

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT

**Economic Impact
and
Industrial Strategy Study**

**VOL I:
ECONOMIC IMPACT**

FINAL REPORT

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Volume I

**National and Provincial Economic Impacts
of High-Speed Rail**

A Macroeconomic Study

Main Report

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National and Provincial Economic Impacts of High-Speed Rail A Macroeconomic Study

Executive Summary

As a means of transporting passengers, and some light freight, a High-Speed Rail (HSR) system would simply shift economic resources from supporting other modes of transportation to HSR. As specifically proposed in six alternative HSR scenarios, this reallocation of resources in the private economy would be approximately balanced, from the year 2004, forward. Under such circumstances, and from that period, one should expect that total output, employment and real incomes in the economy would be little changed. Our analysis supports this obvious point.

Investment needed to support the infrastructure of the HSR, and to provide it with rolling stock and other equipment, will require additional employment and other real economic resources. Accordingly, during that period (approximately from 1995 through 2003 in this study), real output and other measures of economic activity are increased.

Other, detailed analysis of commercial prospects for the HSR has concluded that government financial support, net of subsidies and operating-company revenues paid to governments, will be required through the year 2019/2020. For purposes of this analysis, the Steering Committee of the study project has directed us to assume that such net government financing will be funded by reduced, other capital expenditures of the federal government, and the governments of Ontario and Quebec. The magnitude of those reductions is less than HSR and related investment increases during 1995-2003 so that net of private and public spending, economic activity during that period is increased. Reduced government spending during 2004 through to 2019/2020 is dominant, since operational requirements of HSR and other modes are roughly balanced. Accordingly, over that period, the size of the economy would be reduced to levels of activity below those that would otherwise prevail.

Table 1 summarizes the cumulative effects for total output and employment, by jurisdiction. This indicates the following principal findings.

- In 1995, real output, in billions of 1986 dollars, should be as follows: Canada (550), Quebec (125), Ontario (220) and the Rest-of-Canada (205). Considering this, and that growth of the economy should expand by an average of 2.5-3 per cent over the next 25-30 years, the scale of the cumulative effects is in this context, overall, and for each provincial jurisdiction, insignificant.

- The peak net expansion of overall economic activity (and employment) during the main investment phase should reach (0.4 and 0.3 per cent, respectively) in Ontario and Quebec, for three-four years early in the next Century, and as a maximum for any of the scenarios reviewed. In this sense only, is there overall significance to the HSR.
- The scale of the impacts during the investment phase is sensitive to length of line, and speed of proposed HSR. The Quebec City to Windsor lines require more investment resources, and generate more domestic economic output than do the Toronto-Montreal lines. The 300K options, similarly, require more resources and generate more domestic activity than do 200K options.
- During the operations phase, the reductions in overall activity are partly symmetrical to effects during investment. Reductions in economic output are larger for the Quebec City to Windsor lines. However, because the 200K options are less viable commercially, reduced government capital spending to fund net subsidies provided to the operating company produce larger negative impacts than is true for the 300K options.

Other notable findings include the following.

- Almost all sectors of the economy would be positively impacted during the investment phase, since indirect effects are widespread, and additional consumer and business investment spending induced by income increases spreads the effects throughout all categories of demand. Output impacts would of course be concentrated in those sectors that supply the construction services, and manufactures to equip the HSR, or in those sectors that are indirectly affected as suppliers of goods and services. These include the railway construction industry, rolling-stock manufacturers, and producers of iron and steel, fabricated metals, nonagricultural machinery, electrical and electronic products, and communications wire and cable. Among services industries that can expect to note the effect as significant should be suppliers of business services and wholesale trade. Reduced government capital spending would notably reduce prospects for those supplying the construction of roads and streets, and nonresidential buildings, throughout the investment and operation phases.
- Since HSR spending is concentrated in infrastructure, which in turn, is highly concentrated in construction of the lines and associated facilities, real economic impacts during the main investment phase will be highly concentrated in Quebec and Ontario. Equipment procurement targeted in Central Canada reinforces this. Finally, since induced spending is disproportionately directed to consumer durables, Central Canada as the concentrated location of such production, also benefits.

- As was noted at the beginning of this summary, as operations of HSR begin, and over the period of 2004-2020, additional economic resources required to operate the HSR are approximately offset by reduced private spending for other modes of transportation. That is, private demands and economic activity are largely neutral for total output, and involve only reallocations of resources to alter the mode of passenger traffic. Accordingly, results during this period are dominated by widespread reduced government capital formation. Early after 2003, these reductions are relatively large, but diminish in magnitude as the net financing requirements of the HSR operating company move towards zero.

Accordingly, throughout this operations period, output in most industries is negatively affected, with some notable, but not large exceptions. Railroad rolling stock manufacturers benefit from continuing HSR investments in equipment.

- We anticipate there will be no substantial effects on aggregate unit costs or prices, and throughout most of the operations phase, there are small, but continuing negative effects on household and business incomes. Given the cost/price effects, we anticipate no generalized impact on foreign trade in travel services. Reduced domestic incomes suggest that within-Canada demands for restaurants, accommodation, and recreational services would be diminished to suggest a small reduction in prospects for the tourism industry. By 2020, however, prospects, for this and all other industries, will have returned to, or be slightly improved, compared to those of the Base Case.
- Over the full 25 years, we estimate that public sector balances would be cumulatively improved. Put in other terms, stocks of debt should be reduced. For the public sector as a whole, this follows from the fact that positive effects on balances of a strengthened economy during the first decade reduce their succeeding interest payments by more than annual deficits that emerge during the operations phase.

The federal government's position is strengthened because subsidies to VIA rail and the airlines are reduced throughout the impact period. This elimination of the subsidy, with reduced general employment, effectively explains a slight reduction in real disposable incomes of households. Following 2020, Base Case employment should be restored, or slightly increased, but the permanent elimination of the VIA subsidies suggests a lasting negative effect for household incomes and continuing improvement in federal balances.

On balance, provincial debt is unchanged after 25 years. That of municipalities and the hospital system, for which they have some responsibility, is reduced by a modest amount. In short, the federal fiscal position is improved, and that of other governments is essentially unchanged.

- Additional investment in the Canadian economy, accounting for direct, indirect and induced effects, implies some additional borrowing from foreigners initially. But reduced economic activity following 2003 leads to reduced imports, and a reduction in foreign borrowing (an improvement in the Current Account balance). The assumption that foreign travellers would use the HSR at higher ticket prices (as do domestic consumers) provides a significant addition to nominally-denominated foreign earnings.

On balance, our analysis forces us to conclude that HSR should have notable, if modest, positive effects on economic output, employment and incomes for about a decade. Following that, as the HSR by itself has no significant implications for productivity or the structure of the economy outside of transportation services, there are no permanent effects on growth potential or prospects.

If the legacy of public financing leads to incremental reductions in government capital formation (as has been assumed in this analysis), economic prospects would be diminished, again, by modest proportions for an extended period of time, following the large HSR investments that occur until early in the next century. If government funding is financed through expansion of its debt, real output is increased over the course of the operations phase, but at the expense of growing government deficits and the stock of debt, and increased borrowing from foreigners.

This analysis has been developed with the use of two econometric models representing, respectively, economic activity at the national level, and that of each of the ten provinces. These models include a detailed disaggregation of the economy in industrial terms, including distinct evaluation of several components of transportation services, and construction industries. Accordingly, inputs from other studies that have evaluated direct implications for the railways and other modes have been incorporated, and evaluated at that level. Thus, impacts that are specific to the HSR, and associated changes, have been used to modify the models' standard analysis of industry technology and economic behaviour.

Table 1
High Speed Rail Results, by Alternative Scenario
(Cumulated Changes)

	1995-20	1995-03	2004-20
Total GDP at Factor Cost (\$86 Billions)			
Quebec-Windsor, Mirabel, 300K, Canada	0.9	5.8	-4.8
Quebec	1.3	1.7	-0.4
Ontario	1.2	3.4	-2.2
Rest-of-Canada	-1.6	0.7	-2.3
Quebec-Windsor, Dorval, 300K, Canada	1.6	5.8	-4.2
Quebec	1.4	1.6	-0.2
Ontario	1.6	3.5	-1.8
Rest-of-Canada	-1.5	0.7	-2.2
Quebec-Windsor, Dorval, 200K, Canada	-1.6	5.1	-6.7
Quebec	0.4	1.5	-1.1
Ontario	0.1	2.9	-2.9
Rest-of-Canada	-2.1	0.6	-2.7
Toronto-Montreal, Mirabel, 300K, Canada	0.7	3.3	-2.7
Quebec	0.7	0.9	-0.2
Ontario	0.9	2.0	-1.1
Rest-of-Canada	-0.9	0.4	-1.3
Toronto-Montreal, Dorval, 300K, Canada	1.7	3.2	-1.5
Quebec	0.8	0.7	0.1
Ontario	1.5	2.1	-0.5
Rest-of-Canada	-0.7	0.4	-1.1
Toronto-Montreal, Dorval, 200K, Canada	-1.0	2.9	-3.9
Quebec	0.2	0.8	-0.5
Ontario	-0.2	1.7	-1.9
Rest-of-Canada	-1.1	0.4	-1.4
Total Employment, Establishment Basis (000s)			
Quebec-Windsor, Mirabel, 300K, Canada	43.7	107.6	-63.8
Quebec	18.6	33.8	-15.2
Ontario	30.1	59.7	-29.7
Rest-of-Canada	-4.9	14.0	-18.9
Quebec-Windsor, Dorval, 300K, Canada	51.6	108.9	-57.2
Quebec	19.4	31.8	-12.4
Ontario	35.0	61.8	-26.7
Rest-of-Canada	-2.8	15.3	-18.2
Quebec-Windsor, Dorval, 200K, Canada	14.6	95.5	-81.0
Quebec	8.5	29.4	-20.9
Ontario	20.1	52.4	-32.3
Rest-of-Canada	-14.0	13.7	-27.7
Toronto-Montreal, Mirabel, 300K, Canada	20.7	62.0	-41.3
Quebec	7.3	17.5	-10.2
Ontario	14.5	35.4	-20.9
Rest-of-Canada	-1.1	9.1	-10.2
Toronto-Montreal, Dorval, 300K, Canada	32.0	61.1	-29.0
Quebec	7.9	14.6	-6.7
Ontario	21.8	37.0	-15.2
Rest-of-Canada	2.4	9.5	-7.1
Toronto-Montreal, Dorval, 200K, Canada	6.7	54.7	-47.9
Quebec	2.4	15.2	-12.8
Ontario	7.6	31.5	-23.9
Rest-of-Canada	-3.3	8.0	-11.3

1 Statement of Research Objectives

This study reports on the macroeconomic effects of investing in, and operating, a High-Speed Rail (HSR) System in Canada. The principal focus of the research is on the output, employment and income effects overall, for the Canadian economy, and that of Quebec and Ontario, separately identified.

The study reports more than aggregate implications, however. This follows from the fact that several, previously-completed studies have carefully, and precisely identified how the project will be undertaken, where that research identifies which industries supply what kinds of commodities and services for constructing the new rail system's infrastructure, train sets and other equipment, and equally, for the operation of an HSR. An effectively operated HSR could be presumed to displace conventional rail in the regions where the HSR is operated, and should displace other transportation service activity operated by businesses, and household's use of the automobile. These, and other elements of introducing an HSR into the Canadian economy have sector-specific implications.

Thus, this study also reports on those sectoral implications, both to identify the timing and likely points where supply constraints could emerge, as well as to identify the magnitude of the opportunity that may present itself to directly and indirectly affected suppliers. Prospects for some sectors will be diminished, of course, and these are also identified, and scaled in terms of what might otherwise be expected to occur in those sectors.

The method of analysis employs a framework that assesses indirect and induced effects of the HSR. That is, implications for firms and their employees throughout the chain of production are determined, where the sectoral detail of direct spending effects from previous studies is useful in determining this chain of effects with precision. Given the employment and business incomes generated through direct and indirect spending, this should induce additional household consumption and business investment. Effects of changes to private incomes on the incomes and balances of governments are also assessed, net of government financing of the HSR through re-allocation of spending. Finally, changes to domestic spending within the Canadian economy will have trade and other impacts, affecting financial relations with foreign economies, and this is also assessed.

In short, the study also focuses on incomes of sectors, and the consequences of decisions they are likely to take about whether to alter their spending/saving of income. This, and detail related to producing-sector output and employment, provide the analytical foundation for determining provincial effects.

1.1 High Speed Rail (HSR) as a Direct Impact on Economic Activity

For purposes of this analysis, the HSR can be characterized as having several distinct components, each of which has direct effects on the economy, in the sense that they directly affect the use of labour and capital available in the economy.

- Constructing the infrastructure on which to operate the HSR, providing train sets, signalling, communications and other equipment necessary to the operation of the HSR, construction of, and related equipment, for light-freight operations, and operation of the HSR to move passengers and light freight all require additional labour and use of fixed capital by the industries directly affected. Provision of associated material and services inputs also requires additional resources of the economy. It is also presumed that construction and operation of the HSR will have incremental, positive, effects on exports of Canadian producers that have been associated with the HSR, where these affect exports of goods and business services.

Financing of directly affected industries is drawn from previously-completed studies, and presumes changes to prices, yielding with the volumes of activity undertaken, revenues to cover operating costs, depreciation, and returns to capital. Industries that are indirectly affected are assumed to finance their activities through normal market mechanisms, where in our framework, this is assessed for approximately 120 industries.

- Other private economic activity will be directly altered because of the HSR. This is concentrated in other transportation services produced by the business sector, including airlines, and inter-city busses. This alters both the operations of, and investment in, the private activities of firms in these industries. Displacement of VIA in the HSR operating area is an offset reduction of rail transportation investment and operations. Reduced household use of automobiles for inter-city transportation is reflected as reduced consumer spending on fuel and lubricant inputs and reduced requirements for repair services.

Again, financing implications for industries that are adversely affected are taken directly from previously-completed studies, where available. Financing implications for firms indirectly affected are presumed to respond to normal market mechanisms. Reduced consumer spending for auto-related spending is presumed to add directly to household savings.

- The third major element of direct effect on the economy is centred around decisions related to government financing of the HSR and the source of funds applied to the HSR. A previously-completed study of the private financing of the HSR had indicated a net requirement for financing assistance from

governments, extending from early in the construction period (1998) through to 2019, or 2020, where the length of the requirement depended on the route being studied. Through the late-Summer and Autumn of 1994, discussions were held between the contractors and governments regarding how such government financing was to be funded. The analysis in this report follows decisions of governments to assume that HSR financing was to be currently (e.g., in the year of the financing) funded through reduction of other government capital spending on a dollar-for-dollar basis. Accordingly, while the HSR financing supports the direct positive effect of HSR investment and operations on the economy, there is an offsetting direct reduction on the requirement for economic resources through this assumption.

Six impact scenarios have been assessed, where these are distinguished by length of the rail system, rated speed of the system to be operated, and routing. These are, with our notation for their identification used in this report, as follows:

QW300M	Quebec-Windsor, Mirabel, 300K
QW300D	Quebec-Windsor, Dorval, 300K
QW200D	Quebec-Windsor, Dorval, 200K
TM300M	Toronto-Montreal, Mirabel, 300K
TM300D	Toronto-Montreal, Dorval, 300K
TM200D	Toronto-Montreal, Dorval, 200K

Figure 1 provides a summarized, representative view of the direct effects of the HSR on the economy that distinguishes impacts stemming from length of the system, and rated speed of the trains, with this portrayed over time.¹

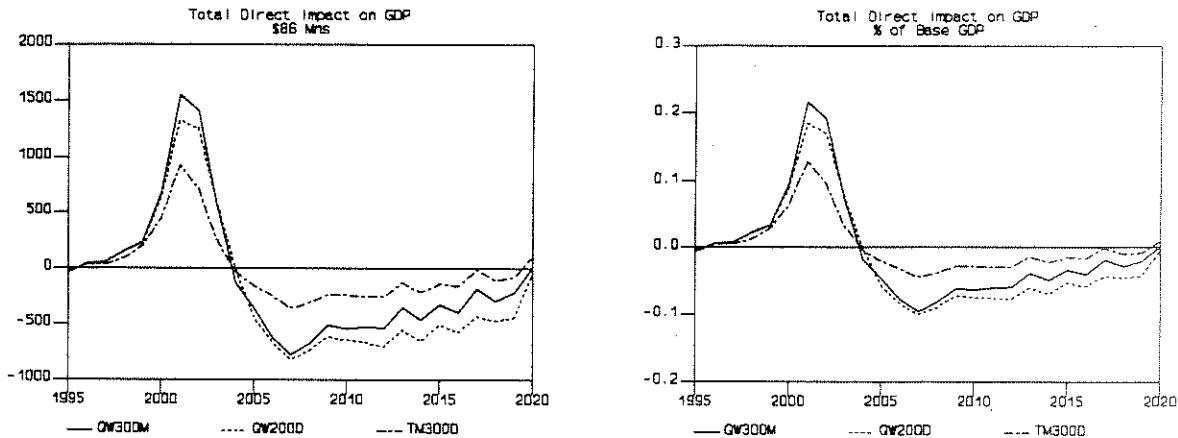
As Figure 1 illustrates, the principal characteristics are as follows.

- The net effects of increased resource demands from the HSR and reduced demands from displaced other private activity and reduced government capital formation produce direct (**ex ante**) demands on the economy from 1995 through to 2003, with neutral or negative effects for 2004 through 2019. By 2020, the direct effects on the economy are essentially neutral. This characteristic of direct positive effects over 1995-2003, followed by prolonged negative effects through 2020 is characteristic of each of the six scenarios.
- The length of the HSR system matters. An HSR extending from Quebec City to Windsor requires larger investment (and more real economic resources), than do systems extending from Montreal to Toronto. Spending reductions in other modes are symmetric to length, with reductions of the Quebec-Windsor line

¹Data from studies that supplied this analysis were defined typically in terms of 1992 constant dollars. Conversion of these into the 1986 dollar terms required for our analytical framework is discussed later.

larger than those of the Toronto-Montreal line. Government capital spending offsets, however, are insensitive to length.

Figure 1



- Options rated at 300 kilometres-per-hour require modestly more resources (i.e., have a larger direct impact on economic activity) in 1995-2003 than do the 200K options, regardless of length of system or routing. Private financing results from previously completed studies indicate relatively smaller government financing (and offsetting capital spending reductions) for the 300K option. Accordingly, the depth of the 2004-2019 reduction in combined, direct offsets for the 300K options is less than that for the 200K options.
- There are minor distinctions, over time, between the routing options for the 300K options.
- The pattern of initial, from 2004-2005, large negative effects on the economy moving back toward smaller reductions over time is dominated by considerations related to government financing and reduced capital spending. For all scenarios, as the HSR moves progressively towards self-financing commercial status, annual net government assistance and offsetting capital reductions is smaller.
- In any year, the scale of the effects of positive and negative direct effects is, on a net basis, small in the overall context of the Canadian economy.

Table 1 summarizes the dollar impacts of the net direct effects of HSR on the economy for 1995-2020, and the two sub-set periods indicated above.

Table 1
High Speed Rail Assumptions, Canada
Total, Net Direct Impact on GDP
(Cumulated Changes in \$86 Mns)

	95-2020	95-2003	2004-2020
Quebec-Windsor, Mirabel, 300K	-2313.7	4624.9	-6938.7
Quebec-Windsor, Dorval, 300K	-1282.8	4665.4	-5948.2
Quebec-Windsor, Dorval, 200K	-4741.0	4223.8	-8964.8
Toronto-Montreal, Mirabel, 300K	-1265.8	2686.1	-3951.9
Toronto-Montreal, Dorval, 300K	-169.5	2663.2	-2832.7
Toronto-Montreal, Dorval, 200K	-12018.8	2420.7	-14439.6

1.2 Other Elements of the Research Process as Inputs to this Study

As is detailed below, the analytical framework used in this study, employs a detailed industrial description of the Canadian economy. For each industry that may be directly affected, that framework separately identifies investment in structures and equipment, where the implications of this for supplying producers of goods and services in the economy represent a standard (industry-wide) "menu" of supplies, and relationship between output, employment and the real capital stock needed to sustain production.

Similarly, for each of the industries, operation of that industry to, for example, supply transportation services, assumes a standard technology is employed, with again, standard relationships between output, employment and the capital stock of the industry. Relationships between potential for production, and relevant demand in its markets also follow standard relationships. Prices for the services offered, and the consequences of this, and volume of production for revenues follow industry-wide norms. The implications of this, for operating input costs, and returns to industry capital also assume industry-wide norms.

The construction, and operation, of the HSR, and implications of this for other elements of the transportation service sector, are not "standard", however. Accordingly, to reflect the special characteristics of the HSR, this study has drawn on several previously-concluded reports and data sets of other research to define the direct effects of the HSR on the economy. Prominent among these are the following:

- Canadian Institute for Guided Ground Transport (CIGGT), from which we have drawn details for HSR infrastructure and equipment investment, with the specific inputs provided through machine-readable spreadsheets;
- HSR revenues from CIGGT;

- Canarail's *High Speed Rail Project Light Freight and Station Concessions Market Study*, from which detailed assumptions have been drawn to reflect changes to light-freight investment in infrastructure and equipment;
- KPMG's report on *The Impact of High Speed Rail on Other Modes and Levels of Government Support*, is the source of details for the investment and operating implications on other modes, including VIA rail investment and operating reductions, airline investment and operating reductions, inter-city bus investment and operating changes, and reductions in household requirements for auto-related goods and services;
- the Simpson-Guerin *Economic Impact and Industrial Strategy Study* is the source of information for HSR-related incremental effects on exports, and an important source of information on provincial allocation of manufacturing impacts related to rolling stock purchases in the HSR; foreign sourcing, and provincial implications of HSR infrastructure spending and reductions in other modes are taken from the CIGGT and Other Modes' studies; and
- the magnitude of annual government financing for the HSR was determined in the Price Waterhouse, *Financial Analysis - High Speed Rail Project*. As indicated above, discussions with governments were the source of decisions for allocation of financing among governments, and for decisions about funding through reallocation of spending.

For the most part, results from input studies have been treated as **ex post** in our modelling framework. That is, estimates of HSR investment in the rail industry and passenger and light-freight revenues, net of VIA rail investment and revenue reductions, are treated as final-result impacts in our study, and are not altered in turn by affects on that industry from an altered general economy.

In treating inputs in this manner, this study serves two roles. First, it provides a framework to ensure a consistent "adding up" of several input studies. Second, it adds value to that information, by assessing the indirect and induced effects on the economy. It should be noted that the Benefit-Cost study being undertaken separately from this analysis also provides a consistent "adding up" of inputs. As these are effectively the same as those required for this analysis, day-to-day working contact between the analysts working on the macroeconomic and benefit-cost studies has provided a "double-check" to ensure that data inputs are consistently interpreted, and agreed to. This process of independent review, although resource demanding for the researchers, has provided a useful form of verification and modification to many of the inputs.

1.3 Plan of this Report

This section is immediately followed by a description of the analytical approach used, details of the analytical structure employed, and a description of the Base Case economy employed in the analysis. This is provided in detail sufficient to indicate how the structure of analysis and Base Case view, as "assumptions" to the study may qualify the results reported. That section is followed by a detailed description of inputs to our framework that describe HSR as a direct impact on the economy. Presentation in that section is provided in sufficient detail for those who wish to understand how inputs from other studies have been "translated" into direct impacts in our framework.

Detailed results of the analysis are reported separately for Canada, and the two provinces (Quebec and Ontario) with immediate interest. Implications for the Rest-of-Canada are provided in abbreviated form. The method of analysis, and its reporting, centres on a sectoral understanding of the impact, and the technical understanding of this focuses on the national description of impacts since the framework integrates demand, supply and price formation implications only at this level. Thus, the report devotes considerable attention to the national results, with emphasis on the sectors most likely to be impacted in major form.

The concluding major section presents the Principal Findings of this study, but also discusses the extent to which the findings would be sensitive to variations in assumptions about HSR, other modes, or government financing assumptions, or to Base Case uncertainties. In this section, we specifically assess two variations on the assumption about government financing.

The models employed in this analysis are defined in terms of more than 20,000 variables or measures of economic performance, to describe Canadian and provincial activity. As there are six scenarios, and almost a generation of annual data to report, the potential for an explosion of reporting detail is high. To manage this, we typically compress our view of impacts over time into two periods (1995-2003) and 2004-2020) given the characteristic differences indicated in Figure 1. Further, where a detailed description of method of analysis or results is required, we have used the QW300M impact scenario as a device for describing this. Choice of this scenario is not meant to indicate preference for this option. Appendixes are liberally supplied with detail to provide by-scenario, and by-year impact data.

2 Research Method

2.1 Overview of Research Method

This study is focused on the impact of the HSR, associated reductions in other private economic activity, and government responses in the form of spending reallocation. Accordingly, the analysis is focused on the differences that occur in the economy because of these events, where the direct impacts on the economy are measured by changes in investment, demands on, and production in transportation services, potential export consequences, and by public financing considerations.

Given these direct "shocks" to the economy, standard procedures are used to develop comprehensive measures of economic effect. A baseline projection of the Canadian economy has been made available for this study. That baseline projection is predicated on a wide array of assumptions about foreign economic activity, prices, and interest rates, which are important to determining future Canadian exports and imports, domestic interest rates, and price changes. The baseline is also predicated on assumptions about fiscal, monetary and structural policies of the Canadian federal, provincial and municipal governments. It presumes that private behaviour that ties demands to prices and incomes, and that determines the relationship between labour and capital, and between industries, remains unchanged, or is changed for reasonably predictable reasons.

To measure overall economic effects, a second, "impact" projection of the future is prepared (in this instance, six times). This leaves most of the assumptions underlying the baseline projection unchanged, but varies assumptions, in this case, about investment and production in the transportation services industries, and public spending on capital formation. These are introduced as increments, or differences, to the economy, and referenced to Figure 1 and Table 1, are summarized by the indicated changes to domestic final demand. Comparison of the thus "impacted", projection under this set of assumptions with that of the baseline projection provides measures of the quantitative impact on the economy of changed activity in the economy.

The analysis is supported by the use of two econometric models that respectively, and consistently, describe behaviour and activity in the Canadian national and provincial economies. Projections developed with those models are provided on a year-by-year basis so that progressively different effects over time can be reported. The models used are structured to capture dynamic effects in the sense that stocks of debt, productive capital, and household residential and durable assets in any given year will have effects in succeeding years on interest payments, business depreciation and productivity, and demands for new autos, appliances, etc.

It should be noted that the full HSR study extends its view of the future to 2025. In undertaking this study, our formal analysis that is aided by the models covers each year from 1995 through 2020, which is the last year reported in the baseline case that has been made available for the study.² In reporting results for major indicators of the overall economic effects, we have extended the analysis with less formal procedures, using 2020 as a guide to likely effects in the following five years.

2.2 Models Applied

Two separate, but integrated, econometric models of the Canadian economy have been used for the analysis. The Informetrica Model (TIM) measures the national economic effects of the initiative, while the Regional-Industrial Model (RIM) allocates these national effects to provinces, using HSR-specific considerations in the process. Appendix A provides an overview of the models' structures. Here, we provide a description of key elements in the models that have received particular attention in implementing the study, or that are a part of the model structure with special significance to this study.

2.2.1 The Informetrica Model

As Appendix A details, TIM incorporates a detailed industrial view of economic activity, with analysis of such activity focused on approximately 120 industries. For each, there is a linkage of industry output to "final" demand (household consumption, residential investment, business investment, spending by governments, and exports and imports) and to demands generated by other industries (intermediate requirements). Final demands are disaggregated in detailed terms so that commodities that are particular to a "shock" can be precisely identified when introducing direct effects. Further, for each of these detailed demands, linkage to output is through an input-output table that can be modified to reflect the special characteristics of the shock. This modifying procedure has been widely applied in this study to incorporate initiative-specific information supplied by other studies.

Production in the model can be characterized as starting with the shipments (or, "Gross Output") of an industry.³ Real resources needed to supply a shipment are

² Limiting the formal analysis to the period through 2020 is forced only by limitations of resources and time available to conduct the study, as with more resources and time, a baseline could be prepared through 2025. As the major direct shocks to the economy have reached steady levels by 2020, the use of impact results in the last year of the formal analysis to extend the analysis to 2025 through less formal procedures is a second-order limitation on the quality of the results, where we report impacts through 2025.

³ Appendix B provides a Base Case view of the rail transportation industry in TIM. Reference to this tabulation may be helpful in following the description of the text of how individual industries are modelled.

composed of the menu of material and service inputs required by the producing industry, and the value that is added by that industry through use of labour and fixed capital inputs. The menus describing purchased inputs can be described as a representation of the technology used to produce the shipment (defined formally as an input-output table), augmented by the use of labour and capital in the industry. Combined, these describe the production process of the industry. It varies over time, and is variably sensitive on an industry basis, to "shocks" to the economy whether they are introduced into the industry, or other industries.

This variance in the relationship of output to labour and capital inputs over time, and sensitivity to any "shock" to the economy are important to the study of impacts, and distinguish results in this form of model from those recorded by "static" analysis using, for example, input-output models. Thus, for example, the baseline projection applied to this study suggests that output per employee in 2020 should be 38 per cent higher than in 1994. By comparison, output per employee in 1994 was 36 per cent higher than was the case 26 years earlier. Under these circumstances of continuing productivity growth in the economy, a "shock" of investment in the rail industry in 2003 will have different employment effects than would be the case if the shock of same size were introduced in 1994, or other earlier years.

Similarly, a "shock" to the economy that generates additional business income that is re-invested in the economy will alter the amount, vintage and quality of capital available for employees to use. Thus, beyond influences from baseline views of productivity change, the extent and nature of the shock can also influence productivity in the economy. We note that these relationships between labour and capital vary from industry to industry, and are sensitive in varying degrees to the nature of the shock imposed on the economy.

The real resources used directly by an industry in the economy are compensated in the form of wage and supplementary incomes for labour, as returns to capital for corporations, and income for unincorporated businesses. With real measures of labour and capital inputs, this provides unit labour and capital costs to provide a foundation for prices offered by each of the industries. (These are modified on an industry-by-industry basis to account for several forms of indirect tax and subsidy systems, and the influence of foreign prices.) Industry prices are then weighted appropriately to produce prices for final demand commodities. This "closes" the economic relationship between supply and demand through prices since demands are determined by price and income. Again, the sensitivity of demand to price and income changes varies by demand category, and this is highly detailed in the model.

Incomes in this framework follow from the compensation elements of the model, and are provided to "private" sectors as households, businesses, or foreigners (through wage, dividend, interest and other payments). Private sector incomes are supplemented by government transfer systems to households (e.g., UI, welfare, and

OAS payments) or businesses (capital and operating subsidies), where the amounts are sensitive to economic conditions of the projection. Government tax and other revenue systems are founded on pre-tax incomes of households and businesses, or the state of trade and general economic activity (for GST, retail tax, customs duties, and other indirect taxes). The net consequences of government expenditures and revenue systems have varying influences on demand in the private sectors, on government exhaustive expenditures needed to operate public administration and the public health care system, and on transfers between levels of government.

Interest rates and exchange rates are identified in the model and are sensitive to foreign interest rates, the state of nominally denominated economic activity, and financial flows between Canada and other economies. Through their influence on the prices of approximately 100 export and import commodities, exchange rates play a pivotal role in determining both industry and final demand prices in the economy.

TIM is a critical starting point in our analysis, because its detailed linkage between demand, output, and prices, and the sensitivity of these to fiscal and monetary aggregates are defined in this model. Put in more secular terms, economic behaviour is assessed in detail and comprehensively, only in TIM. Data that would describe these same relationships at the provincial level do not exist.

2.2.2 The Regional-Industrial Model

RIM allocates TIM projections of industrial output and employment to provinces on a by-industry basis. That is, total provincial activity may be characterized as the sum of the output (and employment) of the industries that are located in its jurisdiction. For the most part, output of goods-producing industries is "exogenous" (i.e., fixed), being determined by the location of industrial and natural resource capital (Alberta produces oil and PEI does not). Investment flows and the size of the capital stock are assessed for each province, with this detailed in terms of approximately 20 industries. In contrast, output of services industries is "endogenous" (i.e., responsive in a projection) to the activity of goods-producing industries, and the size and demographic characteristics of the population in the province, or those near by.

In turn, the size of the population can be made sensitive to migration between provinces, where this is determined by relative employment opportunities among the provinces. Household incomes are determined by labour compensation, and income distributed by business and governments. There is no feed-back to demand on a provincial basis since price details needed to describe consumer and other behaviour credibly are not available.

Given this general framework, construction related to investment in the HSR is concentrated in Ontario and Quebec as determined by other studies, with

manufactured goods needed in the investment provided jurisdictionally in proportion to where such production normally occurs in the country (or, from foreign suppliers), or as information supplied by other studies indicates that special considerations about supply will concentrate manufacturing industry impacts in one or more of the provinces. Employment and related direct services supplied for operation of the HSR (and reductions of VIA, airlines, etc.) is again concentrated in Ontario and Quebec, with other operational inputs of goods again supplied jurisdictionally in proportion to where such production normally occurs, unless otherwise indicated by other studies.

Production that is induced (a modest impact in this study) by the re-spending of household income in the form of increased consumption, or by businesses in the form of increased investment, is jurisdictionally supplied in proportion to the Base Case view of production location. Note, moreover, that production of services in each jurisdiction is then tied to the extent to which that jurisdiction's goods industries are impacted by changes to rail, other-mode, or government investments and operations. All provincial details, at the industry level, sum to national totals to ensure a consistent national and provincial impact.

2.3 Impact Terminology and Base Case

In the language of impact analysis, there are three forms of economic impact to be considered.

- Direct Effects describe the impacts as defined by the proposal. Broadly speaking, in this instance, they are composed of the three elements indicated earlier: (1) the changes to investment and demands on the new HSR, with associated increments to exports from associated suppliers of the HSR, (2) reductions in investment and demand for other modes, and (3) reduced capital spending of governments as they reallocate HSR financing from other spending.
- Indirect Effects describe the consequences of spending among the suppliers of goods and services to the HSR proponents, other modes, and government capital formation. The choice of what is direct or indirect is partly arbitrary. Thus, investment spending by the rail industry can be described as having a direct effect on the construction industry, which in turn procures equipment, material and services from manufacturers of equipment, financial intermediaries and others, who in turn, require inputs from other suppliers. If the direct effect of operating the rail system (net of VIA reductions) is described as that industry's requirement for labour and returns to capital, then the indirect effects are represented by those on other industries that supply materials and services to operate the rail system.

In this instance, indirect effects are developed through use of an input-output relationship that links investment demands of the rail transportation industry to the value added produced by all industries in the chain of supply. As has been indicated earlier, CIGGT and other studies provide information that indicates specific commodity requirements for constructing the rail system, and this has been used to modify the normal input-output relationship to reflect the specifics of building the new rail system. Similarly, to link supplies between industries in the operation of HSR, we have used a standard input-output relationship that reflects technology, but have modified the model's normal view of the relationship between output, capital and employment to reflect specific employment and inter-industry information made available by other studies.

- Induced Effects follow from the fact that directly and indirectly affected employees, and businesses are compensated in the form of wage or business income. Household incomes are altered by the labour income, dividends from business, and changes in government taxes and transfers. Given this, households may save or spend the changed income, and if the latter, then this constitutes additional demands requiring additional outputs and employment by producers in the economy, or from imports. Similarly, business will allocate part of its additional returns to changes in depreciation, to dividend and interest payments to foreigners, or to savings to support additional investment. If the latter occurs, this constitutes new demands on the economy to be supplied by domestic producers or imports. In the case of the rail and other transportation service industries, we have assumed that other studies have determined these effects, and the model has been tuned to reflect these results, **ex post**. For all other industries in the economy, normal market responses are presumed to prevail.

Net effects on government incomes (through changes in revenues and expenditures) may be allocated by them to savings (debt reduction) or to altered spending (or reductions in tax rates and other revenue systems). If the latter use of additional savings occurs, this constitutes yet another source of induced increases in outputs of the economy. In this instance, we have assumed that government financing of HSR is offset on a dollar-for-dollar basis with reduced capital spending. Apart from that, normal endogenous responses in the model (e.g., changes to UI payments are reflected as subsequent changes to employer and employee contributions) are assumed to occur. We have assumed there are no interest-rate implications from this, since budgetary effects and price/cost changes relative to those outside of Canada are minor.

Consequences of any "shock" to the economy may be sensitive to the underlying baseline view of prospects portrayed. Appendix C provides an indicative view of the baseline used in this study, and we here highlight several elements that could be of special significance to these results. These are indicated in Table 2.

Table 2
Base Case Economic Activity

	1995-20	1995-03	2004-20
Average Annual Rates of Growth			
Real GDP, Canada	2.4	2.9	2.1
Ontario	2.8	3.4	2.5
Quebec	2.1	2.5	1.9
Employment	1.1	1.7	0.8
Ontario	1.3	2.0	1.0
Quebec	0.8	1.3	0.5
Unemployment Rate (%), Canada (a)	9.6	10.2	9.3
Ontario (a)	9.1	9.2	9.1
Quebec (a)	10.9	12.2	10.2
GDP Deflator	1.7	1.8	1.7
10-Year Federal Bonds (%) (a)	5.7	5.9	5.6
All-Govt Balance (% of GDP) (a)	-2.3	-3.2	-1.9
Current Account (% of GDP) (a)	-1.0	-1.8	-0.5

(a) Average

Investment in, and operations of a capital-intensive venture such as HSR, will be sensitive to the costs borrowing, and the Financial study of Price Waterhouse has already examined this dimension. As well, cost reallocation by governments to provide their financing of HSR has essentially neutralized them from this dimension. Still, other businesses in the economy, as well as households, will be sensitive, at the margin to borrowing costs as they "decide" whether to spend or save their induced incomes. Measured in real terms, the baseline portrays steadily declining real Canadian long-term interest rates over the longer term from the extraordinarily high levels registered in the past dozen years, but much above those that prevailed in the 1960s and 1970s. Averaged over 1995-2020, the baseline projection for real long-term government bonds as an indicator of this, is a little more than 4 per cent, or approximately the same as prevailed in the past twenty-five years. It should be noted, however, that the projected gap between real interest rates and potential growth of the Canadian economy would be much larger than was true in the past twenty-five years, implying a more stringent set of monetary policy conditions for the future than in the past.

Persistent government deficits, despite a prolonged, and sustained period of primary surpluses is a result. Net foreign borrowing, as indicated by the Current Account balance, rose to extraordinarily high proportions at the outset of the 1990s,

but in our Base Case, is resolved over the next few years, and does not represent a meaningful constraint on demand expansion over most of the next 25 years.

If labour resources are fully employed in the economy, then injections of new demand could simply "crowd out" other real economic activity through generation of an inflationary cycle as producers bid up nominal wage rates and pay higher prices for the same material inputs, and/or through sharply increased demands for credit, driving up interest rates. There is little danger of the economy being overheated in the near term by underlying labour market circumstances, and likely little dispute that a condition of tight labour markets could emerge within the next several years. At a minimum, 300,000 have been "discouraged" from remaining in the labour market since the onset of the recession following 1989. Our baseline projection reflects these near and medium-term conditions, and portrays the longer term as having relatively slack labour markets through most of the next 25 years.

This would be consistent with the view that business cycles of growth and recession will continue in the future. Put more bluntly, given nine recessions since the end of World War II, there is little reason to believe there will not be more in the next generation. We think this basic view is appropriate to the study since the HSR can be realistically described as a set of changed structural conditions taking many years to implement. In this context, disputes about whether we may, or may not, reach "full employment" for some short periods of time are largely irrelevant to the analysis.

Put in measured terms, the baseline projects an average unemployment rate for 1995-2020 of 9.6 per cent. The average of the past twenty-five years was 8.2 per cent, and since the first OPEC shock (the legacy of which is reflected in a still relatively high value for oil), the average has been 9 per cent.

2.4 Technical Description of Direct Impact Introduction

Most changes to reflect HSR and other effects are introduced as increments to appropriate investment, consumption, export, government capital formation, and other final demand variables in TIM to reflect national direct economic effects. Where detailed commodity information is available from other studies, changes to the final demand items have been directed to appropriate supplying industries to reflect this special commodity information. This applies to investment in HSR infrastructure, equipment, and light freight equipment. To reflect the special nature of intermediate industry requirements for the use of rail transportation services, this modification to input-output relations has also been used. Finally, employment implications of rail investment and operations have been targeted to input study information as an **ex post** view of the rail production function.

Dollar-denominated input information was typically provided in 1993 constant dollars. TIM and RIM, both of which are constructed from the Canadian System of National Accounts, define constant-dollar variables in terms of 1986 prices. In converting the input constant-dollar information (and for converting nominal-dollar inputs), deflators specific to the input variable were used to derive the 1986-dollar equivalent of the input information. No special adjustments for quality variation were imposed in this process. Appendix D summarizes our assumptions in 1986-dollar terms, for each of the six impact scenarios. For those who are interested in referencing this work back to other studies, Appendix E provides an equivalent view of the assumptions in 1993 dollars for one 300K and one 200K impact case.

2.4.1 National Model

Starting with the national view of impacts, HSR infrastructure investment is taken to be the sum of the following from the CIGGT spreadsheet:

- Right-of-Way (excluding land purchases, which have no direct impact on use of economic resources)
- Earthworks/subgrade
- Bridges
- Grade Separations
- Other Accommodations
- Track
- Power Distribution System
- Stations
- Equipment Maintenance Facilities
- Infrastructure Maintenance Facilities

These are introduced as an **ex post** increment to investment in structures of the rail transportation service industry, with the annual increments channelled to three elements of the construction industry. These vary over time, and by Impact Scenario. Table 3 presents the allocation for QW300M during the period of most intense investment activity.

Given this allocation, a little less than two-fifths of the impact will be allocated to value-added (GDP) of the construction industry, with material and service requirements spread widely across other industries, but concentrated especially in production of iron and steel, metal fabricating, electrical and electronic products, nonmetallic minerals manufacturing, wholesale trade and business services.

Table 3
Allocation of HSR Infrastructure Spending to
Construction Industry Components
QW300M Impact Scenario
(per cent of Total)

	Nonresidential Buildings	Railway and Telegraph	Other Engineering
1996	1	71	20
1997	1	71	20
1998	2	77	21
1999	negl	78	22
2000	2	76	21
2001	5	74	21
2002	8	72	20
2003	16	66	18
2004	37	49	14

HSR Equipment spending is the sum of the following from CIGGT:

- Signals
- Communications
- Rolling Stock
- Information/Ticketing systems
- Additional Fleet requirements
- Rolling Stock overhauls
- Other ongoing capital

These are introduced as an **ex post** increment to investment in machinery and equipment of the rail transportation service industry, with the annual increments channelled to supply from a large number of industries. As is indicated in Table 4, however, the demands are concentrated in supply provided by manufacturers of railway equipment, and the electrical and electronic equipment industry. Again, reflecting input details supplied by other studies, these vary over time, and by scenario.

Light-Freight Equipment is equal to the rolling stock number from the Light Freight study. Light-Freight Infrastructure is the sum of containers and Terminals and Handling (excluding the cost of land purchased) from the Light Freight study. These are typically small amounts affecting the middle of the next decade. Almost two-thirds of the equipment requirements are channelled through to the railway manufacturing industry, with the balance of requirements widely distributed across supplying industries. Investment in structures is allocated to investment of commercial services, most of which is supplied by the industry that constructs nonresidential buildings.

Table 4
Allocation of HSR Equipment Spending to
Construction Industry Components
QW300M Impact Scenario
(per cent of Total)

	Rail Equipment	Electrical/ Electronics	Metal Fabrication	Nonagricultural Machinery	Other
1996	62	9	3	7	19
1997	51	22	3	6	18
1998	47	25	3	6	19
1999	43	29	2	5	21
2000	30	44	2	4	20
2001	31	44	2	4	19
2002	37	32	2	4	25
2003	47	26	3	5	19
2004	64	8	3	7	18

For Railway Consumption, both the HSR increase and VIA decrease are constant-dollar "volume" measures which track quite closely with the number of passenger-kilometers travelled. With this in mind, we have used a ratio of constant dollar expenditure to passenger-kilometers travelled to develop our estimates of HSR consumption and the VIA reduction. This is introduced into final demand of households for railway transportation, and through the input-output system to represent rail use by other businesses.

VIA Investment Reductions are taken from the Other Modes study directly, except that the "other" category in the Other Modes study is apportioned between equipment and infrastructure for our purposes. This is introduced through rail transportation service industry investment.

Reduced Airline Investment is taken from the Other Modes study directly. Investment impacts are spread from 2005-2020, and are allocated exclusively to reduced spending for equipment.

Reduced Bus Investment is listed as zero in the assumptions table because in our model bus investment is mixed in with other miscellaneous transportation investment so we cannot impact bus investment directly. The aggregate investment category, which includes bus investment, is moving around quite a bit due to other factors during our simulations. These other influences are far larger than the bus investment impact stated in the Other Modes study.

Airline Consumption Reduction in total is the sum of personal and business expenditure reductions necessary to yield the air transport industry revenue loss that

is stated in the Other Modes study. This has been introduced as an impact on both personal consumption and intermediate industry requirements.

Bus Consumption is the revenue change for the bus industry as stated in the Other Modes study.

An Auto-Related Services change is also as reported in the Other Modes study. These, and the impacts on bus transportation, are phased-in beginning in the period from 2003-2004, reflecting the partial operation of the HSR system during those two years.

Government Subsidy changes were taken directly from the financial analysis study. They are calculated as the difference between the subsidies paid by government and the lease payments and dividends received by governments. The offsetting government investment reductions equal the deflated value of the net interest subsidy, and are allocated to federal and provincial spending on a 50/50 basis, and are spread among Base Case government capital formation categories in proportion to Base Case values.

It should be noted that federal capital spending is highly concentrated in expenditures for machinery and equipment, a notable proportion of which is allocated to production of electrical and electronic equipment. Thus, this represents a significant industry-specific offset to the demands posed on that industry by HSR investment in equipment. Provincial spending is more highly concentrated in expenditures for highway and street construction, buildings, and other engineering (e.g., waterworks, sewage). Accordingly, the positive effects of HSR investment in infrastructure on the railway construction industry are offset by reduced construction activity in roads, and buildings.

The Export impacts were taken directly from the Simpson-Guerin Study. Reflecting the commodity composition of incremental exports suggested by that study, these have been allocated exports of (1) railway rolling stock and equipment, (2) telecommunications and electronic equipment, (3) industrial machinery, and (4) business services.

2.4.2 Provincial Model

- Investment in Structures and Machinery and Equipment

It is assumed that all direct investment spending takes place in Quebec and Ontario. The national direct impact on rail investment is shared out between the two provinces using the capital cost shares from CIGGT. The direct impact on

construction investment in machinery and equipment is split in the same manner.

The negative impact from the decline in conventional rail investment is based on a 30/70 (Quebec/Ontario) split (from the Other Modes study) for structures investment, approximately the same as the shares for high speed rail investment for provinces. Machinery and equipment investment is assumed to be split 50-50.

Government investment is split based on shares from **Provincial Cost Sharing and Financial Scenarios**. Based on this document, a 50-50 split between federal and provincial governments is assumed. The provincial share is split between Quebec and Ontario based on the shares provided. The federal government share is apportioned to all provinces based on their share of 1992 tax revenues.

- Impact of Machinery and Equipment Investment on Manufacturing Industries

For the railroad rolling stock and miscellaneous manufacturing industry, the split is Quebec: 38.3 per cent, Ontario: 53.1 per cent, Rest of Canada: 8.6 per cent (these numbers do not sum to 100 due to rounding).

- Construction Activity

Construction activity is assumed to be proportional to the amount of investment taking place within Quebec and Ontario.

- Rail Transportation Industry

The provincial split for rail transportation industry employment is from CIGGT: grand total employment. Assumptions with respect to employment related to soft costs is also from CIGGT. The split for skilled and unskilled workers is also incorporated.

- Air Transportation Services Industry

The direct impact on the air transportation services industry is assumed to affect Quebec and Ontario as described in the Other Modes study. Shares of incremental revenue were used to apportion the decline in air transportation activity within the two provinces.

- Other Motor Transportation Services Industry

A more disaggregated impact is provided for this industry at the national level. Motor transportation (miscellaneous, including highway and bridge maintenance) is directly effected by the decline in air transportation services. Therefore, incremental revenue from air transportation services from *^The Impact of High Speed Rail on Other Modes and Levels of Government Support** is used to split activity between Quebec and Ontario.

Interurban and rural bus transportation is assumed to affect both provinces equally. This approach is taken since the information provided in the Other Modes study is not clear: costs increase and revenues fall in Quebec, while the reverse is true for Ontario.

- Aircraft and Aircraft Parts Industry

The impact on the aircraft and aircraft parts industry is assumed to directly affect Ontario only as outlined in *The Impact of High Speed Rail on Other Modes and Levels of Government Support*, incremental investment.

- Electric Utilities Industry

An impact on the electric utilities industry is split between Quebec and Ontario based on shares as provided in CIGGT: Purchased Materials/Services, electricity.

- Accommodation and Food Services Industry

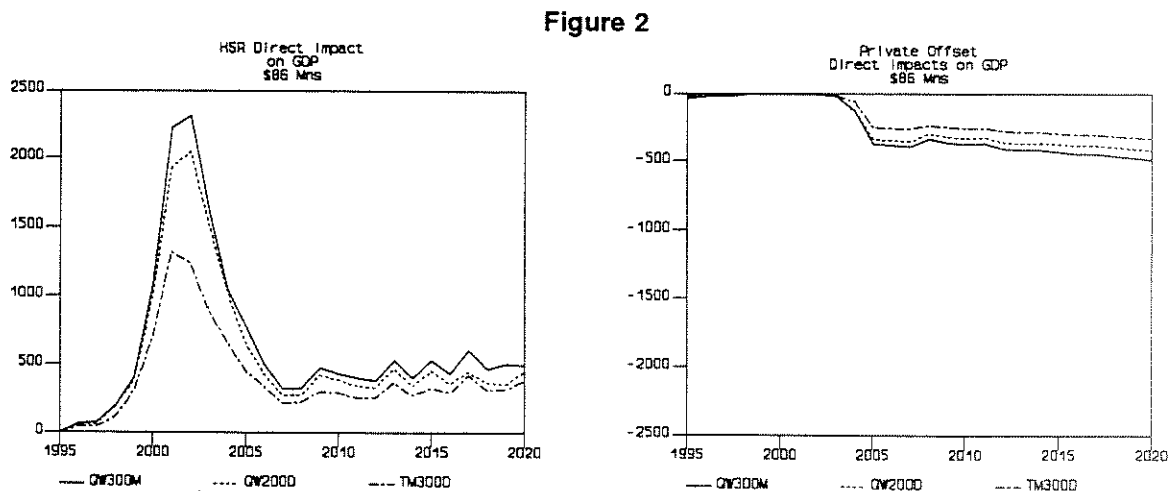
The impact on accommodation and food services for the two provinces is influenced by CIGGT: Purchased Materials/Services, food/related sundries, but of course, also reflects induced effects within the provinces.

3 HSR, and other Events, as Direct Impacts

3.1 HSR and "Other Modes" Overview

3.1.1 Investment

Figure 2 provides a graphic view of the trade-offs for the economy generated by private economic activity. The HSR produces positive effects, which are relatively large (equivalent to a peak of 0.3 per cent of Base Case GDP) during the main investment phase, and smaller, but growing effects as the HSR enters operation and builds demand for its services. Although there are offset reductions in spending in VIA and other transportation modes while the HSR is being constructed, they are minor. Beginning with the operation of the HSR, however, reductions in investment and operations of other modes increases, and grows over time as their services are displaced. By 2020, the positive effect from the HSR is approximately, but not fully, offset directly by impacts on other modes.



As this graphic indicates, the operational effects are approximately symmetric. That is, 300K scenarios tend to generate larger HSR positive direct effects on the economy, but the offset effects in other modes are also larger.

3.2 HSR Infrastructure Investment

Table 5 summarizes the competing influences from investment spending.

As inspection of Table 5 will make clear, 300K scenarios require larger (approximately 10 per cent) capital formation for HSR than do 200K scenarios. The spread between requirements for capital resources, however, is somewhat larger (about 12 per cent) during the "major" investment phase (through 2003), but narrower

Table 5
High Speed Rail Investment Assumptions, Canada
(Cumulated Changes in \$86 Mns)

	95-2020	95-2003	2004-2020
HSR Investment			
Quebec-Windsor, Mirabel, 300K	10279.2	7911.6	2367.7
Quebec-Windsor, Dorval, 300K	10500.2	8052.3	2447.9
Quebec-Windsor, Dorval, 200K	9295.8	7042.6	2253.2
Toronto-Montreal, Mirabel, 300K	6062.6	4574.0	1488.7
Toronto-Montreal, Dorval, 300K	6105.5	4598.2	1507.3
Toronto-Montreal, Dorval, 200K	5371.6	3991.7	1379.9
Light Freight Investment			
Quebec-Windsor, Mirabel, 300K	386.1	0.0	386.1
Quebec-Windsor, Dorval, 300K	386.1	0.0	386.1
Quebec-Windsor, Dorval, 200K	268.4	0.0	268.4
Toronto-Montreal, Mirabel, 300K	178.9	0.0	178.9
Toronto-Montreal, Dorval, 300K	178.9	0.0	178.9
Toronto-Montreal, Dorval, 200K	153.8	0.0	153.8
VIA Investment Reductions			
Quebec-Windsor, Mirabel, 300K	-660.9	-130.7	-530.2
Quebec-Windsor, Dorval, 300K	-660.9	-130.7	-530.2
Quebec-Windsor, Dorval, 200K	-660.9	-130.7	-530.2
Toronto-Montreal, Mirabel, 300K	-349.3	-68.7	-280.6
Toronto-Montreal, Dorval, 300K	-349.3	-68.7	-280.6
Toronto-Montreal, Dorval, 200K	-349.3	-68.7	-280.6
Reduced Airline Investment			
Quebec-Windsor, Mirabel, 300K	-680.9	0.0	-680.9
Quebec-Windsor, Dorval, 300K	-678.5	0.0	-678.5
Quebec-Windsor, Dorval, 200K	-629.5	0.0	-629.5
Toronto-Montreal, Mirabel, 300K	-596.8	0.0	-596.8
Toronto-Montreal, Dorval, 300K	-596.8	0.0	-596.8
Toronto-Montreal, Dorval, 200K	-474.1	0.0	-474.1
Reduced Bus Investment			
Quebec-Windsor, Mirabel, 300K	0.0	0.0	0.0
Quebec-Windsor, Dorval, 300K	0.0	0.0	0.0
Quebec-Windsor, Dorval, 200K	0.0	0.0	0.0
Toronto-Montreal, Mirabel, 300K	0.0	0.0	0.0
Toronto-Montreal, Dorval, 300K	0.0	0.0	0.0
Toronto-Montreal, Dorval, 200K	0.0	0.0	0.0

(8 per cent or less) during the operations phase. Note, of course, that investment in the HSR continues through the operations phase. Scenarios for Quebec to Windsor require more capital than do those for a line running from Montreal to Toronto.

Investment in light freight operations, concentrated at the middle of next decade, is modest, but follows the same pattern as main HSR investment with respect to length and speed comparisons.

Reductions of investment to support VIA Rail operations emerge at the outset, but are modest in scale until operations of HSR emerge. Variations are insensitive to the speed of the HSR option, but are sensitive to the length of the HSR line. Reductions in investment in airlines equipment is assumed to emerge after HSR begins operations, and is sensitive to both length of the HSR, and the speed of the HSR option.

Other salient elements of interest to the macroeconomic impact include the following items.

- Cumulated over 1995-2020, the positive effects on economic activity from investment in HSR and light freight, less offsetting reductions in investment for VIA, airlines, and busses represents a notable positive effect on demand for both construction and output of manufacturers. For QW300M, net increases in spending for infrastructure cumulate to \$6,490 million (at 1986 prices).

At 1993 prices, approximately, the cumulated net increase in demand that is principally directed to construction activity is close to \$7 billion. For investment directed principally to manufacturers, the amount is close to \$4.4 billion. Leakages to imports for equipment will of course be higher, reinforcing the view that the main addition to demand that is likely to be supplied by domestic producers will be the infrastructure spending. Still, allowing for import leakage of one-quarter, the \$4.4 billion increase in demand for equipment translates into more than \$3 billion for domestic producers. It should be noted, of course, that spending for structures and equipment also has implications for a wide range of service and other-goods producers, so that the full weight of these estimates does not fall on construction or manufacturing operations.

- Investment that will be supplied principally as a construction activity, or supplies to that, is short lived. Positive effects, net of both increased and decreased spending, is concentrated at high levels in 1998 through 2004/2005 depending on the scenario for light freight investment. Post that period, spending impacts on the construction industry will be positive, but close to negligible.
- Investment that is directed to purchase of equipment is significantly positive from the end of the 1990s through to 2020, although the largest impacts are also concentrated in the period to the middle of the next decade.

3.2.1 Operations

Table 6 summarizes the direct effects of operating the HSR, and displacement of other activity in the economy, as a consequence.

While the net effects of investment in HSR and reductions in other private spending yield a notably positive overall direct impact on the economy, Table 6 makes it clear that net effects from operations of various transportation modes will have little direct effect of consequence for the general economy before 2003. Following that time, there are consequences, but net of positive and negative effects, annual effects on overall activity remain close-to-inconsequential (\$17 million at 1986 prices for the case with the largest impact: QW300D).

Put in other terms, while there is a small overall effect on the total of resources to produce transportation services, this is minor. Rather, the scenarios all portray a major shift of resources needed to deliver, mainly passenger, transportation services. Resources are moved towards delivery of HSR services from others. The salient features of this are as follows.

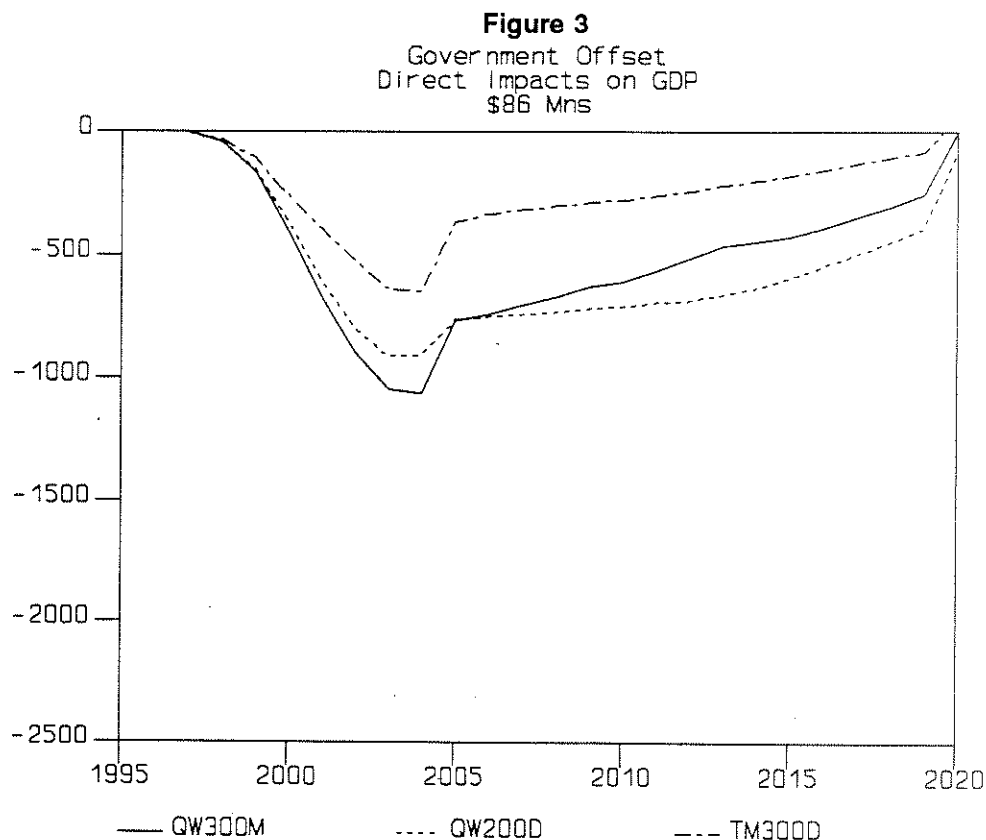
- Reductions in the airlines are the most prominent offset, being equivalent to 54-56 per cent of the increase in HSR resources for the Quebec-Windsor 300K scenarios, and 60 per cent in the case of the 200K scenario. For the shorter length of Toronto-Montreal, the airline reduction is 65-68 per cent for 300K scenarios, and 77 per cent for the 200K scenario. That is, 200K scenarios have a more inimical effect on airline use of resources than do 300K scenarios, and the Toronto-Montreal scenarios similarly have a larger negative effect on airline use of resources. Put in other terms, resource savings are relatively large for shorter distances, and for the 200K options.
- Reduced household purchases of gasoline, lubricants, and auto repair services are also significant, and rank second to reduced air travel as an offset to the HSR positive requirement for economic resources. In this case, resource savings are largely proportional to length of the HSR line.
- VIA reductions are relatively minor, and are determined solely by the length of the HSR system. Impacts on bus transportation are negligible, and as the information in Table 6 indicates, positive for several of the scenarios.

Table 6
High Speed Rail Operations Assumptions, Canada
(Cumulated Changes in \$86 Mns)

	95-2020	95-2003	2004-2020
Total operations GDP			
Quebec-Windsor, Mirabel, 300K	257.8	2.6	255.1
Quebec-Windsor, Dorval, 300K	514.1	3.3	510.8
Quebec-Windsor, Dorval, 200K	-179.0	1.3	-180.4
Toronto-Montreal, Mirabel, 300K	33.3	2.1	31.2
Toronto-Montreal, Dorval, 300K	227.7	2.9	224.8
Toronto-Montreal, Dorval, 200K	-351.8	0.3	-352.1
HSR railway consumption			
Quebec-Windsor, Mirabel, 300K	5765.8	15.8	5750.0
Quebec-Windsor, Dorval, 300K	6021.6	16.5	6005.1
Quebec-Windsor, Dorval, 200K	4561.6	14.3	4547.3
Toronto-Montreal, Mirabel, 300K	3716.2	16.3	3699.8
Toronto-Montreal, Dorval, 300K	3910.3	16.9	3893.3
Toronto-Montreal, Dorval, 200K	2891.6	14.7	2876.9
VIA consumption reduction			
Quebec-Windsor, Mirabel, 300K	-719.3	-2.1	-717.3
Quebec-Windsor, Dorval, 300K	-719.3	-2.1	-717.2
Quebec-Windsor, Dorval, 200K	-720.3	-2.4	-718.0
Toronto-Montreal, Mirabel, 300K	-549.1	-2.6	-546.5
Toronto-Montreal, Dorval, 300K	-549.0	-2.5	-546.5
Toronto-Montreal, Dorval, 200K	-554.0	-2.9	-551.0
Airline consumption reduction			
Quebec-Windsor, Mirabel, 300K	-3244.6	-7.8	-3236.8
Quebec-Windsor, Dorval, 300K	-3244.3	-7.8	-3236.5
Quebec-Windsor, Dorval, 200K	-2740.9	-7.5	-2733.4
Toronto-Montreal, Mirabel, 300K	-2527.2	-9.8	-2517.4
Toronto-Montreal, Dorval, 300K	-2527.0	-9.7	-2517.3
Toronto-Montreal, Dorval, 200K	-2226.6	-9.9	-2216.7
Bus consumption change			
Quebec-Windsor, Mirabel, 300K	-6.3	0.0	-6.3
Quebec-Windsor, Dorval, 300K	-6.3	0.0	-6.3
Quebec-Windsor, Dorval, 200K	13.4	0.0	13.4
Toronto-Montreal, Mirabel, 300K	84.2	0.5	83.7
Toronto-Montreal, Dorval, 300K	84.2	0.5	83.7
Toronto-Montreal, Dorval, 200K	98.7	0.6	98.1
Auto related services			
Quebec-Windsor, Mirabel, 300K	-1537.7	-3.3	-1534.4
Quebec-Windsor, Dorval, 300K	-1537.6	-3.3	-1534.3
Quebec-Windsor, Dorval, 200K	-1292.8	-3.2	-1289.7
Toronto-Montreal, Mirabel, 300K	-690.8	-2.3	-688.4
Toronto-Montreal, Dorval, 300K	-690.7	-2.3	-688.4
Toronto-Montreal, Dorval, 200K	-561.5	-2.2	-559.4

3.3 Government Financing

As comparison of the annual "private" offset reductions in Figure 2 with the government reductions portrayed in Figure 3 will indicate, the decision to finance government subsidies with reduced capital spending in other areas has a relatively large implication for the results, particularly in the case of Quebec-Windsor scenarios.



Indeed, government investment reductions in the Quebec-Windsor scenarios are larger than the increased HSR (plus Light Freight) investment (compare the cumulated government investment reductions in Table 7, with the HSR cumulated investments reported in Table 5). For the 200K options, government reductions are approximately equivalent to HSR increases. Note, finally, that the relatively large reductions in government capital formation for the 200K options follow from the relatively poor commercial financial performance of those scenarios.

It should be noted that reductions in government capital spending during 1995-2003 are equivalent to approximately two-fifths of the HSR investments during that period, providing, thereby, a partial offset to the positive effects on GDP that HSR investment represents. As we indicated earlier, post 2003, positive and negative

effects of operating HSR and reducing activity in other modes was approximately balanced, although changing modestly over time. Accordingly, the large negative effects on GDP following from reduced government investment during that period will dominate results.

Table 7
High Speed Rail Government Assumptions, Canada
Cumulated Changes in \$86 Mns)

	95-2020	95-2003	2004-2020
Total Government Financing (\$C Mns)			
Quebec-Windsor, Mirabel, 300K	13752.0	3286.0	10466.0
Quebec-Windsor, Dorval, 300K	13054.0	3389.0	9665.0
Quebec-Windsor, Dorval, 200K	15460.0	2901.0	12559.0
Toronto-Montreal, Mirabel, 300K	7700.0	1920.0	5780.0
Toronto-Montreal, Dorval, 300K	6637.0	1969.0	4668.0
Toronto-Montreal, Dorval, 200K	8504.0	1677.0	6827.0
Total Government Investment			
Quebec-Windsor, Mirabel, 300K	-12096.3	-3219.0	-8877.3
Quebec-Windsor, Dorval, 300K	-11545.0	-3319.9	-8225.1
Quebec-Windsor, Dorval, 200K	-13345.8	-2842.4	-10503.4
Toronto-Montreal, Mirabel, 300K	-6795.7	-1881.6	-4914.1
Toronto-Montreal, Dorval, 300K	-5936.6	-1929.5	-4007.1
Toronto-Montreal, Dorval, 200K	-7375.7	-1643.9	-5731.8

We reported above that cumulated increases in demand for QW300M that should be directed principally to construction was \$6,490 million (at 1986 prices), with cumulated increases targeted principally on delivery by manufacturing as summing to \$5,517 million. As Table 8 reports, government reductions in investment for equipment (mainly supplied by manufacturing) will exceed the HSR increases by about \$1,500 million while HSR increases in spending delivered principally by construction will exceed that of the government reductions in those areas by about the same amount.

Given these considerations, overall impacts on general economic activity should be very modest, when cumulated over 1995-2020. At the margin, there is a slight positive increase in prospects for those who supply goods and services to investment in structures, and a small negative impact for those who supply equipment.

Table 8
High Speed Rail Government Investment Assumptions, Canada
(Cumulated Changes in \$86 Mns)

	1991	1992	1993
Federal, Total			
Quebec-Windsor, Mirabel, 300K	-6750.3	-1804.8	-4945.5
Quebec-Windsor, Dorval, 300K	-6445.0	-1861.4	-4583.6
Quebec-Windsor, Dorval, 200K	-7436.5	-1593.7	-5842.8
Toronto-Montreal, Mirabel, 300K	-3793.2	-1055.0	-2738.3
Toronto-Montreal, Dorval, 300K	-3316.8	-1081.8	-2235.0
Toronto-Montreal, Dorval, 200K	-4111.5	-921.7	-3189.9
Machinery and Equipment			
Quebec-Windsor, Mirabel, 300K	-5565.1	-1413.8	-4151.3
Quebec-Windsor, Dorval, 300K	-5301.7	-1458.1	-3843.6
Quebec-Windsor, Dorval, 200K	-6175.7	-1248.2	-4927.5
Toronto-Montreal, Mirabel, 300K	-3123.1	-826.1	-2297.0
Toronto-Montreal, Dorval, 300K	-2716.5	-847.1	-1869.3
Toronto-Montreal, Dorval, 200K	-3408.4	-721.5	-2686.8
Nonresidential Construction			
Quebec-Windsor, Mirabel, 300K	-1185.1	-391.0	-794.1
Quebec-Windsor, Dorval, 300K	-1143.3	-403.3	-740.0
Quebec-Windsor, Dorval, 200K	-1260.8	-345.5	-915.3
Toronto-Montreal, Mirabel, 300K	-670.1	-228.9	-441.2
Toronto-Montreal, Dorval, 300K	-600.3	-234.7	-365.6
Toronto-Montreal, Dorval, 200K	-703.2	-200.1	-503.0
Provincial, Total			
Quebec-Windsor, Mirabel, 300K	-5346.0	-1414.1	-3931.8
Quebec-Windsor, Dorval, 300K	-5100.0	-1458.5	-3641.6
Quebec-Windsor, Dorval, 200K	-5909.3	-1248.7	-4660.6
Toronto-Montreal, Mirabel, 300K	-3002.5	-826.6	-2175.8
Toronto-Montreal, Dorval, 300K	-2619.9	-847.7	-1772.2
Toronto-Montreal, Dorval, 200K	-3264.1	-722.2	-2541.9
Machinery and Equipment			
Quebec-Windsor, Mirabel, 300K	-1481.4	-353.3	-1128.1
Quebec-Windsor, Dorval, 300K	-1406.3	-364.4	-1041.9
Quebec-Windsor, Dorval, 200K	-1665.6	-311.9	-1353.7
Toronto-Montreal, Mirabel, 300K	-829.5	-206.4	-623.1
Toronto-Montreal, Dorval, 300K	-715.0	-211.7	-503.4
Toronto-Montreal, Dorval, 200K	-916.1	-180.3	-735.9
Nonresidential Construction			
Quebec-Windsor, Mirabel, 300K	-3864.6	-1060.8	-2803.7
Quebec-Windsor, Dorval, 300K	-3693.8	-1094.1	-2599.7
Quebec-Windsor, Dorval, 200K	-4243.7	-936.8	-3306.9
Toronto-Montreal, Mirabel, 300K	-2173.0	-620.2	-1552.8
Toronto-Montreal, Dorval, 300K	-1904.8	-636.0	-1268.8
Toronto-Montreal, Dorval, 200K	-2348.0	-542.0	-1806.1

3.4 HSR-Related Exports

The final category of potentially significant direct effects on economic activity lies in exports that may be argued to result from the experience gained by domestic firms that are associated with constructing and operating the HSR in Canada. Table 9 indicates the cumulated direct effects that are assumed to occur. As this documents, the amounts are modest. It is also notable that the study presumes that positive implications are larger as a consequence of experience gained in the 200K options than in the 300K options. The scale of the difference, however, is not large, considering other direct effects on economic activity.

Table 9
High Speed Rail Incremental Export Assumptions, Canada
(Cumulated Changes in \$86 Mns)

	95-2020	95-2003	2004-2020
Quebec-Windsor, Mirabel, 300K	201.1	60.3	140.8
Quebec-Windsor, Dorval, 300K	201.1	60.3	140.8
Quebec-Windsor, Dorval, 200K	509.9	153.0	356.9
Toronto-Montreal, Mirabel, 300K	201.1	60.3	140.8
Toronto-Montreal, Dorval, 300K	201.1	60.3	140.8
Toronto-Montreal, Dorval, 200K	509.9	153.0	356.9

3.5 Macroeconomic Considerations

Given the essential demand-neutral nature of the direct effects, the budget-neutral assumptions underlying government financing assistance to HSR, and little *ex ante* indication of relative price effects, we have taken the view that there should be no effect on nominal interest rates or exchange rates. Thus, these are maintained at Base Case levels.

Government spending and revenues are endogenous in TIM, and these elements of the model have been allowed to follow model-normal responses to the impact of HSR. Of special concern, it should be noted that changes in unemployment insurance payments occasioned by HSR and related activity are reflected, with short lags, in compensating adjustments in employer and employee contribution rates to keep the "fund" in balance over the longer term.

4 Results

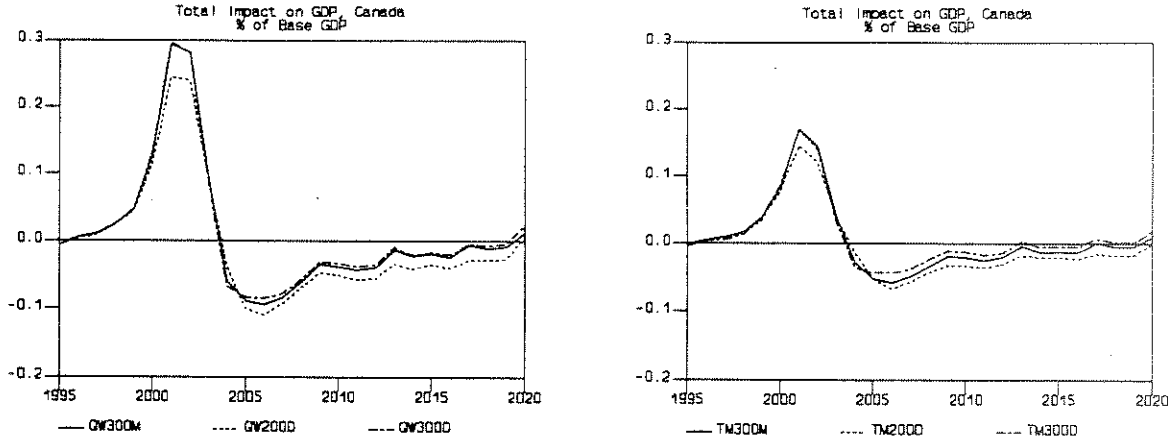
4.1 National

4.1.1 Major Indicators

Appendix F reports year-by-year impacts, in level form, for major macroeconomic indicators, for each of the six impact scenario. Appendix G provides the equivalent tabulations, in per cent impact form, to describe the extent to which impacts are proportionately large or small. For this proportional view of the impact, the Appendix reports results only for QW300M, QW200D, and QW300D to distinguish impacts by length of the line, and speed of the trains.

Figure 4 graphically displays the impacts of all cases as annual per cent impacts in total real GDP (at Factor Cost). This indicates persistent positive effects on output through 2003, and regardless of speed or length, with initially significant negative effects immediately thereafter. These negative effects persist, but with diminishing force until 2020, at which time the economy is returned to, or slightly above Base Case levels. Reference to Figure 1 provided early in this report will indicate that the pattern of positive and negative effects mirrors that of the assumptions. Reference to the scales of Figures 1 and 4 will indicate that modest multipliers are also affecting these results.

Figure 4



Other salient features that emerge from the detailed results are as follows.

- Overall, government balances are improved. Federal balances are improved throughout the impact period; Provincial balances are improved during the investment phase, but are typically worsened by small margins after 2003. From the point-of-view of bond markets, balance improvements for

municipalities (net of effects on hospitals) would partly offset the negative effect on provincial balances.

- The current account balance should worsen initially, given the large shock to domestic final demand, but following the middle part of the next decade, the balance is improved notably, given the persistent reduction in demand, much of which is concentrated in import-intensive reduction in government requirements for machinery and equipment.
- There are no notable implications for aggregate unit costs, or prices.
- As Figure 5 displays, employment mirrors the output effects, with positive effects recorded in 1995-2003, and negative effects registered from 2004 through 2019, after which Base Case employment is approximately restored.

Figure 5

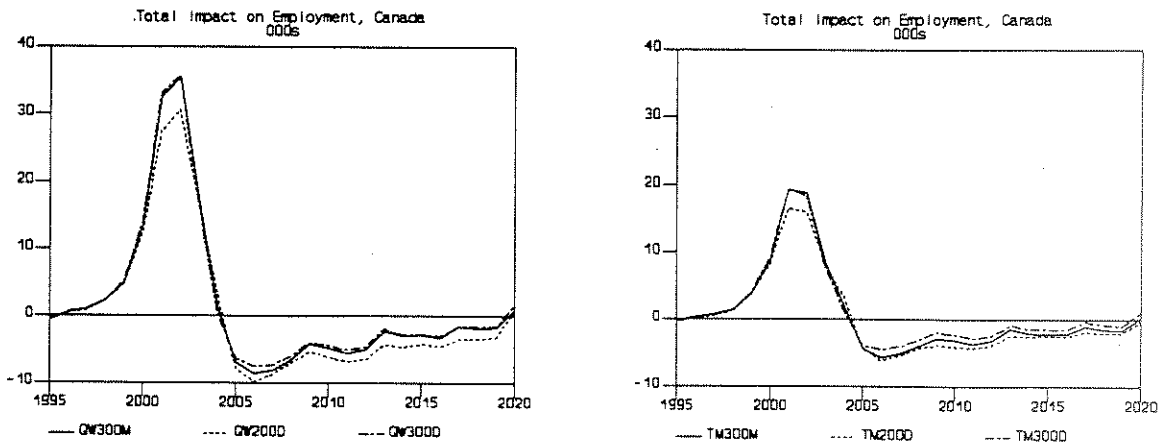


Table 10 summarizes the cumulative effects for total output and employment for each of the six cases.

Table 10
High Speed Rail Results, Canada
(Cumulated Changes)

	1995-20	1995-03	2004-20
	Levels		
Total GDP at Factor Cost (\$86 Mns)			
Quebec-Windsor, Mirabel, 300K	927.9	5776.3	-4848.4
Quebec-Windsor, Dorval, 300K	1570.8	5800.9	-4230.1
Quebec-Windsor, Dorval, 200K	-1632.0	5067.3	-6699.3
Toronto-Montreal, Mirabel, 300K	682.7	3342.2	-2659.5
Toronto-Montreal, Dorval, 300K	1669.9	3178.7	-1508.8
Toronto-Montreal, Dorval, 200K	-1039.6	2858.5	-3898.1
Total Employment (000s)			
Quebec-Windsor, Mirabel, 300K	43.7	107.6	-63.8
Quebec-Windsor, Dorval, 300K	51.6	108.9	-57.2
Quebec-Windsor, Dorval, 200K	14.6	95.5	-81.0
Toronto-Montreal, Mirabel, 300K	20.7	62.0	-41.3
Toronto-Montreal, Dorval, 300K	32.0	61.1	-29.0
Toronto-Montreal, Dorval, 200K	6.7	54.7	-47.9

4.1.2 Final Demand Detail

Table 11 reports the final demand effects of HSR and associated impacts, using basic aggregates for the components of GDP. We report the impact here for QW300M as an illustrative example of impacts on demand.

Table 11
Final Demand: Canada
(Millions of \$86)
QW300M

	1995-20	1995-03	2004-20
	Average Impact		
Consumption expenditure	69.0	193.0	3.3
Government expenditure	-619.2	-378.1	-746.8
Business investment	450.0	936.7	192.2
Residential	0.0	1.7	-0.9
Nonresidential construction	195.7	508.1	30.3
Machinery & equipment	254.2	427.0	162.8
Inventory change	0.1	31.0	-16.2
Net exports	22.5	-192.2	136.2
Exports (+)	-14.7	34.0	-40.4
Imports (-)	-37.2	226.2	-176.6
Gross Domestic Product	-77.6	590.3	-431.2
Nonresident Invest. Income			
Receipts (+)	-5.2	1.3	-8.7
Payments (-)	-17.7	35.6	-45.9
Gross National Product	-65.1	556.1	-394.0
Final Domestic Demand	-100.3	751.6	-551.2

This illustrates the influences of HSR and related events. Dominating the impact is increased business investment, which following 2003 is concentrated in machinery and equipment. Offsetting this positive effect, is the dominating influence of reduced government capital formation, which represents a mixture of nonresidential investment, but also notable spending for machinery and equipment. Given this, and induced negative effects on real incomes following 2003, imports are notably reduced to produce an improvement in real net exports.

Under circumstances of a modest improvement in real incomes in 1995-2003, consumer spending is increased, but following that period, there is little change from the Base Case in total consumption. With essentially neutral effects on household

incomes, and little change in nominal or real interest rates, spending on housing is expected to be little changed.

Table 12 reports cumulated effects for all six impact scenarios for the incomes and major spending of the household and business sectors. Real disposable income of households is initially increased through employment and productivity gains, but following 2003, is typically reduced through reduced employment and general economic activity. Real consumption holds up, however, implying a decline in the personal savings rate, and some influence from "consumer surplus" as households divert income from savings to "enjoy" a "higher quality" transportation service.

Table 12
Household and Business Results, Canada
(Cumulated Changes)

	95-2020	95-2003	2004-2020
Personal Disposable Income (\$86 Mns)			
Quebec-Windsor, Mirabel 300K	-2027.2	2544.3	-4571.5
Quebec-Windsor, Dorval 300K	-2077.7	2589.3	-4667.0
Quebec-Windsor, Dorval 200K	-1279.9	2271.4	-3551.3
Toronto-Montreal, Mirabel 300K	-615.6	1446.1	-2061.7
Toronto-Montreal, Dorval 300K	-590.8	1416.9	-2007.7
Toronto-Montreal, Dorval 200K	-215.2	1272.3	-1487.5
Personal Consumption (\$86 Mns)			
Quebec-Windsor, Mirabel 300K	1793.6	1737.1	56.5
Quebec-Windsor, Dorval 300K	2301.0	1766.8	534.3
Quebec-Windsor, Dorval 200K	986.7	1555.8	-569.1
Toronto-Montreal, Mirabel 300K	1062.2	979.6	82.6
Toronto-Montreal, Dorval 300K	1471.3	965.7	505.6
Toronto-Montreal, Dorval 200K	499.6	869.9	-370.3
Pre-Tax Corporate Profits (\$C Mns)			
Quebec-Windsor, Mirabel 300K	-1574.5	1744.1	-3318.6
Quebec-Windsor, Dorval 300K	-317.5	1842.7	-2160.2
Quebec-Windsor, Dorval 200K	-3606.7	1577.8	-5184.5
Toronto-Montreal, Mirabel 300K	-1007.6	952.1	-1959.7
Toronto-Montreal, Dorval 300K	-11.1	994.2	-1005.3
Toronto-Montreal, Dorval 200K	-2332.8	901.0	-3233.8
Business Investment (\$86 Mns)			
Quebec-Windsor, Mirabel 300K	11930.4	8537.6	3392.8
Quebec-Windsor, Dorval 300K	12238.2	8688.5	3549.7
Quebec-Windsor, Dorval 200K	10363.9	7560.7	2803.2
Toronto-Montreal, Mirabel 300K	6772.8	4937.5	1835.4
Toronto-Montreal, Dorval 300K	6929.6	4940.1	1989.5
Toronto-Montreal, Dorval 200K	5914.4	4289.8	1624.6

Overall pre-tax corporate profits are reduced in nominal and real terms, but business savings is notably increased, and with increased capital consumption allowances directly from the net effects of HSR and other mode impacts on capital formation of business, a notable and persistent increase in business capital formation results. It may be noted that the cumulated business investment reported in Table 12 is 25-30 per cent higher than the sum of the direct business investment effects reported in Table 5. This induced capital deepening of the general economy is reflected in generally higher labour productivity results in all cases.

Finally, Table 13 reports the same impact and information as Table 10, but indicates the extent to which the components of demand are changed proportionately. A quick review of this indicates a single message. For the QW300M case (a relatively large impact compared to most other options), the HSR will represent a minor impact on any year's activity in the Canadian context. That is, the HSR cannot fundamentally alter prospects in the Canadian economy.

Table 13
Final Demand: Canada
(Millions of \$86)
QW300M

	1995-20	1995-03	2004-20
	Average % Impact		
Consumption expenditure	0.0	0.0	0.0
Government expenditure	-0.4	-0.3	-0.4
Business investment	0.2	0.6	0.1
Residential	0.0	0.0	0.0
Nonresidential construction	0.5	1.4	0.1
Machinery & equipment	0.2	0.6	0.1
Exports (+)	0.0	0.0	0.0
Imports (-)	0.0	0.1	0.0
Gross Domestic Product	0.0	0.1	0.0
Nonresident Invest. Income			
Receipts (+)	0.0	0.0	-0.1
Payments (-)	-0.1	0.1	-0.1
Gross National Product	0.0	0.1	0.0
Final Domestic Demand	0.0	0.1	-0.1

4.1.3 Production and Employment, Sectoral Detail

Table 14 provides a summary of the sectoral implications, using QW300M as a representative illustration. This is presented in dollar impact form to facilitate comparison across industries. Appendix G provides more detail, for each year, and for each impact scenario.

Table 14
Gross Domestic Product by Industry
Millions of 1986 Constant Dollars
QW300M

	1995-20	1995-03	2004-20
	Average Impact		
Total - Gross Domestic Product Business + Nonbusiness	36	642	-285
RESOURCE-BASED GOODS	25	114	-22
Food, Beverage and Tobacco	0	16	-8
Wood and Paper	-1	9	-7
Energy	12	19	8
Chemicals & Chemical Products	0	19	-9
Metallic Minerals and Products	13	50	-6
DURABLE AND INVESTMENT GOODS	55	296	-73
Machinery and Eqpt. (Nonelectrical)	13	22	8
Transportation Eqpt.	21	35	13
Electrical and Electronic Components	-6	54	-38
Construction and Related Activities	27	184	-56
BUSINESS-RELATED SERVICES	130	145	122
Transportation Services	101	15	146
Communications	25	59	7
Finance and Insurance	1	27	-12
General Services to Business	3	44	-18
GOVERNMENT & SOCIAL SERVICES	-160	-19	-235
CONSUMER GOODS AND SERVICES	-15	106	-79
Accommodation, Restaurants & Recreation	-3	12	-11
Wholesale and Retail Trade	-5	80	-49
Other Consumer Goods and Services	-6	15	-17
Imputed Rent On Owner Occupied Dwellings	-1	0	-1

As this summary view indicates, almost one-half of the increase in aggregate economic activity during the main investment phase (1995-2003) should be

concentrated in the industries that produce investment goods, and construction services. Positive effects, however, are widespread across industries during that period, with significant additions also for producers of metallic products, telecommunications carriers, professional services (where much of the HSR design work and electronic equipment manufacturing industry are Quebec: 49.95 per cent, would be undertaken), and wholesale trade.

Post 2003, while railway passenger traffic is building, but also during a prolonged period when reduced government capital formation is in place, negative effects are widespread across industries. Notable exceptions include manufacturers of railway rolling stock to supply continuing equipment to HSR, and producers of electric power. Additional resources required to supply the expanded rail operations are more than sufficient to compensate for reduced resources required by airlines and other transportation services, and the transportation service sector, as a whole, increases in size. Despite HSR-related increases in exports, and continuing HSR investment that requires electrical and electronic components, activity in the electrical products industry is reduced because of generally reduced demand, and lower government capital requirements for such products.

Reduced GDP, or real value added, in the government sector is explained wholly by declining depreciations allowances, which reflects the cut back in government capital formation. Excluding this effect, real activity in the public sectors is changed by only small amounts.

Reference to the pattern of impacts displayed in Figure 4 will indicate that the averages reported in Table 14 mask larger-than average reductions in the years immediately following 2003, and much smaller negative effects as 2020 is approached. In that year, output in most industries has approximately returned to Base Case levels so that there is no lasting or "permanent" effect on prospects for most industries. Those effects that can be described as permanent include a substitution of rail for air transportation, and modest continuing improvement in prospects for manufacturers of rolling stock. There should also be lasting positive effects for electric power, telecommunications carriers, and electrical products, but these effects, compared to the scale those industries should achieve by that time, will be minute.

Table 15 reports employment impacts, by sector, and again for QW300M as a representative illustration. As this suggests, and as is reflected in Figure 5, positive employment effects can be expected only for the main investment phase, with general reductions after that time.

Further, as the tabulation reports, employment effects will be largest in those parts of the economy that supply investment services and goods to the HSR investment. The largest gains are concentrated in construction, manufacturing of metallic and electrical products, business services and wholesale trade. Other indirect effects, and

Table 15
Employment, Establishment Basis
(Thousands of Person-Years)
QW300M

	1995-20	1995-03	2004-20
	Average Impact		
Total - Employment Business + Nonbusiness	1.7	12.0 *	-3.8
RESOURCE-BASED GOODS	0.2	1.2	-0.3
Food, beverage & tobacco	0.0	0.3	-0.2
Wood & paper	0.0	0.1	-0.1
Energy	0.0	0.1	0.0
Chemicals & chemical products	0.0	0.1	0.0
Metallic minerals & products	0.2	0.6	-0.1
DURABLE AND INVESTMENT GOODS	1.0	5.6	-1.4
Machinery and eqpt. (nonelectrical)	0.2	0.2	0.1
Transportation eqpt.	0.0	0.3	-0.2
Electrical & electronic components	0.1	0.6	-0.2
Construction & related activities	0.8	4.4	-1.1
BUSINESS-RELATED SERVICES	0.4	2.5	-0.6
Transportation services	0.1	0.4	0.0
Communications	0.1	0.4	0.0
Finance & insurance	0.1	0.2	0.0
General services to business	0.1	1.5	-0.6
GOVERNMENT & SOCIAL SERVICES	0.1	0.0	0.1
CONSUMER GOODS AND SERVICES	-0.1	2.6	-1.5
Accommodation, restaurants & recreation	-0.2	0.7	-0.7
Wholesale and retail trade	0.1	1.2	-0.5
Other consumer goods & services	0.1	0.7	-0.3

induced general expansion in demand, spread employment benefits across most other industries, as well.

Post-1993, negative employment effects are also generalized, Again, we note that these averages mask stronger negative effects early after 2003, with overall employment, and that in most all sectors, returning to Base Case levels. In short, there are no significant, permanent employment effects outside of some substitution of airline employment towards that in rail transportation.

In the following several sections, we report on industries of special interest because they either supply HSR-related activities, or are otherwise affected positively or negatively. Appendix I provides details for the QW300M case as illustrative, and representative.

4.1.3.1 Construction

As Table 14 has reported, the construction industry enjoys the single-largest increase of any industry in the economy over 1995-2003. This, however, reflects notable tradeoffs between increased production for the construction of the HSR, and reduced other forms of construction.

Real output and employment in the Railway, Telephone and Telegraph Construction Industry (SIC 4010-4490) is increased by an average one-fifth during the main construction phase. This follows dominantly from HSR investment, but also reflects small positive induced effects from increased investment in other industries (e.g., telecommunications carriers). Reduced government capital formation would adversely affect this industry, but by small amounts during the main construction phase. Following 2003, the scale of activity in the industry returns to Base Case levels, approximately.

It should be noted that we have assumed that the surge in new activity does not lead to undue increases in labour compensation rates, or in returns to capital among the supplying firms. Experience with other mega-projects suggest this assumption could be at risk, but given a firm prior commitment to undertake the project, that experience, and proper forward planning may be sufficient to yield the assumption we have made.

Activity in the Other Engineering Construction Industry should also be increased through HSR spending, but the scale of the impact is modest, averaging about one per cent annually during the main construction phase. This industry would also be significantly affected adversely by reduced government capital formation, which serves to limit net gains during 1995-2003. Following that period, continuing reductions in government capital formation, and limited HSR investment in infrastructure reduces activity in this industry to below Base Case amounts, but by only small amounts.

The construction industry most likely to be adversely affected is the Road, Highway and Airstrip Construction industry. This follows principally from reduced provincial capital spending, and post-2003, from induced reductions of other investment. We expect that output of the industry would be reduced by about 1.5 per cent over most of the next 25 years.

4.1.3.2 Other Investment-Related Industries

For the Iron and Steel industry (SIC 2910, 2920, 2940), HSR-related investment during 1995-2003 represents a notable, indirect increase in its demand, but aggregate output in the industry is increased by an average of only 0.3 per cent during that period. Following 2003, output returns to Base Case amounts.

Fabricated Metals producers (SIC 3010-3090) are also indirectly affected by HSR investment, and as is true for the iron and steel industry, should enjoy benefits of investment that is induced in other industries during 1995-2003. Still, the positive impact on output in this industry is modest, averaging 0.3 per cent during the main investment phase. Output returns to Base Case amounts following 2003.

Investment in HSR equipment, and indirectly through elements of the infrastructure program, will increase demands for production from Nonagricultural Machinery (SIC 3120, 3190). Output is increased by an average 0.5 per cent over 1995-2003, with a small residual positive effect over the longer term from continuing investment in HSR equipment.

Impacts on producers of the HSR rolling stock will, of course, be significant. Still, we estimate that real output of the Railroad Rolling Stock Industry (SIC 3260) will be increased on average by a modest 3 per cent in 1995-2003, and by about 2 per cent following that period. It should be noted that our results assume there is no surge in labour compensation, or return to capital rates.

Safety and other considerations imply a notable requirement in the HSR for high-technology electrical and electronic equipment. On the other hand, reduced federal and provincial spending on equipment includes a notable component that is typically supplied by the same industry. Accordingly, we find that output in Electronic Equipment industry (SIC 3350) is likely to increase only modestly (less than one per cent) over 1995-2003. Following that, sustained reductions in government capital formation are more than sufficient to offset continuing HSR investment in equipment, and output is reduced by 0.3 per cent below Base Case levels over 2004-2020.

Producers of Communications and Energy Wire and Cable (SIC3380) should be indirectly affected in significant form from HSR investment. We estimate that output will be increased by an average of more than one per cent over 1995-2003, followed by a return of output to Base Case levels.

In dollar terms, we anticipate that HSR requirements for architectural, engineering and other service inputs should represent a significant increase in demand for Professional Business Services (SIC 7730, 7750, 7760). The industry, however, is large, and the scale of the impact is accordingly small, averaging 0.2 per cent over 1995-2003. Following the main investment phase, output returns to, or slightly below,

Base Case levels. Reduced government investment in nonresidential buildings and other engineering projects will adversely affect professional services indirectly during that period.

Wholesale trade services (SIC 5010-5990) are typically an important industry indirectly affected by large construction projects. The industry is large, however, and we anticipate no more than a 0.1 per cent increase in output over 1995-2003. Generally reduced demand yields a reduction from the Base Case of the same magnitude during 2004-2020.

Finally, we note impacts on Telecommunications Carriers (SIC 4820, 4830). Induced demand effects during the construction phase should improve prospects for this industry, and we estimate output would be increased by an average 0.2 per cent over 1995-2003. During the operations phase, induced effects are generally negative, but there is a notable requirement for such services by rail carriers, and the expanding HSR generates a sustained positive effect on the industry's output. Net of these competing considerations, we estimate that the industry output would be largely unchanged over the longer term.

4.1.3.3 Rail Transportation

From the stand point of passenger transportation, the HSR represents a strategic re-direction of the rail industry. From the broader stand point of the railways (SIC 4530), the impact on their operations is more modest, and delayed, of course, until the middle of the first decade in the next Century. Averaged over 2004-2020, we estimate that total railway output will be increased by an annual average of 4 per cent, but from 2010, forward, the increase is approaching 5 per cent. Employment is also increased, but by more modest amounts, suggesting that HSR labour would be more "productive" than our estimate of the average of the railways taken as a whole. This yields a reduction in average industry unit labour costs, but price estimates from other studies have been employed to yield a more than 50 per cent increase in consumer prices. Unit capital costs and real returns to capital are reduced.

4.1.3.4 Air Transportation

We find that the adverse impacts on the Air Transport and Incidental Services Industry (SIC 4510, 4520) would yield an average annual reduction in output of a little more than 2.5 per cent. This follows directly from assumptions about passenger displacement, but also during that period, from induced demands under circumstances of a generally reduced general economy.

It should be noted that the reduced investment in equipment of the airline industry has little consequential affect on domestic producers of aircraft, as we have assumed that approximately 90 per cent of this reduced spending falls on imports. We also have taken the view that "offset" implications do not affect domestic production. That is, for example, reduced purchases of aircraft from the U.S., do not lead to significant reductions in Canadian supplied "offset" parts. We recognize that this assumption may be at risk, but it should also be recognized that much of this impact would fall in the distant future when "offset" arrangements within the aircraft industry may be quite distinct from those that prevail today. Also, it should be noted that the amounts involved would have no significant effect on the character of our national or provincial results.

On the other hand, it should be recognized that the 2.5 per cent reduction of total-Canada air service output is concentrated in a core area, so that the significance to operations in that area (which we do not estimate) would be larger. Further, as we have followed the results of the Other Modes study, we assume there are no significant effects on the relative prices of air carriers, who may or may not move to meet HSR competition through reduced fares. In any event, these considerations suggest that carriers operating in the core would be notably affected adversely.

4.1.3.5 Tourism

The Passenger study indicated no identifiable effect on foreign passengers using the HSR simply because it was there. Considering that operations will not begin for another decade, and that other locations on the Continent could have developed "competing" modes of equivalent attraction by that time, this seems an appropriate, and prudent assumption.

This "special" consideration aside, effects on "tourism" should then rest on general determinants of the demand for such services - real incomes, and relative Canadian costs/prices. These, and the effects on the industries that could be described as elements of the "tourism" sector are reported in Table 16.

As Table 16 indicates, general costs of production in Canada, and price consequences, are essentially unchanged. Thus, relative prices of Canada, with the US and other foreign travel markets, are unchanged. In consequence, there is little reason to expect that general conditions affecting foreigners travelling to Canada, or Canadians travelling abroad, would be changed. Our results for net foreign travel reflect this.

This being the case, impacts on industries typically classified as elements of the tourism sector will depend on implications for the real incomes of households, and business use of such facilities as intermediate inputs to production. As Table 16

Table 16
Tourism Indicators
QW300M

	1995-20	1995-03	2004-20
	Average % Impact		
General Determinants			
GDP Deflator	0.04	-0.03	0.08
Unit Labour Costs	0.04	-0.03	0.07
Real Disposable Income, Households	-0.02	0.07	-0.05
Personal Sector Consumption of:			
Recreational Services	0.01	0.06	-0.02
Restaurants and Hotels	0.00	0.11	-0.05
Travel, Net Foreign Trade (\$86, Mns) (a)	0.00	0.00	0.00
Gross Domestic Product, (\$86, Mns)			
Food and Accommodation	-0.02	0.07	-0.06
Recreation and Amusement	0.00	0.07	-0.03
Urban Transit	0.01	0.00	0.01
Taxicabs	-0.01	0.09	-0.04
Retail Trade	-0.01	0.08	-0.04

(a) Average Level Impact

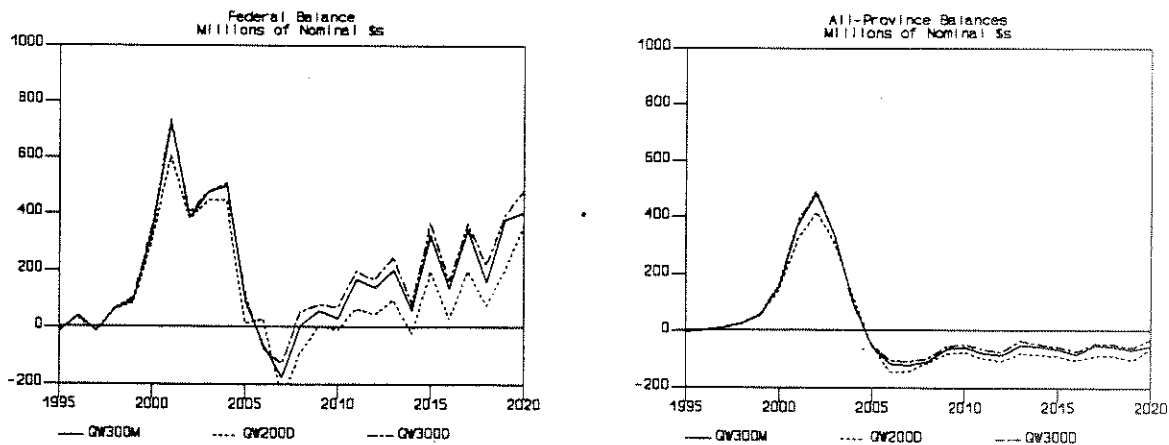
indicates, impacts on disposable income are positive in small degree during the main investment phase, and negative during most of the operations phase. Consumer demand for "tourism" types of services tends to be income elastic, so that demands from this source are slightly reinforced, but as Table 16 reports, household spending for food-away-from home, accommodation for travel, and a wide range of recreational services is changed by only small margins.

Given these effects on household demands, little change to government current spending for operations, and only small changes in overall business production, prospects for the tourism industries is changed by only small amounts over the 25 years assessed. In summary then, there is nothing to indicate special significance to the tourism industry overall, the "competitiveness" of Canadian tourism is not altered, and effects following from income-induced spending are also little changed. In short, HSR has no significant impact on the Canadian industry.

4.1.4 Government Balances

Figure 6 displays likely consequences for the balance of the federal government, and all provinces combined. As this suggests, the implications for the federal government are generally positive, with a short period of negative effects when real output, and tax bases, are most inimically affected by reductions of capital spending in the middle of the next decade. Table 17 provides cumulative effects on balances for all scenarios, and includes total public sector effects, which include implications for municipalities, the hospital system, and public pension plans in addition to implications for the federal and provincial governments.

Figure 6



The stronger positive effects on the federal, than on provincial, balances reflects one implication of HSR-related direct impacts, some subtle distinctions in year-to-year changes of balance performance, and the cumulative effects of debt and interest payments. Given the 50-50 split in financing between the federal and provincial governments, capital expenditure reductions are roughly equivalent, and depreciation considerations are neutralized in the calculation of lending balances.

The major distinction lies in the fact that federal expenditures are reduced substantially through elimination of the subsidies to VIA and the airlines, where provincial subsidies to business are little changed. Two other distinction emerge in the early years of the impact, moreover. For both levels of government, transfers to persons are reduced through, for example, UI payments of the federal government, and welfare payments of the provincial governments. And although the balance effect of this on the federal government is partially neutralized through reduced UI contributions of employers and employees, the net effect in the personal transfer system is stronger for the federal than the provincial governments.

Secondly, transfers from the federal government to provinces and other public systems are reduced, while those of the provinces are increased. For the federal

Table 17
Government Balances
(Millions of Nominal Dollars)
QW300M

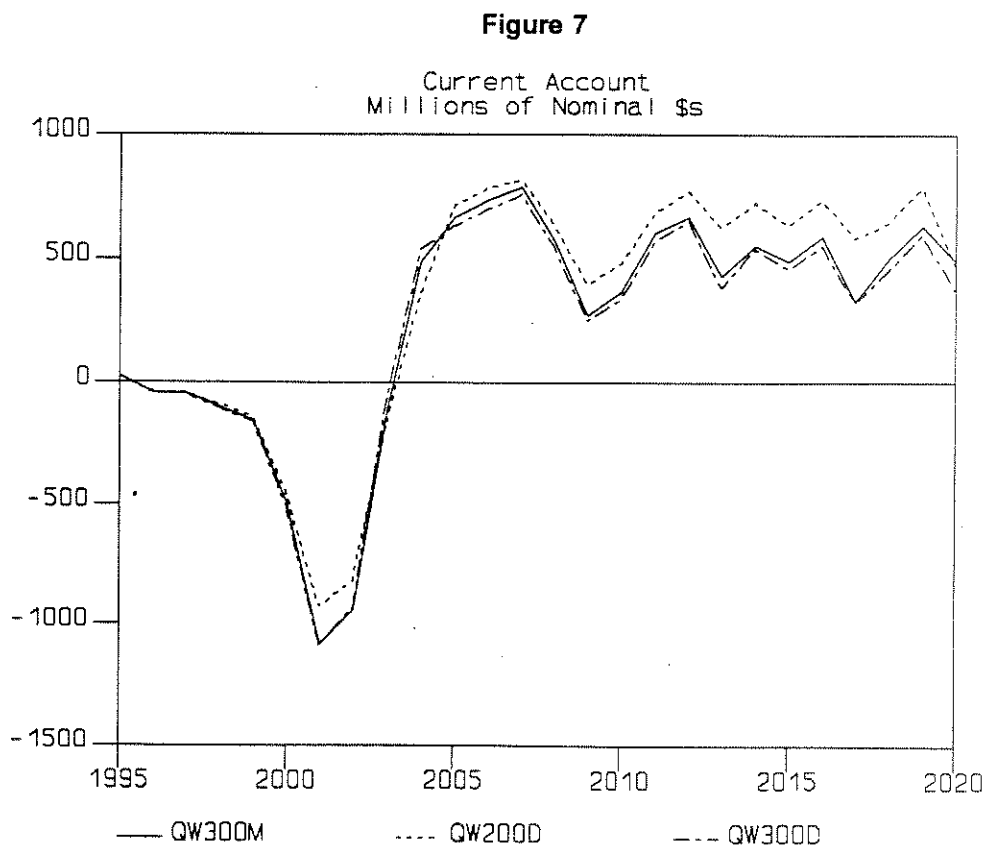
	1995-20	1995-03	2004-20
	Average Impact		
Public Sector Balance (\$C Mns)			
Quebec-Windsor, Mirabel, 300K	6575.4	4057.0	2518.4
Quebec-Windsor, Dorval, 300K	7524.0	4160.4	3363.6
Quebec-Windsor, Dorval, 200K	4271.7	3643.1	628.6
Toronto-Montreal, Mirabel, 300K	3781.6	2388.4	1393.2
Toronto-Montreal, Dorval, 300K	4879.9	2413.9	2466.0
Toronto-Montreal, Dorval, 200K	2725.2	2164.6	560.7
Federal Balance (\$C Mns)			
Quebec-Windsor, Mirabel, 300K	4877.1	2090.8	2786.3
Quebec-Windsor, Dorval, 300K	5512.1	2147.4	3364.6
Quebec-Windsor, Dorval, 200K	3320.6	1895.8	1424.8
Toronto-Montreal, Mirabel, 300K	2786.0	1245.3	1540.7
Toronto-Montreal, Dorval, 300K	3559.2	1266.6	2292.6
Toronto-Montreal, Dorval, 200K	2089.7	1145.7	944.0
All-Provincial Balance (\$C Mns)			
Quebec-Windsor, Mirabel, 300K	369.8	1425.6	-1055.8
Quebec-Windsor, Dorval, 300K	586.2	1458.9	-872.6
Quebec-Windsor, Dorval, 200K	-95.3	1268.7	-1363.9
Toronto-Montreal, Mirabel, 300K	150.8	823.2	-672.4
Toronto-Montreal, Dorval, 300K	357.2	826.6	-469.4
Toronto-Montreal, Dorval, 200K	-62.9	735.3	-798.3

government, a reduced business and inter-governmental transfer system implies reduced requirements for employees and purchased goods and services to administer the programs. For the provinces, these administrative expenses are largely unchanged, or slightly increased.

These early differences, and continuing benefits to the federal government of eliminated VIA benefits, reduce its stock of debt more quickly than that of the provincial governments. Accordingly, the main distinction in results is accounted for by differences in interest costs. In the QW300M case, federal interest payments are cumulatively reduced over 1995-2003 by \$3.3 billion. The provincial measure of this benefit is \$0.8 billion.

4.1.5 Foreign Borrowing

Figure 7 provides a representative view of impacts on the Current Account balance; Table 18 provides an all-scenario view of cumulated impacts.



As this suggests, the increase in domestic demand during 1995-2003 yields an increase in the current account deficit as both indirect and induced demand effects increase imports. Cumulatively, the merchandise balance in the QW300M case is worsened by \$2.1 billion over 1995-2003, and the services balance, by \$0.5 billion. Following that period, reduced domestic demand (largely reflecting the effects of continuing reductions in government capital formation) produces reduced imports and a cumulative improvement in the merchandise trade balance over 2004-2020 of \$3.4 billion.

During this "operational" phase, the services balance is also improved by reduced imports stemming from reduced activity in the economy. That balance, however, is also significantly improved by an increase in nominal-dollar exports of "travel" services. We have assumed there are no "real" benefits in the form of additional foreigners travelling on the Canadian railways, but those that do pay, as do Canadian

consumers, pay a higher price for the service. As travel service exports include some rail transportation content, and as we are assuming there is no price sensitivity for foreign users of the system, this added price adds significantly to nominally-denominated export earnings. Cumulated over 2004-2020, the balance in the services account is improved by \$4.7 billion.

Finally, although increased foreign borrowing in the early years leads to higher interest and other income payments to foreigners, cumulated benefits of an improved balance after 2004 finally lead to reduced Canadian interest and other income payments to foreigners. Over 1995-2020, such payments are reduced by almost \$300 million.

Table 18
Current Account Balance
(Millions of Nominal Dollars)
QW300M

	1995-20	1995-03	2004-20
	Average Impact		
Quebec-Windsor, Mirabel, 300K	6233.1	-2945.1	9178.2
Quebec-Windsor, Dorval, 300K	5800.0	-2909.6	8709.6
Quebec-Windsor, Dorval, 200K	8260.4	-2617.3	10877.7
Toronto-Montreal, Mirabel, 300K	4217.5	-1629.9	5847.5
Toronto-Montreal, Dorval, 300K	3982.0	-1627.2	5609.2
Toronto-Montreal, Dorval, 200K	5435.9	-1353.5	6789.4

4.2 Provincial

4.2.1 Overview

The implications of the HSR alternatives for Quebec and Ontario, and for the rest-of-Canada are summarized in Tables 20 and 21. The impact on provincial activity from the construction and operation of high speed rail is report in Appendixes J (Across-Province Indicator Tables, levels), K (Across-Province Indicator Tables, per cent), and L (By-Province, Production and Employment) for all 6 options.

During the investment phase (1995-2003), aggregate output and employment effects are positive across all parts of the country, and for each of the scenarios. The impacts during this period are concentrated in Quebec and Ontario. For those two provinces, the aggregate output impacts are modest, averaging approximately 0.15 per cent over the nine years for the largest alternatives (300K options for Quebec to Windsor), and approximately 0.1 per cent, or less, for the other options. Impacts,

Table 19
Gross Domestic Product
Millions of 1986 Dollars

	95-03	95-03	04-20	04-20	95-20	95-20
	Cumltd Impact	Av %Imp	Cumltd Impact	Av %Imp	Cumltd Impact	Av %Imp
QW300M						
Quebec	1718.1	0.14	-407.8	-0.01	1310.2	0.03
Ontario	3386.9	0.15	-2177.7	-0.04	1209.2	0.01
Rest-of-Canada	671.3	0.03	-2262.8	-0.04	-1591.5	-0.02
QW300D						
Quebec	1609.6	0.13	-219.2	-0.01	1390.4	0.03
Ontario	3482.8	0.15	-1841.5	-0.03	1641.3	0.02
Rest-of-Canada	708.5	0.03	-2169.4	-0.04	-1460.9	-0.02
QW200D						
Quebec	1494.1	0.12	-1091.2	-0.04	402.9	0.01
Ontario	2940.3	0.13	-2872.3	-0.05	68.0	0.00
Rest-of-Canada	632.9	0.03	-2735.8	-0.05	-2102.9	-0.03
TM300M						
Quebec	918.8	0.07	-222.9	-0.01	695.9	0.02
Ontario	2008.0	0.09	-1134.7	-0.02	873.3	0.01
Rest-of-Canada	415.4	0.02	-1301.8	-0.03	-886.5	-0.01
TM300D						
Quebec	727.0	0.06	77.2	0.00	804.1	0.02
Ontario	2056.1	0.09	-517.9	-0.01	1538.3	0.02
Rest-of-Canada	395.6	0.02	-1068.1	-0.02	-672.6	-0.01
TM200D						
Quebec	761.8	0.06	-547.4	-0.02	214.4	0.00
Ontario	1746.1	0.08	-1921.1	-0.03	-175.0	0.00
Rest-of-Canada	350.6	0.02	-1429.6	-0.03	-1079.0	-0.02

although positive, are proportionately small in the rest of the country, averaging 0.02-0.03 per cent.

There is a roughly symmetrical effect during the operations phase (2004-2020). Impacts are generally negative across all provinces, with the exception of 300K options that pass through Dorval, in which cases, cumulated output effects in Quebec are close to neutral. As between Quebec and Ontario, the somewhat larger negative effects in Ontario are traceable in large measure to the fact that reductions in air and other-mode transportation services are larger absolutely and proportionately than in Quebec. Further, production in Ontario is somewhat more sensitive to induced negative effects from a generalized reduction in incomes across the country. On the whole, however, we regard the distinctions between the two provinces during the operations phase to be minor.

Table 20
Employment
Thousands

	95-03	95-03	04-20	04-20	95-20	95-20
	Cumlt'd Impact	Av %Imp	Cumlt'd Impact	Av %Imp	Cumlt'd Impact	Av %Imp
QW300M						
Quebec	33.8	0.12	-15.2	-0.03	18.6	0.02
Ontario	59.7	0.12	-29.7	-0.03	30.1	0.02
Rest-of-Canada	14.0	0.03	-18.9	-0.02	-4.9	0.00
QW300D						
Quebec	31.8	0.11	-12.4	-0.02	19.4	0.02
Ontario	61.8	0.13	-26.7	-0.02	35.0	0.02
Rest-of-Canada	15.3	0.03	-18.2	-0.02	-2.8	0.00
QW200D						
Quebec	29.4	0.11	-20.9	-0.04	8.5	0.01
Ontario	52.4	0.11	-32.3	-0.03	20.1	0.01
Rest-of-Canada	13.7	0.03	-27.7	-0.03	-14.0	-0.01
TM300M						
Quebec	17.5	0.06	-10.2	-0.02	7.3	0.01
Ontario	35.4	0.07	-20.9	-0.02	14.5	0.01
Rest-of-Canada	9.1	0.02	-10.2	-0.01	-1.1	0.00
TM300D						
Quebec	14.6	0.05	-6.7	-0.01	7.9	0.01
Ontario	37.0	0.08	-15.2	-0.01	21.8	0.01
Rest-of-Canada	9.5	0.02	-7.1	-0.01	2.4	0.00
TM200D						
Quebec	15.2	0.05	-12.8	-0.02	2.4	0.00
Ontario	31.5	0.06	-23.9	-0.02	7.6	0.00
Rest-of-Canada	8.0	0.02	-11.3	-0.01	-3.3	0.00

Taking the entire impact period (1995-2020) as a measure of implications, we note that 300K options that pass through Dorval yield the strongest positive effects, given routing options. The distinctions between the Dorval and Mirabel routes are, however, minor, and are traceable in the final analysis to the slightly stronger financial performance of the Dorval options. And, in any event, it should be noted that averaged over 1995-2020, all options change the size of the provincial economies by very small proportions, and add as a maximum, an average of 1,350 to annual employment. in Quebec, and 2,400 in Ontario.

Further, in 2020, the national and provincial economies are essentially returned back to Base Case levels. There tends to be a slight positive effect in Quebec and Ontario, and for most provinces to the West of those two, but the scale of the effects is minor. In QW300D, the "largest" of the scenarios, approximately 500 are added to employment in Quebec, and a little less than 1000 are added in Ontario in 2020.

On the employment front, the impacts reported in Table 20 generally mirror the aggregate output patterns. During the investment phase, cumulated job gains range between 15,000 and 34,000 for Quebec depending on the scenario. Ontario records a range of 32,000 to 62,000 person years of additional employment over the same, 1995-2003, period. These magnitudes of employment increase are sufficient to lower the unemployment rates in both provinces by 0.1-0.2 percentage points, and yield proportionate employment impacts that range only as high as a little more than 0.2 per cent. We note further that the positive impacts in Quebec and Ontario are highly concentrated between the year 2000 and 2003, when annual averages for the 300K, Quebec-Windsor options are approximately 7,000 for Quebec, and 14,000 for Ontario.

As the employment gains during the investment phase are concentrated in Quebec and Ontario, so too are annual employment losses during the operations phase. Further, these are concentrated in the initial years of operations, roughly from 2005-2010, when reductions in investment spending associated with reallocation of government financing are strongest. Annual employment losses during this period for the Quebec-Windsor 300K options are roughly 2,000 for Quebec and 4,000 for Ontario.

Taken over the whole impact period of 1995-2020, all of the scenarios generate cumulated positive effects on employment in Quebec and Ontario, and essentially neutral or negative effects in the rest-of-Canada. As was true for output, however, we regard the effects over the period as summing to negligible, or neutral, impacts on employment in each of the provinces.

4.2.2 Investment Impacts, QW300M

Any single province in Canada is a small, open economy, which implies substantial import leakage to other provinces and foreign suppliers. Therefore, the provincial multiplier will always be less than the national one. More particularly, the small-area multiplier will be relatively low because income generated in a particular region, even if re-spent in the region, will occasion production widely in the country. For example, wages earned in New Brunswick might be spent on a car produced in Ontario or in the US. Out of the total cost of the car, only a portion of the retail and wholesale margins will remain in the province. As well, it is uncertain that corporate profits, earned in a particular region, will immediately be recycled into new spending in that area.

The character of the reported impacts is similar for each high speed rail alternative; for illustrative purposes, the following discussion focuses on Quebec-Windsor, Mirabel, 300K (QW300M).

Table 21
Detailed Investment Impacts in Provinces
(Millions of 1986 Dollars)
QW300M

	95-03	95-03	04-20	04-20	95-20	95-20
	Cumltd Impact	Av %Imp	Cumltd Impact	Av %Imp	Cumltd Impact	Av %Imp
Nonresidential Construction (Structures)						
Total						
Quebec	1178.5	1.23	-706.7	-0.31	471.8	0.15
Ontario	2117.4	1.72	-1356.2	-0.47	761.2	0.18
Rest-of-Canada	-209.6	-0.10	-802.1	-0.16	-1011.7	-0.15
Transportation						
Quebec	1484.8	137.80	147.6	5.79	1632.4	44.99
Ontario	2756.2	25.19	382.1	1.45	3138.3	8.42
Rest-of-Canada	0.0	0.00	0.0	0.00	0.0	0.00
Government						
Quebec	-381.3	-2.51	-881.1	-2.92	-1262.3	-2.79
Ontario	-736.1	-2.47	-1701.0	-2.60	-2437.2	-2.56
Rest-of-Canada	-238.0	-0.64	-550.0	-0.72	-788.0	-0.70
Other						
Quebec	75.0	0.09	26.7	0.01	101.7	0.04
Ontario	97.3	0.12	-37.3	-0.02	60.0	0.02
Rest-of-Canada	28.4	0.02	-252.1	-0.06	-223.7	-0.04
Machinery & Equipment						
Total						
Quebec	873.5	0.62	-110.4	-0.02	763.0	0.12
Ontario	1523.3	0.45	-1160.0	-0.10	363.3	0.02
Rest-of-Canada	-278.0	-0.12	-1417.4	-0.18	-1695.4	-0.17
Transportation						
Quebec	729.7	11.42	443.4	3.02	1173.1	5.57
Ontario	1288.2	16.20	833.7	4.47	2121.9	7.98
Rest-of-Canada	0.0	0.00	0.0	0.00	0.0	0.00
Government						
Quebec	-503.2	-7.46	-1493.6	-6.53	-1996.8	-6.75
Ontario	-971.4	-4.12	-2883.7	-3.27	-3855.2	-3.45
Rest-of-Canada	-314.1	-1.87	-932.4	-1.60	-1246.5	-1.66
Other						
Quebec	646.9	0.51	939.8	0.21	1586.7	0.27
Ontario	1206.5	0.40	890.1	0.09	2096.6	0.16
Rest-of-Canada	36.0	0.02	-485.0	-0.07	-448.9	-0.05

Investment activity is a dominating expenditure influence on the results. Further, as Table 21 illustrates, effects are essentially a trade-off between the positive effects of spending on the HSR (net of other-mode investments in "Transportation") and negative impacts stemming from reduced government investments (in "Government, Nonresidential"). The salient features of this are as follows.

- HSR-related investment in transportation (net of other-mode investment effects) is concentrated in Quebec and Ontario, and for the transportation industries in these two provinces, annual investment spending in 1995-2003 is a major proportionate increase beyond spending that we estimate would otherwise occur. Spending on transportation structures is fully concentrated in its effect on the construction industry activity of the two provinces. Spending for machinery and equipment is also concentrated, by assumption and through the fact that most direct and indirect effects will be delivered by manufacturers in Central Canada. Some of this spending will have indirect consequences for producers outside that region, however.
- Beyond 2003, spending on transportation structures remains positive, but modest, with continued stronger spending for rolling stock reflected in investment in machinery and equipment. Concentration of these effects on a provincial basis follow the basic rules described above for the period 1995-2003.
- Reductions in government spending for structures and for machinery and equipment begin early in the analysis, and persist throughout the impact period. Allocations of provincial reductions (one-half of the reductions in each case) between provinces vary by alternative, and are determined exogenously from financing considerations. In the QW300M case, Quebec accounts for 34.6 per cent of the provincial reductions and Ontario, 65.4 per cent. Allocation of federal reductions among provinces is similarly allocated by assumption. This distribution is scenario insensitive, and is Quebec - 21.7 per cent, Ontario - 43.2 per cent, and the rest-of-Canada - 35.1 per cent.

Combining these distributions for QW300M yields an **ex ante** distribution of the government nonresidential reductions for 1995-2003 as Quebec - 28 per cent, Ontario - 54 per cent, and the rest-of-Canada - 18 per cent. These shares are reflected in the provincial distribution of the results reported in Table 21, combining impacts on both structures and spending for machinery and equipment.

- Spending for machinery and equipment by "other" than the transportation and government sectors in 2004-2020 is positive for Quebec and Ontario. This, perhaps surprising result in light of generally reduced investment spending by business, follows dominantly because of continued investment on equipment by

the construction industry. During the investment phase through 2003, that industry's output and capital stock used to deliver its services is quickly expanded in Quebec and Ontario to meet the HSR requirements. Although construction activity is reduced by a small margin after 2003, we assume that the industry in those two provinces continues to invest to ensure that its enlarged stock of real capital is maintained. That is, replacement of economically depreciated capital is offset by continuing investment.

Summarizing the investment view, investment spending is increased across the country during the HSR main investment phase, and is then reduced across the country as reductions in government capital formation dominate. summing for all years (1995-2020), there are small additions to investment spending in Quebec and Ontario, with modest reductions across the rest of the country.

4.2.3 Output Results, QW300M

Table 22 details the implications for the output of industries for the QW300M case, as an illustration of impacts that are characteristic of the scenarios. Particular attention is paid to those industries that are directly or indirectly affected by HSR and government investment, and to the transportation sector.

As the table details, almost 50 per cent of the positive effect on the economies of Quebec and Ontario during the investment phase is concentrated in just four industries (construction, electrical products, railway manufactures and professional services). Employees in these industries, design and put the infrastructure into place, and deliver the rolling stock and electrical products needed for operating the rail system safely. Even so, the sustained requirements imposed by added investment do not yield particularly strong proportionate increases for any of the industries, beyond railway manufactures where we estimate that the size of these industries in Quebec and Ontario would be increased by 2-3 per cent beyond what otherwise might occur.

Outside of Central Canada, prospects for most industries are also improved during the investment phase, if by small margins. Reduced government spending for capital formation from federal reallocations is, however, more than sufficient to offset added business investment elsewhere in the country, and construction activity in the rest-of-Canada is reduced. Associated manufacturing, including metal fabrications is reduced by this, or our direct assumptions about the direct procurement targeting of HSR investment.

During the operations phase (2004-2020), when reduced government capital formation is a formidable influence, activity is generally reduced in most industries outside of rail transportation services, and the railway manufacturing (and, its supplying, machinery) industries. Reductions in construction activity are allocated as

Table 22
Detailed Industrial Impact in Provinces, Output, QW300M

	95-03	95-03	04-20	04-20	95-20	95-20
	Cumlt'd Impact	Av %Imp	Cumlt'd Impact	Av %Imp	Cumlt'd Impact	Av %Imp
Total GDP (\$86 Mns)						
Quebec	1718.1	0.14	-407.8	-0.01	1310.2	0.03
Ontario	3386.9	0.15	-2177.7	-0.04	1209.2	0.01
Rest-of-Canada	671.3	0.03	-2262.8	-0.04	-1591.5	-0.02
Business Sectors						
Quebec	1745.9	0.17	592.5	0.02	2338.4	0.06
Ontario	3455.0	0.18	-205.1	0.00	3249.9	0.05
Rest-of-Canada	728.4	0.04	-1240.3	-0.03	-512.0	-0.01
Construction						
Quebec	595.2	0.78	-210.4	-0.12	384.9	0.15
Ontario	1067.3	0.97	-378.9	-0.12	688.4	0.17
Rest-of-Canada	-51.8	-0.04	-211.6	-0.07	-263.4	-0.06
Manufacturing						
Quebec	502.2	0.19	-318.9	-0.04	183.3	0.02
Ontario	1218.9	0.20	-579.9	-0.03	639.0	0.03
Rest-of-Canada	127.2	0.06	-311.9	-0.05	-184.7	-0.02
Primary Metals						
Quebec	20.6	0.32	-3.0	-0.02	17.6	0.08
Ontario	110.8	0.32	-16.3	-0.02	94.5	0.08
Rest-of-Canada	17.2	0.32	-2.5	-0.02	14.6	0.08
Metal Fabrications						
Quebec	70.5	0.55	8.9	0.03	79.4	0.18
Ontario	204.6	0.50	-38.1	-0.03	166.6	0.10
Rest-of-Canada	-52.9	-0.40	-15.4	-0.05	-68.3	-0.15
Machinery						
Quebec	37.2	0.51	25.9	0.12	63.0	0.22
Ontario	117.4	0.51	81.7	0.12	199.2	0.22
Rest-of-Canada	45.7	0.41	31.8	0.10	77.5	0.18
Electrical Products						
Quebec	115.1	0.36	-152.0	-0.12	-37.0	-0.02
Ontario	323.7	0.36	-428.9	-0.12	-105.2	-0.02
Rest-of-Canada	48.2	0.33	-63.6	-0.12	-15.4	-0.02
Railway Manufactures						
Quebec	88.6	2.79	179.3	2.13	267.9	2.31
Ontario	124.6	2.21	248.9	1.68	373.5	1.83
Rest-of-Canada	20.7	1.51	40.1	1.11	60.8	1.22

Table 22 (continued)
Detailed Industrial Impact in Provinces, Output
QW300M

	95-03	95-03	04-20	04-20	95-20	95-20
	Cumltld Impact	Av %Imp	Cumltld Impact	Av %Imp	Cumltld Impact	Av %Imp
Wholesale Trade						
Quebec	90.1	0.13	-79.0	-0.05	11.2	0.00
Ontario	282.9	0.16	-186.2	-0.04	96.8	0.01
Rest-of-Canada	98.0	0.10	-225.5	-0.09	-127.5	-0.04
Professional Services						
Quebec	100.5	0.43	-39.8	-0.07	60.7	0.07
Ontario	164.9	0.31	-57.3	-0.04	107.6	0.06
Rest-of-Canada	64.0	0.14	-46.0	-0.04	18.0	0.01
Rail Transportation						
Quebec	15.5	0.17	1858.5	8.02	1874.0	5.80
Ontario	21.2	0.18	2671.9	8.02	2693.1	5.98
Rest-of-Canada	-1.1	-0.01	-26.6	-0.06	-27.7	-0.04
Air Transportation						
Quebec	2.3	0.05	-497.9	-4.22	-495.7	-3.07
Ontario	6.2	0.07	-1281.0	-5.24	-1274.8	-3.81
Rest-of-Canada	-0.7	-0.01	-10.6	-0.03	-11.4	-0.03
Other Motor Transportation						
Quebec	5.3	0.04	-40.1	-0.13	-34.8	-0.08
Ontario	10.0	0.07	-95.9	-0.25	-86.0	-0.16
Rest-of-Canada	2.9	0.02	-3.4	-0.01	-0.6	0.00
Other Business Sectors						
Quebec	434.8	0.07	-80.0	-0.01	354.8	0.02
Ontario	683.7	0.07	-297.8	-0.01	385.9	0.01
Rest-of-Canada	489.8	0.04	-404.6	-0.01	85.3	0.00
Non-Business Sectors						
Quebec	-27.8	-0.01	-1000.3	-0.23	-1028.1	-0.16
Ontario	-68.1	-0.02	-1972.6	-0.24	-2040.7	-0.18
Rest-of-Canada	-57.2	-0.02	-1022.6	-0.14	-1079.8	-0.10

follows: Quebec (26 per cent), Ontario (47 per cent) and the rest-of-Canada (26 per cent), which follow roughly from the allocations of reduced government investment in structures over that period (see Table 21).

It is important to note that most of the federal government investment being reduced is concentrated in spending for machinery and equipment, much of which is supplied by the electrical products industry, and its indirectly affected suppliers. In turn, this industry is concentrated in Central Canada, and the reductions in this industry over 2004-2020 are equivalent, alone, to more than one-fifth of the total reductions in Central Canada over that period.

Results during the operations phase are also heavily influenced by direct implications for transportation services. Rail transportation in Quebec and Ontario is changed by equivalent proportions, and for this sector, impacts in the two provinces account for almost the entire impact. Reduced operations in the rest-of-Canada are induced by generally lower requirements for freight operations that follow from reduced activity in the goods-producing sectors, and through reduced passenger demand from lowered disposable incomes of households.

Reduced use of air services, and other forms of passenger transportation are also concentrated in Central Canada, with the effect in Ontario proportionately larger. Net of effects on rail, air and other transportation, the real impacts in Quebec and Ontario are both positive, but also of approximately the same magnitude. At the margin, this provides a stronger, proportionate impact on aggregate results in Quebec than in Ontario since the Ontario baseline economy is substantially larger than that of Quebec. Given the direct and induced structures investment associated with the project, it is not surprising that more than 30 per cent of the activity increases in both provinces are attributable to the construction sector. Impacts on non-rail modes of transportation in the rest-of-Canada are induced by activity and income effects.

Finally, we note that reduced activity in the non-business sectors (governments' public administration, public health, education, etc.) during the operations phase is concentrated mainly in Quebec and Ontario. At Factor Cost, our measure of GDP, this includes reduced real depreciation expenditures of governments, which, of course, are concentrated in Ontario and Quebec, where most of the reduced government capital formation occurs.

Summarizing these details, we conclude the following.

- Activity in the business sectors of Quebec and Ontario will be increased modestly during the investment phase, with activity in all sectors increased, but generally by less than one per cent on average.
- During the operations phase, activity in the two provinces is reduced, but generally by insignificant proportions, except for construction and electrical products, in which industries activity is reduced on average by 0.1-0.2 per cent for an extended period.

- Enduring positive effects in the two provinces are concentrated in railway manufactures, machinery, and of course, railway transportation services. In the latter case, the change in fortunes is significant (5-6 per cent), but air transportation services are also significantly reduced, notably in Ontario.
- Impacts in the rest-of-Canada are negligible, being slightly positive during the investment phase, and symmetrically, negative after the middle of next decade.

For the sake of completeness, detailed, by-industry employment effects are reported in Table 23. These largely mirror the output effects reported above, with differences in proportionate effects sensitive to varying productivity levels (output per employment) of industries, and the changes to labour productivity that occur at the margin. Approximately 60 per cent of the employment gains in Quebec and Ontario during 1995-2003 are accounted for by employment increases in construction, electrical products, railway manufactures and professional services.

We also note the employment gains in the public sector (despite the large output declines associated with reduced depreciation). These, however, are small, numbering less than 100 per year in Quebec and Ontario. This impact on public sector employment reflects the fact that excluding depreciation, impacts on public sector output are essentially neutral.

Finally, we report likely effects on provincial government balances, summarized as the change in the stock of debt held by provincial governments in 2020. It will be recalled that all scenarios provide an **ex ante** financing of provincial government assistance to the operating company through reduced spending on capital formation. Also, it should be noted that increased economic activity in the first decade of the impact tends to reduce debt stocks during that period, thereby reducing interest costs in the years after 2003 as an offset to the negative balance implications of operating provincial economies at lower levels from that point forward.

In short, these impacts have been founded on a view that impacts on provincial balances should be essentially neutral. As Table 24 indicates, this is the result we report, with indirect and induced effects considered. Reductions in the stock of debt of \$100-200 million in the year 2000, although a "positive" feature of the result, may be construed as essentially neutral or very modest positive impacts. At an 8 per cent discount rate, the net present value of the Ontario \$275 million debt stock improvement for the QW300D routing is \$250 million, discounted to 1995, and given the pattern of annual balance changes.

Table 23
Detailed Industrial Impact in Provinces, Employment
(Establishment Basis)
QW300M

	95-03	95-03	04-20	04-20	95-20	95-20
	Impact	Av %Imp	Impact	Av %Imp	Impact	Av %Imp
Total GDP (\$86 Mns)						
Quebec	33.8	0.12	-15.2	-0.03	18.6	0.02
Ontario	59.7	0.12	-29.7	-0.03	30.1	0.02
Rest-of-Canada	14.0	0.03	-18.9	-0.02	-4.9	0.00
Business Sectors						
Quebec	33.0	0.15	-16.6	-0.04	16.4	0.03
Ontario	59.6	0.16	-30.9	-0.04	28.7	0.02
Rest-of-Canada	13.1	0.04	-20.6	-0.03	-7.5	-0.01
Construction						
Quebec	14.6	1.03	-4.5	-0.17	10.2	0.25
Ontario	26.0	0.85	-8.0	-0.12	18.0	0.18
Rest-of-Canada	-1.4	-0.05	-4.6	-0.09	-6.0	-0.07
Manufacturing						
Quebec	4.7	0.11	-7.1	-0.09	-2.4	-0.02
Ontario	13.5	0.16	-5.4	-0.03	8.0	0.03
Rest-of-Canada	2.5	0.07	-4.0	-0.05	-1.5	-0.01
Primary Metals						
Quebec	0.3	0.31	0.0	-0.02	0.3	0.08
Ontario	0.7	0.28	-0.1	-0.03	0.6	0.10
Rest-of-Canada	0.2	0.30	0.0	-0.02	0.2	0.07
Metal Fabrications						
Quebec	0.9	0.34	-0.2	-0.03	0.7	0.10
Ontario	3.5	0.35	-0.8	-0.04	2.7	0.08
Rest-of-Canada	-0.1	-0.06	-0.2	-0.03	-0.3	-0.04
Machinery						
Quebec	0.4	0.29	0.3	0.10	0.7	0.15
Ontario	1.0	0.32	0.7	0.09	1.8	0.16
Rest-of-Canada	0.8	0.28	0.9	0.13	1.8	0.18
Electrical Products						
Quebec	1.5	0.47	-1.1	-0.15	0.4	0.04
Ontario	3.6	0.46	-2.6	-0.15	0.9	0.04
Rest-of-Canada	0.6	0.44	-0.5	-0.14	0.1	0.03
Railway Manufactures						
Quebec	0.7	2.07	0.7	1.78	1.5	1.91
Ontario	1.9	2.23	2.9	1.76	4.9	1.92
Rest-of-Canada	0.4	2.17	0.7	1.62	1.1	1.81

Table 23 (continued)
Detailed Industrial Impact in Provinces, Employment
(Establishment Basis)
QW300M

	95-03	95-03	04-20	04-20	95-20	95-20
	Impact	Av %Imp	Impact	Av %Imp	Impact	Av %Imp
Wholesale Trade						
Quebec	1.5	0.11	-0.8	-0.03	0.7	0.02
Ontario	2.6	0.10	-1.9	-0.03	0.7	0.01
Rest-of-Canada	2.3	0.10	-2.7	-0.05	-0.4	0.00
Professional Services						
Quebec	3.1	0.46	-1.0	-0.07	2.0	0.10
Ontario	4.7	0.35	-1.5	-0.05	3.2	0.07
Rest-of-Canada	2.3	0.17	-1.9	-0.07	0.4	0.01
Rail Transportation						
Quebec	1.4	1.31	9.9	5.73	11.2	4.05
Ontario	1.9	1.28	14.1	5.47	16.0	3.94
Rest-of-Canada	0.0	0.00	0.0	0.00	0.0	0.00
Air Transportation						
Quebec	0.0	0.03	-5.2	-2.77	-5.2	-1.75
Ontario	0.1	0.06	-13.5	-6.22	-13.5	-3.88
Rest-of-Canada	0.0	0.00	0.0	0.00	0.0	0.00
Other Motor Transportation						
Quebec	0.2	0.04	-1.8	-0.14	-1.6	-0.09
Ontario	0.5	0.06	-4.4	-0.24	-3.9	-0.15
Rest-of-Canada	0.1	0.02	-0.2	-0.01	0.0	0.00
Other Business Sectors						
Quebec	7.4	0.06	-6.0	-0.02	1.5	0.00
Ontario	10.4	0.05	-10.3	-0.02	0.1	0.00
Rest-of-Canada	7.3	0.03	-7.3	-0.02	0.0	0.00
Non-Business Sectors						
Quebec	0.8	0.01	1.4	0.01	2.2	0.01
Ontario	0.1	0.00	1.2	0.00	1.3	0.00
Rest-of-Canada	1.0	0.01	1.7	0.01	2.7	0.01

Table 24
Changes in Provincial Debt, at 2020
(Millions of Nominal Dollars)

	95-20
QW300M	
Quebec	-105.5
Ontario	-178.7
Rest-of-Canada	-85.6
QW300D	
Quebec	-140.5
Ontario	-274.6
Rest-of-Canada	-171.1
QW200D	
Quebec	2.5
Ontario	3.1
Rest-of-Canada	89.6
TM300M	
Quebec	-40.5
Ontario	-79.4
Rest-of-Canada	-30.9
TM300D	
Quebec	-73.7
Ontario	-170.1
Rest-of-Canada	-113.3
TM200D	
Quebec	18.6
Ontario	-4.9
Rest-of-Canada	49.3

5 Conclusions and Qualifications

5.1 Qualifications

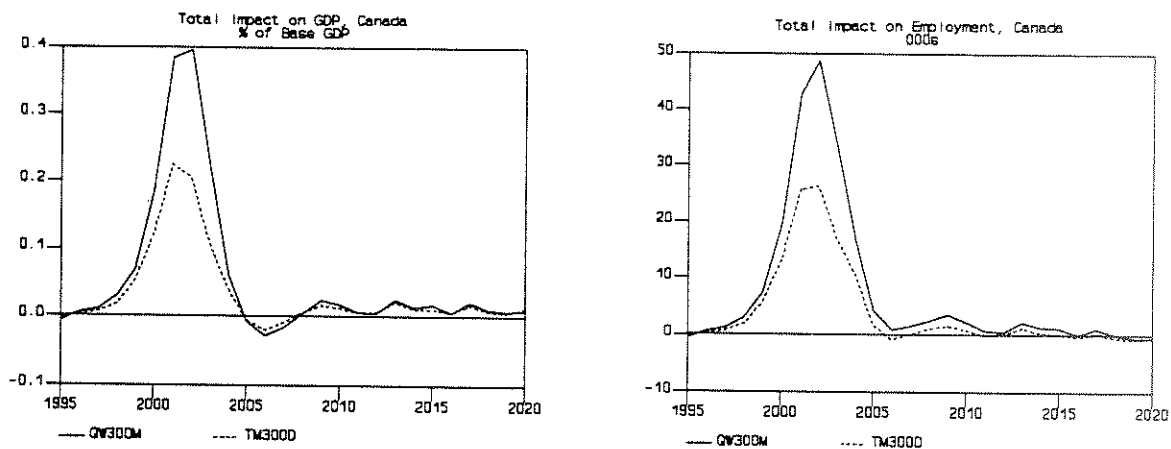
5.1.1 Sensitivity to Financing Assumptions

5.1.1.1 National Impacts

The results reported in the text above are conditional on a view that government financing support to the commercial company that constructs and operates the HSR will be funded by a dollar-for-dollar reduction in other government capital formation. But the financing is seen largely as capital assistance to the HSR, which in the view of the Financial Analysis study, produces an asset that on a Net Present Value basis, may have positive value. It could be argued, then, that debt markets would absorb the additional financing (for a capital asset) with no adverse direct effect on general interest rates, as was assumed to be the case in results reported earlier.

Two additional simulations, assessing QW300M and TM300D, have been developed to assess the general economic effects of this financing assumption. Figure 8 displays the year-by-year impacts of such a result for total output and employment. Table 25 provides a view of the cumulative effects on the economy for several basic indicators. Appendix M provides detailed, year-by-year tabulations describing the impacts on basic indicators, sectoral output, and employment.

Figure 8



As the figure indicates, the main distinction for the real side of the economy is that, except for five years following 2003, the economy operates at greater than Base Case levels. The short, modest reduction immediately following 2003 reflects the competing influences of "private" additions to the economy (HSR) and "private" reductions (other modes effects), and an inventory cycle as the economy adjusts to a

post-investment state. The effect on economic activity after 2003, while positive, is modest.

Table 25
High Speed Rail Results, Canada
Deficit Financing
(Cumulated Changes)

	1995-20	1995-03	2004-20
Total GDP at Factor Cost (\$86 Mns)			
Quebec-Windsor, Mirabel, 300K	10080.4	8543.2	1537.3
Toronto-Montreal, Dorval, 300K	6170.1	4841.4	1328.6
Total Employment (000s)			
Quebec-Windsor, Mirabel, 300K	192.8	155.5	37.2
Toronto-Montreal, Dorval, 300K	105.4	89.9	15.5
Personal Disposable Income (\$86 Mns)			
Quebec-Windsor, Mirabel, 300K	4130.2	3595.5	534.7
Toronto-Montreal, Dorval, 300K	2591.8	2044.1	547.7
Personal Consumption (\$86 Mns)			
Quebec-Windsor, Mirabel, 300K	5933.1	2490.8	3442.2
Toronto-Montreal, Dorval, 300K	3612.5	1416.6	2196.0
Public Sector Balance (\$C Mns)			
Quebec-Windsor, Mirabel, 300K	-8258.8	1833.7	-10092.5
Toronto-Montreal, Dorval, 300K	-2580.5	1085.5	-3666.0
Federal Balance (\$C Mns)			
Quebec-Windsor, Mirabel, 300K	-2872.3	1082.7	-3955.1
Toronto-Montreal, Dorval, 300K	-346.6	668.5	-1015.2
All-Provincial Balance (\$C Mns)			
Quebec-Windsor, Mirabel, 300K	-8915.4	9.2	-8924.5
Toronto-Montreal, Dorval, 300K	-4310.2	-25.1	-4285.1
Current Account Balance (\$C Mns)			
Quebec-Windsor, Mirabel, 300K	-5539.8	-4990.5	-549.3
Toronto-Montreal, Dorval, 300K	-1890.3	-2850.7	960.4

The table, and comparison of this to equivalent tables reported earlier, indicates some important trade-offs that are involved. For the national economy, salient elements of this include the following.

- Measured by the scale of the cumulated change in real output, deficit financing yields a 55-60 per cent larger impact during the investment phase, and

cumulated over 1995-2020, the effect is a approximately an order-of-magnitude (10 times) larger. The scale of the additions in employment terms is less large, but significant. The smaller scale, relative to output, reflects notable benefits to productivity (in labour terms) from the stronger economy.

- Where household disposable income was reduced during the operations phase in the "reallocation" cases, it is now positively affected, providing strong induced effects to economic activity though the longer term. Similar, positive effects occur for business income and investment.
- Although government subsidies to the HSR are occurring over the investment phase, the stronger general economic activity in the "deficit" cases during this period yields a modest **ex post** benefit to government balances at all levels. Continuing subsidy payments through the operations phase, with small positive effects on the real economy and tax bases, yields growing cumulative deficits after 2003. Cumulated over 1995-2020, the deficits of the federal and provincial governments (the governments providing the subsidies) are \$11.8 billion for the Quebec-Windsor line and \$4.6 billion for the Montreal-Toronto line. The increased interest payments of governments are linked positively to improved household incomes, but are also made in part to foreigners.
- The current account impacts are cumulatively negative over 1995-2020, but largely because of increased deficits during the strengthened economic activity of 1995-2003. Following that period, the impacts are essentially neutral.
- For the period following 2003, the economy as a whole returns to Base Case levels. Although only a modest effect, unit costs and prices are higher, and price-sensitive exports (mainly manufactures) are adversely affected. Thus, trade-sensitive producing sectors (those in the Durable and Investment Goods Sectors reported in Appendix M) and the resource-based goods industries that supply them operate at slightly below Base Case levels. Services industries operate, generally at, or slightly above, Base Case levels.
- Total employment operates within 1,000-2,000 of Base Case levels following the major investment phase. Sectoral implications are generally insignificant, as well.
- In the year 2020, the "deficit" and "non-deficit" cases are essentially equivalent since government financing (and its direct funding reaction to that) is at an end. In this sense, the cases are equivalent, and are distinguished only by induced effects related to stocks of debt, and resulting income flows.

5.1.1.2 Provincial Impacts

Table 26 summarizes output and employment effects for the provinces for the deficit-financed cases. This can be directly compared to tables 20 and 21 for comparison to financing through reallocation. Appendix N provides annual, and increased levels of detail to report the impacts.

Table 26
Output and Employment Impacts, Deficit Financing Cases

	95-03	95-03	04-20	04-20	95-20	95-20
	Impact	Av %Imp	Impact	Av %Imp	Impact	Av %Imp
GDP, \$86 Mns						
QW300M						
Quebec	2373.4	0.19	1281.9	0.04	3655.4	0.08
Ontario	4668.4	0.21	803.3	0.01	5471.7	0.07
Rest-of-Canada	1501.3	0.07	-548.0	-0.01	953.4	0.01
TM300D						
Quebec	1147.2	0.09	654.8	0.02	1802.0	0.04
Ontario	2889.2	0.13	983.5	0.02	3872.7	0.05
Rest-of-Canada	805.0	0.04	-309.6	-0.01	495.4	0.01
Employment (000's)						
QW300M						
Quebec	45.8	0.16	11.8	0.02	57.6	0.07
Ontario	79.9	0.16	12.4	0.01	92.4	0.06
Rest-of-Canada	29.8	0.07	13.0	0.01	42.8	0.03
TM300D						
Quebec	23.0	0.08	4.0	0.01	27.0	0.03
Ontario	50.3	0.10	5.4	0.00	55.7	0.04
Rest-of-Canada	16.6	0.04	6.1	0.01	22.7	0.02

Viewed as cumulated impacts over 1995-2003, and compared to the financing through reallocation results, real output impacts in Quebec are 110 per cent larger, in Ontario, 62 per cent larger, and in the rest-of-Canada, 43 per cent larger for the QW300M case. Comparable increases for the TM300D case are even larger, with the implications for Quebec and Ontario proportionately increased by approximately the same magnitudes. And where the reallocation case for the rest-of-Canada yields negative impacts over the 26 years, the deficit financing case yields cumulated positive effects. Employment effects are increased by even larger proportions.

The interesting dimension of these impacts is centred in the explanation of negative impacts for the rest-of-Canada during 1994-2020, while effects for Ontario and Quebec during this period are positive. It should be recalled from the discussion

of the national impacts that with generally increased economic activity, unit costs of production are increased in Canada, and trade-sensitive sectors are adversely affected through this "competitiveness" effect over the longer term. In the QW300m case, net exports, priced at 1986 dollars, are reduced by a cumulated \$7.1 billion over 2004-2020, while in the TM300D case, the deterioration amounts to \$4.1 billion.

The implied loss of production from this effect is shared roughly proportionately by producers across all provinces of the country. At the same time, however, production in Quebec and Ontario is benefitting from positive effects in the form of continuing investment in HSR and related facilities. Further, in these two provinces, the net effect of changed passenger transportation systems is to produce increased production of transportation services in Central Canada, while leaving those in the rest-of-Canada largely unchanged. These effects are illustrated, for the QW300M case, in Table 27.

As this documents, there is a significant positive effect on transportation investment in Central Canada, amounting to a cumulated \$1.7 billion (at 1986 prices), while there are no effects in the rest-of-Canada. This is reflected in the relatively strong proportional effect on construction activity in Quebec and Ontario. Similarly, there is a cumulated net increase in transportation services related to HSR and other-mode operations in Central Canada of \$2.6 billion. There is a small decrease in the rest-of-Canada.

At the same time, manufacturing output, the most sensitive sector of the economy to unit cost influences, is reduced across the country, and by approximately the same proportion. The slightly stronger negative effect in the rest-of-Canada reflects the fact that elements of the transportation investment in machinery and equipment will have a disproportionately large positive effect in Quebec and Ontario, to partially offset trade implications.

Given these transportation and trade-sensitive impacts, induced effects in Central Canada tend to be positive, while those in the rest-of-Canada are negative. This is reflected in the positive effects for "other business sectors" in Quebec and Canada, and negative effects in the rest-of-Canada.

This relatively sanguine view of impacts for output and employment in Central Canada comes at a cost to government balances, since the HSR subsidy contributions by these two provinces are only partially offset through increased revenues. Cumulated over 1995-20290, we estimate that deficits in the provinces for the QW300M case would be increased as follows: Quebec - \$3.2 billion, Ontario - \$6.2 billion, and the rest-of-Canada - \$-0.5 billion. In the TM300D case, the deficit increases are: Quebec - \$0.7 billion, Ontario - \$3.9 billion, and the rest-of-Canada - \$-0.3 billion.

Table 27
Selected Impact Measures, QW300M Deficit-Financing Case
(Millions of 1986 Dollars)

	95-03	95-03	04-20	04-20	95-20	95-20
	Cumlt'd Impact	Av %Imp	Cumlt'd Impact	Av %Imp	Cumlt'd Impact	Av %Imp
Investment, Structures						
Transportation						
Quebec	1486.0	137.91	125.4	4.92	1611.5	44.41
Ontario	2758.2	25.21	358.8	1.36	3117.0	8.37
Rest-of-Canada	0.0	0.00	0.0	0.00	0.0	0.00
Investment, Equipment						
Transportation						
Quebec	731.1	11.45	430.7	2.93	1161.8	5.51
Ontario	1291.2	16.24	822.6	4.41	2113.8	7.95
Rest-of-Canada	0.0	0.00	0.0	0.00	0.0	0.00
Construction Output						
Quebec	732.2	0.96	99.6	0.06	831.8	0.33
Ontario	1319.0	1.20	225.1	0.07	1544.1	0.37
Rest-of-Canada	182.9	0.13	89.7	0.03	272.6	0.06
Rail Transportation Output						
Quebec	20.0	0.22	1858.4	8.02	1878.4	5.81
Ontario	27.1	0.23	2671.4	8.02	2698.5	5.99
Rest-of-Canada	8.6	0.04	-26.4	-0.06	-17.8	-0.03
Air Transportation Output						
Quebec	3.7	0.08	-496.6	-4.20	-492.9	-3.05
Ontario	9.0	0.10	-1278.2	-5.23	-1269.2	-3.79
Rest-of-Canada	3.2	0.03	-6.9	-0.02	-3.7	-0.01
Other Motor Transportation Output						
Quebec	8.3	0.07	-36.4	-0.12	-28.1	-0.07
Ontario	13.7	0.09	-91.4	-0.24	-77.7	-0.15
Rest-of-Canada	6.1	0.05	0.7	0.00	6.8	0.01
Manufacturing Output						
Quebec	709.9	0.27	-396.6	-0.06	313.3	0.03
Ontario	1678.1	0.28	-1017.5	-0.06	660.6	0.03
Rest-of-Canada	245.5	0.11	-440.6	-0.07	-195.1	-0.02
Other Business Sectors Output						
Quebec	608.7	0.10	194.7	0.01	803.4	0.04
Ontario	966.5	0.10	230.8	0.01	1197.3	0.04
Rest-of-Canada	744.3	0.06	-157.9	-0.01	586.4	0.01

5.1.2 Sensitivity to Base Case Assumptions

These impacts record year-to-year implications over a period of more than 25 years. Since the future is not forecastable with a high degree of accuracy, it should be recognized that the proportional effects (percentage impacts in tabulations and Figures) are vulnerable to this, and describe a "sizing" or "characteristic" description of the impact only.

The dollar (or, level) impacts are less sensitive to this consideration, but are in some cases sensitive to presumed underlying conditions. Among these, the most important are the interest rate settings. A strong consensus has built up around the view that interest rates will remain "relatively" high for the next several years, but beyond this decade at least, that presumption is problematical.

On the one hand, it can be argued that government policies today, and for the past decade, have been targeted heavily at reducing future interest rates ("getting inflation, and now, deficits, down") to more sustainable levels for growth of economic potential. Were one to presume there is success in these policies, then interest rates would be notably lower than are assumed in our case. In that event, the commercial viability of such a capital-intensive project as HSR would almost certainly be enhanced. In turn, the size of the governments' subsidy, and the amount of funding reallocation, would be notably reduced, yielding real output and employment effects closer to those of the "deficit" financing case than to those reported in the main body of the report. As well, it is likely that a lower general interest rate setting would yield stronger induced effects for business investment and consumer durables.

A higher interest rate setting (effectively, a forecast predicated on the "failure" of a decade-long strategy of governments) has symmetric, adverse implications for the impacts.

5.1.3 Sensitivity to HSR and Other, Direct Impact Assumptions

In the long run, these results indicate that HSR simply provides a different way (with altered sectoral resource implications only) to transport passengers between cities. As compared to the Base Case, it has few significant overall impacts on the economy, and does not appear to change overall productivity and growth potential of the economy. In this sense, then, the results simply "add up" the detail provided this analysis from other studies. Further, in that sense, the results reported here are vulnerable to uncertainties that affect estimates of investment, passenger forecasts, and effects on other modes.

As the section above indicated, it is also sensitive in a major respect, to the assumption that government financing will be funded through reductions in other spending. Two vulnerabilities of the analysis follow from this.

First, the funding approach assumed represents a notable reduction in the size and/or quality of the infrastructure supplied to private economic activity by governments. Our results presume that there is no adverse effect of this on private productivity, and at the margin, incomes. Although there is a wide range of opinion about the extent to which infrastructure contributes to productivity, it is widely accepted that such a contribution to productivity exists. In this respect then, our estimates of impact are too "optimistic", but we are unable to quantify the extent to which this is true.

The choice of reduced capital spending as the means of financing the subsidies represents a second, bold assumption. Many other expenditure and/or revenue actions are conceivable, and over a 25 year period, constitute reasonable alternatives to this form of reallocation. As the multipliers in Table 28, below, indicate, we judge that at least the short-term impacts for the economy can vary widely depending on the reallocation "instrument" chosen.

Table 28*
Multiplier Summary

	Year 1	Year 2	Year 3	Year 5
Expenditure Shocks				
Federal Nonwage Expenditure				
Cumulated Multiplier	1.16	1.37	1.32	1.24
Federal Government Wage Expenditure				
Cumulated Multiplier	1.24	1.97	2.14	2.15
Federal Wage Deflator				
Cumulated Multiplier	0.32	0.47	0.48	0.53
Federal Defence Expenditure				
Cumulated Multiplier	1.35	1.49	1.43	1.34
Federal Building Investment				
Cumulated Multiplier	1.22	1.44	1.41	1.35
Federal Transfers to Persons				
Cumulated Multiplier	0.51	0.68	0.71	0.73
Revenue Shocks				
Personal Income Tax				
Cumulated Multiplier	0.50	0.63	0.66	0.68
Corporate Direct Tax				
Cumulated Multiplier	0.38	0.74	0.96	1.03
Payroll Tax (UI)				
Cumulated Multiplier	0.52	0.56	0.57	0.58
GST Impact				
Cumulated Multiplier	0.70	0.91	0.97	1.04

*Adapted from Jacobson, Bromfield and Justus, **The Response of the Informetrica Model to Selected Policy Shocks** (Informetrica, Ottawa) November, 1992.

5.2 Conclusions

5.2.1 Comparison to Previous Results

Several studies have been previously undertaken to estimate the likely macroeconomic effects of HSR. We have summarized these elsewhere⁴, and provided that to the governments sponsoring this study. Direct comparison to those studies is inappropriate because of major differences in assumptions about the scale and details of building the HSR, offsetting influences on other modes, and most importantly, the assumption taken in this study that governments would offset HSR financing with reduced spending elsewhere. The deficit financing cases of this study approximate the assumptions underlying some of those studies, however, and provide a rough comparison guide. Adjusting for the scale of effects, we find that our implicit multiplier is modestly below that reported in the Peat Marwick Stevenson and Kellogg report of January 1992, and follows from their apparent use of an input-output method, which would typically overestimate impacts because of static productivity (in the Base Case) assumptions.

Having this in mind, on balance we judge that the results reported here characteristically equivalent to those reported in the earlier studies.

5.2.2 Principal Findings

The project assessed in this study is composed of details on the timing and nature of economic resources needed to construct, equip, and operate HSR, investment and operating impacts on other modes of transportation, and government reallocation of capital expenditures to finance their subsidy contributions to the HSR. Given these inputs, the following are our major findings.

- Spending on the infrastructure for, and equipment of, the HSR should lead to overall increases in output, employment, and real incomes in 1996-2003. This is true for all options studied, but varies with length (Quebec-Windsor options require more resources and produce, thereby, larger measures of output and employment), and speed (300K options have larger impacts than 200K options). Reduced private spending on other modes occurs during this period, but is small on balance. Reduced government spending on other capital also occurs, but is insufficient to offset the dominating influence of HSR investment.
- Almost all sectors of the economy would be positively impacted since indirect effects are widespread, and additional consumer and business investment

⁴ Sonnen, C. *Macroeconomic Multipliers and Previous Studies of High Speed Rail Construction and Service*, March 3, 1993.

spending induced by income increases spreads the effects throughout all categories of demand. Output impacts would of course be concentrated in those sectors that supply the construction services, and manufactures to equip the HSR, or in those sectors that are indirectly affected as suppliers of goods and services. These include the railway construction industry, rolling stock manufacturers, and producers of iron and steel, fabricated metals, nonagricultural machinery, electrical and electronic products, and communications wire and cable. Among services industries that can expect to note the effect as significant should be suppliers of business services and wholesale trade. Reduced government capital spending would notably reduce prospects for those supplying the construction of roads and streets, and nonresidential buildings.

- Since HSR spending is concentrated in infrastructure, which in turn, is highly concentrated in construction of the lines and associated facilities, real economic impacts during the main investment phase will be highly concentrated in Quebec and Ontario. Equipment procurement targeted in Central Canada reinforces this. Finally, since induced spending is disproportionately directed to consumer durables, Central Canada as the concentrated location of such production, also benefits. The impact in Ontario, as a proportion of Base Case activity, is higher than in Quebec, but the difference is small. And in these two provinces, the average increase in GDP over the period ranges from 0.06-0.15 per cent, where the impact for the country-as-a-whole is less than 0.3 per cent.
- As operations of HSR begin, and over the period of 2004-2020, additional economic resources required to operate the HSR are approximately offset by reduced private spending for other modes of transportation. That is, private demands and economic activity are largely neutral for total output, and involve only reallocations of resources to alter the mode of passenger traffic. Accordingly, results during this period are dominated by reduced government capital formation. Early after 2003, these reductions are relatively large, but diminish in magnitude as the net financing requirements of the HSR operating company moves towards zero.

Cumulated over the whole period of 2004-2020, economic activity, and consequent employment and real incomes, are reduced. At the end of the period, when the HSR is operating fully and government offsets are completed, the economy is basically back to Base Case Levels.

- Cumulated over 1995-2000, our formal, model-based analysis suggests very small impacts. The QW300D routing, which generates the largest employment effect, produces average annual employment effects equivalent to only 0.02 per cent of Canadian employment recorded in 1994.

Further, in 2020, when net subsidies to the operating company have been replaced by net returns to governments, the change in GDP in that year ranges from a small negative impact (less than 0.01 per cent) for the TM200D routing to a positive maximum of 0.02 per cent for both 300K routes through Dorval.

Assuming the level impacts for 2020 are extended indefinitely into the future, the cumulated impacts reported in table 10 would be modified as below.

Table 29
High Speed Rail Results, Canada
(Cumulated Changes)

	1995-2025
Total GDP at Factor Cost (\$86 Mns)	
Quebec-Windsor, Mirabel, 300k	2099.2
Quebec-Windsor, Dorval, 300K	3000.1
Quebec-Windsor, Dorval, 200K	-1199.8
Toronto-Montreal, Mirabel, 300K	1457.5
Toronto-Montreal, Dorval, 300K	2739.2
Toronto-Montreal, Dorval, 200K	-760.8
Total Employment (000s)	
Quebec-Windsor, Mirabel, 300K	67.1
Quebec-Windsor, Dorval, 300K	80.2
Quebec-Windsor, Dorval, 200K	23.2
Toronto-Montreal, Mirabel, 300K	36.2
Toronto-Montreal, Dorval, 300K	53.4
Toronto-Montreal, Dorval, 200K	12.3

- Throughout this operations period, output in most industries is negatively affected, with some notable, but not large exceptions. Railroad rolling stock manufacturers benefit from continuing HSR investments in equipment.
- We anticipate there will be no substantial effects on aggregate unit costs or prices, and throughout most of the operations phase, there are small, but continuing negative effects on household and business incomes. Given the cost/price effects we anticipate no generalized impact on foreign trade in travel services. Reduced domestic incomes suggest that within-Canada demands for restaurants, accommodation, and recreational services would be diminished. By 2020, however, prospects will have returned to those of the Base Case.
- As positive effects during the investment phase were spread across the country, we expect negative effects to follow this same pattern, with the possible exception of Quebec, where Base Case economic activity is likely to be sustained on average.

- Over the full 25 years, we estimate that public sector balances would be cumulatively improved. Put in other terms, stocks of debt should be reduced. For the public sector as a whole, this follows from the fact that positive effects on balances of a strengthened economy during the first decade, reduce their succeeding interest payments by more than annual deficits that emerge during the operations phase. In addition, the federal government's position is strengthened because subsidies to VIA rail and the airlines are reduced throughout the impact period. On balance, provincial debt is unchanged after 25 years. That of municipalities and the hospital system, for which they have some responsibility, is reduced by a modest amount. Put succinctly, the federal fiscal position is improved, and that of other governments is essentially unchanged, or slightly improved in Quebec and Ontario.
- Additional investment in the Canadian economy, accounting for direct, indirect and induced effects, implies some additional borrowing from foreigners initially. But reduced economic activity following 2003 leads to reduced imports, and a reduction in foreign borrowing (an improvement in the Current Account balance). The assumption that foreign travellers would use the HSR at higher ticket prices (as do domestic consumers) provides a significant addition to nominally-denominated foreign earnings.
- On balance, our analysis forces us to conclude that HSR should have notable, if modest, positive effects on economic output, employment and incomes for about a decade. The HSR by itself has no significant implications for productivity or the structure of the economy outside of transportation services and manufacturing suppliers to it. Accordingly, there are no permanent positive effects on growth potential or prospects. If the legacy of public financing leads to incremental reductions in government capital formation, economic prospects would be diminished, again, by modest proportions for an extended period of time. For both directly affected provinces, and others, positive and negative variations from Base Case levels of activity can reach as much as 1.5 per cent.