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# INTERCITY PASSENGER TRAVEL IN THE QUEBEC-WINDSOR CORRIDOR: Time Series Data

Working Paper
prepared for

Canarail

by

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# 1.0 INTRODUCTION

## 1.1 Objectives

The objectives of this Working Paper are to:

- describe the time series which were developed by CIGGT for the Corridor; and
- present the forecast growth rates which are being used by the Sofrerail/Canarail/CIGGT team in the Reference case, i.e. to forecast fraffic growth in 2005 and 2025 with absence of high speed rail.

The organization of the Working Paper is as follows. In the rest of section 1, we describe the data which were used to develop the time series. The time series themselves are presented in Sections 2 to 6: total traffic (section 2), air traffic (section 3), rail traffic (section 4), bus traffic (section 5) and auto traffic (section 6). Section 7 describes the analysis which was carried out on the time series data. This consisted primarily of linear and logarithmic regressions on macroeconomic variables. The reference case forecast growth rates are presented in Section 8.

## 1.2 Data Sources

Table 1 summarizes the main data sources which were utilized to develop the time series.

The differences between modes in the geographic and temporal coverage of the data are evident from Table 1. Ideally, a time series approach to forecasting intercity traffic calls for the development, for each city-pair, of a time series by mode. In this case, the data consist of provincial estimates for total traffic and auto traffic, national estimates for bus (route specific data being regarded as proprietary), route handlings for rail and origin-destination traffic for air.

# 2.0 TOTAL TRAVEL

## 2.1 Introduction

There is no reliable source for developing comprehensive estimates of intercity travel in the Corridor. At the national and provincial levels, there are two main sources for estimating intercity travel activity:

- **Carrier surveys** as reported annually by Statistics Canada; and
- The **Canadian Travel Survey**, which is sponsored by Toruism Canada and the provincial governments.

Both sources suffer from the limitation that the reporting unit is either the province or in some instances Canada[1]. Imputations concerning Corridor travel activity must be drawn from

[1] This is the case in the carrier surveys in order to preserve confidentiality, in cases where there are few respondents to a modal survey. One example is the survey of intercity bus carriers.

**Table 1: Summary of Data Sources**

| MODE | SOURCES | GEOGRAPHIC COVERAGE | PERIOD | COMMENTS |
|---|---|---|---|---|
| **Total travel** | Canadian Travel Survey* | National, Provincial | 1979, 1980, 1982, 1984, 1986, 1988, 1990 | Trips by mode (80km+) |
| **Air** | Statistics Canada; Transport Canada# | Individual routes (origin-destination traffic) | Since 1960s (1983-91 for smaller carriers) | The most complete data set available |
| **Rail** | CTC, VIA¶ | Individual Corridor Routes (handlings) | 1972-77, 1984-92 | Data for some years unavailable |
| **Bus** | Statistics Canada‡ | National | 1970-90 | Little corridor data available |
| **Auto** | Royal Commission on National Passenger Transportation; provincial Ministries of Transportation§ | Provincial; link volumes | Since 1970s | Quality of estimates depends on validity of assumptions; link volumes include *all* traffic |

**Notes:**

* Statistics Canada Catalogue 87-504.

\# *Air Passenger Origin and Destination* (S.C. Cat. 51-204); Statement 4 data for regional/local services provided by Aviation Statistics Centre.

¶ 1972-77 data from *Economic and Financial Analysis of the Corridor Rail Passenger System* (CTC Report 40-79-03, 1979); and 1984-92 data from VIA Rail.

‡ Statistics Canada Catalogue 53-215.

§ Leore, R. (1992), *Intercity Passenger Transportation Data Compendium* (report prepared for the Royal Commission on National Passenger Transportation, RR-14); *Traffic Volumes* (Ministry of Transportation of Ontario; tabulations received from Transports Québec).

provincial and/or national data.

## 2.2 Limitations of the Carrier Surveys

In addition, the carrier surveys suffer from the following limitations:

- automobile travel is not measured. Hence to develop an estimate of total travel, it is necessary to find some other way of measuring automobile travel, for example, using fuel consumption data.

- intercity travel is generally not explicitly identified separately from local travel. Instead, the surveys distinguish between intercity and urban *carriers*. But intercity carrier such as VIA Rail have also carried commuter traffic, and vice versa[2]. Careful analysis coupled with judicious assumptions are required in order to develop intercity estimates

[2] For example, on the now discontinued Montreal-Sherbrooke and Toronto-Havelock services and Coteau passengers on some Toronto-Montreal trains.

- changes in methodology or definition can seriously skew time series analysis. For example, between 1985 and 1990 GO Transit progressively assumed responsibility for operations on its bus routes, leading to a reclassification of some Toronto-area bus activity from intercity to urban.

## 2.3 Canadian Travel Survey (CTS)

The CTS is conducted every two years in order to measure the domestic travel behaviour of Canadians. Key characteristics of the CTS, including limitations, are summarized below.

Table 2 summarizes estimates of total travel activity in Ontario and Quebec between 1979 and 1990. 1979 was the first year in which the CTS was conducted, while 1990 is the last year for which data are currently available[3].

**Table 2: Estimates of One-Way Intercity Trips Within Ontario and Quebec, 1979-1990 (Thousands)**

| | Ont-Ont | Ont-Que | Que-Que | Que-Ont | Total |
|---|---|---|---|---|---|
| 1979 | 66,928 | 5,471 | 45,783 | 3,946 | 122,128 |
| 1980 | 65,996 | 5,474 | 47,184 | 4,969 | 123,623 |
| 1982 | 62,692 | 5,964 | 39,597 | 4,072 | 112,325 |
| 1984 | 63,223 | 5,486 | 35,796 | 3,525 | 108,031 |
| 1986 | 72,391 | 6,959 | 43,778 | 6,451 | 129,580 |
| 1988 | 89,854 | 6,720 | 48,220 | 7,268 | 152,062 |
| 1990 | 89,984 | 6,414 | 47,778 | 5,056 | 149,232 |
| AAGR, 1979-90 | 2.73% | 1.46% | 0.39% | 2.28% | 1.84% |

Notes:
1. Trips over 80 km.
2. Raw data multiplied by 2 to convert to one-way trips.
3. Raw data consisted of estimates of total trips, 1988-90 and overnight trips in other years. Overnight factored up to total by applying the ratio of total:overnight by province of origin.
Source: Canadian Travel Survey (S.C. Cat.87-504).

### Limitations of the CTS

Travel estimates derived from the CTS tend to be significantly lower than estimates based on the carrier surveys. The discrepancy between the CTS and carrier data is greatest for bus and rail. The discrepancies appear to be reasonably consistent over time[4].

Two *partial* explanations for the discrepancies are the following:

- CTS excludes trips under 80 km; and

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[3] It is expected that the results of the 1992 surveys will be available in xxxxxxx.

[4] This comment is based on an analysis carried out within Transport Canada for the period 1980-1988. "Evaluation of 'Horizons' Data Base" (unpublished working paper, 1990?).

- In the case of trips using more than one mode, CTS only counts the mode which was used the longest distance, whereas the carrier data counts all the modes employed in a trip.

In conclusion, the CTS cannot be considered a reliable indicator of total (or modal) traffic volumes; it is best used as an indicator of *trends* in travel volumes.

## 3.0 AIR TRAVEL

The most reliable travel data in the public domain is for the air mode. O/D travel between major city pairs is reported by Statistics Canada in *Air Passenger Origin and Destination* (S.C. Cat.51-204). This falls short of providing a comprehensive picture of air passenger traffic in three main respects:

- Only the larger air carriers participate in the survey. This has become a more important problem in recent years, as a result of the growth of corridor air services provided by the regional affiliates of Air Canada and Canadian Airlines, in addition to independent carriers such as Wardair (prior to 1988/9), Intair and Nationair. We have compensated for this by including data on local and regional carriers for the years 1983-91[5];

- Connecting traffic is excluded (this can represent over half the traffic on links such as Toronto-London and Montreal-Quebec); and

- Private air movements (e.g. by corporate aircraft) are also excluded.

Table 3 shows air O/D travel trends on key corridor routes.

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[5] 1983 was the first year for which Transport Canada's Aviation Statistics Centre has local/regional carrier data. This should not affect the quality of the air time series unduly, since it is only since the introduction of economic regulatory reform in 1984/5 that the smaller carriers have grown in importance.

**Table 3: Air O/D Traffic on Major Corridor Routes, 1972-1991**
**One-Way Trips**

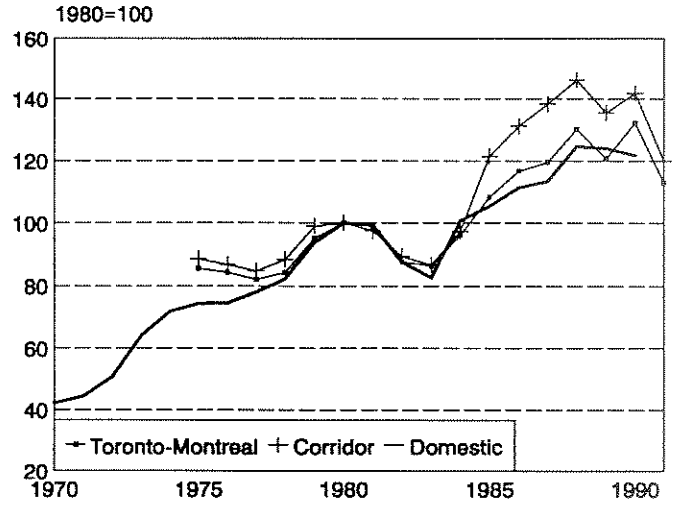
| | Toronto-Montreal | Toronto-Quebec | Toronto-Windsor | Toronto-London | Toronto-Kingston | Toronto-Ottawa | Montreal-Quebec | Montreal-Ottawa | Quebec-Ottawa | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1975 | 962,760 | 77,540 | 93,230 | 21,660 | 10 | 495,900 | 112,860 | 60,290 | 47,120 | 1,871,370 |
| 1976 | 948,380 | 76,330 | 92,300 | 14,750 | 0 | 479,760 | 117,030 | 61,200 | 43,360 | 1,833,110 |
| 1977 | 924,140 | 68,140 | 88,250 | 5,020 | 0 | 487,000 | 115,390 | 59,850 | 42,510 | 1,790,300 |
| 1978 | 948,720 | 74,400 | 95,330 | 5,530 | 10 | 513,070 | 128,420 | 57,650 | 44,620 | 1,867,750 |
| 1979 | 1,073,640 | 95,750 | 111,380 | 6,540 | 0 | 563,650 | 142,550 | 51,890 | 50,410 | 2,095,810 |
| 1980 | 1,127,380 | 88,380 | 108,180 | 4,960 | 20 | 574,550 | 123,960 | 48,970 | 38,460 | 2,114,860 |
| 1981 | 1,115,150 | 85,620 | 92,660 | 4,400 | 20 | 558,870 | 125,670 | 41,610 | 37,370 | 2,061,370 |
| 1982 | 987,630 | 83,700 | 79,490 | 17,660 | 100 | 570,520 | 83,840 | 34,170 | 31,780 | 1,888,890 |
| 1983 | 972,320 | 81,990 | 66,508 | 142,235 | 10,686 | 579,230 | 79,860 | 66,867 | 29,540 | 2,029,236 |
| 1984 | 1,085,327 | 97,200 | 80,707 | 147,915 | 7,659 | 670,836 | 90,170 | 75,973 | 31,660 | 2,287,447 |
| 1985 | 1,220,176 | 96,450 | 106,122 | 153,214 | 17,956 | 775,698 | 86,254 | 73,979 | 36,819 | 2,566,668 |
| 1986 | 1,316,110 | 100,220 | 115,748 | 166,419 | 20,514 | 802,658 | 129,425 | 78,799 | 42,867 | 2,772,760 |
| 1987 | 1,346,700 | 101,749 | 130,616 | 203,568 | 35,760 | 826,095 | 136,038 | 101,763 | 44,787 | 2,927,076 |
| 1988 | 1,466,686 | 107,774 | 174,699 | 84,710 | 30,658 | 883,447 | 188,830 | 102,435 | 51,251 | 3,090,490 |
| 1989 | 1,362,032 | 112,600 | 148,509 | 59,403 | 28,940 | 788,943 | 188,963 | 120,829 | 54,464 | 2,864,683 |
| 1990 | 1,491,910 | 115,930 | 116,340 | 58,499 | 38,887 | 813,979 | 204,330 | 108,149 | 54,110 | 3,002,134 |
| 1991 | 1,271,657 | 90,450 | 89,911 | 63,668 | 35,798 | 690,115 | 168,661 | 86,793 | 47,133 | 2,544,186 |
| AAGR | | | | | | | | | | |
| 75-80 | 3.21% | 2.65% | 3.02% | -25.53% | 14.87% | 2.99% | 1.89% | -4.07% | -3.98% | 2.48% |
| 80-85 | 1.59% | 1.76% | -0.38% | 98.59% | 289.62% | 6.19% | -7.00% | 8.60% | -0.87% | 3.95% |
| 85-91 | 0.69% | -1.06% | -2.73% | -13.62% | 12.19% | -1.93% | 11.83% | 2.70% | 4.20% | -0.15% |
| 75-91 | 1.75% | 0.97% | -0.23% | 6.97% | 66.77% | 2.09% | 2.54% | 2.30% | 0.00% | 1.94% |

Source: *Air Passenger Origin and Destination* (S.C. Cat.51-204); Statement 4: Regional/Local Services.
Note: Local carrier data only for 1985-91.

Figure 1 compares historic trends for all domestic trips, corridor trips (using the "Total" column from Table 2) and Toronto-Montreal, the most important corridor route.

From Table 2 and Figure 1, it can be seen that:

- Corridor air travel has been growing at about 2 per cent annually over the long run (1975-91);
- The growth rate for the Montreal-Toronto route has been slightly lower than than the growth rate for some of the




Sources: S.C. 51-206.

**Figure 1: Trends in Air Travel (Enplaned & Deplaned Passengers), 1970-1991**

smaller corridor routes. This is probably attributable to the impact of economic regulatory reform on the smaller routes (see section 7).

- Traffic on the Toronto-Montreal route tracks trends in overall domestic traffic quite well; and

- As expected, air traffic, both nationally and in the corridor, is very sensitive to business cycle fluctuations, as indicated by the traffic downturns of 1981-83 and 1988 on.

It should be noted that the long-term growth rate for air travel is quite sensitive to the choice of analysis period. If, for example, the period 1975-1990 were selected, on the grounds that 1991 represented an atypically bad year for air traffic, the long run growth trends would be as follows:

| | 1975-90 | 1975-91 |
|---|---|---|
| Toronto-Montreal | 3.0% | 1.8% |
| Corridor | 3.2% | 1.9% |

## 4.0 RAIL TRAVEL

A time series of passenger handlings on major corridor routes was developed from a number of sources: Canadian Transportation Commission reports, working papers of VIA Rail's *Review of Passenger Rail Transportation in Canada* (1989) and VIA Rail officials. Table 4 illustrates these trends.

**Table 4: Rail Passenger Handlings on Major Corridor Routes**
**Thousands of One-Way Trips**

| | Montreal -Toronto | Toronto-Kingston | Montreal -Que.* | Montreal -Que.** | Montreal -Ottawa | Ottawa-Toronto# | Ottawa-Tor.## | Toronto-Windsor | Toronto-London | Toronto-Sarnia | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1972 | 1,182 | 60 | 192 | 135 | 246 | 147 | 24 | 727 | 446 | a | 3,159 |
| 1973 | 927 | 57 | 142 | 86 | 201 | 139 | 19 | 682 | 426 | a | 2,679 |
| 1974 | 1,056 | 66 | 149 | 81 | 210 | 165 | 20 | 774 | 588 | a | 3,109 |
| 1975 | 1,007 | 55 | 131 | 63 | 182 | 138 | 19 | 737 | 499 | a | 2,831 |
| 1976 | 947 | 92 | 122 | 48 | 209 | 233 | 19 | 757 | 600 | a | 3,027 |
| 1977 | 905 | 114 | 113 | 48 | 225 | 330 | 19 | 793 | 676 | a | 3,223 |
| 1978 | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. |
| 1979 | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. |
| 1980 | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | 991 | 420 | 488 | n.av. |
| 1981 | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | 938 | 500 | 476 | n.av. |
| 1982 | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | 838 | 538 | 429 | n.av. |
| 1983 | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | n.av. | 827 | 528 | 459 | n.av. |
| 1984 | 1,520 | n.av. | 336 | b | 370 | 220 | -- | 798 | 623 | 412 | 4,279 |
| 1985 | 1,438 | 80 | 276 | 62 | 390 | 310 | -- | 879 | 633 | 500 | 4,568 |
| 1986 | 1,207 | 73 | 256 | 53 | 314 | 346 | -- | 779 | 526 | 445 | 3,998 |
| 1987 | 1,192 | 71 | 234 | 24 | 282 | 350 | -- | 758 | 341 | 530 | 3,782 |
| 1988 | 1,290 | 76 | 274 | 12 | 361 | 454 | -- | 789 | 307 | 592 | 4,155 |
| 1989 | 1,204 | 64 | 262 | 36 | 317 | 505 | -- | 783 | 307 | 589 | 4,067 |
| 1990 | 915 | -- | 185 | -- | 232 | 428 | -- | 627 | -- | 342 | 2,730 |
| 1991 | 950 | -- | 206 | -- | 227 | 455 | -- | 653 | 66 | 322 | 2,880 |
| 1992 | 901 | -- | 221 | -- | 251 | 516 | -- | 607 | 72 | 288 | 2,856 |

Notes:
* South Shore
** North Shore
# via Brockville
## via Belleville
a included in Toronto-London
b included in South Shore

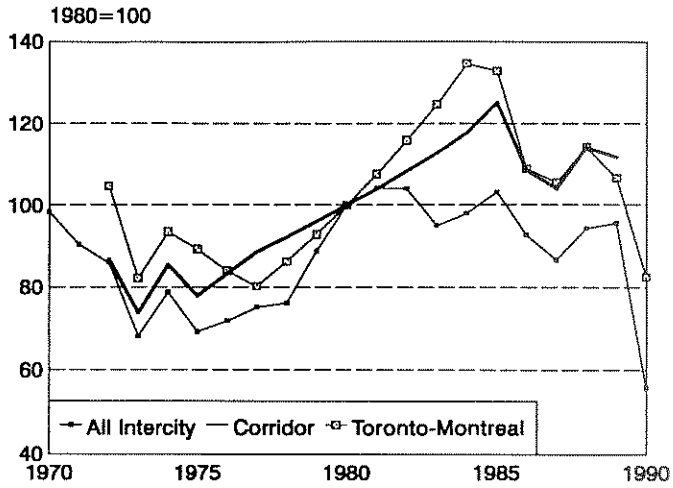
Sources: 1972-77 from *Economic and Financial Analysis of the Corridor Rail Passenger System* (CTC Report 40-79-03, 1979); other years from VIA Rail.

In addition, Corridor trends were compared with national ones, in Figure 2. This shows an index of passenger rail handlings. "All intercity" denotes passenger handlings of Canadian rail carriers, with the exclusion of commuter trips (based on Statistics Canada nomenclature). This has the advantage of allowing the development of a time series extending back many years: VIA only assumed responsibility for passenger rail operations in 1979-80. Although a number of Class II carriers continue to account for about 10 per cent of passenger handlings, the VIA and "All intercity" data have generally tracked one another very closely since 1980. The Corridor and Toronto-Montreal data are extracted from Table 4.

Major trends indicated by Table 4 and Figure 2 are as follows:

- At the national level, passenger rail traffic has followed a downward trend (which began in the 1940s), interrupted by periods when it appeared as if the trend might be reversed or stabilized (e.g. late 1970s, late 1980s, 1991-2);

- Rail traffic in the Corridor has resisted the downward trend more effectively. In the years immediately before the service cuts of 1990, traffic levels were at their highest levels in the period for which we have data;




Sources: Leore (1992), VIA (1989), CIGGT Files.

**Figure 2: Trends in Intercity Passenger Rail Handlings, 1970-1990**

- Unlike for the airlines, the most important factor which explains the periodic decreases in traffic is not macroeconomic, but changes in service levels, the two main examples being in late 1981 and early 1990.

Table 5 indicates the magnitude of the capacity decrease in 1990, compared to 1989. Although there are more seat-miles offered on the Ottawa-Toronto route now than in the mid-1980s, on other routes capacity remains well below 1985 values.

**Table 5: Seat Miles Offered on VIA Corridor Routes, 1985-1992**

| | Montreal-Toronto | Montreal-Quebec | Montreal-Ottawa | Ottawa-Toronto | Toronto-Windsor | Toronto-Kichener-London |
|---|---|---|---|---|---|---|
| 1985 | 583,153 | 106,687 | 82,401 | 151,300 | 290,013 | 119,943 |
| 1989 | 494,831 | 106,690 | 69,326 | 188,699 | 204,192 | 51,238 |
| 1990 | 351,132 | 60,295 | 46,868 | 144,304 | 195,836 | 0 |
| 1992 | 351,876 | 65,565 | 60,783 | 167,401 | 196,288 | 13,056 |
| 1985-92 | -39.7% | -38.5% | -26.2% | 10.6% | -32.3% | -89.1% |
| 1989-90 | -29.0% | -43.5% | -32.4% | -23.5% | -4.1% | -100.0% |

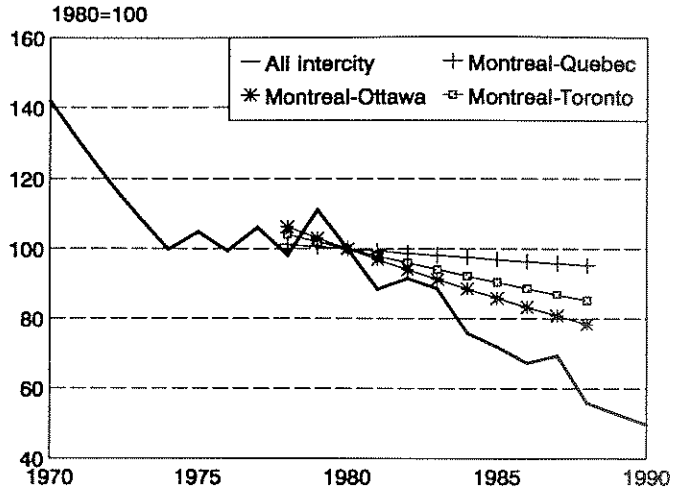
Source: VIA Rail.

## 5.0 BUS TRAVEL

Data on bus travel in the Corridor are very spotty: route specific traffic data have been regarded as proprietary. Estimates of O/D traffic volumes have been generated for specific years, for example in previous high speed rail studies, but time series data are sparse.

Figure 3, adapted from a recent federal/provincial/ industry study, shows trends in bus travel on three of the most important corridor routes in comparison with national trends for the intercity bus industry.

Figure 3 illustrates the losses in traffic which have affected the scheduled intercity bus industry over the past generation. A number of other observations can be made:




Sources: S.C.53-215, BBL (1992).

**Figure 3: Trends in Intercity Bus Ridership, 1970-1990**

- The trend lines for the Corridor routes suggest that the rate of decline has not been uniform;
- The rate of decline on these routes has been slower than the national average; and
- Bus ridership appears to have moved in the opposite direction to GDP. During the recession of the early 1980s, bus ridership levels appear to have flattened out, in contrast to air and automobile ridership, which fell sharply. This is consistent with the view that bus is often the mode of last resort and that an income subsititution effect occurs between bus and other modes, as real incomes increase.

## 6.0 AUTOMOBILE TRAVEL

The automobile is the dominant mode of intercity transportation in the corridor. Its share of the total corridor intercity travel market has been estimated to approximately 90 per cent of one-way trips. This is fairly close to national estimates generated from the Canadian Travel Survey.

Automobile travel trends, either for individual routes or for the corridor as a whole, cannot be observed directly on the basis of available data. Instead, they must be constructed from a variety of indirect indicators: traffic counts, fuel consumption or vehicle registrations.

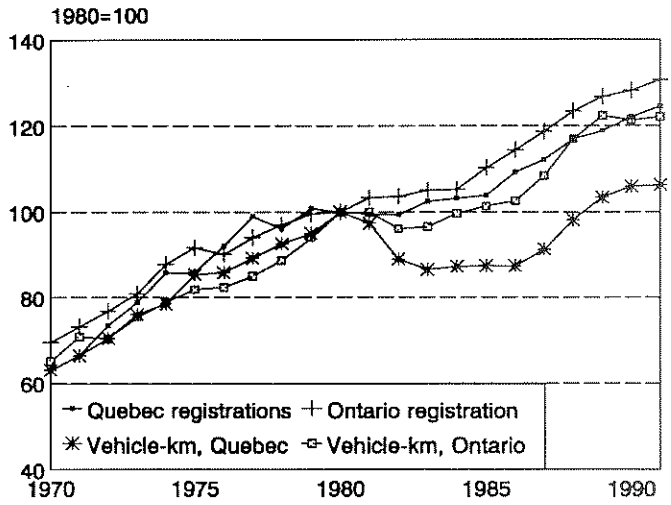
None of these are problem free.

- Traffic counts measure *all* traffic—local and intercity, everything from private automobiles to combination vehicles.
- Fuel consumption data must be coupled with information concerning changes in fuel efficiency.

- Registration data is meaningless in the absence of data concerning the extent of vehicle usage. Care must be taken in interpreting registration data because of changes in registration procedures over time.

In addition, whereas registration and count data can be obtained at the sub-provincial level, fuel consumption data are generally available only at the provincial level: imputations must be made to generate corridor time series.

Figure 4 provides an estimate of automobile travel trends in Ontario and Quebec between 1970 and 1991.




Sources: S.C. Cats. 53-218, 53-219; Leore (1992)

**Figure 4: Trends in Usage of Automobiles and Light Trucks, 1970-1990**

The estimates of distance travelled (vehicle-kilometres) were generated using Statistics Canada road fuel time series data and fuel efficiency estimates provided by Leore in his work for the Royal Commission on National Passenger Transportation (1992, Tables C-4.6 and C-4.8). These should be treated with some caution, since some of the underlying assumptions were derived from American (Federal Highway Administration) data.

The main trends indicated by these estimates are as follows:

- average annual growth rates in automobile (plus light truck) vkms between 1970 and 1991 are estimated to have been 2.5 per cent in Quebec and 3.0 per cent in Ontario;

- since 1980, there has been a clear tendency for the growth rate to slow down. Part of the explanation probably lies in the maturation of the mode. The growth in the number of vehicles per capita, which was still reasonably strong in the 1970s (4.1% p.a. in Quebec and 2.4% in Ontario) tailed off to 1.4% and 1.1% respectively since 1980.

- our Ontario estimates were compared with the province-wide estimates of highway travel produced annually by the Ministry of Transportation of Ontario. The latter are not strictly comparable, as they include all highway traffic (including buses and trucks). The estimated rates of growth were very similar.

Table 6 provides a more localized view of trends in road travel, showing changes in traffic levels at the sites which have been selected for the auto surveys.

**Table 6: Changes in Average Annual Daily Traffic Counts at Specific Sites, 1972-1990**
**Average Annual Growth Rates**

| Hwy | Location | Link | 1972-81 | 1981-90 | 1972-90 |
|---|---|---|---|---|---|
| 401 | Furnival Rd IC 129 | London-Windsor | -0.84% | 2.88% | 1.00% |
| 401 | Drumbo Rd IC 250 | London-Kitchener/Toronto | -0.31% | 6.12% | 2.85% |
| 401 | W Jct Hwy 6 IC 295 | London/Kitchener-Toronto | 1.93% | 5.02% | 3.46% |
| 2 | W Jct Hwy 53 | London/Brantford-Toronto | 0.55% | -0.31% | 0.12% |
| 401 | Hwy 41 IC 579 - Napanee | Toronto-Kingston/Ottawa/Mtrl | 3.91% | 4.51% | 4.21% |
| 401 | Edward St IC 716 - Prescott | Toronto/Kingston-Montréal | -0.16% | 7.33% | 3.52% |
| 7 | Perth E Lts - Lots 2&3 | Toronto-Ottawa | 7.58% | -2.68% | 2.32% |
| 40 | Rigaud | Montréal-Ottawa | -- | -- | 4.74%* |
| 40 | Louiseville | Montréal-Québec (N.Shore) | -- | -- | 7.15%* |
| 20 | Saint Eugene | Montréal-Québec (S.Shore) | -- | -- | n/a# |

Notes: * 1975-1989
# Highway 40 was only opened between Trois-Rivières and Quebec in 1985.
Sources: *Traffic Volumes* (Ministry of Transportation of Ontario, annual); Transports Québec.

The sites selected for Table 6 are the ones which are being used to conduct the automobile intercept surveys for the current HSR study. They are typically sites with the lowest AADT counts on each major intercity link, and therefore contain the least 'noise' from local traffic.

# 7.0 ANALYSIS OF RIDERSHIP TRENDS

## 7.1 Introduction

In order to analyze the relationships between the ridership trends and the macroeconomic environment, a number of simple and multiple regression analyses were performed on variables such as GDP, per capita GDP. Logarithmic and nonlinear models were also tested, but did not improve the results. The limited number of data points was an impediment to the development of a more sophisticated modelling approach. This section describes the results of the models which were tested, while in the next section we present the reference case forecasts themselves.

As discussed in section 1, the characteristics of the data set vary by mode. At the Corridor level, we were only able to develop models for air (by o/d and for all corridor traffic) and for car.

## 7.2 Results of Regression Analysis

The main results of the analysis were as follows:

### Total Traffic

Total traffic shows a strong and positive relationship with per capita GDP ($R^2 > 0.85$). At the corridor level, we have no total traffic time series; for Ontario/Quebec, we have only 7 years for which estimates are available (1979, 80, 82, 84, 86, 88, 90).

### Air Traffic

Air traffic shows a strong and positive relationship with per capita GDP, at both the national ($R^2 > 0.95$) and the corridor ($R^2 > 0.80$) level. This holds true for the major corridor routes (Montreal-Toronto, Ottawa-Toronto). The relationship breaks down for smaller city-pairs, where traffic levels have grown rapidly in recent years in response to changing supply conditions.

Separate models were developed for Montreal-Toronto, Ottawa-Toronto and all corridor O/Ds:

**Air Corridor Trips**

| Parameter | Estimated Value | Standard Error | "t" Statistic |
|---|---|---|---|
| Constant | -175565 | 219421 | 0.800 |
| Ont. & Que. GDP | 8.230 | 0.711 | 11.581* |

$R^2 = 0.899$

* denotes significant parameter estimate

**Montreal-Toronto Air Trips**

| Parameter | Estimated Value | Standard Error | "t" Statistic |
|---|---|---|---|
| Constant | 121178 | 96542 | 1.255 |
| Ont. & Que. GDP | 3.393 | 0.313 | 10.852* |

$R^2 = 0.877$

* denotes significant parameter estimate

**Ottawa-Toronto Air Trips**

| Parameter | Estimated Value | Standard Error | "t" Statistic |
|---|---|---|---|
| Constant | -11230.**6 | 77720.9 | -0.144 |
| Ontario. GDP | 3.467 | 0.400 | 8.670* |

$R^2 = 0.834$

* denotes significant parameter estimate

## Auto Traffic

"Car" traffic (automobiles and light trucks) also shows a strong and positive relationship with GDP ($R^2 > 0.85$) at both the national and provincial levels. Route-specific models were also developed, but the results were generally not satisfactory, probably because of noise in the data, whether it be the inclusion of other vehicular traffic or the need for more localized socioeconomic data.

The following models were developed and were used to generate the reference case forecasts:

**Ontario Auto Vehicle-Kilometres Travelled**

| Parameter | Estimated Value | Standard Error | "t" Statistic |
|---|---|---|---|
| Constant | .17026E+08 | 3627655 | 4.693* |
| Ontario GDP | 311.887 | 19.906 | 15.668* |

$R^2 = 0.925$

* denotes significant parameter estimate

**Quebec Auto Vehicle-Kilometres Travelled**

| Parameter | Estimated Value | Standard Error | "t" Statistic |
|---|---|---|---|
| Constant | .18650E+08 | 3727401 | 5.004* |
| Quebec GDP | 258.612 | 36.432 | 7.099* |

$R^2 = 0.716$

* denotes significant parameter estimate

## Bus Traffic

National scheduled intercity bus traffic shows a strong but inverse relationship with GDP ($R^2 > .90$). Because of the lack of route-specific traffic data, it has not been possible to pursue corridor regression analysis. However, on the basis of the limited information which are available, it is probable that similar results would be found.

It is conceivable that the inverse relationship between bus traffic and GDP is partially spurious, i.e. that it masks more fundamental reasons for the decline in bus traffic, for example, the fall in the numbers of the young adult population which has traditionally made up an important part of the bus clientele, or the growing access to automobiles of the bus clientele. In any case, even if the traffic/GDP relationship is valid, it is questionable whether

it will prevail, at least to the same extent, in the future: the mechanical application of the bus model to Transport Canada's forecasts of GDP would lead to the prediction that the last intercity bus passenger would board the bus in 2006!

### Rail Traffic

Rail traffic shows very little relationship with GDP at the national level. $R^2$s of less than 0.10 were found for national rail traffic. For the corridor routes, there were insufficient data points to generate a credible model. However, an inspection of scatter plots of GDP and rail handlings indicated that the pattern of the 1970s bore little resemblance to that of 1985-92. This suggests that other factors, such as level of service variables, may be more important determinants of passenger rail traffic in Canada.

## 7.3 Other Factors in Modal Traffic Growth

The implicit assumption in the macroeconomic analysis is that of *caeteris paribus*, all other things being equal. However, during the period from 1975 to 1992, there were some important developments which affected the relative competitiveness of the various modes. These can be summarized as:

- shifts in modal prices, in favour of air and auto and to the disadvantage of rail and bus;
- economic regulatory reform of commercial aviation; and
- a variety of changes affecting the passenger rail industry.

The shifts in modal prices for the period 1975-88 are illustrated in Table 7.

**Table 7: Real Price Indices by Intercity Passenger Mode**

| Mode | Rail | Air | Bus | Car | |
|---|---|---|---|---|---|
| Basis for Index | Revenue/Pkm | Revenue/Pkm | Revenue/ Passenger | Variable Costs | Total Cost |
| 1975 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 101 | 101 | 110 | 109 | 109 |
| 1977 | 99 | 105 | 108 | 95 | 111 |
| 1978 | 98 | 99 | 110 | 83 | 94 |
| 1979 | 103 | 91 | 99 | 82 | 93 |
| 1980 | 97 | 94 | 104 | 80 | 93 |
| 1981 | 99 | 97 | 106 | 78 | 95 |
| 1982 | 115 | 98 | 115 | 84 | 101 |
| 1983 | 104 | 97 | 117 | 78 | 101 |
| 1984 | 117 | 94 | 121 | 84 | 99 |
| 1985 | 123 | 95 | 125 | 84 | 98 |
| 1986 | 131 | 90 | 130 | 69 | 93 |
| 1987 | 130 | 92 | 124 | 73 | 98 |
| 1988 | 128 | 84 | | 76 | 101 |
| 1989 | | | | 77 | 101 |

Source: Transport Canada, *Intercity Passenger Transportation Trends and Forecasts* (TP 10419, March 1990).

It is probable that these price trends continued during the 1988-1992. For example, while the Canadian Automobile Association's annual *Car Costs* booklet estimated that the real costs of operating a car in Canada increased by 2.4% (variable costs) and 9.7% (total costs), VIA's revenue per passenger kilometre increased by 7%-37% in the Corridor during the same period.

The impact of economic regulatory reform was felt on both prices and frequency; the inclusion of a dummy variable into the air models to represent the years since 1985 produced the expected (positive) result, accounting for almost 10 percent of the total traffic (more on the smaller routes, less on Montreal-Toronto).

A number of factors affected the performance of the passenger rail mode during the period covered by the time series:

- The disillusionment of CN and CP with the prospects for passenger rail services in the years prior to the creation of VIA;
- Problems with VIA's on-time performance, which have only been addressed in the past few years;
- The fact that the cost of using rail, relative to air or automobile, has increased over the course of the study period;
- Cuts in rail frequency, notably in 1990, at a time when air service, for example, was expanding; and
- Other changes in service of the rail, air and bus modes.

# 8.0 REFERENCE CASE FORECASTS

## 8.1 Approach

From the analysis which was presented in sections 4 and 7 that the relationship between Corridor rail traffic and macroeconomic variables is far from straightforward. Within the study period, rail traffic first continued to fall (during the period prior to the creation of VIA Rail), rose equally steadily (early years of VIA Rail), fluctuated around 4 million handlings (1984-89), and since the 1990 service cuts has been steady at a little under 3 million handlings.

In order to develop traffic forecasts for the reference case, we have adopted three approaches, the results of which are illustrated in Tables 8, 9 and 10:

- assume rail traffic remains at current levels (table 8);
- assume rail traffic retains current market share (table 9); and
- assume continuation of the rail traffic trends of the past twenty years (table 10).

**Table 8: Assume Continuation of 1972-92 Rail Traffic Trend**

| One way trips ('000s) | 1992 | 2005 | 2025 | Historic growth* | 1992-2005 | 2005-2025 | 1992-2025 |
|---|---|---|---|---|---|---|---|
| Auto (all O/Ds) | 77,626 | 102,902 | 155,803 | 3.0% | 2.19% | 2.10% | 2.13% |
| Rail (all O/Ds) | 1,851 | 1,734 | 1,569 | -0.5% | -0.50% | -0.50% | -0.50% |
| Bus (all O/Ds) | 2,320 | 2,320 | 2,320 | # | 0.00% | 0.00% | 0.00% |
| Air (all O/Ds) | 2,631 | 3,838 | 6,383 | 3.2%** | 2.95% | 2.58% | 2.72% |
| Total (all O/Ds) | 84,428 | 110,794 | 166,074 | 2.5-3% | 2.11% | 2.04% | 2.07% |
| Market Share | | | | Notes: | | | |
| Auto | 91.9% | 92.9% | 93.8% | * As documented in sections 2-6 of this Working Paper. | | | |
| Rail | 2.2% | 1.6% | 0.9% | | | | |
| Bus | 2.7% | 2.1% | 1.4% | # No Corridor estimate available. | | | |
| Air | 3.1% | 3.5% | 3.8% | ** 1975-90. | | | |
| | 100.0% | 100.0% | 100.0% | | | | |

**Table 9: Assume Rail Retains Current Market Share**

| One way trips ('000s) | 1992 | 2005 | 2025 | Historic growth* | 1992-2005 | 2005-2025 | 1992-2025 |
|---|---|---|---|---|---|---|---|
| Auto (all O/Ds) | 77,626 | 102,902 | 155,803 | 3.0% | 2.19% | 2.10% | 2.13% |
| Rail (all O/Ds) | 1,851 | 2,445 | 3,687 | -0.5% | 2.16% | 2.08% | 2.11% |
| Bus (all O/Ds) | 2,320 | 2,320 | 2,320 | # | 0.00% | 0.00% | 0.00% |
| Air (all O/Ds) | 2,631 | 3,838 | 6,383 | 3.0%** | 2.95% | 2.58% | 2.72% |
| Total (all O/Ds) | 84,428 | 111,505 | 168,193 | 2.5-3% | 2.16% | 2.08% | 2.11% |
| Market Share | | | | Notes: | | | |
| Auto | 91.9% | 92.3% | 92.6% | * As documented in sections 2-6 of this Working | | | |
| Rail | 2.2% | 2.2% | 2.2% | Paper. | | | |
| Bus | 2.7% | 2.1% | 1.4% | # No Corridor estimate available. | | | |
| Air | 3.1% | 3.4% | 3.8% | ** 1975-90. | | | |
| | 100.0% | 100.0% | 100.0% | | | | |

**Table 10: Assume Rail Traffic Remains at Current Levels**

| One way trips ('000s) | 1992 | 2005 | 2025 | Historic growth* | 1992-2005 | 2005-2025 | 1992-2025 |
|---|---|---|---|---|---|---|---|
| Auto (all O/Ds) | 77,626 | 102,902 | 155,803 | 3.0% | 2.19% | 2.10% | 2.13% |
| Rail (all O/Ds) | 1,851 | 1,851 | 1,851 | -0.5% | 0.00% | 0.00% | 0.00% |
| Bus (all O/Ds) | 2,320 | 2,320 | 2,320 | # | 0.00% | 0.00% | 0.00% |
| Air (all O/Ds) | 2,631 | 3,838 | 6,383 | 3.0%** | 2.95% | 2.58% | 2.72% |
| Total (all O/Ds) | 84,428 | 110,911 | 166,357 | 2.5-3% | 2.12% | 2.05% | 2.08% |
| Market Share | | | | Notes: | | | |
| Auto | 91.9% | 92.8% | 93.7% | * As documented in sections 2-6 of this Working | | | |
| Rail | 2.2% | 1.7% | 1.1% | Paper. | | | |
| Bus | 2.7% | 2.1% | 1.4% | # No Corridor estimate available. | | | |
| Air | 3.1% | 3.5% | 3.8% | ** 1975-90. | | | |
| | 100.0% | 100.0% | 100.0% | | | | |

Implicit in each of these forecasts is a view about the nature of competitive forces in the Corridor and about the policy climate facing the passenger rail sector:

- The view of the future in Table 8 is that the future will resemble the past, which implies that rail services (in terms of price and other service variables) will be uncompetitive.

- The view of the future in Table 9 is that the future will *not* resemble the past, in that rail traffic will benefit from projected economic growth and thereby maintain its market share. It is consistent with a scenario under which rail prices stabilize in relation to those of other modes. It should be noted that the forecast rail growth rates could only be achieved on the assumption that additional capacity would be available on certain routes. This presupposes that VIA would be able to fund the necessary equipment acquisitions.

- Table 10 presents an intermediate perspective: rail traffic in the Corridor no longer decreases, but stabilizes at current levels. Such a perspective may be consistent with a

scenario under which the rail operator is unable to offer additional capacity to satisfy growing demand, and instead increases fares in a revenue maximizing strategy.

- Given that the forecasts of air and auto traffic growth are based upon relationships between travel demand and economic growth which existed in the past, there is also an underlying assumption that the future growth in demand for these modes will not be affected by factors such as congestion or the development of a price-raising oligopoly or monopoly in the aviation industry. Depending on the advice which is given by the consultant who has been engaged to forecast the evolution of the competing modes, this assumption may have to be modified.

## 8.2 Comparisons with Previous Studies

Table 11 compares the forecasts in Corridor traffic presented here with those which have been developed for the reference case of other recent high speed studies in this Corridor.

**Table 11: Comparison of Reference Case Forecasts: Québec/Ontario Corridor**

| | VIA (1989) | OQRTTF (1990) | CIGGT (1993) Continuation of Past Trends | CIGGT (1993) Rail Maintains Current Market Share | CIGGT (1993) Rail Maintains Current Traffic |
|---|---|---|---|---|---|
| Rail | 2.1% | 2.6% | -0.5% | 2.1% | 0.0% |
| Air | 1.8% | 0.4% | 2.7% | 2.7% | 2.7% |
| Bus | 0.9% | 1.9% | 0.0% | 0.0% | 0.0% |
| Auto | 1.2% | 1.0% | 2.1% | 2.1% | 2.1% |

Sources: KPMG Peat Marwick, *Analysis of the Market Demand for High Speed Rail in the Québec/Ontario Corridor* (1990); VIA Rail, *Corridor Demand Forecasts: Final Results* (1989).

In comparison with the forecasts of previous studies, our reference case forecasts show lower forecasts of traffic growth for bus and higher forecasts of traffic growth for air and auto. The comparison of rail forecasts depends on which of our three alternatives is selected. Our forecast of total traffic growth is quite similar to that of both previous high speed rail studies.

Two other recent and relevant forecasts are those of:

- Transport Canada (aviation forecasts, 1992-2005); and
- the Ontario Round Table on Environment and Economy.

Transport Canada expects domestic air traffic to grow at 2.7% p.a. to 2005, very close to the values projected in this Working Paper, once the impacts of the traffic downturn of 1990-92 are taken into account.

The Ontario Round Table projected the following annual growth rates for the period 1990-2005: auto +2.1%, bus +2.8%, rail -0.6% and air +4.0%. With the exception of bus, these are close to our forecasts.

Sources: *Transport Canada Aviation Forecasts: 1992-2005* (TP7960E, 1992); Ontario Round Table on Environment and Energy, *transportation Sectoral Task Force: Draft Report* (no date: 1991?).

**Other Passenger Forecasts**

It should be noted that the socioeconomic forecasts upon which the VIA, OQRTTF and CIGGT reference case traffic forecasts are based are broadly similar, as shown in Table 12.

**Table 12: Comparison of Socio-Economic Forecasts: This Study and Previous Studies**

| Forecast Growth Rates | Informetrica (1988)* | Transport Canada (1992)# |
|---|---|---|
| Canadian population | 0.7% | 0.9% |
| Households | 1.2% | 1.3% |
| Employment | 1.1% | 1.0% |
| GDP | 2.2% | 2.5% |

Notes:

* Informetrica growth rates are for 1988-2005 (reference case), and were derived from the tables in Appendix A of *National, Provincial and Local Economic Prospects of Relevance to the Hospitality Industry and Passenger Traffic* (for VIA Rail, April 1988).

\# The growth rates from the Transport Canada document are for the base case, 1992-2025, and were derived from the narrative and the numbers on pages 13-14.

Some of the differences in the traffic forecasts are almost certainly attributable to differences in approach. Both the VIA and the OQRTTF forecasts were developed using cross sectional regression models, whereas ours was based on time series analysis. Implicit in the VIA and OQRTTF forecasts is the view that the future of passenger transportation in the Corridor will not resemble the past: air and auto traffic growth will decelerate significantly, whereas the trends in rail and particularly bus traffic will move in opposite directions to the historic trends.