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Modelling the effect of foreign origin on mode choice in two different cycling cultures

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Research on mode choice has shown an increased interest in factors of travel socialisation. This includes the effect of parents' and peers' norms, attitudes and behaviour on mode choice (e.g., Döring et al., 2017; Haustein et al., 2009; Underwood et al., 2014) as well as the effect of specific events in the personal mobility biography, such as the move to a different mobility culture (e.g., de Haas et al., 2018; Klinger & Lanzendorf, 2016).

Another approach to reveal effects of travel socialisation is by examining immigrants' mobility behaviour: immigrants live in the same mobility culture as natives, but they have additionally been exposed to other cultural influences, either directly or mediated by their parents in case of descendants. In a European context, identified differences between natives and immigrants include that immigrants cycle less (e.g., Kasper et al., 2007; Welsch et al., 2016), especially immigrant women with a non-Western origin (Harms, 2007; van der Kloof, 2017). Dutch adolescents are almost three times more likely to use the bicycle for their general transport than adolescents with parents born in another country (de Bruijn et al., 2005).

Differences between natives and immigrants in car use can partly be explained by differences in social and demographic factors, such as lower car ownership, lower household income, lower licensure rates, and a higher population concentration in urban areas (e.g., Chatman, 2014; Contrino & McGuckin, 2009). However, some differences remain even when these factors are controlled for. This indicates that different cultural norms could also play a role leading to different preferences (or restrictions) and choices. Similarly, a recent German study found a small effect of immigrant status on cycling, when controlling for selected demographic factors (Welsch et al., 2016).

The contribution of the present study is twofold. First, we aim to assess the effect of immigrant background[1] on cycling behaviour in the Netherland and Denmark – both countries with a distinct cycling culture (Carstensen & Ebert, 2012; Haustein & Nielsen, 2016). Since it may be expected that, within these countries, the cycling norms of people with a foreign origin differ more strongly from the national norm towards cycling, we expect a more pronounced effect (compared to previous studies) of immigrant background on cycling behaviour. Furthermore, as indicated based on descriptive data from the Netherlands (e.g., van der Kloof, 2017), we expect that the effect is bigger for non-Western as compared to Western[2] foreign origin and females as compared to males (of foreign origin). Second, we aim to assess the additional influence of the share of people of non-Western origin at the neighbourhood/municipality level on people's personal cycling behaviour. Here, we expect that, if this share is substantial (over 20%), the individual cycling behaviour of people of non-Western origin will further decrease.

[1] In this study a person with an immigrant background is defined as someone who has either a first generation (born abroad) or second generation (at least one parent born abroad) foreign background. The Danish sample so far only includes first generation immigrants and not second generation immigrants (descendants). This is due to data access issues and will be changed in the final model.
[2] Defined as someone originating from a country in Europe (excluding Turkey), North America or Oceania or Indonesia or Japan.

Hence, if people of non-Western origin reside in a neighbourhood where cycling is to a lesser extent the norm (as indicated by a relatively large share of people of non-Western origin) we expect a stronger effect of immigrant background on cycling behaviour than when they reside in a neighbourhood where cycling is the norm.

To achieve these aims, a series of binary logistic regression models is estimated using data from the Danish National Travel Surveys (N=42,888, years 2007-2011) and Dutch National Travel Surveys (N=27,031, year 2014). These surveys are similar in set up and size; they both represent annual national surveys in which individuals participate during the course of the whole year. Participants are selected randomly from the respective population registers of both countries. They both include a 1-day travel diary to measure people's travel behaviour and additional questions covering relevant background characteristics of respondents. Using as the dependent variable whether the respondent made at least one trip by bicycle on the day of the survey (or not), two models are estimated for each dataset, the first with only main effects and a second including two additional interactions, which are based on the expectations formulated above. Table 1 presents the parameter estimates and standard errors.

The results of the main-effect-only models [1] indicate that, controlling for relevant socio-demographic and economic factors, non-Western foreign origin has – in line with expectations – a significant negative effect on the probability of having made a cycling trip in both the Danish and Dutch dataset. The effect of Western foreign origin is also negative in both datasets, but much smaller and only reaches statistical significance in the Dutch dataset. Interestingly, in the Dutch dataset, the dummy indicating that the share of people of non-Western origin is 20% or higher at the neighbourhood level has a negative effect on all individuals' propensity to cycle. This suggests the presence of 'reverse socialization', whereby the foreign 'anti-cycling' norm influences the local norm towards cycling (of immigrants and natives alike).

Turning to the models with interactions [2], the results indicate that, as expected, especially women of non-Western origin cycle less. In addition, in the Dutch dataset, the interaction between non-Western origin and high share of people of non-Western origin in the neighbourhood is also significant and negative. This means that, if people of non-Western origin reside in a neighbourhood where cycling is to a lesser extent the norm, as indicated by a relatively large share of people of non-Western origin, they will cycle (even) less. Theoretically, this suggests that people of non-Western origin are less probable to cycle if they feel supported (by the neighbourhood norm) in their individually-held norm not to cycle.

That interaction effects are significant in the Dutch model but not in the Danish one may be due to the fact that the Danish models so far only include immigrants but no descendants. This will be changed in the final models and may lead to an assimilation of results. If differences persist, we will examine other factors, such as a different composition of immigrant groups or different efforts of integration in both countries as potential reasons.

Table 1. Parameter estimates of the binary logit models

	Danish NTS		Dutch NTS	
	[1]	[2]	[1]	[2]
Dummy indicating Western immigrant	-0.044	-0.045	-0.186***	-0.192***
Dummy indicating Western immigrant origin	(0.095)	(0.095)	(0.052)	(0.052)
Dummy indicating non-Western immigrant	-0.870***	-0.658**	-0.740***	0.190
Dummy indicating non-Western immigrant origin	(0.162)	(0.312)	(0.064)	(0.197)
Dummy indicating female	0.143***	0.144***	0.067*	0.093**
	(0.026)	(0.026)	(0.028)	(0.029)
Dummy indicating Non-Western immigrant * dummy indicating female		-0.070		-0.483***
*Dummy indicating Non-Western immigrant origin * dummy indicating female*		(0.326)		(0.12)
Age	0.050***	0.050***	-0.008***	-0.008***
	(0.006)	(0.006)	(0.001)	(0.001)
Age squared	-0.0005***	-0.0005***	0.0002***	0.0002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Education intermediate	-0.015	-0.015	-0.064	-0.060
	(0.036)	(0.036)	(0.037)	(0.037)
Education high	0.154***	0.154***	0.163***	0.165***
	(0.031)	(0.032)	(0.041)	(0.041)
Occupational status student	0.705***	0.706***	0.937***	0.943***
	(0.071)	(0.071)	(0.077)	(0.077)
Occupational status employed	0.138***	0.138***	-0.093*	-0.092*
	(0.042)	(0.042)	(0.045)	(0.045)
Occupational status housekeeper	-0.071	-0.072	0.192**	0.204**
	(0.126)	(0.126)	(0.068)	(0.068)
Household disposable income, €10,000-20,000	-0.376***	-0.376***	0.155	0.157*
	(0.104)	(0.104)	(0.079)	(0.079)
Household disposable income, €20,000-30,000	-0.221**	-0.220**	0.277***	0.28***
	(0.103)	(0.103)	(0.079)	(0.079)
Household disposable income, €30,000-40,000	0.152	-0.151	0.397***	0.401***
	(0.104)	(0.104)	(0.083)	(0.083)
Household disposable income, €40,000-50,000	-0.021	-0.020	0.384***	0.390***
	(0.106)	(0.106)	(0.096)	(0.096)
Household disposable income, > €50,000	0.103	0.104	0.375***	0.381***
	(0.105)	(0.105)	(0.102)	(0.102)
Car license	0.104**	0.104**	-0.462***	-0.468***
	(0.043)	(0.043)	(0.047)	(0.047)
City size (1000 inhabitants)	0.0002***	0.0002***	0.073***	0.07***
Level of urbanization	(0.00003)	(0.00003)	(0.012)	(0.012)
Number of household members	0.038***	0.038***	0.134***	0.136***
	(0.013)	(0.013)	(0.013)	(0.013)
Dummy indicating one car	-1.041***	-1.041***	-0.417***	-0.412***
	(0.040)	(0.040)	(0.051)	(0.051)
Dummy indicating two cars	-1.964***	-1.964***	-1.006***	-1.001***
	(0.055)	(0.055)	(0.061)	(0.061)
Dummy indicating more than two cars	-1.996***	-1.996***	-1.347***	-1.34***
	(0.129)	(0.129)	(0.086)	(0.086)
Share of non-Western immigrants, municipality	-0.843	-0.645	-0.446***	-0.378***
Dummy indicating that the share of non-Western origin is higher than 20%, neighbourhood	(1.221)	(1.238)	(0.051)	(0.054)
Share of non-Western immigrants * dummy indicating non-Western immigrant		-7.619		-0.483***
*Dummy indicating that share of non-Western origin is higher than 20% * Dummy indicating non-Western immigrant origin*		(8.537)		(0.126)
Share of households with low income (<€30,000), municipality	1.963***	1.957***	0.728***	0.725***
Share of households with low income (<40st percentile), neighbourhood	(0.193)	(0.193)	(0.182)	(0.182)
Share of residents with social assistance, municipality	-0.691	-0.688	-2.372*	-2.220
Share of residents with social assistance, neighbourhood	(0.673)	(0.673)	(1.172)	(1.174)
Dummy indicating year 2007	-0.123***	-0.123***		
	(0.047)	(0.047)		
Dummy indicating year 2008	0.001	0.001		
	(0.047)	(0.047)		
Dummy indicating year 2009	0.018	0.017		
	(0.045)	(0.045)		
Dummy indicating year 2010	-0.045	-0.046		
	(0.046)	(0.046)		
Constant	-2.362***	-2.364***	-0.878***	-0.930***
	(0.183)	(0.183)	(0.132)	(0.133)
Log likelihood	-20,573	-20,573	-15,820	-15,804
Number of observations	42,888	42,888	27,031	27,031

Notes: explanatory variables in **bold font** are operationalized in the same way in both the Danish and Dutch NTS. When these operationalisations are different the normal font represents the operationalization in the Danish NTS and the *italic font* the operationalization in the Dutch NTS. Standard errors in parentheses; the reference category associated with the dummies representing immigrants is "native citizen"; the reference category associated with the dummies representing education is "low education"; the reference category associated with the dummies representing occupational status is "other"; the reference category associated with the dummies representing household income is income below €10,000; the reference category associated with the dummies representing years is year 2006 (only for Danish NTS); *,**, *** indicate that estimates are significantly different from zero at the 0.05, 0.01 and 0.001 levels, respectively.

The result show that immigrants in countries with a cycling culture cycle less than natives, in particular when they originate from non-Western countries. These differences cannot be explained by a different socioeconomic status, car access or level of urbanisation as these factors were controlled for in the analyses. Instead, we assume that experiences and cultural norms mediated by parents play a relevant role here, in particular as it is especially non-Western women who cycle less. However, results should be interpreted with care as the design does not allow for any causal interpretations. Studies based on longitudinal data and studies explicitly measuring norms and attitudes related to cycling of both natives and immigrants would be relevant to validate our assumptions and could also allow for conclusions about relevant measures to increase the level of cycling among immigrants.

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