



Investment in the Canadian and U.S. Oil and Gas Sectors

A TALE OF DIVERGING FORTUNES

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Executive Summary

The oil and gas industry is critically important to Canada's economy. It accounts for almost 8 percent of Canada's GDP, as well as for a significant share of the tax revenue collected by governments. The oil and gas sector is particularly important to the provincial economies of Alberta and Saskatchewan. It accounts for almost 30 percent of Alberta's GDP and slightly over 23 percent of Saskatchewan's GDP. As such, the economic health of the oil and gas sector is a direct contributor to employment and economic activity in Western Canada and an indirect contributor to the rest of the domestic economy through links to industries that supply inputs to the sector, as well as use the outputs of the sector.

The upstream segment of the oil and gas sector encompasses exploration and production of crude oil and natural gas. It is the single largest segment of the oil and gas sector, which also includes midstream gathering and pipeline facilities and downstream refineries. The oil sands account for almost two-thirds of Canada's oil production. Since activity in the mid and downstream sectors will ultimately reflect the production of crude oil and natural gas in the upstream sector, the willingness of companies to explore for and produce oil and gas in Western Canada dictates the pace of economic activity throughout the industry's total supply chain.

A sharp drop in the world price of crude oil in 2015 and 2016 hurt the profitability of upstream oil and gas companies in both Canada and the US. However, while economic activity in the US upstream segment increased substantially with a modest recovery in crude oil prices in 2017 and 2018, investment in Canada's upstream segment as a share of total capital expenditures in Canada declined consistently from 2014 through 2018. While total capital expenditures in Canada declined post-2014, the decline in capital expenditures for oil and gas extraction was even more pronounced. Thus, while capital expenditures for oil and gas extraction accounted for approximately 28 percent of total Canadian industrial capital expenditures in 2014, oil and gas extraction accounted for only 14 percent in 2018.

Investment analysts and portfolio managers have recently warned that investment in the oil and gas sector is moving increasingly to the US and away from Canada, and that they are reluctant to invest their clients'

savings in Canadian oil and gas companies. An unfavourable business environment for oil and gas exploration and production in Canada is cited as the reason, particularly compared to the business environment in the US. A number of Canadian oil and gas companies have also reallocated their exploration budgets away from Western Canada to the more profitable shale oil producing regions of the United States.

In the absence of changes to Canadian government policies affecting the sector, relatively low prices for Western Canada crude oil as well as depressed profitability of Canadian oil and gas companies are likely to continue. As a consequence, the ongoing shift in the location preferences of North American oil and gas companies towards the US might well intensify with drastic consequences for the fiscal health of the Alberta and Saskatchewan governments.

While limited pipeline capacity is the major factor depressing the price of Canadian heavy crude oil, more favourable tax and regulatory environments in the US compared to Canada are also contributing to the diversion of upstream oil and gas investments from Canada to the US. By way of illustration, whereas capital expenditures in the upstream segment were around 41 percent higher for the US when comparing 2018 to 2016, they were only about 15 percent higher in Canada. An investment manager in the United Kingdom recently wrote a letter to Prime Minister Trudeau saying that it was hard for her to watch a vibrant Canadian oil and gas industry being strangled by regulation, carbon taxes, and the inability of producers to get their products to world markets. Recent investment patterns in the North American oil and gas sector support this sentiment.

1. Introduction

Alberta Premier Rachel Notley's December 2, 2018 announcement of a "temporary" 8.7 percent cut in the allowable production of raw crude oil and bitumen starting January 1, 2019 is a clear signal of the troubled state of Canada's upstream oil and gas sector.¹ The sharp decline in the price of crude oil in the fourth quarter of 2018 compared to prices in the year's first three quarters underlies a portion of the current economic difficulties facing Canada's oil and gas producers. By way of illustration, the West Texas Intermediate (WTI) price of crude oil, the standard metric for North American crude oil prices, averaged around US\$67.50 per barrel through the first three quarters of 2018. After reaching a high of US\$76.41 per barrel on October 3, 2018, the WTI price declined to a low of US\$44.61 per barrel on December 22, 2018.² In addition, the price of Western Canada Select, the benchmark for Canadian heavy crude oil prices, was well below the WTI price at the time of Premier Notley's announcement (Healing, 2018).³

By way of contrast, and notwithstanding the recent drop in the WTI price, the US oil and gas industry continues to expand capacity and production. For example, the US government's Energy Information Agency announced on November 13, 2018 that US shale oil output was on target to hit a record high in December 2018 (Kumar, 2018). Clearly, Canada's oil producers are faring worse than their US counterparts given current industry conditions. Most observers attribute the economic crisis surrounding the Canadian oil sector to limited pipeline capacity, particularly

¹ For a discussion of Premier Notley's announcement, see Bellefontaine (2018). The reduction equates to a decrease of 325,000 barrels of crude oil per day.

² WTI prices are provided at <https://www.microtrends.net/2516/wti-crude-oil-prices-10-year-daily-chart>. WTI crude oil is sourced from US oil fields, primarily in Texas, Louisiana, and North Dakota. The Western Canada Select price refers to heavy crude oil produced in Western Canada.

³ Since it takes more energy to produce refined petroleum products from heavy crude oil than from light (or conventional) crude oil, the former trades at a discount to the latter. In 2017, the oil sands (heavy crude) accounted for 64 percent of Canada's total oil production. In December 2018, Western Canada Select sold at an average discount of more than US\$40/bbl. See Alberta, 2019.

for oil exports.⁴ Others identify the contribution of increased taxation and regulatory requirements to additional costs and significant delays in project approvals facing Canadian producers (Morgan, 2018a). Apparently Canada's government believes that the issues facing Canadian oil and gas producers are sufficiently complex to warrant announcing in April 2018 that it will spend \$280,000 on a study into why investment in the country's oil and gas sector is falling behind the rest of the world (Gunter, 2018).

The primary purpose of this essay is to present and assess data on recent investment and production activity in Canada's upstream oil and gas sector and contrast the activity in Canada to that in the US. The comparison is relevant, since investors traditionally see the US and Canadian oil patches as being alternative locations for investing (Aliakbari and Stedman, 2018a). As well, the oil and gas sector is the most economically prominent in the energy industry as a whole. The data highlights the dramatic decline in the performance of this economically important sector in Canada, particularly relative to the US, and underscores the economic costs to the Canadian economy, particularly to the Alberta economy, of the ongoing politicization of the infrastructure investment process in Canada's oil and gas sector.

The essay proceeds as follows. Section 2 discusses the importance of the oil and gas industry to the Canadian economy and particularly to the provincial economies of Alberta and Saskatchewan.⁵ It also highlights the importance of the upstream oil and gas segment of the industry. Section 3 presents and discusses data on capital expenditures in the upstream oil and gas sector in Canada and the US. It identifies the diverging experiences of that segment in the two countries. In particular, it identifies a substantial divergence in recent years with investment in the US substantially outpacing investment in Canada. Section 4 provides drilling rig data for Canada and the US, which further underscores the divergence in economic activity between the two countries in recent years. The section also supplies some observations from oil and gas executives describing the economic conditions for oil and gas exploration and production in Canada compared to the United States. The final section offers concluding comments.

⁴ Mark Sholz, the president of the Canadian Association of Oilwell Drilling Contractors, recently characterized the members of his association as being on "life support" (see OGJ Editors, 2018a).

⁵ Oil and gas production is also an important activity for the economy of Newfoundland & Labrador. However, hydroelectric power is a substantially larger proportion of its energy sector than it is in Alberta and Saskatchewan.

2. The Canadian Oil and Gas Industry in Context

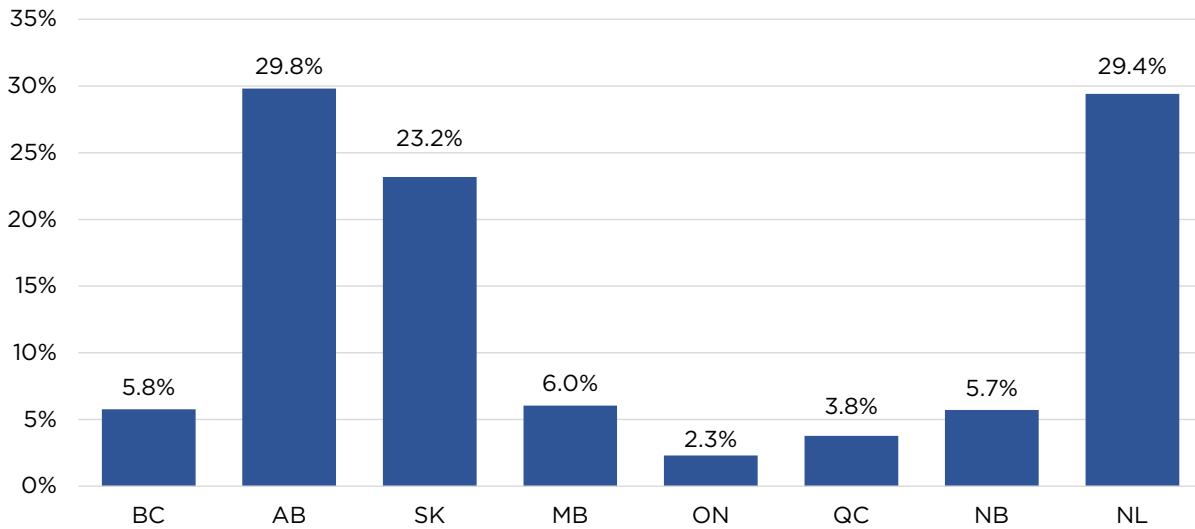
It is crucial to note at the outset that the oil and gas sector is very important to the Canadian economy, and particularly to Alberta and Saskatchewan. Natural Resources Canada (2016-2017) estimated that Canada's energy sector directly accounted for 7.2 percent of Canada's Gross Domestic Product (GDP) in 2016. The oil and gas sector by itself accounted for 5.2 percent of Canada's GDP with electricity production accounting for the remaining 1.9 percent. When the output of industries that supply goods and services to the energy sector are added to the direct output of that sector, energy accounts for 10.8 percent of Canada's GDP. The direct and indirect contribution of the oil and gas sector alone is 7.7 percent of GDP.⁶ Since the energy sector, including oil and gas, is relatively capital intensive, the relative contribution of the oil and gas sector to employment is smaller than its relative contribution to GDP. Specifically, direct and indirect employment in the oil and gas sector accounted for almost 4 percent of total employment in Canada in 2016-2017 (Natural Resources Canada, 2016-2017).

The energy sector broadly defined also accounts for a significant share of the tax revenue collected by governments. Between 2010 and 2014, the energy sector's share of total taxes collected by all levels of government in Canada amounted to 9.1 percent. When royalties and other fees are included, the energy sector's share of government revenues was 13 percent. The largest share of government revenues from energy (slightly over 90 percent) was collected from the oil and gas industry (Natural Resources Canada, 2016-2017).

The importance of energy exports, primarily of oil and gas with essentially all exported to the US, as a share of total exports means that the magnitude of oil and gas production has a significant impact on Canada's exchange rate and, therefore, on Canada's terms of trade.⁷ In particular, if

⁶ The direct contribution of the energy sector to Canada's GDP in 2017 and the first three quarters of 2018 was around 9.2 percent (see Statistics Canada, 2019a).

⁷ A country's terms of trade essentially measures the ratio of the prices it receives for exports relative to the prices it pays for imports.

Figure 1: Energy Industry as a Percentage of Provincial GDP, 2017

Source: Statistics Canada, 2019a.

US buyers demand more oil and gas from Canada, and Canadian producers are willing and able to meet that increased demand, the Canadian dollar should appreciate, other things being constant. As a result, Canadians will enjoy more purchasing power in international markets.

While the oil and gas industry is important to the Canadian economy as a whole, its importance varies substantially across provinces. Figure 1 highlights the prominence of the energy industry to the provincial economies of Alberta, Newfoundland & Labrador, and Saskatchewan.⁸ Specifically, it reports the output of the energy industry as a percentage of provincial GDP in 2017. The oil and gas share within the energy sector was 87.2 percent in Alberta and 79.1 percent in Saskatchewan in 2017. Given the data reported in figure 1, the oil and gas sector therefore accounts for almost 30 percent of Alberta's GDP and slightly over 23 percent of Saskatchewan's GDP.⁹ Hence, while the health of the oil and gas industry is important to the overall Canadian economy, it is crucial to the economic performance of the economies of Alberta and Saskatchewan.

⁸ Table 1 in the appendix reports the data underlying figure 1.

⁹ As noted above, a significant proportion of energy production in Newfoundland & Labrador is hydroelectric power. Alberta alone accounted for almost 81 percent of oil production in Canada in 2017.

The oil and gas industry consists of three main segments. The “upstream” segment finds and produces crude oil and natural gas. The “midstream” segment processes, stores, markets, and transports crude oil, natural gas, and natural gas liquids. Transmission pipeline companies constitute a major part of the midstream petroleum industry. The “downstream” segment includes oil refineries, petroleum product distributors, retail outlets, and natural gas distribution companies. Since upstream oil and gas production provides the inputs for virtually all of the downstream sales of oil and gas products, capital investment specifically and economic activity more generally in the oil and gas industry depend critically upon the expected profitability of the upstream segment of the industry.

In 2017, the oil sands accounted for 64 percent of Canada’s oil production (Natural Resources Canada, 2018). We have noted earlier the economic stress facing that particular segment of the oil and gas industry. In particular, Western Canada Select crude oil sells at a substantial discount to crude oil sold at WTI prices, and this discount averaged US\$25.45 on a monthly basis over the first eleven months of 2018.¹⁰ The comparable discount in 2016 was US\$13.80 and in 2017 it was US\$12.56.¹¹ Other things being constant, the lower realized price for Canadian heavy crude oil compared to crude oil sold at WTI prices could be expected to make exploration and production activity in Canada less attractive than in the United States.¹² The extent to which this has been the case, combined with the prominent role the upstream oil and gas industry plays in the Canadian economy, constitute a major threat to Canada’s economy and, perhaps, to its political unity. In the next two sections of this study, we report data on investment and production activities in the Canadian and US oil and gas sectors.

¹⁰ Aliakbari and Stedman (2018b) project that the portion of the 2018 discount due to pipeline constraints in Canada will reduce revenues for Canadian oil and gas companies by roughly CA\$16 billion in 2018. This projection is based on the average price differential between WTI and Western Canada Select in the first quarter of 2018.

¹¹ The author’s calculations come from data reported in *Alberta Economic Dashboard* (Alberta, 2019).

¹² The increasing reliance on rail transportation for Canadian crude oil relative to pipeline carriage has also reduced the profitability of the upstream oil and gas sector in Canada. For a discussion of the factors that have reduced the net realized price for Western Canada Select crude oil, see *The Economist* (2018).

3. Capital Expenditures in the Canadian and US Oil and Gas Industry

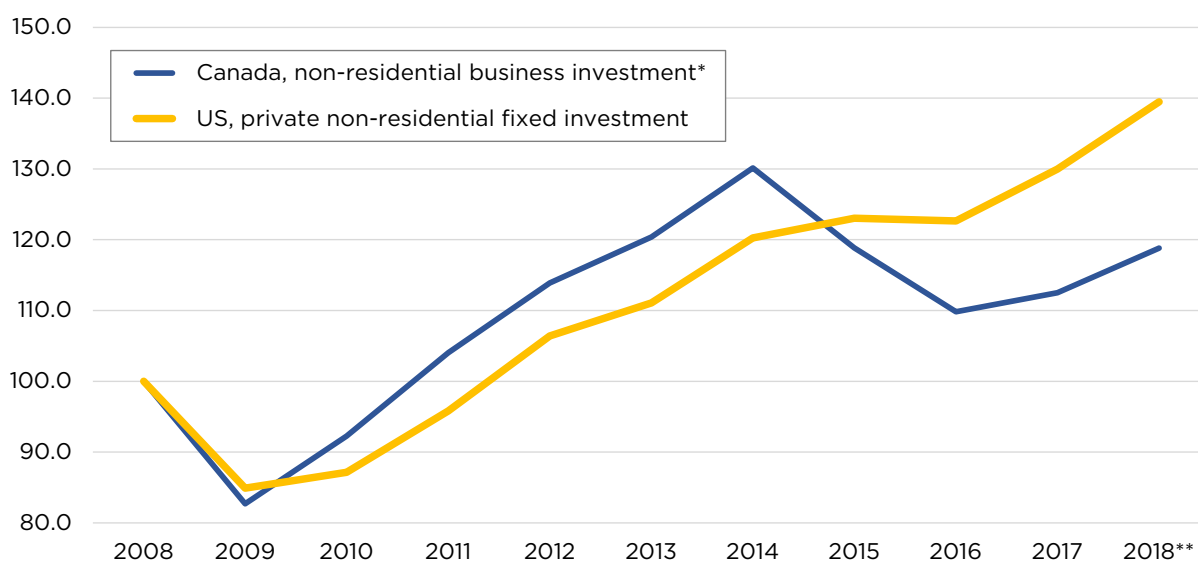
Investment in plant and equipment is a meaningful measure of the long-run economic attractiveness of a national economy, as well as specific sectors of national economies. Capital investments are relatively long-lived and often relatively illiquid commitments. Hence, investors will be concerned with the expected profitability of operating the assets in question over years, perhaps decades. A comparison of recent capital investment activity in the oil and gas sector in Canada and the US, therefore, provides reliable insight into the future economic attractiveness of the sector in each country. In this regard, it is relevant to note that capital investment growth across Canadian industries more broadly has slowed dramatically in recent years. It is of additional interest to assess how capital investment activity in Canada's oil and gas sector has compared not just to its counterpart sector in the US, but also relative to other Canadian industries.

Figure 2 reports data on capital expenditures on non-residential assets (i.e., excluding residential housing) for Canada and the United States.¹³ Specifically, the series for Canada is an index of expenditures on non-residential tangible structures, machinery, and equipment in nominal dollars with 2008 as the base year.¹⁴ The series for the US is an index of private sector non-residential fixed investment with 2008 again the base year.¹⁵ The Canadian and US series do not include public sector capital expenditures. They do include private sector investments in intellectual products. Investments in the creation of intellectual property are of

¹³ Appendix Table 2 provides the data summarized in figure 2.

¹⁴ The Canadian data reported are the authors' calculations from Statistics Canada, 2019b. Choosing 2008 as the base year provides insight into how capital expenditures in Canada and the US fared during and after the severe recession of 2008-2009. It also offers a sufficiently long period to identify changes in patterns of capital expenditure.

¹⁵ The US series is the authors' calculations from data reported in Federal Reserve Bank of St. Louis, 2019.

Figure 2: Capital Expenditure Index, US and Canada, 2008 - 2018**Notes:**

* Business gross fixed capital formation: non-residential structures, machinery and equipment, and intellectual property products.

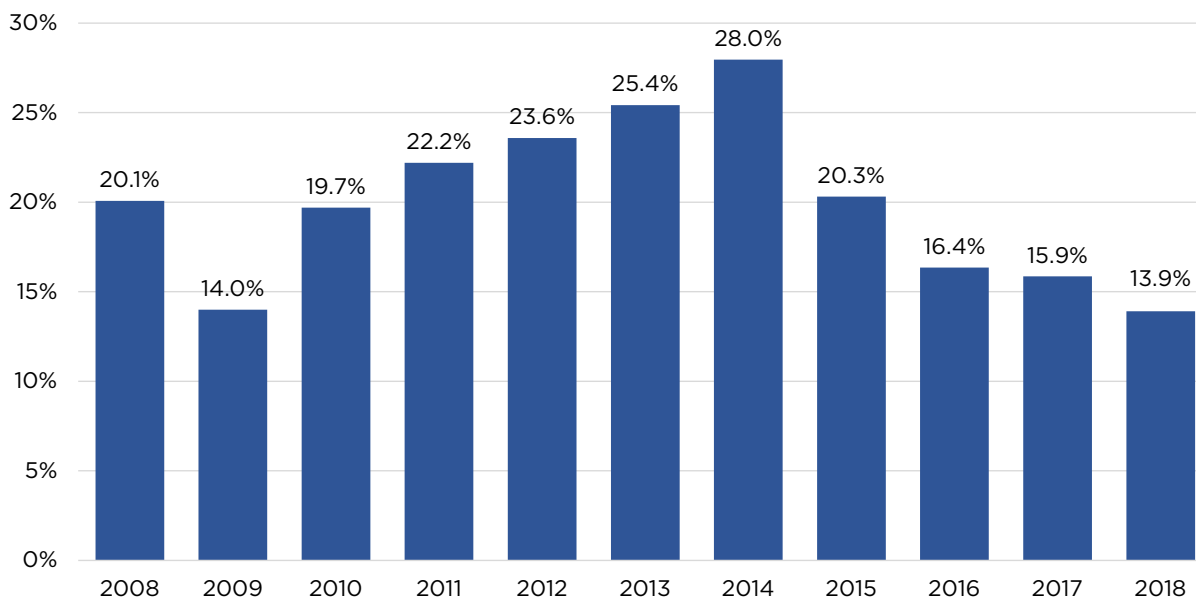
** The 2018 US value is an estimate based on the average of the first three quarters of “Private Nonresidential Fixed Investment,” seasonally adjusted at annual rates. The 2018 Canadian value is an estimate based on the average of the first three quarters of “Non-residential structures, machinery and equipment,” seasonally adjusted at annual rates.

Sources: Federal Reserve Bank of St. Louis, 2019; Bureau of Economic Analysis, 2019; Statistics Canada, 2019b; Statistics Canada, 2019c.

relatively greater importance for the US than for Canada, and they arguably grew more quickly over the sample period in the US (Globerman and Press, 2018).

The data reported in figure 2 reinforce findings from numerous studies that capital investment growth in Canada decreased markedly in recent years compared to earlier years, as well as in comparison to growth rates in other developed countries (Cross, 2017; Globerman and Press, 2018). For Canada, capital expenditures relative to expenditures in 2008 reached their peak in 2014. Capital expenditures decreased in 2015 and 2016 and then increased only modestly in 2017. Estimated capital expenditures for 2018 showed stronger growth than in 2017 but are still below rates seen in 2013 and at the 2014 peak. In contrast, capital expenditures in the US increased consistently from 2008-2018, with the exception of the severe 2009 reces-

Figure 3: Capital Expenditures for Oil and Gas Extraction Relative to Canadian Total



Source: Statistics Canada, 2019e.

sion and 2016. As a result, capital expenditures in 2018 for Canada were around 19 percent higher than in 2008, whereas US capital expenditures in 2018 were about 40 percent higher than in 2008.

The slowing growth of overall private sector capital expenditures in Canada in the post-2014 period implies that capital expenditures in the oil and gas sector also declined, since the oil and gas industry is subject to many of the same macroeconomic forces that influence capital expenditures in other sectors of the Canadian economy. However, issues specific to the oil and gas sector, such as transportation bottlenecks due to regulatory constraints on pipeline capacity have exerted unique influences on the investment environment in that sector. These constraints might be expected to make capital investment in Canada's oil and gas sector even less attractive than in other sectors, and the data reported in figure 3 support this inference.

Figure 3 reports the ratio of capital expenditures for oil and gas extraction relative to total capital expenditures on non-residential tangible assets expressed as a percentage.¹⁶ This ratio increased consistently from 2009-2014 indicating that capital expenditures in Canada's oil and gas sec-

¹⁶ The data in figure 3 are the authors' calculations from Statistics Canada, 2019e.

Table 1: Oil & Gas Industry Capital Spending (CDN \$Billions)

	2016		2017		2018		2016 -2018 growth, %	
	Canada	US	Canada	US	Canada	US	Canada	US
Exploration/ Production	19.5	121.7	27.3	164.0	28.7	171.9		
Oil Sands*	15.4		13.6		11.4			
Subtotal	34.9	121.7	40.9	164.0	40.1	171.9	15%	41%
Other	7.0	76.3	10.9	51.2	10.6	67.4	51%	-12%
Total	41.9	197.9	51.8	215.2	50.7	239.3	21%	21%

* = *In situ* mining and upgrading.

Sources: Xu, March 5, 2018; IRS (2019), *Yearly Average Currency Exchange Rates*.

tor increased faster than capital expenditures on non-residential tangible assets for the Canadian economy as a whole over this period. However, the ratio decreased dramatically after reaching its 2014 peak. By 2018, capital expenditures in the upstream segment of the oil and gas sector relative to total capital expenditures were half of what they were in 2014. Hence, the slowing growth of capital investment in Canada post-2014 portrayed by the data in figure 2 is especially dramatic for the upstream oil and gas sector.

The divergence between Canada and the United States in the overall growth of capital expenditures in recent years is mirrored in the investment performances of the upstream oil and gas sectors in the two countries. This is shown in table 1, which reports capital spending in each country's oil and gas industry, as well as in the exploration and production and other segments of the industry separately for 2016, 2017, and 2018. Unfortunately, we could not find a comparable data source that permits a similar comparison for earlier years. Note that the data reported for 2018 are based on surveys of expected capital expenditures.

For the oil and gas industry as a whole, capital expenditures in Canada in 2018 were about 21 percent higher than in 2016, while they were also about 21 percent higher in the US. However, there were substantial differences in the Canadian and US experiences within the industry. Specifically, capital expenditure growth in the upstream segment of the industry in the US substantially outpaced the growth of investment in the upstream segment of Canada's oil and gas industry. Whereas capital

expenditures in the upstream segment (i.e., production and exploration) were around 41 percent higher for the US when comparing 2018 to 2016, they were only about 15 percent higher in Canada when upstream includes the oil sands. The upstream sector of the industry in both countries accounts for the bulk of investment expenditures in the oil and gas industry, and the output of the upstream sector conditions the profitability of investments in the mid- and downstream sectors. Hence, while investment growth in Canada's mid- and downstream sectors outpaced investment growth in the comparable US sectors for 2016-2018, this might not continue in the future unless the investment environment in Canada's upstream oil and gas sector improves significantly.¹⁷

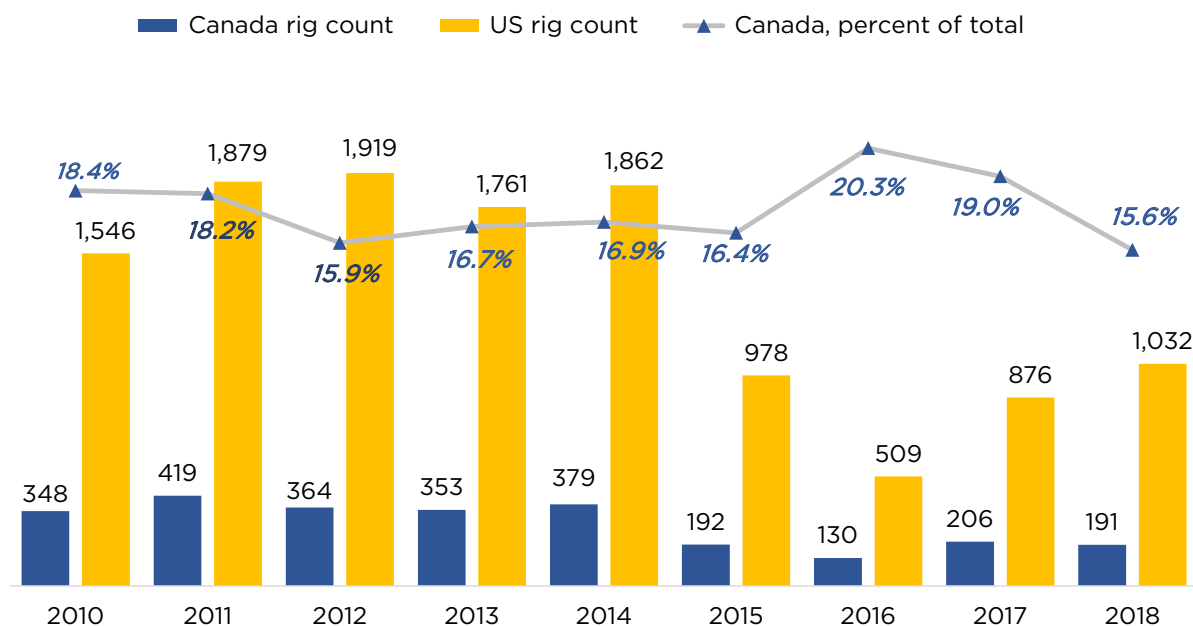
¹⁷ To be sure, increased pipeline investments in Canada would improve the profitability of Canada's upstream segment.

4. Drilling as a Measure of Activity and Assessments of the Oil and Gas Sector

Other measures of economic activity also highlight a dramatic deterioration in the expected profitability of the upstream oil and gas sector in Canada compared to its US counterpart. One such measure is the number of drilling rigs located in Canada and the US. Figure 4 reports the rig counts for Canada and the US from 2010 through 2018.¹⁸ It also reports the percentage of the total number of rigs in North America that were working in Canada in each sample year. Significant changes in rig counts should be a meaningful indicator of changes in the expected profitability of upstream oil and gas activity across geographical locations.

The rig count data in Figure 4 does not provide as clear a picture of the relative attractiveness of doing business in Canada's upstream oil and gas industry as does the data on capital expenditures. In particular, while the number of rigs operating in Canada dropped dramatically between 2014 and 2016, the decrease over that period was even more marked for the United States. Hence, Canada's share of the total rigs operating in North America actually increased in 2016. However, while the number of rigs operating in Canada increased in 2017, it declined in 2018, whereas the number increased substantially in the US. Hence, in 2018, Canada's share of total North American rigs was lower than in any other sample year reported in figure 4. Furthermore, rig counts for the first six weeks of 2019 relative to the same period in 2018 show a 33.5 percent drop in Canada and a 12.1 percent increase in the US. Changes in the geographical distribution of rigs in North America in the past two years therefore reinforce the conclusion drawn from capital expenditure data, namely,

¹⁸ Rig count estimates are found in Baker Hughes, 2019. See Appendix Table 4 for the data underlying figure 4. The starting year for the series (2010) provides a sufficient period to identify significant changes in recent years compared to earlier years. The importance of oil sands production in Canada qualifies the relevance of the Canada-US comparison.

Figure 4: North American Rotary Rig Counts

Source: Baker Hughes, 2019.

Canada's upstream oil and gas industry looks increasingly unattractive as a place to do business compared to its US counterpart.

Numerous industry executives and investment analysts have discussed the changing competitive positions of Canadian and US oil and gas companies. Their comments reinforce the unfavourable competitive outlook for oil and gas drilling and production activity in Canada. For example, the Canadian Association of Oilwell Drilling Contractors expects the Canadian drilling rig fleet to decrease by 58 units (almost 25 percent of the total operating as of January 25, 2019) as rigs move to the US (OGJ Editors, 2018b). Individual Canadian companies reinforce the Association's forecast. Ian Dundas, CEO of Enerplus Corp., is quoted as saying that his company has dramatically transitioned its business into the US and that 90 percent of the company's capital investments in 2018 and 2019 will be made in the US (Morgan, 2018 a). Steve Williams, CEO of Sunoco, recently said that his company will reduce its investment in Canada due to burdensome government regulations and uncompetitive tax rates (Aliakbari and Stedman, 2018). Grant Fagerheim, CEO of Calgary-based Whitecap Resources Inc., said that conditions in Canada's oil and gas sec-

tor are getting so bad that not even Canadian institutional investors can be convinced to buy Canadian energy company shares (Healing, 2018). Finally, citing a lack of market access and a dysfunctional pipeline nomination process in Canada, an executive of Canadian Natural Resources Ltd. announced that the company's base capital program in Canada for 2019 would be about \$1 billion below its longer-term normalized capital program (OGJ Editors, 2018b).

It might be argued that Canadian oil and gas executives have a stake in exaggerating problems in Canada's energy sector. In this regard, supporting statements from asset managers located outside of Canada are particularly salient. One example is Darren Peers, an analyst and investment manager in Los Angeles. He is one of the largest foreign holders of Canadian energy stocks. In a letter to Prime Minister Trudeau, Peers warned that investors and companies will continue to avoid the Canadian energy sector unless more is done to improve market access. Susan Johns, a UK-based fund manager, also sent a letter to Prime Minister Trudeau dated November 7, 2018, in which she called on the Canadian government to recognize the numerous issues that are affecting Canada's energy sector. Her letter said that it was hard for her to watch a vibrant industry being strangled by regulation, carbon taxes, and the inability of producers to get their products to world markets (Morgan, 2018 b).

A broad survey of international managers and executives in the upstream petroleum industry as reported in Stedman and Green (2018) provides additional support for concerns about a deteriorating investment environment in Canada relative to the US. Survey respondents were asked to evaluate geographical jurisdictions on different tax and regulatory-related criteria. The evaluations were then compiled into an overall measure of the investment attractiveness of each jurisdiction. The upstream industry includes companies exploring for oil and gas and those producing natural gas and oil from conventional and non-conventional sources, including from oil sands and shale formations.

Perhaps most significant for purposes of this essay, the respondents identified a decrease in the investment attractiveness of the major oil and gas producing provinces of Canada in recent years. In particular, Alberta ranked in the 85th percentile of attractiveness in 2014, whereas it ranked in the 47th percentile in 2018. The absolute value of Alberta's overall investment attractiveness index declined by almost 21 percent between 2014 and 2018. British Columbia ranked in the 53rd percentile of investment attractiveness in 2014 but only in the 28th percentile in 2018. Saskatchewan ranked in the 98th percentile in 2014 but dropped to the 78th percentile in 2018. Newfoundland & Labrador declined from the 73rd to the 68th percentile over the period. While several jurisdictions in the US also declined

in investment attractiveness, the major growth locations encompassing shale oil exploration, notably Texas and New Mexico, were more attractive locations for investment in 2018 than they were in 2014. Furthermore, of the 10 most attractive jurisdictions in 2018 for investment in petroleum exploration and development, eight were US states and one was the offshore Gulf of Mexico. The only jurisdiction outside the US making the top ten list was the UK North Sea.

In summary, the opinions of a broad range of industry executives and investment managers confirm the insights from capital expenditure data. Namely, the upstream Canadian oil and gas sector has become significantly less attractive as a location for investment and economic activity in recent years, whereas major production areas in the US have, if anything, become more attractive locations.

5. Concluding Comments

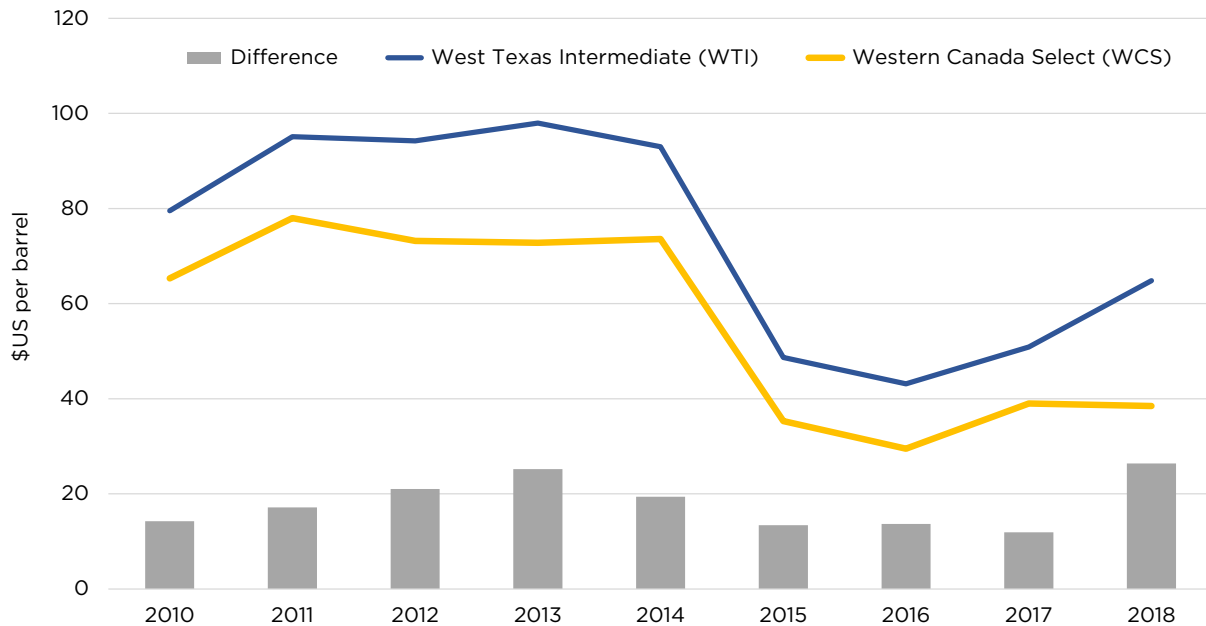
As noted in the introduction, there has been extensive media coverage of the deteriorating profitability of upstream oil and gas activity in Canada. What is perhaps less appreciated by many Canadians is how serious the deterioration has become, especially relative to the upstream oil and gas sector in the United States. The proximate cause of the unfavourable economics confronting oil and gas exploration and production companies in Canada is low oil prices, particularly for heavy crude oil produced in Alberta.

In this regard, figure 5 reports the average annual price per barrel in US dollars for West Texas Intermediate crude oil and Western Canada Select crude oil for the years 2010-2018.¹⁹ The substantially lower prices for crude oil in the 2015-2018 period compared to earlier years is evident from the data. Figure 5 also reports the difference between the prices for West Texas Intermediate and Western Canada Select crude oil. The fact that the difference from 2014 through 2018 is comparable (or lower) than the differences in early years suggests that reduced capital expenditures in Canada relative to the US in recent years reflects the expectations of oil company executives that the gap between realized oil prices for US and Canadian crude would increase markedly in the future. Indeed, the widening of the gap in January 2019 to an all-time record is a confirmation of such expectations. For the month of January 2019, WTI averaged almost US\$46/bbl more than Western Canada Select. The persistence of a large price gap ensures that the US will continue to be a more favoured location than Canada for exploration and drilling activities in North America.

Recent and prospective capital allocation decisions announced by executives of various oil and gas companies underscore the risk that Canada's upstream oil and gas sector will be increasingly less competitive than the US sector in the absence of substantive policy changes. As noted earlier, the lack of pipeline capacity for exported oil and gas is a major contributor to the low net prices that Canadian companies are receiving for

¹⁹ The price data are from Alberta, 2019. These data are also reported in Appendix Table 5.

Figure 5: Oil Prices (\$US per barrel) for West Texas Intermediate and Western Canada Select, and the Difference



Source: Alberta, 2019.

their outputs. Numerous ongoing reviews and changes to provincial and federal regulatory systems that create uncertainty for oil and gas companies are also prominent concerns of Canadian oil and gas executives and asset managers (Healing, 2018). In the absence of substantive changes to government policies affecting Canada's oil and gas sector, it is difficult to see any abatement in the drift of investment to US oil-producing locations and away from Canadian locations.

Appendix Tables

Appendix Table 1: Energy Industry as a Percentage of Provincial GDP, 2017

BC	5.8%
AB	29.8%
SK	23.2%
MB	6.0%
ON	2.3%
QC	3.8%
NB	5.7%
NL	29.4%

Source: Statistics Canada, 2019d.

Appendix Table 2: Capital Expenditure Index

	Canada, Non-residential business investment	US, private non-residential fixed investment
2008	100.0	100.0
2009	82.7	84.9
2010	92.3	87.1
2011	104.0	95.8
2012	113.9	106.4
2013	120.4	111.1
2014	130.1	120.3
2015	118.9	123.0
2016	109.8	122.7
2017	112.5	130.0
2018**	118.8	139.5

Notes:

- 1) Business gross fixed capital formation: non-residential structures, machinery and equipment, and intellectual property products.
- 2) The 2018 US value is an estimate based on the average of the first three quarters of “Private Nonresidential Fixed Investment,” seasonally adjusted at annual rates.
- 3) The 2018 Canadian value is an estimate based on the average of the first three quarters of “Non-residential structures, machinery and equipment,” seasonally adjusted at annual rates.

Sources: Federal Reserve Bank of St. Louis, 2019; Bureau of Economic Analysis, 2019; Statistics Canada, 2019b; Statistics Canada, 2019c.

Appendix Table 3: Capital Expenditures for Oil and Gas Extraction Relative to Canadian Total

	Percentage
2008	20.1%
2009	14.0%
2010	19.7%
2011	22.2%
2012	23.6%
2013	25.4%
2014	28.0%
2015	20.3%
2016	16.4%
2017	15.9%
2018	13.9%

Source: Statistics Canada, 2019e.

Appendix Table 4: North American Rotary Rig Counts

	Canada	US	Canada, percent of total
2010	348	1,546	18.4%
2011	419	1,879	18.2%
2012	364	1,919	15.9%
2013	353	1,761	16.7%
2014	379	1,862	16.9%
2015	192	978	16.4%
2016	130	509	20.3%
2017	206	876	19.0%
2018	191	1,032	15.6%

Source: Baker Hughes, 2019.

Appendix Table 5: Oil Prices, \$US per barrel

	West Texas Intermediate (WTI)	Western Can- ada Select (WCS)	Difference
2010	79.5	65.3	14.2
2011	95.1	78.0	17.2
2012	94.2	73.2	21.0
2013	98.0	72.8	25.2
2014	93.0	73.6	19.4
2015	48.7	35.3	13.4
2016	43.1	29.5	13.7
2017	50.9	39.0	11.9
2018	64.8	38.5	26.4

Source: Alberta, 2019.

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