

EXPANDING THE CONTINUUM OF TRAVEL ASSIMILATION: UNCOVERING NEW
MEASURES AND SOCIAL PRACTICE THEORY INSIGHTS

EXPANDING THE CONTINUUM OF TRAVEL ASSIMILATION: UNCOVERING NEW
MEASURES AND SOCIAL PRACTICE THEORY INSIGHTS

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TITLE: Expanding the continuum of travel assimilation: Uncovering new measures and social practice theory insights

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Lay Abstract

This thesis aims to better understand the transportation patterns of immigrants and the changes that may occur to their travel behaviour the longer they stay in their destination country. After moving to a new country, the transportation patterns of immigrants tend to go through a dynamic process. They typically start off travelling through sustainable modes, but overtime begin to adopt a more auto-centric lifestyle, which is more representative of the native born-population. This process can be referred to as travel assimilation. To help uncover the different ways in which travel assimilation can occur and what factors contribute to this experience, a qualitative study through semi-structured interviews was implemented. The results indicated that travel assimilation is a spectrum of experiences, it is not a uniform process. Using a theoretical framework four factors emerged in influencing travel assimilation: The built environment, economic factors, childcare and community programs influenced travel assimilation.

Abstract

Immigrant transportation patterns are observed to change over time. Their initial travel patterns are typically more sustainable than the native-born population; engaging in higher rates of walking, biking, and public transit. However, immigrant travel patterns begin to mimic that of their native-born counterparts over time. This phenomenon is called travel assimilation. The study contains two chapters of research which contribute to the conceptualization of travel assimilation and factors that may cause this process to occur. Semi-structured interviews were conducted (n=11) with immigrants who were past participants of Bike Host, a cycling mentorship program in Toronto, facilitated by CultureLink, a settlement organization. Thematic analysis was used to analyze the interview data through NVivo. The results in the first chapter highlight four new findings. First, travel assimilation exists on a continuum; it is not a binary experience as immigrants often do not fully transition towards auto-centric lifestyles, nor do they stay completely car-free either. Second, travel assimilation is a non-linear process, as transportation patterns can shift between sustainable and auto-centric ones. Third, travel assimilation is not always experienced the same in a single household. Fourth, implementing multiple variables helps best measure travel assimilation. The second chapter used a theoretical framework of Social Practice Theory (SPT) to understand why transportation patterns of immigrants are evolving, or not. Four interconnected factors were found to shape travel assimilation. First, the built environment directly impacts immigrants' access to different forms of transportation. Second, changes in income impact which modes of transportation are available to newcomers. Third, the presence of children introduces mobility of care trips, especially for mothers, impacting travel mode. Finally, community programs like Bike Host can increase the

longevity of sustainable transport. Results from both chapters can help inform future research and policies, focused on immigrant communities in increasing the use of sustainable transport.

Keywords: Travel assimilation, immigrants, Bike Host, Social Practice Theory (SPT), travel behaviour, qualitative.

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Chapter One: Introduction

With immigration in Canada growing annually, understanding the mobility patterns of immigrants is essential in creating equitable transportation, catering to the needs of newcomers. Transportation plays a vital role in the immigrant experience in facilitating access to employment opportunities and community-networks. Reliable transportation modes help immigrants access these essential resources and create a positive experience in the destination country. The transportation patterns of immigrants and their Canadian born counterparts vary as immigrants are using public transit at almost three times higher of a rate in comparison to their Canadian born counterparts (Statistics Canada, 2022). Immigrants make up a larger portion of public transit users, but their transportation patterns do not stay the same and overtime undergo various changes. Examining how and why immigrants' transportation patterns evolve overtime can help address their mobility needs more accurately.

This research focuses on the transportation patterns of immigrants in Canada and how it changes the longer they stay in Canada. This thesis contains two chapters that focus on the phenomenon of travel assimilation. Travel assimilation is the foundation of both studies as it refers to the pattern of immigrants initially travelling sustainably upon arrival in the destination country and later transitioning towards an auto-centric lifestyle (Delbosc & Shafi, 2023). In the two chapters travelling sustainably is described as using public transit, cycling, walking, and e-scooters.

Both studies employed the same methodology with semi-structured interviews (interview guide in Appendix 1) with participants of Bike Host, a community-based cycling program in Toronto. Bike Host is a free mentorship program created by CultureLink which is also based in Toronto. CultureLink seeks to support immigrants and refugees in Canada through various settlement programs to help newcomers navigate new systems and services through mentorship. One of

those settlement programs, Bike Host is a cycling program in which participants are loaned a bike, helmet and lock in Toronto for the summer. It allows some participants to learn how to bike for the first time who may not have previously, and an opportunity to discover the city with their mentors alongside other newcomers.

The first chapter seeks to understand different ways in which to measure travel assimilation in participants of Bike Host. Alongside, the types of changes that may occur to their mode of transportation for their duration of stay in Canada through a non-traditional lens. The second chapter looks to uncover the social and economic factors that may cause these changes in travel behaviour to occur and the impact of Bike Host on their transportation.

The first chapter focuses on broadening the concept of travel assimilation. Existing research typically views travel assimilation as a binary experience, with immigrants fitting into one of two categories of either transitioning to an auto centric lifestyle or not experiencing travel assimilation and continuing to travel sustainably. This chapter identifies four new concepts of travel assimilation as it is often experienced as a continuum, it is not always a linear process, possibly not experienced uniformly across households, and is best measured using multiple indicators. The second chapter in the thesis focuses on uncovering the factors that influence travel assimilation to occur. This study confirms findings in the literature, while shedding new light on factors not accounted for in past research. The four factors involved in the occurrence of travel assimilation are the built environment, economic factors, mobility of care trips, and the impact of community settlement programs.

Chapter Two: Looking beyond the binary: four new insights into measuring travel assimilation in immigrant communities ¹

Introduction

Canada attracts a large number of immigrants each year and immigration accounts for 75% of the population's growth (Immigration, Refugees, and Citizenship Canada, 2023). By the year 2036, immigrants are expected to make up over 30% of the Canadian population, a 10% increase from 2011 (Immigration, Refugees and Citizenship Canada, 2023). With growing immigration rates, access to adequate transportation is imperative as a way for one to be able to socially and economically participate in society. In 2021, 55.9% of commuters who use public transit were immigrants or non-permanent residents and 13.1% of all immigrants commuted by public transit (Statistics Canada, 2022). Understanding the transportation patterns of immigrants and how they evolve overtime can help inform research and policy that is reflective of their mobility needs.

This study focuses on how immigrants' travel patterns change over time. Current research on immigrants and their transportation notes that upon arrival to the destination country, immigrants tend to travel more sustainably than their native-born counterparts, using public transit, walking, carpooling at a much higher rate (Delbosc & Shafi, 2023; Heisz & Schellenberg, 2004; Blumenberg & Smart, 2011; Xu, 2018; Preston, McLafferty, & Maciejewska, 2022; Hu, 2017; Chatman, 2014; Tal & Handy, 2010; Casas, Arce & Frye, 2004; Liu & Painter, 2012; Yu & Teschke, 2018; Smart, 2015; Newbold, Scott & Burke, 2017). However, it is observed that the longer an immigrant stays in the destination country, they begin to travel like their native-born counterparts, leading more autocentric lifestyles (Delbosc & Shafi, 2023; Chatman & Klein,

¹ Chapter One: Looking beyond the binary: four new insights into measuring travel assimilation in immigrant communities is currently under review in *Travel Behaviour and Society*

2009; Heisz & Schellenberg, Kim, 2009; 2004; Preston, McLafferty, & Maciejewska, 2023).

This phenomenon of transitioning from sustainable forms of transport to adopting more of a car-dependent lifestyle is referred to as travel assimilation (Delbosc & Shafi, 2023).

Looking specifically at the Canadian context, over 36.3% of new immigrants (less than 5 years of stay) use public transit, whereas only 20.9% of Canadian born citizens are users of public transit (Heisz & Schellenberg, 2004). Overtime this gap narrows, and immigrant public transit rates become more reflective of those born in Canada, representing travel assimilation in action.

This paper contributes to the conceptualization of travel assimilation. Current literature tends to think of travel assimilation as a binary experience, as something newcomers experience (i.e., transition to car use) or do not experience (i.e., continue to use transit and walk). Drawing on interviews with newcomers to Canada, this paper identified four lessons so far lacking in the literature: that travel assimilation is (1) often experienced as a continuum, (2) is not always linear, (3) can be experienced unevenly across households, and (4) is best captured using multiple variables.

Literature Review:

This literature review focuses on papers in which travel assimilation is measured. In the literature travel assimilation is not the only term that the literature uses to describe the phenomenon of immigrants’ changing travel patterns. Some papers directly refer to the term travel assimilation, but other papers refer to a variety of terminologies including assimilation theory (Kim, 2009; Lee, Smart & Golab, 2021), immigrant effect (Lee, Smart & Golab, 2021; Yu & Teschke, 2018), acculturation (Blumenberg & Evans, 2010; Martinez et al., 2008), cohort effect (Lo, Shalaby, & Alshalfah, 2011), or transport assimilation (Blumenberg, 2009; Blumenberg & Evans 2010, Blumenberg & Smart, 2011; Schouten, Blumenberg & Taylor, 2024; Liu & Painter, 2012). Herein, we will consider all these concepts interchangeably and use the term travel assimilation for consistency.

Travel assimilation is measured in many ways, including through both quantitative and qualitative studies. Table 1 summarizes the methods that are used in studies to measure travel assimilation. Most papers on travel assimilation use quantitative methods (16 of the 19 papers).

Table 1. Existing literature measurement of travel assimilation.

Article	How Travel Assimilation is Measured	Data Source
Quantitative Studies		
Heisz & Schellenberg (2004)	Likelihood of using public transit to commute to work	Census microdata files data from 1996 to 2001 from Montreal, Toronto, and Vancouver analyzing results at CMA

Xu (2018)	Travel assimilation is measured through public transit ridership to get to work (dependent variable + “binary indicator”)	IPMUS ^{1,2,3} (integrated Public Use Microdata Series) and ACS ⁴ census data: four data sets of 1980 ¹ , 1990 ² , 2000 ³ , 2010 ⁴
Lee, Smart & Golab (2021)	Frequency of Car Sharing Service use, Smartphone Rideshare App Use, and Bike Share Program Use	2017 national household travel survey (NHTS) USA
Preston, McLafferty, & Maciejewska, (2023)	Use of commuting modes between automobile, transit and active modes for recent, established immigrants and Canadian born workers.	2016 Canadian census data
Tal & Handy (2010)	Auto ownership, number of vehicles per adult, public transit use or mix use	2001 National household travel survey
Yu & Teschke (2018)	Likelihood of active commuting	Canadian community health survey sample 2013-2014
Smart (2010)	Likelihood of using alternative (non-SOV; cycling) modes of transportation	2001 National household travel survey

Hu (2017)	Rate of public transit, automobile and active commute between 2001 and 2009 cohort	2001 and 2009 National household travel survey
Chatman & Klein (2009)	Rate of carpooling, driving alone, transit usage, active transport to get to work	2007 American community survey derived from US census
Blumenberg (2009)	Automobile Ownership + Automobile Use (driving alone)	2006 Census data from American Community survey (ACS), 2001 National household travel survey, census data 1980, 1990, 2000
Chatman & Klein (2011)	Transit access to work and home	2005, 2006, 2007, 2008 American community survey and Public Use Microdata Sample (PUMUS) census data
Schouten, Blumenberg, Taylor (2024)	The rate of transit ridership in California	2009 and 2017 California National Household Travel Survey
Blumenberg & Evans (2010)	The rate of transit ridership in California	1980, 1990, 2000 IPUMUS census data
Martinez et al. (2008)	Likelihood of walking children to school	Survey of Latino immigrant parents with children attending 13 San Diego Schools (n=812)

Kim (2009)	Likelihood of carpooling, driving alone, public transit, walking to work	2006 Integrated Public Use Microdata Series (IPUMS) US census data
Blumenberg & Smart (2010)	Likelihood of carpooling	2001 National household travel survey

Qualitative studies

Chatman & Klein (2013)	Car ownership and dependency for significant outside of home responsibilities	Focus groups with immigrant support service groups in New Jersey
Delbosc, Shafi & Rose (2022)	Carpooling with friends or family until one is able to obtain a driver's license and own a car	Semi-structured interviews through multi-cultural advisory committee at Monash university.
Waite, Kerr & Klocker (2016)	Automobile ownership	Semi-structured interviews with Chinese immigrants and sketch drawing

In quantitative papers, travel assimilation is understood as a binary experience: as something that either does or does not take place based on a set of indicators from survey responses. The data sources that these papers use are typically from census data, public use micro datasets, or from the national household travel survey (Blumenberg & Evans, 2010; Chatman & Klein, 2011; Heisz & Schellenberg, 2004; Lee, Smart & Golab, 2021; Schouten, Blumenberg & Taylor, 2024; Xu, 2018; Preston, McLafferty & Maciejewska, 2023; Tal & Handy, 2010; Kim, 2009; Hu, 2017; Smart, 2010; Blumenberg & Smart, 2010). Across studies, the likelihood of public transit use and

automobile ownership are the most used measures. For instance, many studies use census data to study the likelihood of taking public transit to work to determine the existence of travel assimilation (Heisz & Schellenberg, 2004; Xu 2018, Chatman & Klein 2011, Blumenberg & Evans 2011, Schouten, Blumenberg & Taylor 2014). Here, if an immigrant is no longer using transit after a certain number of years to commute to work, they are considered assimilated. In other studies, multiple data points are used, including public transit use, automobile ownership, active transport, and number of adults per vehicle (Preston, McLafferty, Maciejewska, 2023, Tal & Handy, 2010, Hu, 2017; Chatman & Klein, 2009; Kim, 2009; Smart 2010). Other metrics used to measure whether travel assimilation occurs include frequency of use of car share, rideshare and bikeshare apps (Lee, Smart and Golab, 2021), likelihood of parents walking their children to school or not (Martinez et al., 2008), cycling behaviours (Yu & Teschke, 2018), and carpooling with friends and family (Blumenberg & Smart, 2010).

Though less common, qualitative approaches have also been used to uncover travel assimilation (Shafi, Delbosc & Rose, 2022; Chatman & Klein, 2013; Waitt, Kerr & Klocker 2016). Delbosc, Shafi & Rose (2022) conducted 20 interviews with 13 different South Asian immigrant households in Melbourne, Australia. They describe travel assimilation occurring in two phases, first through driver's license acquisition and the next step being automobile ownership. The researchers note that once a driver's license was obtained it was almost inevitable that car ownership would proceed, as both are necessary for travel assimilation to fully occur. In Chatman & Klein (2013), six focus groups were conducted with the assistance of immigrant support services in New Jersey. The criteria to be able to participate was that they fell in the age group of 20-64 and had significant responsibilities outside of the home. Results indicate increased auto use and ownership occurs the longer immigrants stay in America. Both semi-

structured interviews and sketch maps of everyday journeys were employed by Waitt, Kerr & Klocker (2016) to study travel assimilation amongst female Chinese immigrants living in Sydney. When comparing travel behaviours in China and in Australia, car ownership emerged as the key measure of travel assimilation as none of the women owned vehicles in China, and all of them had a license and owned a car in Sydney.

Across qualitative studies, there is no direct measure of travel assimilation through indicators. Instead, the focus tends to be on the process of travel behaviour change, and in-depth responses are collected to understand why people's travel behaviour changes. Qualitative studies also tend to differ from quantitative ones in the trips they capture. Quantitative studies typically employ census data, and therefore often only capture the journey to work. Qualitative studies are not limited to this one trip and instead account for all trips. These studies therefore go beyond considering the trip to work, while also emphasizing household trips, childcare, and the difference in access to the family vehicle.

Methods

This study was conducted in partnership with CultureLink, a settlement organization that facilitates various programs to assist newcomers in connecting with the City of Toronto as a new immigrant or refugee. This research focused on participants of one of their programs called Bike Host, a free cycling mentorship program. Every summer, new immigrants and refugees are loaned a bicycle, lock, and helmet and put in groups with a cycling mentor. The program allows for participants to discover and connect with different parts of Toronto on a bike. It also presents opportunities to meet with other members of the program, both mentors and mentees. By the end of the programs' duration those who actively participate are gifted a bicycle.

The study employed a qualitative approach through semi-structured interviews. This was chosen as the most appropriate form of data collection as it helps uncover complex patterns and relationships with the assistance of an interview guide (Adeoye-Olatunde & Olenik, 2021).

Census data does not necessarily capture trips related to caretaking (picking and dropping children off to school), or household duties (grocery shopping, doctor's trips, etc.). To be inclusive of all travel behaviours, a qualitative approach would be able to capture all these unique experiences. The participants were recruited through purposive sampling: they had to be an immigrant and previously participated in Bike Host to be eligible for the study. Participants from the 2017 and 2018 cohorts were selected to capture immigrants who have been in Canada for 7-8 years and are therefore expected to have undergone travel assimilation.

The interviews were approximately one hour long and were conducted on Zoom. The rationale to having interviews being done on an online platform was to increase accessibility to all possible participants. For instance, remote interviews make it easier for those who have additional responsibilities that prevent them from participating in-person to take part in research. Further,

online interviews allowed participants who had moved outside of Toronto, or even Canada, to participate.

After receiving ethics clearance from the McMaster Research Ethics Board (MREB) to conduct this qualitative study (MREB #7049) the interviews commenced in July of 2024 and concluded in October of 2024. Interviews were conducted by the lead author. Participants were recruited through emails that were sent to previous participants of Bike Host from the years of 2017 and 2018. Their contacts were facilitated from the project's community partner at Bike Host. Those that responded were sent a Letter of Information and Consent Form. They all signed and returned their consent form before each interview took place. They were provided with an incentive of a \$25 Visa gift card for participating in the interview.

The interviews covered four themes. It first inquired about the initial and current transportation modes that the participants use, and what prompted each modes' frequency of use. The second theme focused on the different factors that influenced respondents' travel behaviour, ranging from car ownership, occupation, income, geographic proximity, place of residence, and presence of children or caregiving responsibilities. The third theme addresses the impact that community led programs like Bike Host had on shaping current transportation modes and travel behaviour. Finally, the interview focused on looking at the interconnection of transportation and its impact on health and well-being.

The interviews were transcribed verbatim and coded through NVivo software. Before coding the participants' names were de-identified and they were given pseudonyms to ensure confidentiality. Thematic analysis was used to analyze the interview transcripts and identify reoccurring themes and patterns (Braun & Clarke, 2006). The six steps outlined by Braun & Clarke (2006) were implemented. First, data familiarization occurred by reviewing each

participant's auto-transcriptions and fixing any mistakes or discrepancies. Initial codes were then generated from the interviews based on insight from the participants concerning their travel patterns. These initial codes were then reviewed, and several were grouped together to create themes that represent common experiences across multiple participants.

The lead author's positionality can be perceived as an insider and outsider position. Their positionality as an insider is because she was born to South Asian immigrant parents in Canada. Growing up she witnessed the mobility changes her parents went through and would classify them as being travel assimilated as they only travelled on the bike and public transit their first four years in Canada until they purchased their first vehicle. However, she would also classify herself as an outsider as she was born in Canada and did not personally experience any immigration processes. Witnessing her parent's immigrant transportation journey does not equate to her personal experiences as a Canadian born citizen. Addressing the reflexivity of her positionality is a critical step before commencing the research, as it informs the nature of the relationship with the participants in the interview (Berger, 2015; Yip, 2024).

Results:

A total of 11 interviews took place. Women were overrepresented across the sample. Table 2 describes the sample. Across interviewees, it emerged that travel assimilation is not as simple as it can be portrayed in the literature. Of the 11 participants, only one fully assimilated, as they exclusively travel by car. On the other end of the continuum one participant did not assimilate at all and rarely use a car. Everyone else was somewhere in between, reinforcing travel assimilation as a continuum, rather than a binary experience.

Table 2. Description of Participants.

Sample Characteristics		n	%
Gender	Male	3	27%
	Female	8	73%
Children in household: Under the age of 18	Yes	6	55%
	No	5	45%
Car ownership	Yes	5	55%
	No	6	45%
Employment Status	Currently Working	8	73%
	Not working	3	27%

Throughout the interview process, it became evident that each participant's pathway to travel assimilation is unique and does not follow a homogenous path. Travel assimilation is influenced by a multitude of factors, highlighting the complex nature of this phenomenon. The following four sections share participants' experiences to exemplify how, contrary to the literature, travel assimilation is not a binary, non linear, experienced unevenly across households, and can not be captured with singular variables.

Travel assimilation as a continuum

Though much of the reviewed literature discussed above viewed travel assimilation as a binary, as something that people either do or do not experience, this was only the case for two of the 11 participants in this study. One of these participants is Amir who experienced the 'typical' shift and has completely assimilated over the eight years since he moved to Canada. When Amir first arrived in Canada, he solely relied on public transportation to navigate the city as a newcomer and to get to work. He then used a bicycle more frequently after joining Bike Host. However, once he purchased a vehicle of his own, he never returned to travelling on public transit and felt most comfortable driving his own car. Amir purchased this vehicle when he moved to a more remote town with no bike lanes or public transit. He shared:

There is no public transport from my city, so the closest would be I think [A different city one hour away, name removed to maintain anonymity]. There is no bike lanes or busses, I haven't seen any bus... So, in that case there is no way I can go even grocery [shopping].

I can bike, but it would be biking on the highway, so I'd rather take the car and drive.

The transition away from cycling and transit can be attributed to the lack of bike lanes present within the town that would make Amir feel safe biking on the road and the lack of bus options.

After residing in Canada for several years, he now solely relies on his private vehicle for his functional daily activities.

Another participant, Alexsei, had the opposite experience and never experienced travel assimilation. Alexsei joined Bike Host with very limited experience riding a bike. Joining Bike Host provided her with an opportunity to meet new people, discover the city of Toronto and learn to ride a bike as an adult.

When Alexsei first arrived in Canada she did not have access to her own vehicle, relying on the subway to get to work. Alexsei lived with her relatives upon her arrival and if she ever needed to make a trip that was inaccessible on public transit she would get a ride from them. She shared how she prefers using public transit and other sustainable modes of transport, like walking and biking. She does not have a driver's license and does not intend on getting one as she does not see the need in obtaining a license or owning a car, saying “...*Then my friends pick me up and we go someplace or relatives, and I don't need my own car and don't want to have it.*” She has not conformed to the auto-centric lifestyle of many Canadians and continues to travel in a sustainable manner years after immigrating here.

These two participants represent two different ends of travel assimilation: Amir has completely travel assimilated and Alexsei has not travel assimilated. However, all other interviewee experiences are not reflective of this binary experience. Instead, they fall somewhere on the travel assimilation continuum. Halima's experience is an example of a participant who has partially assimilated. When she initially arrived in Toronto, Halima's travel behaviour encapsulated a sustainable lifestyle, travelling exclusively on the TTC and biking after participating in Bike Host. She purchased a vehicle after the birth of her child and temporarily used it to drive to work. However, she found it exhausting to commute downtown by car

everyday noting “*Of course driving your own car is great, but the construction, lack of parking in downtown, how expensive it is to pay for parking, I couldn't do it.*” This showcases her experiences do not fit in a binary experience of travel assimilation as she went back to travelling to work on the TTC.

Halima does not use the TTC for all trips, for example she does not travel with her child on the TTC, reflecting “*When I'm traveling with my child. I don't want the stress of going in the bus and coming down.*” She also recently purchased an e-scooter which replaced her bike. She describes her current travel mode below:

So, I would say I use TTC 3 days a week, because I go in office 3 days a week. I use my personal car every day just to go drop my daughter and pick her up. It's like in the mornings, and in the evenings... Cycling, I switched that out for e-scooter I use that every other day, for leisure, grocery within a 20-minute radius... If the errand is 30 minutes away, I would drive.

It would be difficult to categorize Halima's experience as strictly travel assimilated or not. She does exhibit some patterns that are reflective of an auto-centric lifestyle, but there is still an active effort on her end to lead a sustainable lifestyle through her purchase and reliance on the e-scooter. She is amongst the nine participants who show the importance of shifting our framework from a binary viewpoint of travel assimilation, to viewing travel assimilation as a continuum of experiences. All remaining participants' experience are also examples of being somewhere on the continuum of travel assimilation.

Travel assimilation is not always linear

In the literature, travel assimilation is often studied in a cross-sectional manner: it captures people's travel patterns at one point in time. Results from this study indicate that this may fail to capture the complete story, as travel patterns do not always follow a linear trajectory. Take, for instance, Nancy, who challenges the conventional notion of travel assimilation occurring in a linear manner.

Nancy first immigrated to Canada from China two decades ago. She initially settled in Alberta for work and currently resides in Ontario, though she has returned to China on multiple occasions over the past 20 years. During her time in Alberta, she solely relied on her personal vehicle to travel on a day-to-day basis due to the weather and lack of accessible public transport. She notes that:

While I was in Alberta, I didn't take the bus nor bike, I drove because the working place is far away from me - over 20 km. There was no traffic there, so it was easier to drive.
And not a lot of people take public transit in Alberta.

Nancy's experiences in Alberta formed an auto-centric lifestyle using her car for all her trips. Distances between destinations were far, and she felt that the cultural norm was for everyone to have their own vehicle, so she did too.

After some time in Alberta, she moved back to China, and later returned to Canada, but this time to Toronto instead. This new city drastically changed her transportation behaviours, she shared how:

After I moved to Toronto I don't have a car, a personal car, anymore. In Alberta I had the job, I needed the car, in Toronto I don't have a job, I don't need a car. Now I walk more often.

Nancy's story highlights how travel assimilation is not always linear. While in Alberta she would be considered to have undergone travel assimilation, while in Toronto, however, she would be considered as someone who has not assimilated.

Travel assimilation is not always equally experienced across households

Across the interviews, it became evident that travel assimilation does not always occur uniformly across a household. Namely, there are examples of gendered discrepancies that exist within a household when it comes to accessing a vehicle – and this gendered access to vehicles impacts the degree to which travel assimilation occurs.

For example, Anahita, who is a married mother of two young children under the age of 10.

Anahita's travel behaviours are reflective of her role as the primary caregiver to her children. The household has access to one car; however, Anahita does not drive herself. Her husband is the sole driver of the vehicle. Anahita travels sustainably for the most part, saying that she "*prefers to walk.*" She lives in the city and can access most essential services within a walking distance like her children's school, part-time job and grocery shopping. However, there are some trips that she makes that are not within walking distance; when this is the case she shares: "*Mostly I use Uber because I don't have a car, and I don't drive.*" While travelling together as a family, Anahita explains how "*if we want to go to somewhere, we all go together with the car. But if, for example, my kids, they need to go to visit the doctor, I take Uber with the rest of them.*"

Children have resulted in more car-centric travel for Anahita and her family. However, Anahita's husband's car use is greater than hers given that she cannot drive. Anahita's story unfolds how even within the same household the rate at which travel assimilation is experienced varies significantly based on the level of access to transportation modes, like a personal vehicle. This

emphasizes the importance of doing studies that are inclusive of all members of a household and not just one person being representative of the data in one household.

Diversifying indicators of travel assimilation

Results suggest that the indicators used to measure travel assimilation should be expanded. For instance, In the literature, quantitative studies tend to look at the rate of public transit use for trips to work as a measure of travel assimilation (Blumenberg & Evans 2010; Chatman & Klein, 2011; Heisz & Schellenberg 2004; Kim 2009; Xu 2018; Preston, McLafferty & Maciejewska, Hu; 2017 Schouten, Blumenberg & Taylor 2024). By only measuring the trip to work, this fails to account for experiences of those who do not work. Within this study, as noted in Table 2, 27% of participants did not work but were all users of public transit at some point in their time here in Canada. Even amongst participants who are currently employed, some travelled to work on public transit but used a personal vehicle for other types of trips. By measuring a broader selection of trips beyond the trip to work, future studies will be able to capture a wider and nuanced experience of travel assimilation.

Further, travel assimilation is often thought to be measured through car ownership (Blumenberg, 2009; Chatman & Klein, 2013) or declining public transit usage (Heisz & Schellenberg, 2004; Xu, 2018). However, interviews revealed that there are other ways to measure travel assimilation. For instance, it emerged that you do not necessarily need to own your own car or drive yourself to showcase signs of travel assimilation. The use of Uber or traditional car rental can be used as an indication of assimilation occurring.

This becomes apparent through the experiences of one of the participants, Miguel. Miguel's transportation journey is one that does not follow the 'typical' path that is outlined for travel

assimilation. When Miguel first arrived in Canada, he relied primarily on walking and public transit to meet his daily travel needs. He has continued to try and use sustainable transportation modes; he shared *“For essential everyday stuff we still rely on walking, and the TTC. We don't rent cars or take Ubers for that.”*

However, some of Miguel's behaviours are reflective of a move away from sustainable modes of transport. Miguel explained how when he first arrived, he didn't rely on using any sort of taxi service (Uber included) or driving himself, as he did not prefer to drive. However, as time went on living in Canada there were some changes that occurred in his and his family's travel behaviour. Even though, for their day-to-day travels they still use the same transportation mode, for personal trips or those trips they find difficult to access via public transit they now either rent a car or take an Uber. For instance, he shared the following story:

When we first arrived, we didn't do uber or taxis as much as we do now, I don't know why we take more Ubers now, maybe because now we are a little bit more financially stable than when we first arrived...and we also now do rent the occasional car. But maybe, when we have to take a trip, [...] you cannot get there by public transportation at all, right?... yeah the renting cars is pretty recent, just within the last year, maybe.

This anecdote highlights that though Miguel has not fully assimilated, his travel patterns have still become more car centric. The rise in renting cars and Uber use is an indicator of the broad changes in immigrant travel patterns. Although the change is not a radical one, it is significant enough to note as it speaks to adapting to the auto-centric lifestyle of Canadians. Using these two modes of transportation help fills a mobility gap and may act as a bridge prior to car ownership. Miguel falls on the continuum of travel assimilation, and this is evident through Uber and car rental, two metrics rarely used to measure travel assimilation. Using a survey, Miguel would

appear as not experiencing travel assimilation: in his household there are no indicators of car ownership or reduced transit use. However, there are other ways in which Miguel falls onto the continuum of travel assimilation.

Diversifying the ways in which travel assimilation is measured could allow for a more holistic understanding of how immigrants' travel behaviours change overtime. New indicators could include transportation mode beyond the trip to work and taxi/Uber and car rental behaviours. Travel assimilation is a dynamic process and does not occur with one decision or action but is an evolving process that requires a broad set of indicators.

Discussion

Drawing on interviews with newcomers to Canada, this research sheds new light on the process of travel assimilation. Results uncover that travel assimilation is not a one-time process that happens once an automobile is purchased. It is a layered, complex process that is constantly evolving, and most participants do not adhere to a binary framework of travel assimilation (i.e., assimilated or not).

This study also emphasizes the importance of considering multiple timeframes when measuring travel assimilation, as it is not always a linear process. While most of the literature focusing on travel assimilation views this trend as a one-time linear process, some studies are aware of this limitation or have even included it through a longitudinal study. For instance, Xu (2018) and Yu and Teschke (2018) acknowledge this as a limitation in their studies. By using census data and surveys, they state that they are only able to capture data from one point in time. These studies find that it is important to incorporate data from multiple points of time to increase accuracy. Within a year, a person's place of residence can change, they can move back to their home country permanently, or travel back and forth between countries. These moves can impact travel assimilation. Hu (2017) measures travel assimilation by directly comparing 2001 and 2009 NHTS survey data in a longitudinal study. This helps address this limitation since there is an 8-year gap in both datasets. This enforces the importance of longitudinal studies (quantitative and qualitative) in accurately reflecting many participants' experiences within research.

Further, results highlight how within one household travel assimilation can be experienced to different degrees, with one being more assimilated than the other because of the differential access to transportation modes. Finally, expanding the indicators that are used to measure travel assimilation may better capture people's experiences of this trend. For example, many studies in

the literature (e.g., Blumenberg & Smart (2011), Blumenberg (2009), Chatman & Klein (2013), Waitt, Kerr and Klocker (2016)) use car ownership as the indicator to measure travel assimilation. However, results from this study highlight that there are more indicators of travel assimilation that are not currently captured in most existing quantitative studies. Indeed, 45% of participants of this study do not own a car (Table 2). And yet, many are still reliant on a vehicle through other means such as renting, Uber or relying on a family member that does own a car to drive them (within the same household). Other studies capture these less traditional forms of car use (e.g., Delbosc, Shafi & Rose (2022), Lee, Smart and Golab (2021), Blumenberg & Smart (2010)). For example, Delbosc, Shafi & Rose (2022) look at driver's license acquisition, carpooling and the reliance of a partner or relative to drive them for their trips and Lee, Smart and Golab (2021), Smart (2010), Blumenberg & Smart (2010) omits the measurement of car ownership focusing on alternative measures of travel of immigrants that help capture a broader experience of travel assimilation. This indicates that some of the literature is already incorporating this lesson that emerged from this study.

The key limitation of this study is its relatively small sample size (11 participants). For this study 11 participants were able to reach data saturation for its results. However, for future studies incorporating a larger sample size can help uncover other experiences of participants travel patterns that are not captured and can expand the understanding of the continuum that travel exists on. Recruitment was limited to past participants of the Bike Host program, which limited the number of people that could be sampled. Many immigrants are not a part of these programs, and their experiences may not be captured in this study. It is also possible that recruiting from this program resulted in a sample less likely to experience travel assimilation as they are prone to

enjoy cycling. Recruiting beyond community programs would help increase the scope of the study, which would, in turn, also help increase our sample size.

Conclusion

This study adds nuance to current conceptualizations of travel assimilation. Results indicate that travel assimilation can occur across a continuum, be non-linear, be uneven across a household, and should be measured through a multitude of indicators.

For future research purposes, it is recommended that studies employ a longitudinal framework to view the travel patterns of an immigrant from multiple points in time, rather than a single timeframe. Employing more qualitative studies also helps researchers better understand the mobility of immigrants and their preferred method of travel. Incorporating more gender disaggregated studies can help illuminate the differences in access to different modes of transportation. Measuring travel assimilation using indicators beyond driver's license, car ownership, and public transit use can also help capture tendencies toward auto-centric lifestyles. Specifically, taxi/Uber use, car rentals, and car sharing in a household can be used as indicators to capture experiences of travel assimilation.

Chapter Three: Identifying four factors influencing travel assimilation through the Social Practice Theory (SPT) framework

Background

Currently, over 8.3 million Canadians are immigrants, and this number is progressively growing (Statistics Canada, 2023). According to the 2021 census, 1.3 million are recent immigrants, arriving between years 2016-2021 (Statistics Canada, 2023). Transportation plays an essential role in the immigration process; it is essential to access employment opportunities, healthcare services, and community organizations. This research focuses on immigrants' travel behaviour, and specifically how it changes over their early years in Canada. Differences currently exist in transportation patterns between immigrants and Canadian born citizens. For example, 13.1% of immigrants commuted to work using public transit in Canada in 2021, whereas only 4.7% of Canadian born individuals did so (Statistics Canada, 2022). However, over time immigrants' travel patterns begin to mirror their Canadian born counterparts, moving towards an auto-centric lifestyle (Heisz & Schellenberg, 2004). This pattern is observed not only in Canada, but also in the U.S., Australia, New Zealand, and other countries with high immigration rates. Indeed, the existing literature notes that when an immigrant initially arrives in the destination country, they tend to travel sustainably. However, over time their travel behaviour becomes more reflective of their native born counterparts who tend to travel less sustainably (Delbosc & Shafi, 2023; Heisz & Schellenberg, 2004; Blumenberg & Smart, 2011; Xu, 2018; Preston, McLafferty, & Maciejewska, 2022; Hu, 2017; Chatman, 2014; Tal & Handy, 2010; Casas, Arce & Frye, 2004; Liu & Painter, 2012; Yu & Teschke, 2018; Smart, 2015; Newbold, Scott & Burke, 2017). This process of immigrant transportation modes becoming more auto centric the longer they reside in the destination country is referred to as travel assimilation.

This study focuses on travel assimilation. Specifically, it uncovers factors that influence whether – and to what extent travel assimilation occurs. Through semi-structured interviews with immigrants in Canada who participated in a community cycling program, four factors that impact the manifestation of travel assimilation are identified. They are: the built environment, economic factors, mobility of care, and the impact of local settlement programs. The data collected in this study confirms findings in the literature, while also shedding new light on factors that are not currently accounted for in past research.

Literature Review

Existing research notes that the initial travel patterns of immigrants typically consists of more sustainable forms of transport in comparison to their native-born counterparts' auto-centric lifestyles (Blumenberg & Evans, 2010; Tal & Handy, 2010; Shafi, Delbosc & Rose, 2023; Heisz & Schellenberg, 2004). The longer an immigrant stays in the destination country, the more likely they are to change their travel behavior, thus experiencing travel assimilation (Delbosc & Shafi, 2023; Preston, McLafferty & Maciejewska, 2023; Xu, 2018; Heisz & Schellenberg, 2004; Kim, 2009; Schouten, Blumenberg & Taylor 2024; Harun, Pierre, & and Moos, 2022). Understanding why travel assimilation occurs is essential in identifying factors that result in inadequate access to sustainable transportation modes for immigrants. Fostering an environment that is supportive and inclusive of sustainable transport will translate to social practices that are reflective of this. In doing so, this will help implement policies and infrastructure that are focused on immigrants' transportation needs in continuing sustainable travel. These policies can help focus on increasing access and the longevity of sustainable transport for immigrants. The existing literature has identified a variety of factors that are responsible for travel assimilation occurring amongst immigrants. Across the literature, the main contributors to travel assimilation are economic, geographic, and cultural. Research on these three factors which are often interconnected, is discussed below.

Economic factors

Affordability and income are seen as significant influences that shape travel assimilation. Studies have found that when immigrants first arrive in the destination country, affordability is a determinant of what transportation mode is going to be used (Amar & Teelucksingh, 2015; Farber et al., 2018; Allen & Farber 2020). This has been found using different methodologies.

For instance, Amar & Teelucksingh (2015) used a qualitative approach through interviews while Allen & Farber (2020) employed a quantitative approach using the 2016 Transportation Tomorrow Survey (a household travel survey in the GTHA) as their data source. Farber et al. (2018) used a mixed-method form of data collection, combining focus groups and paper surveys. Regardless of methodology, these studies have found that the high cost of living limits newcomers to solely using public transit for their daily needs, as they are unable to afford a personal vehicle (Amar & Teelucksingh, 2015; Farber et al., 2018; Allen & Farber 2020). Financial constraints create an environment in which many immigrants feel that they are not able to access all forms of transportation when they first arrive.

Over time, immigrants' income increases and can mirror that of their native-born counterparts. As this occurs, immigrants' travel behaviour also begins to reflect that of people born in their destination country. Indeed, higher public transit use amongst immigrants is typically associated with lower employment income in the first few years after they arrive in the destination country (Harun, Pierre, & and Moos, 2022; Lovejoy & Handy, 2008; Chatman & Klein, 2013; Clark & Wang, 2010). A correlation has been observed between the duration of stay and employment income; in other words, as one becomes more established in the destination country, their income tends to rise, which in turn impacts their travel behaviour. A higher income results in greater access to additional transportation modes, such as car ownership (Lovejoy & Handy, 2008; Clark & Wang, 2010; Xu, 2018).

Geographic factors

Where an immigrant decides to reside impacts their travel patterns as it determines the access they may or may not have to adequate transportation and services. In a study by Amar & Teelucksingh (2015), many of the participants initially resided in areas that were close to bus

lines in comparison to subway lines because these areas tended to provide more affordable housing options. This example shows the interdependence of economic and geographic factors in shaping travel assimilation. As bussing was their main form of transportation it was essential that they live in an area that had easy access to it, whilst managing the cost of living.

In Preston, McLafferty & Maciejewska (2023)'s analysis of census data across Canadian cities, results indicate that immigrants tend to reside in primary metropolitan cities that have extensive public transit networks. However, over time they transition toward living in secondary metropolitan cities (more suburban cities) that do not have as expansive of a public transit system, which may require higher rates of car ownership.

Being close to cultural amenities plays a role in deciding where to live as well. Many immigrants decide to move out to areas that are more culturally familiar, (i.e., 'ethnic enclaves') to feel closer to their community (Amar & Teelucksingh, 2015; Delbosc & Shafi, 2023). Public transit can often pose a hurdle into accessing culturally familiar areas as there may not be an effective transit system in a rural or suburban area they may currently reside in (Farber et al., 2018).

Oftentimes, the best way to access these cultural amenities is through a personal vehicle (Amar & Teelucksingh, 2015; Farber et al, 2018).

Cultural Norms

Some cultural notions are associated with sustainable transport that shape the rate at which travel assimilation occurs. For example, the literature has found that cycling can often be seen as a symbol of poverty from newcomers' experiences from their home country, presenting itself to be a conflict with their identity (Barajas 2020; Reid-Musson, 2018; Law & Karnilowicz, 2015).

Barajas (2020) focuses on Latin-American communities in San Francisco, and specifically how

cycling is perceived within the community as it may indicate a person is unable to drive or lack the skills for driving, leading to feelings of shame and resentment within participants. Feelings of isolation and embarrassment are a reoccurring theme within the literature as new immigrants feel they are limited to just cycling and unable to access other forms of transportation (Reid-Musson, 2018; Law and Karnilowicz, 2015). These negative associations with cycling may further prompt immigrants to move away from sustainable transport and towards car ownership.

Theoretical Framework

This paper draws on Social Practice Theory (SPT) as a theoretical framework to better understand how immigrant travel behaviours are informed through social practices. The framework of SPT looks to understand how daily routines – or practices - come to fruition (Reckwitz, 2002; Shove, Pantzar & Watson 2012). Shove et al., (2012) propose that practices are the outcome of the interconnection of three elements: meanings, competencies and materials (Shove, et al., 2012; Kent; 2021; Ravensbergen, et al., 2023; Bruno & Nikolaeva, 2020). These elements interact with one another to maintain these practices. Meanings are representative of the values and social norms of the practice at hand. Competencies refer to the skills required to be able to engage in that particular practice. Materials refer to the physical things and infrastructure (built environment) that is required for the social practice. All of these elements are intertwined with one another, if one of these changes, it directly impacts the practice (Kent, 2021). For example, driving a car is a practice, influenced by factors such as, an auto-centric infrastructure (i.e., materials), obtaining a driver's licence (i.e., skills), cultural significance of car ownership (i.e., meanings) (Kent, 2021). In Kent (2021)'s critical review, it uncovers the nuances associated with sustainable transport practices, exploring beyond individual behaviour, and including the role of social structures in practice theory.

SPT views these three elements as intertwined with one another and in this instance, can help uncover why travel assimilation is occurring amongst immigrants. A major component of travel assimilation is immigrants transitioning towards an auto-centric lifestyle. In the context of this research study, participating in local community programs are reflective of practice theory. In particular, looking at the role that community led programs like Bike Host have in furthering SPT with materials (bicycle, helmet, lock), competencies (cycling in Toronto), meanings

(mentorship and community) being offered to newcomers. SPT offers a comprehensive framework in understanding changing travel patterns on micro and macro levels (Kent 2021; Ravensbergen et al., 2023; Bruno & Nikolaeva, 2020).

Methodology

The interviewees of the study were all past participants of the free cycling mentorship program Bike Host in Toronto. Bike Host is created by CultureLink which is an organization that helps newcomers with their settlement journey in Canada through various group activities and programs. For the duration of Bike Host, the participants were loaned a bike, helmet and lock, while they cycled through different parts of Toronto with their respective group and mentor. Bike Host runs through the summer of each year in Toronto and after engaging in the program, participants who were actively involved were gifted a second-hand bicycle at the conclusion of Bike Host.

Recruitment for the study was done through purposive sampling. The participants had to be an immigrant or refugee and a previous participant of Bike Host, specifically from the year 2017 or 2018. These years were selected as at this point, they have at the minimum been in Canada for roughly 7-8 years, assuming travel assimilation has occurred in that span of time. The past participants of Bike Host were recruited for this study with the assistance of a partner at CultureLink through sending emails that included portions of the Letter of Information (LOI). Those that replied to the email were then forwarded the complete LOI and consent form. Once the forms were signed and consent was provided, the interviews commenced. For offering their time and insights during the interview the participants were each given a \$25 Visa gift card.

The data collection method that was employed in this study was qualitative, using semi-structured interviews. A qualitative approach allows unique trip types, varying duration, family related trips and employment dynamics to be captured in the data collection process. Semi-structured interviews create an opportunity for building trust directly with the participants of the study, allowing for more in-depth responses that are more accurately reflective of their

experiences (Adeoye-Olatunde & Olenik, 2021). The interviews were roughly one hour long and were all done online through Zoom. The online platform Zoom was the chosen medium for the interviews, as it is globally used, so participants who may have moved either away from Toronto or internationally are still able to participate and share their input. For those that still reside here but are bound by prior employment or family obligations have the option of partaking from their home as well by using Zoom.

The interviews began in July of 2024 after obtaining ethics clearance from the McMaster Research Ethics Board (#7049). The interviews concluded in October of 2024 after reaching data saturation. The overall theme of the interview guide was focused on understanding what shapes travel assimilation amongst the Bike Host participants. Specifically, the interview guide targets four key topics in helping answer the research question. It first looks at the differences or similarities between their initial travel patterns when they arrived as newcomers and now, seven or eight years after participating in Bike Host. The second looks at various external factors that may have influenced their transportation mode like employment income, automobile ownership, family responsibilities, place of residence, proximity to sustainable transport. The interview then shifted focus to uncovering the impact that Bike Host had on shaping the current travel behaviours of participants and their experience with the program. The interview guide then concluded with inquiring about whether different transportation modes affected their health and well-being.

The data from the interviews was analyzed using thematic analysis which helped identify similar trends and experiences amongst the participants. Braun and Clarke (2006) identify six steps in thematic analysis which were applied in this study to understand the patterns in the data in shaping travel assimilation. The first step was data familiarization by going over and correcting

any errors the auto-transcript created by Zoom to ensure the accuracy of the transcript.

Preliminary codes were then developed based on the experiences of the participants with transportation. After going over the preliminary codes, many of them were then grouped together to reflect the themes in the transcripts. This assisted with helping uncover the overarching patterns present in the experiences of all the participants.

Results

A total of 11 participants took part in this study. Across interviews, four factors shaping travel assimilation emerged. They were the built environment, economic factors, mobility of care, and the impact of Bike Host. As is the case in the literature, these factors were found to be interconnected. SPT was used to analyze the participant's travel patterns and how each of the elements interact with one another to shape these practices. Each factor that was found to shape travel assimilation is described below.

Built Environment

The built environment plays an essential role in how immigrants interact with transportation modes in the destination country. The built environment refers to the physical surroundings of the participants that they interact with daily. For example, their place of residence, proximity to adequate transit and bike lanes play a significant role in the participants' travel behavior.

Throughout the interview process it became evident that the built environment shapes the extent to which travel assimilation occurs. The likelihood of leading an auto-centric lifestyle increases when newcomers reside in a car-dependent city. Likewise, it was observed in the interviews that living in a city that has high access to transit and essential services within walking distance, sustainable transport modes were more likely to be adopted. Approximately half of the participants (n=6) noted that their current residence does not have adequate access to bike lanes and public transit for their daily commute, meaning that they are more likely to purchase a personal vehicle instead to accommodate their travel needs.

Though participants do not necessarily follow the linear path of conforming to travel assimilation, the interviews emphasized the role that the built environment had on expediting or

detering travel assimilation from occurring. Take for example, one of the participants, Anh, whose built environment has been constantly changing, shaping her travel behaviour. When she first arrived in Canada, she was a university student in Toronto, living near the campus. During her time at the university she states, *“I am not very much into driving and I did not have a driver’s license then...I lived really nearby the campus, so I mainly walked and took public transit.”* As Anh recounts, due to her school being near her place of residence there was not a necessity or desire for her to start driving. Anh had the physical infrastructure (materials) to be able to travel as she pleased, as she lived near her school, she could practice her preferred mobility of walking and using public transit. She did not have the competencies (driver’s license) to pursue driving, further enforcing her mobility patterns in traveling using sustainable travel modes like walking and public transit.

However, after moving to a more suburban region in Ontario, she attempted to continue travelling using sustainable forms of transport, particularly cycling after taking part in Bike Host. However, she found it difficult to navigate cycling in her new home due to the lack of existing cycling infrastructure. She shared:

I did bike – I did try to bike, I even bought a bicycle but because of the experience that I have in [redacted location for anonymity purposes] I kind of gave up on cycling. I felt like I was the only one who was cycling on the road, it’s definitely not very friendly to cyclists, the infrastructure, the mentality of people on the road, the cars behind me are not very happy when to turn on the left side of the road and I have to pass a car in an inner section it wasn’t inclusive it felt like they weren’t yielding me.

While trying to still maintain sustainable travel behaviour, Anh’s built environment contradicted her own personal desires to want to continue cycling. The existing physical environment did not

allow Anh to comfortably travel on a bicycle and having to later conform to the predominant transportation in the city – travelling by car. Anh goes over how the others on the road were “*not very friendly to cyclists.*” It shaped her travel experience as she completely stopped cycling afterwards. The materials and meanings of this new residence deterred Anh from travelling sustainably. With the roads being catered towards automobiles, it creates an environment in which drivers become hostile while sharing the road with cyclists, as shared through Anh’s experiences.

Looking at how travel patterns of participants have changed, SPT’s framework helps provide a broader, more holistic understanding as to why these changes have occurred. For those participants who have moved out of downtown Toronto, many have stopped travelling on their bike, or do not ride it nearly as much as they used to. The lack of bicycle lanes is reflective of an auto-centric culture which fosters an environment in which the practice of cycling cannot be upheld to the standard it once was. There is a concern for safety when riding a bike in more suburban and rural cities where cars consist of all the traffic, making participants feel like they have to opt out of cycling. SPT informs in this case how these elements, once changed, can create a scenario that can deter individuals from maintaining their practice. Even though, there is a strong personal desire to continue cycling, the social structures in place discourage this.

Economic Factors: Job Opportunity and Income

One of the most significant factors that lead to travel behaviours changing is employment (Preston, McLafferty & Maciejewska, 2023; Clark & Wang, 2010). The participants in the study showcased notable changes in their travel behaviour once they began working or changed jobs. Employment either led to participants changing their place of residence, increasing travel time,

and/or earning a typically higher income. Income has a direct impact on transportation as it either enables or limits one's ability to own a car and possibly move to an auto-centric city.

Some of the participants in the study detail how after getting their first job in Canada they had to adopt to a more auto-centric lifestyle as operating a private vehicle made it easier to travel to different locations and between work and home. For instance, Anh shared, "*That job it required me to move around quite a lot, the job isn't at one singular location. It's multiple – 3 places in one day...the car is pretty necessary for the specific job.*" The nature of Anh's employment did not allow her to access these jobs within a timely manner on public transit and she opted to use a car, despite her preferring to travel sustainably. This changed Anh's competencies as it pushed her towards an auto-centric lifestyle.

Similarly, Javed initially resided just 4 km away from his place of work and was able to commute to work by cycling or by subway easily. However, after changing jobs, the commute distance significantly increased as he started using his own vehicle and the GO train to get to work and he was unable to use his bike. Javed expressed concerns with the amount of time he now spends commuting saying:

Absolutely I would love to work close to my home and it take me less than 5 min to get to work. I don't want to spend too much time I don't like that, especially in the morning. I leave home at 5 am and I get to work at 7 am and I finish work at 3:30, and I arrive home at 5:30... I think 4 hours is too much and it makes me more tired when I get home.

Javed's experiences with varying commute times and transportation modes reiterate the role that employment plays in deciding one's travel patterns. An increase in commuting distance alongside travel time to work can be correlated with the adoption of an auto-centric lifestyle. As

a result of his employment changing, the materials that he once used to commute to work, have significantly changed. Biking and adequate public transit infrastructure are representative of the materials that Javed lacked due to the change in employment for his daily commute.

As a result of employment, it also impacts the level of financial security or insecurity newcomers may experience, as the range of income in this study are not homogenous in nature. Some of the participants come from low-income backgrounds and solely travel by walking, rarely using the bus. Emma, for example, shared how she does not work and does not receive any employment income. Their mode of transportation is limited for the most part to walking and has not changed since she arrived in Canada. She notes *“I’m very poor. I don’t have money for this Uber or Taxi or something else, I just walk in downtown like a half an hour. It’s okay.”*

Another participant, Sarah, currently works but has not changed jobs ever since she arrived in Canada eight years ago. Prior to her employment, walking was her main form of transportation. After her employment began there was an uptick in her use of the TTC and her personal vehicle depending on which of her two work locations she needed to commute to. She talks about her decision on which mode to travel with:

If you are going to Toronto you would not take a vehicle but then if its like further out like North York, you would take a vehicle as you feel like it’s easier to travel on car by there as compared to Toronto.

Through this scenario there is a direct relationship between the place of employment and mode of transportation as she is now able to access both modes, an option she did not have earlier. She talks about how her financial status has changed overtime in Canada stating, *“When I first came it was more about settling down a bit, about surviving as a newcomer. Those things were in play,*

but now I'm in a better place, job wise, financially.” Sarah’s experiences echo the sentiments present within existing literature as immigrants become more established within the destination country, the transition towards an auto-centric lifestyle will occur (Heisz & Schellenberg, 2004; Delbosc & Shafi 2023; Xu, 2018; Preston, McLafferty and Maciejewska, 2023). When contemplating about whether or not to purchase her own vehicle (second in her household), Sarah emphasized the role of employment income in that potential decision, “*Finances are a big factor, also cars are a lot to maintain and parking is crazy expensive here...If I happen to move jobs, maybe then I might consider buying a car of my own.*” Looking at these excerpts through SPT, it reinforces how the lack of access to parking (materials) because of its cost is shaping Sarah’s travel behaviour. It reiterates the role of economic factors in helping shape travel assimilation amongst immigrants. Based on the level of employment income an immigrant is earning, it widens or constrains the access to different modes of transportation.

Mobility of Care

A contributing factor to travel assimilation occurring is the arrival of children in a household. Just over half of the participants in this study have children (N= 6), with some of the participants being a part of the same household (2 couples took part in this study). All participants who were parents altered their transportation patterns after having children. These ‘mobility of care’ trips are all unpaid trips that are done by a caregiver (Ravensbergen, Fournier & El-Geneidy, 2023). In all cases in this study the mothers were the primary caregivers for their young children. When participants had children, their travel behaviours changed through obtaining car ownership, moving to a more auto-centric city, or gradually moving away from sustainable methods of travel.

One of the participants, Maria, is currently on maternity leave with her first child. Though she was an avid cyclist, during her pregnancy her transportation patterns began to shift. She was unable to bike once she got pregnant due to safety concerns and personal discomfort. Since the birth of her child, she can bike again, but does not do so at the rate she used to. She explained how this is because she is the primary caretaker of her baby and it would only be possible to bike if someone else was watching her baby. She shared:

He just turned 6 months old, he is a little stronger now in his neck and everything, but we are still going to wait until the baby is one year old to bike with the baby in the back...

But right now, if we are going somewhere with the baby we walk or TTC or if we go far away, we use Uber.

In many ways, Maria has not experienced travel assimilation: she still resides in downtown Toronto for walkability and transit access, alongside not owning or driving a car herself.

However, the birth of her child has increased her reliance on Uber, an auto-centric transportation mode. The materials that are needed of Maria when she must travel with her child have shifted from when she used to travel individually. Ensuring the transportation method is physically safe for her baby to be in, she opts to travel on infrastructure she deems child friendly. This can also be seen as the societal expectations (meanings) that are placed on new mothers, where their travel patterns must be reflective of their child's needs mainly, neglecting their own personal preferred travel modes. Her mobility is now mainly associated with caretaking trips, significantly reducing her personal trips.

As another example, Sarah shared how the arrival of her second child resulted in her travel shifting towards using a vehicle more, as she moved with her family to a larger home without other transport options. She said:

We were expecting a second child, and the previous place was not big enough so we needed to move...previously with the 16 year old [first child] we didn't have the car so we used to take the TTC or walk everywhere, and after we had the 3-year old [second child] his daily commute to his daycare is on the car.”

Here, the arrival of Sarah's second child resulted in a change in residential location which, in turn, directly impacted her transportation patterns. Sarah immigrated to Canada when her first child was much younger and did not have access to a personal vehicle at the time. However, she was able to purchase a car and move to a new home by the time her second child was born, shifting away from using the TTC. Sarah developed a new travel routine as a result of her second child's birth and with her acquisition of a personal vehicle. Her commute after the birth of her second child became geared towards her son's needs. She obtained new skills through learning how to drive and navigating a new route for her child's daycare. She altered her transportation patterns based on her role as a mother of two children, showcasing the role of multiple children on travel behavior. For recreational activities with their children, they still try to make an active effort to travel using the TTC. But, for essential trips, like daycare she uses the car as to drop and pick her son off from daycare before and after work.

Though Maria and Sarah are at different stages with childcare, in both cases the presence of children was identified as a key indicator of travel assimilation occurring. Caring for children requires travel or more room, and both seem to result in a more auto-centric lifestyle. The presence of children has a significant impact on mobility patterns highlighting the gendered practice of mobility. It reinforces how travel behaviours are not an individual choice, but a broader social practice, through the evolving needs of motherhood and the newfound skills associated with it.

Impact of Bike Host

Throughout the interviews, all the participants looked back fondly on the Bike Host program facilitated by CultureLink. As a result of the Bike Host program many of the participants (N=6) still actively cycle now after being a part of the program over 7-8 years ago. The program had a direct impact on travel assimilation – dwindling its effect.

Many participants were first introduced to cycling through Bike Host and some even continue to use the same bicycle (n=3) they received at the time. If not for the program, many of the participants would not have taken up cycling as it was not a familiar form of transport. In fact, some participants (n=4) expressed anxieties about travelling as a cyclist alongside drivers on the road prior to the program. But through mentorship and guidance, they were able to feel comfortable riding a bike. Sarah notes her experience with her mentor and members, easing her anxiety about biking saying

But my mentor, she gave me a lot of support, my other teammates they were like “yeah you can do it! Come on!” So that gave me a lot of confidence and felt very nice that I could do it...I felt a sense of freedom, you know, when I was able to bike and travel farther distances and not have to worry about wasting money.

Sarah’s experience shows how a community led program like Bike Host can be very encouraging for those attempting to learn something new as there is a network of a supportive mentees and mentors in place. This thought is explored within the literature as well in Barajas (2020) and van der Kloof, Bastiaanssen, & Martens, (2014); both studies emphasize the importance of community-led programs with immigrants to help encourage more cycling. The literature reiterates that lessons and group activities, similar to those in Bike Host, can foster an

environment that helps remove any obstacles present for those wanting to lead sustainable lifestyles through transportation. (Barajas 2020; van der Kloof, Bastiaanssen, & Martens, 2014).

Although Bike Host's main purpose was to enable cycling amongst newcomers in the City of Toronto, there were many unintended community building benefits of the program as well. The participants found that through the program they were able to meet new people and build connections with other newcomers. It also provided a space in which many participants were able to practice their English, as some did not feel the most confident yet speaking in English, with Maria stating:

I really appreciate that we have those programs when we come to Canada, because really it is tough for anyone to just come to a new city knowing no one, you create that feeling that you belong to a community and there is someone that you know now and you are able to move and feel more confident. Practice your English – that is really important for new immigrants.

Without the presence of these types of programs, immigrants can feel isolated at times and wanting to belong, seen through Maria's excerpt. Bike Host provided a space in which participants felt more confident about themselves and pursued friendships within the group. Some of the participants delved further into community building because of their experience with Bike Host. One of the participants later worked with CultureLink as a mentor in a different program to help the settlement process of other newcomers. Similarly, another participant eventually purchased their own bike and gave the bicycle they had received from Bike Host to another newcomer they knew. These experiences emphasize the importance of local, community-led programs in helping promote sustainable transport and ease the settlement process.

Similarly, another benefit of the program was the impact on the well-being of participants and how cycling took up a different meaning in wanting to lead an active lifestyle. Alexsei fondly recalled her experience with Bike Host saying:

I never think about bike... I only used bike only in my childhood, but after Bike Host my behaviour completely changed absolutely... participating in Bike Host company changed my mind changed my behaviour. I try only use bike to go to work. It's a very good way to keep healthy lifestyle.

The participants were left with a positive experience with Bike Host, reinforcing the need for community programs for newcomers in learning a new skill, building community and a sense of belonging while, discovering other facets of themselves.

The impact of this community-based program can be understood through the theoretical framework of SPT. Through Bike Host, participants were able to attain the skill of cycling by learning over one summer how to ride their bike in Toronto with mentors. They were provided the materials of a bike, lock and a helmet to practice their newfound skill. Through Bike Host, many found a feeling of independence and a sense of community with the program and its members (meanings). Some elements extend beyond the program, further reinforcing how the factors shaping travel assimilation are interdependent. For example, everyone was learning to bike in the same location of downtown Toronto, where the built environment (e.g., biking infrastructure) play a critical role in whether cycling can exist or not.

Discussion and Concluding Thoughts

This study identifies factors that shape travel assimilation. They are the built environment, economic factors, mobility of care, and a community cycling mentorship program. All the factors have a direct impact on one another, particularly looking at the place of residence and economic factors, as the income levels are what typically enable or limit the choice in residence.

This is aligned with existing literature where income and place of residence were one of the largest influences in shaping immigrant travel behaviour (Delbosc & Shafi, 2023; Preston, McLafferty & Maciejewska, 2023; Xu, 2018; Heisz & Schellenberg, 2004; Amar & Teelucksingh, 2015; Lovejoy & Handy, 2008). Employment income enabled many to make a change in their place of residence, influencing their choice of transportation. With one of the participants whose travel patterns have stayed the same since she has arrived in Canada, it was because of a lack of an employment income. This reinforces the role of economic factors in determining the place of residence and accessibility to transportation modes. The finding that affordability is a main priority for newcomers is echoed in Amar and Teelucksingh (2015) where many of the participants were earning less than \$30,000 annually during the time of the interviews. This directly impacted their transportation options as they felt that they were limited in what they were able to access because of a lack of affordable options, influencing their place of residence as well (Amar & Teelucksingh, 2015). As reflected in the literature and results, only once a newcomer has established themselves economically, they are able to move towards car ownership, contributing to travel assimilation occurring.

One of the factors that the literature does not capture or at least focuses less on, is the role that children play in contributing to travel assimilation. In the study, six out of the eleven participants had children (18 and under), and each of them had significant changes to their travel after the

arrival of children. Changes to transportation patterns did not occur uniformly within the same household, with an emphasis on a shift in travel behaviour on mothers after the arrival of children. As mothers tend to be the primary caretakers of their children in Canada, their mobility patterns are impacted more significantly after they have children (Ravensbergen, Fournier & El-Geneidy, 2023). In this study, travel assimilation was reflected in their mobility of care trips in which the mothers were relying on a more auto-centric lifestyle through increased use of Uber, reduced cycling, purchase of a vehicle, moving to a city with limited public transit infrastructure. The presence of children exacerbates the phenomenon of travel assimilation as it is now introducing new routines and trips solely focused on children. The role of children and household responsibilities in shaping travel assimilation is a gap within the existing literature. Future research should examine immigrant caretakers' transportation patterns, as their transportation journey may be overlooked.

Another unique contribution of this work is the use of Social Practice Theory as a theoretical framework to understand travel assimilation. This framework can help future policy and research incorporate more sustainable transport designs, in helping maintain sustainable mobility practices. Using this framework highlights the importance of sustainable land use design in cities (i.e., materials) to promote greater accessibility to all transportation modes and reduce the transition towards an auto-centric lifestyle. The implementation of programs like Bike Host help create an environment for immigrants to feel comfortable to learn how to ride a bike, developing a new skill (i.e., competencies) to travel the city independently. Meeting other newcomers in programs like Bike Host can help foster a sense of community and belonging (i.e., meanings), and reduce feelings of isolation that are often felt upon arrival. This is reflected in the works of Barajas (2020) and van der Kloof, Bastiaanssen, & Martens, (2014) who all emphasize the

importance of community led programs for cycling in communities that may not have had any prior experience. It helps provide the resources, support and access an individual needs to take up this practice.

The sample size of the project of being 11 participants was able to reach data saturation for this research context in uncovering the four identified factors in shaping travel assimilation within Bike Host participants. However, to uncover additional factors (i.e., cultural factors) that may influence travel assimilation a larger sample size would assist future studies in uncovering this. The sample size is a result of recruitment being done from only two particular years (2017 and 2018) of Bike Host participants. Recent participants of Bike Host were not deemed eligible to be a part of this study as there needed to be a duration of at least seven years since their initial arrival to Canada. Implementing this timeframe allows there to be a significant time spent in Canada to determine if the participants experienced travel assimilation or not. Anything less than that amount of time was not deemed a sufficient timeframe to determine the existence of travel assimilation, hence the small sample size.

Another gap within the study is that it did not focus on communities from similar demographics as it just required participants to be immigrants that participated in Bike Host at least seven years ago. Focusing on communities that come from similar demographics (i.e., cultural or economic backgrounds) can help inform future research and policy that are catered to those communities' needs for adequate sustainable transport. Barajas (2020) and Martinez et al. (2008) focus solely on Latino communities and their travel patterns. It helps provide an insight into cultural notions around cycling within the community and how future policies can continue outreach towards sustainable transport. Similarly in Amar & Teelucksingh (2015) most of the participants come

from low-income backgrounds which can help inform future research and policy on the transportation access concerns within the community and to make it more affordable.

The paper contributes to uncovering the factors associated with travel assimilation. The four factors identified were: built environment, economic factors, childcare responsibilities, and community programming for newcomers. Through the theoretical framework of Social Practice Theory, this paper gives an insight into how each of these factors are interconnected with one another in shaping transportation patterns.

With regard to policy recommendations, the implementation of more community led initiatives that are catered to immigrant communities can help increase the adoption of more sustainable forms of travel. Through the implementation of local programs like Bike Host, it can help steer newcomers away from adopting auto-centric lifestyles and continue travelling sustainably on their bikes, buses and walking. Doing more community-based studies, especially longitudinal studies with immigrants in the future is also recommended. It will help provide a framework that can help researchers and policy makers create networks based on how immigrant's transportation needs evolve over time as they do not stay stagnant for a long period of time, it is a dynamic process.

Conclusion

The two papers contained in this thesis contribute to understanding what is defined as being travel assimilated and what causes travel assimilation to occur amongst immigrants. The first paper's results emphasizes that travel assimilation exists on a continuum, is non-linear, is experienced unevenly across households, and is measured using multiple variables. The second paper uses the theoretical framework of Social Practice Theory to give insight into how interconnected the built environment, economic factors, childcare responsibilities, and local community programs are in influencing or reducing travel assimilation. The second paper's findings highlight that travel assimilation is not an individual process and that after interacting with the elements of the destination country, the mobility patterns thus shift.

Future policy recommendations can be to increase the implementation of more community-led programs like Bike Host that are catered towards newcomers. With a positive experience, these programs can help increase the adoption of sustainable transportation modes and can help create a sense of community and belonging for immigrants. These programs can help deter the process of travel assimilation from occurring and encourage newcomers to continue travelling sustainably. With engaging lessons and mentorship in these programs it can help steer newcomers away from adopting an auto-centric lifestyle.

For future research purposes, as highlighted in chapter one, employing more longitudinal studies is recommended to best understand the evolving nature of immigrant travel behaviour. Viewing mobility patterns from multiple points in time can help provide greater context to the factors that influence the changes in travel behaviour. Emphasizing the implementation of more qualitative studies can assist future researchers in better understanding the nuances in immigrant travel behaviour that may not be captured in quantitative studies. These future studies can help expand

the tools used to measure travel assimilation beyond traditional methods alongside incorporating gender disaggregate studies to measure mobility of care trips. These future research recommendations will help give a nuanced and more holistic understanding into the changing transportation patterns of newcomers.

Finally, limitations are noted. The sample size ($n=11$) is a limitation present in that; in this study context it was able to uncover that travel assimilation is not a binary experience and exists on a continuum and identify four key factors that shape travel assimilation. However, it is not representative of all immigrant experiences as there may be experiences that are not accounted for, but these 11 are reflective of this study's research. Future studies can implement a larger sample size beyond community programs and mixed methodologies to uncover different experiences on the continuum alongside additional factors shaping travel assimilation.

Having a larger sample size would allow for further analysis of travel assimilation amongst immigrants. As the study was limited to past participants of Bike Host from 2017 and 2018, this narrowed down the amount of participants that were able to be interviewed for this study.

Recruiting participants from multiple programs and those that have not participated in community programs would help strengthen the results and provide greater insights.

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Appendix 1

Interview guide:

Start off:

Thank you for agreeing to participate in this interview that supports my Master's research at McMaster University. Your participation in this interview will help us understand the phenomenon of travel assimilation. The interview looks to understand how your daily travel behaviours have changed since you arrived in Canada, why this is the case, and the impact of this on your health and wellbeing. The interview should take approximately one hour. Your responses will be de-identified and kept confidential. Your participation in this interview is voluntary and you are allowed to withdraw from this interview with no consequence. I ask that you do so before October 2024.

Do I have your consent to include your participation in this interview and audio record your answers?

Would you like a summary of the results when they become available?

Semi-Structured Interview:

Themes	Guiding Questions
Part 1: Initial and Current transportation modes	<p>Can you tell me about when you first came to Canada? When was it? Where did you settle? And how did you first travel on a day-to-day basis?</p> <p>As best you can remember, on a weekly basis how often did you use each type of transportation mode?</p> <ul style="list-style-type: none"> - Cycling - Public Transit - Walking - Taxi/uber - Personal vehicle <p>For the modes of transportation that were used on less than a weekly basis, how often were they used on a monthly or yearly basis?</p> <p>Potential prompt:</p> <ul style="list-style-type: none"> - What influenced the frequency of use of transportation mode over the other? <p>Why did you use these travel modes? Did you ever wish you could travel differently? Why/ why not?</p> <p>Did things change at any point? When and why? And how did these changes influence your travel behaviour?</p>

	<p>How about now? Do you still travel today using the same transportation?</p> <p>Today, how often did you use the following modes?</p> <ul style="list-style-type: none"> - Cycling - Public Transit - Walking - Taxi/uber - Personal vehicle <p>Why do you use these modes now? Do you wish things could be different? Why/ why not?</p>
<p>Part 2: Factors Influencing Travel Behaviour</p>	<p>Do you own a personal vehicle? What influenced your decision to purchase a car? If you do not, what factors come into play that sway you away from purchasing a vehicle?</p> <p>Potential prompts:</p> <ul style="list-style-type: none"> - Occupational income <ul style="list-style-type: none"> o Has your workplace or location of your job changed since you first arrived in Canada? How often have you changed jobs? How did you travel to get to your job? o After changing jobs or a change in income, did your transportation concurrently change as well? Why or why not? - Geographical proximity <ul style="list-style-type: none"> o Approximately, how close is the nearest bus or subway line to where you currently reside? Are there any bicycle lanes? - Place of residence <ul style="list-style-type: none"> o Do you still live in the same place when you first arrived in Canada? - Children or caretaking <ul style="list-style-type: none"> o Do you have any children or care for someone currently? How do you travel with your children for the most part? <p>Follow up for those who indicated they owned a vehicle: When you purchased a vehicle, did you find yourself using your car for all types of trips like personal, work, social, etc, whether you intended to or not? Do you solely travel on a car now or use the other modes of transportation?</p>

	Do you miss biking or travelling on a bus? Why or why not?
Part 3: Bike Host and Culture Link	<p>Looking back, what do you think the impact of the Bike Host program was...?</p> <p>Prompts:</p> <ul style="list-style-type: none"> - On your travel behaviour? Do you still travel using a cycle? Do you live in a cycling-friendly city or not? - On your settlement in Canada? E.g., making friends, discovering places, finding work, etc.
Part 4: Connecting transportation to health and well-being	<p>When you first arrived to Canada how did you access healthcare? What transportation method do you remember using the most? Do you use the same transportation method today to access healthcare? Why or why not? Has accessing healthcare become easier the longer you have been in Canada?</p> <p>Potential prompts:</p> <ul style="list-style-type: none"> - How long does it take to get to the doctor? - Do you feel this time frame would change on a different transportation mode? <p>How do you maintain your well-being now and what physical activities do you partake in today? Do you still continue to cycle or participate in other activities to maintain your physical/mental well-being?</p> <p>Do you feel that the mode of transportation that you take has an impact on your health and well-being? Is your health/well-being in a better or worse condition then when you first arrived in Canada?</p>
Part 5: Additional comments	Is there anything else you would like to add that wasn't mentioned earlier in the interview about travel assimilation that you would like to discuss?