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The path of least resistance: Identifying supporters of public and active transportation projects

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ABSTRACT

The financing and implementation of transportation projects are more likely to be successful with the support of local communities. Hence, in order for cities and transportation agencies to develop strategies that will improve public acceptability and reduce resistance to funding transportation projects, it is important to understand differences in the levels of local support. This study uses a factor-cluster analysis to segment a university population in order to better understand current levels of support towards transportation investments and to seek out important allies to endorse public and active transportation projects. The results of this study reveal five clusters of individuals with varying opinions towards transportation investments and distinct motivations. *Strong advocates* are the greatest allies for promoting public and active transportation investments. They support financing public and active transportation projects, and are also well-positioned to endorse the necessity and advantages of such investments. *Highway / transit funders* are motivated by their dissatisfaction with the current transportation system, and *cycling advocates* are valuable in publicizing the benefits of expanding the bicycle network. In addition, *infrequent commuters* do not travel to the university as often as the other groups, and are supportive of transportation investments in general. Despite the overall positive opinion towards investing in public and active transportation projects, there is a minority of *funding opponents* who are generally against financing transportation projects. The results of this study are helpful for policy makers intending to communicate the benefits to transportation projects to various community groups.

1 **INTRODUCTION**

2 While the social and economic benefits of investing in transportation infrastructure are
3 unquestionable, the transportation sector is often underfunded, putting a halt to necessary
4 infrastructure maintenance and upgrades (1-3). Although, in many regions, planning bodies,
5 governments, and transport agencies have developed strategies to acquire funding for specific
6 transportation projects, these initiatives frequently lack public acceptance and political will. For
7 example, in Canada, the results of the recent Metro Vancouver Transit Plebiscite, which was
8 mandated by the province, showed overwhelming public resistance (62% in opposition) to
9 introducing a 0.5% Metro Vancouver Congestion Improvement Tax to support the Mayors’
10 Transportation and Transit Plan (4). While this plan mostly focused on improvements to the public
11 transit system, it also included proposals to expand the bicycle network and replace aging bridge
12 infrastructure, benefiting different types of travellers and mode users (5).

13 Public acceptability of funding initiatives and infrastructure improvement programs are not
14 always easy to obtain. Yet, financing and implementing transportation projects typically have
15 higher success rates when local communities are supportive (6; 7). With this in mind, the first
16 objective of this study is to measure the current level of support towards transportation
17 infrastructure investment. The second objective is to differentiate and identify groups that would
18 be important allies in promoting funding for public and active transportation infrastructure, as well
19 as others who would require more persuasion to gain their support. Being able to identify
20 supporters and understand the reasons that certain groups oppose transport-related investments is
21 an important step towards identifying the path of least resistance. This study uses empirical data
22 from a university travel survey, in which respondents identified their level of support for using
23 taxes to fund various transportation infrastructure investments (highway network, public
24 transportation, bicycle network, pedestrian areas and sidewalks). The underlying hypothesis of this
25 study is that within a given population, there will be different clusters of people with similar
26 motivations and preferences who will have similar opinions towards transportation investments.
27 Hence, based on individuals’ personal characteristics, commute experience and support for public
28 and active transportation infrastructure investment, a factor-cluster analysis is conducted to
29 identify and differentiate groups.

30 The paper begins with a review of the current literature on public acceptability of public
31 and active transportation infrastructure investments. It then proceeds with descriptions of the data
32 and methods used in this study. This is followed by a presentation and discussion of the resulting
33 groups from the factor-cluster analysis. Lastly, the paper concludes with policy implications and
34 proposed directions for future research.

35

36 **LITERATURE REVIEW**

37 The current literature on public opinion towards investment in transportation infrastructure is
38 limited. Existing studies often focus on public acceptability of funding options and analyzing
39 transportation ballot outcomes (8-10). For example, Hannay and Wachs (9) analyzed three local
40 transportation sale tax elections in California and found that the closer the voters lived to proposed

1 transportation projects, the more likely they would be to support the tax measures. The authors
2 also found that income levels and political views influenced the level of support received. Haas
3 and Estrada (8), on the other hand, studied how the process leading up to the election ballot
4 influenced the outcome. These authors concluded that public participation, public consensus of a
5 congestion crisis and the presence of prominent advocates are important factors affecting
6 referendum results.

7 Other existing research examines public opinion towards the allocation of funds to
8 transportation infrastructure projects. For example, the Reason Foundation (11) surveyed 1,200
9 Americans on transportation spending priorities. The results showed that 62% of the sample
10 believed that the government should prioritize funding for road and highway projects, compared
11 to 30% who believed that the government should prioritize funding for mass transit projects
12 instead. More recently, Gase et al. (12) surveyed registered voters in Los Angeles County on the
13 presence and importance of pedestrian and cycling infrastructure in their community, as well as
14 their travel behavior and preferences. Gase et al. (12) found that the majority of the 1,005
15 participants viewed pedestrian, cycling and public transportation infrastructure as important and
16 supported reallocating transportation funds to invest in active transportation infrastructure. The
17 greatest support for pedestrian and cycling infrastructure was found among Latinos, African
18 Americans and those with lower education attainment.

19 In another instance, The Gilmore Research Group (13) was commissioned to conduct a
20 study for the Washington State Department of Transportation on attitudes towards pedestrian and
21 cycling infrastructure planning in Washington State. The objective of their study was multi-fold.
22 They were interested in understanding the current active transportation mode share, as well as
23 obstacles deterring people from using active transportation. However, their ultimate goal was to
24 garner an understanding of the public opinion towards financing pedestrian and cycling facility
25 improvements. The Gilmore Research Group (13) surveyed 400 randomly selected adult residents
26 by telephone, and found that of the survey sample, 98% had at least one working motor vehicle in
27 their household, but only 62% had a bicycle. According to their findings, there was a consensus
28 that the government should provide additional pedestrian facilities to improve walking conditions
29 in communities. Yet, only 48% of the survey respondents were willing to support additional
30 spending on pedestrian infrastructure assuming that it would not require an increase in taxes. The
31 level of support dropped to 21% if new taxes were needed. To improve cycling conditions,
32 respondents suggested that the government should provide additional cycling facilities, improve
33 existing facilities and create safer cycling environments. However, support for increased spending
34 on cycling infrastructure significantly depended on whether new taxes were necessary, and the
35 majority did not support additional taxes. Respondents who were opposed to additional taxes to
36 fund pedestrian and cycling infrastructure typically believed that they were already paying too
37 many taxes and that there were other more important projects that the government should fund.
38 Overall, survey respondents believed that government spending on transportation projects should
39 be prioritized in the following order: (1) expanding the public transportation network, (2)

1 expanding the road network and widening highways, (3) creating safer walking and cycling
2 environments, and (4) expanding the cycling network and trails.

3 Only recently have academic researchers developed interest in acquiring a deeper
4 understanding of public opinion towards transportation infrastructure projects. For example, Smart
5 (14) set out to assess the determinants of public opinion towards public transportation spending,
6 and found that the volatility of gasoline prices influenced Americans' willingness to support mass
7 transit expenditures. Other significant factors were political views and place of birth. Foreign-born
8 residents in this study were found to be more likely to support public transportation investment
9 than native-born citizens. Interestingly, income was not a significant factor.

10 Manville and Cummins (15) also conducted a study to understand why American voters
11 support public transportation. In particular, these authors examined the discrepancy between
12 support for public transportation spending and low public transportation ridership. They found that
13 while transit users generally support increased transit spending, transit supporters might not
14 necessarily be transit users. Thus, Manville and Cummins (15) cautioned against associating transit
15 supporters to transit users. At least in the United States of America (USA), transit supporters and
16 transit users often have different demographic characteristics; relative to transit users, transit
17 supporters are wealthier, better-educated, less likely to be immigrants and more likely to live in
18 single-family homes (15). Furthermore, Manville and Cummins (15) proposed that transit
19 supporters are motivated by their beliefs that transit can reduce congestion, improve environmental
20 quality, provide access for the poor and socially disadvantaged groups, revitalize cities and create
21 jobs. In other words, transit supporters in the USA may view public transit as a solution to social
22 problems, rather than a method of transportation (15).

23 In summary, the existing literature, albeit scarce, suggests that personal characteristics such
24 as education, ethnicity and political views may partially account for a person's opinion towards
25 transportation investment. However, the cited studies are all situated in American contexts, and
26 therefore factors, such as ethnicity and race, may not play as large of a role in determining public
27 acceptability elsewhere.

28 Other important determinants include a person's proximity to a proposed project and
29 acknowledgement of a congestion crisis. In order words, it seems that perceived personal benefits
30 may have an effect on an individual's opinion towards transportation projects. On the other hand,
31 if funding a project requires additional taxes from residents, public acceptability is likely to
32 decline. The aforementioned studies also demonstrate the influence of prominent advocates, public
33 participation and gasoline price volatility. Nevertheless, the existing literature on public opinion
34 towards investment in transportation infrastructure is sparse. Hence, this study will attempt to
35 expand the existing literature by developing an understanding of different opinions towards
36 various transportation infrastructure investments and underlying motivations as found in the
37 context of a population of Canadian university students, staff, and faculty.

38 39 40 **METHODOLOGY**

1 **Data**

2 This study uses data from the 2013 McGill Commuter Survey, an online university-wide travel
3 survey conducted over a span of thirty-five days during March and April 2013. A total of 20,851
4 McGill University students, staff and faculty were randomly selected to complete the survey, and
5 prizes were offered as incentives for participation (16). The response rate of the survey was 32%,
6 which is comparable to previous surveys conducted at other North American universities (17; 18).
7 The initial data inspection resulted in a dataset containing 5,599 observations (16). However, due
8 to further data requirements described below, the final sample used in this research was reduced
9 to 2,319 observations. These only include respondents whose travel destination is to McGill
10 University's Downtown Campus and do not include individuals travelling to McGill University's
11 suburban Macdonald Campus as the provision of transportation infrastructure is very different in
12 the two areas.

13 In the survey, respondents documented details about their typical commuting experience
14 from their home location to McGill University for a cold and snowy day, and similarly for a warm
15 and dry day. For the purpose of this study, one of these weather conditions was randomly selected
16 for each individual and linked to only one commuting trip, which is a method that has been
17 previously tested and applied (19). The survey included questions to capture information such as
18 commute duration, commute frequency, modes used, and mode satisfaction. The respondents also
19 reported socio-demographic information, mode preference, home selection criteria and personal
20 opinion towards various transportation investments. Individuals who had incomplete responses,
21 selected "Prefer not to answer" or answered "I don't know" for general (not mode-specific)
22 questions were removed in order to ensure a complete set of responses for each observation. The
23 final set of responses was entered into a factor-cluster analysis, as described in the following
24 section, to identify and differentiate between supporters of and opponents against investing in
25 public and active transportation projects.

26

27 **Methods**

28 This study uses a two-step approach to isolate clusters of individuals within the study sample
29 bearing similar characteristics and opinions. First, a principal component factor analysis was used
30 to identify sets of highly correlated variables, which were then grouped as factors. Varimax
31 rotation was applied to the output for better interpretation of the factor loadings. Standalone
32 variables that did not group with other variables were eliminated, as were variables that are
33 grouped with others of dissimilar qualities. Only meaningful factors with a minimum eigenvalue
34 of 1.00 were retained for further analysis. The resulting set of factors represents overarching
35 themes from the underlying variables to be treated as uncorrelated variables in the subsequent
36 analysis. Second, a cluster analysis was conducted to group respondents into clusters, by
37 maximizing the mean difference between clusters and minimizing the mean difference within
38 clusters. Analysis of variance and the Tukey-Kramer method are used to detect statistically
39 significant differences between the resulting clusters. This two-step approach, known as factor-
40 cluster analysis, has been used by other researchers to create cyclist typologies (20; 21), perform

1 public transit market segmentation (22), and profile different groups of people with distinct travel
2 motivations and preferences (23).

3 In this study, the principle component factor analysis generated eight factors from 27
4 variables, which are presented in Table 1. Together, the factors account for 63% of the variance of
5 the original variables. The first factor, *support for public and active transportation investment*,
6 groups variables that inquired about respondents' opinions towards using taxes to improve and
7 expand public transportation, pedestrian areas, sidewalks and the bicycle network. The second
8 factor, *preference for public and active transportation*, indicates whether respondents intend to
9 cycle, walk or use transit more than they currently do. The third factor, *preference for driving*, is
10 a group of variables related to the dependency and enjoyment of driving. The fourth factor,
11 *unpleasant commuting experience*, captures a commute's potential negative effects. The fifth
12 factor, *commuting frequency*, comprises of variables that affect travel frequency. The sixth factor,
13 *residential selection criteria*, groups the importance of several considerations when determining
14 home location. The seventh factor, *household characteristics*, includes the number of licensed
15 drivers, individuals and owned automobiles per household. Finally, the eighth factor, *personal*
16 *characteristics*, includes age, income, occupation, duration of current residence and the number of
17 years commuting to McGill University.
18

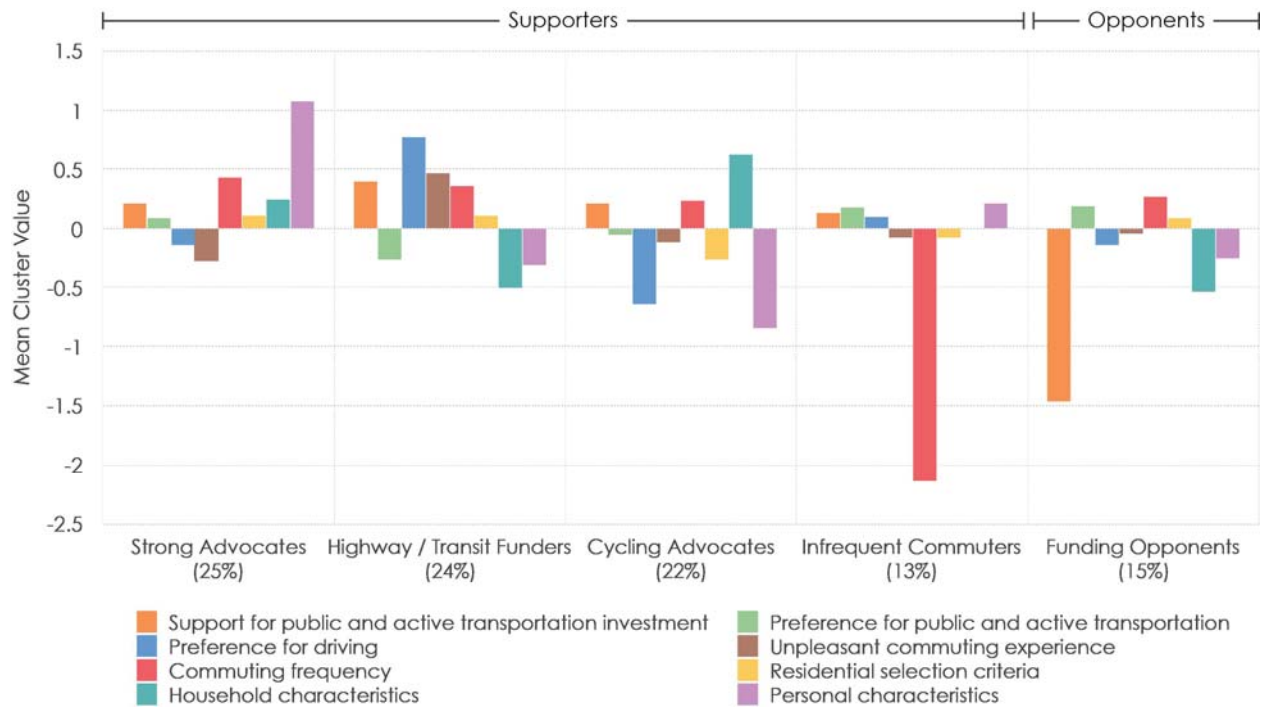
TABLE 1: FACTORS, VARIABLES AND LOADINGS

FACTORS	VARIABLES	LOADING
Support for public and active transportation investment	We need to use taxes to improve and expand public transportation.	0.772
	We need to use taxes to improve and expand pedestrian areas and sidewalks.	0.763
	We need to use taxes to improve and expand the bicycle network.	0.704
Preference for public and active transportation	I would like to cycle more than I currently do.	0.699
	I would like to walk more than I currently do.	0.699
	I would like to transit more than I currently do.	0.606
Preference for driving	We need to use taxes to improve and expand the highway network.	0.761
	I need a car to do many of the things I like to do.	0.691
	I would like to drive more than I currently do.	0.666
Unpleasant commuting experience	I feel stressed during my trips to McGill.	0.847
	My commute to McGill negatively impacts my punctuality / attendance / working hours.	0.837
	I feel energized when I arrive at McGill.	-0.708
Commuting frequency	How often are you on campus?	0.803
	Are you at McGill full-time?	0.798
	I'm on campus during regular work day hours from approximately 9am – 5pm.	0.662
Residential selection criteria	When you moved into your current residence, how important were the following factors in your decisions?	
	Cost of commuting (excluding the cost of parking)	0.773
	Proximity to public transportation	0.761
	Being in a location where I wouldn't have to drive	0.696
	Proximity to McGill	0.635
Household characteristics	How many licensed drivers are in your household, including yourself?	0.893
	How many people are in your household, including yourself?	0.858
	How many automobiles are owned by your household?	0.687
Personal characteristics	What is your age?	0.911
	Are you a faculty or staff at McGill?	0.820
	For how many years have you been regularly commuting to McGill?	0.804
	What is your yearly personal income?	0.742
	For how many years have you been living at your current residence?	0.662

1 Next, a non-hierarchical (k-means) clustering analysis was conducted using the eight factors
 2 developed from the principal component factor analysis. Reiterations of the cluster analysis were
 3 performed to produce results ranging from two to ten clusters. The best segmentation of the study
 4 sample, however, were obtained through five clusters. Separating the respondents into five clusters
 5 allows discernible distinction of opinions, travel patterns, travel experiences and characteristics
 6 between the clusters. The following section describes each cluster in detail.

7
 8 **RESULTS**
 9 The five clusters identified from the factor-cluster analysis are: *strong advocates*, *highway / transit*
 10 *funders*, *cycling advocates*, *infrequent commuters* and *funding opponents* (Figure 1). The assigned
 11 labels were given after careful examination of the cluster analysis results and summary statistics
 12 (Table 2), and signify key characteristics of each cluster.

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 17 **Figure 1: K-means cluster analysis**

TABLE 2: SUMMARY STATISTICS – MEAN OF VARIABLES

	Sample size	All 2319	Strong Advocates 589	Highway / Transit Funders 561	Cycling Advocates 521	Infrequent Commuters 309	Funding Opponents 339
SUPPORT FOR PUBLIC AND ACTIVE TRANSPORTATION INVESTMENT							
We need to use taxes to improve and expand:							
Public transportation (1–5)		4.12	4.40*	4.50*	4.20*	4.23*	2.82*
Pedestrian areas and sidewalks (1–5)		3.48	3.76*	3.73*	3.55	3.62*	2.32*
The bicycle network (1–5)		3.60	3.77*	3.56	4.10*	3.66	2.53*
PREFERENCE FOR PUBLIC AND ACTIVE TRANSPORTATION							
I would like to ... more than I currently do:							
Cycle (1–5)		3.24	3.21	2.85*	3.69*	3.22	3.23
Walk (1–5)		3.23	3.55*	2.98*	2.93*	3.46*	3.31
Transit (1–5)		2.12	2.14	2.10	1.99*	2.39*	2.06
PREFERENCE FOR DRIVING							
We need to use taxes to improve and expand the highway network. (1–5)		3.04	2.96	3.84*	2.40*	3.22*	2.65*
I need a car to do many of the things I like to do. (1–5)		2.79	3.04*	3.22*	1.93*	3.11*	2.65
I would like to drive more than I currently do. (1–5)		1.92	1.56*	2.50*	1.52*	2.00	2.10*
UNPLEASANT COMMUTING EXPERIENCE							
I feel stressed during my trips to McGill. (1–5)		2.74	2.40*	3.31*	2.56*	2.66	2.72
My commute to McGill negatively impacts my punctuality. (1–5)		2.70	2.22*	3.32*	2.70	2.54*	2.65
I feel energized when I arrive at McGill. (1–5)		2.87	3.14*	2.45*	2.95	2.97	2.85
COMMUTING FREQUENCY							
Frequency on campus (days per month)		18.18	19.39*	19.86*	20.31*	7.20*	20.00*
Full-time status		0.87	0.98*	0.98*	0.98*	0.17*	0.97*
Regular work hours		0.76	0.91*	0.84*	0.76	0.30*	0.77
RESIDENTIAL SELECTION CRITERIA							
Importance of following factors in selecting current home:							
Cost of commuting (1–5)		3.31	3.32	3.61*	2.92*	3.27	3.46*
Proximity to public transportation (1–5)		4.10	4.29*	4.23*	3.82*	4.03	4.02
Being in a location where I wouldn't have to drive (1–5)		3.75	3.80	3.62*	3.89*	3.63	3.78
Proximity to McGill (1–5)		3.47	3.44	3.56	3.45	2.95*	3.87*

HOUSEHOLD CHARACTERISTICS	All	Strong Advocates	Highway / Transit Funders	Cycling Advocates	Infrequent Commuters	Funding Opponents
Number of licensed drivers per household	1.90	2.03*	1.45*	2.31*	1.80*	1.42*
Number of individuals per household	2.70	2.99*	2.21*	3.21*	2.61	2.15*
Number of automobiles per household	1.00	1.35*	0.79*	1.00	1.14*	0.63*
PERSONAL CHARACTERISTICS						
Age	36.90	50.75*	32.93*	25.35*	42.47*	32.09*
Faculty or staff	0.53	0.99*	0.48*	0.12*	0.54	0.40*
Years at McGill	8.07	16.20*	5.32*	2.75*	8.62	6.19*
Income (0–10)	2.03	4.10*	1.35*	0.46*	2.82*	1.26*
Years at current residence	6.94	12.42*	4.36*	4.02*	8.61*	4.67*
CURRENT MODE SHARE						
Cycle	0.07	0.08	0.03*	0.13*	0.06	0.05
Drive	0.13	0.21*	0.09*	0.01*	0.30*	0.10*
Transit	0.55	0.59	0.64*	0.53	0.47*	0.43*
Walk	0.25	0.12*	0.24	0.33*	0.17*	0.42*

Notes:

- 5-point Likert scale: 1 = “Strongly disagree” or “Extremely unimportant”, 5 = “Strongly agree” or “Extremely important”
- Income: 0 = “\$0 – \$19,999”, 10 = “Above \$200,000”
- *: Significantly different from sample mean at $\alpha = 0.05$

1 **Strong Advocates**

2 *Strong advocates* (25% of the sample) support investing in public and active transportation. They
3 show statistically higher levels of agreement for using taxes to improve and expand public
4 transportation (mean of 4.40 out of 5), pedestrian areas and sidewalks (mean of 3.76 out of 5) and
5 the bicycle network (mean of 3.77 out of 5) than the average individual from this study. Although
6 all the other clusters except *funding opponents* also demonstrate high levels of support towards
7 improving and expanding public transportation, *strong advocates* are unique in that they display
8 statistically higher levels of agreement towards all three public and active transportation
9 investments. Moreover, *strong advocates* typically wish to increase their use of active
10 transportation, tend to enjoy walking (mean of 3.55 out of 5) more than this study's average
11 individual, and reveal low intentions to increase driving (mean of 1.56 out of 5). Amid the different
12 clusters, they also seem to experience the most pleasant commute. As a group, they undergo the
13 least commuting stress (mean of 2.40 out of 5) and generally do not perceive that their commutes
14 interfere with their punctuality (mean of 2.22 out of 5). They are also statistically above average
15 with regard to feeling energized when arriving at McGill University (mean of 3.14 out of 5).
16 Relative to individuals in other clusters, *strong advocates* tend to be older (mean age of 50 years)
17 and have higher incomes (median income of \$60,000 to \$79,999). Ninety-nine percent of *strong*
18 *advocates* are full-time McGill University faculty or staff. Individuals in this group are inclined to
19 strategically select their home location to be near public transit (mean of 4.29 out of 5), and where
20 they would not have to drive (mean of 3.80 out of 5).

21 22 **Highway / Transit Funders**

23 *Highway / transit funders* (24% of the sample) are highly supportive of investing in public
24 transportation (mean of 4.50 out of 5). Unlike *strong advocates*, however, *highway / transit funders*
25 do not seem to desire an increase in their use of active transportation. Compared to this study's
26 average individual, they reveal significantly lower intentions to cycle more (mean of 2.85 out of
27 5) and walk more (mean of 2.98 out of 5). Yet, they are in favor of investing in pedestrian areas
28 and sidewalks (mean of 3.73 out of 5). Perhaps, it is the lack of pedestrian-friendly infrastructure
29 that is deterring them from wanting to walk more. Nevertheless, what distinguishes *highway /*
30 *transit funders* from other clusters is their relatively high preference for driving. They tend to be
31 the greatest proponents of using taxes to improve and expand the highway network (mean of 3.84
32 out of 5), are inclined to perceive that having a car is a necessity (mean of 3.32 out of 5), and have
33 a comparatively high desire to increase driving (mean of 2.50 out of 5). This may correspond with
34 the relatively low importance they place on not having to drive when selecting their home locations
35 (mean of 3.62 out of 5). *Highway / transit funders* tend to be unhappy with their current commutes
36 and show the highest levels of commuting stress (mean of 3.31 out of 5) and tardiness (mean of
37 3.32 out of 5), as well as the lowest levels of energy (mean of 2.45 out of 5). The transit share of
38 this cluster is currently at 64%, which is the highest among all the different clusters. However,
39 given the discussed characteristics of *highway / transit funders*, the mode share distributions may
40 change.

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Cycling Advocates

Cycling advocates (22% of the sample) are generally younger individuals (mean age of 25 years), who show the greatest support towards using taxes to improve and expand the bicycle network (mean of 4.10 out of 5). Amid the different clusters, they also exhibit the greatest desire to cycle more (mean of 3.69 out of 5) and possess the lowest preference for driving. *Cycling advocates* tend to oppose investing in highway network improvements (mean of 2.40 out of 5), have low dependency on cars (mean of 1.93 out of 5) and do not typically desire to increase their car usage (mean of 1.52 out of 5). *Cycling advocates* also place the highest importance of living at a location where driving is not necessary (mean of 3.89 out of 5), typically find their commutes enjoyable, and endure significantly lower levels of commuting stress (mean of 2.56 out of 5) than the average individual from this study. Eighty-eight percent of *cycling advocates* are McGill University students, who have a median income below \$20,000 and their living arrangements are significantly different from individuals of other clusters. *Cycling advocates* report the highest number of individuals (mean of 3.21 persons) and licensed drivers (mean of 2.31 persons) per household, perhaps suggesting that many live with roommates. While not all *cycling advocates* commute by cycling, they do boast the highest proportion of cycling commuters among the different clusters.

Infrequent Commuters

Infrequent commuters (13% of the sample), by definition, do not travel to McGill University on a regular basis. Compared to the average individual in this study who commutes to McGill University 18 days per month, *infrequent commuters* travel to the university only seven days per month. Nevertheless, *infrequent commuters* are generally supportive of transportation investments and do not discriminate between modes, demonstrating levels of support similar to those of *strong advocates*, *highway / transit funders* and *cycling advocates* for the various transportation infrastructure projects. In other words, individuals identified as *infrequent commuters* may hold opinions towards transportation investments that are similar to individuals belonging in other advocate groups. Only 17% of *infrequent commuters* are full-time faculty, staff or students, and less than one-third are on campus during regular work hours (9:00 am to 5:00 pm). Among the various clusters, *infrequent commuters* seem to be the least concerned about situating their residence near McGill University (mean of 2.95 out of 5). Perhaps due to a combination of these characteristics, 30% of *infrequent commuters* commute by driving, which is the highest proportion among the different clusters.

Funding Opponents

Funding opponents (15% of the sample) are a group of individuals who are against using taxes to fund any transportation infrastructure improvements or network expansions. They show significantly lower levels of agreement for using taxes to improve and expand public transportation (mean of 2.82 out of 5), pedestrian areas and sidewalks (mean of 2.32 out of 5) and the bicycle network (mean of 2.53 out of 5) than the average individual from this study. They are also opposed

1 to using taxes to improve and expand the highway network (mean of 2.65 out of 5). In relation to
2 the average individual in this study, *funding opponents* place significantly higher importance on
3 commuting cost (mean of 3.46 out of 5) and being in proximity to McGill University (mean of
4 3.87 out of 5), when selecting their residential location. The high value they place on commuting
5 cost may be associated to their comparatively low income (median of \$20,000 to \$39,999). On the
6 other hand, it may be important for individuals in this cluster to live near the university due to their
7 frequent travels to campus (mean of 20 days per month). *Funding opponents* are also characterized
8 by having the fewest number of individuals (mean of 2.15), licensed drivers (mean of 1.42) and
9 automobiles (mean of 0.63) per household. Considering these attributes, it is not surprising that
10 42% of the individuals in this cluster commute by foot.

11

12 **DISCUSSION**

13 Before discussing the specifics of the results, it is important to reflect on the situational context of
14 this study. In general, it was found that most people at McGill University support public transit
15 investments, but only a small percentage would like to use it more than they currently do. This
16 discrepancy between transit support and desired increase of transit use among all the clusters is
17 portrayed in Figures 2 and 3. Granted that more than half of McGill University's population
18 commutes regularly by public transit, the lack of desire to increase transit use may be explained
19 by existing frequent use, or by the factors relating to service quality and convenience. Also
20 important to note is the general tendency of the McGill University community to limit car use and
21 increase participation in active transportation modes (Figure 3). Interestingly, overall support for
22 investing in pedestrian infrastructure (mean of 3.48 out of 5) and expanding the bicycle network
23 (mean of 3.60 out of 5), although present, is not as strong as the support for public transportation
24 spending (mean of 4.12 out of 5). Figure 2 also illustrates the diverse opinions among the different
25 clusters towards investing in the highway network. In contrast, apart from the constant opposition
26 from *funding opponents*, opinions regarding investing in public transportation, pedestrian areas
27 and sidewalks and the bicycle network are relatively consistent. In general, the opinions of
28 individuals at McGill University about investments in transportation differ greatly from the
29 previously discussed American studies. Hence, the findings of this paper highlight that public
30 opinion is context- and culture-specific, and confirm that the results of other studies should not be
31 casually applied to any setting.

32

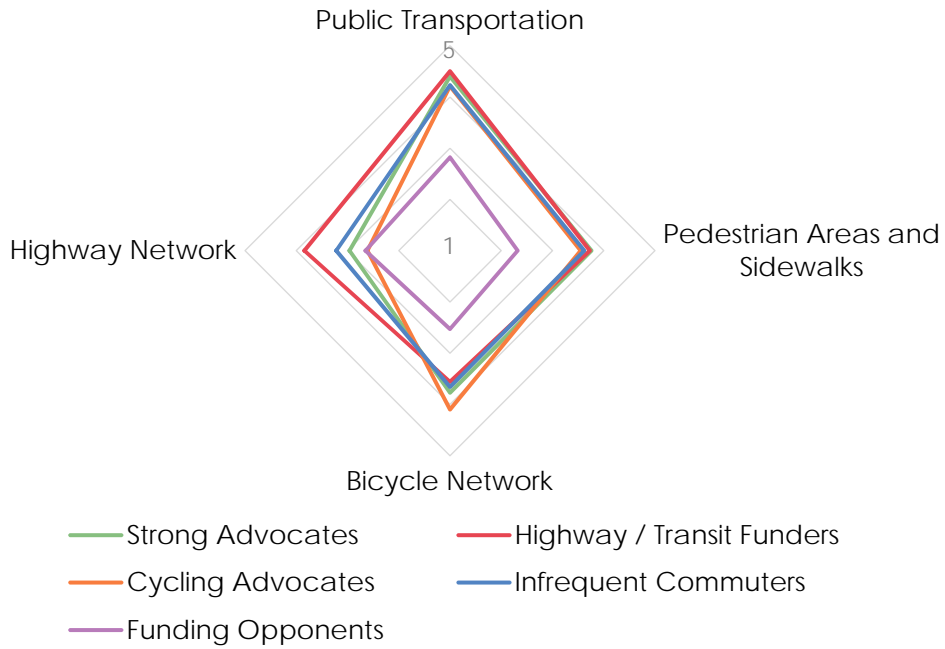


Figure 2: Support for transportation investment

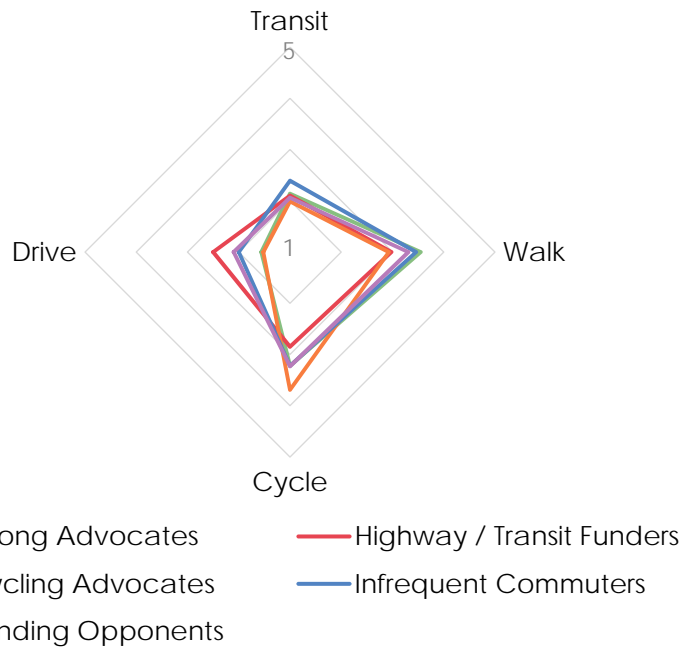


Figure 3: Desire to increase use of mode

1 Considering the context of this study, it is not surprising that among the five clusters generated
2 from the factor-cluster analysis, only one consists of individuals who oppose using taxes to fund
3 transportation investments (*funding opponents*). However, it is difficult to interpret whether
4 *funding opponents* are simply against spending, opposed to transportation infrastructure
5 investment in general, or specifically against using tax revenue to fund these projects. As suggested
6 by The Gilmore Research Group (13), opposition to tax-funded transportation projects may be due
7 to the belief that there are too many taxes already. On the other hand, *funding opponents* may
8 perceive that the government should prioritize financing other projects instead. Nevertheless,
9 proper investigation into the reasons behind the *funding opponents*' lack of support is essential to
10 addressing issues of public acceptability. Such investigation may be done through public
11 consultation, as it would enable policy makers to become aware of public opinion and address
12 public concerns directly.

13 *Strong advocates, highway / transit funders, cycling advocates and infrequent commuters*
14 demonstrate support towards investing in public and active transportation, signalling positive
15 public opinion towards public and active transportation investment. However, this does not
16 indicate that they all have identical motivations and desires. Some *infrequent commuters* seem to
17 show a discrepancy between transit support and current transit use. This could be a scenario similar
18 to the phenomenon described by Manville and Cummins (15), where public and active
19 transportation become ideologies rather than a lifestyle. Although this seems to be a possibility for
20 some, this is not to say that it is the case for all *infrequent commuters*, especially since commuting
21 by car does not necessarily imply that all trips are made, or are preferred to be made, by car. Even
22 so, encouraging *infrequent commuters* to travel more by public and active transportation could
23 potentially help improve their opinion towards public and active transportation investment to a
24 level comparable to that of *strong advocates*. A previous study comparing mode satisfaction of
25 regular public transit users and infrequent public transit users revealed that regular public transit
26 users have a higher overall satisfaction with public transit than infrequent users (24). In the same
27 study, Pedersen, Friman and Kristensson (24) also demonstrated that habitual car users tend to
28 underestimate their satisfaction with public transit. Hence, with increased travelling frequency, it
29 may be possible for *infrequent commuters* to develop more positive opinions towards public and
30 active transportation investment.

31 *Highway / transit funders* appear to be driven by a perceived failure of the existing
32 transportation system. As discussed in the previous section, *highway / transit funders* tend to be
33 unhappy with their current commutes and demonstrate a relatively high preference for driving.
34 Given that most *highway / transit funders* are currently transit users, their inclination towards
35 driving may suggest a potential mode switch in the future (25). It would be of value, therefore, to
36 understand their source of dissatisfaction. Understanding the public transit system's weaknesses
37 as experienced by current users would allow effective allocation of funds to finance discernible
38 transportation infrastructure improvements (26; 27). It may also increase user satisfaction and limit
39 mode switches from using public transit to driving (25).

1 As mentioned previously, there appears to be less support for investing in the bicycle
2 network than for public transportation spending. Hence, *cycling advocates* are crucial in promoting
3 the importance of expanding the bicycle network. In Montreal, *cycling advocates* currently have
4 the support of influential politicians who are eager to develop Montreal into a better cycling city
5 (28). Elsewhere, *cycling advocates* may need to develop partnerships with influential spokespeople
6 to further their cause. For example, in the Canadian province of Ontario, London Cycle Link
7 recently presented their proposals to city council and demonstrated how implementing cycling
8 projects can help the city achieve the council's strategic goals (29).

9 Individuals classified as *strong advocates* are the ideal allies to promote investing in public
10 and active transportation. Since many of them are full-time McGill University faculty or staff, they
11 are likely to be in well-placed positions to endorse the necessity and benefits of public and active
12 transportation infrastructure. *Strong advocates* also indicate an intention to increase walking and
13 cycling trips. It will be interesting to observe whether these motives will be realized with the
14 implementation of quality pedestrian and cycling infrastructure since researchers have previously
15 found that appropriate installation of walking and cycling facilities is associated with increased
16 walking and cycling (30-32). On the other hand, if the implementation of such facilities does not
17 increase the number of walking and/or cycling trips for commuting and non-commuting purposes
18 despite the expressed intentions, then it is possible that some individuals answered the survey
19 based on what they assumed was socially acceptable, in lieu of their true sentiments (33). Of
20 course, there may be other valid explanations; thus, this is a topic for future research.

21 Finally, *strong advocates*, *highway / transit funders*, *cycling advocates* and *infrequent*
22 *commuters* possess statistically distinct personal characteristics, such as age and income, when
23 compared to each other. This may imply that a person's stage of life partially accounts for that
24 individual's attitudes and preferences (34). For instance, *cycling advocates*, who on average have
25 the lowest income and the lowest average age, are particularly supportive of investing in cycling
26 facilities. On the other hand, *strong advocates*, who have the highest incomes and the highest
27 average age, support investing in public transit, cycling and walking infrastructure. Hence, future
28 research should examine whether current *cycling advocates* will remain solely enthusiastic about
29 cycling, or whether they will shift towards other existing clusters, supporting a wider range of
30 transportation infrastructure as they age. Findings from this future research may reveal whether
31 the observed phenomenon is a result of life phases or generational trends.

32 33 **CONCLUSION**

34 In conclusion, *strong advocates* are the greatest allies of promoting public and active transportation
35 investments, while *cycling advocates* are valuable for publicizing the benefits of expanding the
36 bicycle network. Despite the presence of *funding opponents*, at McGill University public opinion
37 towards investments in public and active transportation is positive. However, this level of support
38 may be distinct to the university and not representative of the public opinion in Montreal. Hence,
39 care should be taken when extending the geographic application of this study's findings.

1 Additionally, it is possible that survey respondents answered the questions in a manner which they
2 thought was socially appropriate and concealed their true opinions (33).

3 Furthermore, it is important to develop a deeper understanding of the reasons behind
4 opinions that oppose transportation investments. Ballots reveal preferences, but do not disclose
5 underlying motivations (15). Therefore, based on the existing survey questions, it is not possible
6 to interpret whether *funding opponents* are simply against spending, opposed to transportation
7 infrastructure investment in general, or specifically disagree with using tax revenue to fund these
8 projects. Future research should aim to nurture a better comprehension of issues hindering public
9 acceptance in order to address them effectively, and personal interviews would be an effective
10 method. On the other hand, discussions with *highway / transit funders* may uncover current
11 weaknesses in the transportation system, which can guide the allocation of funds to finance
12 discernible transportation infrastructure improvements. While having a public dialogue is
13 important to gauge public opinion and understand underlying issues, there is no straightforward
14 approach to addressing the various concerns of the different clusters. Instead, policy makers should
15 carefully weigh the criticisms of each cluster in order to best improve public acceptability. Lastly,
16 it is important to keep in mind that stronger support for transportation infrastructure investment
17 may not automatically translate to increased mode usage (15). Therefore, while advocating for
18 public and active transportation investments, transit agencies and cities should also promote
19 increased usage of public transit, walking and cycling.

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