Understanding the relationship between changes in accessibility to jobs, income and unemployment in Toronto, Canada

ABSTRACT

Context: In many cities, transport investments are being directed towards increasing accessibility in socially deprived neighbourhoods in order to enhance quality of life and equity. However, little research has been conducted to assess the impacts of such targeted interventions.

Purpose: To evaluate the impacts of accessibility improvements over time on census tract socio-economic status in the Greater Toronto and Hamilton Area, Canada, by examining the relationship between changes in accessibility and:

- Changes in median household income
- Changes in the unemployment rate

Results: In low and medium income census tracts, transit accessibility improvements are associated with larger increases in income and smaller increases in the unemployment rate compared to census tracts that experienced a decrease in accessibility. For high-income census tracts, increases in accessibility by public transport are related to decreases in income.

STUDY CONTEXT AND DATA

A case study was performed at two points in time (2001 and **2011**) in the **Greater Toronto and Hamilton Area**, Canada. During this time, a new subway line was opened, several new train stations were constructed and new express bus services were introduced.

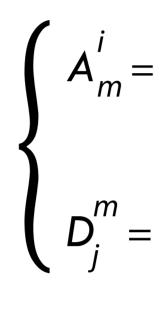
Three data sources were used for the analysis:

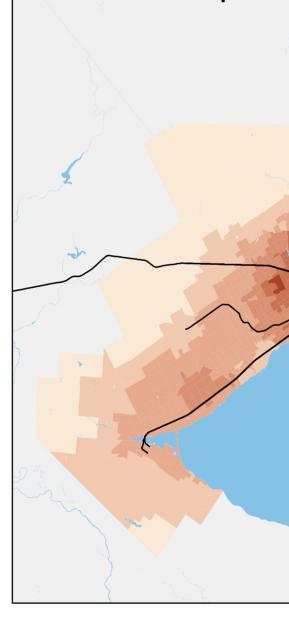
- Travel times in 2001 for car and transit, supplied by Metrolinx
- Census and employment data from Statistics Canada
- O Data from the General Transit Feed Specification for 2011

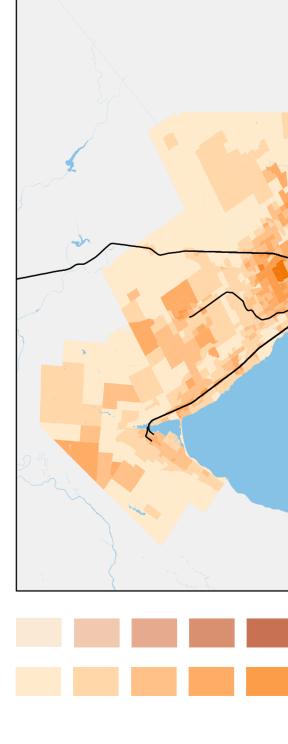




Accessibility was calculated through a competitive measure to explicitly account for competing job searchers:





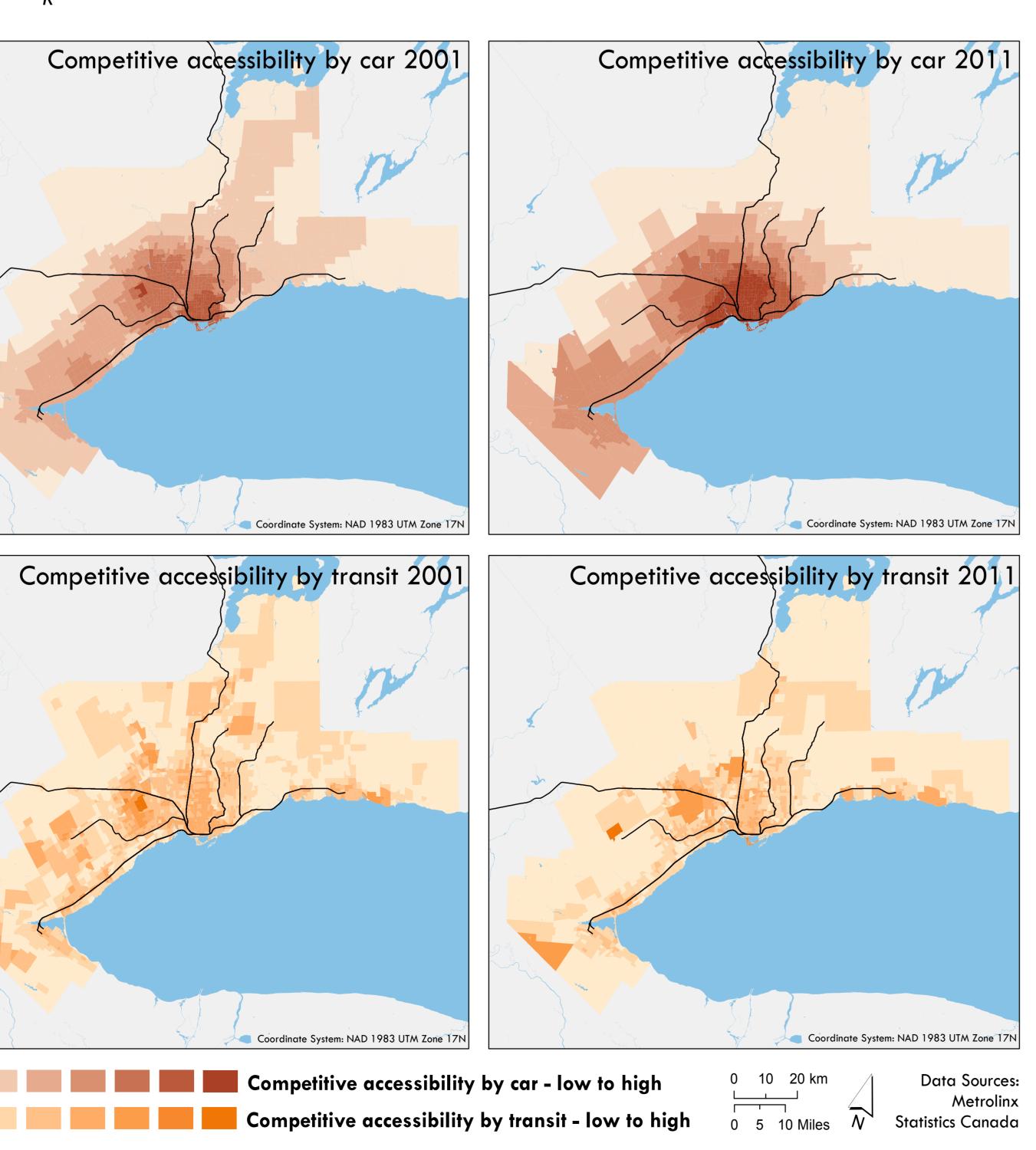


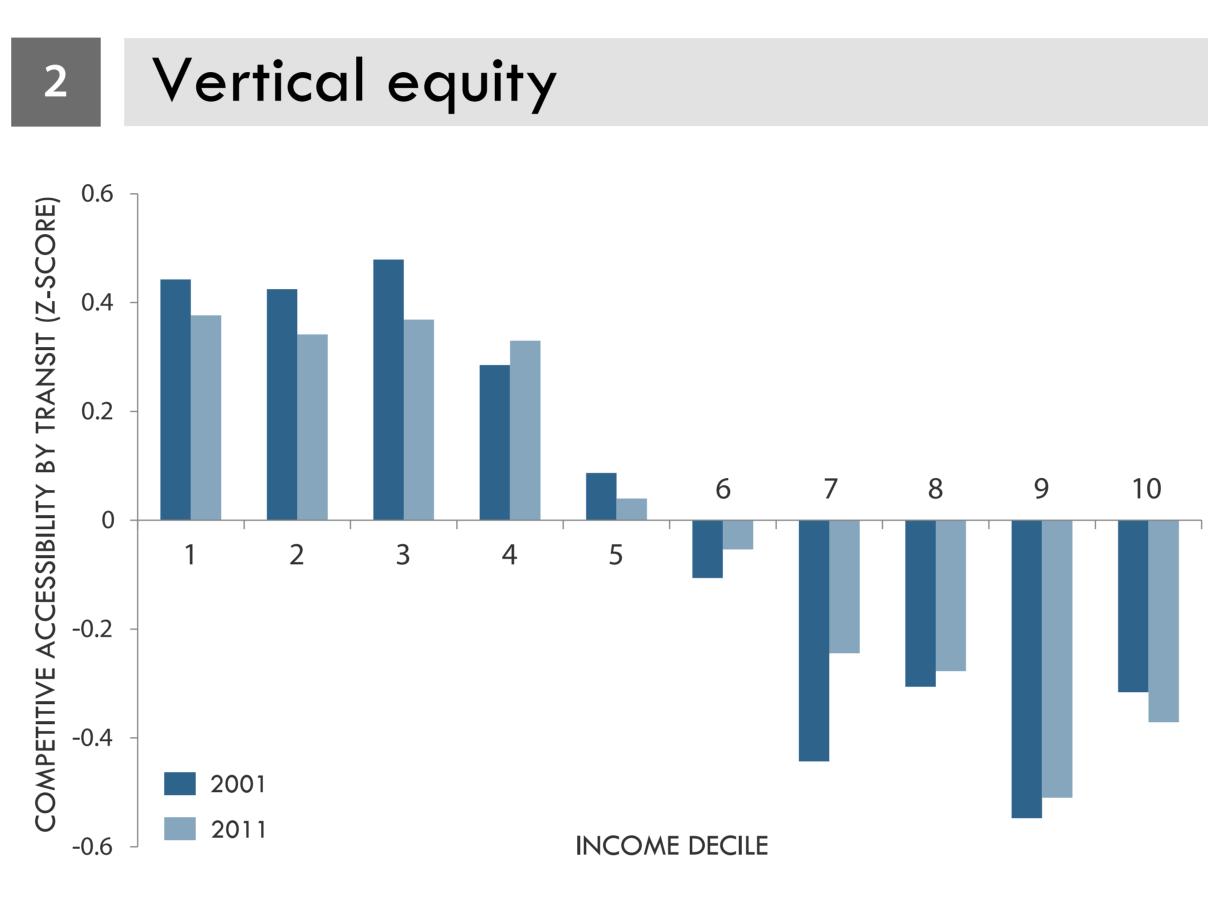
ANALYSIS

1 Competitive accessibility

$$\sum_{j} \frac{O_{j} \cdot f(t_{ij}^{m})}{D_{j}^{m}} \quad \text{where} \quad f(t_{ij}^{m}) = \begin{cases} 1 & \text{if } t_{ij}^{m} \leq 45 & \text{min} \\ 0 & \text{if } t_{ij}^{m} > 45 & \text{min} \end{cases}$$
$$\sum_{k} LF_{k} \cdot f(t_{kj}^{m})$$

- Accessibility at point *i* for transportation mode *m* Number of job opportunities at location j
- Demand for job opportunities at location j
- LF_{L} Labour force at location k





3 Regression

Two ordinary least squares regression models are employed:

- population movement.



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- In 2001, the four deciles with the lowest income in the region experienced considerably higher competitive accessibility levels by transit than all other groups.
- O Competitive accessibility decreased between 2001 and 2011 for the most vulnerable groups, although they continued to have a substantially higher accessibility than the other income deciles.
- In 2011, while the vertical equity of the transportation and land use system was still high, there was a trend towards decreasing vertical equity and increasing horizontal equity.

• Median household income in 2011 predicted via median household income in 2001 and changes in competitive accessibility by car and transit, while controlling for population movement.

O Unemployment rate in 2011 predicted via unemployment rate in 2001 and changes in competitive accessibility by car and transit, while controlling for

	Income				Unemployment rate			
Variable	Coefficient	Sig.	Confidence interval[†]		Coefficient	Sig.	Confidence interval ^{\dagger}	
Constant	5.110	***	2.071	8.150	4.779	***	4.265	5.293
Median household income in 2001	1.121	***	1.093	1.149	-	-	-	-
Unemployment rate in 2001	-	-	-	-	0.699	***	0.636	0.761
Change in accessibility by transit	7.670	*	1.276	14.065	-2.552	**	-4.252	-0.853
Change in accessibility by transit • Median household income in 2001	-0.099	*	-0.181	-0.016	0.033	*	0.011	0.055
Change in accessibility by car	3.370	***	1.490	5.249	-0.540	**	-1.037	-0.044
Change in percentage of residents with a bachelor's degree or higher	0.664	***	0.554	0.775	-0.093	***	-0.123	-0.063
Percentage of residents that have moved between 2006 and 2011	-0.154	***	-0.206	-0.103	0.012		-0.002	0.025
Adjusted R ²	0.8695				0.352			

Dependent Variables: Median household income in 2011 (\$1.000). Unemployment rate in 2011 (%) * 95% significance level | ** 99% significance level | *** 99.9% significance level 5% confidence interval

• A one unit increase in car accessibility is related to an increase in census tract 2011 median household income of \$3,370.

• A one unit increase in transit accessibility for low income census tracts is related to an increase in income in 2011. The effect of transit accessibility reverses when income in 2001 is higher than \$77,475.

- A one unit increase in car accessibility is related to a decrease in the 2011 unemployment rate of 0.53 percentage points.
- A one unit increase in transit accessibility for low income census tracts is related to a decrease in the unemployment rate in 2011. The effect of transit accessibility reverses when income in 2001 is higher than \$78,052.



CONCLUSION

- Accessibility to jobs by **public transport is vertically** equitable in the Greater Toronto and Hamilton Area, although vertical equity decreased between 2001 and 2011.
- In low and medium income census tracts, increases in transit accessibility are related to higher increases in income and lower increases in the unemployment rate.
- For wealthier census tracts, increases in transit accessibility are associated with decreases in income, potentially due to the migration of high-income populations to less dense neighbourhoods, away from transit.
- The change in accessibility by car has a uniform effect across income deciles and is associated with larger income increases and smaller increases in the unemployment rate.
- This study highlights the need for further research to disentangle the complex socio-spatial relationships uncovered in this study. Ideally, future research should employ micro-data to track individuals over time, and use surveys and interviews to shed more light on individual changes in accessibility and socio-economic status.



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