Did September 11 Affect Freight Mode Split in the Quebec New-York Corridor?

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ABSTRACT

This paper considers whether there has been any change in merchandise rail mode split along the Quebec-New York corridor since the terrorist attacks of September 11th, 2001. In particular the papers seeks to establish whether increased border security has led to increases in border wait times and whether border wait times have been affected differentially for trucks and trains providing competitive advantage to rail as a mode to move freight along this corridor. While it was not possible to compare actual border wait times before and after September 11th because of the fact that border wait time information was only collected after September 11th, it does not seem that there has been an appreciable increase in border wait time along this corridor and in particular not enough to provide an increased advantage to rail. As well, there is little support for the hypothesis that rail mode split was positively affected in the post 9/11 period. This includes traditional, bulk freight categories, as well as non-traditional freight categories, yet further econometric analysis is necessary to better establish this. However, it does seem that there has been a reversal in the pattern of declining rail mode split of imports from Quebec to New York starting at the beginning of 2001 – long before the events of September 11th. The actual reason for this reversal in the fortune of rail is not entirely understood and is the subject of continuing research.

INTRODUCTION

The tragic events of September 11, 2001 had ramifications for many aspects of everyday life for citizens of the United States as well as those from around the world particularly with respect to increased security resulting in longer line-ups at airports and border crossings. The purpose of this paper is to consider whether changes in security affected freight mode split along the Quebec – New York corridor.

This corridor is significant in terms of trade. The main Quebec-New York border crossing is the 6th busiest in Canada [17]. Quebec exports to New York are worth around US1996$5 billion per year (around 4% of Quebec GDP) and New York exports to Quebec are worth around US1996$1.4 billion per year (around 0.2% of NY Gross State Product).

More particularly, this paper investigates the degree to which increased security after September 11 impacted Quebec – New York border wait times, and if it did affect border wait times, whether increases in border delays may have affected the mode split of freight being carried between Quebec and New York. Implicitly, this tests the hypothesis that longer border wait times increase the relative competitiveness of trains to ship freight across borders. The study uses anecdotal evidence on border wait times along this corridor as well as data from the US Bureau of Transportation Statistics Transborder Surface Freight Data database.

CURRENT WORK ON THE IMPACT OF SEPTEMBER 11

Academic literature about the effects of September 11 has tended to fall into two broad categories. The first focuses on issues affecting financial markets, the insurance industry or consumer confidence either broadly or in the United States (see for example [12], [2], [9]). The second category involves research on particular industries or places in various parts of the world including New York City ([1], [3]). Given the importance of September 11, there are likely countless other studies around the world looking at its economic impacts in the government literature and the press.

Apart from the more general literature, lately there has been some work more specifically on the economic impacts of border crossing times and other border related costs on the Canada and US economies. This work has tried to understand: changes in traffic levels over time; immediate post 9/11 impacts, and the causes of extended border crossing times ([15] and [16]). These broad reaching papers, while considering overall economic impacts, do not look at the issue of mode split of trade and do not look specifically at the Quebec – New York corridor, something this paper attempts to remedy.

OBJECTIVE OF THE STUDY

Several factors prove to be important in freight mode choice. Those factors include, among others, total logistics costs, time and reliability (of timing of shipments, as well as of the safety of shipments). One key characteristic of train or intermodal freight transportation that might be expected to affect its competitiveness relative to trucks in a climate of tighter borders is that trains along this corridor are cleared as a whole by customs, so that an entire train can normally cross the border in less than 30 minutes, whereas trucks need to be cleared individually at the border thereby potentially leading to longer wait times. For example, one author writes:

> Intermodal services have become attractive to time-sensitive businesses/shippers which are cognizant of the fact that intermodal trains have scheduled departure-arrival times, that they run over separate and dedicated corridors, and that rail's transactional times at border crossings are minimal. This has been particularly true in the wake of the September 11th attacks when commercial trucking sustained massive wait times at crossings [11].

Thus, the objective of this study is to test the following hypotheses: First, whether increased security after September 11 increased border wait times between trucks and trains differentially; and second whether any such changes may have resulted in increased mode split for rail on this corridor. As a result, the first thing to consider is whether there was a change in border wait times after September 11.

BORDER WAIT TIMES PRE AND POST SEPTEMBER 11

Primary border time data were sought from government sources. Secondary sources were sought from the academic and government literatures, and anecdotal information was sought through interviews with government officials, representatives of the Chambers of Commerce of Quebec and New York as well as representatives from railway companies.

Primary data was sought from three sources, for Canada from the Canada Customs and Revenue Agency and the Ministry of Transportation of Quebec and for the US from the US Customs. Border wait time data for Canada and the US exist, but were not collected until after September 11.

One study was found that compared border wait times before and after September 11 [4]. The paper used tachograph and GPS data for trucks traveling across three Ontario border crossings in order to show how these technologies could be used to measure travel times across the Canada US border. It found that at the three border crossings examined, statistically significant differences in border (in either direction) travel times could not be found when comparing the pre and post September 11 border crossing times. While this study does not consider the Quebec – New York border crossing, it provides evidence for how border travel times may have changed at border crossings in the very busy Southern Ontario border crossings, including Canada's busiest border crossing at Detroit - Windsor.

Interviews (see acknowledgements for list of interviewees) on the Canadian side included the director of the Association de Camionnage de Quebec and the head of the Border Issues Committee of the Railway Association of Canada. The Association de Camionnage representative answered for road traffic. His analysis of the situation was that border wait times had not really worsened since or because of September 11.

The head of the Railway Association of Canada's Customs Committee reported that immediately following September 11, there had been no increase in border wait time at all for trains, followed by a period of slightly closer scrutiny for a couple of weeks, after which wait times returned to their normal levels. This lack of increase in border wait times for trains was attributed to the fact that so much of rail freight is "pre-cleared" before it even arrives at the border.

On the US side, the President of the Plattsburgh Chamber of Commerce reported that at peak period there are significant delays, particularly for crossings into the US, but more and more for crossings into Canada. However, he reported that these delays were only marginally (if at all) attributable to September 11 and more to insufficient capacity.

Thus, based on the experience at Southern Ontario border crossings, as well as on interviews, it seems that there is reason to believe that there has not been a significant effect on border crossing and release times at the Lacolle-Champlain border crossing since September 11. At the same time, it does seem as though there might have been marginal increases for road traffic, but not for rail. As a result, it is worth considering mode split between these two modes and if they have seen any important changes since September 11.

DATA DESCRIPTION

The dataset used for this study came from the US Bureau of Transportation Statistics (BTS) Trans-border Surface Freight Database. The dataset used is monthly data that covers the period January 1997 to September 2003. It is available at a 2-digit HS (Harmonized System) Code level of detail. The Harmonized Commodity Description and Coding System (or Harmonized System, HS) is a system for classifying goods in international trade, developed under the auspices of the Customs Co-operation Council (now known as the World Customs Organization). The two-digit classification is the broadest classification, with each of the two-digit codes representing a broad commodity chapter. For example, HS code 44 refers to chapter 44 of the HS system and includes "Wood and article of wood; Wood charcoal."

The data covering freight moving from Quebec to New York include both freight volumes by current $US value, as well as by weight. The data for freight moving from New York to Quebec, on the other hand, only

include freight volumes by current $US value. Several modes are included in the data, road, rail, mail, pipeline, foreign trade zone, other or unknown. The last two classifications do not refer to an actual mode. Fortunately, and as will be seen, these categories make a relatively small proportion of freight movements, especially for those categories of greatest interest for this analysis. For the purposes of this analysis then, modes other than rail and road were classified into the category "other."

METHODOLOGY

Rail freight shipments were used as the basis of the analysis. Analysis began with an examination of the original import and export data by 2-digit HS code category was undertaken. Freight movements from Quebec to New York are referred to as imports. Movements from New York to Quebec are referred to as exports.

The purpose of this part of the analysis was to determine which categories of freight are carried most commonly and consistently by rail, and second to see whether there had been any categories which began to be carried by rail after September 11. A "category" was considered as the direction (import or export) by HS 2-digit category. Total imports and exports were also considered their own categories. No categories of freight not traditionally carried by rail that began to be carried by rail after September 11 and analysis was restricted to 9 categories imports and 4 of exports.

Once these categories of freight were selected, mode split for each of the categories by weight and value for imports and by value for exports was calculated. The rest of the analysis was essentially graphical, comparing patterns in the evolution of mode split before and after September 11. In effect, evidence for a change in mode split evolution was sought for each of the permutations of weight, value and direction.

MODAL ANALSIS – INTRODUCTION

Before continuing with the analysis of the data, it is worth mentioning the opinions of the individuals who were interviewed during the course of research for this paper. All together people were interviewed, those above and a fourth from Statistics Canada.

None of those interviewed felt that there had been any large effect of September 11 on mode split. Most thought that any increase in relative competitiveness caused by relatively improved wait times at the border for trains would be very small relative to other characteristics of the different modes affecting mode choice and split.

The modal analysis of these movements will be carried on below considering first imports and then exports. Imports will be further analyzed by value and weight as well as by major freight category both for before and after September 11, whereas exports will be analyzed only by value and by major freight category. This information is summarized in Table **1** found in the Discussion section below.

MODAL ANALYSIS

Imports (Quebec to New York)

By Value

Over the entire period, the vast majority (around 90%) of imports by value have been carried by road. A much smaller proportion (around 10%) is carried by rail. The balance between these two categories is made up of the category "other." Over the entire period, road and rail mode split have been declining, both of them losing market share to the "other" category that at some points has reached as high as 16% of mode split. This large proportion is anomalous for this analysis (it is the only instance in this analysis in which the "other" category is so important) and is explained by two freight categories. These categories appear to be high value and low weight categories. They are HS chapters 24 and 27 classified as Tobacco and Mineral Fuels. In terms of what it tells us about how mode split has been evolving on this corridor unfortunately, it is not very informative. The reason is that these two freight categories are associated with mode categories that are not very informative. In particular, Chapter 24 goods are not assigned to particular modes, but rather to their final destination of Free Trade Zones. Chapter 27 goods are for the most part

carried by "other" or unknown modes. As such, it is difficult to say precisely by what modes they were carried.

That having been said, this paper analyses the post 9/11 trends in freight movements. . In the post 9/11 period, truck mode split continues to trend downwards, while train mode split begins to trend upwards. "Other" mode split continues to trend upwards but at a faster rate than before. It is important, however, to note that while train mode split does trend upward during this period, from inspection, it appears that this change in trend began in March of 2001.

By Weight

The picture for imports by weight is quite different. The main reason is that the "Other" category is insignificant due to the low weights of the freight from Chapters 24 and 27. Another difference is that rail doubles its mode split when mode split is calculated by weight to around 20%, whereas road mode split declines to around 80%.

This is likely unsurprising in some respects. Rail has many advantages when it comes to being able to transport heavier loads. First of all, most main rail lines are able to carry cars of up to 286,000 lbs. Second, there are restrictions and limits on the size of trucks that can be carried on highways. As well, and as is the case in New York State, there are many fees associated with trucking some of which are related to the weight of trucks as well as the number of axels. While in Quebec (according to the Association de Camionnage de Quebec) there are no such (e.g. Highway Use Tax) taxes or fees, there are several fees in New York State that vary with the size and weight of trucks.

First, there are the vehicle licensing fees [14]. These are required by all vehicles that use State of New York Highways. These annual fees are based on full vehicle weight and amount to $4.31/500lbs. Thus this can vary from $155 to more than $700 depending on the size of vehicle. In addition to this there is the New York State Highway Use Tax. This is a rate based tax, whose rate changes depending on the weight of the truck. The rate varies between $0.006 - $0.0574 per pound depending upon the weight, type of vehicle and weight scale used (i.e. by full or unloaded weight). Based on an average of 63,000 miles traveled by combination vehicles [8], this could amount to between $378 and $3616. This is of course supposing that all vehicle miles were traveled in New York State. Moreover, this number would not be entirely accurate because of the fact that the Highway Use Tax applies only to non-toll highways.

This brings to the fore another fee that trucks in New York face, tolls. For movement of goods between Montreal and New York City, the tolled portion of the road runs between Albany and New York City. For a Class 3 Vehicle (5 or more axels, 53ft trailer) this amounts to $19.40 heading south and $13.40 heading north over $30 dollars for a return trip. This thus helps to understand the difference in rail mode split as measured by weight and value and we can continue with the analysis of mode split by weight.

Over the entire period, road mode split is trending upward, whereas rail mode split is trending downward. Restricting the time frame to after 9/11 reveals a switch in this pattern, resulting in rail mode split trending upwards and road mode split trending downwards. This reversal in pattern realized in June 2001 and thus, predates 9/11.

As was described in the methodology section, nine different freight categories, categorized by their 2-digit HS Codes were identified as being important and consistent for the movement of freight from Quebec to New York. Those categories were generally, with the exception of railway parts, bulk commodities. The commodities selected were: salt and sulfur; inorganic chemicals; wood and articles of wood; pulp of wood; paper and paperboard; copper and parts thereof, aluminum and parts thereof; zinc and parts thereof; and railway parts and components.

MODE SPLIT ANALYSIS BY FREIGHT CATEGORY

Salt and Sulfur

By Value

Rail mode split has evolved over the period considered starting at around 25% in 1997 and ending at around 60% in September, 2003, with the concomitant decline in road mode split. The "Other" category carried an insignificant amount of Salt and Sulfur. Because the "Other" category is generally negligible for most of the freight categories considered, it will only be mentioned below if it is not negligible. In the period after 9/11, the same pattern emerges, but seems to be less pronounced with train mode split rising more slowly.

By Weight
A similar pattern emerges as by value except that it does not rise at such a significant rate as rail mode split by value. Rail mode split trends upward if one considers the whole period starting the period around 60% of mode split and rising to around 85%. Considering the post 9/11 period does not reveal a dramatically different pattern, as rail mode split seems to trend upward at around the same rate. Perhaps the difference observed in the imports by value and weight has to do with an increase in prices for salt and sulfur.

Inorganic Chemicals

By Value
Considering the period as a whole, rail mode split trended upward while road mode split trended downward with rail mode split starting at around 65% in 1997 and ending at around 90% in September, 2003, with the concomitant decline in road mode split. In the period after 9/11, the same pattern emerges, but less pronounced with train mode split rising more slowly, a trend starting in July of 2001.

By Weight
A similar pattern emerges as by value. Rail mode split is higher than for value and trends upward if one considers the whole period starting the period around 70% of mode split and rising to around 90%. Considering the post 9/11 period does not reveal a dramatically different pattern as rail mode split seems to trend upward at around the same rate, if not slightly slower, also starting in July 2001.

Wood and Articles of Wood; Wood Charcoal

By Value
Considering the period as a whole, rail mode split trended downward while road mode split trended upward. The large majority of wood by value was carried by road oscillating around 90%. While a the trend over the period is declining for rail, this seems to be partly due to fact that there was a period from February 1998 to April 1999 where rail mode split was particularly high and road low. Apart from this extended spike, if anything, rail mode split would seem to be rising slightly over the entire period. If one considers the post 9/11 period, rail mode split continues the decline at a slightly faster rate, a trend which began in March of 2002.

By Weight
A very similar pattern to that of wood by value emerges, but with rail having a larger mode split by weight. The high period of rail mode split in 1998-1999 causes rail mode split to decline over the entire period, however, apart from this period, rail mode split would appear to be rising, starting at around 10% of mode split by weight in 1997 and ending around 20% in 2003. A pattern of increasing mode split is seen if one looks at the post 9/11 period, however, this rising pattern seems to have started in August of 2000.

Pulp of Wood or of Other Fibrous Cellulosic Material; Waste and Scrap of Paper or Paperboard

By Value
Considering the entire period, rail mode split is declining quite dramatically, whereas road is increasing. Over the period, rail mode split drops from around 60% to around (apart from the last two observations) 45%. This pattern changes when the post 9/11 period is considered. Over this period, rail mode split trends very slightly upwards between 9/11 and September 2003. The date of this reversal is not completely obvious, but it appears to begin in April of 2001.

By Weight
The pattern by weight for pulp of wood is somewhat similar to that by value, except that rail mode split by weight is generally lower than by value, and the pattern of decline of rail mode split by weight is less pronounced than by value. As a result, rail mode split declines from around 45% to around 30% (apart from

the last 2 observations) over the entire period. This pattern is reversed in the post 9/11 period, so that rail mode split is rising albeit not by very much over this period. Again, the beginning of this increasing trend is not easy to identify starting as late as June of 2002, and potentially as far back as April of 2001.

Paper and Paperboard; Articles of Paper Pulp, of Paper or of Paperboard

By Value
The pattern for paper and paperboard is similar to that of wood in that there is a period of high rail mode split between February 1998 and April 1999. Considering the entire period, rail mode split trends downward, a pattern pronounced by the period of high rail mode split, but which may have also emerged without this period starting at around 30% and declining to around 28%. The post 9/11 period shows a reversal of this pattern with rail mode split trending slightly upward over the period, a trend which begins around April of 2001.

By Weight
A similar pattern appears as to that for mode split by value, except that rail mode split is generally higher than was the case by value. Rail mode split trends downwards over the whole period, the degree of the trend being pronounced by the high rail mode split period. In the absence of this period, the overall pattern would likely be slightly positive. The post 9/11 period shows an increasing trend in rail mode split, a trend that begins, however, in May of 2001.

Copper and Articles thereof

By Value
When considering the entire period, rail mode split by value of copper has declined continuously and precipitously starting with some points as high as 50 and 60% and ending in September 2003 with only 22%. Lower points drop to only 2 or 3% percent towards the end of the period. When considering the post 9/11 period, this pattern is reversed, in that it trending upward, although this not a very convincing upward trend seeing as the lowest points seem to continue trending downwards. Also, it is difficult to see when this upward trend might have begun, but it looks as though an upward trend of sorts might have begun as far back as October 2000 and as recently as March 2003.

By Weight
The pattern for copper imports by value is basically identical as that for copper imports by value.

Aluminum and Articles thereof

By Value
Rail mode split for aluminum by value trends downward if one considers the entire period, a pattern pronounced by an early very high value of 30% for mode split. Apart form this point, rail mode split begins around 12-15% and declines to around 5% towards September 2003. If one considers the post 9/11 period, the pattern is reversed as mode split trends upwards. This upward trend seems to begin in May 2001.

By Weight
The pattern for aluminum imports by weight is virtually identical to that for imports by value.

Zinc and Articles thereof

By Value
The pattern for zinc and articles thereof is quite different from those of the other categories. If one considers the entire period, rail mode split for zinc trends upwards slightly starting with values of just below 50% and ending with values just above 50%. Considering the post 9/11 period reveals a pattern of declining mode split, a pattern beginning at the beginning of 2001 if not at the beginning of 2000.

By Weight
The pattern for mode split by weight is very similar as that to mode split by value, with one difference being that the post 9/11 downward trend is more pronounced in mode split by weight. The beginning of this decline is also the beginning of 2001.

Railway or Tramway Locomotives, Rolling Stock and Parts thereof; Railway and Tramway Track Fixtures and Fittings and Parts thereof; Mechanical (Including Electromechanical) Traffic Signaling Equipment of All Kinds

By Value
This category of goods shows the most variation of mode split than any of the other categories with all imports being carried in some months solely by road and others solely by rail. The general pattern for the entire period is one of declining rail mode split although this decline is tempered by a rapid increase towards the end of the period. As a result the post 9/11 period is a period of rapidly rising mode split for this category so that while in November 2001 rail had a 0% mode share, by September 2003 it had a mode share of 86%.

By Weight
The pattern for mode split by weight is generally the same as for mode split by value except that the rise in the post 9/11 period is less dramatic rising only to 67% in September of 2003. This is likely due to increases in the value of the railway parts over that period. As well, mode split by weight of exports seems to begin trending upward in March 2001.

Exports

While there was a relatively common pattern for rail mode split in freight imports from Quebec by both value and weight, namely a decreasing trend over the entire period and an increasing trend towards the end of the period, generally starting before the events of September 11, there is no such common pattern for the mode split of exports.

As was described in the methodology section, four different freight categories, categorized by their 2-digit HS Codes were identified as being important and consistent for the movement of freight from New York to Quebec. Those categories were generally bulk commodities. The commodities selected were: ores, slag and ash; inorganic chemicals; plastics and articles thereof; and pulp of wood. Unlike imports, data was only available by value for the exports.

Exports by Value

Considering the entire period, the vast majority of freight by value is carried by road, with its share trending upward over the period from just over 96% to around 99% by September 2003. Rail mode split has declined over this period from about 3% to a nearly negligible proportion of mode split. The fact that rail mode split is so much smaller for exports than for imports suggests that exports to Quebec from New York are more likely not to be bulk goods or commodities for which trains have advantages in hauling. This would fit with Canada's traditional role of provider of unfinished products that become inputs to industrial and manufacturing processes elsewhere. The fact that exports are more likely to be carried by truck, suggests that higher value, non-commodity goods are being exported to Canada. . Throughout this period, the "other" category has been trending upwards. Understanding the meaning of the increase of the "Other" category is complicated by the fact that Chapter 98 of the Harmonized System (special classification provisions) does not provide much information and neither does the mode by which it is carried (other or unknown). The general pattern observed for post 9/11 period is very similar to that for the entire period.

Mode Split Analysis by Freight Category

Ores, Slag and Ash

Because of the smaller volumes of freight moving from New York to Quebec, the frequency of relatively small observations for the freight categories of exports was higher than for imports, and as a result there is more variation in the observations as well. This is the case with most of the freight export categories including ores, slag and ash. That having been said, despite the wide swings in observed values there is a trend of decreasing mode split by rail for exports of ores, slag and ash. This pattern becomes more pronounced if one considers only the post 9/11 period. However, in as much as a pattern can be discerned

due to the frequency of very low mode split values, it would seem that this pattern of a more quickly declining trend of rail mode split began around the end of 2000 or the beginning of 2001.

Inorganic Chemicals

As with imports of inorganic chemicals, rail mode split trends upward if the whole period is considered. This pattern is more pronounced in the period following September 11 and in fact begins in the months following September 11 suggesting perhaps an increase as a result.

Plastics and Articles thereof

Considering both the entire period, rail mode split of exports of plastics was on a precipitous decline representing around 50% by value in January of 1997 declining to 0% for five of the six months leading up to September 2003. While it seems that the trend is less pronounced in the post 9/11 period, this (a pattern starting in June 2002) and is likely due to the fact that mode split cannot go any lower than zero, the value for rail mode split for 7 of the last 12 observations.

Pulp of Wood

Considering the entire period, the rail mode split of exports of pulp of wood has been trending downwards while road mode split has been increasing. At the beginning of the period, mode split value of around 20% were not uncommon, whereas towards the end, mode split value of 0% were not uncommon. Between October 2000 and September 2001 there was a period of high rail mode split. There has also been a sporadic increase in "other" mode split. Other mode split is exclusively assigned to the other/unknown category and is thus not terribly helpful in understanding the mode split of this commodity. In the post 9/11 period, the pattern is more pronounced.

SEASONALITY AND STRUCTURAL DIFFERENCES IN IMPORTS AND EXPORTS

The structural differences in imports and exports can be observed by plotting Autocorrelation Functions (ACF). This exercise will identify the structural differences between exports and imports and will also reveal seasonality in the time series. In the presence of serial autocorrelation, the use of OLS will result in the inclusion of insignificant variables, since such variables will return inflated t-statistics.

To forecast a time series, the minimum requirements are that the mean and the covariance structure (the covariance between the current and past values) should be stable over time and finite. Such data are referred to as covariance stationary. The covariance stationarity assumption is tested using the ACF, which is normalized by the standard deviations of the underlying variables and its value falls between the interval [-1, 1]. If the ACF of a time series does not dampen gradually, the series may be non-stationary. In addition, if the probability of the Ljung-Box statistic is less than 0.05, the set of autocorrelations is significant, and the time series is probably seasonal.

Figure 1 presents the ACF for exports and imports by trucking only. The gradually dampening ACF for imports and exports (much more pronounced for imports than exports) suggest covariance stationarity. The probability of the Ljung-Box statistic is less than 0.05 for both imports and exports suggesting seasonality in the time series. A close examination of the ACF for exports reveals that the four highest correlations are observed at lags 1, 6, 5, and 12. This suggests both annual and semi-annual seasonality for exports. Meanwhile, the three highest correlations for imports occur at lags 1, 2, and 3. This suggests quarterly seasonality in imports.

The above discussion offers two guidelines. First, the use of OLS is not suitable for modeling this data. Second, the difference in autocorrelation structures between imports and exports suggest inherent structural differences, which may require different approaches to modeling imports and exports. In addition, the ACF for different commodities (not shown here) reveal different trends and dependencies, which suggest that certain commodities within exports and imports should be modeled separately. Lastly for trucking imports, differences in autocorrelation structure (not shown here) was observed between pre- and post- 9/11 data.

DISCUSSION

Thus, did the events of September 11 and subsequent increased vigilance at the border between Canada and the United States affect the relative competitiveness of rail and thereby increase rail mode split along this corridor? If this hypothesis were correct, then one would expect to see one of three outcomes.

If rail mode split had been decreasing, one would expect to see the rate of decline slow, or possibly a reversal in the decline following September 11. If rail mode split had been increasing one would expect to see an increase in the rate of increasing rail mode split.

In order to facilitate this analysis, a table has been compiled that records the salient features of each of the cases examined. The table includes, for each case, the trend in rail mode split for the entire period, rail mode split at the beginning and ending of the period, the trend for rail mode split in the post 9/11 period, the approximate date of the beginning of the trend found in the post 9/11 period, and whether or not these findings are consistent with the hypothesis being considered about rail mode split. In some cases, while the pattern of rail mode split trend is consistent with the hypothesis, the timing is wrong. For example, imports of pulp of wood by value show a pattern consistent with the hypothesis (initially decreasing and then increasing for the post 9/11 period), but the pattern of increasing rail mode split seems to have originated long before the events of September 11 and as such is not consistent with the hypothesis.

As can be seen from Table 1, only two cases are consistent. The first, imports of railway parts by value appears consistent, with a reversal of declining mode split occurring in November of 2001, two months after September 11. However, while the same overall pattern is repeated for imports of railway parts by weight, the reversal appears to take place in March of 2001, long before September 11. The reason for this inconsistency is the relatively small share in value of railway parts shipments by rail relative to that for trucks during the period between March and November 2001. The other category of freight which shows a mode split pattern consistent with the hypothesis being considered is exports by value of inorganic chemicals whose increasing mode split trend seems to become more pronounced after November of 2001, although it is possible that an analysis by weight could provide evidence otherwise.

There are also two categories for which a conclusion of consistency with one of the hypotheses might be possible - pulp of wood and copper. With respect to pulp of wood, it is unclear when the reversal of the declining trend took place, and it is possible that it took place after September 11, a result that would be consistent with the hypothesis being considered. However, if one considers pulp of wood by value, the reversal of the trend does not seem to be ambiguous and happens in April of 2001, before September 11 suggesting that the pattern demonstrated for pulp of wood by value is also not consistent with the hypothesis.

The other uncertain category is copper. The pattern is clear and is observed for both copper imports by value and weight, yet the timing is unclear. As such, it is not possible using this analysis to determine whether or not copper imports were affected positively by September 11 or not.

Considering all of the evidence together (one category which is consistent with the hypothesis, one category which is inconclusive, and thirteen categories that are not consistent (including total exports and total imports)), it is safe to say that there is little evidence to suggest that the events of September 11 have increased the rail mode split on this corridor.

In order to establish more firmly whether it is indeed the case that September 11 has had no effect, a more rigorous analysis involving econometric modeling of total imports (by value and weight) and exports (by value), as well as analyses for each of the categories to test statistically for structural changes in imports and exports after September 11 by each of the main modes (road and rail) would be needed. As was seen in the last section a traditional OLS analysis would not be suitable.

Perhaps the most interesting finding to emerge from this paper is not so much that September 11 did not have a positive effect on rail mode split on this corridor, but rather that rail mode split for imports is on the rise after having been on the decline in all but one of the important rail freight categories. The reasons for

this are not entirely clear. Attempts were made to communicate with analysts that might have insights into these issues in a number of places. Canadian Pacific Railway, the Quebec Trucking Association, the Ministry of Transportation of Quebec and New York State Department of Transportation were all contacted.

None of these organizations had looked specifically at freight mode split on this corridor after September 11 and thereby were not able to provide insight into these issues, especially at a commodity by commodity level. Research into the explanation of the trends by commodity thereby continues.

In particular, when considering patterns of mode split of imports as a whole, the reversal of trend appears to take place in March of 2001. Closer inspection of the underlying data, namely of rail and road volumes (by value and weight) provide a possible explanation. In particular, the reversal of rail mode split at the beginning of 2001 seems to have been explained by two factors. The first is that while both rail and road traffic peaked in August – September of 2000, the difference between the two is that road traffic seems to have fallen very quickly after this. As well, it seems that rail began to recover in April of 2001 whereas road traffic, if it can be said to have recovered at all, did not begin to recover until December of 2001. Both of these factors help explain increasing rail mode split in the post September 11 period. Research still needs to be undertaken to understand why rail seems to have recovered relatively more and more quickly on this corridor over this period.

CONCLUSION

The main findings of this paper are three fold. Although border wait time data were not available, interviews with relevant specialists in Canada and the US, as well as other secondary research has suggested that there has not been a dramatic increase in border wait times since September 11 and that if there have been increases, then September 11 can only be considered to be responsible marginally for any increase in wait times.

Second, with respect to whether the post September 11 period has led to an increase in rail mode split along this corridor, an analysis of imports (by value and weight) from Quebec to New York and exports from New York to Quebec (by value), as well as by important rail freight categories suggests there is little support for the hypothesis that rail mode split (the pattern of mode split for only one of the 11 categories examined is consistent with the hypothesis) was positively affected in the post 9/11 period. This includes traditional, bulk freight categories, as well as non-traditional freight categories. In order to more firmly establish this conclusion more rigorous statistical analysis needs to be done in addition to the trend analysis performed here.

That having been said, the third (and unexpected finding) of this paper is that there has been a reversal in the pattern of the rail mode split of imports from Quebec to New York. Whereas until quite recently rail mode split for imports had been trending downwards on this corridor, there seems to have been a reversal in the trend of rail mode split on this corridor starting at the beginning of 2001. The actual reason for this reversal in the fortune of rail is not entirely understood. One possible explanation is that the reversal in mode split has to do not only with a change in the trend of rail traffic, but also with a change in the trend of trucking. In particular there was a rapid decrease in freight traffic by road toward the end of 2000. The reason for the increase in rail mode split remains unanswered. It should be noted that no such change in trend was observed for exports.

ACKNOWLEDGEMENTS

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Figure 1: ACF plots for imports and exports

17Table 1 – Summary of Findings for Cases Examined

Imports by Value	Whole Period Trend	Start Period Split (%)	End Period Split (%)	Post 9/11	Start Date of Last Trend	Consistent with Hypothesis?
All Imports	Negative	10	6	Reversed	March-01	No
Salt & Sulfur	Extremely Positive	25	60	Less pronounced	Jan-01	No
Inorganic Chemicals	Strongly Positive	65	90	Less pronounced	July-01	No
Wood	Negative**	8	15	More pronounced	Mar-02	No
Pulp of Wood	Strongly Negative	60	45	Reversed	Apr-01	No
Paper and Paperboard	Slightly Negative	30	28	Reversed	Apr-01	No
Copper	Extremely Negative	55	2	Reversed (?)	Oct-00 – Mar-03	(?)
Aluminum	Negative	13	5	Reversed	May-01	No
Zinc	Slightly Positive	49	51	Reversed	Feb-01	No
Railway Parts	Negative***	50	80	Reversed	Nov-01	Yes
Imports by Weight	Whole Period Trend	Start Period Split (%)	End Period Split (%)	Post 9/11	Start Date of Last Trend	Consistent with Hypothesis?
All Imports	Negative	23	19	Reversed	June-01	No
Salt & Sulfur	Strongly Positive	60	85	Unchanged	January-97	No
Inorganic Chemicals	Strongly Positive	70	90	Less Pronounced	July-01	No
Wood	Negative**	10	20	Reversed	August-00	No
Pulp of Wood	Strongly Negative	45	30	Reversed	April-01 – June-02	(?)
Paper and Paperboard	Slightly Negative	36	34	Reversed	May-01	No
Copper	Extremely Negative	55	2	Reversed	October-00-March-03	(?)
Aluminum	Negative	18	6	Reversed	May-01	No
Zinc	Positive	50	54	Reversed	January-01-February 01	No
Railway Parts	Negative***	50	60	Reversed	March-01	No
Exports	Whole Period Trend			Post 9/11	Start Date of Last Trend	
All Exports	Negative	4	1	Unchanged	January-97	No
Ores, Slag and Ash	Slightly	100	Very	More Pronounced	December-00	No

Imports by Value	Whole Period Trend	Start Period Split (%)	End Period Split (%)	Post 9/11	Start Date of Last Trend	Consistent with Hypothesis?
	Negative		variable			
Inorganic Chemicals	Strongly Positive	18	30	More Pronounced	November-01	Yes
Plastics and Articles thereof	Extremely Negative	50	0	Less Pronounced	June-02	No[1]
Pulp of Wood	Strongly Negative	20	0	More Pronounced	April-01	No
* The date of the beginning of the last trend is the best guess of the author's, although due to difficulty in seeing clear time period marking the trend, it could be wrong.						
** It is negative because of high mode split period 1/98-7/99.						
***Negative because of early high mode split.						

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[1] See explanation for not being consistent in written description.

Figure 1 – ACF Plots for Imports and Exports
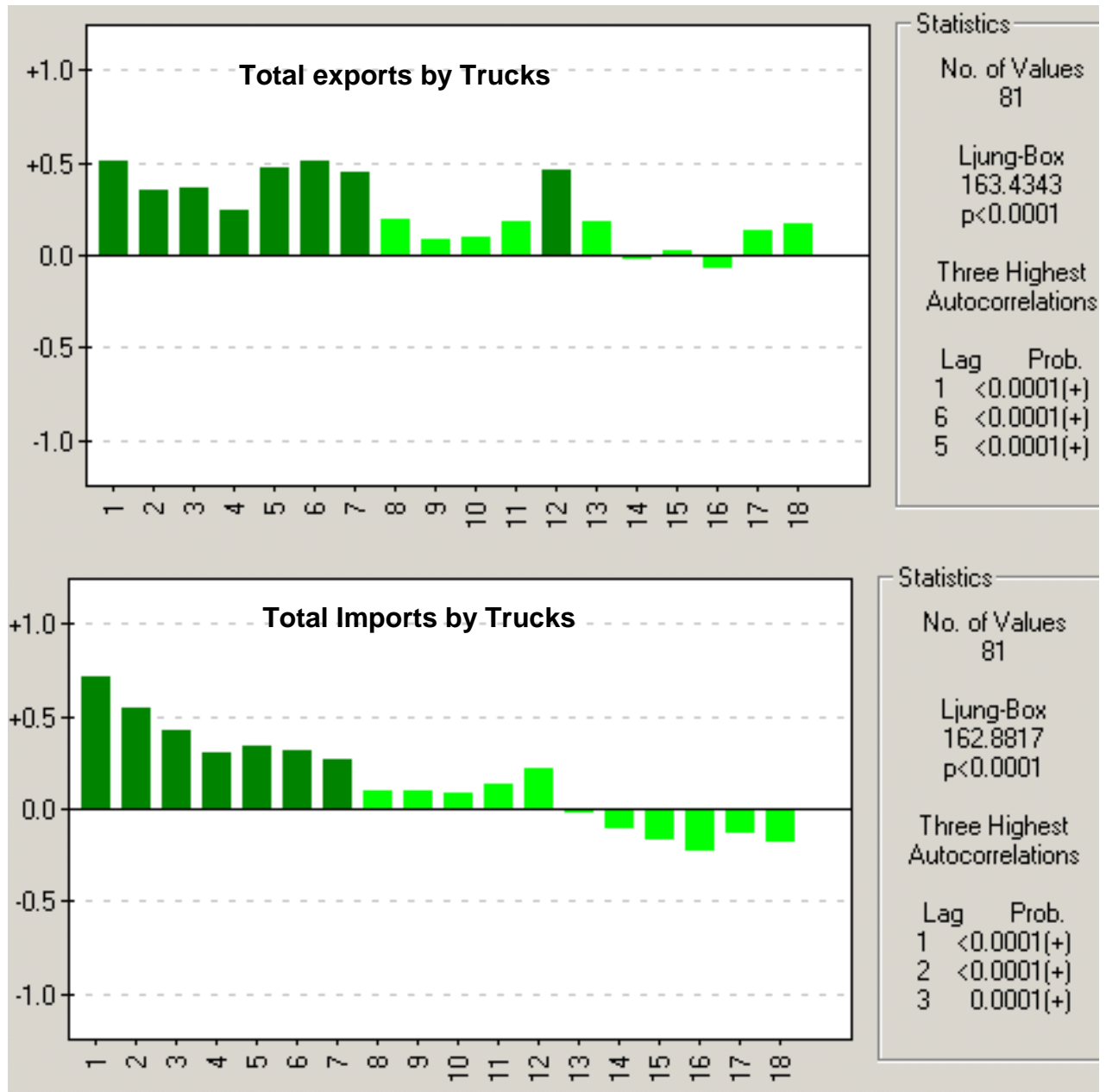
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