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THE OIL PRODUCTION RESPONSE TO ALBERTA'S GOVERNMENT-MANDATED QUOTA

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SUMMARY

Two years ago, the Alberta government put in place a temporary oil-production quota. However, the quota's impact could well be felt in the province's oil production for years to come. The quota applied only to firms producing more than 10,000 barrels of oil per day and was instituted as a response to pipeline constraints that caused Alberta oil prices to be much lower than prices elsewhere. Production from both oilsands mines and oil wells dropped as soon as the government announced the quotas. The media warned that the quotas would force production to transfer to Saskatchewan, but the research for this paper found that this never occurred.

The quota policy was announced in December 2018 and a week later, the price of Alberta oil had jumped from \$29.09/bbl to \$50.08 bbl, a 72 per cent rise. When the quota policy actually took effect the first of January 2019, the price increased again, but by much less. The anticipation of the quota alone was enough to create the desired price increase.

The quota, which set limits for the total combined crude oil and bitumen permitted to be produced, was assigned to individual operators and designed to provide an 8.5 per cent reduction in oil production. The total quota was fixed at 3.56 million barrels a day in January 2019, but individual quotas could be traded across eligible operators, minimizing the overall costs of achieving the total goal. However, total production continued falling even when the quota was eventually relaxed; the market and a low world price created a scenario in which production fell below the amount permitted by the quota. All the oil companies

reduced their production regardless of whether they fell within the quota's guidelines or not; however, the firms that were subject to the quota reduced their production more than the others. The quota was lifted in December 2020 when export capacity again became sufficient.

While curtailing production had the desired result of raising Alberta oil prices and resolving the differential between local prices and the world benchmark, its ripple effects may well be felt in the longer term. This paper finds that fewer wells are being drilled and more wells are suspending production. Tradition dictates that when a well becomes inactive, it is rarely returned to a productive state. Those firms that resorted to low levels of drilling in order to meet the quota have created a situation that could affect Alberta oil production in the years ahead.

In 2019, the Alberta government implemented a curtailment order that put a hard cap on provincial oil production. The order was in response to pipeline constraints causing the price of oil in Alberta to be much lower than prices elsewhere. Alberta prices responded immediately following the announcement of the quota, even before the quota itself was implemented. Once implemented, the quota slowed down production. Schaufele and Winter (2021) estimate that the increase in oil prices resulted in a transfer of over \$600 million per month from refiners to oil producers. In this communiqué we examine the ways in which oil producers adjusted to the quota. We find a reduction in production from both oilsands mines and oil wells. Production reduction from oil wells came from fewer wells being drilled and more wells stopping production. While media reports warned that production would shift to Saskatchewan (Nickel 2019; Williams 2019), we do not see this shift in the data.

SPECIFICS ABOUT ALBERTA'S PRODUCTION QUOTA

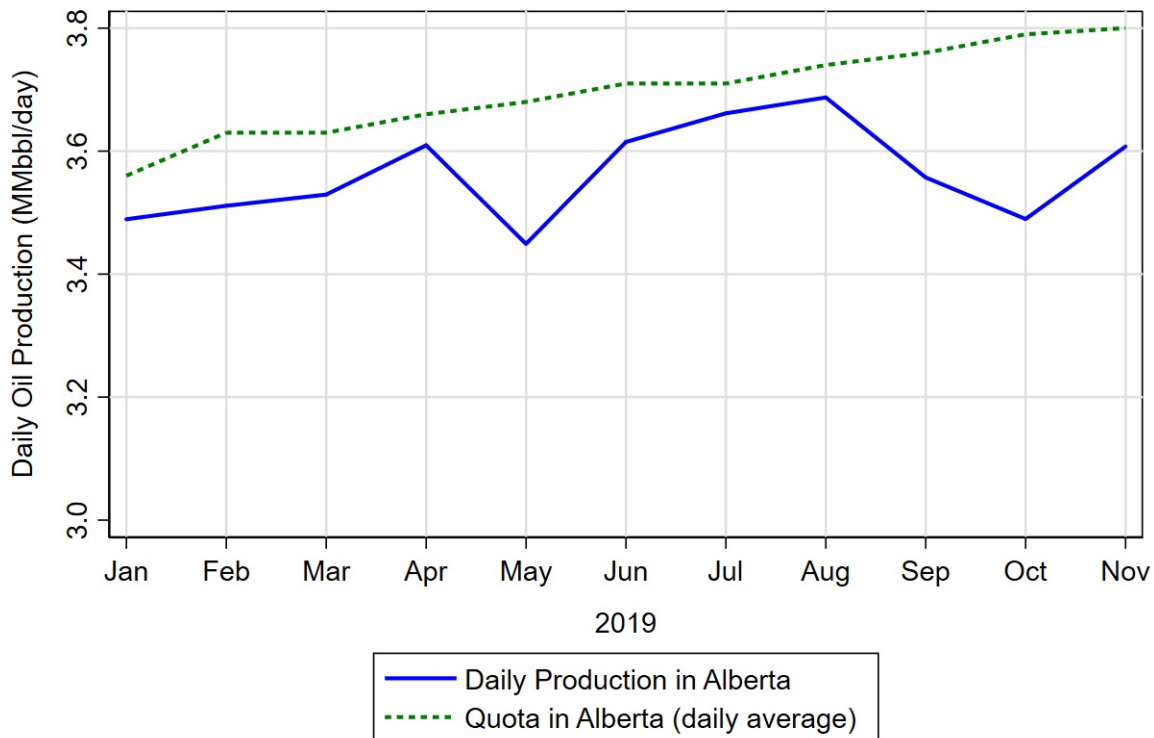
Alberta's curtailment order was announced on December 2, 2018, to be in effect from January 1, 2019; it stayed in place until December 2020. The curtailment order allowed for the establishment of a total quota each month limiting the amount of combined crude oil and bitumen that could be produced in the province. To make the quota enforceable, individual quotas were assigned to individual operators; that is, to the firms that control the output of an oil well or mine (Government of Alberta 2018). The individual quotas were based on an operator's "baseline production," the maximum quantity produced in any given month in the year preceding the announcement. Operators with a baseline production below 10,000 barrels per day (bbl/day) were exempt from a quota (and starting in October 2019 the threshold for eligibility was raised to 20,000 bbl/day). The remaining operators were allowed to produce a certain percentage of their baseline production above the threshold of 10,000 bbl/day, and any of this allocation that was not used could not be carried over to the next month. The percentage was calculated each month so that the total production in the province did not exceed the total quota established for that month.

The quota was designed to initially provide roughly an 8.5 per cent reduction in Alberta's oil production (in January 2019, the quota was set at 3.56 million bbl/day and forecasted production absent the quota was 3.89 million bbl/day). In a clever policy design, quotas could be traded across eligible operators, a policy choice that minimized the overall costs of achieving the total quota. That is, in allowing trading, the firms' own incentives worked towards production being cut from the lowest cost options (e.g., a high-cost firm would have an incentive to pay a low-cost firm to take on more quota).

OIL PRODUCTION AND QUOTA

As seen in Figure 1, the total provincial quota was gradually increased throughout 2019. Total daily production never perfectly matched the quota, implying that in any given month, some operators did not use their full allocation. While the transfer of quotas between operators was permitted, transaction costs may have been too high to allow for such transfers to be fully used. The non-binding quota could also indicate the fuzzy ability of firms to hit a production target, or the existence of hidden costs to reduce production, that resulted in firms overshooting the quota. We do not know what the counterfactual production would be in the absence of the quota, and it could be that firms would not have continued to produce at 2018 levels. Regardless, we can see that up until August 2019, total production followed a similar trajectory with the provincial quota, suggesting the quota did have an effect on controlling the growth of total oil production. However, beginning in September 2019, total production dropped, despite a continued relaxation of the quota. Market conditions and a low world price caused operators to lower production even more below the amount permitted under the quota. While outside the time period of our study, the December 2020 end to the quota was attributed to the quota being unnecessary given sufficient export capacity.

Figure 1: Alberta 2019 Oil Production and Quota (Averaged to the Day)



Sources: Author's calculations for daily production from GeoLOGIC Systems (2020) and Alberta Energy Regulator (2020). Author's calculations for daily quota from Government of Alberta (2020).

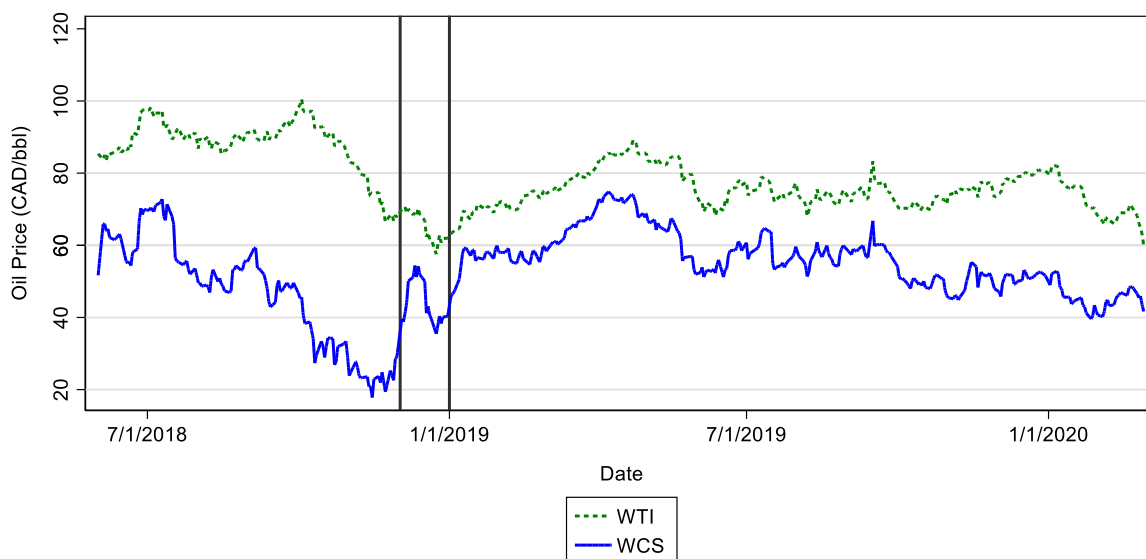
Note: Aggregated monthly production data are divided by the number of days in each month.

OIL PRICES

Using daily oil-price data retrieved from Natural Resources Canada, we see the oil price increased more following the announcement of the quota (in December 2018) than following its implementation (in January 2019). Figure 2 plots the two prices most often compared when evaluating the strength of the Alberta oil market: a global benchmark, West Texas Intermediate (WTI), which is a light, sweet crude oil, with an Alberta benchmark, Western Canada Select (WCS), a heavy, sour blend of crude oil. Although WTI and WCS do not represent the same grade of oil, WTI is commonly used as a benchmark to compare to the WCS because they are strongly correlated (monthly data from January 2005 to February 2020 yield a correlation coefficient of 0.94). The typical difference between the two prices hovered around C\$13.22/bbl, until 2013 when, coupled with apportionment of pipeline space on the Trans Mountain Pipeline and Enbridge Mainline, the difference began to increase (Fellows 2018). The difference reached a record high of \$65.03/bbl on October 11, 2018, which was most likely due to pipeline constraints (Fellows 2018).

The quota policy was announced December 2, 2018 (indicated by the first vertical line in Figure 2) and came into effect on January 1, 2019 (indicated by the second vertical line). The announcement alone was followed by a large increase in the Alberta oil price, jumping from \$29.09/bbl before the announcement to \$50.08/bbl a week later, an increase of 72 per cent. When the production curtailment finally came into effect, the Alberta price increased by a much smaller amount. The anticipation of the quota had already restored the differential to be within its typical range. Even though the quota was never binding, the drop in production was enough to see a large increase in the Alberta price. In a world with pipeline constraints, a small reduction in production can result in a large increase in local prices, if the drop is large enough to alleviate the pipeline constraint (McRae 2017). For example, consider that the local price is determined by the cost to transport the marginal barrel (i.e., the cost to supply the most expensive barrel in the market); if the marginal barrel is shipped by rail, we will have a lower price than if the marginal barrel is shipped by pipe. A discontinuous jump in price can arise when production shifts from a world with pipeline constraints to a world without.

Figure 2: Daily Oil Prices, June 2018 to February 2020



Sources: Author's calculations from Natural Resources Canada (2020).

FIRM BEHAVIOUR IN RESPONSE TO QUOTA

Alberta produced less oil following the quota. Figure 3 (a) depicts monthly oil production by companies that were subject to the quota and those that were not. While both types of companies reduced production, the companies subject to the quota reduced more, and the reduction persisted. Focusing only on the production of quota-eligible companies, in Figure 3 (b), the reduction appears to have come from both oilsands mining and oil wells (which include conventional and unconventional, including oilsands in-situ wells).

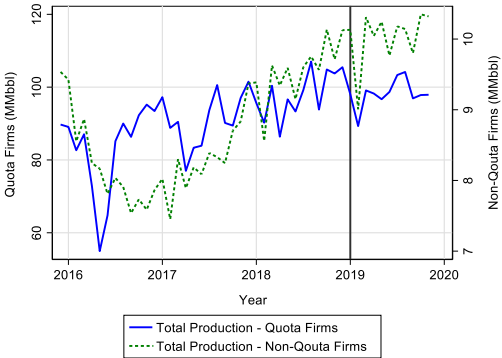
On what margin did firms reduce production? We see fewer wells being drilled (Figure 3, c) and more wells suspending production (Figure 3, d). Previous research has found that conventional and unconventional production responds to price changes through changes in the number of wells drilled, and not through changes in production from existing wells (Anderson et al. 2018; Newell et al. 2018). We find similarly that drilling is a responsive margin, but further document that inactivating wells is another margin through which firms respond. For the count of wells drilled in a month, we only want to include oil wells, so we exclude the wells that only ever produced gas or condensate. To count the number of wells that stopped producing, we count the number of wells that switched from producing oil in the month before to not producing in the next month (shut-ins). In January 2019, when the quota was implemented, we see the gap between quota-eligible firms and non-eligible shrink in terms of the number of wells drilled. Similarly, the quota-eligible firms saw a large jump in the number of wells that were producing the previous month but then stopped producing. Quota-eligible firms were perhaps scheduling an early shutdown of wells that were soon going to stop producing anyway, because

in the following months the number of wells switching to zero production is lower than the average monthly number in previous years. The drop in shut-ins in the last month of our data could be an artifact of the data not yet being updated, only reiterating the importance of having a control group to compare. Nonetheless, the jump in shut-ins in the month the quota was introduced poses a concern, considering that inactive wells are rarely reactivated (Muehlenbachs 2015).

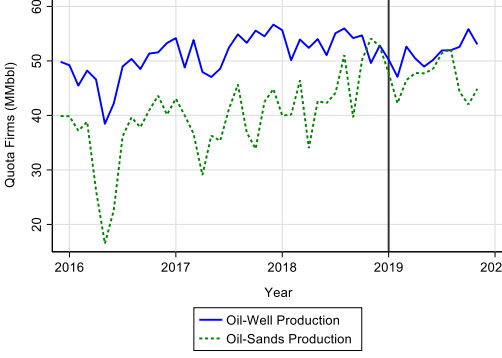
Newspaper reports discussed production moving to Saskatchewan as a result of the quota (Nickel 2019; Williams 2019). While we do not know what would have happened without the quota, Figure 3 (e) shows that during this time, Saskatchewan oil production also decreased.

Figure 3

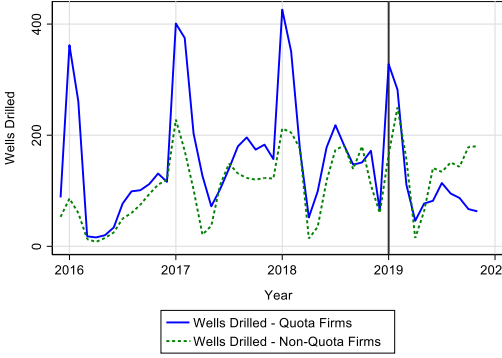
(a) Oil Production by Firms



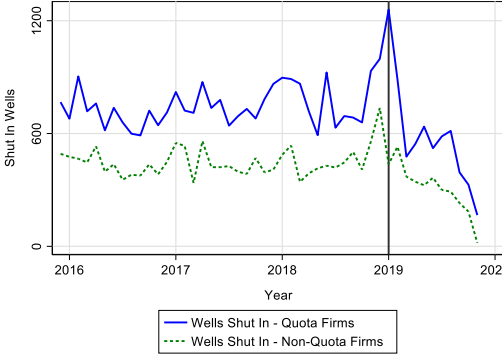
(b) Production by Type for Quota Firms



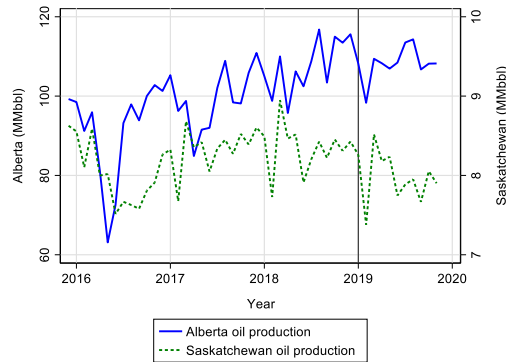
(c) Drilling by Firms



(d) Shut-ins by Firms



(e) Comparing Production with Saskatchewan



Sources: Author's calculations from GeoLOGIC Systems (2020) and Alberta Energy Regulator (2020).

POLICY IMPLICATIONS

This analysis shows that Alberta's curtailment policy was successful in resolving the extreme price differential found between the local oil price and a world benchmark oil price. At least for the first few months, the policy appears to have restrained growth in oil production from companies subject to the quota. One way that firms responded when faced with a quota was to reduce drilling activity. While the quota was intended to be a temporary measure to alleviate a temporary problem, the low levels of drilling seen in 2019 may have impacts on oil production in Alberta for years to come.

REFERENCES

- Alberta Energy Regulator. 2020. "ST39: Alberta Mineable Oil Sands Plant Statistics Monthly Supplement." Oil Sands Production Data (2009-2019). Accessed April 2020. <https://www.aer.ca/providing-information/data-and-reports/statistical-reports/st39>.
- Anderson, Soren T., Ryan Kellogg, and Stephen W. Salant. 2018. "Hotelling under pressure." *Journal of Political Economy* 126, no. 3: 984-1026.
- Fellows, G. Kent. 2018. "Energy and Environmental Policy Trends: The Invisible Cost of Pipeline Constraints." The School of Public Policy Publications 11.
- GeoLOGIC Systems. 2020. Oil well production data retrieved from geoSCOUT (2009-2019). Accessed February 2020. <https://www.geologic.com/products/geoscout/>.
- Government of Alberta. 2018. "Curtailment Rules under Responsible Energy Development Act." Accessed June 12, 2020. <https://www.alberta.ca/assets/documents/energy-curtailment-rules-webinar.pdf>.
- . 2020. "Oil Production Limit." Accessed April 2020. <https://www.alberta.ca/oil-production-limit.aspx>.
- McRae, Shaun. 2017. "Crude Oil Price Differentials and Pipeline Infrastructure." NBER Working Paper w24170.
- Muehlenbachs, Lucija. 2015. "A Dynamic Model of Cleanup: Estimating Sunk Costs in Oil and Gas Production." *International Economic Review* 56, no. 1: 155-185.
- Natural Resources Canada. 2020. "Oil Pricing." Accessed April 2020. <https://www.nrcan.gc.ca/our-natural-resources/energy-sources-distribution/clean-fossil-fuels/crude-oil/oil-pricing/18087?wbdisable=true>.
- Newell, Richard G., Brian C. Prest, and Ashley B. Vissing. 2019. "Trophy Hunting versus Manufacturing Energy: The Price Responsiveness of Shale Gas." *Journal of the Association of Environmental and Resource Economists* 6, no. 2: 391-431.
- Nickel, Rod. 2019. "Alberta Oil Cuts Offer Lifeline to Producers — and Create a Bunch of New Problems." *Financial Post*, January 6. Accessed April 2020. <https://financialpost.com/commodities/energy/canadas-oil-cuts-offer-lifeline-to-producers-but-create-new-problems>.
- Schaufele, Brandon, and Jennifer Winter. 2021. "Measuring the Economic Impact of Alberta's Crude Oil Curtailment Policy." Ivey Business School Policy Brief.
- Williams, Nia. 2019. "Canada's Husky Steers Investment Away from Alberta Due to Oil Curtailments." Reuters, October 24. Accessed April 2020. <https://www.reuters.com/article/us-husky-energy-results-idCAKBN1X31DI>.

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