COMMUTE DISTANCE AND POLICY IMPLICATIONS

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Introduction

Commute distance is the distance between a worker's place of residence and his/her usual place of work. Nationally, Census data is the best source of this information to compare the pattern across communities as well as to examine the trend of changes within a region over the past. In addition to taking a full count of the population, census includes detailed information from a sample (one in five) of the households, which covers several information about workers in the household such as their usual place of work and the mode of travel used to get to work.

Commuting distances in a region are influenced by a variety of factors, including the urban structure and the nature of transportation system serving the region. There is an established body of information in the literature about the link between land use and transportation, covering wide areas such as impact of urban density and form on travel behaviour or how transit corridors affect land development patterns around the corridor. Trend analysis of how commuting pattern is changing in a region will also give an indication of how the region has been growing, both in terms of urban development and transportation system. This is not to understate the role of other factors that influence commuting distances, such as the make up of labour force, type of regional economy, and concentration of employment / activity centres.

At the micro level, households go through a complex collective choice process with regard to where they choose to live; the place-of-work of each worker in the household may be one of the factors they may consider in this process. The choice of place-of-residence may be for the long timeframe, whereas the place-of-work for each worker in the household may be subject to change, due to various conditions. The household may choose to relocate when one or more worker in the household changes the job. There is a multitude of factors that a household considers in choosing to locate in a place, of which housing cost (which includes price and local taxes) must be one of the most important factors. This paper examines these factors through a

trend analysis and cases study of the conditions in the Greater Toronto Area[1] (GTA).

Definition

At the outset, it will be useful to define the terminologies used in this paper, as well the method associated with measuring distance. For the purpose of trend analysis, it would be useful to normalize the data to make meaningful observations from the analysis.

Firstly, commuting refers to trips that workers make from their home to "usual" place of work. Workers may be full-time or part-time, and the latter category includes several types based on various factors. It is clear that part-time workers' pattern of commuting is likely (but not necessarily) to be more irregular than the full-time workers'. For the purpose of this study, we shall only focus on the full-time workers, although it would be useful to know also the trend in number of workers that have no fixed work place, or have more than one part-time job.

Secondly, the distance between one's home and one's place-of-work would depend upon how one travels; for drivers, it depends upon the route one takes and similarly for transit riders, it depends upon the transit service one chooses among a variety of different of options (if available). Obtaining reliable and accurate travel distance from commuters is almost impossible, unless it is done through controlled survey mechanisms. Such surveys become costly and can only cover small samples. The methods used by Statistics Canada's is to base it on the exact address of home and workplace and then deducing it based on the coordinate system, regardless of the mode of travel or the route used. It should be noted that measuring distances through coordinates will result in underestimation in some cases, for example due to barriers such as lakes, rivers, or railroads.

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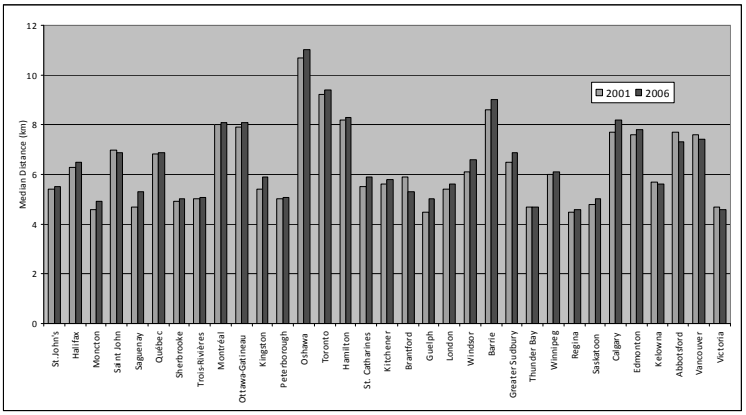
[1] Normally, GTA is defined as including the City of Toronto and the surrounding regions (of Durham, York, Peel and Halton). For the purpose of this paper however, GTA is defined as including the Census Metropolitan Areas (CMA) of Toronto, Hamilton, Oshawa and Barrie.

National Trend

A Statistics Canada report[2] analyzing the data from 2001 and 2006 Census found that the national median commuting distance increased from 7.2 km in 2001 to 7.6 in 2006, while the median for Census Metropolitan Areas (CMA), increased from 7.3 km to 7.5 km. between 2001 and 2006. Figure1 shows the comparison between 2001 and 2006, for each CMA. It is interesting to note that all four CMA's in British Columbia show a decreasing trend, in contrast with the rest of the nation, the only exception being Brantford CMA. Workers in the four CMA's in the GTA have high median distances among all CMA's, with Oshawa exhibiting the highest commute distance, followed by Toronto and Barrie.

Figure 1.Change in Commuting Distance for CMA's 2001 to 2006



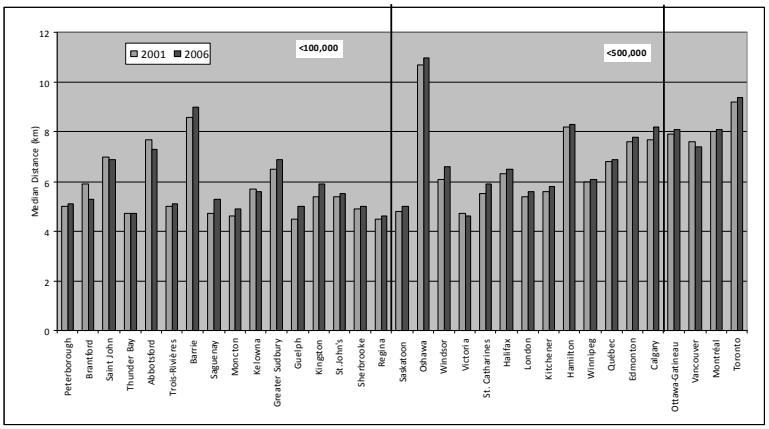
Source: Census of 2001 & 2006

In Figure 1, the CMA's were ordered from east to west while in Figure 2, the CMA's are ordered by the number of workers in 2006 (ranging from about 50 thousand for Peterborough to 2.5 million for Toronto). The lines divide the CMA's into three groups, viz., with employed labour force in a) less than 100,000, b) between 100,000 and 500,000, and c) greater than 500,000. Although the figure does

[2] Statistics Canada, 2008. *Commuting Patterns and Places of Work of Canadians, 2006 Census' Catalogue No.97-561-X,* Ottawa.

not show clear break points in terms median commuting distance, it does show that CMA's with employed-labour force greater than 500,000 generally tend to have high commuting distance.

Figure 2. CMA's ordered by Size



Case Study of GTA

This section examines the pattern of commuting distances in municipalities in the Greater Toronto Area. Table 1 shows the distribution of commuting distances for Census Subdivisions (lower-tier municipalities) in the GTA. It is interesting to note that the CMA's of Barrie and Oshawa whose median commute distance was among the highest in the nation, the high values are due to workers that live in suburban communities. For Barrie, the towns of Innisfil and Springwater had long commute distances, bringing Barrie's median value to be high. Similarly, Oshawa CMA has a high median distance due to Whitby and Clarington (both at 15 km), while the City of Oshawa itself had a low median distance (of 7km).

As mentioned earlier, there are several factors that can be attributed to high commute distances, of which three variables are explored using the data from Census, viz., job/worker balance within communities, transit modal split which is also an indirect indicator of transit service levels and availability, and finally, the housing cost.

Table 1. Commuting Distance for Municipalities in GTA

			% of Workers by Commuting Distance						
CMA	Municipality	Employed Labourforce	Less than 5 km	5 to 9.9 km	10 to 14.9 km	15 to 24.9 km	25 km or more	Median Distance km	ST Mode%
Barrie	Barrie, CY	55,810	43%	18%	3%	3%	33%	6	10%
Barrie	Innisfil, T	12,555	11%	8%	18%	13%	49%	24	4%
Barrie	Springwater, TP	7,255	14%	19%	14%	22%	31%	16	4%
Barrie, CMA		75,625	35%	17%	6%	7%	35%	9	8%
Hamilton	Burlington, CY	74,340	32%	18%	11%	14%	26%	10	12%
Hamilton	Grimsby, T	10,440	24%	8%	6%	26%	36%	21	8%
Hamilton	Hamilton, C	207,120	33%	25%	13%	12%	16%	8	16%
Hamilton, CMA		291,905	33%	23%	12%	13%	19%	8	15%
Oshawa	Clarington, MU	33,940	17%	18%	14%	20%	31%	15	6%
Oshawa	Oshawa, CY	59,660	39%	22%	6%	8%	24%	7	13%
Oshawa	Whitby, T	50,070	23%	17%	9%	7%	44%	15	13%
Oshawa, CMA		143,680	28%	20%	9%	10%	33%	11	12%
Toronto	Ajax, T	41,355	24%	10%	5%	19%	42%	21	17%
Toronto	Aurora, T	21,350	26%	12%	5%	22%	35%	19	12%
Toronto	Brampton, CY	188,995	21%	24%	20%	20%	15%	11	13%
Toronto	Caledon, T	24,990	17%	7%	8%	29%	39%	21	4%
Toronto	E.Gwillimbury, T	9,410	16%	19%	13%	10%	43%	16	6%
Toronto	Georgina, T	17,595	17%	4%	7%	21%	52%	27	6%
Toronto	Halton Hills, T	25,290	26%	6%	13%	28%	27%	17	8%
Toronto	King, TP	8,100	10%	11%	13%	27%	39%	21	7%
Toronto	Markham, T	111,650	22%	24%	17%	23%	14%	11	17%
Toronto	Milton, T	26,255	26%	5%	14%	26%	29%	17	8%
Toronto	Mississauga, CY	294,340	24%	25%	17%	20%	14%	10	19%
Toronto	Mono, T	2,915	24%	14%	8%	8%	46%	18	4%
Toronto	New Tecumseth, T	11,790	32%	6%	7%	11%	45%	19	9%
Toronto	Newmarket, T	34,655	41%	9%	3%	11%	36%	11	11%
Toronto	Oakville, T	71,450	27%	15%	8%	17%	32%	15	18%
Toronto	Orangeville, T	12,250	50%	2%	1%	3%	44%	7	9%
Toronto	Pickering, CY	39,755	20%	10%	12%	26%	33%	18	16%
Toronto	Richmond Hill, T	68,820	19%	19%	18%	27%	17%	13	16%
Toronto	Toronto, C	1,016,825	34%	28%	18%	14%	6%	8	43%
Toronto	Uxbridge, TP	7,620	21%	7%	5%	13%	54%	27	7%
Toronto	Vaughan, CY	103,665	24%	26%	16%	27%	8%	10	11%
Toronto	W.Gwillimbury, T	10,815	20%	10%	19%	11%	40%	15	7%
Toronto	W-Stouffville, T	9,995	20%	10%	11%	29%	30%	18	8%
Toronto, CMA		2,160,020	29%	23%	16%	18%	14%	9	28%
	Canada	**13,041,190**	**36%**	**23%**	**13%**	**14%**	**14%**	**8**	**19%**

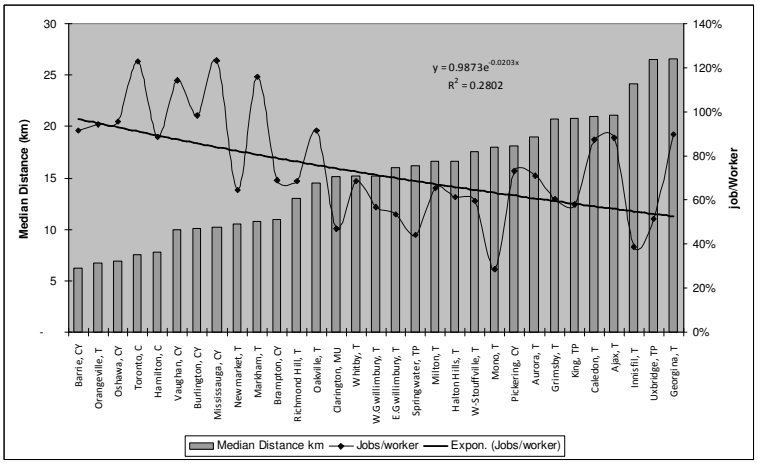
Source: 2006 Census

Job/worker balance:

This is a measure of the level of land use mix within a municipality. In an ideal situation, there would be one job for every worker within the community with the land use pattern such that the workers do not have to travel long distances to go to their jobs. On the other end are bedroom communities where commuters travel to jobs in far off places. Note that even when there is a perfect symmetry between the number of workers and jobs within a community, there is no guarantee that all the jobs are taken up by local resident workers. This is particularly true as the type and nature of jobs will dictate the type of commuter shed that an employment centre attracts. Notwithstanding, it is meaningful to explore if there is a link between commuting distances and the job/worker balance within communities.

As in Figure 2, the place-of-residence and place-of-work data for the census sub-divisions within the GTA are ordered by median commute distance to visually see if there is any pattern. Figure 3 shows the two variables, i.e., commuting distance and job/worker ratio.

Figure 3. GTA CSD's Commuting Distance & Job/Worker Ratio



This figure shows the CSD's ordered by median commuting distance, ranging from the lowest (Barrie) to the highest (Georgina). The line with points represents the job/worker ratio for the CSD, while the continuous line is the regression line. This figure exhibits a trend in that the suburban CSD which predominantly rural in nature tend to have high median commute distance. When compared against the job/worker ratio for these CSD's, there is also a declining trend as distance increases, although the trend line is not a very strong one.

Transit & Active Transport Modal Shares:

As mentioned earlier, the median commute distance for communities can be compared with the sustainable modes (transit and active transport modes, i.e., walking and bicycling) shares. Figure 4 shows the data from table 1, in a graphic form. Again, there appears to be a negative relationship between commuting distance and sustainable mode share.

While it is reasonable that active transportation modes (walk and non-motorized modes) are only used for commute trips that are short-distance in nature, transit mode need not have the same features. In fact, commuter rail trips tend to be much longer than local transit trips. Nevertheless, the trend line does show a negative trend (mode share decreases as commute distance increases). The R^2 for from the regression is not very high (at 0.28), but also not insignificant.

Housing Affordability:

The last factor which is an important one for this case study is housing price. Studies in urban economics have established the land price gradient which states that price decreases with distance from the CBD. Lower prices in the suburban areas will have the effect of attracting residents to suburban areas, while they commute long distance to place of work. Census data on housing cost affordability is used instead of price itself. Affordability is measured by percentage of households in the CSD, whose housing cost (i.e., rent or mortgage payment) is less than 30% of their monthly household income. Figure 5 shows the relation between this variable and commute distance.

Figure 4. Commuting Distance vs Modal Share

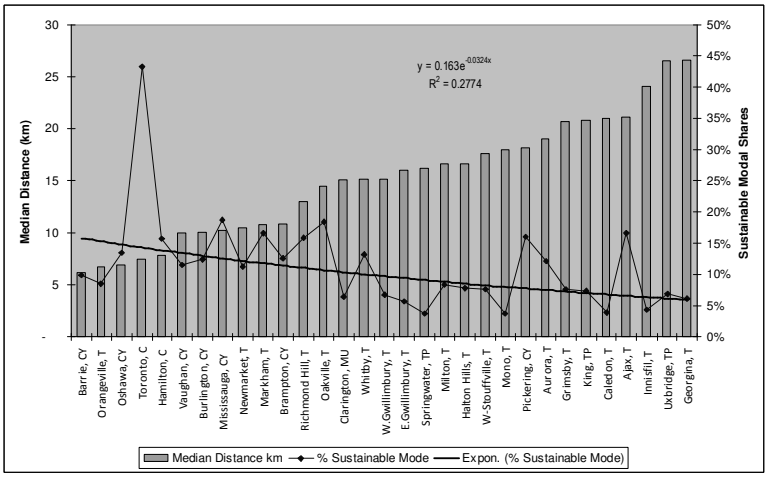
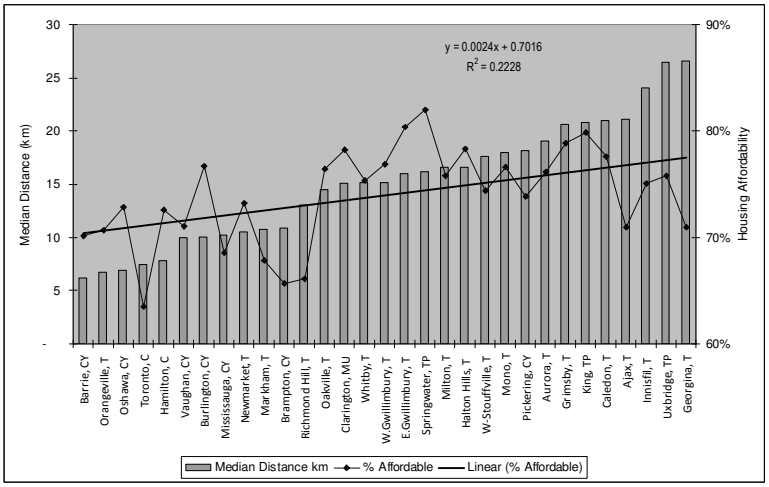


Figure 5. Commuting Distance vs Housing Affordability



It is interesting to note that housing affordability appears to increase with commuting distance. Although the regression is less significant, the figure does show that CSD's with high median distance also tend to have high housing affordability rates.

Tax Structure:

Coupled with the land/house price gradient is the property tax structure/rates in GTA municipalities that influence the live-work relationship in the GTA. Local taxes in the GTA are based on the assessed market value of properties, and a tax rate set by each local municipality. Figure 6 shows the tax rate for municipalities in the GTA. The municipalities are ordered by distance from the CBD of Toronto. The bars (on y-axis on the left) indicate the tax rate for residential single units, as a percentage of the property's assessed value. The line with points (on the y-axis on the right) indicates each municipality's tax ratio, i.e., ratio of commercial property tax rate to that of residential property. Some observations from this figure are:

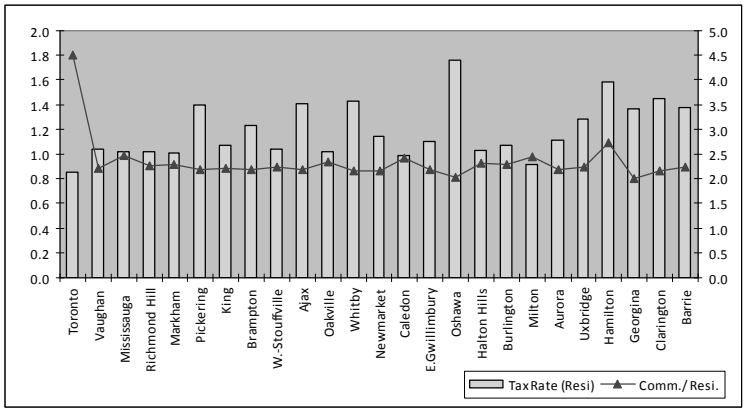
Tax ratio is constant at around 2.2 for most municipalities, except for the cities of Toronto and Hamilton. Whether this implies a cross-

subsidy between residents and businesses within a municipality would require a closer examination of the tax base and revenues. However, the large imbalance between residential and commercial rates of Toronto is worth noting.

Considering the residential rate, Toronto has the lowest rate compared to all the surrounding municipalities. Milton has the second lowest tax rate. Toronto's low tax rate may be offset by high assessed property value, if we were to reckon housing cost of resident property owners. Toronto has a large imbalance between the commercial rate and residential.

Considering commercial tax rates, it can be seen that rates in "905" municipalities is so much lower than Toronto's which may explain the migration of jobs from centre to suburban municipalities (between 2001 and 2006, growth in employment in Toronto was 0.7% compared to 12.9% for suburban municipalities (Census of 2006).

Figure 6. Municipal Tax Rates in GTA



source: Novae Res Urbis – GTA Edition, July, 2009

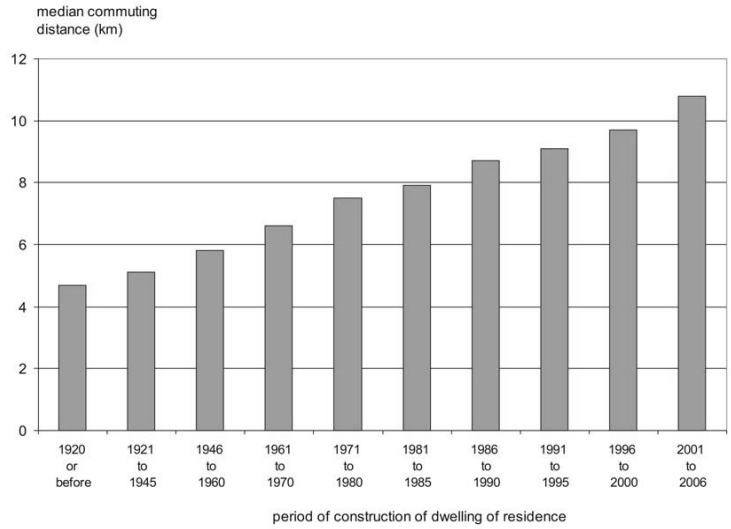
Policy Implication

The housing cost which includes the property tax burden (especially for home-owners) is an important factor in the household's choice of residential location. The land/house price gradient implies that, with

all else being equal, locations away from central areas (which are also likely to be large employment centres) have lower price. Households may locate away from city centre and/or work places to take advantage of this price advantage and rely on the transportation system for their commute. A fast and efficient transportation network may actually facilitate this behaviour.

The study of commuting pattern by Statistics Canada[3] examined the commuting distance of workers in CMA's against the age of the house they live in using the 2006 Census data and found that workers in houses that are less than 5 years of age had the highest commute distance. In fact, the correlation between commute distance and age of the house appears very strong from the figure (reproduced from Statistics Canada report)

Figure 7. Commute Distance and Age of the Building



Source: Statistics Canada, 2008.

[3] Statistics Canada, 2008. *Commuting Patterns and Places of Work of Canadians, 2006 Census' Catalogue No.97-561-X,* Ottawa.

There are several policy implications from the above observations.

While the housing price is determined by market forces, the policies on property taxes (which is linked to the house price/value), provision of public transportation network/services and its pricing, should be to counteract the behavioural tendency of households to locate far from their work places, promoting sustainable development and travel patterns. Besides urban form and design features that favour pedestrian-and-transit-friendly landscape, pricing is the most effective tool that the public agencies have to influence the way the region develops and operates.

Local Taxes and Transportation Pricing:

Property taxes are levied on residents and business located within the municipality. However, no municipality in the GTA has any preferential rate or incentives for residents who also work in the same municipality; similarly, commercial tax rates could be structured to give incentives to those whose employee pool comes predominantly from within the municipality. Such a taxation structure will give incentive to those that locate within the city where they work and in the long-run discourage migration of workers causing sprawl.

It is a common practice that most municipalities have a differential user-fee structure between residents and non-residents for some of the community services that have a user-fee. However, this kind of incentive or disincentive is not applied to transit fares. For example, pricing of transit passes could favour riders who live and work in the same municipality. One such a scheme would be to sell, through large-size employers, discounted transit passes to their employees who live within the same town/city.

Traditional forms of charging for transportation services tend to favour long-distance travel. For example, much of the transit fare structure that exists in the GTA favour long-distance traveller. Most transit operators adopt a flat-fare system that does not have an option for a lower fare for short-distance commute. Even the distance-based fare structure adopted by commuter rail services have a formula that has a fixed price plus variable part that results in a lower per-km charge for longer distance travellers. Removing the fixed portion and making it fully variable by distance could overcome this inefficiency. A more complicated scheme could add a premium for long-distance commuters over short-distance commuters.

On the private travel modes, road pricing in the form of cordon charges can have the same effect of penalizing long-distance travellers. City centre or sub-areas of cities could be cordoned in such a way that local residents making auto trips within their city do not have to pay any user-charge. Devising a transportation pricing scheme that considers both public and private modes, with the objective of giving incentive to certain sectors, can be developed through studies and public consultation.

Conclusion:

Commute distance in most metropolitan and urban areas in Canada have been on the increase, with the exception of those in British Colombia. This paper examined the relationship between median commute distances in the communities within the GTA and a few variables, including housing cost/affordability, job/worker ratio, and transit modal split.

The structure of local taxation and transportation service pricing are examined at a cursory level to provide some policy implications, as well as some policy initiatives that could counteract and influence household behaviour with regard to location choice and commuting.