

## **OPERATING RATIO AS A MEASURE OF RAILWAY OPERATING EFFICIENCY**

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### **Introduction**

Following the implementation of the “precision railroading” or “precision scheduled railroading” model at CN and CP by the late Hunter Harrison, CN and CP significantly decreased their operating ratios. Much public commentary, including from generally well respected sources, has attributed those decreased operating ratios to increased operating efficiency. For example, the Conference Board of Canada’s report entitled “Building for Growth: Trade, Rail, and Related Infrastructure” stated:

“CP and CN have been very successful in lowering their operating ratios and now are among the most efficient railways in the world.”<sup>3</sup>

Mr. Harrison, who was appointed CEO of CP on June 29, 2012 and resigned that post on January 18, 2017, receives a significant amount of credit for CP’s operating ratio improvement due to the “precision railroading” model he has championed. Indeed, the trade journal “Railway Age” named Mr. Harrison the “Railroader of the Year” for 2015 for his work at CP, citing in support that “...CP has posted record revenues and earnings, a record-low operating ratio, and a stock share price that has more than tripled”.<sup>4</sup>

While some of the reduction in CP’s operating ratio during Mr. Harrison’s tenure is properly attributable to genuine improvements in railway operating efficiency, much of it is the result of factors that are beyond management control, including changes in fuel prices, or other contributing factors, such as freight rate increases, which represent the exercise of market power more than any change in operating practice.

### **Operating Ratio Analysis**

A railway’s operating ratio represents the ratio of its operating costs to its revenue.<sup>5</sup> Accordingly, a lower operating ratio means a railway is incurring less operating cost per dollar of revenue.

CP’s operating ratio has been on a decreasing trend in recent years. CP’s operating ratio for the year ended December 31, 2012 was 83.3% (and its “adjusted operating ratio” for the same period was 77.0%).<sup>6</sup> By the end of 2016, CP had reduced its operating ratio to 58.6%.<sup>7</sup> This paper analyzes some of the more significant factors driving that decrease.

### **Impact of Fuel Prices on CP’s Operating Expenses**

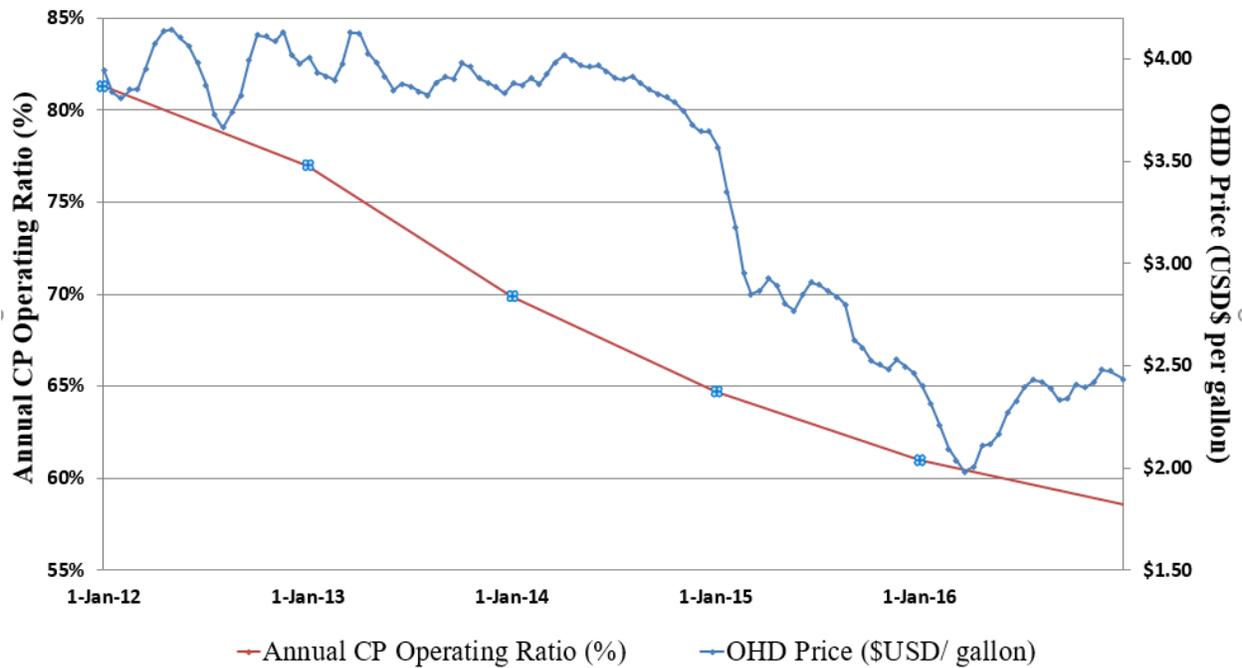
CP’s annual reports show a significant reduction in its operating expenses per revenue ton mile (“RTM”) from 2012 to 2016.<sup>8</sup> Specifically, CP reduced its operating expense per RTM by approximately 24% in the year ended December 31, 2016 relative to the year ended December 31, 2012.<sup>9</sup> However, a significant proportion of that reduction is attributable to factors other than operating improvements, including changes in fuel prices.

Over the years 2012 through 2016, fuel prices declined significantly. Figure 1 below uses the price of on-highway diesel (“OHD”)<sup>10</sup> to illustrate the trend in fuel price relative to CP’s annual operating ratio:

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<sup>1</sup> 54th Annual Meeting of the *Canadian Transportation Research Forum*, May 26-29, 2019 at Vancouver, British Columbia.

**Figure 1 - Annual CP Operating Ratio vs. On-Highway Diesel Price (2012 – 2016)<sup>11</sup>**



The downward trend in fuel pricing had the effect of reducing CP’s operating expenses, and therefore its operating ratio, independently of CP’s management or operating decisions.

CP reduced its operating expense per RTM by approximately 24% in 2016 relative to 2012. However, if we remove the impact of CP’s fuel expenses, CP’s operating expense per RTM would have decreased by approximately 18%.<sup>12</sup> Stated a different way, about one quarter of the reduction over that time period can be explained on the basis of the decrease in CP’s fuel expenses (of which some is attributable to decreased locomotive fuel consumption, as discussed below).

The change in CP’s fuel expenses from 2012 to 2016 is shown in Table 1 relative to the other operating cost components that CP publicly reports.

**Table 1 – Change in Components of CP’s Operating Expenses (2016 vs 2012)**

<b>Component of CP’s Operating Expenses</b>	<b>% Change In Expense Per RTM (2016 vs 2012)</b>	<b>% of CP Total Operating Expenses (2016)</b>
Compensation and benefits	-21.6%	33%
Materials	-24.9%	5%
Equipment rents	-16.6%	5%
Depreciation and amortization	+17.9%	17%
Purchased services and other	-4.4%	25%
Fuel	-43.6%	15%
<b>Total Operating Expenses</b>	<b>-23.5%</b>	<b>100%</b>

Table 1 demonstrates that of the six expense categories that CP reports, the (i) Fuel and (ii) Compensation and benefits expense categories are the main drivers of the decrease in CP’s operating expenses. The other four cost components either (a) increased (*e.g.* Depreciation and amortization) or decreased a relatively small amount (*e.g.* Purchased services and other), or (b) comprised only a small portion of CP’s overall costs (*e.g.* Materials, Equipment rents), from 2012 to 2016.

### **Impact of Fuel Prices on CP’s Operating Ratio**

Decreased fuel prices impact not only CP’s costs but also its revenues due to the application of CP’s fuel surcharge tariff 9700. Accordingly, the analysis of the impact of fuel prices on CP’s operating ratio must consider the impact on both the revenue and cost components of the operating ratio.

CP has represented to the United States Surface Transportation Board that its fuel surcharge programs simply pass through to shippers CP’s fuel costs without markup.<sup>13</sup> Accepting that at face value, a \$50 million incremental reduction in CP’s fuel expenses should produce a \$50 million reduction in revenue, which would work together to reduce CP’s operating ratio. For example, if CP’s total operating expenses in a given quarter were \$750 million and its total revenues were \$1 billion, that would produce an operating ratio of 75%. If, in the next quarter, CP incurred \$50 million less in operating expenses as a result of lower OHD prices (which also resulted in lower fuel surcharge revenue), that would produce operating expenses of \$700 million and revenues of \$950 million, respectively, or an operating ratio of 73.6% (assuming fuel consumption was substantially unchanged between quarters).

CP’s fuel expenses in 2016 were \$567 million compared to \$999 million in 2012, a difference of \$432 million. Because CP improved its locomotive fuel consumption in 2016 relative to 2012, some of the \$432 million reduction in fuel expenses is attributable to decreased fuel consumption, as opposed to decreased fuel prices. Table 2 below calculates the impact of the change in fuel prices between 2012 and 2016, as well as CP’s improved fuel consumption.

**Table 2 – Impact of OHD Prices on CP’s Operating Ratio (2016 vs 2012)**

<b>Component</b>	<b>2012</b>	<b>2016</b>	<b>2016 (had 2012 OHD prices applied)</b>
Gross ton-miles (millions) (as reported by CP)	254,354	242,694	242,694
Fuel consumption (U.S. gallons of locomotive fuel consumed per 1,000 GTM) (as reported by CP)	1.15	0.98	0.98
Fuel consumed (U.S. gallons) (calculated)	292,507,100	237,840,120	237,840,120
Fuel expenses (C\$ millions) (as reported by CP)	\$999	\$567	\$812
Locomotive fuel price (C\$/gallon) (calculated)	\$3.42	\$2.38	\$3.42
Fuel expense differential due to fuel prices (C\$ millions) (calculated)	N/A	N/A	\$245
Total operating expenses (C\$ millions) (as reported by CP)	\$4,746	\$3,654	\$3,899
Total Revenue (C\$ millions) (as reported by CP)	\$5,695	\$6,232	\$6,477
<b>Operating Ratio</b>	<b>83.3%</b>	<b>58.6%</b>	<b>60.2%</b>

Accordingly, a non-negligible portion of CP’s reduction in its operating ratio from 2012 to 2016 (58.6% vs 60.2%) resulted from OHD prices alone, even after accounting for reduced locomotive fuel consumption.

While CP reduced its locomotive fuel consumption by approximately 15% in 2016 relative to 2012 (from 1.15 to 0.98 U.S. gallons of locomotive fuel per 1,000 gross ton miles), the structure of CP’s fuel surcharge has remained substantially unchanged over the same period.<sup>14</sup> In a normally functioning and competitive market, those efficiency gains would have been shared with the consumer (the shipper), perhaps in the form of reduced fuel surcharges or reduced rates or both, none of which have occurred in any meaningful fashion (see the discussion below regarding CP’s freight rate increases). CP’s failure to pass on efficiency gains demonstrates its market power over many of its customers.

### **Impact of Freight Rate Increases**

From 2012 to 2016, CP increased its average freight revenue per RTM by approximately 8.5%, which had the effect of lowering CP’s operating ratio on its own.<sup>15</sup> If we normalize CP’s traffic mix for 2016 to CP’s traffic mix in 2012 (*i.e.* by weighting the 2016 traffic mix by the percentage of RTMs that CP transported in 2012 for each of CP’s seven business lines in 2012), CP’s freight revenue per RTM increased by approximately 11.8%.<sup>16,17</sup>

However, when we remove the confounding impact of changes in CP’s fuel expenses (which, as described above, are affected by both fuel prices and the fuel efficiency of CP’s locomotives), the freight rate increases per RTM are even more striking. If we subtract CP’s reported fuel expenses from its total freight revenue, CP’s rail freight revenue per RTM increased by 19.9% from 2012 to 2016.

When we conduct the same adjustment for traffic mix as described above, CP's rail freight revenue per RTM increased by 23.9% from 2012 to 2016. The tables in Schedules "A.1" and "A.2" summarize the findings.

While increasing revenue per RTM contributes to a reduction in CP's operating ratio, those revenue increases result primarily from CP exercising its market power, as opposed to increased operating efficiency.

The impact of CP's exercise of market power on its operating ratio is quite striking when we consider the level of CP's freight revenue if CP had passed along its productivity gains to shippers, as would be the case in a competitive environment. We can approximate that impact by considering what CP's freight revenue would have been if it had adjusted its rates by the year over year change in the Rail Cost Adjustment Factor (adjusted) ("RCAF-A"), which is a railway cost index that is calculated and published by the Association of American Railroads that "measures the rate of inflation in railroad inputs such as labor and fuel" and is modified for productivity gains.<sup>18</sup>

If CP had adjusted the freight rates applicable to each shipper on its network on each January 1 during the 2012 through 2016 period considered herein (*i.e.* on January 1 of each of 2013, 2014, 2015 and 2016) by the percentage change in the average of the RCAF-A for the last available four quarters compared to the average of the RCAF-A of the previous four quarters, CP's 2016 total freight revenue would have been approximately \$4.86 billion (not the \$6.06 billion it actually generated), which represents a decrease of approximately 12% relative to CP's total freight revenue in 2012 of \$5.55 billion.<sup>19</sup> When we add, without adjustment, CP's 2016 non-rail freight revenues of approximately \$172 million, CP would have generated total revenue of approximately \$5.03 billion in 2016. When we divide CP's 2016 reported operating expenses of \$3.654 billion by that number, we calculate an operating ratio of approximately 72.6%, which is significantly higher than CP's reported 2016 operating ratio of 58.6%.<sup>20</sup> While this analysis ignores the impact of fluctuations in foreign exchange and other variables, it is quite clear that had market forces required CP to pass along its productivity improvements, CP's operating ratio likely would not have decreased as much as it did from 2012 to 2016.

## **Conclusion**

CN and CP have become more efficient in recent years, but we urge caution when considering operating ratio improvements as evidence of efficiency gains. Railway freight rate increases and fluctuations in fuel prices may have significant impacts on operating ratio, much of which represents serendipity or the exercise of market power.

**Schedule “A.1” – Summary of CP’s Key Financial Metrics (2012 and 2016 Revenue)**

<b>Period</b>	<b>Operating Ratio (reported)</b>	<b>Total Revenue (reported, C\$ millions)</b>	<b>Total Freight Revenue (reported, C\$ millions)</b>	<b>Total Freight Revenue (excl. fuel, calculated, C\$ millions)</b>	<b>Total RTMs (reported, millions)</b>	<b>Total Rail Freight Revenue per RTM (reported)</b>	<b>Total Rail Freight Revenue per RTM (excl. fuel, calculated)</b>
2012	77.0	\$5,695	\$5,550	\$4,551	135,032	4.11	3.37
2016	58.6	\$6,232	\$6,060	\$5,493	135,952	4.46	4.04
% Change (2016 vs 2012 –not normalized)	-23.9%	9.4%	9.2%	20.7%	0.7%	<b>8.5%</b>	<b>19.9%</b>
2016 (normalized to 2012 traffic mix by % RTMs)	56.9	\$6,417	\$6,245	\$5,678	135,952	4.59	4.18
% Change 2012 to 2016 (normalized to 2012 traffic mix by % RTMs)	-26.1%	12.7%	12.5%	24.8%	0.7%	<b>11.8%</b>	<b>23.9%</b>

**Schedule “A.2” – Summary of CP’s Key Financial Metrics (2012 and 2016 Expenses)**

<b>Period</b>	<b>Total Operating Expenses (reported, C\$ millions)</b>	<b>Fuel Expenses (reported, C\$ millions)</b>	<b>Total Operating Expenses (cents per RTM) (calculated)</b>	<b>Fuel Expenses (cents per RTM) (calculated)</b>	<b>Total Operating Expenses (cents per RTM, excl. fuel) (calculated)</b>
2012	\$4,746	\$999	3.5147	0.7398	2.7749
2016	\$3,654	\$567	2.6877	0.4171	2.2707
% Change (2016 vs 2012 –not normalized)	-23.0%	-43.2%	-23.5%	-43.6%	-18.2%
2016 (normalized to 2012 traffic mix by % RTMs)	N/A <sup>21</sup>	N/A	N/A	N/A	N/A
% Change 2012 to 2016 (normalized to 2012 traffic mix by % RTMs)	N/A	N/A	N/A	N/A	N/A

## Endnotes

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<sup>3</sup> Coad, L., Knowles, J., Lauerman, V., Robins, A., Gill, V. (2016). *Building for Growth: Trade, Rail, and Related Infrastructure*. Ottawa: The Conference Board of Canada, page 53.

<sup>4</sup> See, Railway Age website at: <https://www.railwayage.com/freight/class-i/hunter-harrison-canadian-pacific>.

<sup>5</sup> Footnote 3 on page 60 of CP's 2016 Annual Report states: "Operating ratio is defined as operating expenses divided by revenues".

<sup>6</sup> CP Annual Report 2016, page 60.

<sup>7</sup> *Supra*, note 6.

<sup>8</sup> A revenue ton mile or "RTM" refers to a railway's movement of one ton of freight one mile. Revenue per RTM is often expressed in cents per RTM, or CRTM.

<sup>9</sup> CP reported total operating expenses of \$4,746 million and total RTMs of 135,032 million in 2012, or 3.5147 cents per RTM. CP reported total operating expenses of \$3,654 million and total RTMs of 135,952 million in 2016, or 2.6877 cents per RTM, which is about a 24% decrease.

<sup>10</sup> CP's tariff 9700 imposes on shippers a fuel surcharge that fluctuates with OHD prices.

<sup>11</sup> OHD prices per gallon were obtained from CP Tariff 9700.

<sup>12</sup> These calculations are based on CP's publicly reported total RTMs, total operating expenses and fuel expenses. We calculated a total operating expense per RTM for each year and a total fuel expense per RTM for each year, subtracted the latter from the former, and compared CP's operating expense per RTM (excluding fuel) in 2016 relative to 2012.

<sup>13</sup> See Verified Statement before the United States Surface Transportation Board of Marcella Szel, Senior Vice President, Marketing and Sales for CP, dated April 26, 2006, page 5: "The Board's *March 14 Decision* indicates that some shippers are concerned that railroad fuel surcharges "are designed to recover amounts over and above increased fuel costs." (*March 14 Decision* at 1.) This is certainly not true of CPR's fuel surcharge program...CPR's fuel surcharge program is not designed to recover amounts in excess of the increase in its fuel expense during a given year and it has not done so."

<sup>14</sup> CP reported that it consumed 1.15 U.S. gallons of fuel per 1,000 gross ton-miles (GTM) in 2012 (page 34 of CP's annual report 2012), compared to 0.980 U.S. gallons of fuel/GTM in 2016 (page 63 of CP's annual report 2016).

<sup>15</sup> CP generated total freight revenue of 4.11 cents per RTM in 2012 (page 43 of CP's 2012 annual report) and total freight revenue of 4.46 cents per RTM in 2016 (page 68 of CP's 2016 annual report).

<sup>16</sup> In order to normalize CP's 2016 traffic mix to CP's 2012 traffic mix, we calculated an average revenue per RTM for 2016 for each of CP's seven business lines (see note 17 regarding treatment of CP's changes to its business lines between 2012 and 2016). We then allocated CP's total 2016 RTMs by the percentage of RTM's each of the seven business lines represented in 2012, then multiplied the number of RTM's in each 2016 business line by the 2016 average revenue per RTM for each business line to generate a traffic mix-adjusted number for CP's 2016 total freight revenue. CP reported nearly identical total RTMs in 2012 (135,032,000,000) and 2016 (135,952,000,000), so the traffic mix normalization should not result in any major distortions. CP's average length of haul is also relatively consistent from year to year, so distortion due to distance is unlikely. For example, page 5 of CP's 2017 Investor Fact Book reports an average length of haul of 846 miles for 2016 and page 35 of CP's Investor Fact Book 2014 reports an average length of haul of 844 miles for 2013 (CP appears not to have publicly reported its average length of haul for 2012).

<sup>17</sup> CP began reporting its business lines differently in its 2014 annual report, in which (i) the former "Grain" business line was divided into "Canadian Grain" and "U.S. Grain", (ii) the former "Intermodal" business line was divided into "Domestic Intermodal" and "International Intermodal", (iii) the former "Industrial and consumer products" business line was divided into "Metals, Minerals and Consumer Products", "Chemicals and Plastics" and "Crude", and (iv) the former "Sulphur and Fertilizers" business line was divided into "Fertilizers and Sulphur" and "Potash". The calculations underpinning this paper combine CP data for the 2016 business lines into their 2012 categories to ensure a proper weighting of 2016 traffic mix.

<sup>18</sup> For further detail, see the Association of American Railroads' description of the Rail Cost Adjustment Factor at: [https://www.aar.org/wp-content/uploads/2018/03/Index\\_RCAFDescription.pdf](https://www.aar.org/wp-content/uploads/2018/03/Index_RCAFDescription.pdf). CP is a member of the Association of American Railroads.

<sup>19</sup> For example, CP's total freight revenue of \$5.550 billion in 2012 would be adjusted as of January 1, 2013 by the percent change in (i) the annual average of RCAF-A in 2012 (0.48300) relative to (ii) the annual average of RCAF in 2011 (0.48325). That produces a reduction of approximately 0.05% in 2012 relative to 2011, which, when applied to CP's total freight revenue of \$5.550 billion in 2012, would have reduced CP's total freight revenue in 2013 to \$5.547 billion.

<sup>20</sup> We did not attempt to adjust CP's 2016 total reported operating expenses of \$3.654 billion for changes in fuel prices because RCAF-A includes the impact of changes in fuel prices.

<sup>21</sup> It is not possible to normalize CP's 2016 costs to its 2012 traffic mix because CP does not report its costs in relation to its business lines (*i.e.* CP reports a single cost number across its entire network for each cost category).