Supplemental information

Description of independent variables

We apply seven variables to measure accessibility, public transport (PT) quality and local density characteristics. The first concerns *proximity to rail-based PT*. Studies from cities in U.S.A. and Europe document that railway (local trains), metro and tram provide higher PT share than bus services (Cao and Schoner, 2014; Hanssen et al., 2005; Knowles and Ferbrache, 2014; Knowles, 1996; Kuby et al., 2004; Senior, 2009; Transport of London, 2002). In Norway, The Bergen Light Rail, introduced in 2010, significantly increased the share of PT in the city of Bergen (Engebretsen et al., 2017). In urban areas, the limit of the catchment areas around railway, metro or tram stops normally decrease non-linearly with increasing distance up to 1 km from the stop (Engebretsen et al., 2018). As an indicator in this study, we use a binary variable for the existence of train, metro or tram stop within 1 km from the residence (based on data from Entur).

The second variable measures the *modal travel time disparity* between PT and car, measured by trip chain travel time. Studies based on data from several years of Norwegian NTS and some local transport surveys, have shown that the relationship between travel time by PT and travel time by car, has clear implications for the mode choice (Engebretsen, 2017, 2006, 2005, 2003, 1996; Engebretsen and Christiansen, 2011; Lunke et al., 2021; Solheim, 1988; Strand et al., 2013; Vibe et al., 2005; Vibe and Hjorthol, 1993). The travel time relationship appears as a significant factor in both bivariate and multivariate models. In this study, modal travel time disparity is expressed as

$$(P - C)/(P + C)$$

Where P and C are the total travel times through the whole trip chain by PT and car, respectively (based on data from the regional transport model). This variable varies between -1 and +1, where 0 means equal travel time, negative values mean that PT is fastest and positive values mean that the journey is fastest by car. This operationalization is inspired by the indexes used in Schoon et al. (1999), Kwok and Yeh (2004) and Janatabadi et al. (2022), among others. Travel time by PT (P) consists of time on board and walking times to, from and between stops (i.e. door-to-door travel time).

The third variable measures the total waiting time, as a proxy for PT service frequency. Several studies have found that service frequency is a key factor for increased ridership of the PT service (Balcombe et al., 2004; Ewing and Cervero, 2010; Redman et al., 2013). We use the *sum of waiting time* for the whole trip chain (based on data for single trips from the regional transport model). The waiting time is defined as half the time between each departure, as we expect that this is the mean waiting time if arrival at the PT station is completely random. Due to nonlinearity, we have used the natural logarithm of the waiting time as indicator in the model.

The fourth and fifth variables concerns accessibility by car, focusing on parking. Several surveys based on the Norwegian NTSs have shown that free parking at the workplace is of importance for the mode choice on work trips. The most detailed studies are presented by Christiansen at al. (2017, 2015). To capture this effect in the study, we have included a bivariate indicator for the *lack of free parking at work* (at the workplace or in the neighbourhood) for any work trips in the trip chain. This variable is measured for all individuals who are employed with a fixed workplace location, hold a driver's license and have access to a car. We lack sufficient information on this variable for around 14 % of the employed individuals with a fixed workplace location. An additional variable on parking availability measures the *maximum parking restrictions* in the trip chain. Based on aggregated data from NTS 2013/2014 and NTS 2018/2019, we have estimated the percent of workplaces without parking options (both free and paid) within a 1 km radius around all nodes in the trip chains. For each node the estimate is used as a general index of parking restrictions and thus as an indicator of limited accessibility by car to the node. The variable included in the model is the maximum index across the destination nodes in the trip chain – meant as an indicator of limited possibility of using car on the trip chain.

The sixth and seventh variable covers the concentration of services, such as employment, which are often used metrics in travel behaviour studies (Cervero and Kockelman, 1997; Ewing and Cervero, 2010): density at the residential location and centrality (at the trip chain node with the highest value). *Density* is expressed by the concentration of residents and jobs within a radius of 1 km around the residences (based on 250x250m grid data). The effect of density is nonlinear; therefore, the square root of density is used as index in the regression model. *Centrality* is measured by an index, developed by Statistics Norway (Høydahl, 2020). The index is created by measuring the number of employment and other service opportunities reachable within 90 minutes travel time by car from each populated census tract in Norway, with a distance decay function to weigh opportunities by travel time. Opportunities are weighted by travel time. The index takes values from 0 to 1,000 along a continuous scale. The variable used in this study applies to the highest registered centrality among the destination nodes in the trip chain.

A string of control variables is also included. *Weekday* indicates whether the registered trip chain was conducted on a weekday (Monday to Friday) or not. Characteristics of the individuals include *gender* (binary for woman), *age*, indicator for economically active person (*employed,* binary), *personal income* (nine levels) and indicator for *car subsidies* (binary). Each of the levels in the income scale amounts to NOK 100,000/year, except for the intervals of NOK 700,00-999,000 and NOK 1 million and above (ie a flattening at the top). Car subsidies apply to persons who dispose a free company car or receives other car use subsidies from their employer. Trip chain characteristics are described by three binary indicators. The first measures whether the chain includes at least one single work trip. The second determines whether shopping or errands are among the purposes of the chain, while the third indicate accompaniment of children as one of the purposes.

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