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From workplace attachment to commuter satisfaction before and after a workplace relocation

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ABSTRACT

While attention has been paid to travel satisfaction studies during the last decade, less research has investigated the relationship between the influence of a sense of place – and more particularly the psycho-environmental concepts of workplace attachment and workplace satisfaction – and commuting satisfaction. Using a retrospective survey, this paper focuses on the relocation of a workplace within the city of Montréal (Canada); the McGill University Healthcare Centre. It examines the motivations and barriers involved in the evolution of commuting characteristics, using the theoretical framework of mobility biographies. The empirical analysis includes a large dataset of independent variables, applying a multinomial logistic model in order to explain the transition of the employees' commuting satisfaction. With regard to the measurement of change in commuting satisfaction, the findings confirm the role of attitudes, while taking into account the contextual differences before and after relocation. The change in travel time is found to be an important factor in the evolution of commuter satisfaction, whereby reduced commuting time improves satisfaction, as expected. In addition, the more an employee is attached to the new workplace, the more the commuting satisfaction will increase. The results provide further evidence that the meaning of the workplace goes beyond a location or a space, and opens up new avenues for research in travel behavior.

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1. Introduction

Literature on transport is increasingly focusing on issues related to travel experience, satisfaction, and quality of life (Lowe et al., 2015). For example, people using active transport modes (cycling and walking) report more satisfaction with travel compared with those using other modes (Chng, White, Abraham, & Skippon, 2016; Hilbrecht, Smale, & Mock, 2014; St-Louis, Manaugh, Van Lierop, & El-Geneidy, 2014; Zhu, Li, Chen, Liu, & Zeng, 2017). Other studies have focused more specifically on the relationship between driving and stress and its consequences, or even more serious physiological risks such as cancer (Ding, Gebel, Phongsavan, Bauman, & Merom, 2014).

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Many articles, however, point out the fact that it is still difficult to estimate links between mobility and wellbeing, especially since defining and measuring multidimensional concepts such as wellbeing are challenging (Friman, Fujii, Ettema, Gärling, & Olsson, 2013). Some studies actually find no correlations between travel and wellbeing (Adam, Walasek, & Meyer, 2018; Dickerson, Hole, & Munford, 2014; Lorenz, 2018; Morris & Zhou, 2018), while others do (De Vos, Schwanen, Van Acker, & Witlox, 2013; Fordham, van Lierop, & El-Geneidy, 2018). Moreover, while the built environment related to transport is one of the issues of sustainability and climate change, the question of its “meaning” is much more rarely involved in the understanding of these correlations. Lastly, very little research has studied the dynamics and evolution of travel satisfaction linked to the relocation of regular activities, especially workplace relocation (Abou-Zeid & Fujii, 2016; de Kruijf, Ettema, & Dijst, 2018; De Vos, Ettema, & Witlox, 2019; Schneider & Willman, 2019).

The current paper examines the satisfaction with commuting following an involuntary life event, namely workplace relocation. Commuting behavior, in general, depends on the location of the place of residence and of work, and the areas around them. An employee will develop experiences and activities in both locations, such as expanding his or her social network or use of leisure facilities. The experiences developed within people-place relationships have been widely discussed in the social sciences (Chen & Dwyer, 2018). They have given rise to the conceptualization of several interconnected dimensions (Scannell & Gifford, 2010), such as sense of place, place satisfaction, place identity, and place attachment, particularly in the fields of tourism, marketing literature, and environmental psychology. However, these psychosocial concepts have not been widely used in transport studies (Sekar, Chen, Cruzat, & Nagappan, 2017), especially when it comes to applying them in an experimental setting involving a change in the location of a workplace. The current paper aims to fill this gap and to link some of these psycho-sociological concepts (place attachment and place satisfaction) to examine changes in travel behavior and travel satisfaction due to the relocation of a workplace.

More precisely, this paper has two objectives. The first is to understand how workplace satisfaction (WPS) and workplace attachment (WPA) influence satisfaction with the commute, before and after relocation. The second objective is to bring understanding of the WPA-WPS evolution (Morgan, 2010) to the relationships between space, place, and people.

Whereas existing literature on workplace relocation is mostly devoted to job decentralization (Zarabi & Lord, 2019), the current study focuses on an organizational merger of the McGill University Healthcare Centre (MUHC) within the city of Montreal (Canada). It investigates satisfaction with commuting, using the interdisciplinary conceptual framework of mobility biographies (Lanzendorf, 2003; Scheiner, 2007, 2018) and life-oriented approach (Zhang, 2017).

The paper is structured as follows. First, a literature review covers the dimensions of sense of place related to the workplace and satisfaction. Next, the methodology section details the retrospective ad hoc survey designed for this study. It comprises a large set of independent variables, computed and categorized as control, transition, and latent attitudinal variables. The third section presents and analyzes a multinomial logistic model explaining the change in commuting satisfaction after the MUHC relocation. Last, the results are discussed and summarized.

2. Literature review

The objective of this review is twofold. First, we examine the extent to which sense of place and (work)place attachment are complementary, especially concentrating on workplace attachment, which is rarely used for analyzing travel behavior. Second, we distinguish between attachment and satisfaction in order to help in building our conceptual framework and research question.

2.1. From sense of place to workplace attachment

The concept of sense of place has frequently been used in various contexts and disciplines to describe complex human-environment relationships (Scannell & Gifford, 2010; Soini, Vaarala, & Pouta, 2012; Tuan, 1977). Because of its complexity, this concept takes into account several characteristics; material and non-material (Stedman, 2003), and human and physical (Chen & Sekar, 2018). In order to categorize these relationships, many authors have created different dimensions related to sense of place, with the most commonly used factors being conative, cognitive, and emotional (Jorgensen & Stedman, 2001). Place identity is the conative relationship between the identity of a person and the place considered (Proshansky, 1978), and place dependence corresponds to the degree of association of cognitive perception that exists between the person and the place considered. Place attachment is a personal affective and emotional relationship with a place or environment (Manzo & Devine-wright, 2014), which can involve both positive and negative emotions (Manzo, 2005). These dimensions sometimes remain intertwined, with place attachment including the other two (Williams, Patterson, Roggenbuck, & Watson, 1992).

Since the beginning of the 1990s, there has been some scientific consensus on the definition of place attachment. It corresponds to the emotional, functional, and psychosocial bond that a person maintains or wishes to maintain with a place (Hidalgo & Hernandez, 2001), especially their place of residence (Tigger-Ross & Uzzell, 1996). The desire for this bond is based on attachment theory – which suggests the will (or even the need) for a search for appeasement, security, proximity, and comfort – advanced in childhood developmental psychology by Bowlby in 1969 (quoted in e.g. Leiter, Day, & Price, 2015; Scannell & Gifford, 2010).

Although initially inspired by the psychology of development, we further link the definition of place attachment to environmental psychology by referring more to a human-environment relationship according to functional and emotional crite-

ria. The concept of place attachment can then be applied to different places and scales, depending on the person and their life experiences (Westin, 2016). The places we focus on change according to the social or geographical origin, and in addition the attachment will evolve according to the age or to the place of residence (Hay, 1998). Further, the attachment will concern places that are different (with relationships that may evolve), from the main residence or its neighborhood to city regions (Giuliani, 1991; Lewicka, 2010), recreational areas, shopping centers (Deutsch, Yoon, & Goulias, 2013), resort locations (Maitland, 2008; Ried et al., 2019), or the workplace.

The concept of WPA has been extensively employed in organizational psychology with regard to the field of labor conditions. The related studies primarily concern the assessment of different psychometric scales (Rioux, 2006; Scrima, 2015, 2018; Scrima, Moffat, & Rioux, 2015; Scrima, Rioux, & Lorito, 2014) and human resources, such as the possible improvement of the meaning given to work (Rioux & Pignault, 2013) or job satisfaction (Dinç, 2007; Pransky, Benjamin, Savageau, Curriuan, & Fletcher, 2005). These recent studies have clearly established, all things being equal, that the WPA is a good predictor of quality of work life and performance, whether this involves showing support for colleagues or providing good team spirit. Employees who identify strongly with their job, who enjoy it, who invest in it, and who have a relatively strong WPA, tend to improve their performance and even their overall satisfaction or wellbeing (Meyer, Stanley, Herscovitch, & Topolnytsky, 2002). Indeed, some empirical results from longitudinal databases specify the existence of this causal relationship in the sense that the loss of a place attachment in general assumes psychological distress or disruption to work performance (Carroll, Morbey, Balogh, & Araoz, 2009; Windsor & Mcvey, 2005). Further, using an experiment dealing with the visualization of attachment places, Scannell and Gifford confirm this causal relation at the level of self-esteem, meaning, and belonging (Scannell & Gifford, 2017).

2.2. (Work) place attachment and (travel) satisfaction

Several papers have addressed issues of satisfaction in general with regard to place attachment, particularly in studies related to tourism or housing. With regard to a recent survey of residents of Silesia, in Poland, Mandal notes a correlation between age and place attachment, which itself affects life satisfaction (Mandal, 2016). Although the workplace covers a major structuring point of employees' daily life (Hägerstrand, 1970; Lenntorp, 1976), very few studies outside the field of the labor market have looked at WPA. However, the hypothesis of the presence of cumulative effects, or at least "interdomain transfer effects" between the different domains of satisfaction (e.g. travel, job, residence, and family domains) can have the consequence of increasing or decreasing overall satisfaction (Abou-Zeid & Ben-Akiva, 2011). Transfer effects for different categories of satisfaction have been confirmed in other more recent papers (e.g. Gerber, Ma, Klein, Schiebel, & Carpentier-Postel, 2017; Smith, 2017).

Deutsch and colleagues go further in the field of satisfaction, transport, and mobility (Deutsch et al., 2013). In their work, six latent dimensions (attachment, dependency, identity, satisfaction, atmosphere, and community) are used to compare the sense of place of two malls in Santa Barbara, California. Without going into the results here, we should note the authors also point out that the link between the sense of place and choice of travel mode remains largely under-exploited. This is even more the case between WPA and travel behavior, especially with regard to travel satisfaction. More recently, Westin examined the opposite relationship, by explaining – among other things – the role of attachment related to commuting, concluding that non-commuters are more locally attached than commuters (Westin, 2016). De Vos and Witlox relate a bi-directional sense between "overall job satisfaction" and travel satisfaction (De Vos & Witlox, 2017). The authors support their argument on the basis of other bi-directional links between travel mode choice and travel satisfaction, and travel-related attitudes and travel satisfaction. In establishing that travel satisfaction is a continuous process between these complex relationships, this conceptual framework lacks empirical results, a gap highlighted by the authors. The current paper aims to address this by exploring the previously under-researched issues of how WPA and WPS influence commuting satisfaction in a novel context of workplace relocation.

Whether for work or personal reasons, the relocation of a workplace or place of residence inevitably presupposes substantial (in)voluntary changes in daily mobility behavior (Rau & Manton, 2016). The concepts of mobility biographies (for a recent literature review, see Scheiner, 2018) or life-oriented approach (Zhang, 2017; Zhang & Van Acker, 2017) support this statement. However, while there are numerous papers on the links between a change of residence and its impacts on travel behavior, there have been few analyses of interactions due to workplace change. According to a recent literature review taking into account involuntary workplace relocations (Zarabi & Lord, 2019), out of 22 papers, only one discusses travel satisfaction in relation to utility after a relocation of the University of Luxembourg, without taking into account WPA or WPS (Sprumont, Astegiano, & Viti, 2017). It is therefore important to fill a gap in the measurement of commuting satisfaction, which we assume can easily evolve over time and space (de Kruijff et al., 2018), as is shown in our conceptual framework (Fig. 1). Through a major life event such as workplace relocation, it shows in a simple manner how it is possible to tackle the issue of the evolution of satisfaction with commuting. In taking into account the contextual constraints before and after relocation, with in-between transitional variables, it offers the opportunity to use the traditional variables needed to understand travel behavior (e.g. Schwanen & Lucas, 2011) and its changes: socio-demographic characteristics (age, sex, etc.), and environmental and psychosocial variables (e.g. travel-related attitudes), in addition to several differentials (e.g. accessibility) or variables of comparison between the situations before and after relocation (e.g. modal shift).

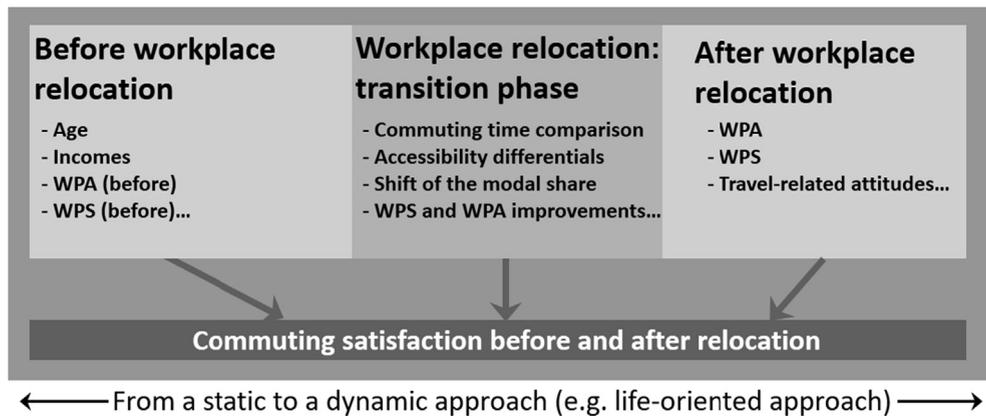


Fig. 1. Conceptual framework.

Based on this conceptual framework and our case study, the research question is as follows: In the context of a workplace relocation concerning a hospital in Montreal, what is the benefit of adding WPA and WPS (and their change) in modeling and explaining commuting satisfaction, taking into account other categories of travel behavior determinants?

We assume there is an association between WPA-WPS, and commuter satisfaction, more specifically between the evolution of WPA-WPS and the evolution of commuter satisfaction in relation to the workplace relocation: the greater the attachment to and satisfaction with the new workplace, the greater the satisfaction with the commute. This supposes therefore a need for controls and for comparison between past and present situations.

3. Context, data, and methods

The starting point of this study is to measure the change in commuting satisfaction after an involuntary workplace relocation, while focusing on the specificities related to WPA and WPS. This implies describing the specific geographic context, the data sampling, and the different variables (in line with [De Witte, Hollevoet, Dobruszkes, Hubert, & Macharis, 2013](#); [Langlois, van Lierop, Wasfi, & El-Geneidy, 2015](#)) we use in the methodological framework described hereafter.

3.1. Geographical context

Our target population is the 11,000 employees working at the new McGill University Health Centre (MUHC) in Montreal, Canada. Opened in 2015, this center brought together four hospitals in a single pericentral location. In addition, the MUHC has various facilities in terms of accessibility, including the presence of a regional rail station and a metro station, both integrated into the site, as well as a highway interchange nearby. This workplace improves overall access by all modes of transport compared with the old hospital locations, especially by private car and by public transport ([Zarabi, Gerber, & Lord, 2019](#)).

3.2. Data sampling

An original retrospective online survey (designed with LimeSurvey) was conducted in May 2018 with the help of the MUHC human resources service, and received 1977 responses from MUHC employees. It is possible to address our research question by using the different topics included in the questionnaire. These topics supplement those in traditional transport surveys, by adding specific items, such as socio-psychological questions ([Van Acker, Van Wee, & Witlox, 2010](#)), as well as Likert satisfaction scales. This acknowledges that there is no perfect measurement of travel satisfaction ([De Vos, Schwanen, Van Acker, & Witlox, 2015](#); [Singleton, 2019](#)) and avoids the associated burden on the participants.

Some incentives were used in order to improve the response rate. The survey was divided into five separate modules: i) The first module asked about the main transport mode used (the one in which the respondent spent the most time) during the previous week, with specific days and shifts (N = 1977), ii) the context and the satisfaction with the work and residential places before and after the relocation of the workplace (N = 1372), iii) the possibly changed typical daily travel before and after relocation (N = 1147), iv) a module concerning travel-related attitudes and routines (N = 1072), and v) the residential and household characteristics (N = 1010). Nevertheless, relative to the human resources records, the sample underrepresents people under 35 years of age (22.8 percent versus 36.8 percent in the records) and overrepresents females (78 percent versus 74 percent respectively) among the target population. Given these limitations in terms of representativeness and the target population, we do not want to suggest that our results can be extrapolated to the entire Montreal population.

3.3. Data and methodology characteristics

After data cleaning, the sampling dataset includes the descriptive statistics tested in the models, which are illustrated in Tables 1 and 2. Three main categories of variables are included in Table 1: the control, transition, and dependent variables. Table 2 gives the descriptions of the latent variables.

The first category essentially brings together sociodemographic, economic, and geographical characteristics that appear in many models (for a recent general review, see e.g. Ye & Titheridge, 2019). Respondents are categorized into four age groups, assuming that the effects of age on satisfaction are not necessarily linear. If activity patterns become more complex as the number of people per household increases, commuting satisfaction may be lower. Other control variables are retained in the models: household groups depending on the number of cars available (accounting for the number of household members with a driving license), socioeconomic variables by eight types of employment (recoded according to the nomenclature of the MUHC, offering a very good proxy for the level of education), plus seven salary categories.

The large majority of respondents were women (78 percent, Table 1). This gender specificity is controlled for in our models. There is also a large sample of nurses, therapists, and other technical medical staff profiles are present (34.4 percent). The six residential areas of Greater Montreal were not retained due to non-significance, detracted by the accessibility indicator. This accessibility measurement was calculated for each respondent using secondary data sources, established from a GIS based on the census tracks at peak hours on a Tuesday in April 2017. The accessibility differential variable between public transport (PT) and car is retained in the analysis.

The second category of variables concerns transitions that may affect satisfaction with the commute. Thus, the proportion of modal shift and modal share is assumed to be one of the most important elements to take into account (Kamruzzaman, Baker, Washington, & Turrell, 2013). In our sample, 58.7 percent did not change their travel routine, whether by public transport and active modes (23.8 percent) or car use (34.9 percent). Among the 41.3 percent that did change, the largest proportion is from one sustainable mode to another sustainable mode (e.g. subway to train) (15.2 percent), followed by car (and other possible modes) to sustainable (14.2 percent). The lowest proportion, changing from using sustainable modes to car travel, accounts for 11.9 percent of the sample; this is the least desired behavior change in Transit Oriented Development (TOD) operations. These people might have had some resistance to changing their travel routine (Bamberg, 2006; Zarabi, Manaugh, & Lord, 2019), which is expected to have a negative impact on commuter satisfaction. Changes to the workplace and modes of transportation are also likely to result in changes to travel time, in turn usually leading to a different degree of satisfaction with commuting (Zhu & Fan, 2018). The majority of respondents (51.6%) for whom we know the difference in travel time before and after the relocation report an unchanged commuting time. Some 25.0 percent experienced a reduction in travel time, whereas for 23.4 percent there was an increase. These last two profiles of travel time can be contrasted in terms of changes to commuting satisfaction. The workplace satisfaction improvement (three items) comes from the perceived change in the five characteristics for employee satisfaction associated with the old and the new place of work (for the five characteristics, see Table 2). Only 22.9 percent of employees considered that there had been no improvement, which could have a negative impact on commuting satisfaction compared with the others.

Lastly, the third category of variables is based on a satisfaction-comparison question concerning the situation before and after relocation: "Overall, how satisfied were/are you with your typical daily commute. . . before the relocation to the Glen site/after the relocation to the Glen site?" Answers were given on a five-point Likert scale (from very satisfied, to very unsatisfied). People who indicated the same level of satisfaction before and after relocation are taken as the reference for comparison in the model. We compare two transitions or categories with one other (same satisfaction) over time. The first transition refers to people who experienced an improvement in home-to-work travel satisfaction after workplace relocation; from very unsatisfied, unsatisfied, or neutral, to satisfied or very satisfied. The second transition refers to the opposite: employees who experienced a worse situation after relocation; from neutral, satisfied, or very satisfied, to unsatisfied or very unsatisfied. This categorical dependent variable, with three distinct and separable alternative choices, is suitable to use in a multinomial logistic model (MNL), as these alternatives are independent and not nested. MNL regression is widely used for explaining travel behavior. It assumes maximizing random utility (e.g. Ben-Akiva & Lerman, 1985) and having independent and irrelevant alternatives (IIA), meaning that the choice between two options is not affected by other options in the choice framework (e.g. Zhou et al., 2019). Our model determines the independent transition of travel satisfaction while controlling for the explanatory variables, which are the control variables, the transition variables, and the latent variables (Tables 1 and 2). We used IBM SPSS 25 to operationalize the model as well as to build the latent variables.

3.4. Latent attitudinal variables and methodology characteristics

Since attitudes can influence commuting satisfaction and travel behavior (Heinen & Bohte, 2014; Manaugh & El-Geneidy, 2013; St-Louis et al., 2014; Ye & Titheridge, 2017), we created some latent variables related to travel attitudes: residential self-selection, workplace attachment, and workplace satisfaction (WPA and WPS). We applied three Principal Component Analysis (PCA) to extract the main information from the many variables of attitude measurement (e.g. Hwang, Lee, & Chen, 2005) and the Cronbach's alpha coefficient for controlling congruence of the indicators (Hoyle, 2014). The details of the 16 tested latent variables are summarized in Table 2. Eight of these were retained in the final model.

Based on different surveys, such as the cross-border workers' survey (Gerber, Thériault, Enaux, & Carpentier-Postel, 2018) or the CURHA project (Cuignet et al., 2020; Kestens et al., 2016), 42 variables were built on five-tier semantic differentials

Table 1
Sample characteristics.

Variables (N respondents)	Description	%
<i>Control variables</i>		
Age groups (N = 1104)		
Age group 1 ^a	<35 years	22.8
Age group 2 ^a	35–44 years	26.1
Age group 3 ^a	45–54 years	26.2
Age group 4 ^a	>54 years	24.9
Gender ^a	1 = Female; 0 = Male	7.8
People per household (N = 1023)	Discrete (mean and SD)	2.77 (1.388)
Household motorization (N = 1029)		
Household motorization group 1	# car = # driving licenses	46.9
Household motorization group 2	# car < # driving licenses	45.9
Household motorization group 3	# car > # driving licenses	7.2
Residence location (N = 1253)		
Residence location 1	Montreal (island)	64.9
Residence location 2	Laval (island)	6.9
Residence location 3	Longueuil	10.1
Residence location 4	North Shore	3.6
Residence location 5	South Shore (except Longueuil)	11.1
Residence location 6	Outside Greater Montreal	3.4
Income groups (N = 1018)		
Income group 1 ^a	<60,000 \$CAN	14.1
Income group 2 ^a	60,000–100,000 \$CAN	23.8
Income group 3 ^a	100,000–140,000 \$CAN	17.4
Income group 4 ^a	140,000–180,000 \$CAN	11.2
Income group 5 ^a	180,000–300,000 \$CAN	8.7
Income group 6 ^a	>300,000 \$CAN	5.9
Income group 7 ^a	Nonresponse	18.9
Type of employment (N = 1383)		
Type of employment 1 ^a	Nursing, therapists, and perfusionists	34.4
Type of employment 2 ^a	Service, para-technical, and volunteer staff	6.9
Type of employment 3 ^a	Administration technicians	7.4
Type of employment 4 ^a	Administration professionals	11.1
Type of employment 5 ^a	Health, social, and laboratory technicians	11.8
Type of employment 6 ^a	Health and social professionals	7.1
Type of employment 7 ^a	Doctors, specialists, managers, and residents	12.4
Type of employment 8 ^a	Professionals and researchers	8.8
WPA before Glen site (N = 1204)		
WPA before Glen site 1 ^a	Strongly disagree to disagree	15.6
WPA before Glen site 2 ^a	Neutral	26.6
WPA before Glen site 3 ^a	Agree to strongly agree	57.9
Accessibility differential (N = 1251) ^a	Differential public transport/car [mean in minutes (SD)] from residence to WP by census track	1.388 (0.543)
<i>Transition variables (before and after WP relocation)</i>		
Modal share/shift (N = 1071)		
Modal share/shift 1: No change ^a	Sustainable modes: public transport and/or active modes	23.8
Modal share/shift 2: No change ^a	Car	34.9
Modal share/shift 3: Change ^a	Car (and all other modes possible) to sustainable	14.2
Modal share/shift 4: Change ^a	Sustainable to car (and others)	11.9
Modal share/shift 5: Change ^a	Sustainable modes to other sustainable modes	15.2
Commuting time comparison (N = 1000)		
Commuting time comparison 1 ^a	Equal time	26.3
Commuting time comparison 2 ^a	More or less equal time (± 10 min)	25.2
Commuting time comparison 3 ^a	Increased time (up to 20 min)	11.5
Commuting time comparison 4 ^a	Large increased time (>20 min)	12.0
Commuting time comparison 5 ^a	Decreased time (up to 20 min)	14.7
Commuting time comparison 6 ^a	Large decreased time (>20 min)	10.3
WPS improvement (N = 1204)		
WPS improvement 1	No improvement (Table 2 for WPS details)	22.9
WPS improvement 2	One to two improvements	36.0
WPS improvement 3	Three to five improvements	44.1
<i>Dependent variables (before and after WP relocation)</i>		
Commuting satisfaction (N = 1140)		
Commuting satisfaction ^a	From unsatisfied to satisfied	23.9

(continued on next page)

Table 1 (continued)

Variables (N respondents)	Description	%
Commuting satisfaction ^a	From satisfied to unsatisfied	10.4
Commuting satisfaction ^a	Stable satisfaction	65.7

NOTES: a: variable kept in the analyses; other variables not retained because they were not statistically significant. All are dummy variables except person per household and Accessibility differential. SD = Standard Deviation.

Table 2

Latent attitudinal variables used in the models.

Latent	Items (by order of importance from PCA)	Cronbach α	Eigenvalue	Variance explained (in %)
<i>Transport-related attitudes (one PCA, N = 1070)</i>				
Pro Train ^a	Train comfort, Train relaxation, Train security, Train speed, Train ecological	0.784	3.02	7.19
Pro Active Modes	Bike cheapness, Walking cheapness, Bike ecological, car polluting	0.732	2.88	6.85
Pro Bike	Bike comfort, Bike relaxation, Bike speed, Bike security	0.781	2.67	6.36
Pro Walking	Walking comfort, Walking relaxation, walking security	0.819	2.32	5.52
Pro Metro	Metro comfort, metro relaxation, metro security, bus security	0.738	2.29	5.45
Pro Bus ^a	Bus relaxation, bus comfort, bus speed	0.651	2.01	4.79
PT low cost	Bus cheapness, metro cheapness, train cheapness	0.712	2.01	4.78
PT ecological ^a	Bus ecological, metro ecological	0.483	1.83	4.35
Active modes reliability	Walking reliability, bike reliability	0.682	1.70	4.06
PT Reliability ^a	Metro reliability, Bus reliability, Train reliability, metro speed	0.482	1.70	4.05
Pro Car Comfort ^a	Car security, car relaxation, car comfort, car cheapness	0.442	1.70	4.04
Pro Car Access	Car speed, car reliability	0.597	1.63	3.87
<i>Residential self-selection (one PCA, N = 1233)</i>				
Residential self- selection	Being in: proximity to public transport, a location where they would not have to drive, proximity to grocery stores, a walkable neighborhood, proximity to work	0.753	2.585	51.7
<i>Workplace attitudes at Glen site (one PCA, N = 1380)</i>				
WP Attachment (WPA) ^a	Agreed on: 1) I would recommend working at the MUHC to a friend or a family member, 2) I am presently attached to my new job location, 3) I plan to work for the MUHC for the next five years	0.637	1.649	20.61
WP Satisfaction 1 (WPS1) ^a	Satisfied with: 4) proximity of amenities Glen offsite, 5) availability of amenities at Glen site, 6) accessibility to paid parking	0.562	1.729	21.61
WP Satisfaction 2 (WPS2) ^a	Satisfied with: 7) accessibility to public transport, 8) distance between work and your current home	0.575	1.495	18.68

NOTE: a: variable kept in the analyses; other variables not retained because they were not statistically significant.

scales of speed, cost, ecology, comfort, safety, relaxation, and reliability for the following modes of transport: bus, metro, train, car, bike, and walking. To summarize, attitudes concerning twelve transport-related components are extracted (with eigenvalues greater than 1.0) within one PCA after a Varimax rotation, accounting for 61.3 percent of the total variance. Even though the Cronbach's α remains relatively low for several components, we expect that the five travel attitudes retained in the model (the others were not statistically significant) will influence commuting satisfaction in a different manner: as public transport access became easier than for the previous workplace locations, people who are pro-public transport or environmentally friendly should have developed a higher level of satisfaction. Residential and neighborhood self-selection (Lin, Wang, & Guan, 2017) were evaluated using five variables based on another PCA with one component, accounting for 51.7 percent of the total variance (Cronbach's $\alpha = 0.64$). Participants reported whether when they chose their current residence they considered it important to be i) in a walkable neighborhood, ii) in proximity to grocery stores, iii) in a location where they would not have to drive, iv) in proximity to public transport, and v) in proximity to work. This control variable was rejected in the model as non-significant.

The last three attitudinal latent variables, WPA, WPS1, and WPS2 are derived from two different concepts, in the sense that the former is based on sentiments and emotions developed toward place, whereas the latter refers to the evaluation of the quality of the physical, functional, and social environment (Mesch & Manor, 1998). In our context related to workplace relocation, one should also consider the evolution over time of attachment and satisfaction. This is challenging, and operationalized here by bringing together cognitive, affective, and conative measurements (Jorgensen & Stedman, 2001; Low & Altman, 1992), using a combination of 14 questions. More precisely, eight of them relate to the new workplace and the other six to the former one.

With regard to the new workplace, three questions are related to WPA. This is based on a five-point Likert scale (strongly agree, somewhat agree, neutral, somewhat disagree, and strongly disagree) measuring satisfaction with the work environment (Moffat, Mogenet, & Rioux, 2016). WPS is associated with the following general question (see Table 2): "What is the

degree of satisfaction with each of the following elements?" with five sub-questions based on another five-point Likert scale (from very satisfied, to very unsatisfied). From a technical point of view, the PCA provided from the eight variables delivers three latent components (with eigenvalues greater than 1.0) after a Varimax rotation, accounting for 60.91 percent of the total variance. As expected, one component is derived from the three WPA related elements (Cronbach's $\alpha = 0.637$), whereas the other two latent components are related to workplace satisfaction. WPS1 (Cronbach's $\alpha = 0.562$) is more physical based, and related to the material representation of the workplace. WPS2 (Cronbach's $\alpha = 0.575$) is more functional based, and related to connections between the workplace and the place of residence. Moreover, the results of this last PCA confirm that the concepts of WPA and WPS deserve to be considered separately. Although we assume them to be complementary, their technical construction allows us to consider them independently of one another thanks to the orthogonality of the components obtained.

With regard to the former workplaces, in order to take into account the evolution of WPS, the respondents had to state if there had been an improvement compared with the former workplace for each of the five WPS elements, and if they were still "attached" to their old hospital. From a technical point of view, the five WPS items give an ordinal variable going from no improvement to five improvements (recoded into three items). The last related WPA question is kept single (see [Table 1](#)).

4. Results

Commuting satisfaction increased between the two considered periods. Nearly 70 percent of respondents stated they were satisfied or very satisfied with their commute to work compared with 59.3 percent before the relocation, testifying to a general improvement in the travel conditions, or at least the perception of them. Rather than looking at a static situation by comparing before and after, we chose to analyze a dynamic situation through our model. This was operationalized based on the same independent variables, according to our conceptual framework ([Fig. 1](#)).

Thus, the results from the multinomial logistic model ([Table 3](#)) focus on people:

- (1) moving from a perceived situation of satisfaction (or neutral) to one of dissatisfaction after relocation, compared with the stable satisfaction in the reference group;
- (2) moving from a situation of dissatisfaction (or neutral) to a situation of satisfaction compared with the same stable satisfaction in the reference group;
- (3) moving from a situation of satisfaction (or neutral) to one of dissatisfaction after relocation, compared with the opposite group as a reference. This modification to the reference group should allow extreme situations to be revealed.

The results compare explanatory variables according to commuting satisfaction transitions. Except for gender and accessibility differentials in order to control the sample, some other variables were not statistically significant and were accordingly removed from the final results as they offered no contribution to the explanations. The explanatory variables are distributed as follows: four groups of control variables (with 24 dummy items) and two dummy variables, three transition variables (with 14 items), and eight latent attitudinal variables. An odds ratio (OR) > 1 indicates that the risk of the outcome falling into the comparison group relative to the risk of the variable falling into the reference group increases as the variable increases.

In general, despite a slight decrease in observations due to missing values (promoting an increase of statistical units leads to small variations in units depending on the models), the model nevertheless makes it possible to obtain good explanatory power. The pseudo R squared is satisfactory at 0.497 (it decreases at 0.432 when the three latent variables of WPS and WPA are not included). In general, the results are statistically significant (at the 99 percent level) to highly significant (at the 99.9 percent level) on two types of variables: the latent and transition variables have satisfactory to very satisfactory explanatory power; the control variables are less significant. Gender, age groups, and the accessibility differential are not statistically significant (or only at $p < 0.1$). This is unlike findings in other studies ([St-Louis et al., 2014](#)), not to mention some other variables not listed in this table (listed in [Tables 1 and 2](#) as non-significant).

With regard to the control variables, for column 1 (from satisfied to dissatisfied compared with stable), health and social professionals experience a sharp decline in the propensity of this transition (OR = 0.080, $p < 0.05$) between the two periods. The transition variables are not highly significant ($p < 0.05$ or $p < 0.1$): keeping or changing the mode of transport is non-significant regarding the propensity to go from satisfied to dissatisfied, everything else being equal. An increase in the commuting time raises the propensity to be dissatisfied with several items when compared with the time remaining unchanged: increased ($p < 0.05$, OR = 3.455) and greatly increased commuting time ($p < 0.05$, OR = 2.623). The attitude variables work in a different way and show the highest levels of significance. The WPS1, more physical based, stands out in an expected manner ($p < 0.05$, OR = 0.631). It is more significant for the WPS2 which is functional based ($p < 0.001$, OR = 0.362): the more satisfied a person is with their workplace – especially with regard to site accessibility and the distance between home and work – the less likely they are to change from being satisfied to being dissatisfied with their commute. The level of significance is the same for WPA ($p < 0.001$, OR = 0.553): the more attached an employee is to the workplace, the less they would go from satisfied to dissatisfied regarding commuting. To a lesser extent, attitudes related to modes of transportation play disparate roles with relative significance: for instance having a pro-train attitude can increase the propensity to go from satisfied to

Table 3
Multinomial logistic model (MNL) for transitions in commuting satisfaction.

	1. Satisfied to dissatisfied (vs stable)		2. Dissatisfied to satisfied (vs stable)		3. Satisfied to dissatisfied (vs better)	
	B	OR	B	OR	B	OR
Control variables						
Age group 1 (<35 years)	-0.218	0.804	-0.705	0.494*	0.488	1.629
Age group 2 (35–44)	ref	ref	ref	ref	ref	ref
Age group 3 (45–54)	-0.852	0.427°	-0.167	0.846	-0.685	0.504
Age group 4 (>54 years)	-0.491	0.612	-0.300	0.741	-0.192	0.826
Gender	-0.081	0.922	-0.238	0.788	0.157	1.171
Income 1 (<60,000)	ref	Ref	ref	ref	ref	ref
Income 2 (60,000–100,000)	-0.501	0.606	-0.044	0.957	-0.457	0.633
Income 3 (100,000–140,000)	0.325	1.384	0.327	1.386	-0.002	0.998
Income 4 (140,000–180,000)	0.571	1.771	0.086	1.090	0.485	1.625
Income 5 (180,000–300,000)	0.313	1.368	0.266	1.304	0.047	1.049
Income 6 (>300,000)	0.386	1.471	-0.130	0.878	0.516	1.675
Income 7 (Nonresponse)	0.668	1.951	-0.081	0.922	0.749	2.115
Employment 1 (Nursing...)	ref	ref	ref	ref	ref	ref
Employment 2 (Service...)	-0.328	0.721	0.200	1.222	-0.528	0.590
Employment 3 (Adm. Tech...)	0.757	2.133	-0.343	0.710	1.100	3.005
Employment 4 (Adm. Prof...)	-0.187	0.829	0.057	1.058	-0.244	0.784
Employment 5 (Health Tech...)	-0.514	0.598	0.368	1.445	-0.882	0.414
Employment 6 (Health Prof...)	-2.530	0.080*	0.691	1.995°	-3.221	0.040**
Employment 7 (Doctors...)	0.723	2.061	-0.319	0.727	1.042	2.836°
Employment 8 (Researchers...)	-0.299	0.742	0.096	1.101	-0.395	0.674
WPA before Glen: Disagree	-0.397	0.672	0.636	1.889*	-1.033	0.356
WPA before Glen: Neutral	ref	ref	ref	ref	ref	ref
WPA before Glen: Agree	0.344	1.410	-0.537	0.585*	0.880	2.411°
Accessibility differential [PT/Car]	0.029	1.029	0.290	1.336°	-0.261	0.770
Transition variables						
No mode change: Car	ref	ref	ref	ref	ref	ref
No mode change: PT – Active modes	-0.667	0.513	-1.393	0.248***	0.726	2.067
Mode Change: Car -> Sustainable	0.415	1.515	0.207	1.231	0.208	1.231
Mode Change: Sustainable -> Car	-0.493	0.611	-0.203	0.816	-0.289	0.749
Mode Change: Sustainable -> Other sustainable	-0.828	0.437	-0.569	0.566°	-0.259	0.772
Commute time: Equal	ref	ref	ref	ref	ref	ref
Commute time: ± Equal	0.815	2.259°	0.824	2.279**	-0.009	0.991
Commute time: Increase	1.240	3.455*	0.856	2.354*	0.384	1.468
Commute time: High increase	0.964	2.623*	-0.247	0.781	1.211	3.358°
Commute time: Decrease	-0.552	0.576	1.248	3.483***	-1.800	0.165*
Commute time: High decrease	1.313	3.719°	2.338	10.360***	-1.024	0.359
WPS improvement: No	ref	ref	ref	ref	ref	ref
WPS improvement: One to two	-0.553	0.575	0.761	2.140*	-1.313	0.269*
WPS improvement: Three to five	-0.734	0.480	1.453	4.275***	-2.187	0.112***
Latent variables						
Pro-train attitude	0.313	1.368*	-0.043	0.958	0.356	1.428
Pro-bus attitude	-0.236	0.790	-0.038	0.963	-0.198	0.820
PT ecological attitude	0.266	1.305°	-0.334	0.716**	0.600	1.823**
PT reliable attitude	-0.328	0.720*	-0.103	0.902	-0.224	0.799
Car comfortable attitude	0.066	1.068	0.034	1.034	0.032	1.032
WP Attachment	-0.592	0.553***	0.278	1.320*	-0.869	0.419***
WP Satisfaction 1	-0.460	0.631*	-0.008	0.992	-0.451	0.637*
WP Satisfaction 2	-1.016	0.362***	0.416	1.516**	-1.432	0.239***
Intercept	-2.797	**	-2.833	***	0.036	
N = 813						
R ² = 0.497						

Note: B = Beta; OR = Odds ratios; ***, p < 0.001, **, p < 0.01, *, p < 0.05, °, p < 0.1; R² = Nagelkerke R².

dissatisfied (p < 0.05, OR = 1.368), while an attitude related to reliable public transport can have the opposite effect (p < 0.05, OR = 0.720).

With regard to column 2 (from unsatisfied to satisfied compared with stable satisfaction), again, no control variables show a high level of significance. The younger age group (<35 years old) shows small significant results compared with the aged 35–44 group (p < 0.05, OR = 0.494). The WPA measurement for the previous workplace appears in two expected ways: an increase in propensity (p < 0.05, OR = 1.889) to go from unsatisfied to satisfied if the person is not more attached, and conversely, a decrease in propensity (p < 0.05, OR = 0.585) if the person is still attached to their former workplace. The transition variables have the highest significance here. For example, still using PT or active modes (ref: car) hinders the transition from unsatisfied to satisfied (p < 0.001, OR = 0.248) and contrasts with the first column. The items related to travel

time changes also show high significance: a decrease of at least 20 min in travel time from that to the former workplace and that to Glen compared with an equal time produces more than 10 times ($p < 0.001$, $OR = 10.365$) more likelihood to change from dissatisfied to satisfied. If there is a decrease, but less than 20 min, it still results in three times more likelihood ($p < 0.001$, $OR = 3.483$). Another group of transition variables involves the WPS improvement: the more a feeling of improvement is recorded (i.e. from one to two, or from three to five points of improvement), the more the change from dissatisfaction to satisfaction is likely. For the latent variables, three stand out: believing that public transport is ecological slows down the transition from dissatisfaction to satisfaction ($p < 0.01$, $OR = 0.716$). By contrast, and with the same explanatory power, the functional WPS2 presents the opposite ($p < 0.01$, $OR = 1.516$): the more an employee is satisfied with their workplace from a functional point of view, the more likely they will be to have a higher level of satisfaction with their commute. To a lesser extent ($p < 0.05$, $OR = 1.320$), being attached to the workplace will also favor this progression.

The last column completes the two previous ones with a change to the reference group, by contrasting the two satisfaction transitions. In fact, the control variables do not provide substantial additional explanation, except a greater statistical significance for the health and social professionals compared with the first column ($p < 0.01$, $OR = 0.040$). Transition variables do not provide more explanatory power than previously, except for the significance level of the WPS improvement. This relates to the perceived improvement (either functional or physical based) between the former workplace and the Glen site: whether improvements in propensity of one to two ($p < 0.05$, $OR = 0.269$) or three to five ($p < 0.001$, $OR = 0.112$), thus slowing the change from commuting satisfaction to commuting dissatisfaction. Decreasing the commuting time between the two periods diminishes the propensity from satisfied to dissatisfied ($p < 0.05$, $OR = 0.165$ for a small decrease in travel time). Lastly, the attitude variables are also strongly to highly significant. On the one hand, a pro-ecological attitude toward PT implies an increase in the propensity to become dissatisfied with commuting ($p < 0.01$, $OR = 1.823$). On the other hand, WPA has a high level of significance and tends to decrease this propensity ($p < 0.001$, $OR = 0.419$): physical-based workplace satisfaction decreases it to a lesser extent ($p < 0.05$, $OR = 0.637$), but functional-based WPS is highly significant ($p < 0.001$, $OR = 0.239$).

5. Discussion and conclusion

This paper addresses the underexplored issue of how WPA and WPS influence commuting satisfaction before and after workplace relocation, and how modeling this adds value to research into travel behavior and relationships between space and place. The three transition models presented testify to complex changes in daily life. The independent variables nevertheless confirm the role of attitudes in the measurement of commuting satisfaction, and more particularly that concerning WPA and WPS, while considering contextual changes over time.

Some limitations of the study should nevertheless be acknowledged, especially in the survey design. A panel survey – or at least two cross-sectional surveys taking place before and after this natural experiment of the workplace relocation – would be needed to fully explore the causal structure of links between the socio-demographic characteristics, travel-related and workplace attitudes, and travel satisfaction. A longitudinal approach would make it possible to capture temporal effects while facilitating the measurement of behavioral changes, both in terms of travel choices and related attitudes (de Dios Ortúzar, Armoogum, Madre, & Potier, 2011).

Using a cross-sectional retrospective survey, focusing more on meanings of the workplace than of the place of residence (the characteristics of the latter being found not statistically significant), this paper nevertheless demonstrates the importance of the experience of mobility (Tuan, 1977) and mobility biographies including attitudes (Scheiner, 2018), all else being equal. Thus, an association exists between travel-related attitudes and commuting satisfaction, although the association is only clear with regard to the evolution of satisfaction. It probably depends on the travel consonance or dissonance (De Vos, 2018), which was not measured per se. Differences in the accessibility and use of different transport modes, experienced as more or less easy, may also lead to different assessments of these attitudes (Bohte, 2010; De Vos & Witlox, 2017), as well as the evolution of the professional and geographical context constrained here by the change of workplace (Zarabi & Lord, 2019). This is in line with the emergence of our two latent variables related to WPS; one functional-based, the second physical-based.

In this sense, WPA and WPS are attitudinal latent variables at the level of their construction on the one hand, while on the other, they play an undeniable role in commuting satisfaction and its evolution. It is not so much the working conditions that are considered here, but rather the workplace and its environment in terms of its identity, functionality, and relationship with the employee. The commuting satisfaction, and the underlying subjective wellbeing that can accompany it (Zhu et al., 2017), improve when an employee can appropriate their workplace, project themselves into it, and feel secure; in other words, become attached to it. In our example, this positive feeling of attachment took place relatively quickly; a few years was enough for most employees. The one aspect that we did not test in our MNL model, although we did control for it, is the potential relationship between WPS and WPA. This association is still under debate within the scientific community and no consensus has yet been reached regarding its direction of causality (Chen & Dwyer, 2018). Further investigation should be devoted to these different dimensions of sense of place, as well as to their interrelationships.

Control variables, on the other hand, have a structuring power, but their association and explanatory power turn out to be weak. In the rare studies linking commuting satisfaction and behavioral change, the results are mixed for these variables. de

Kruijf et al. (2018) find that personal characteristics have no impact on changes to satisfaction, whereas Schneider and Willman (2019) report an impact of age groups or gender.

With regard to travel-related latent variables, the effect is also moderate. Eight out of twelve components were rejected at the beginning of the implementation of the MNL, and the remaining four are shown to have little impact on commuting satisfaction. Nevertheless, some tangible and interesting results have been shown in several papers concerning travel mode choice (Enaux & Gerber, 2014) or travel satisfaction using this particular method of semantic differentials (Zarabi et al., 2019).

Some other explanatory factors for commuting satisfaction are confirmed through this retrospective study, although they may invite discussion. With regard to the characteristics of journeys, travel time remains an essential determinant: the shorter the time, the higher the level of satisfaction, as revealed for example in Morris and Guerra (2015) and St-Louis et al. (2014), and more recently in a similar retrospective study examining a change of the place of residence (De Vos et al., 2019). Thus, a workplace relocation leading to a general improvement to its accessibility, especially through the improvement of WPS, contributes greatly to the increase of satisfaction with the commute. The situation appears more nuanced with regard to transport mode choices. While active modes are generally the ones that increase commuting satisfaction the most (De Vos, 2019; Smith, 2017; Turcotte, 2011), it appears that this is not the case with regard to this involuntary relocation. Derived from a similar model where only the current mode choice is considered (results not shown), the active modes also produce no significant results compared with use of a car, but the use of public transport increases commuting satisfaction.

Three factors might explain this ambiguity. First, the workplace relocation led to improved accessibility by public transport and, to a lesser extent, by car (Zarabi et al., 2019). People “get along with” the transport mode, more than they choose it. This meets the specified idea developed by St-Louis and colleagues (2014: 169) where “This may be related to whether the mode is the outcome of a choice or a constraint (possibly captive mode users).” De Vos expands on this statement by using the distinction between the travel mode consonance and the travel mode dissonance: the former is favorable to commuter satisfaction whereas the latter is not (De Vos, 2018). Second, the retrospective survey certainly offers a natural experiment of behavioral change without bias, but supposes a confrontation between current and past emotions (related to satisfaction), which is difficult to measure within a cross-sectional survey. This phenomenon, called biased recall, compromises the level of quality of the old situation by focusing on some intense moment in past experience, compared with the current situation (Pedersen, Friman, & Kristensson, 2011). Third, most of the employees were aware of the move to Glen in the late 1990s, undoubtedly promoting resilience when facing the challenges associated with the changes.

In the context of commuting satisfaction, the second factor implies another issue; that is, its measurement. This can concern the name of this measurement (Handy & Thigpen, 2018), the scale of measurement used (Ettema et al., 2011), or the interpretation given to this measurement (Schneider & Willman, 2019). Here, two simple questions were used; retrospectively, they allow the employee to form a comparative assessment of the possible evolution of satisfaction with the mobility experience over time and space, in a place full of meaning and sensitivity.

Lastly, with regard to public and economic implications, the feeling of workplace attachment should not be neglected. By imagining ways to improve the workplace neighborhood (accessibility, availability of amenities, etc.), but also within the workplace itself (relative flexibility of schedules, awareness campaigns, etc.), it would be possible to improve both comfort and performance at work. This is undeniably an asset for the HR services of the management (Scrima, 2016). More generally, the consideration of “activity places” has proved useful in explaining commuting satisfaction and subjective well-being, but these places of activity must be considered in a more phenomenological framework. Thus, as already practiced by some researchers regarding questions related to tourism (Ramkissoon, Graham Smith, & Weiler, 2013), working conditions (Scrima, 2018), or recently health geography (Perchoux et al., 2019), the destination must then be (re)considered; certainly as a spatial, physical, and functional object (Mokhtarian & Salomon, 2001), but also as a social, individual, and relational object. In other words, in the place-making process (Kienast, Buchecker, & Hunziker, 2018).

CRediT authorship contribution statement

Philippe Gerber: Formal analysis, Conceptualization, Visualization, Funding acquisition, Investigation, Project administration, Data curation, Methodology, Validation, Supervision. **Ahmed El-Geneidy:** Methodology, Validation, Supervision. **Kevin Manaugh:** Validation, Supervision. **Sébastien Lord:** Funding acquisition, Investigation, Project administration, Data curation, Validation, Supervision.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.trf.2020.03.022>.

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