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ENERGY AND NATURAL RESOURCES POLICY

The Big Squeeze: Lessons from the Trans Mountain Pipeline about the Costs of Invisible Bottlenecks

by G. Kent Fellows

- While oil pipeline constraints can often affect Canadian upstream investment and production, they can also affect Canadian consumers. Depending on the nature of the constraint, consumers may end up paying more for fuels like gasoline and diesel. I provide an examination of the effect of infrastructure constraints on the Trans Mountain pipeline, which primarily affected refined product shipments from Edmonton to cities in British Columbia. This analysis shows that a “big squeeze” on gasoline and diesel shipments is responsible for a pronounced increase in wholesale fuel prices in the Lower Mainland BC that has cost residents an estimated \$1.5 billion per year.
- When faced with high gasoline prices relative to the rest of Canada, the BC government launched an investigation (through the BC Utilities Commission) to examine market power effects in retail and wholesale gasoline sales. However, such efforts are off target, since the cause of these high fuel prices is related to a lack of pipeline capacity rather than any collusion between wholesale distributors or retail gas stations.
- The case of Trans Mountain provides a cautionary tale on the broader cost implications and risks of infrastructure constraints, whether regarding (i) natural gas – for example, the move by Michigan governor Gretchen Whitmer to shut down Enbridge’s Line 5 pipeline, which supplies fuel to Ontario through Wisconsin and Michigan via the Straits of Mackinac; (ii) electricity – Canada’s increasing reliance on electrification will require expansions of our electricity transmission and distribution networks; or, (iii) transportation – potential limitations on road and rail infrastructure may similarly affect internal and international trade of goods.
- Canada is the largest G7 Nation in terms of geographic area and the smallest in terms of population. At a broad level, we should have a formal national transportation infrastructure strategy. Compared to other developed countries Canada is alone in not having one.

Introduction

While inflation has hit Canadians hard over the past three years, British Columbia has recently dealt with a particularly challenging and persistent problem – high gasoline prices. Starting in mid-2015, BC gasoline prices began to decouple from prices in neighbouring Alberta and have generally outpaced both western Canadian prices and the national average.

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This pricing behaviour was acute enough to prompt a formal investigation by the British Columbia Utilities Commission (BCUC) into wholesale gasoline prices.¹ In a two-part report following the investigation, the BCUC identified an “unexplained difference of approximately 13 cpl [cents per litre]” between Vancouver and Seattle prices and a similar discrepancy between Vancouver prices and Edmonton prices (BCUC 2019). Based on this assertion, the BC government concluded that these high and rising gasoline prices resulted from collusion and price fixing. In response, it passed the *Fuel Price Transparency Act* in November 2019. This act was intended to combat price increases by compelling certain market actors to submit fuel data to a government administrator (Government of British Columbia 2019).²

However, as shown in a recent peer-reviewed paper published in *The Energy Journal* (Fellows 2022), the relative price increase in BC markets is a result of a transportation infrastructure deficit – specifically, insufficient pipeline capacity to ship gasoline from refineries in Edmonton to BC’s southern interior and Lower Mainland.

While not always fully understood, private and public transportation infrastructure tends to obey the laws of supply and demand. Insufficient infrastructure will result in higher costs for individuals or companies that want to use that infrastructure. Because most infrastructure is either public (no user fee is charged) or regulated (a regulatory body restricts the user fee) it is easy to overlook the fundamental supply and demand relationship. Specifically, because we do not see a definite price change associated with using a specific piece of infrastructure, it is easy to ignore the costs associated with insufficient infrastructure. However, those costs still exist, and they end up appearing elsewhere in the economy. The result can be an increase in the prices of final consumption goods and, when these price increases are acute, as with the case of BC gasoline, this becomes a public policy problem.

In diagnosing the issue of high gasoline prices, the BC government has mistakenly identified a case of insufficient pipeline infrastructure as an abuse of market power.

A Brief History of the Trans Mountain Pipeline and Expansion

Figure 1 shows a simplified map of both the Trans-Northern Alberta Products pipelines and the Trans Mountain pipeline (TMPL). These two lines transport refined products including gasoline from Edmonton area refineries to Calgary, and to various points in British Columbia, respectively. The existing Trans Mountain pipeline transports both refined products and various types of crude oil. It does this using a process called “batching” wherein different commodities are received at a transportation hub and put into the pipeline one after another, to be extracted at a delivery point.

Edmonton represents the hub for Western Canadian refining. While Vancouver is home to the Parkland refinery, the firm that operates it routinely purchases additional refined gasoline to supplement its production since the refinery generally runs at full capacity except for periods of maintenance and unplanned outages. This contrasts with Edmonton area refineries, which ship refined gasoline to Calgary (via the Trans-Northern Pipeline) and to cities in BC (via the TMPL).

1 The BCUC analysis attempted to take account of known factors affecting retail prices, including but not limited to the BC clean fuels standards. The “unexplained difference” of 12 cents per litre was the remaining difference after accounting for these factors.

2 In November 2019, the BC government passed the *Fuel Price Transparency Act*. (<https://www2.gov.bc.ca/gov/content/industry/natural-gas-oil/responsible-oil-gas-development/15626>) However, despite this act coming into force in May 2020, the price differences between British Columbia cities and Edmonton and Seattle have persisted.

Figure 1: Refined Product Pipelines in Alberta and BC

TMPL began shipping crude oil in 1953 and was modified to allow for batching to facilitate refined product shipments in 1983. In the period leading up to 2015, TMPL was responsible for most of the gasoline supply to BC, shipping gasoline and diesel from Edmonton to Kamloops and Vancouver.

Bottlenecks Appear

For most of its history until 2006, TMPL has operated with excess capacity. However, since 2006 it has seen regular prolonged periods of excess demand (Figure 2), with shippers expressing a desire to ship more product than the physical capacity of the pipeline could accommodate. Because energy pipeline tolls are regulated in Canada, rather than adjusting the price to balance quantity demanded and capacity (as in an unregulated market), TMPL is required to apportion quantity on a prorated basis, which is a non-market way to determine who gets to transport how much.

Every month, TMPL shippers nominate, or submit an offer on, the volume they want to ship on the line for the upcoming month. In periods of excess demand (when the combined nominations exceed the physical capacity of the pipe), shippers get a prorated portion of their nominated demand. As with TMPL's tolls, the apportionment

process is implemented under a formal regulatory process mandated by the Canadian Energy Regulator (CER), formerly called the National Energy Board (NEB).

As indicated, TMPL has regularly been under apportionment since as early as 2006, but the apportionment rate grew significantly in 2010 and shippers persistently had their nominated volumes reduced by 60 percent or more from mid-2011 until 2015. Due to this growth in demand, Kinder Morgan Canada (TMPL's former owner) applied in 2013 for regulatory approval to construct an expansion to more than double the size of the pipeline. The initial application called for a 2019 completion date.

Well-documented regulatory and construction delays have extended the expansion's planned in-service date by more than half a decade and contributed to the growing apportionment issue. As the CER/NEB's apportionment process was only ever intended to address short durations of excess demand, this persistent and prolonged use of apportionment on TMPL has led to potential "gaming" of the system. In 2012, the National Energy Board received a complaint that long-term apportionment had led to "strategic over-nomination" wherein shippers adjusted their nomination values, misrepresenting actual demand, to gain a larger share of constrained capacity (NEB 2015). This behaviour led to perceptions of unfair treatment, as shippers able and willing to misrepresent their capacity demands could avoid some of the apportionment effect.

The 2015 NEB Rule Change

Before the 2012 complaint, the NEB required shippers to arrange for a third party to attest that the shipper was prepared to fully ship their entire nominated volume and capable of doing so. Following an investigation, the NEB concluded that the existing attestation was insufficient to guard against over-nomination. It conceded that the existing procedure was "likely contributing to the ongoing apportionment of the pipeline" (NEB 2015).

To address this issue, in 2015, the NEB mandated a new verification procedure that limited nominated volumes to the higher of:

"...average deliveries to a shipper ... using [the highest] 18 months out of the 24-month period immediately preceding the nomination date; or three per cent of the available capacity" (NEB 2015).

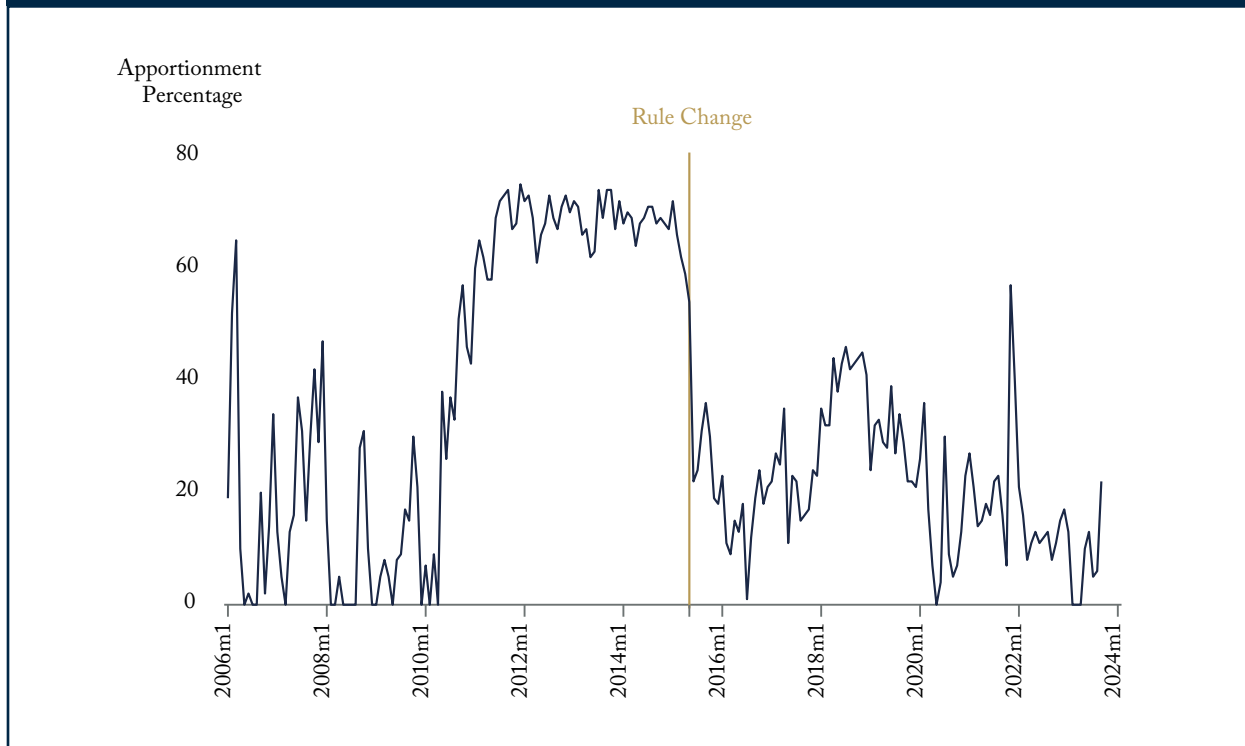
This new procedure had the intended effect of reducing apportionment rates (Figure 2).

While the same verification procedure applies to all commodities shipped on TMPL (crude and refined), it has impacted various commodities differently. The old procedure appears to have allowed refined product shippers to better game the system to secure a larger portion of their desired throughput whereas the new system completely removes the option of gaming the system and, in so doing, has shifted the composition of throughput. There has been an increase in crude shipments and a reduction in refined product shipments.

Following the rule change, refined product shipments generally fell for a period of two years before stabilizing at roughly half their historic volumes. That was just under 5,000 cubic metres per day, (m³/d) post-2018 vs almost 10,000 m³/d prior to 2015 (Figure 3). This reduction in refined product shipments accommodated an offsetting increase in crude oil throughput volumes (predominantly heavy crude) as the TMPL continued to operate under apportionment over the entire post-2015 period.

As detailed in Fellows (2022), the pre-2015 third-party verification procedure constituted a more effective constraint on crude oil shipment nominations relative to refined products, whereas the post-2015 "historic volumes" verification procedure reflects a more effective constraint on refined product shipments. In short, Fellows (2022) explains that before 2015, it was likely easier for refined product shippers to misrepresent actual

Figure 2: TMPL Apportionment Rate

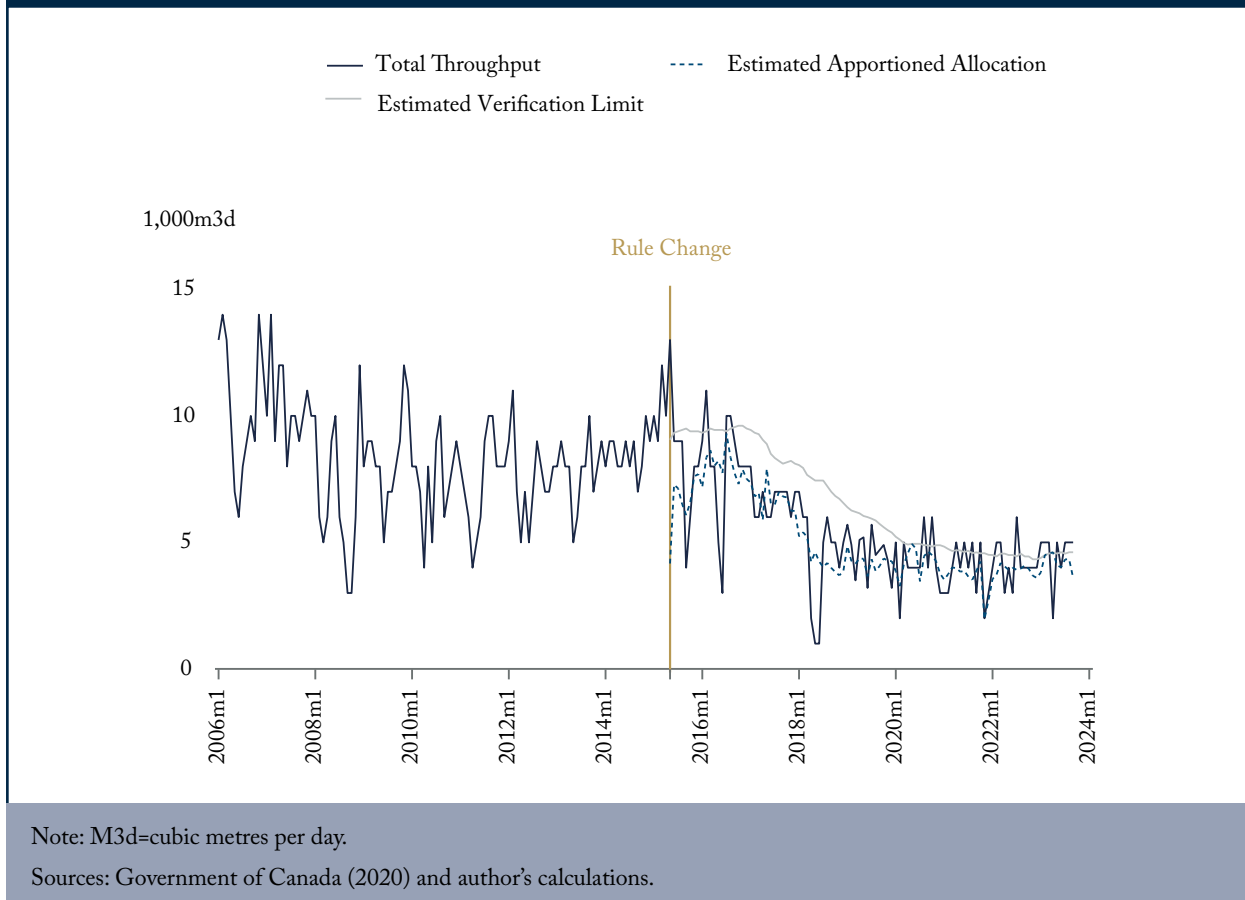


Source: Government of Canada (2020) and author's calculations.

throughput demand. In contrast, the post-2015 verification limit directly restricts nominations based on a historical mean. Strategic over-nomination notwithstanding, refined shipments have always accounted for a smaller share of total TMPL throughput relative to crude oil. As such, monthly variations in the capacity allocated to crude and refined products will result in a higher variance of refined shipments vs crude shipments. Over time, the verification-limit calculation mandated by the NEB becomes self-reinforcing since the calculation begins to factor in months that are themselves subject to the calculated verification limit. Over time, this has meant that refined product shipments have fallen, as per Figure 3. Because of this, the decline in refined product throughput is likely a direct result of the 2015 NEB rule change.³

3 Note that Figure 3 includes a projection of the estimated verification limit and an estimated apportioned allocation. Full details are documented in Fellows (2022), but as a summary: the estimated verification limit and apportioned allocation are calculated using pre-2015 throughput data and the observed overall apportionment rate. The realized refined throughput after 2015 does not enter the estimation. This is important since it demonstrates that the reduction in refined product throughput following the 2015 rule change is a direct result of the rule change itself. It is not being caused by some other factor.

Figure 3: TMPL Refined Product Throughput

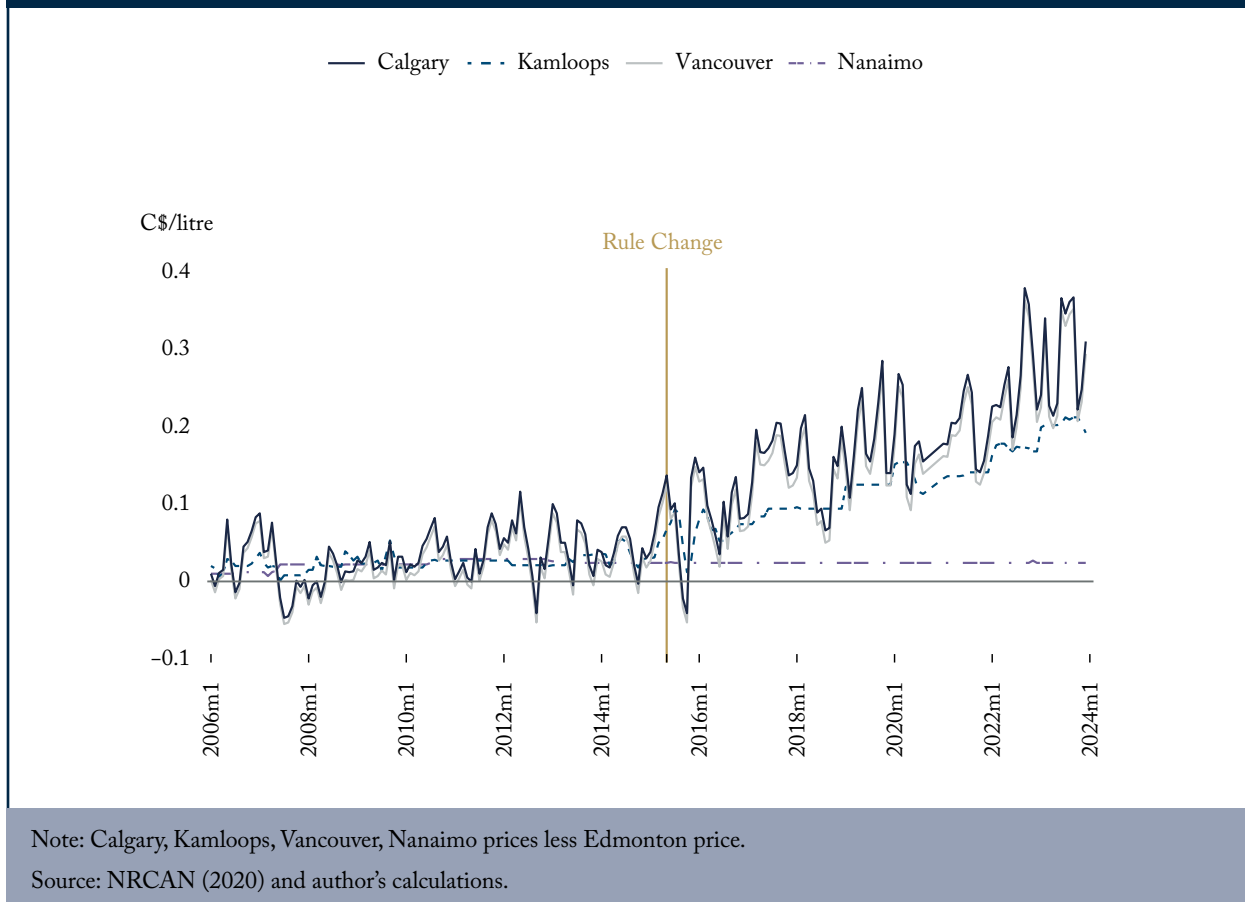


As discussed in Fellows (2022):

Prior to TMPL's 2015 rule change the only constraint on shipper nominations was a requirement that an arm's length third party could verify a shipper's ability to dispatch and receive (or have someone receive on their behalf) the total nominated volume should it be awarded. It is reasonable to speculate that this third-party verification constitutes a more effective constraint on nominations for crude oil shipments relative to refined products. Crude shipments on TMPL are larger in total volume accounting for approximately 80 percent of the pipeline's throughput, by extension these shipments require more storage or takeaway capacity at delivery compared to the smaller total refined product volumes.

Additionally, since the verification limit directly restricts nominations based on a historical mean, it dampens (or eliminates) variations in desired nomination volumes above the historical mean while permitting those below the historical mean (which then become part of the calculations for future historical means). This effect is then more pronounced for refined products due to their more pronounced seasonal variations in shipping demand, an assertion reflected in submissions of several shippers (NEB 2015). The reference to "shipping demand" rather than "shipments" is critical here since a portion of the variance in pre-2015 crude oil volumes is driven by variations in refined product nominations (with crude and refined throughput jointly endogenous to the nominations for both)....

Figure 4: Western Canadian Wholesale Regular Gasoline Prices Relative to Edmonton



The Evolution of British Columbia Prices vs Alberta Prices

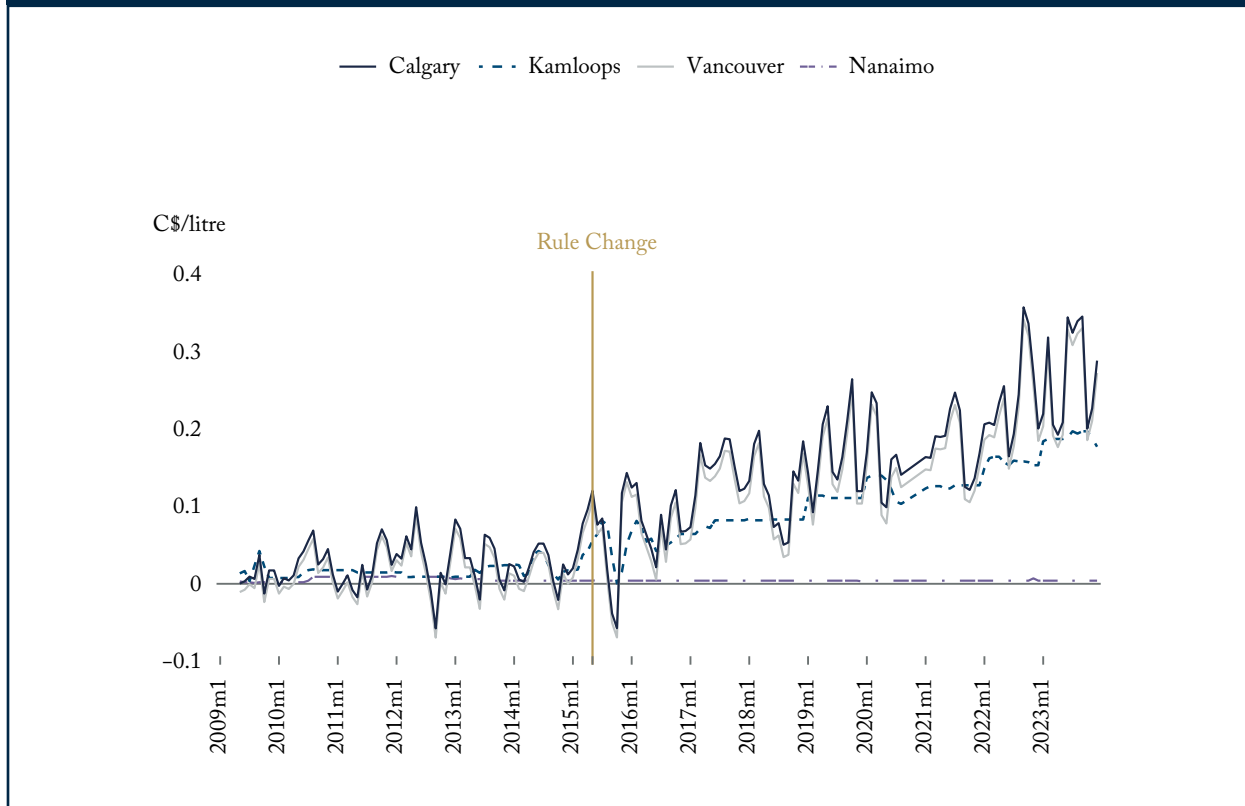
While the refined product throughput on TMPL has halved since 2015, overall gasoline consumption in BC has not reduced by the same amount. This means that BC gasoline wholesalers are (as expected) substituting for other supply sources. In particular, evidence submitted to the BC utilities commission suggests that much of the gasoline volume that used to move between Edmonton and BC via TMPL now does so via higher-cost rail shipments.

Examining the wholesale gasoline price differences between the TMPL delivery points in BC and the refined product receipt point in Edmonton, we can clearly see a gap begin to widen subsequent to the 2015 rule change. Comparing Figure 4 to Figure 3, the relationship between falling refined product flows on TMPL (Figure 3) and the increasing price difference between Edmonton and BC cities (Figure 4) is unmistakable.

In addition to the primary supply received from Edmonton, wholesale markets in Vancouver and Nanaimo also procure gasoline via international imports and through production from the Parkland Refinery.⁴ Despite this,

⁴ Imported gasoline accounts for 70 percent of British Columbia gasoline demand and Edmonton area refineries are responsible for between 80 percent and 95 percent of refined gasoline imports to British Columbia depending on the year (BCUC 2019).

Figure 5: Western Canadian Wholesale Regular Gasoline Prices Relative to Edmonton Adjusting for Pipeline Tolls



Note: Calgary, Kamloops, Vancouver, Nanaimo prices less Edmonton price and pipeline toll.

Source: NRCAN (2024), CER (2024) and author's calculations.

before the 2015 rule change, prices in these cities tracked Edmonton prices very closely. After adjusting for pipeline tolls ($[City Price] - [Edmonton Price + Pipeline Toll]$) as in Figure 5, the most considerable pre-2015 variation was under 10 cents and, in most months, the price differences were within 5 cents. In fact, in Kamloops and Calgary, which procure wholesale gasoline exclusively from Edmonton-area refineries, price variations relative to Edmonton were either null or a fraction of a cent after adjusting for pipeline tolls pre-2015.

The period following the 2015 rule change is, of course, a very different story. Since the Trans-Northern Pipeline (which ships refined products from Edmonton to Calgary) is not subject to apportionment and not regulated by the CER/NEB, it did not face a rule change and is unaffected by the TMPL situation. As a result, Calgary prices remain essentially identical to Edmonton prices (after adjusting for tolls) pre- and post-2015. However, prices in the BC delivery wholesale markets (Kamloops, Vancouver and Nanaimo) immediately begin to decouple from and outpace Edmonton Area prices even after adjusting for the TMPL toll.

As of 2023, the price difference had grown to between 20 and 35 cents per litre, depending on the city and month. This is a direct result of insufficient infrastructure, specifically the constraints on the Trans Mountain pipeline.

While the 2015 NEB rule change has essentially exposed the economic costs of insufficient pipeline capacity, it is important to note that the costs were already present before 2015. The rule change did not cause apportionment; it simply acted to shift the burden away from TMPL crude oil shippers towards refined product shippers and consumers. Other estimates have tried to assess the economic loss associated with insufficient pipeline capacity (e.g., Fellows 2018). The difference here is that shifting the burden to gasoline consumers makes the costs salient. The economic damage done to crude oil producers by insufficient capacity prior to 2015 was more diffuse and easier for policymakers to ignore.

In evaluating the overall impact of pipeline expansion on Lower Mainland BC drivers, it is important to note that, with the completion of Trans Mountain Pipeline expansion in May 2024, the pipeline shipping tariffs for crude oil and refined product shipments have increased.⁵ At present, the interim tolls being charged to shippers are approximately 5.9 cents per litre higher than the pre-expansion tolls.⁶ From Figure 5 (and the analysis in Fellows 2022) it is reasonable to assess that the existing pipeline constraint (and NEB/CER rule change) has been adding more than 10 cents per liter to BC Lower Mainland wholesale fuel prices since 2019 and added between 20 and 30 cents per liter in 2023. As such, the 5.8 cent per litre increase in tolls is more than offset by the reduction in shipping costs associated with relaxing the constraint and moving volumes off expensive rail and back onto the TMPL system. BC residents should see some gas-price relief.

Policy Implications

BC gasoline consumption is generally around 1,100 litres per capita per year, and diesel consumption is around 900 litres per capita per year.⁷ Based on this, a rough calculation suggests that insufficient pipeline capacity costs the BC economy an average of around \$500 per person per year. Since an average BC household consists of 2.4 people, the average household costs would be close to \$1,200 per household per year.⁸ This is a remarkable burden, particularly given the recent inflationary issues in Canada.

Continuing this rough calculation, there are three million people in the BC Lower Mainland. If the average burden associated with insufficient pipeline capacity is \$500, then the total cumulative annual costs are in the range of \$1.5 billion per year.

Note that this cost is before we consider any costs or benefits to the oil industry. The calculation does not concern industry profits or Canada's crude oil export potential. This is just an approximate measure of the consumer burden in BC's Lower Mainland.⁹

5 At the time of publication, Trans Mountain shippers are paying "interim tolls." Final tolls will be approved by the Canadian Energy Regulator following a formal review and will take effect at some point in the future.

6 Based on CER regulatory filings (Interim Tariff No. 117) and author's calculations.

7 Canadian Energy Regulator (2024) Provincial and Territorial Energy Profiles – British Columbia <https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-british-columbia.html>. Note that these data are from 2019, which is the latest pre-covid data available at the time of publication.

8 Assume a \$0.25 increase in fuel prices per litre as indicated in Figure 5.

9 This measure also doesn't account for the demand response, specifically that consumers would have purchased more fuel at lower prices. As such, it should be considered an under-estimate of the lost consumer surplus.

How Can Canada Do Better?

While this paper is about TMPL specifically, there is a broader theme here. Transportation infrastructure is paramount to the entire energy sector, where issues related to electricity transmission capacity and interties and LNG export capacity are at the forefront of today's energy policy discussions. But the problem is even broader than that. Every productive sector in the Canadian economy requires high-quality transportation or telecommunications infrastructure to function. Canada is the largest G7 Nation in terms of geographic area and the smallest in terms of population. We need to be able to move goods and services around the country and its various regions to maintain and grow the economy.

Trans Mountain represents perhaps the most visible Big Squeeze when it comes to infrastructure constraints. But in this case, even government regulators in British Columbia did not properly recognize the telltale signs of an otherwise invisible pipeline bottleneck. There are other infrastructure bottlenecks across the Canadian economy.¹⁰

According to the European Court of Auditors, Canada is the only Western industrialized economy without a recognizable transportation strategy. The EU recently benchmarked its own strategy against comparable policies in Australia, Switzerland and Canada. Its conclusion was that Canada does not have a strategy.¹¹ In addition to this lack of strategy, the cost of constructing infrastructure in Canada is worrying. When the Trans Mountain expansion was first proposed, the initial budget for the capacity expansion was estimated at just over \$5 billion. As the pipeline enters service in 2024, the final budget has exploded to more than \$30 billion. This is a problem.

While there are myriad costs to having insufficient infrastructure, we can only address those costs if we can make efficient investments in infrastructure development. A sixfold increase in budget for what was effectively a brownfield investment does not inspire confidence for private- or public-sector investments in infrastructure.

While there is much yet to be revealed about the specifics of the Trans Mountain budget overruns, Canada does have a documented issue in attracting infrastructure investment. As Khanal et al. (2023) show, Canada has serious reputational issues in attracting investment, resulting in declining rates of foreign direct investment inflows. This is occurring at the same time as federal government spending on infrastructure which is also falling (the federal government's investment in the Trans Mountain expansion notwithstanding). Much of this reduction in infrastructure investment stems from perceived regulatory and bureaucratic delays (including increases in the time required to obtain regulatory approvals and construction permits).

Misdiagnosing a lack of infrastructure as a market power issue (as the BC government has done regarding TMPL and wholesale gasoline price increases) also does not help. If governments and regulators cannot recognize the Big Squeeze that was pre-expansion Trans Mountain, we have little hope of avoiding, recognizing, and mitigating other smaller squeezes across the country.

Even restricting the focus to pipelines, not enough has been said about the major implications of Michigan

10 See, for example, Rodrigue (2021).

11 See European Court of Auditors (2021). Specifically, "Table 3 – Strategy definition: key features, weaknesses in the EU context and other practices in non-EU countries", under "Existence", the EU court of Auditors entry for Canada is "No". We are the only country with that entry.

governor Gretchen Whitmer's push to shut down Enbridge's Line 5 pipeline. Closing line 5 would cause a shortage of over 50 million liters per day spread across Ontario, Quebec, Wisconsin, Indiana, Ohio and Pennsylvania.¹²

Outside of pipelines, but still within energy, Canada's climate policy projections rely quite heavily on electrification, yet our existing transmission and distribution networks will require substantial expansion to avoid being squeezed.

Finally, as the Canadian Northern Corridor Research program has documented across several dozen studies over the last decade, limitations on Canada's road and rail infrastructure similarly squeeze both our internal and international trade of other goods (Fellows and Tombe 2018, Fellows et. al. 2020, Rodrigue 2021). The need for a national transportation strategy is very apparent. Compared to other developed countries Canada is alone in not having a recognizable transportation infrastructure strategy.¹²

Conclusion

Insufficient transportation infrastructure, whether an energy pipeline, electricity transmission or any other mode, has actual economic costs. These costs are not always transparent. As the case of TMPL shows, it is easy to misdiagnose price increases that result from insufficient infrastructure. Other assessments of BC's recent gasoline price issues focus on the competitive environment, but competition does not work to lower prices unless firms can operate with sufficient infrastructural support. When there is not enough infrastructure, firms face higher costs (for example, shipping refined products by rail at a higher cost) or they simply cannot expand at all. When there is insufficient supply, either prices increase to reduce the quantity demanded, or supply has to be rationed.

As a country, Canada needs to do better. At a broad level, we should have a formal national transportation infrastructure strategy. But, more immediately, regulators and provincial governments should better recognize the need for transportation infrastructure investments, and the implicit and explicit value they provide to the economy. If we cannot even identify Trans Mountain's Big Squeeze, we have no hope of identifying and mitigating the smaller ones.

12 See <https://financialpost.com/commodities/energy/sarnia-fears-thousands-of-job-losses-if-michigan-blocks-enbridges-line-5-pipeline>

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