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The Economy-Transportation Linkages in Ontario: A Sectoral Perspective

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Introduction

Transportation is integral to Ontario's economic and social well-being. The production, distribution and consumption of almost all goods and most services directly embodies transportation. Yet, there is a huge gap in knowledge on the role and importance of transportation in the changing economy. Statistics such as tonne-kilometres of cargo moved and vehicle-kilometres travelled, while essential to the management of many aspects of the transportation business, are not sufficient for placing transportation within the wider economic context.

Provincial income and product accounts provide aggregate measures of the contributions of economic sectors and activities in terms of value added, employment, expenditures and other relevant indices. These aggregate indices do not provide much information on how any sector relates to other sectors and activities in the economy. This is especially problematic for transportation, given its extensive linkages to other sectors. An additional complication is that transportation is defined very narrowly in the provincial income product accounts. Excluded are transportation services not purchased in the marketplace and some key expenditures on transportation services by households, government and businesses.

This paper is based on a broader study undertaken to identify, develop and quantify a large set of indicators and measures to gauge the many complex linkages and contributions made by transportation to the economic wealth and wellbeing of the province of Ontario over the past two decades. Selected aspects of that study are reported here.

* The views expressed are those of the authors and not necessarily those of the ministry.

The Sectoral Perspective: Is Transportation Just Another Sector?

Each economic system has a unique internal structure. The study of this internal structure is a prerequisite to the proper understanding and management of the economy. Consequently, techniques such as "input-output" analysis and/or process analysis have been used to describe the internal economic framework of many countries.

Inter-industry tables are now widely used accounting frameworks for the analysis of sectoral linkages. In this framework, each sector is considered to buy its inputs from other sectors and sell its outputs to other sectors and, in the "open" version of the system, to an "autonomous sector" which has no output of its own. The "autonomous sector", if there is one, represents final demand and is explained within the model. Analysis of these tables through appropriate techniques (e.g. input-output analysis) provides valuable insight into the indirect relationships of an economic system and their consequences.

This paper uses input-output data for Ontario for 1979, 1984 and 1990, with detailed analysis of the economic and technical implications of sectoral interdependencies involving the transportation sector in the Ontario economy. Space permits the display of only the 1990 data. Implications of the following will be examined in some detail:

- the nature and extent of indirect and induced links among the various sectors of the economy with the transportation sector, with associated multipliers for the transportation subsectors;
- the position of the transportation sector within the different types of productive sectors classified according to their input uses and output distribution;
- the nature and extent of forward and backward linkages among sectors connected to the transportation sector;
- the determination of measures of dispersion of the various coefficients of linkages, and
- the identification of "key" sectors of Ontario's economy in relation to the transportation sector.

Transport Cost Intensities in Ontario's Structure of Production

An industry may directly sell or buy from only a few industries, but its customers and suppliers may be connected with many industries. This industry may thus have a profound influence on the economy through its indirect relationships with other industries. The technical **input-output matrix** is a valuable resource in understanding such relationships.

The impact of transportation cost on the competitiveness of industries in the domestic and international markets is a policy concern. The output tables for Ontario in 1979, 1984 and 1990 provide invaluable information on the intensity of transportation cost in the value of output of different industries. The input output system of accounts defines the transportation industry in a restrictive sense as the sum of revenues received by carriers from the users of transportation services. The latter include commercial (for hire) air, water, rail, truck as well as services incidental to transportation. Private freight transportation services such as private trucking are considered as part of the internal operations of the establishments and whose costs are included implicitly in the output of the transportation industry.

The **intensity** of transport cost for an industry is defined as the cost of transport as a percentage of the total cost of its output. The concept of **transportation margins** is important in estimating the transportation cost. In the Use matrix of an input-output table, commodities are valued at producers prices and the added costs incurred by the purchaser are shown as margins. There are typically seven margins in input-output tables--transportation, retail, wholesale, tax, storage, gas, pipelines margins. The transportation cost of purchasing a commodity in the Use Matrix is shown as a purchase from the transportation industry. It is also shown as a transportation margin when it is embedded in the cost of other inputs purchased by the firm to produce its output.

Services, the transportation sector itself and forestry had the highest transport cost intensities in Ontario in 1979. Some industries, such as wood, furniture and printing, do not appear to make large purchases from the transportation sector directly but they pay significant transportation margins. Services show a transportation cost intensity of $0.14 for 1979 without transportation margins and about $0.15 with the margins. The total transportation cost intensities for transportation and forestry were $0.07 and $0.063 respectively. Nonmetallic minerals and refined petroleum ranked

next. Sectors with high transport cost intensity are also sectors with high direct value added coefficients. This fact suggests that sectors with extensive dependence on transportation services are also high income contributors to the economy.

Not much has changed over time in the ranking of sectors by transport cost intensities between 1979 and 1990. Industry rankings by relative transportation cost intensities are very similar for 1979, 1984 and 1990. However, the magnitudes of the intensities have changed markedly. Transportation, services, forestry, mining and refined petroleum show relatively high transport cost indices, but their values are far below those in the 1979 with the exception of the transport sector itself (Table 1).

Table 1

Ontario
Transportation Intensities, Margins And Value Added, 1990

	Transportation Intensities	Transportation Margins	Transportation Cost Shares	Value Added Coefficients
Transportation	0.1610	0.0043	0.1653	0.5318
Fishing	0.0557	0.0008	0.0565	0.4311
Refined Petroleum	0.0225	0.0038	0.0263	0.1190
Other Services	0.0182	0.0021	0.0203	0.3899
Mining	0.0089	0.0035	0.0125	0.6705
Forestry	0.0077	0.0026	0.0103	0.6439
Metals	0.0072	0.0325	0.0396	0.2699
Chemicals	0.0057	0.0100	0.0157	0.3873
Paper	0.0051	0.0187	0.0238	0.3694
Food & Beverage	0.0046	0.0146	0.0192	0.3193
Non-Metallic Minerals	0.0044	0.0119	0.0163	0.4672
Trade & Finance	0.0040	0.0004	0.0044	0.7121
Agriculture	0.0033	0.0073	0.0106	0.3643
Textiles	0.0029	0.0077	0.0106	0.6135
Transportation Equipment	0.0028	0.0071	0.0099	0.2382
Clothing	0.0024	0.0070	0.0094	0.4261
Fabricated Metal	0.0023	0.0105	0.0128	0.4580
Construction	0.0023	0.0083	0.0106	0.5058
Wood	0.0022	0.0201	0.0223	0.3472
Electrical Products	0.0021	0.0050	0.0071	0.4614
Furniture	0.0015	0.0095	0.0110	0.4106
Machinery	0.0012	0.0063	0.0075	0.4075
Printing	0.0008	0.0109	0.0118	0.5562
Misc. Manufacturing	0.0006	0.0037	0.0043	0.4160
Foreign Export	0.0140	0.0220	0.0360	N/A
Interprovincial Exports	0.0390	0.0350	0.0740	N/A

Source: Econometric Research Limited

The results indicate that bulky natural resources and high valued commodities require directly or through purchased inputs, large transport inputs in their production processes, whereas textiles, agriculture, electrical products and clothing have low transportation costs per unit of output.

Transportation cost intensities are relatively high for exports generally, but more so for interprovincial exports than for foreign exports. The high ratios of transport to other costs in the export sector are typical of moving goods to distant markets. This is a potential drag on the competitiveness of Ontario exports, particularly to other provinces.

Another fact to be noted is the composition of Ontario exports. Transport equipment exports are significant. They accounted for about 40% of total Ontario foreign exports in 1979, and increased to about 44% in 1990. If we were to add the exports to other provinces, these shares would rise to 50% of total Ontario exports.

The Transportation Sector Industrial Linkages

To evaluate an industry's direct and indirect relationships with other industries, we have to evaluate the "matrix multiplier" $(I-A)^{-1}$. The gross output levels (x's) required to sustain a given vector of final demand (f) in the open model is determined by the following equation system:

$$\textcircled{1} \qquad x = (I-A)^{-1} f$$

If the inverse of (I-A) matrix exists, it may be expressed by means of binomial expansion:

$$(I-A) = I^{-1} + (-1)I^{-2}(-A) + \frac{(-1)(-2)}{2!}I^{-3}(-A)^2 + \frac{(-1)(-2)(-3)}{3!}I^{-4}(-A)^3 + \ldots$$

$$\textcircled{2} \qquad = I + IA + IA^2 + IA^3 + \ldots$$

$$= I + A + A^2 + A^3 + A^4 + \ldots$$

$$= \sum_{k=0}^{\infty} A^k$$

The inverse matrix, $(I-A)^{-1}$, indicates the total direct plus indirect output required per unit of final demand. The series in (2) simply explains the general composition of this total output requirement. The first term, I, accounts for one unit of output to be delivered to final demand. The second term, A, indicates the direct input required to produce this unit of final demand. The next term, A^2, indicates first-round indirect inputs required to produce the direct input A, and so on. Due to the fact that the elements of the A matrix satisfy the Hawkins-Simon condition $a_{ij}^{(k)}$ decreases as k increases and the $(I-A)^{-1}$ is approximated by the sum of the powers of A.

Income and Employment Multipliers in the Ontario Economy

The macro "Keynesian" multipliers are simply the overall total of direct and indirect effects of a dollar increase in final demand. This summing of direct and indirect income effects is quite similar to the summing of the direct and indirect output effects in the input-output context discussed in the preceding

section. In fact, it is also possible to use input-output techniques to evaluate the income effects due to a change in final demand. By its very nature macroeconomics is concerned with the economy at large but strictly at the most general level. This is also true of its income multipliers. The question of what industries will produce the extra output when final demand is increased is irrelevant to the macroeconomic perspective. Input-output analysis deals with smaller components of the economy than does aggregate macro-economic analysis. The emphasis is on individual sectors, not the national total. In this way the transport sector is seen as a subcomponent of a larger system of interacting sectors.

Table 2 presents multipliers and other sectoral indicators that position the transportation sector in relation to other sectors in the economy for 1990. The objective here is to examine the transportation sector (transportation services and transport equipment) within the overall structure of production in Ontario for three specific years for which an input output table exists. The sectoral perspective is examined by using traditional output and income multipliers, direct value added and labour income (wages and unincorporated income) coefficients, jobs per million dollar of output, the share of labour in total income of the sector and finally average labour productivity. Twenty four sectors are evaluated on the same platform using these indicators.

The income and output multipliers are suggestive of the efficiency with which these sectors generate their output and income per one dollar of final demand. Industries (sectors) with high income multipliers are those that generate large incomes when the demand for their output increases. They may do so through a high direct income or through the relationships they maintain indirectly with sectors that are efficient in generating income per unit of their output.

Table 2

Comparative Industrial Indicators by Sector, 1990

Sector	Output Multipliers	Income Multipliers	Direct Value Added	Wage Value Added	ncorpora Income	Labour Income	Share of Labou Value Added	Employment Per Million $	Average Labou Productivity
Agriculture	2.54208	1.06753	0.36426	0.11952	0.0610	0.18056	0.4957	18.8	$53,246
Forestry	2.34795	1.30277	0.64387	0.32160	0.1719	0.49353	0.7665	10.6	$94,604
Fishing	2.90976	1.33556	0.43114	0.31628	0.0431	0.35935	0.8335	30.0	$33,288
Mining	2.01940	1.17002	0.67047	0.22610	0.0036	0.22975	0.3427	5.4	$184,386
Food & Beverage	2.64934	1.04940	0.31927	0.17114	0.0007	0.17185	0.5382	4.3	$230,919
Textiles	2.30110	1.23575	0.61352	0.40633	0.0012	0.40757	0.6643	5.3	$190,074
Clothing	2.50316	1.17179	0.42610	0.32390	0.0026	0.32652	0.7663	23.1	$43,262
Wood	2.85277	1.21915	0.34717	0.26380	0.0047	0.26850	0.7734	9.4	$106,872
Furniture	2.60865	1.16804	0.41060	0.29546	0.0023	0.29775	0.7252	9.6	$103,828
Paper	2.67327	1.14436	0.36941	0.25123	0.0000	0.25123	0.6801	5.3	$189,405
Printing	2.54115	1.28661	0.55624	0.38496	0.0031	0.38805	0.6976	9.3	$107,358
Metals	2.69866	1.03231	0.26993	0.20393	0.0001	0.20401	0.7558	4.8	$208,568
Fabricated	2.61176	1.19190	0.45800	0.33065	0.0024	0.33305	0.7272	9.8	$101,779
Machinery	2.39163	1.05260	0.40748	0.26558	0.0006	0.26620	0.6533	6.9	$145,724
Transportation. Eq	2.58295	0.87671	0.23819	0.14951	0.0001	0.14962	0.6282	3.5	$285,828
Electrical	2.40155	1.12142	0.46138	0.30741	0.0002	0.30759	0.6667	7.3	$137,187
Non-Metallic Miner	2.40825	1.16962	0.46722	0.29486	0.0010	0.29590	0.6333	7.4	$135,783
Refined Petroleum	1.44443	0.33335	0.11898	0.04100	0.0002	0.04116	0.3459	1.6	$611,254
Chemicals	2.39254	1.03700	0.38731	0.22560	0.0002	0.22575	0.5829	4.2	$240,320
Misc. Manufacturin	2.50681	1.15723	0.41601	0.29232	0.0012	0.29352	0.7055	9.7	$102,901
Construction	2.52104	1.23094	0.50579	0.33210	0.0388	0.37088	0.7333	6.4	$156,135
Transportation	2.29782	1.16819	0.53177	0.26997	0.0070	0.27697	0.5208	8.3	$119,976
Trade	2.27214	1.33974	0.71209	0.34108	0.0566	0.39773	0.5585	11.3	$88,120
Other Services	2.91691	1.28611	0.38992	0.22820	0.0666	0.29478	0.7560	22.1	$45,346

Source: Econometric Research Limited

A high value added coefficient is indicative of a high degree of internal processing. A sector that ships raw materials without any further processing typically has low value added coefficients. Sectors with high value added per unit of output are those that purchased inputs that are processed within the respectice sectors, adding significant value through the use of labour, capital and entrepreneurship.

A high labour income share in value added reveals the labour intensity of the production process of the sector. Refined petroleum, for example, uses few workers and as such should show a low share of labour income per unit of output or in value added.

Obviously, a high employment content per million dollar of output designates the sector as a significant contributor to employment generation in the province. This may often be consistent with low average labour productivity in the sector.

The transportation and storage sector in 1979 had below average output multipliers, above average income multipliers, a very high labour income share in value added, a relatively high employment content and not surprisingly a relatively low average labour productivity. Transportation and storage were effective in generating income and employment for the province but did not contribute much to its overall labour productivity.

By way of contrast, the transportation equipment producing sector shows a relatively high output multiplier (among the top 5 sectors) and one of the lowest income multipliers. This combination is indicative of a highly specialized but integrated production structure of the auto industry in North America. Establishments fabricate only a small part of the total product they sell. At the same time, transport equipment production in 1979 had a relatively low direct value added coefficient but a surprisingly high labour share in value added. The latter follows from the type of labour used in production and the high wages they received, given their high productivity. Alternatively, it is not surprising to find that employment per million dollar of output in this sector is relatively low (9.1 jobs) while average labour productivity is relatively very high ($109.7 thousands). The sector, however, sustains very high skilled, highly productive and well paid labour.

The combination of the transport and storage sector with the production of transport equipment sector within a broader and more comprehensive transportation sector provides a more "balanced" sector with even output,

income, employment and productivity contributions.

The consideration of structural change over time by using the input output tables for 1984 and 1990 reveals some interesting developments. The output and income multipliers of transportation and storage services declined between 1979 and 1984 but increased substantially in 1990 (see Table 2). On the other hand, employment per million dollar of output declined continuously over the period with the concomitant increase in average labour productivity.

Similar trends are observed in transportation equipment production. The results in Table 2 show a small but steady rise in the output and income multipliers of the sector but a drastic decline in employment per million dollar of output, with a notable rise in labour productivity.

The increased capitalization of the transportation sector, including both transport equipment and transportation services and storage, the anticipation of NAFTA and the intensification of global competition have combined to increase the efficiency of this sector. This increased efficiency was not accompanied by commensurate gains in employment.

Transportation and storage and the production of transportation equipment compare very favourably with other sectors in terms of both of the indicators, but particularly in the 1990 case.

The sectoral perspective on transportation from the selective indicators above is one of an efficient sector with high labour income ratios and substantial contributions to output, income and productivity. Missing from this presentation is the enormous contribution the transport equipment sector makes to the balance of payments of Ontario with the rest of the country and the rest of the world. The transport equipment sector is, after all, the leading export sector in Ontario.

Is Transportation A Key Sector in the Ontario Economy?

Hirschman defines a key sector as a sector with high forward and backward links with other domestic sectors. Hirschman's definition, however, does not impose any restrictions on variability of the linkages. This is a crucial issue because a sector can have very large links to only one sector. Far more important here is the spread of these links over many sectors. That is why we define the key sector to be one with large backward and forward links to many sectors. We gauge the links of a specific sector by the magnitude and the

spread of its purchases from and sales to other sectors.

Variability is measured by the lack of concentration of these purchases or supplies in a small subset of sectors.

A high v_j may be interpreted as indicating that a particular industry draws heavily on one or a few sectors and a low v_j as a sector drawing evenly from other sectors. Similarly, one can interpret that v_i's in the same way.

Adopting Hazari's criterion, a key sector is one which has:

(a) both u_i and u_j greater than, and

(b) both v_i and v_j are low relative to their averages.

This definition of key sectors can again be identified with Hirschman's definition of a key sector as one with high forward and backward links. Hirchman's definition, however, does not impose any restrictions on variability.

In Table 3 we present a two-way classification of forward and backward linkages and their respective distributions in 1990. Obviously the sectors that fall under high (backward links) L_j and low (variability) V_j reveal a high absorption rate from a large number of sectors in the economy. Similarly, sectors with high (forward links) L_i and low (variability) V_i show high forward linkages with a large supply network.

The sectors that possess both high L_i and low V_i, and high L_j and low V_j are key sectors in the economy. Surprisingly, only the food and beverages sector qualify for the key sector designation in Ontario. In 1979, transportation and storage was one of the sectors that showed higher than average forward linkages (1.82) and a low coefficient of variation (1.25), signifying that it supplied a large number of sectors with its services. On the other hand, it had low backward linkages (0.93) and a high coefficient of variation (2.70) indicating a low absorption rate of the products of only a few sectors in Ontario. By way of contrast, the transportation equipment sector had low forward linkages and these were highly concentrated in few sectors, in 1979.

The backward linkages of both the transportation services and transportation

Table 3

Forward Linkages and Coefficients of Variation, 1990

Sector Name	*Variability (V_i)*	*Forward Linkage (L_i)*
Sectors with Low Forward Linkage and Low Coefficient of Variation		
Agriculture	3.11	0.76
Mining	3.04	0.66
Paper	3.07	0.75
Printing	2.97	0.69
Primary Metals	2.92	0.83
Fabricated Metal	3.12	0.67
Transportation Equipment	2.95	0.91
Chemicals	2.48	0.93
Misc. Manufacturing	2.86	0.76
Sectors with Low Forward Linkage and High Coefficient of Variation		
Forestry	4.74	0.44
Fishing	3.69	0.61
Textiles	4.10	0.48
Clothing	4.20	0.47
Wood	4.02	0.53
Furniture	4.42	0.46
Machinery & Equipment	4.02	0.51
Electrical	3.40	0.63
Non-Metallic Minerals	3.94	0.52
Refined Petroleum	4.49	0.43
Construction	3.21	0.60
Sectors with High Forward Linkage and Low Coefficient of Variation		
Food & Beverage	2.09	1.12
Transportation	1.14	2.02
Trade & Finance	0.67	3.16
Other Services	0.59	5.04

equipment sectors did not change much in relative magnitudes between 1979

and 1990. Almost the same backward linkage pattern was observed between 1979 and 1990. On the other hand, the forward linkages of the transportation equipment sector underwent some significant changes between 1979 and 1990. In fact, the coefficient of variation of the forward linkages increased to above average values between 1979 and 1984 and then decreased to below average values by 1990.

For both transportation subsectors, the observed forward and backward linkages have, however, changed in absolute terms between 1979 and 1990. These developments are indicative of a process of greater integration of the Ontario sectors with foreign and other Canadian sectors outside Ontario. The 1990 coefficients amplify these trend and capture the maturation process that the transportation sectors have undergone between 1979 and 1990 (see tables 3 and 4). The transportation equipment sector remained exactly within the same blocks of designation in terms of backward linkages throughout the period. What changed were the absolute values of the coefficients. This is more pronounced in the case of forward linkages than in the case of backward linkages.

While only one sector qualified for the key sector status in Ontario between 1979 and 1990, other sectors may qualify, were we to relax the strict conditions (a) and (b). Tables 3 and 4 show some of these possible candidates that may have qualified as key sectors but did not because of slight violation of one of the conditions in (a) and (b) while ranking better than average on the rest. Transportation equipment and transportation and storage both are good potential candidates. Transportation and storage would benefit from larger backward linkages while transportation equipment would benefit from larger forward linkages.

It is to be noted that the key sector status should not be judged outside the full appreciation of the many indicators that were used in this study. The focus of this section is on the way the transportation activity, be it in terms of services or equipment, is a critical link in the production chains of the province. The objective here is to quantify the extent to which the health of the Ontario economy is linked to the health and proper functioning of the transportation sector. This perspective is all the more important when issues of efficiency and competitiveness are taken into account. The transportation sector, narrowly or broadly defined, is shown to be a critical sector in Ontario not only in terms of the size of its direct contribution to the economy, but also in terms of the linkages to other critical sectors in the province.

Table 4

Backward Linkages and Coefficients of Variation, 1990

Sector Name	*Variability (V_j)*	*Forward Linkage (L_j)*
Sectors with Low Backward Linkage and Low Coefficient of Variation		
Forestry	2.35	0.95
Textiles	2.28	0.93
Machinery & Equipment	2.25	0.97
Electrical	2.35	0.97
Non-Metallic Minerals	2.23	0.97
Sectors with Low Backward Linkage and High Coefficient of Variation		
Mining	2.56	0.82
Refined Petroleum	3.33	0.58
Chemicals	2.55	0.97
Transportation	2.86	0.93
Trade & Finance	2.93	0.92
Sectors with High Backward Linkage and Low Coefficient of Variation		
Agriculture	2.42	1.03
Fishing	2.25	1.18
Food & Beverage	2.38	1.07
Clothing	2.18	1.01
Wood	2.06	1.15
Furniture	2.08	1.05
Paper	2.28	1.08
Printing	2.22	1.03
Primary Metals	2.38	1.09
Metal Fabricated	2.17	1.06
Misc. Manufacturing	2.31	1.01
Construction	2.10	1.02
Sectors with High Backward Linkage and High Coefficient of Variation		
Transportation Equipment	2.68	1.04
Other Services	3.11	1.18

There exists a high correlation between sectoral contributions to GPP and the intensity of transportation costs in total production cost of these sectors. The high forward and backward linkages and relatively low coefficients of variation of transportation services and transportation equipment suggest that the economy of Ontario is strongly dependent on the proper functioning and the efficient use of the transportation infrastructure and services.

Economic Structural Change and Transportation

Structural change is a significant feature of the transportation sector in both of its components. The output and income multipliers of transportation services declined between 1979 and 1984 but increased substantially in 1990. Given the large and rapid increases in oil prices during the period, these changes are easy to understand. Similar trends were observed in the transport equipment sector. The increased capitalization of the transportation sector (engendered by declining real rates of interest), the anticipation of FTA and NAFTA and the intensification of global competition have combined to increase the efficiency with which both transportation services are delivered and transport equipment are produced.

Transportation costs can act as an impediment to exports. Indeed, exports show higher transport cost intensities than domestic production, particularly in the case of exports to other provinces. It is the nature of the products exported and the location of the export markets that account for this fact. Nonetheless, this reduces the competitiveness of Ontario Exports in distant provinces where American firms in the proximity may be more competitive. This must be balanced against the enormous contribution the transport equipment sector makes to the Ontario and Canadian balance of payments.

There is an evident maturation process through which the two transport sectors have passed between 1979 and 1990. This process has evidently accelerated after FTA and NAFTA were concluded. Both trade agreements have increased the pace and level of integration of the North American markets. Globalization of production has also increased the diversification of the sector and its material sourcing. There is a definite trend towards lower domestic contents and increased capitalization, efficiency and exports. These trends are evident in the indicators displayed in this study.

Summary and Conclusions

The importance of the transportation sector to the economy is generally not questioned in the literature. There is, however, little consensus on the exact

boundaries (what activities it should include) of this sector and the magnitudes of its importance (contributions to GDP and employment). The issues are both conceptual and empirical.

The study reported in this paper attempts to draw a more comprehensive and consistent picture of the transportation sector's contribution to Ontario's economy than has been available in the past. Showing how this contribution has evolved over time makes it clear that transportation is still a key sector in Ontario. It is highly developed and efficient in delivering transportation services and products whose health is of great importance to the economy. This work needs to be extended (e.g. subprovincial analysis) and accompanied by additional analyses, such as the description and quantification of specific mechanisms through which transportation infrastructure contributes to growth in output and productivity. Together, such analyses will provide the insight necessary in addressing the contemporary economic policy questions aimed at ensuring a responsive yet economically efficient transportation system.

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