HOW LOCAL IS MAIN STREET?

NON-WORK TRAVEL BEHAVIOUR TO COMMERCIAL STREETS

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ABSTRACT

With increasing concern about global climate change and sustainable development, local shopping in pedestrian friendly environments has been promoted as a strategy to reduce travel distances and increase the use of sustainable transportation modes. The resurgence of central neighborhoods and traditional commercial streets has led to livelier streets. Accordingly, an understanding of the current travel pattern to traditional neighborhoods is important for transportation planners, designers and decision-makers, to help them in designing and promoting commercial settings that can reduce trip distances and encourage sustainable transport. This paper focuses on non-work related trips to four traditional main streets in Montréal, Québec, Canada. We use the Montréal Origin and Destination survey to model each individual trip to the studied streets. Three linear regression models are generated to investigate factors influencing trip length for auto users, transit users and pedestrians and cyclists. Different factors are found to have influences on trip distance for users using different modes. For auto users it is found that neighborhood characteristics, trip purpose and type of destinations have an influence on trip distance. This can be contrasted to pedestrians and cyclists, where the destination has a little influence on distance but personal characteristics are found to be the main determining factor. For transit riders, distance is affected by their accessibility to service, activities at destination and personal characteristics.
Findings in this paper can help land use and transportation planners and decision-makers in understanding the factors leading to a reduction of trip distances and attracting more nearby customers to main commercial streets.

INTRODUCTION

This study looks at non-work related trips that were made to four traditional commercial streets in Montréal, Québec. The goal of this study is to determine what factors influence the length of trips to this sample of commercial streets. It is assumed that longer trip distances are less sustainable than shorter ones. The study of non-work related trips is important because many users may have more flexibility in the short-term to change their travel behavior than is the case for work trips. Of course, the redesign of streets is a long-term process rather than a short-term one.
The selected streets are Saint-Laurent, Saint-Hubert, Monkland and Ontario. They were selected based on the presence of a business improvement association, the number of trips, the number of businesses and the mix of shops.

Table 1 - Description of studied streets

	Street			
Variable	Monkland	Ontario	Saint-Laurent	Saint-Hubert
Limits	Grand to Girouard	Darling to Pie-IX	Sherbrooke to Mont-Royal	de Bellechasse to Jean-Talon
Length (km)	1.01	0.98	1.57	1.23
Neighborhood	Notre-Dame-de-Grâce	Hochelaga-Maisonneuve	Plateau-Mont-Royal	Rosemont-la-Petite-Patrie
General orientation	East-West	East-West	North-South	North-South
Number of Businesses (Susceptible to be frequented by non-work users)	122	145	333	273
Top 3 business categories	Eating Places (19) Beauty Shops (7) Real Estate Agents (6)	Eating Places (20) Beauty Shops (8) Misc. Retail Stores (7)	Eating Places (64) Drinking Places (21) Clothing (3 sub-cats, tied at 12)	Women's clothing stores (47) Shoe Stores (21) Jewelry Stores (19)
Average Yearly Sales per Establishment ($)	709,209	697,210	779,754	437,779
Business Density (#/km)	120.8	148.0	212.1	222.0
Number of Other Commercial Streets within 800m of Street	1	1	8	4
Number of Grocery Stores	4	5	11	1
Percentage of Eating Places (%)	15.6	13.8	19.2	4.8
Percentage of Food Shops (%)	9.8	9.7	6.0	1.5
Percentage of Clothing Shops (%)	6.6	13.1	15.3	42.1
Percentage of Local Shops (%)	25.4	26.2	13.5	11.4
Total trips by Car	62	78	134	85
Total trips by Transit	6	28	60	53
Total trips by Bicycle and walking	33	67	120	48
Total trips	101	173	314	186

DATA AND METHODOLOGY

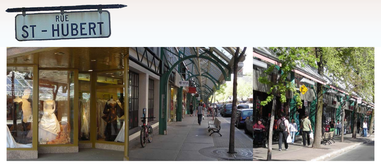
This study used the following data:

- The 2003 Montréal origin-destination survey which samples 5% of households is the main data source. It contains information on origins and destinations as well as information on the trip, the individual and the household.
- The Canada Census was used to obtain home neighborhood characteristics.
- Business information was obtained from a Dun and Bradstreet database.
- Street and transit networks were obtained from DMTI and the STM.

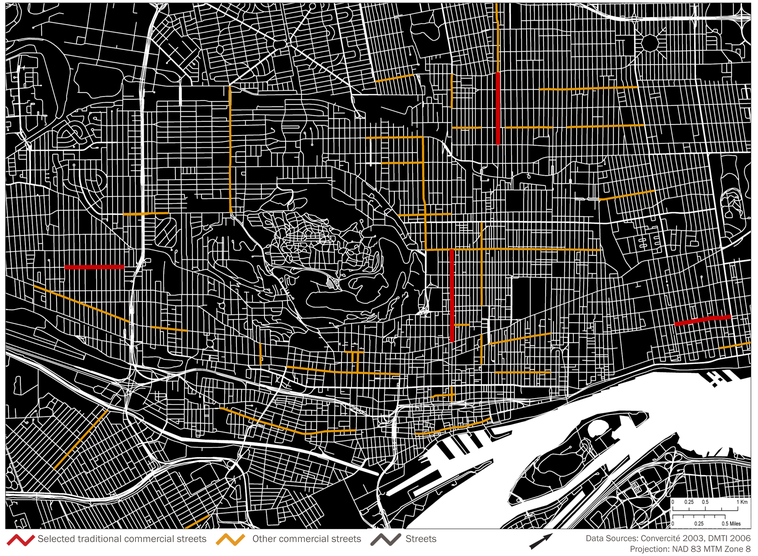
A sample of 774 trips was analyzed each having and origin and a destination. Trip distances were calculated based on the shortest travel time (car) or shortest distance (transit and active) using the appropriate network for each case. Home neighborhood characteristics were associated with each trip from the census. Visited street segments were characterized based on the mix of businesses present using the NAICS code. Variables used are displayed in the following table.
Trip distance models are then generated using these variables for each mode: car, transit, and walk and bike.

Table 2 - Description of variables

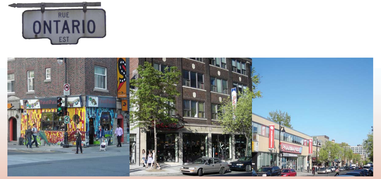
Variable	Description	Source	Year
Trip/Individual Variables			
Trip Distance (m)	Distance based on the shortest travel time (car) or shortest distance (other modes) accounting for the mode used	OD Survey Road DMTI STM	2003 2008 2007
Sex	Sex of respondent (0 = Male; 1 = Female)	OD Survey	2003
Age	Age of respondent	OD Survey	2003
Trip Start Time	Starting time of trip	OD Survey	2003
Number of Trips	Number of trips that the survey respondent undertook during the same day. For example, a trip chain from home to the store and back would be counted as two trips.	OD Survey	2003
D Home	Dummy variable for trips starting from the respondent's home (1 = home origin, 0 = other origin)	OD Survey	2003
D Shopping	Dummy variable for shopping trips (1 = shopping; 0 = Other reason)	OD Survey	2003
D Entertainment	Dummy variable for entertainment trips (1 = entertainment; 0 = Other reason)	OD Survey	2003
D Other	Dummy variable for other non-work related travel including school, health and (1 = other non-work travel; 0 = Other reason)	OD Survey	2003
D Car User	Dummy variable for car users (1 = car user, 0 = other mode)	OD Survey	2003
D Transit User	Dummy variable for transit users (1 = transit, 0 = other mode)	OD Survey	2003
D Cyclist	Dummy variable for cyclists (1 = cyclist, 0 = other mode)	OD Survey	2003
Street Variables			
D St-Hubert	Dummy variable for the street (1 = street user, 0 = not a street user)	OD Survey	2003
D St-Laurent	Dummy variable for the street (1 = street user, 0 = not a street user)	OD Survey	2003
D Ontario	Dummy variable for the street (1 = street user, 0 = not a street user)	OD Survey	2003
D Monkland	Dummy variable for the street (1 = street user, 0 = not a street user)	OD Survey	2003
Street Segment Variables			
Diversity Index	The diversity index is a representation of the diversity of each street segment by dividing the number of business categories represented on each street segment by the total number of business categories on all street segments (146). Business categories are determined using the NAICS number.	Dun & Bradstreet	2008
Characteristics of Home Area			
Income	Median household income of the respondent's home census tract (2000, $)	Canada Census	2001
N Bus Stops Home	Number of transit stops (bus stop or métro station) within 400 meters of user's home using the walking network	STM Road Network (DMTI)	2007 2006



Location of traditional commercial streets in Montréal



Data Sources: Convercité 2003, DMTI 2006
Projection: NAD 83 MTM Zone 8



RESULTS

Two sets of distance decay curves are generated for each mode and each street.

Figure 1 - Distance decay by mode

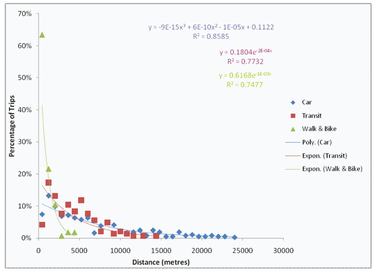
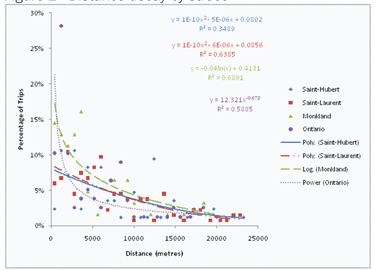


Figure 2 - Distance decay by street



It is clear that auto users travel longer distances to reach these streets. Motorists reside in areas of higher median house hold income compared to the household incomes for pedestrian and cyclists, who are mainly coming from the neighboring area of each street. Car users undertook more trips in a day than for other modes, especially transit users. This suggests that transit users have less accessibility than other users.
When comparing all four models, we notice that factors influencing trip distance are mode dependent. Neighborhood of origin, trip purpose and destination characteristics have a large influence on the length of trips for transit users. This can be contrasted by pedestrians and cyclists for whom personal characteristics had the main impact on the travel distance but, surprisingly, none of the destination variables had an influence on increasing trip distances.

CONCLUSION

This research shows that when looking at designing similar streets, it is important to note that the function of the street will have a large impact on the types and the lengths of trips attracted, especially motorists. Streets that are more local in character have less business density and attract more trips from closer by. Streets that have a large number of shops that aggregate together such as Saint-Hubert and Saint-Laurent attracts people from further distances. This being said, it is also not possible to further distribute these types of shops because these establishments derive benefits from clustering because customers tend to comparison shop for these goods or services.
Customers using different travel modes are attracted for different reasons. Pedestrians and cyclists seem to be using these streets because of their proximity. For transit riders, attention should be placed on the diversity of the destination and the accessibility of transit. Car users seem to be the most impacted by the attractiveness of the destination, represented by the diversity index, since added distance represents less travel time than for other modes. Although, having successful and diverse streets is desirable, it seems that one of the problems of this success is that car users will be more willing to travel there because of its attractiveness.

Table 3 - Trip distance linear regression models

Variable	Car		Walk and Bike		Transit		All Modes	
	B	t	B	t	B	t	B	t
(Constant)	2.26	0.01	1047.42	2.84***	5102.22	1.73*	2839.58	2.59***
Sex	-221.43	-0.39	-153.15	-1.69*	-285.59	-0.48	-245.57	-0.84
Age	7.01	0.34	2.35	0.82	-29.47	-1.71*	0.69	0.07
Number of Trips	-274.51	-2.25**	-31.18	-1.63	-200.90	-1.13	-165.41	-2.59***
Shopping Trip Dummy	436.93	0.59	-547.51	-4.00***	-374.53	-0.49	-114.72	-0.30
Entertainment Trip Dummy	813.91	1.20	-146.90	-1.02	1125.01	1.47	568.18	1.50
Home Start Dummy	833.36	1.32	-31.79	-0.34	-181.29	-0.29	234.20	0.75
AM Trip Start Time Dummy	1403.81	1.76*	-56.83	-0.42	1767.27	2.08**	999.82	2.38**
PM Trip Start Time Dummy	1177.57	1.62	202.76	1.83*	682.18	0.83	717.71	1.93*
Saint-Laurent Dummy	2185.84	2.31**	30.32	0.17	2262.58	1.47	1642.05	3.12***
Saint-Hubert Dummy	1930.09	1.66*	288.03	1.35	4563.05	2.80***	2135.00	3.49***
Ontario Dummy	1436.74	1.49	118.52	0.59	1575.74	0.96	1133.27	2.08**
Median household income (per $1,000)	36.38	2.82***	1.04	0.21	55.47	1.91*	34.31	3.94***
Diversity Index	140.02	1.69*	0.52	0.05	-164.06	-2.29**	33.51	0.86
Number of Transit Stops within 400m of Home	–	–	–	–	-109.32	-1.73*	–	–
D Bike	–	–	1672.00	9.43***	–	–	-3789.84	-3.97***
D Pedestrian	–	–	–	–	–	–	-5067.80	-13.86***
D Transit	–	–	–	–	–	–	-1999.68	-4.78***
R Square	0.100		0.333		0.224		0.315	
N	359		268		147		774	

Dependent Variable: Trip Distance (m)
* 90% significance level | **95% significance level | *** 99% significance level

FURTHER RESEARCH

Further research could look into incorporating and comparing the number of opportunities that could also be accessed based on a number of constraints such as work trips, the travelled distance and the probable route taken. It would also be of use to see what characteristics of each street have an effect on the travel distance. This could be done only by increasing the sample size or designing a specialized survey. Also incorporating more streets in the analysis should lead to a more in-depth understanding of the reasons that can lead to a decline in travel distances.

ACKNOWLEDGEMENTS

We would like to thank Daniel Bergeron of the AMT for providing access to the OD survey and the STM for access to its transit network file.

TRANSPORTATION RESEARCH BOARD ANNUAL MEETING
WASHINGTON, D.C.
JANUARY 12, 2009

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