WILL CANADA'S FUTURE DOWNTOWNS BE RICH?

by

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ABSTRACT

Following the Second World War, a mass exodus of wealthier inhabitants leaving downtowns for the suburbs took place in North American cities. However, beginning in the 1960's, small pockets of the downtown cores began to be re-inhabited by wealthier individuals in a phenomenon commonly known as "gentrification". The question posed in this paper is: To what extent is gentrification in Canada anecdotal and restricted to a select few neighbourhoods, or a widespread phenomenon?

I construct a novel dataset to measure the phenomenon of gentrification in Canada. The empirical evidence of gentrification in Canada is overall similar to the United States but stronger for Canada's three largest cities. Once I divide relative household income by the square root of household size (for a different definition of "wealth", on a per capita level), the gap between suburbs and downtowns shrinks further and in Vancouver, Montreal and Toronto, downtowns are richer than suburbs.

Keywords: Gentrification; Canada; Urban Economics; Household Income; Housing Age; Public Transit

DEDICATION

I would like to dedicate this project to my parents, Elhassane and Naïma, my little brother Azhar, my entire family and my friends who have always encouraged me.

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TABLE OF CONTENTS

Approval ... ii
Abstract ... iii
Dedication ... iv
Acknowledgements ... v
Table of Contents ... vi
List of Figures ... vii
List of Tables ... viii
Glossary ... ix

1: Introduction ... 1

2: Literature Review ... 4

3: Data ... 8
3.1 Methodology ... 8
3.2 Descriptive Statistics ... 12

4: Empirical Model ... 17
4.1 Theoretical Foundation ... 17
4.2 Econometric Model ... 18

5: Results ... 22
5.1 Linear Distance ... 22
5.2 Stratification by City Size ... 24
5.3 Non-monotonic Distance Effects ... 27

6: Will Canada's future downtowns be rich? ... 31

7: Discussion: an alternate dependent variable—relative household income divided by the square root of household size ... 37

8: Conclusion, policy implications, recommendations and future research ... 45

Reference List ... 48

LIST OF FIGURES

Figure 1 -- A simple illustration of the parenthood of a tract 10
Figure 2 -- Fraction of housing 0 to 5 years old by (CMA size) 13
Figure 3 - Fraction of housing over 50 years old by (CMA size) 13
Figure 4 -- Relative incomes in cities with fewer than 100 tracts 29
Figure 5 -- Relative incomes in cities with 100 to 500 tracts 29
Figure 6 -- Relative incomes in cities with 500 to 1000 tracts 30
Figure 7 -- Relative incomes in cities with fewer than 100 tracts 34
Figure 8 -- Relative incomes in cities with 100 to 500 tracts 34
Figure 9 -- Relative incomes in cities with 500 to 1000 tracts 35
Figure 10 -- Average Household Size 38
Figure 11 -- Relative incomes in cities with fewer than 100 tracts 41
Figure 12 -- Relative incomes in cities with 100 to 500 tracts 41
Figure 13 -- Relative incomes in cities with 500 to 1000 tracts 42
Figure 14 -- Relative incomes in cities with 100 to 500 tracts 43
Figure 15 -- Relative incomes in cities with 100 to 500 tracts 43
Figure 16 -- Relative incomes in cities with 500 to 1000 tracts 44

LIST OF TABLES

Table 1 – Summary Statistics 14
Table 2 -- Neighbourhood relative average household income in 2006 22
Table 3 -- Neighbourhood relative average household income in 2006 26
Table 4 -- Neighbourhood relative average household income divided by the square root of household size in 2006 39

GLOSSARY

Census Tract	A census tract is a relatively stable delimited geographic area containing 2500 to 8000 people. Tracts are divided into multiple tracts when the population exceeds 8000 in the following census.
Census Metropolitan Area	Tracts belong to Census Metropolitan Areas (CMA's). A "Census Metropolitan Area" is Census Canada's term to describe an urban agglomeration. For example, the "Vancouver CMA" is more commonly known as the "Greater Vancouver Regional District" or "Metro Vancouver" and contains the municipalities of Vancouver, North Vancouver, West Vancouver, Delta, Burnaby, Port Coquitlam, Surrey, among others.

1: INTRODUCTION

As early as the 1960's, following mass suburbanization in North American cities, small pockets of the downtown core have been progressively, and at first very slowly, re-inhabited and restored by wealthier individuals in a phenomenon commonly known as gentrification. During this time, the deterioration of the housing stock, rising crime rates and poverty became characteristic of North American downtowns. Jane Jacobs, in her seminal book "The Death and Life of Great American Cities" (1960), was a counter-current to the commonly accepted idea that living in the suburbs was preferable for those with means, and provided important documentation of the advantages of living in denser neighbourhood , closer to the city centre. Over the last half century, urban scholars have argued that a combination of heritage architecture (Jacobs, 1960), greater and more heterogeneous amenity provision thanks to greater density (Florida, 2002, Florida, 2007 and Jacobs, 1960), greater natural and historic amenities (Brueckner et al, 1999) and proximity to work seem to be attracting an ever increasing number of highly educated, high income individuals back into the downtowns of North America. Brueckner and Rosenthal study the effects of housing stock age on income localization patterns in American cities and find that, while the income gap between downtowns and suburbs is expected to shrink over the next ten years, downtowns will on average remain poorer. Brueckner and Rosenthal argue that gentrification is happening in American cities, but not at the speed and magnitude that many urban studies case studies and press articles posit. By focusing only on neighbourhoods that experienced the most dramatic improvements and reinvestment, it is easy to see how one gets an exaggerated picture of changes in localization patterns. The question I ask is: To what extent is gentrification in Canada anecdotal and restricted to a select few neighbourhoods, or a widespread phenomenon? Measuring gentrification has important implication on public policy; everything from transportation infrastructure, to health and education, as well as on private sector land development. We cannot assume the Canadian experience will be identical to the American experience so I replicate Brueckner and Rosenthal's empirical model and projections after constructing a novel Canadian dataset.

There are numerous interesting results. First, the positive correlation between a neighbourhood's relative average income (a neighbourhood's average income divided by its respective city's average income)[1] and distance from the city centre disappears after controlling for two important factors explaining different income groups' localization choices: public transit access and housing age. Second, when I allow for a non-linear relationship between distance and income, incomes appear to rise in the suburbs and then fall in more rural areas (the marginal cost of living far from the centre outweighs the marginal benefit

[1] This normalizes neighborhood average incomes to one, so that richer and poorer cities' neighborhoods' average incomes are comparable to each other. The expected relative neighborhood average income at *t* is always 1.

from cheaper real estate after a certain distance)[2]. Third, I find overall that evidence of gentrification in Canada is similar to the United States. My predictions of average relative neighbourhood household income in 2016, which are included as a comparative exercise with Brueckner and Rosenthal's (2009) simulation model, show that the gap between suburban and downtown incomes is expected to shrink in Canada's three largest cities; Vancouver, Montreal and Toronto, and in Canadian midsize cities[3]. This is consistent with Brueckner and Rosenthal's (2009) 2020 predictions for American cities of similar size. Once I divide relative household income by the square root of household size (for a different definition of "wealth", on a per capita level), a different picture emerges. The gap between suburbs and downtowns shrinks further and in Vancouver, Montreal and Toronto downtowns are on average richer than suburbs.

[2] This paper limits itself to studying the city centre, its characteristics and its pull on urban residents. It is certain that preferences vary widely and some people experience much higher disutility from urban density and other features of city living. These people much prefer the countryside to the city, which has its own benefits. The characteristics of the countryside of the cities surveyed, while very interesting, and possibly the topic of a future paper, will not be addressed in this paper.

[3] In my data, Canadian midsize cities are cities with 100 to 500 tracts. They are: Quebec, Ottawa-Hull, Hamilton, Winnipeg, Calgary and Edmonton

2: LITERATURE REVIEW

Gentrification is the phenomenon of higher income groups moving back into a more centrally located neighbourhood and renovating or rebuilding the housing stock. Although many empirical studies of gentrification exist, case studies are more common. In the empirical literature, gentrification is defined as either downtown housing stock renewal or as an increase in downtown average income. For my purposes, I choose the latter.

Many papers in the empirical literature on gentrification look at housing redevelopment. These models typically use logit/probit models to assess the variables that make housing redevelopment most likely (Helms, 2003, Mayer, 1981 and Melchert and Naroff, 1987). The traditional finding is that older housing is most likely to be renovated, which makes sense since it is at once the generally the most dilapidated but also the most desirable (given renovation) since these are often “heritage” buildings, with unique and desirable aesthetic and/or structural features. Other statistically significant factors that increase the probability of renovation are proximity to downtown and proximity to parks/open spaces.

Rather than looking at redevelopment, Kolko (2007) looks at the variables driving income changes in below average income neighbourhoods. Similar to the aforementioned papers, similar variables have a positive effect on neighbourhood income change; old housing stock, proximity to the downtown core, and wealthy adjacent neighbourhoods.

Rosenthal (2007) studies the persistence of poverty in neighbourhood and finds that surprisingly the neighbourhoods that have the highest persistency of poverty tend not to have the highest poverty rates to begin with (interestingly, persistence is highest in neighbourhoods with poverty rates below 15%, but Rosenthal doesn't provide an explanation or interpretation of this result). Good access to public transit and old housing stocks have positive effects on poverty reduction.

Rosenthal (2008) finds that neighbourhood economic status is continually going through cycles of decline and renewal around a long-run mean. Rosenthal (2008) thus shows that neighbourhood economic status is a stationary process, rather than a random walk. This process is linked to the deterioration of the housing stock followed by redevelopment. Rosenthal gathers data on Philadelphia County from 1900 to 2000, and finds that the most recent cycle in this region lasted up to 100 years[4].

The literature on the localization decisions of individuals is rich. In classic monocentric-city models (Alonso, 1964, Muth, 1969 and Mills, 1967), people face two pulls, time-cost pull towards the city centre (where work is located) and a housing-consumption pull towards the suburbs (lower cost per square foot). Wheaton (1977) presented early evidence that in the 1970's the two pulls were

[4] Rosenthal (2008) does not speculate about the length of previous cycles in Philadelphia County. In other regressions, Rosenthal studies 35 cities, or about one seventh of the census tracts in the United States, for a shorter time span (from 1950 to 2000), and finds evidence of cycling around a long-run mean. Another interesting finding of this paper is that middle-aged housing reduces the chance a neighborhood's economic status will improve over the next twenty years. The interpretation is that middle-aged housing is likely to continue deteriorating, as it is not yet ripe for renovation/demolition.

about equal in force leading to an indeterminate location pattern based on this theory.

Glaeser et al. (2008) find that the time-cost pull is much stronger than the housing consumption pull, which implies a central location for higher income households. They show that part of the reason downtowns are on average poorer than suburbs is because inner cities have the density required for well-functioning public transit, and the poor value good access to public transit.[5]

Taxation and local amenities also affect people's localization decisions. Brueckner et al. (1999) argue that when the city centre has strong natural amenities or historical amenities (monuments, a waterfront, beautiful buildings), the city centre exerts a strong pull on the rich leading to a "Paris-style" location pattern of rich in the centre and poor in the periphery. Nechyba et al. (2004) show how powerful local zoning boards segregate certain groups in order to avoid internalizing certain citywide problems or costs.

Brueckner and Rosenthal (2009) look at how housing stock age affects localization decisions. In their model, they show that cycles of housing deterioration and subsequent demolishing and rebuilding makes the housing stock in a city dynamic over time and can help explain location variation over time of income groups in a city. Since housing deteriorates over time, people prefer new housing stock to old and move accordingly as housing stocks deteriorate over time until they are rebuilt or renovated. Using this model, and updating housing age, Brueckner and Rosenthal (2009) predict that between

[5] Other services targeted to the poor and found in inner cities such as employment services, cheque cashing and soup kitchens should have a similar, and perhaps even stronger, effect. In a future paper I would like to control for this.

2000 and 2020, the income gap between downtown and suburb households should shrink to varying degrees in cities of all sizes. However, they conclude that downtowns will continue to be poorer than their suburban counterparts. This model's choice of variables (dependent and explanatory), intelligent use of fixed effects (which I describe in detail in section 4) and simplicity make it ideal for performing a cross-city regression on income localization patterns, and is the main reason I chose it for this paper. An additional and important advantage of choosing this model is that it allows for comparability with Brueckner and Rosenthal's American results and predictions.

In section 3 below, I describe my data.

3: DATA

One of this paper's main contributions is the creation of a new dataset to study Canadian urban trends at the census tract level. In this section, I detail the methodology behind its creation as well as provide some descriptive statistics.

3.1 Methodology

My unit of observation is the census tract. A census tract (hereafter, "tract"), is a relatively stable delimited geographic area containing 2500 to 8000 people. Tracts are divided into multiple tracts when the population exceeds 8000 in the following census. For simplicity, in this paper, a tract can be thought of as a "neighbourhood" and I will use these terms interchangeably.

Tracts belong to Census Metropolitan Areas (which I will refer to simply as "CMA's" moving forward). A "Census Metropolitan Area" is Census Canada's term to describe an urban agglomeration. For example, the "Vancouver CMA" is more commonly known as the "Greater Vancouver Regional District" or "Metro Vancouver" and contains the municipalities of Vancouver, North Vancouver, West Vancouver, Delta, Burnaby, Port Coquitlam, Surrey, among others. For simplicity, in this paper a CMA can be thought of as a "city". My dataset consists of 42 CMA's. My only selection criterion was that a CMA had to be present in the 1996, 2001 and 2006 Canadian Census Tract files[6]. For certain regressions and

[6] As a result, the following CMA's were omitted from my data set and regressions: Chicoutimi, Chilliwack, Drummondville, Frederickton, Granby, Medicine Hat, Matsqui and Saguenay

figures, I stratify the dataset into three size groups. I only study tracts belonging to cities with fewer than 100 tracts (33 CMA's)[7], 100 to 500 tracts (six CMA's)[8] and 500 to 1000 tracts (Toronto, Vancouver and Montreal CMA's) respectively

The first four digits of a tract serve as a unique identifier. This is crucial for comparing census tracts over multiple census years. For example, in Figure 1, tracts 0171.01 and 0171.02 were originally were part of tract 0171. Given the data set uses information from two census years, 1996 and 2006, it was essential to merge the 2006 tracts back to their 1996 delimitations.[9] I used the Canadian Census Correspondence tables for 2006-2001 and 2001-1996 and tract population sizes from the 2006 and 2001 Canadian Census respectively for the merge (weight was proportional to tract population size when averaging to generate new values).

[7] Abbotsford, Barrie, Belleville, Guelph, Kitchener, London, Brantford, Kingston, Oshawa, North Bay, Lethbridge, Moncton, Peterborough, Prince George, Halifax, Kamloops, Kelowna, Nanaimo, Sherbrooke, St. Catherines-Niagara, Sault St. Marie, Saskatoon, Victoria, Windsor, London, Red Deer, Regina, Saint John, St. John's, Sudbury, Thunder Bay, Trois-Rivieres, Saint-Jean-sur-Richelieu

[8] Quebec, Ottawa-Hull, Hamilton, Winnipeg, Calgary and Edmonton

[9] I merge in this direction as I don't know which people went to which new tract, but I know all of them originated from the same tract

Figure 1 -- A simple illustration of the parenthood of a tract

Relative average household income, public transit access, and housing age, were collected from 2006 and 1996 Canadian Census Tract files.

Relative average household income is average reported household income for the tract divided by the CMA's average reported household income. This normalizes average household income to one for each CMA.

Household size is the average reported household size in a tract.

Public transit is a ratio calculated using the number of responses under the public transit category divided by the total number of responses regarding transportation methods. I then create a dummy for "public transit access" setting the dummy to zero if the ratio is less than 0.1 and setting the dummy to 1 if the ratio is above 0.1. Brueckner and Rosenthal set this threshold low (and for the same reason use a dummy instead of the proportion of people using public transit in a tract) so that public transit access is exogenous to the model because they expect public transit provision to change along with housing development/redevelopment.

From the Canadian Census files, I use the period of construction categories[10] to determine housing age categories. I divide each category by the total number of responses regarding housing age to get a percentage.

School district dummies were created using the July 2009 Census of Canada Postal Code Conversion File and school district official websites. Each census tract, in addition to belonging to a CMA, also belongs to a municipality or town (found using Census of Canada Postal Code Conversion File) which in turn belongs to a school district. In my dataset, there are 91 school districts. There are 42 CMA's in the dataset.

Distances were calculated as being the distance from the postal code containing a CMA's city hall to the centre of a tract. 2006 postal code locations were given as longitudes and latitudes in the most recent Census of Canada Postal Code Conversion File. A tract's location was the average of all the postal codes coordinates belonging to it. Distances were calculated using the Haversine formula[11], commonly used to measure distances between two points on a spherical surface. As shown in Phibbs and Lubbs (1995), travel time and

[10] The periods of construction are: before 1946, 1946-1960, 1961-1970, 1971-1980, 1981-1990 and 1991-1996

[11] $\sin^2(d/R) = \sin^2((latitude1-latitude2)/2) + \cos(latitude1)*\cos(latitude2)*\sin^2(longitude1-longitude2)$

distance are very highly correlated; choosing one measure over the other should have little effect on the qualitative nature of the results[12].

3.2 Descriptive Statistics

Figure 2 shows that for the two largest city size groups, on average, as we get further away from the city centre, the percentage of new housing stock tends to increase slightly. For the smallest city size group, cities with less than 100 tracts, the proportion of new housing stock is relatively stable regardless of distance. Figure 3 shows the opposite relationship for the two largest city size groups, as we get further away from the city centre, the percentage of old housing stock decreases sharply then is relatively stable after about 6 to 8 miles from the city centre. For the smallest city size group, cities with less than 100 tracts, the proportion of old housing stock decreases at first then tends to increase for distances greater than four miles.

[12] To be sure, I run two separate regressions, one for tracts with a public transit coefficient of one and another for zero coefficients. I find that with squared distance, distance negatively affects income at a faster rate as distance increases for the public transit equals one regression. This is consistent with the idea that as distance increases, more public transit transfers are needed to get from A to B, causing jumps in commuting time with each additional transfer. This affects linear distance coefficient estimation but not the non-monotonic distance regressions.

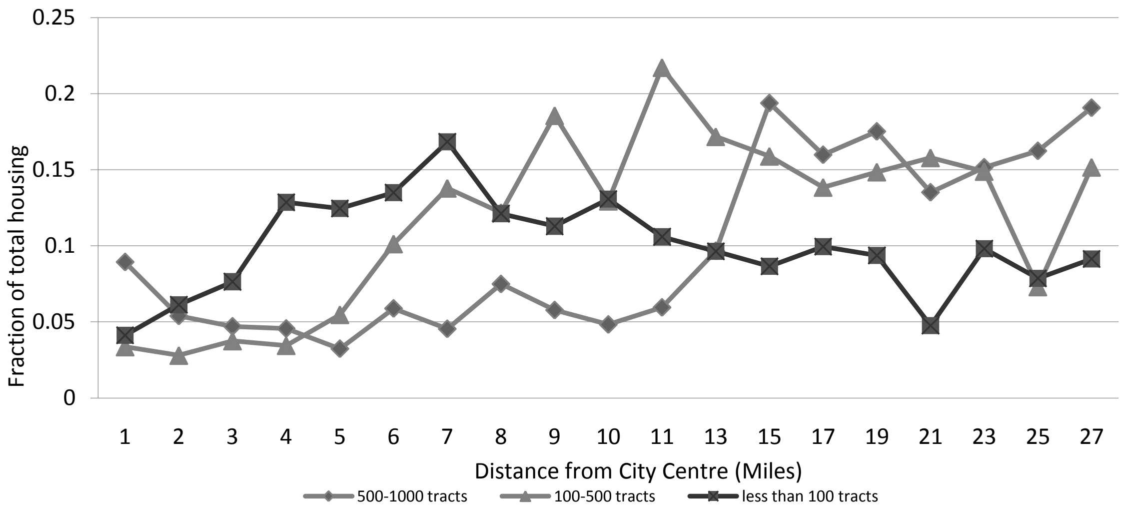

Figure 2 -- Fraction of housing 0 to 5 years old by (CMA size)

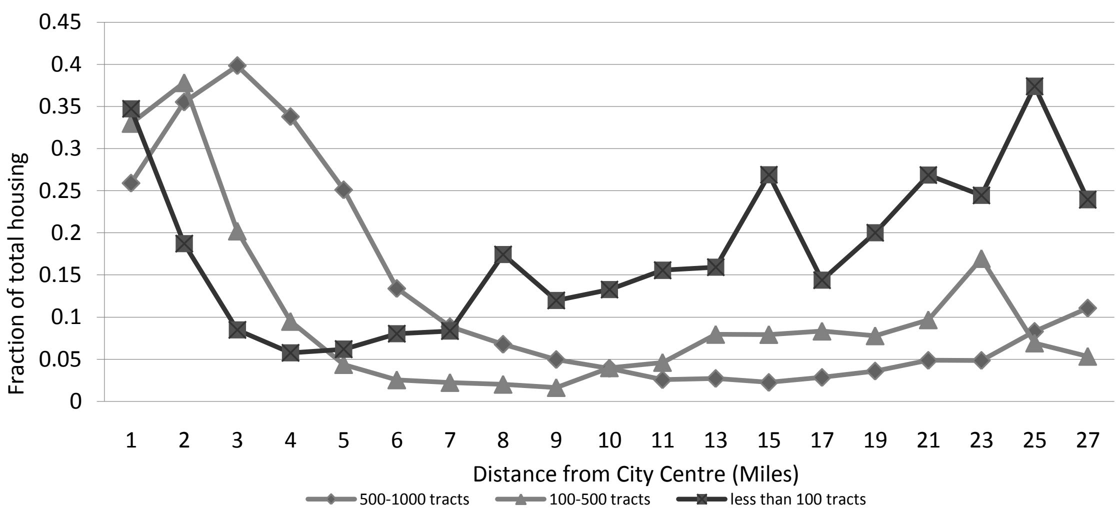

Figure 3 - Fraction of housing over 50 years old by (CMA size)

Table 1 – Summary Statistics

	Mean			Standard Deviation			Min			Max		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Observations	1059	881	1689	1059	881	1689	1059	881	1689	1059	881	1689
Household Income (2006)	67,953	78,235	78,380	22,778	34,331	47,044	21,570	25,486	17,269	271,529	353,880	810,843
Relative Household Income (2006)	0.99	0.99	1.02	0.31	0.40	0.56	0.36	0.28	0.30	4.00	3.75	9.23
City Population (2006)	181,857	891,352	3,621,767	113,651	210,830	1,498,332	63,424	692,911	2,116,581	457,720	1,130,761	5,113,149
Tract Population (2006)	4,228	4,555	4,789	1,976	2,175	2,069	75	308	156	23,880	21,628	22,724
Tract Density (people/sq km) (2006)	1,622	2,584	5,103	1,340	2,104	4,955	0	3	5	8,794	17,569	63,765
City Population (1996)	162,185	776,364	3,140,644	100,107	148,485	1,226,653	60,075	624,360	1,831,665	398,616	1,010,498	4,263,757
Tract Population (1996)	4,264	4,536	5,056	2,070	2,080	2,545	48	45	58	18,302	17,323	25,437
Tract Density (people/sq km) (1996)	1,664	2,718	5,231	1,434	2,321	5,232	0	3	7	9,062	20,392	73,133
% who regularly use public transit (1996)	5	13	23	5	8	14	0	0	0	45	45	65
Census Tract Distance from City Centre (miles)	4.43	5.74	10.27	4.39	4.76	7.54	0.00	0.08	0.28	26.74	51.12	47.85
% dwellings 0 to 5 years in 1996	0.08	0.07	0.07	0.10	0.11	0.11	0.00	0.00	0.00	0.68	0.73	0.96
% dwellings 6 to 15 years in 1996	0.18	0.19	0.19	0.15	0.19	0.20	0.00	0.00	0.00	0.91	0.95	0.97
% dwellings 16 to 25 years in 1996	0.23	0.26	0.20	0.16	0.20	0.17	0.00	0.00	0.00	0.88	0.94	0.86
% dwellings 26 to 35 years in 1996	0.17	0.18	0.20	0.12	0.17	0.16	0.00	0.00	0.00	0.76	0.87	0.88
% dwellings 36 to 50 years in 1996	0.17	0.17	0.20	0.14	0.18	0.18	0.00	0.00	0.00	0.77	0.84	0.89
% dwellings 50 years and over in 1996	0.16	0.13	0.15	0.18	0.19	0.20	0.00	0.00	0.00	0.85	0.86	0.90

(1): cities with fewer than 100 tracts (2): cities with 100 to 500 tracts (3): cities with 500 to 1000 tracts

Table 1 presents summary statistics for my data set. In 2006, the average city size was approximately 180,000 people in small Canadian cities, 890,000 in mid-size cities, and 3.6 million in Canada's three largest cities.

Average household income is higher in midsize and large Canadian cities, approximately 78,000 dollars in 2006, (relative average household incomes average out to 1 for all three city size groups). The standard deviation of average household income also increases with city size. The richest census tract in 2006 was Toronto's famous and very affluent Bridle Path neighbourhood and had an average household income of 810,000 dollars, more than ten times the average for its city size group!

Average tract population is approximately the same in all three city size groups[13] (this is to be expected since census tracts by definition should have between 1,500 and 8,000 people). Tract density, however, is increasing with city size. The average tract density in Vancouver, Montreal and Toronto was approximately 5,100 people per square kilometre in 2006, but the highest tract density was approximately 64,000 people per square kilometre (in downtown Toronto, around Bloor and Sherbourne).

The percentage of people who use public transit is also increasing in city size. In 1996, about a quarter of the people living in Canada's three largest cities used public transit regularly, versus only 5% in small Canadian cities. This is consistent with Glaeser et al. (2008) who show that population density is needed

[13] Looking at the maximum value for census tract populations, we can see that in 1996 the most populous census tract had 25,000 residents, three times the maximum amount. In the following census year, 2001, this tract will be divided into three or four census tracts.

for good public transport provision, which in turn makes public transit more attractive relative to other means of transportation. Larger cities are more spread out as we can see from average tract distance from the city centre, which increases with city size.

The average composition of housing stock age in a city is approximately the same in all three city size groups.

I present my empirical model in the following section.

4: EMPIRICAL MODEL

4.1 Theoretical Foundation

In this subsection, I go through an overview of the theoretical model behind Brueckner and Rosenthal's regressions (2009). Our city begins at *t*=0 as a dimensionless point. It grows outward over time in concentric rings of lesser urban density around this point.

Housing deteriorates over time. Housing consumption is a function of the condition of housing (itself a function of its age) and its size. People prefer newer larger housing. Since density decreases as we get further away from the city centre, and housing is newer, housing consumption is highest in the suburbs.

The city has two income groups, rich and poor. For simplicity, I assume the city has one centre, as in Alonso (1964), Muth (1969), and Mills (1967). Both groups must commute to work, which is located in the city centre.[14] In this model, leisure is not taken into account, so every minute spent commuting is a minute of lost income. Since rich households earn more, their marginal cost of commuting is higher, so they prefer more to be in the city centre.

At a given *t*, the oldest housing stock in the city centre is renovated, so it goes from being the most dilapidated to becoming the newest in the city (age equals zero). Since housing consumption is inversely related to housing age,

[14] In recent decades, suburban employment subcentres have begun to emerge which reduces the commuting pull of downtowns, while this would mitigate the effect of a linear relationship between distance and income, my distance dummy regressions are unaffected since the employment subcentres are captured in the dummies

housing consumption is now highest in the city centre, so rich people move back to the city centre. Rosenthal (2008) finds that in Philadelphia County, the most recent full city cycle (rich moving back in and/or poor becoming rich) took about one hundred years.

From the theoretical model, we can see the important and dynamic role that housing age plays. It explains why people would leave the city centre then move back in. Amenities, taxation and public transit access are important factors in understanding localization decisions as shown by the literature (Glaeser et al., 2008, Brueckner et al., 1999, and Nechyba et al., 2004), but are not as dynamic over time and would not provide much of an explanation of changing income patterns in the city.

4.2 Econometric Model

In all my regressions, the dependent variable is relative average neighbourhood income. This is the neighbourhood's average household income divided by the city's average household neighbourhood income. This normalizes all average incomes to one and allows me to control for cities with higher average incomes. For comparability, my four regressions are the same as in Brueckner and Rosenthal (2009). My regression results are presented in columns 1-4 of Tables 1 and 2, and their specifications are described below.

The regression equation for column 1 uses city fixed effects (dummy controls) and linear distance. $y_{i,2006}$ is the relative average household income for the tract:

$$y_{i,2006} = \beta_0 + \beta_1 * distance_i + \beta_2' * City_i + \varepsilon_i \qquad (1)$$

The interpretation of the coefficient on distance is that it allows me to place income on a straight line from the origin point of the city (the downtown). In other words the coefficient on distance is the average relationship between distance and income, after holding transit access, local amenities or housing stock age constant (depending on the regression column); it allows me to see how different income groups sort themselves according to distance. If the coefficient is positive, incomes tend to rise on average when we look at neighbourhoods further away from the city centre. If the coefficient is negative, incomes tend to decline when we look at neighbourhoods further away from the city centre[15].

Using city fixed effects allows me to control for city level amenities and taxation. Once I replace this with school district fixed effects, I look at a city as a number of zones. All school districts belonging to a city will capture the citywide characteristics, but now I have refined the fixed effects estimation to control for local amenities. School districts capture innumerable local characteristics like natural amenities, parks, crime, density, pollution, location relative to the city centre, employment or commercial subcentres, etc.[16] (Brueckner and Rosenthal, 2009) The regression equation for column 2 uses school district fixed effects instead of city fixed effects:

$$y_{i,2006} = \beta_0 + \beta_1 * distance_i + \beta_2^{'} * school\ district_i + \varepsilon_i \qquad (2)$$

[15] With squared distance, I see an inverse U-shaped relationship, with incomes rising as I get further from the city centre, but begin to decline after a certain distance

[16] In my regressions, school district dummy coefficients are in some cases positive and in other cases negative, meaning some school districts are more desirable than others are. It is the same as for city-level fixed effects, except the school districts allow for a more granular division of space (since there can be multiple school districts in a city), thus allowing us to pick up differences within-city differences as well as between-city differences

The regression equation for column 3 adds a dummy variable for public transit access. If more than 10% of people surveyed in a neighbourhood used public transit in 1996, the “public transit access” dummy takes a value of 1. Lower income households tend to choose locations with better transit access (Glaeser et al., 2008) so I need to control for variables affecting the localization decisions of the poor:

$$y_{i,2006} = \beta_0 + \beta_1 * distance_i + \beta_2' * school\ district_i + \beta_3 * public\ transit\ access_i + \varepsilon_i \quad (3)$$

The regression equation for column 4 adds my variable of interest, housing age. As I explained in the previous section, housing deteriorates with age and becomes less desirable so this will affect richer households localization decisions. This final column is what I use to predict average relative household income in 2016 in section 6 of this paper. Housing age is divided into 5 categories, and each is measured as the ratio of housing in that age category out of all survey houses in the neighbourhood:

$$y_{i,2006} = \beta_0 + \beta_1 * distance_i + \beta_2' * school\ district_i + \beta_3 * public\ transit\ access_i + \beta_4 * \%\ of\ housing\ age\ 0\ to\ 5_i + \beta_5 * \%\ of\ housing\ age\ 6\ to\ 15_i + \beta_6 * \%\ of\ housing\ age\ 16\ to\ 25_i + \beta_7 * \%\ of\ housing\ age\ 36\ to\ 50_i + \beta_8 * \%\ of\ housing\ aged\ over\ 50\ years_i + \varepsilon_i \quad (4)$$

The regression equation for section 7 uses a different dependent variable, relative average tract household income divided by the square root (to account for household economies of scale) of the tract’s average reported household size, to control for multiple income households and supporting dependents. The right hand side of the equation is identical to equation (4). I describe this equation and the intuition behind it in more detail in section 7.

In the following section, I present my empirical results.

5: RESULTS

5.1 Linear Distance

In this subsection, I present the results of my linear distance regressions, described in the previous section.

Table 2 -- Neighbourhood relative average household income in 2006

	(1)	(2)	(3)	(4)
Distance (miles from city hall)	0.0103*	0.0076*	0.0016	0.0014
	(7.39)	(4.68)	(0.91)	(0.88)
Access to public transit in 1996			-0.3271*	-0.2986*
			(-8.93)	(-7.92)
% dwellings 0 to 5 years in 1996				0.3836*
				(4.92)
% dwellings 6 to 15 years in 1996				0.3861*
				(6.61)
% dwellings 16 to 25 years in 1996				-0.0114
				(-0.16)
% dwellings 26 to 35 years in 1996				-
% dwellings 36 to 50 years in 1996				0.0902
				(1.04)
% dwellings 50 years and over in 1996				0.2752*
				(2.98)
Constant	0.9499	0.8616	1.1201	0.9779
Observations	4001	4001	3730	3693
CMA fixed effects	yes	no	no	no
School district fixed effects	no	yes	yes	yes
R2	0.0234	0.0765	0.1131	0.1454
RMSE	0.4873	0.4768	0.4705	0.4501

Notes: The dependent Variable is the year 2006 average tract income relative to CMA average income. Robust t-statistics are presented in parentheses. Starred coefficients are significant at the 95% level.

Public transit access equals 1 if 10% or more of a tract's population used public transit in 1996.

Dwelling ages are measured as of 1996; dwellings aged 26-35 years old are the omitted category.

In Table 2, column 1 confirms the positive correlation between income and distance we tend to find in North American cities. As we get further away from the city centre, average incomes rise. In other words, with city fixed effects, every additional mile away from the city centre I expect relative income to rise one percentage point. Controlling for local amenities by using school district fixed effects in column 2 removes some of this positive relationship, but the coefficient remains significant.

However, this linear relationship between income and distance disappears in columns 3 and 4.[17] This is contrary to Brueckner and Rosenthal (2009) who find a negative and significant coefficient for distance once housing age controls are added.

The constant in all four columns is the baseline expected relative average income for tracts located in both the city centre and in the dropped city (column 1) or school district (columns 2, 3 and 4) dummy, with a public transit dummy of zero (columns 3 and 4), and before housing age effects are added (column 4).[18]

The dummy variable on public transit access has a negative and significant coefficient, confirming that poorer households locate themselves in

[17] When I added a squared distance variable to the regressions (to allow for a non-linear, or *richer*, relationship between distance and income), coefficients on distance and distance squared became significant in all four columns. This is to be expected since income tends to rise in the suburbs and then fall in rural areas, which is why a strictly linear relationship between distance and income is not as effective. Rather, an inverse U-shaped representation is a more accurate depiction of how income sorts itself according to distance, with income rising at first as distance increases and then falling after a certain point. Table A1 in the appendix shows the results from these regressions.

[18] In Tables 1, 2 and 3, I choose not to show the coefficients for the city and school district dummy variables (fixed effects) because there are too many coefficients to allow for meaningful interpretation despite often being statistically significant.

neighbourhoods with better public transit access.

The coefficients on the two youngest housing categories in column 4 are positive and significant[19], confirming my theoretical model. People prefer new housing. The coefficient on the oldest housing group is also positive and significant. Remember, housing age is the time since a house's construction. This means renovated and untouched old houses are both included within the same age category. In the literature review, I showed that older housing had the highest probability of being renovated. One possible explanation for this positive coefficient is that there is a large amount of old, renovated housing stock. This would drive the coefficient upwards. Another possible interpretation is that the people who bought homes 30 to 40 years age never moved and their incomes rose on average. It is most likely that some combination of both interpretations is driving this coefficient upwards.

5.2 Stratification by City Size

I now stratify my dataset by city size. The actual size groups are an arbitrary choice by nature, so I used the same size groupings as Brueckner and Rosenthal (2009). Larger cities tend to be older so may be at a different stage in the renewal cycle. They also tend to have older downtown housing stocks and different public transit provision/access.

In Table 3, I present the results from the regressions on the three different city size groups. These are the same four regressions as in Table 2, except in

[19] Combining the two youngest housing categories does not change the qualitative or quantitative nature of my results. The model's R-Squared and the coefficient's significance are unchanged, the coefficient's value appears to be the weighted average of the two housing groups' coefficients

each subtable, A, B and C, I only study tracts belonging to cities with fewer than 100 tracts (33 CMA's), 100 to 500 tracts (six CMA's) and 500 to 1000 tracts (Toronto, Vancouver and Montreal CMA's) respectively.

I focus on the results from column 4 for the three city size groups. The two youngest housing age categories still have positive and, for all but one, significant coefficients in subtables A, B and C. The coefficient on the oldest housing age category is negative and significant for the smallest city size group, insignificant for the mid-size city group and positive and significant for the largest city size group. The coefficient on distance is insignificant in the two largest city size groups, and positive and significant in the smallest city size group.

Table 3 -- Neighbourhood relative average household income in 2006

	A - CMA's with less than 100 tracts				B - CMA's with 100-500 tracts				C - CMA's with 500-1000 tracts			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Distance (miles from city hall)	0.0174*	0.0181*	0.0129*	0.0087*	0.0253*	0.0269*	0.0111*	0.0057	0.0064*	-0.0039	-0.0125*	-0.0039
	(7.76)	(7.20)	(5.14)	(3.97)	(5.9)	(5.61)	(2.37)	(1.42)	(3.62)	(-1.37)	(-3.11)	(-0.93)
Access to public transit in 1996			-0.3133*	-0.2599*			-0.4054*	-0.3575*			-0.3243*	-0.2581*
			(-7.68)	(-5.88)			(-8.35)	(-6.85)			(-3.59)	(-2.76)
% dwellings 0 to 5 years in 1996				0.4785*				0.1112				0.2521*
				(3.99)				(0.85)				(2.16)
% dwellings 6 to 15 years in 1996				0.4152*				0.3206*				0.3390*
				(4.59)				(3.74)				(3.84)
% dwellings 16 to 25 years in 1996				-0.0268				-0.2008*				-0.0095
				(-0.27)				(-2.12)				(-0.08)
% dwellings 26 to 35 years in 1996				-				-				-
% dwellings 36 to 50 years in 1996				-0.0940				-0.0630				0.2155
				(-0.74)				(-0.63)				(1.55)
% dwellings 50 years and over in 1996				-0.2426*				-0.0836				0.6427*
				(-2.99)				(-0.79)				(4.03)
Constant	0.9004	0.9732	1.0138	1.0054	0.8601	0.7743	1.1349	1.1353	0.9196	1.0394	1.2866	0.7812
Observations	1059	1059	1059	1059	881	881	881	881	1689	1689	1689	1689
CMA fixed effects	yes	no	no	no	yes	no	no	no	yes	no	no	no
School district fixed effects	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes
R2	0.0643	0.0767	0.1473	0.2613	0.1006	0.1371	0.2581	0.2953	0.0106	0.0865	0.1091	0.1285
RMSE	0.3019	0.3011	0.2895	0.2701	0.3763	0.3714	0.3445	0.3367	0.5584	0.5407	0.5342	0.5236

Notes: The dependent Variable is the year 2006 average tract income relative to CMA average income. Robust t-statistics are presented in parentheses. Starred coefficients are significant at the 5% level.

Public transit access equals 1 if 10% or more of a tract’s population used public transit in 1996.

Dwelling ages are measured as of 1996; dwellings aged 26-35 years old are the omitted category.

5.3 Non-monotonic Distance Effects

For this section's results, I ran the same regressions as in Table 3, but now with dummy variables for distance (from the city centre), as opposed to linear distance. Every mile of distance was given its own dummy for zero to ten miles from the city centre, after which I generated a new distance dummy by intervals of two miles for miles 11 to 39 and finally a final distance dummy for any tracts that were 40 miles or more away from the city centre.[20] In this section, I graph the coefficients of the distance dummies, given the controls used in columns 1 to 4.[21]

The dummy containing the city centre is the omitted distance dummy. This means that the coefficient on the distance dummy is the average difference in relative income for that distance relative to the city centre, holding all other controls constant (depending on which regression equation was used). Positive values mean that these distances are on average richer than the city centre. Negative values mean that these distances are on average poorer than the city centre. Take for example Figure 4. Relative incomes four miles from the city centre are on average 38% higher than relative incomes in the city centre when I control for housing age, public transit access and school district fixed effects.

In all three size stratifications (Figure 4 for cities with fewer than 100 tracts, Figure 5 for cities with 100 to 500 tracts and Figure 6 for cities with 500 to

[20] I didn't graph this final distance dummy because it's a catch-all for the few tracts that were "very very far away" from the city centre so any interpretation of its value would be dubious

[21] For Figures 4, 5 and 6, I do not present confidence intervals around the lines so that the diagrams are easy to read. The average robust standard errors around the individual distance dummy points were 0.05 in Figure 4, 0.07 in Figure 5 and 0.1 in Figure 6.

1000 tracts), incomes rise in the suburbs and fall in more rural areas, creating an inverse U shape.

In the two largest size groups, controlling for public transit access gives the flattest income differences (and second flattest for the smallest size group). The income gap between downtowns and the suburbs would be smaller if public transit access were the same across the city. In the two smallest city size groups, housing age tends to flatten the income differences (meaning less of a gap between downtown and suburban incomes). With cities of fewer than 100 tracts, controlling for transit access flattens the income differences, and controlling for housing age further flattens the income differences. For the two largest city size groups, once I add controls for housing, the income gap widens between downtowns and suburbs. This means that if the housing stock had the same age characteristics across the city, incomes in the suburbs would be even higher than the city centre. This is understandable since for the largest city size group (Toronto, Montreal and Vancouver), recall that the coefficient on the oldest housing group is positive and old homes tend to be located closer to the city centre. The coefficient on the oldest housing group is negative for the smallest city group. In the two largest city size groups, housing controls flatten the income gap in more rural areas. In the largest city size group, when I control for transit access but not housing, the city centre is on average richer than neighbourhoods that are 8 to 13 miles away from the centre.

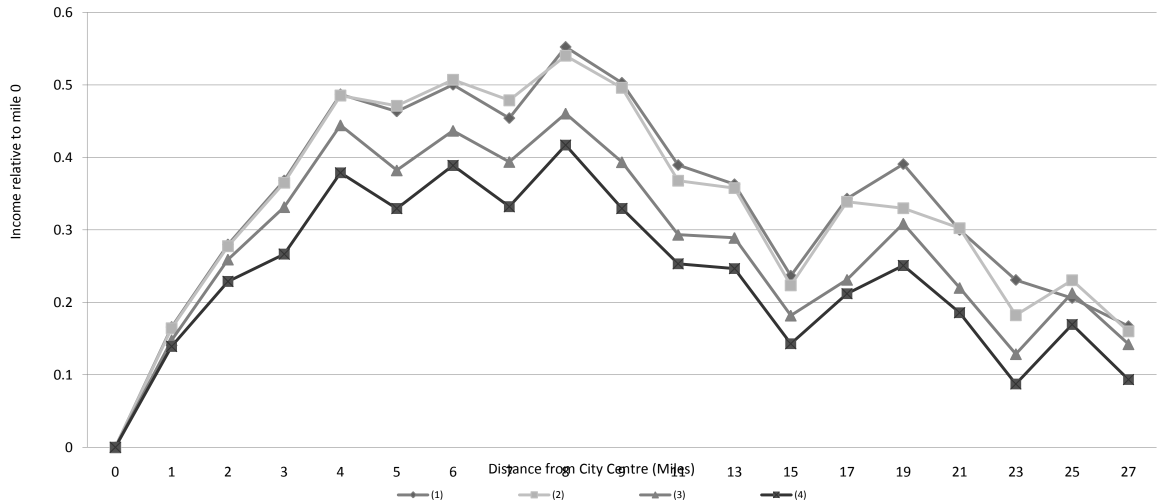

Figure 4 -- Relative incomes in cities with fewer than 100 tracts

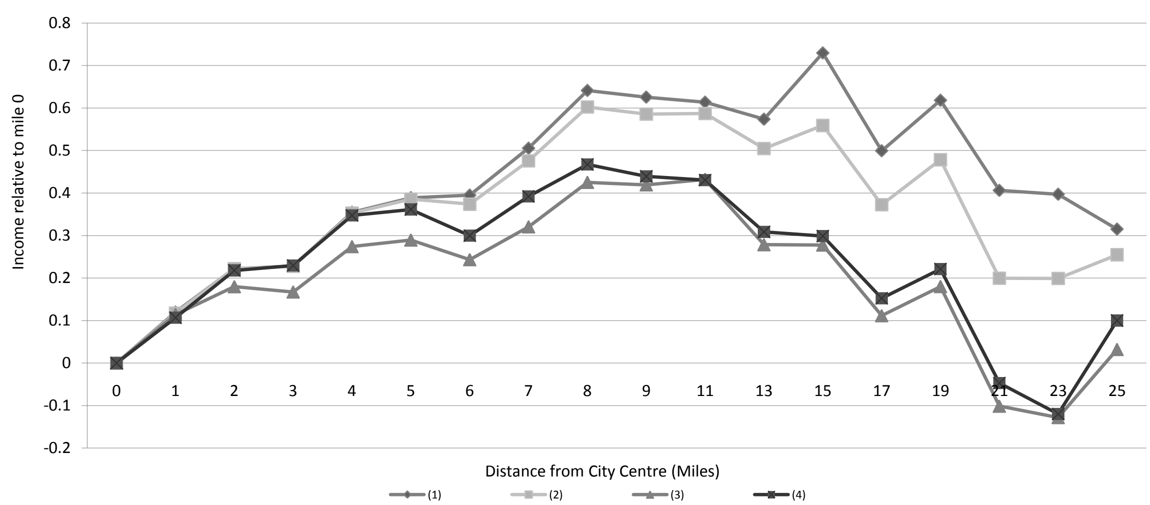

Figure 5 -- Relative incomes in cities with 100 to 500 tracts

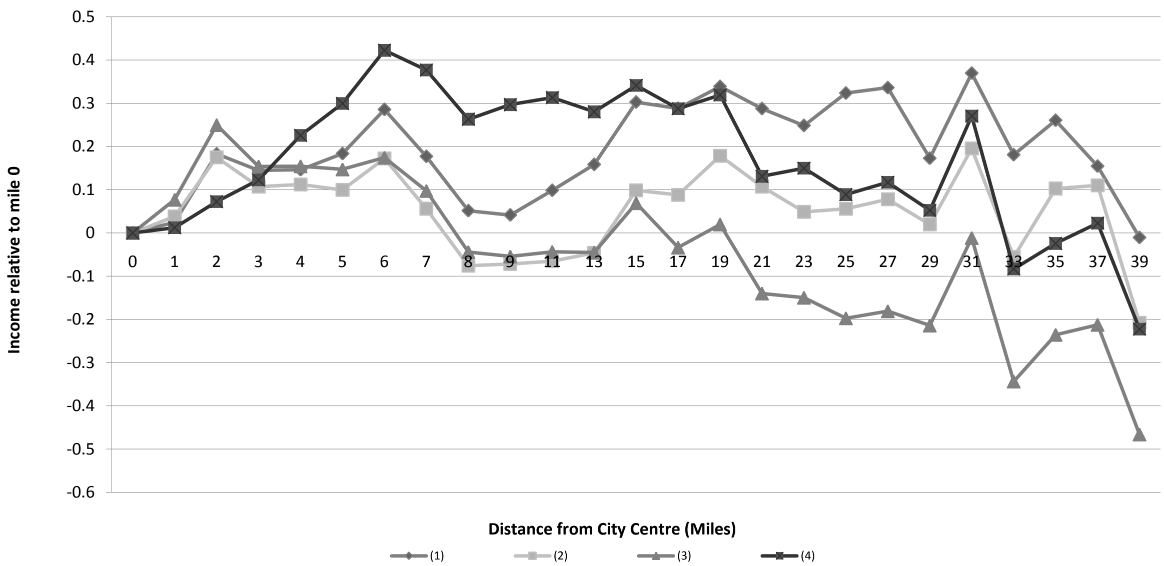

Figure 6 -- Relative incomes in cities with 500 to 1000 tracts

6: WILL CANADA'S FUTURE DOWNTOWNS BE RICH?

The simulations in this section (and section 7) are included as a comparative exercise with Brueckner and Rosenthal's (2009) simulation model. There are a number of assumptions in Brueckner and Rosenthal's (2009) simulations that render the results merely suggestive, the most important of which is that Brueckner and Rosenthal (2009) assume the values of the coefficients and age, demographic and other unobservable characteristics' distributions within the city do not change over time. Another issue is that the simulations implicitly assume housing stock age changes affect changes in average neighbourhood income and are thus causal. This interpretation is stronger than in the preceding empirical work and theoretical model as it implies that a house aging and moving to the oldest age group will increase average neighbourhood income. Nevertheless, the simulation exercise as presented here is intended as a comparison between Canadian and American housing dynamics over the medium term.

I use my model to predict neighbourhood economic status in 2016. First, I find fitted values for 2006 relative income using the coefficients from the non-monotonic distance effect regressions used to generate Figures 4, 5 and 6[22].

[22] The coefficients are from their CMA size category's respective non-monotonic distance regression and are the same coefficients used in equations (5) and (6).

Next, I use these same coefficients to predict 2016 relative average household income:

$$\hat{y}_{i,2006} =$$

$$\hat{\beta}_0 + \hat{\beta}_1 * distance_i + \hat{\beta}_2' * school\ district_i + \hat{\beta}_3 * public\ transit\ access_i + \hat{\beta}_4 *$$
$$\%\ of\ housing\ age\ 0\ to\ 5_i + \hat{\beta}_5 * \%\ of\ housing\ age\ 6\ to\ 15_i + \hat{\beta}_6 *$$
$$\%\ of\ housing\ age\ 16\ to\ 25_i + \hat{\beta}_7 * \%\ of\ housing\ age\ 36\ to\ 50_i + \hat{\beta}_8 *$$
$$\%\ of\ housing\ aged\ over\ 50\ years_i \qquad (5)$$

$$\widehat{Transit\ effect_i} = \hat{\beta}_2 * [public\ transit\ acces_{i,2006} - public\ transit\ acces_{i,1996}] \qquad (6)$$

$$\widehat{Housing\ effect_i} = \hat{\beta}_3 * [\%\ of\ housing\ age\ 0\ to\ 5_{i,2006} - \%\ of\ housing\ age\ 0\ to\ 5_{i,1996}]$$
$$+ \hat{\beta}_4 * [\%\ of\ housing\ age\ 6\ to\ 15_{i,2006} - \%\ of\ housing\ age\ 6\ to\ 15_{i,1996}]$$
$$+ \hat{\beta}_5$$
$$* [\%\ of\ housing\ age\ 16\ to\ 25_{i,2006} - \%\ of\ housing\ age\ 16\ to\ 25_{i,1996}]$$
$$+ \hat{\beta}_6$$
$$* [\%\ of\ housing\ age\ 26\ to\ 35_{i,2006} - \%\ of\ housing\ age\ 26\ to\ 35_{i,1996}]$$
$$+ \hat{\beta}_7$$
$$* [\%\ of\ housing\ age\ 36\ to\ 50_{i,2006} - \%\ of\ housing\ age\ 36\ to\ 50_{i,1996}]$$
$$+ \hat{\beta}_8$$
$$* [\%\ of\ housing\ aged\ over\ 50\ years_{i,2006}$$
$$- \%\ of\ housing\ aged\ over\ 50\ years_{i,1996}] \qquad (7)$$

$$\hat{y}_{i,2016} = \hat{y}_{i,2006} + Housing\ effect + Transit\ effect \qquad (8)$$

Finally, I normalize both the fitted 2006 and predicted 2016 values so that their respective city averages return to one.

To illustrate how I calculate predicted 2016 values for relative household income, take a census tract in Toronto (the largest city group) that has a public transit dummy of one in 1996 and zero in 2006. The “transit effect” for this tract is “-1 x -0.2581 = +0.2581”.

The graphs in figures 7, 8 and 9 present the distance dummy coefficients on fitted 2006 income values and predicted 2016 values. The coefficients graphed in figures 7, 8 and 9 are obtained from the following regression equations:

$$\hat{y}_{i,2016} = \hat{\beta}_i * Distance\ Dummy_i \quad (9)$$

$$\hat{y}_{i,2006} = \hat{\beta}_i * Distance\ Dummy_i \quad (10)$$

The coefficients in figures 7, 8 and 9 are to be read as the average relative household income I should expect to see in the respective distance band, relative to the city centre average household income[23]. For example, in Figure 7, at 5 miles from the city centre, 2006 average incomes are 39% higher and 2016 predicted incomes are 42% higher than their respective city centre average household incomes. In 2016, in cities with fewer than 100 tracts, I expect the income gap between the city centre and neighbourhoods 5 miles away from the city centre to widen by three percentage points[24].

[23] The average robust standard errors around the individual distance dummy points were 0.025 in Figure 7, 0.035 in Figure 8 and 0.05 in Figure 9.

[24] It is easy to relate these percentage point changes back to real income values to get a better picture of the magnitude of these gaps. Looking at the example above, suppose the average household income in the city centre of Guelph is $60,000, then this means the original gap of $25,200 between the city centre and neighbourhoods 5 miles away from Guelph’s city centre will shrink by $1,800.

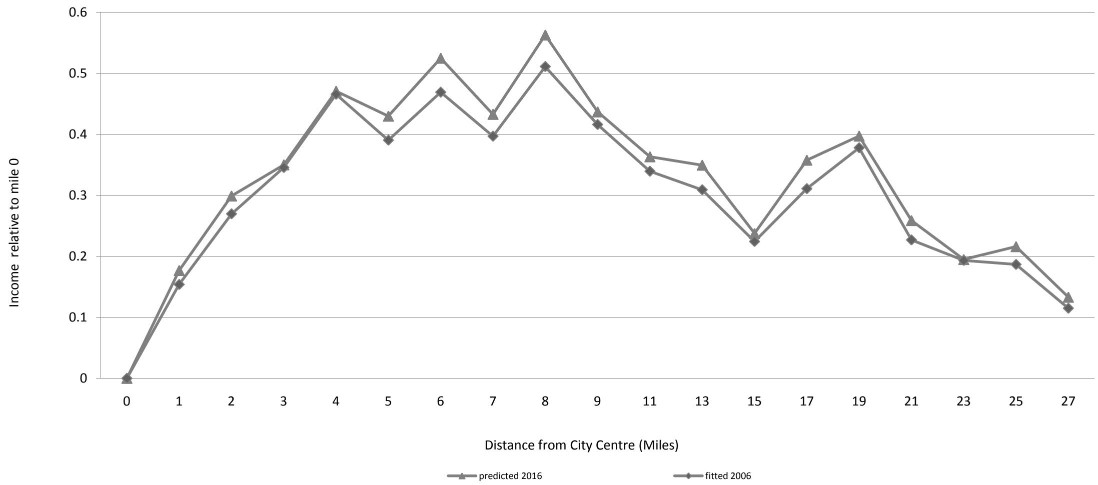

Figure 7 -- Relative incomes in cities with fewer than 100 tracts

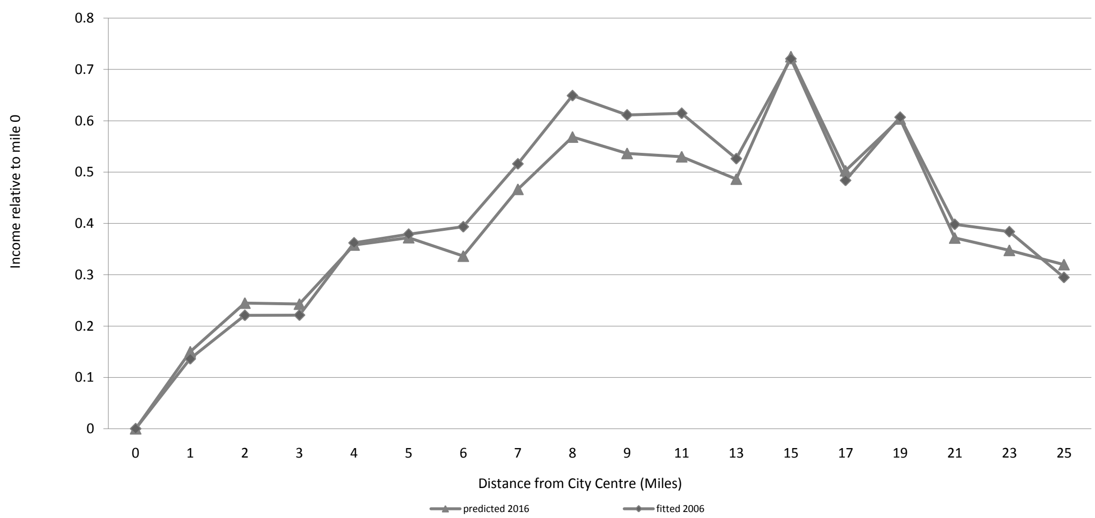

Figure 8 -- Relative incomes in cities with 100 to 500 tracts

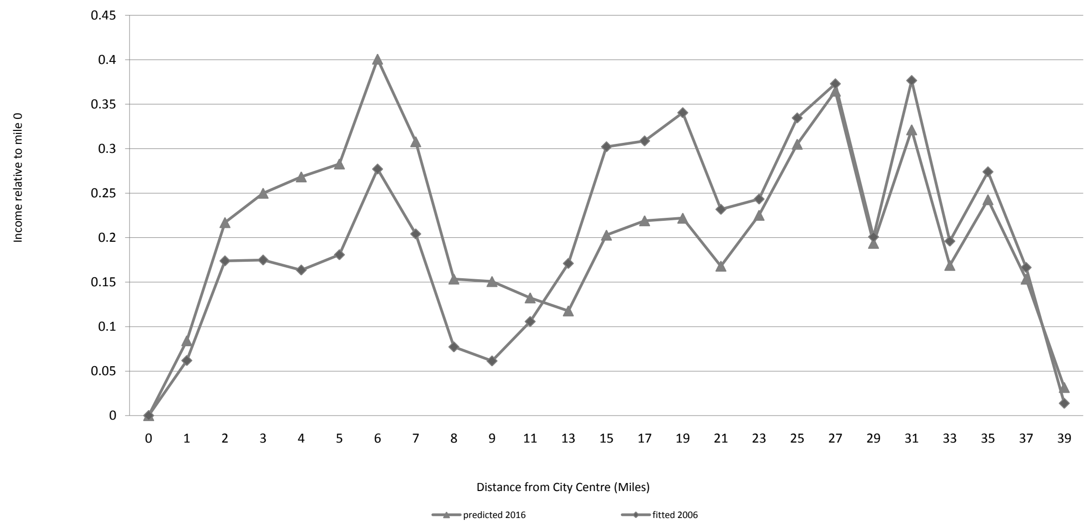

Figure 9 -- Relative incomes in cities with 500 to 1000 tracts

For the smallest city size group (Figure 7), 2016 predictions show that the income gap between suburbs and city centres should widen. In Figure 7, I see that the predicted line (2016 relative income) is higher than the fitted line (2006 relative income), implying the income gap is expected to widen between downtowns and suburbs.

For the midsize city group (Figure 8), 2016 predictions show that the income gap between suburbs and city centres should shrink. In Figure 8, between 5 and 15 miles from the centre, the predicted line is lower than the fitted line and between 0 and 4 miles, the predicted line is higher than the fitted line, meaning suburban relative incomes are expected to fall and downtown relative incomes are expected to rise.

Figure 9 presents relative income differences in Canada's the largest cities; Toronto, Vancouver and Montreal, is more complex. Both the fitted and predicted lines seem to be showing the same income difference pattern. The predicted line is higher until about 11 miles, after which it switches and drops below the fitted line. This is saying that in 2016, in the three largest Canadian cities, both the periphery of the urban core and very close suburbs will see relative incomes rise and have some of the highest incomes in the city, whereas relative incomes in the downtown core, further away suburbs and more rural areas will fall.

According to this model's predictions, there should be some reduction in the overall gap between downtowns and suburbs in the two largest city size groups, but downtowns will remain poorer than suburbs.

7: DISCUSSION: AN ALTERNATE DEPENDENT VARIABLE—RELATIVE HOUSEHOLD INCOME DIVIDED BY THE SQUARE ROOT OF HOUSEHOLD SIZE

In this section, I divide relative household income by the square root of household size. In Figure 10, household size rises as I get further from the city centre, so it is easy to see why this new dependent variable would flatten income differences. In Table 4, all explanatory variables' coefficients shift downwards relative to Table 3.

This new dependent variable has strengths and weaknesses. Its biggest strength is that it is essentially per capita household wealth. In a household of two people, household income is shared and I can now account for this. I divide by the square root of household size to account for any economies of scale. On the other hand, households earning two incomes make different wage earning choices than single income earning households. The main strength of my regression equations is that none of the explanatory variables have any effect on wage earning ability. The main result in this section is that coefficients and income differences between geographic locations are shifted downwards when I divide relative household income by the square root of household size. I believe this section captures the idea that DINKS (Dual Income No Kids) and people who live alone make very different localization decisions than parents.

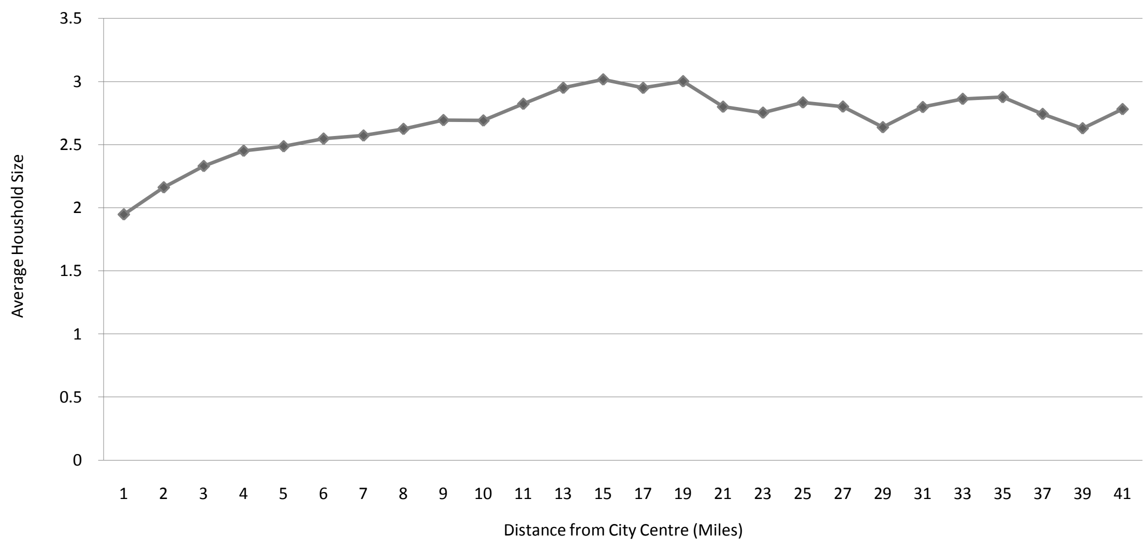

Figure 10 -- Average Household Size

In Table 4, coefficient values on housing age and distance seem to have shifted downward relative to Table 3, they are less positive in Table 4 when they were positive in Table 3 (or become negative) and more negative in Table 4 when they were negative in Table 3. The coefficient on public transit is the least affected by the change in dependent variable. The most interesting result in Table 4 is the coefficient on distance for the largest city group in columns 2-4 becomes negative and significant (it was insignificant or positive and significant for this city size group in Table 3).

Table 4 -- Neighbourhood relative average household income divided by the square root of household size in 2006

	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Distance (miles from city hall)	0.0108*	0.0114*	0.0071*	0.0043*	0.0165*	0.0151*	0.0013	-0.0005	0.0008	-0.0092*	-0.0173*	-0.0076*
	(5.80)	(5.41)	(3.31)	(2.19)	(5.15)	(4.30)	(0.35)	(-0.14)	(0.49)	(-3.35)	(-4.66)	(-2.06)
Access to public transit in 1996			-0.2601*	-0.2227*			-0.3539*	-0.3260*			-0.3076*	-0.2353*
			(-7.13)	(-5.63)			(-7.98)	(-6.85)			(-3.92)	(-2.88)
% dwellings 0 to 5 years in 1996				0.3538*				-0.0264				0.1629
				(3.36)				(-0.22)				(1.49)
% dwellings 6 to 15 years in 1996				0.2928*				0.1914*				0.2742*
				(3.51)				(2.42)				(3.34)
% dwellings 16 to 25 years in 1996				-0.0814				-0.2518*				-0.0308
				(-0.89)				(-2.82)				(-0.29)
% dwellings 26 to 35 years in 1996				-				-				-
% dwellings 36 to 50 years in 1996				0.0700				-0.0624				0.1773
				(0.58)				(-0.66)				(1.39)
% dwellings 50 years and over in 1996				-0.1789*				-0.0603				0.6829*
				(-2.41)				(-0.61)				(4.73)
Constant	0.9516	1.0303	1.0640	1.0757	0.9098	0.8793	1.1941	1.2386	0.9932	1.1563	1.3909	0.8927
Observations	1059	1059	1059	1059	881	881	881	881	1689	1689	1689	1689
CMA fixed effects	yes	no	no	no	yes	no	no	no	yes	no	no	no
School district fixed effects	no	yes	yes	yes	no	yes	yes	yes	no	yes	yes	yes
R2	0.0264	0.0405	0.1062	0.1863	0.0478	0.0874	0.2030	0.2282	0.0001	0.0725	0.0962	0.1435
RMSE	0.2650	0.2641	0.2550	0.2439	0.3458	0.3411	0.3189	0.3148	0.5207	0.5054	0.4990	0.4866

Notes: The dependent variable is the year 2006 average tract income relative to CMA average income divided by average household size for the tract. Robust t-statistics are presented in parentheses. Starred coefficients are significant at the 5% level.

Public transit access equals 1 if 10% or more of a tract's population used public transit in 1996.

Dwelling ages are measured as of 1996; dwellings aged 26-35 years old are the omitted category.

Figures 11, 12 and 13[25] look very similar to figures 4, 5 and 6, except the lines have flattened (but maintained the same overall shape). In many cases the lines have shifted below the x-axis, implying neighbourhoods that on average were richer than the downtown core are now on average poorer when I look at per capita wealth, rather than household wealth. In addition, in neighbourhoods that are still richer than the city centre, the income gap is smaller relative to figures 4, 5 and 6. For example, neighbourhoods 8 miles from the city centre on average tend to be the richest in the city in both figures 11 and 4 (smallest city size group). In Figure 11, the average neighbourhood is about 40% percent richer if I look at per capita wealth and in Figure 4 these same neighbourhoods are 55% richer if I look at total household wealth. Figure 13 shows that for Vancouver, Montreal and Toronto, tracts more than 20 miles away from the city centre are on average poorer than the city centre when we control for housing age and tracts more than 6 miles away are on average poorer than the city centre when we control for public transit but not housing age.

[25] The average robust standard errors around the individual distance dummy points were 0.05 in Figure 11, 0.07 in Figure 12 and 0.1 in Figure 13.

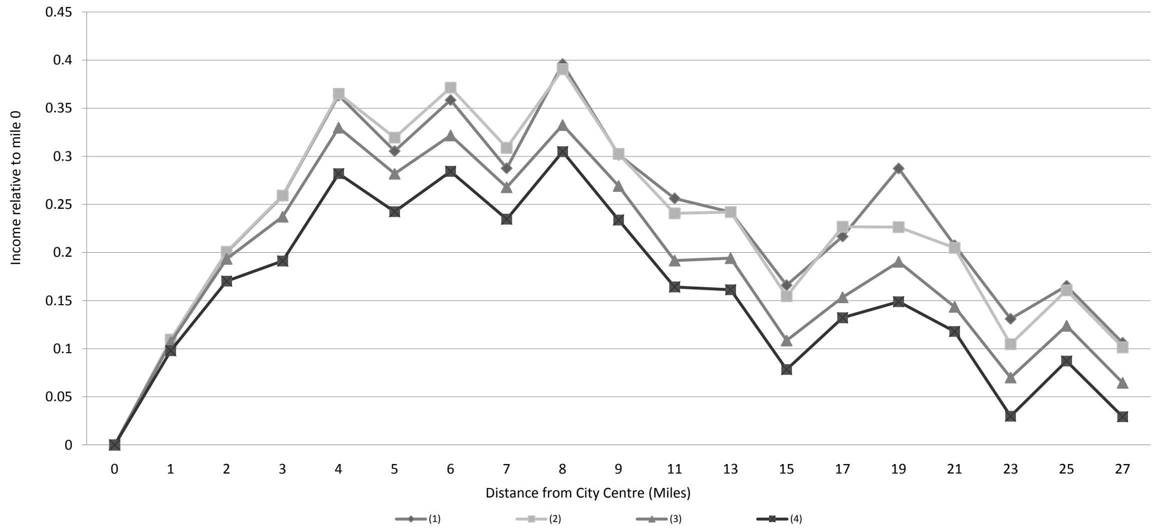

Figure 11 -- Relative incomes in cities with fewer than 100 tracts

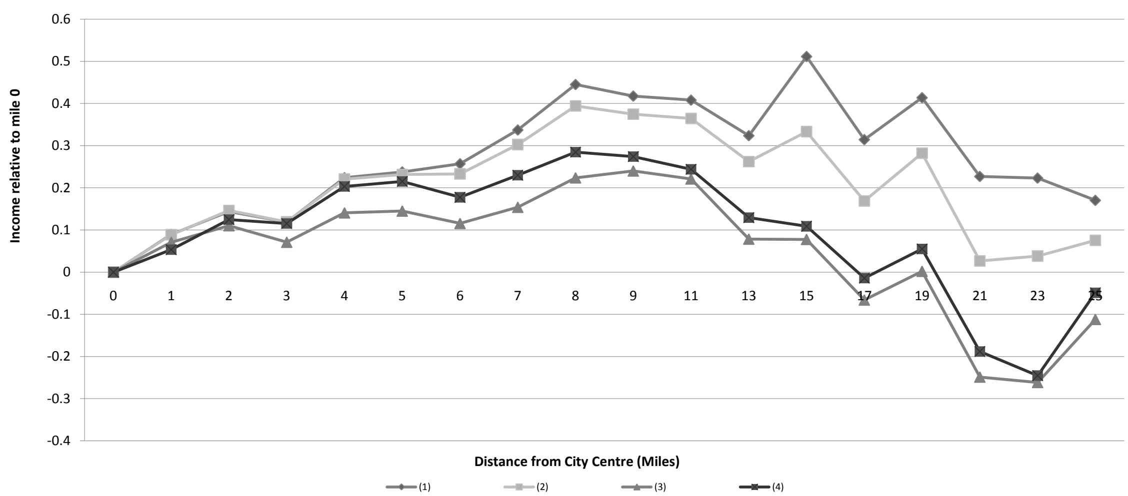

Figure 12 -- Relative incomes in cities with 100 to 500 tracts

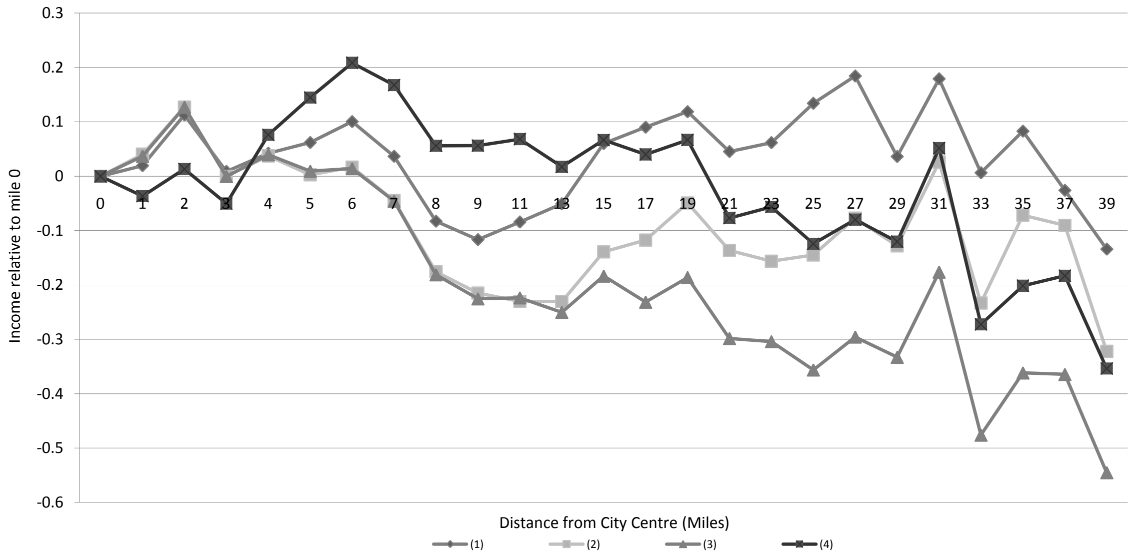

Figure 13 -- Relative incomes in cities with 500 to 1000 tracts

The income differences for 2006 are flatter in figures 14, 15 and 16[26], compared to figures 7, 8 and 9. For the three largest cities (Figure 16) neighbourhoods 8 to 15 miles away from the centre are now relatively poorer than the city centre (negative coefficient). The gaps shrink by about the same magnitude, but shrink less in absolute terms, since the gaps were smaller to begin with, in figures 14, 15 and 16. Figure 16 shows that in Vancouver, Montreal and Toronto, tracts that are 8 to 16 miles away from the city centre are predicted to be on average poorer than the city centre.

[26] The average robust standard errors around the individual distance dummy points were 0.02 in Figure 11, 0.032 in Figure 12 and 0.045 in Figure 13.

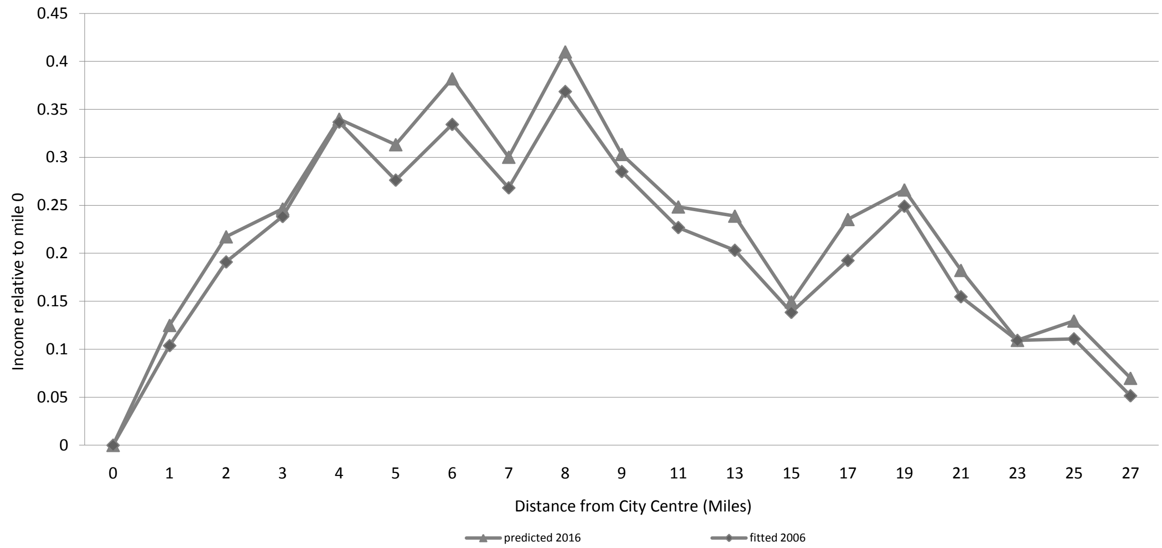

Figure 14 -- Relative incomes in cities with 100 to 500 tracts

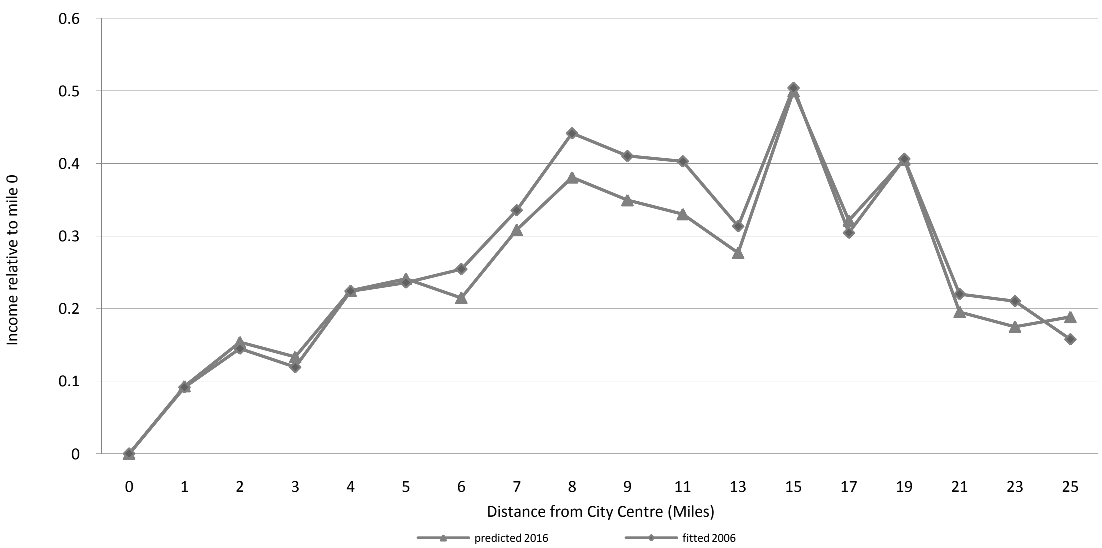

Figure 15 -- Relative incomes in cities with 100 to 500 tracts

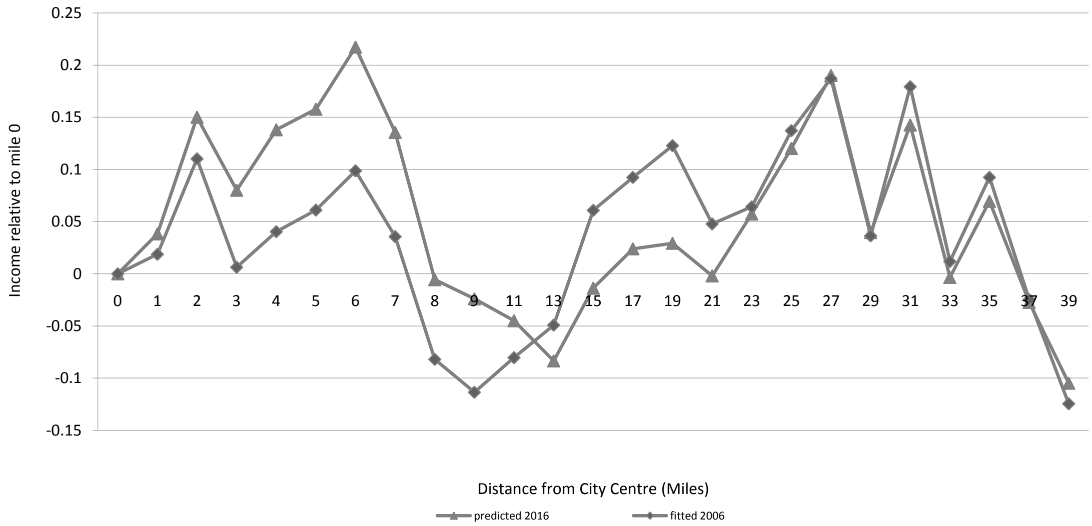

Figure 16 -- Relative incomes in cities with 500 to 1000 tracts

8: CONCLUSION, POLICY IMPLICATIONS, RECOMMENDATIONS AND FUTURE RESEARCH

In this paper, I used the Brueckner and Rosenthal model (2009) to study and predict Canadian urban income localization patterns using a new dataset. My findings are generally consistent with Brueckner and Rosenthal's findings with American data. First, the positive linear relationship between income and distance disappears after controlling for two important factors explaining different income groups' localization choices: public transit access and housing age (Brueckner and Rosenthal find this relationship becomes negative with American data). Second, when I allow for a non-linear relationship between distance and income, an inverse U-shaped relationship emerges, resembling American data. Third, I find overall that evidence of gentrification in Canada is similar to the United States. In my simulation exercise, the gap between suburban and downtown incomes was predicted to shrink in Canada's three largest cities; Vancouver, Montreal and Toronto, as well as in mid size Canadian cities, which is consistent with Brueckner and Rosenthal's (2009) 2020 predictions for American cities of similar size.

In section 7, Canadian downtowns are relatively richer when I look at per capita wealth, rather than total household wealth. I believe this captures the idea that DINKS (Dual Income No Kids) and single people make very different localization decisions than parents. My 2016 predictions using this dependent variable imply that in Vancouver, Montreal and Toronto downtowns will be on average richer than suburbs.

The policy implications of understanding urban localization decisions are essential to successful city design and planning. The most obvious implication of gentrification is that if higher income households are moving into a less affluent neighbourhood, they are pricing out lower income households to another neighbourhood. This means services and amenities need to be moved around the city to where they are most needed. In Vancouver for example, *Insite* (a safe injection clinic) and other crucial services such as homeless shelters, soup kitchens and legal services for Vancouver's most vulnerable citizens will need to be relocated as Gastown and the Downtown Eastside gentrify. This in turn means we need to find out where the less wealthy households priced out of gentrifying neighbourhoods are moving.

Furthermore, residents displaced by gentrification need to be compensated by the "winners", those who benefit or profit from redevelopment, such as real estate developers and the municipal government. Increased taxation revenue from neighbourhoods with higher property value can subsidize local services and amenities in lower-income neighbourhoods through a transfer mechanism. Transfers of ownership and large-scale renovation/reconstruction can be subject to one-time taxes and fees in gentrifying neighbourhoods.

A less obvious, yet very interesting, possible interpretation of higher-income households relocating to more centrally located neighbourhoods could be that, due to a change in aggregate preferences, the quality of life outside the home has, for some people, become relatively more important than housing consumption. The obvious policy implication is that cities must make downtowns as liveable and attractive as possible in order to attract talent and subsequently business investment. For cities with important service sectors like Toronto, Montreal, Ottawa or Vancouver, investing in a new art museum might be more beneficial than a tax break for out-of-town investors. Florida (2002, 2007) argues that amenities matter and affect the between-city localization decisions of highly educated people in the Western world. Albouy et al. (working paper, 2009 draft) measure the premium Canadians place on quality of life (by looking at wages, taxation and rents) and find that Toronto is Canada's most productive city, Victoria has the highest quality of life and Vancouver is the most valued.

Finally, we look at some possible avenues for future research. In a future paper, I would like to extend my model by controlling for local crime rates, which I expect to have a significant and negative impact on relative household income since it is a very important deterrent when deciding where to live. I would also like to look more closely at how age, household size, marital status, children and education can affect people's localization decisions. Like Guerrieri et al. (working paper, 2009 draft), I would like to study "endogenous gentrification". Guerrieri et al. (working paper, 2009 draft) show that as richer people move into a neighbourhood, it becomes more attractive relative to other neighbourhoods. Finally, neighbourhood externalities and spillovers are important for refining measurements of the characteristics driving localization decisions.

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