OBSERVATIONS ON RAIL COSTING IN CANADA

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Introduction

Rail costing, in Canada, emerged as an important issue for government with the 1959-1961 Royal Commission on Transportation (usually referred to as the MacPherson Commission). The Commission's report recommended, among other things, that Canadian transportation providers that had public service obligations be compensated for the costs of such imposed services. This was a major shift in thought – up until then, governments policy was that carriers should cross-subsidize imposed money-losing services from the profits they made on other services they had been granted a licence to provide.

Historically, almost from the beginning of the industry, railway rates in Canada developed as commodity rates that were essentially based on value-of-service pricing reflecting conditions by market (domestic, US and overseas) and geography (regions or provinces). When a regulatory body was established in the 1903 *Railway Act*, railway costs had not been a major focus. The focus of the Board of Railway Commissioners was largely on reducing regional and territorial disparities in the commodity class rates, and adjusting for inflation. (See the extensive discussion of the regulatory development of railway rates in Scott 1985.) In fact, when there was a request for basing western Canadian rates on railway costs, the regulators rejected that call because of problems in allocating costs to specific movements (Scott, p. 95). There was also a period where political and social considerations (e.g., regional equity) played a major role in setting rates. Costs, and even economics, were subordinated to that (Scott, 1985, Chapter 4).

But clearly, if the government was to start compensating carriers for their losses on these imposed services, as recommended by MacPherson, it had to have some understanding of carrier costs. This led to developing costing models in the 1960s and 1970s so that government could compensate carriers for the losses they incurred serving the public interest.

The History of Costing Regulations in Canada

In Canada, railway costing models had their legal genesis in 1967, through the *National Transportation Act.* The legislation, which was inspired by the recommendations of the MacPherson Commission, included provisions for regulation to be put in place "regarding items and factors relevant in the determination of costs" (CTC, 1969) as per the amendments made to the *Railway Act* at that time. A technical committee was tasked with the actual computations of the railway costs, and in keeping with the recommendations of the MacPherson Commission elected to use regression analysis to compute some of the relationships between costs and traffic for the railways (also used in the United States). At the time, in the mid 1960s, most regression analysis was computed manually, without the aid of computers and software. Computer programs for statistical/econometric analysis did not become available until the late 1960s and early 1970s.[2] Thus, the initial regression analysis for railway costing was necessarily simple,

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[2] E.g., the first releases of Minitab and SAS were in 1972. Some researchers developed Fortran based regression programs, but due to the single precision nature of early computing, many of these either were unable to invert the regression cross products matrix or produced erroneous results.

possibly simplistic, with complex railway operational influences on costs confined to a relationship to a single variable. Even in the 1980s when the next generation of railway costing models emerged during implementation of the Staggers Act, most cost relationships continued to be univariate, with a few having two variables. Not only were cost relations simplistic due to computing limitations, railroading itself was simple. At the time of the MacPherson Commission, steam was still a major source of motive power at Canadian railways, containerization did not exist, there could be short (perhaps 40 car) solid trains for a few commodities such as iron ore but unit train operations such as we have today did not exist, much less operations with the Scheduled Railroad concept.

There were various cost elements included in the calculations, varying from depreciation and cost of capital to fuel costs and general overhead costs. The Commission held multiple hearings, receiving input from the railways, provincial governments and other stakeholders. The regulations were put into place in 1969 (CTC orders R6313 And R6314) two years after the Act came into force. These regulations laid out the guidelines for variable costs of the railways (calculated separately and confidentially for each railway). The costing relations (equations) were simplistic – e.g., they did not distinguish costs of identical car movement on a specific distance in flat Saskatchewan versus in the mountains of B.C.

A review of railway costing in Canada was completed by G. Hariton, and published by the Canadian Transport Commission in 1987 (CTC, 1987). While some today characterise rail costing systems as dividing railway total costs (including cost of capital) into fixed and variable components, in fact Hariton divided costs into three components: variable, line specific fixed costs (p. 41), and other fixed costs. The line specific fixed costs are almost always overlooked in independent railway cost estimates, even though they are a critical conceptual cost element. These costs are especially critical in the current era where railways are no longer required to continue operations on any rail line. If the line does not generate revenue to cover variable costs plus line specific fixed costs (and make a contribution to other fixed costs), then the line is uneconomic. Railways are not compelled and are discouraged from cross subsidizing some traffic from other traffic.

Hariton also discussed the fact that cost relations were likely non-linear, even though costing systems today continue to have simplistic linear (or log linear) specifications. He also posited that railway costing include the avoidable costs of operations (i.e., the opportunity costs). This is an important distinction for railway costing as it takes into account the actual economics of the railway operations. He identified the railway economics problem of using historical cost data, which are much lower than current opportunity costs of railway assets (land, way and structure, motive power and rolling stock).

The current *Canada Transportation Act* still references the underlying cost regulations of the 1960's, but does make mention of updates to general methodologies. (CTA, 2018) Improvements in technology have changed the underlying economics of rail transportation, but the regulations themselves are unchanged since the 1960s, and the same simplistic, manual regression analysis approach suggested by the MacPherson Commission is still the key driver of how Canadian railway cost relationships are determined. Today's regulatory cost estimates are based on a 1950s/1960s simplistic nature of railway operations and a simplistic manual statistical/econometric method. While the Agency itself has in the past paid considerable attention to estimating line specific fixed costs, today the costing system, these costs are largely ignored in cost estimates, especially those of independent costing models that do not have access to the confidential railway cost data filed by the carriers with the Agency. Some have argued that all this could be solved by forcing the railways to disclose their costs, but we argue that the very cost accounting definitions are archaic and based on bygone era of steam and manifest train operation.

The History of Costing Regulation in the United States

In the United States, regulation of the railroads began in 1887 with the enactment of the Interstate Commerce Act, and the subsequent Interstate Commerce Commission (ICC). (United States Senate, n.d.)

Regulation of rail costs began in 1939, when the Cost Finding Section of the ICC introduced a costing tool, Rail Form A (RFA). (Interstate Commerce Commission Bureau of Accounts, n.d.) The original methodology was based on expenses reported to the ICC by the railroads, and only accounted for total costs of the railway. This costing tool was necessarily based on ratios, as regression analysis was not part of the economist's tool box at the time and most analysis was done with adding machines, at best. There were a number of subsequent revisions to RFA, starting with the calculation of variable costs (not merely total costs). Between the late 1940's and the mid-1970's, there were additional revisions to the RFA, but the underlying methodology remained roughly the same. (Interstate Commerce Commission Bureau of Accounts, n.d.)

Following the Regulatory Reform Act of 1976, the ICC eventually began research into a new costing methodology, the Uniform Rail Costing System (URCS), after it develop a new uniform classification of accounts. The passing of the Staggers Rail Act of 1980 included the use of costing *as a threshold* in rate regulatory proceedings for potential regulatory relief, spurring the need for the updated costing method. URCS officially replaced RFA in 1989 (Surface Transportation Board, 2019), although at the time it was viewed as an interim step and there was an expectation of further development of costing methodology. Other than a few minor tweaks, this did not happen. Following the dissolution of the ICC in 1995, the Surface Transportation Board (STB) took on the role of regulation, and continues to use the URCS costing system. It is important to note that URCS is not the basis for setting rates, although the ultimate regulated rates are often re-expressed as a markup on URCS costs merely to allow inflationary adjustment to regulated rates which may be set for as long as 10 years by the STB.[3]

Issues with the Practitioners Approach to Railway Cost Modelling

In both Canada and the US, the regulatory bodies responsible for rail regulation adopted a practitioner's approach to developing their respective cost models. This approach is generally a mixture of the experience/knowledge of railway experts that can directly assign some costs, on engineering studies of the cost under consideration, and statistical and regression analysis looking at the relationship between costs and output levels (e.g., crew cost per car mile).[4]

Given the inability of accountants to actually measure marginal costs (the avoidable costs related to a specific movement), the railways and regulators adopted the practitioner's costing approach to determine long-run variable costs as a proxy for marginal or avoidable costs. The basic concept driving the models was avoidable cost: what costs would the railway have not incurred had the movement not taken place. This necessitated an examination of line-specific costs.[5]

There are a number of issues with the implementation of the practitioner's approach used to develop Canada's regulatory cost model. While the model is supposed to determine the avoidable costs of a rail movement, it is unable to do so. There are a number of reasons:

- Because of data and computing limitations, the practice of rail costing focussed on calculating system averages based on annual data. Unfortunately, system averages do not shed much light on specific services unless those services are the average. For example, the system average crew cost per car mile cannot be relevant to both a unit train of three locomotives pulling 150 cars on

[3] The STB also has a three benchmark methodology for disputed rates of traffic with annual revenues/payments below a threshold. While this methodology will make comparisons relative to URCS estimates for the traffic, at its core the methodology is a comparative rates method, with the URCS computations a mere convenience.

[4] The practitioner approach is distinguished from what is often described as the aggregate econometric approach. The latter is used to reveal general characteristics of railway costs such as the degree of economies of traffic density, and is not intended to produce estimates of the costs of specific traffic, nor is this approach capable of estimating costs of specific traffic.

[5] Hariton actually refers to estimating avoidable costs. (p.40.)

mainline track and a short consist train of one locomotive pulling five cars on a difficult and remote line. Significantly, railways distinguish the costs of different locomotive types and simply estimate cost based on "locomotive miles" can seriously misstate the costs of a movement.

- Average costs do not address the issue of the avoidable costs of a particular shipment.
- Average costs do not account for line specific costs. All fixed costs are lumped together, essentially implying cross subsidy of traffic between lines.
- Average costs do not reflect the current opportunity cost of using a given set of resources (locomotives, cars, crew, fuel etc.) for a particular move. It does not matter if the specific traffic is moving with a new high efficiency locomotive or uses 30 year old equipment. All locomotive costs are averaged together on an historical cost basis.
- These regulatory costs are based on historical costs, yet avoidable costs should be based on current and forward-looking costs. Given that many rail assets are extremely long-lived, the difference between historical cost and current opportunity costs of the capital assets (or forward looking cost for issues on future movement) can be considerable.
- Regressions that seek to establish the relationship of costs to relevant drivers of costs do not include a number of (some might say most of) the key drivers of railway costs, such as congestion, weather, terrain, and, in particular, changes in technology and productivity.
- Moreover, the regulatory cost model cannot address how one should allocate fixed costs (line specific and other fixed costs) to specific shipments. Given that fixed costs by definition cannot be attributed to any particular movement, this is problematic for any form of regulatory rail costing model.

The CTC in its 1987 review of railway costing noted a number of issues that complicate the regulatory cost models, a key one being the use of historic costs instead of the preferred current or forward looking costs (CTC, 1987, p. 10). The author also noted that the costing methodology only partially distinguishes between train types and train runs (ibid, p.53). In our view this means that even though some of the regulatory costing approach starts at a fairly specific level of detail, aggregation and other factors (such as the allocation of fixed and common costs) mean that the models cannot, by their very design, meaningfully depict the avoidable costs of any particular movement.

Rail Costing by Railways Today

Railways have long abandoned the costing approach still followed by the Canadian Transportation Agency (and the Surface Transportation Board in the US). Certainly, the railways still submit the prescribed data to the Agency (following the "Uniform Classification of Accounts and Related Railway Records") that enables the Agency to run its rail costing model. But we are advised that the railways themselves do not use the results of the Agency's regression analysis for anything, let alone to determine the cost of any particular service.

Railways now do resource-based costing that can determine the cost of the specific resources required for any given movement. This drills down to the level of the specific locomotive(s) and cars involved. (The performance of locomotives, for example, varies and even different numbers of locomotives are used depending the type; performance varies among engines of the same model.) The need for resource-based costing has been driven, in part, by the dramatic changes in railroading with far more specialized cars and a wide range of motive power with dramatically different cost profiles. Most important, railway operations today are dramatically different than in the 1950s and 1960s when the CTC R6313 methodology was developed. The methodology was developed for short, manifest trains that only were assembled and moved when enough cars had been assembled. The methodology cannot distinguish operations of heavy unit trains,[6] multimodal through trains, scheduled trains, use of distributed power and

[6] URCS has been tweaked to deal with some aspects of unit trains, in part because it became apparent that URCS was seriously mis-costing unit trains, and by implications all other traffic.

extensive signalling and IT systems, etc. The costing system also does not embrace any level of service measures. Shippers can and do request specific levels of service and are willing to pay higher rates for unique requests. The costing system is incapable of dealing with this, despite the importance of level of service in the dialogue between shippers, carriers and government. Today's high efficiency railway operations have been enabled by the modern era's ability for the railways to collect, organize and analyze incredible amounts of data on individual movements. The simplistic system-side costing averages that regulatory costing models produce in both Canada and the US have essentially become irrelevant to the railways' operations.

The CTA Rail Costing Model in the Modern Era

As noted previously, the CTA's model dates back to the late 1960s and early 1970s following Orders R-6313 and R-6314. The regulations that still govern railway costing date from April of 1980. The Agency is updating the regulations, but the model is still one from an era when railways were dinosaurs compared to today. There was no precision railroading whereby trains operated to schedules and spent very little time idle. Cars and locomotives spent a lot of time sitting in a multitude of hump yards. Trains were short and the age of steam locomotives was not yet over. The concept of unit trains, positive train control and highly specialized efficient cars did not yet exist. The model does not include key drivers of the cost of railroading in Canada today, such as weather and congestion. As we saw in the winter of 2013-2014, cold and snow can significantly impact on operations, and as we reach ever higher traffic volumes, mainline and yard congestion is an increasingly important issue. Railways operate a network, and congestion in one area has a significant spill-over effect in other areas. It is not as if one can simply flick a switch and everything goes back to normal when the congestion is cleared. Just as a snowstorm at Pearson International Airport can affect flights from all across the country, once it ends, it can take a long time for the back-log to be cleared.

Moreover, railways are seldom the entire supply chain for traffic movements. Rather, railways are just one part of an extensive supply chain that includes trucking, shipping lines, marine ports, and inland ports. In addition to the transport modes, there are also services as freight forwarders, customs brokers and government agencies such as Canada Customs. Bottlenecks at other points, such as ports, customs clearance, etc., can also have a significant impact on railway costs. None of these factors are built into the Agency's rail costing model.

The Agency did revisit the costing model recently to update it percent variability, and found that contrary to its assumption that fixed costs make up about 20% of total costs,[7] they actually make up roughly 40%. These fixed costs should be divided into line specific and other fixed costs, but they are not. Fixed costs, which cannot properly be allocated by these costing models are far larger (about twice as large) than conventional wisdom had them. While the Agency decisions changed overnight from 20% to 40% fixed costs, railway operations did not change overnight. The cost division was simply wrong, and may still be wrong. The Agency acknowledged in Order No. 2015-R-91 that a more fundamental review was needed.[8]

Rail Costing Uses in Canada. A question now is whether the regulatory costing model has any relevance today that would warrant a fundamental review and restructuring. Is it possible to develop a model that can actually measure avoidable costs of individual movements without violating the confidentiality of

[7] In past interswitching decisions, the Agency used fixed cost ratios as low as 8%.

[8] We also note that the change from 20% to 40% fixed costs does not mean that variable cost estimates from the old 20% costing models simply need to be scaled. Some cost elements (e.g., fuel) are almost 100% variable, whether in the old or new system. Thus the costs of specific traffic cannot be estimated by scaling down the LRVC estimates from an 80-20% costing model. Each individual cost account must be reconsidered for new variabilities. The Agency has released no details on its 2015 costing change to allow researchers to make such adjustments.

proprietary commercial information of railways and shippers that would be required to get to this level of detail? Or should we be looking to other approaches to accomplish the same regulatory ends?

Before that question is addressed, we should examine the potential benefits of developing such a sophisticated model for regulatory purpose. What is the regulator's rail costing data actually used for?

In Canada the rail regulatory cost model is primarily used for setting interswitching fees. These are payments between railways for traffic carried by one railway, but which had a short-haul pick-up from, or drop-off to, the customer by another railway. The interswitching fee is not a rate that the shipper pays. It is a charge that the railways exchange between themselves. When one of the railways carries more traffic under the interswitching rate than the other carrier is, the level of the interswitching fee becomes important. The 2015 CTA Review raised a question whether the interswitching fee computed by the Agency was in fact compensatory, and noted concerns had been raised that such a formulaic approach was "not consistent with commercial considerations, as stipulated in section 112 of the *Canada Transportation Act*." (CTA Review, p. 163) If the fee truly is not compensatory, then the carrier carrying more of the short-haul traffic under the interswitching rate will suffer financial harm relative to the other carrier. Would an improved costing model address this? Possibly, but it is interesting that the wording of the CTA Review report would seem to suggest a commercially based approach (distinguished from a cost based approach?) in order to be consistent with section 112 of the Act.

Regulatory rail costing is also used for payments by subsidized VIA Rail to CN/CP for access to track. Again, this fee is not directly related to rates, or in this case, to the fares the passengers pay. It is a fee paid by one railway (VIA) to another. This determination of payment also applies to other commuter rail operations. It is used for establishing the net salvage value of lines that are to be transferred or abandoned, should a party to such a transaction ask the Agency to determine this.

Finally, regulatory rail costing is used for the determination of the volume-related composite price index (VRCPI) which is used for the determination of the revenue cap (the Maximum Revenue Entitlement, or MRE) on the movement of regulated western grain. (There was also a one-time use to establish the first western grain revenue cap.) However, it should be noted that the latest *Canada Transportation Act* Review recommended that the revenue cap be modernized (to exclude containerized grain and interswitching revenue from the MRE, incentivize investment in hopper cars, expand the list of eligible grains and make provisions for rate premiums to guarantee car supply and service) but then be eliminated entirely in seven years in favour of market pricing for grain (CTA Review, p. 159). If this recommendation were to be adopted by the government, this would eliminate one of the few remaining uses of regulatory costing estimates.

Regulatory rail costing data is no longer used for determining the level of subsidization payments to the railways for imposed public duties. This was the primary reason for developing the cost model in the first place. There was a hypothetical temporary role for the model during the period 1967-1987 when there was maximum rate regulation. During this period, however, there was only one application for relief, but the process was not completed and no maximum rate decision was ever rendered. Prior to the revisions to the 1967 *Act* in response to the MacPherson Commission's recommendations, rail costing was not used by the government at all – it didn't have any rail costing capabilities.

Given the limited use for the costing model, developing alternative tools for accomplishing these tasks might be preferable to a major review and overhaul of a cost model. Even if the model could determine the variable costs of individual movements precisely, it would still fail in its goal due to insurmountable issues relating to allocating fixed and common costs to individual movements.

Recent Criticisms of the Use of Rail Costing Models

In the US, the continued use of URCS is under fire. A recent Transportation Research Board report (TRB 2015) was highly critical of the use of rail costing models. The authors, a group of eminent transportation economists, oppose the necessarily arbitrary allocation of fixed and shared costs to individual units of traffic by any rail costing model. In their view, this allocation cannot be done properly by any model. The very definition of fixed costs are those that do not vary with volume – how can you assign them to a movement when the cost would be the same whether or not that movement takes place? Shared costs similarly have no indisputable way of being assigned to the individual movements sharing those costs. These arguments are persuasive: any method of assigning fixed or common costs to a particular movement is by definition arbitrary. Economic theory does provide guidance for pricing traffic where there are fixed or joint costs (e.g., Ramsey pricing) but this is not a matter for a costing system.

We also note that the regulatory costing system in Canada does not provide proper economic guidance when an infra-marginal increase in traffic is under review. E.g., if in order to handle a new shipper the line needs large investment (such as double or triple tracking merely to provide the capacity needed to serve the incremental shipper), then the regulatory costing system using cost averages is fundamentally inappropriate. In such cases, costing should recognize the full costs of the investment (one of us has referred to this as project costing) when contemplating the appropriate rate. One of us was involved in a rate dispute and proposed such a method, and the matter was reviewed by the court who seemed to have ruled that because the costing did not adhere to the R6313 costing method it should not be used. This is perplexing given that rail rates paid by shippers in Canada have not been linked by regulation or in practice to costs.

Alternative approaches to Rail Costing

The TRB report reviewed the US URCS and essentially concluded that the costing system fails to reflect economic opportunity cost of specific traffic and that there was no alternative costing methodology that could replace it. The recommendation was to abandon regulatory URCS-type costing. In its place, the authors of the recent TRB report on modernizing freight rail regulation proposed the use of competitive rate benchmarking. Benchmarking would be confined to comparable shipments. Interestingly they also recommended potentially replacing STB review with arbitration instead of the current rate reasonableness hearings that employ data produced by regulatory rail costing models (TRB, p.5, 6.). This is consistent with the approach in Canada, where Final Offer Arbitration (FOA) has been a long-standing shipper relief mechanism, and the recent addition of long-haul interswitching as another shipper relief mechanism that is based on a comparable rate methodology. FOA proceedings and decisions are confidential, but in the debate on the 2018 revisions to the Canada Transportation Act, where the Senate version of the bill originally required the Agency to provide the arbitrator with LRVC estimates, the Minister stated on the record that FOA were not intended to choose rates based on cost. Instead rates were to be targeted to be commercially determined.

Rather than expend the time and effort to modernize an old tool whose raison d'être is at best questionable, our view is that it would be preferable that the focus be on other flexible and modern mechanisms to replace the regulatory rail costing model for its limited remaining functions.

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