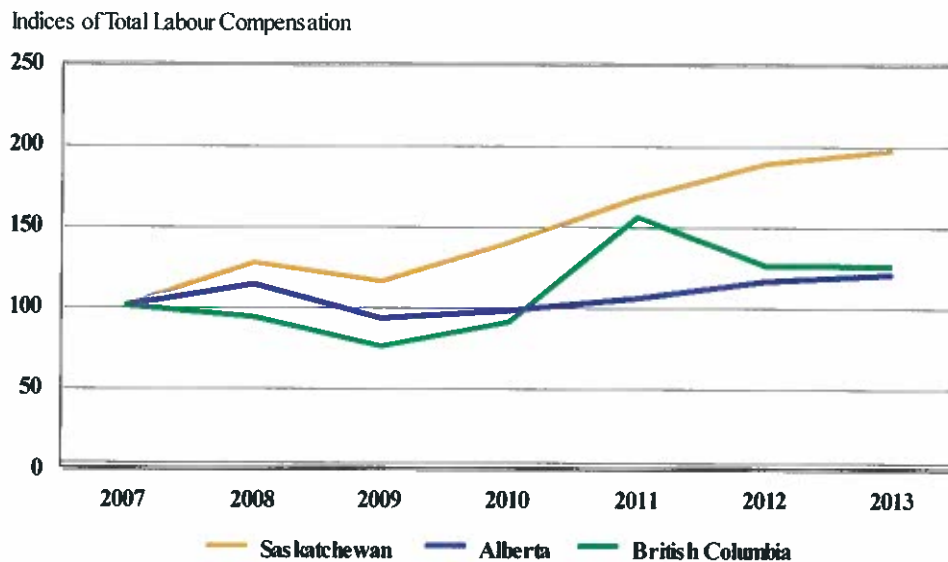


Figure 7 shows that total compensation in the Support Activities sector in Alberta did not grow between 2007 and 2010 in Alberta and British Columbia while it grew by almost 40 percent in Saskatchewan.

Impact of the Royalty Increase on Labour Compensation in the Oil and Gas Industry

In response to the increased cost resulting from higher conventional oil and gas royalties in Alberta, firms may have reduced exploration and development activities by reducing the number of workers employed. Wages and salaries rates for employed workers may have also declined due to the labour market downturn. The overall effect would be a reduction in total labour compensation paid by the industry in Alberta.

Regression results for total compensation in the oil and gas extraction industry are presented in Table 1. The estimate for the model was for 1997 to 2007, while the prediction is for the year 2008 to 2013.

Table 1: Regression Results for Compensation in Oil and Gas Extraction				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
α	-1034000	268000	-3.859	0.00482 **
β_1	-12.75	3.019	-4.22	0.00291 **
β_2	4.809	3.899	12.333	1.74e-06 ***
Residual standard error: 243100 on 8 degrees of freedom				
Multiple R-Squared: 0.9908				
Adjusted R-Squared: 0.9886				
F-statistic: 433.1 On 2 and 8 DF, p-value: 7.012e-09				

The coefficient estimates, especially for Saskatchewan, are highly statistically significant. The R-Squared values are also very high, which indicates that the model tracks the trend in labour compensation for oil and gas extraction sector in Alberta very well.

Table 2: Actual and Predicted Labour Compensation for Oil and Gas Extraction in Alberta				
Year	Actual Amount (\$ Million)	Predicted Amount (\$ Million)	Difference (\$ Million)	% Difference
2008	9,389.654	10,993.660	-1,604.006	-15%
2009	9,914.379	14,194.679	-4,280.300	-30%
2010	10,101.723	13,921.444	-3,819.721	-27%
2011	11,650.838	11,677.660	-26.822	-0.23%
2012	11,916.686	14,980.871	-3,064.185	-20%
2013	12,737.662	14,765.030	-2,027.368	-14%

The second column in Table 2 shows the actual labour compensation for oil and gas extraction in Alberta while the third column shows the predicted total labour compensation in Alberta for the years after 2007 based on the regression model and the actual labour compensation in oil and gas extraction in British Columbia and Saskatchewan in the predicted years. The difference between the predicted compensation and the actual compensation can be interpreted as the impact of the royalty increase on total compensation. For example, in 2009 the predicted total labour compensation was \$14.19 billion, while actual total compensation was \$9.91 billion. The difference, \$4.28 billion, can be interpreted as the impact of the royalty increases on labour compensation in the oil and gas extraction sector in Alberta.

Although the royalty increase did not take effect until January 1, 2009, the predicted compensation indicates a 15 percent reduction due to the announced increases. Similarly, by 2009 the total compensation in the oil and gas extraction sector had declined by 30 percent,

which was twice as large as the decline in the previous year. In 2010, which was the year the government announced a reversal to the increases to royalty rate, the decline was 27 percent.

By 2011, with the revision to the royalty system, total compensation was reduced by less than one percent. However, in the two years after the return to the status quo, the model seems to overestimate total labour compensation.

The Impact of the Royalty Review on Total Labour Compensation

Based on the regression models results, the reduction in total compensation for the oil and gas sector and the support activities sector was in excess of \$4 billion in 2009. This was more than twice the projected increase in revenues from the royalty increases of \$1.9 billion. The reduction in total compensation is even higher for 2010. These reductions represent a loss to Albertans through reduction in their earnings. In terms of income tax revenues forgone, it could have been as high as \$400 million in 2009 and 2010 and a little less for the subsequent years.

Impact of the Royalty Increase on Labour Compensation in the Support Industry

A similar approach has been used to estimate the effect of the royalty review on labour compensation in the support activities sector. Table 3 shows the regression results and Table 4 shows the actual and predicted total labour compensation for support activities in Alberta from 2008 to 2013.

The coefficient estimate for British Columbia is only significant at the 10 percent significant level which may be due to the fact that support activities for the oil and gas extraction sector in British Columbia is very small compared to Alberta. Compared to the oil and gas extraction activities sector, the decline in total compensation for the support activities sector was smaller in terms of percentage difference, especially in 2009.

Table 3: Regression Result for Support Activities				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
α	736,500	104,300	7.063	0.000106 ***
β_1	9.189	3.151	2.916	0.019398 *
β_2	8.756	2.35	3.725	0.005826 **
Residual standard error: 151900 on 8 degrees of freedom				
Multiple R-Squared: 0.9895				
Adjusted R-Squared: 0.9868				
F-statistic: 375.9 On 2 and 8 DF, p-value: 1.229e-08				

Table 4: Total Compensation for Support Activities					
Year	Actual Amount (\$ Million)	Predicted Amount (\$ Million)	Difference (\$ Million)	% Difference	
2008	6,070.17	6,240.96	-170.79	-3%	
2009	4,968.3	5,631.34	-663.04	-12%	
2010	5,185.00	6,876.19	-1,691.19	-25%	
2011	5,639.51	7,832.48	-2,192.97	-28%	
2012	6,200.28	8,259.54	-2,059.26	-25%	
2013	6,456.04	8,376.83	-1,920.79	-23%	

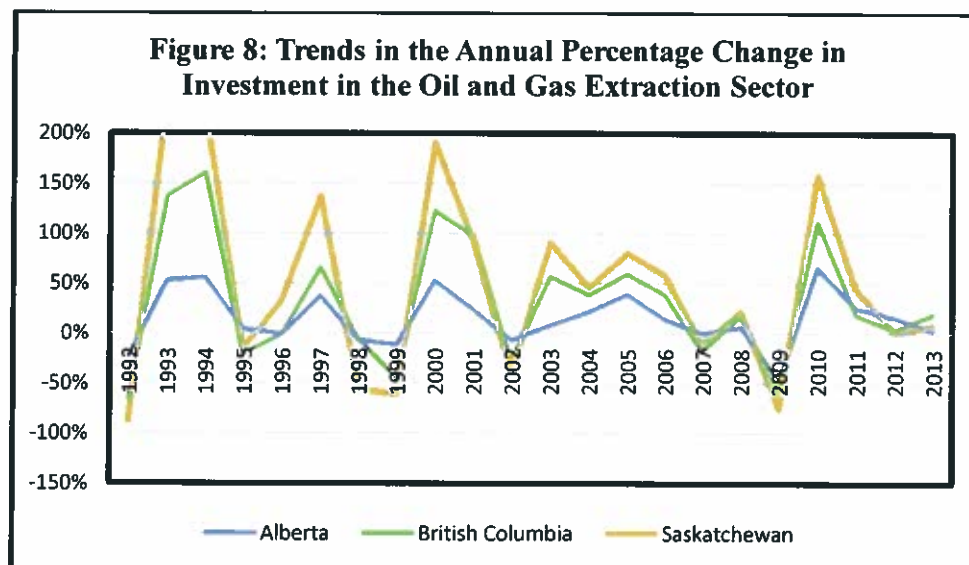
Forgone Income as a Result of the Royalty Review

Based on the prediction of what income would have been in Alberta, we can conclude that the government, by increasing the royalty rate and its effect on compensation, lost tax income that would have been collected from workers whose compensations were reduced. Combined reduction in total compensation for the oil and gas sector and the support activities sector was in excess of \$4 billion in 2009. Compared to the projected increase revenue of \$1.9 billion, this represents a huge loss to the province. The reduction was even higher in 2010. In terms of tax dollars potentially forgone, it was in excess of \$400 million for each year between

2009 and 2010 and a little less for the subsequent years. These are huge losses compared to projected increase in government revenue from the royalty increase.

The Impact of the Royalty Increase on Investment in the Oil and Gas Industry

The negative impact on investment has been one of the strongest arguments advanced by those opposed to royalty increase. The same model for labour compensation employed to predict investment in Alberta that would have occurred in the absence of a royalty increase, based on the trends in investment in British Columbia and Saskatchewan. Investment in Alberta is tracked closely by investments in British Columbia and Saskatchewan. Figure 8 shows the long-term investment trends in the three provinces using the annual percentage change.



Regression Estimate for Investment

The regression equation for the investment is similar to the one for labour compensation but with different variables:

$$I_{iABt} = \delta + \rho_1 I_{iBCt} + \rho_2 I_{iSKt} + \mu_t$$

I_{iABt} is total investment for the oil and gas extraction industry in Alberta and $t = \{1991, 1992, \dots, 2013\}$; δ is the intercept term while ρ_1 and ρ_2 are the coefficients; I_{iBCt} and I_{iSKt} are investment in British Columbia and Saskatchewan respectively, while μ_t is the error term. The regression was run for the years 1991 to 2007 while the predictions were for the years 2008 to 2013.

Though this regression estimation looks simple, it captures significant information. As can be seen in Figure 8, investment in British Columbia and Saskatchewan tracked very closely that of Alberta.

Table 5 shows the regression output obtained for the relevant prediction. Contrary to expectation, the regression result shows BC as being more significantly correlated with Alberta. This is surprising because, given that Saskatchewan is more similar to Alberta in terms of oil and gas operation, one would expect to see a stronger correlation between investment in oil and gas extraction in Alberta and Saskatchewan. This surprising result means that another set of regression with only one independent variable at a time is required. The multiple and adjusted r-squares were still very high in each case.

Table 5: Regression Result for Investment				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
δ	817.9164	1029.6304	0.794	0.4412
ρ_1	5.5817	0.5525	10.103	1.6e-7 ***
ρ_2	2.3532	1.1369	2.07	0.0589 .
Residual standard error: 1748 on 13 degrees of freedom				
Multiple R-Squared: 0.9721				
Adjusted R-Squared: 0.9678				
F-statistic: 375.9 On 2 and 8 DF, p-value: 7.855e-11				

Table 6 present the predicted values for investment in Alberta.

Table 6: Total Investment					
Year	Actual Amount (\$ Million)	Predicted Amount(\$ Million)	Difference (\$ Million)	% Difference	
2008	40110.9	35582.59	4528.31	13%	
2009	21579.6	30584.57	-9004.97	-29%	
2010	35622.5	44362.03	-8739.53	-20%	
2011	44603.9	44427.52	176.38	0%	
2012	51941	40124.87	11816.13	29%	
2013	53362.6	43462.91	9899.69	23%	

Investments in Alberta for the years after the royalty rate increase were predicted by regressing investment in Alberta (in the oil and gas extraction industry) on those of British Columbia and Saskatchewan. This was done for the period before the royalty rate changes. The estimates of coefficients obtained from the regression output in Table 5 were used to predict the investment for the years after the royalty increase. The predicted value was subtracted from the actual value. The obtained difference is the basis for the inference of the impact of royalty rate increase on investment in Alberta.

Looking at the difference in each of the years, we can draw certain conclusions about the results that are consistent with the industry's claims. For example, for the years 2009 and 2010, investment in Alberta was negatively impacted by the royalty rate increase. For 2008, 2012 and 2013, the model seemed to under predict investment in Alberta. One possible explanation for the under prediction for 2012 and 2013 could be due to the growth of oil sands investments in Alberta and the non-existence of oil sands operations in British Columbia and Saskatchewan.

As a robustness check, same prediction was done using one province at a time. First, investment in Saskatchewan's oil and gas extraction sector was used and then same prediction was done using only British Columbia. Below are the results:

Table 7: Regression Result for Investment using only Saskatchewan				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
δ	-1721.995	2862.614	-0.602	0.557
ρ_2	11.885	1.819	6.535	1.32e-05 ***
Residual standard error: 5010 on 14 degrees of freedom				
Multiple R-Squared: 0.7531				
Adjusted R-Squared: 0.7355				
F-statistic: 42.71 on 1 and 14 DF, p-value: 1.322e-05				

The regression result, using only Saskatchewan, is significant at all three significant levels. This is contrary to the initial regression where Saskatchewan variable was insignificant at any of the three significant levels. Although the multiple and adjusted r-squared are lower than the previous case, having the Saskatchewan variables significant at all three levels of significance is more statistically justifiable and important.

Table 8: Total Investment based Regression from Table 7					
Year	Actual Amount (\$ Million)	Predicted Amount (\$ Million)	Difference (\$ Million)	% Difference	
2008	40110.9	34972.8	5138.1	15%	
2009	21579.6	29474.64	-7895.04	-27%	
2010	35622.5	43909.38	-8286.88	-19%	
2011	44603.9	55158.86	-10554.96	-19%	
2012	51941	54362.54	-2421.54	-4%	
2013	53362.6	47915.93	5446.67	11%	

The predictions, which are based on the regression coefficients in Table 7, tend to over predict the total investment for 2008. From Figure 3, investment declined substantially from 2008 to 2009. However, the prediction of the model shows a 15 percent increase for 2008. All the decline between the two year periods was ascribed to the year 2009 by the model.

Table 9: Regression Result for Investment using only BC				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
δ	2286.6058	829.0077	2.758	0.0154 *
ρ_1	6.5307	0.3425	19.068	2.05e-11 ***
Residual standard error: 1942 on 14 degrees of freedom				
Multiple R-Squared: 0.9721				
Adjusted R-Squared: 0.9678				
F-statistic: 363.6 on 1 and 14 DF, p-value: 2.052e-11				

Table 9 presents the regression result for investment in Alberta regressed on investment in British Columbia for the oil and gas extraction sector. Investment in British Columbia is still significant at all three levels of significance test. The multiple and adjusted r-squared values are very high, which could mean that the model explain a significant amount of variation in investment in Alberta using investment in British Columbia.

Table 10: Total Investment					
Year	Actual Amount (\$ Million)	Estimated Amount (\$ Million)	Difference (\$ Million)	% Difference	
2008	40110.9	34461.44	5649.46	16%	
2009	21579.6	29887.33	-8307.73	-28%	
2010	35622.5	42663.35	-7040.85	-17%	
2011	44603.9	40134.01	4469.89	11%	
2012	51941	35284.31	16656.69	47%	
2013	53362.6	40683.24	12679.36	31%	

These results confirm the outcome obtained from the case where both provinces were used, though with same limitations.

A qualification that has to be made in claiming that royalty rate impacts investment is that there could have been a capital flow to these other provinces if the increase in the royalties

in Alberta made these provinces more attractive investment locations. If that is the case then our results could be biased.

Limitation of the Analysis

Some of the shortcomings of the methodology should be acknowledged. The model itself would fall short of some key statistical conditions, which are required for the necessary inference to achieve a measure of confidence. One of such requirement would be the size of the observations, and this is particularly true for the labour compensation, where only 17 observations are used. A smaller number of observation means lower degrees of freedom. This would reduce our confidence in the result due to reduced information captured by the data.

Without doubt, events in Alberta in the affected industries also spilled over to those in British Columbia and Saskatchewan. In other words, the problem of reverse causality is a possibility. The problem of reverse causality, if present, could bias the estimates of the coefficients. A biased estimate of the coefficients will lead to a less accurate prediction

Conclusion

Despite the limitations of the study, we can conclude that the increase in royalty rates announced in 2007 following the royalty review had negative consequences for key economic variables. This study showed that the 2007 royalty increase cost the province through its unintended negative consequences on salaries, wages and investment in the oil and gas sector as well as in the support sector for the oil and gas sector.

The findings of this study could serve as a lesson for future royalty reviews, including the ongoing review. Failure by future royalty review panels to look at the process with the holistic approach it deserves will risk repeating the same mistake of the past.

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