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A Border Effect in Airport Choice: Evidence from Northwest Europe

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Abstract

Some researchers suggest that air travelers are very reluctant to use a foreign airport as point of departure for their trips. Such reluctance has implications for marketing and policy measures, especially in smaller countries, such as the Netherlands and Belgium. In this study, we test this supposed border effect with empirical data.
Our research is based on a large-scale survey among German, Dutch and Belgian adults (n=8,407). Respondents were asked about their last flights, preferences regarding long distance travel, and general travel behavior. The survey information about the last trip is linked to OAG flight schedule data for the Northwest Europe region. We modelled 18 airports in this region. On average, however only 10 airports offered direct connections to the destinations of the respondents' last flight. A conditional logit model with varying choice sets allowed us to model only these relevant options per respondent.
The choice model's findings confirm our expectations: people strongly prefer a departure airport situated in their own country. This while accounting for other known determinants in airport choice, such as the distance to the airport, number of available flights and dominance of low-cost carriers at the airport.
The performance of our model is good. In about 68% of the cases, the model correctly predicts the actual departure airport from a list of 18 airports in total. Our research offers a new perspective on airport choice: even when travelling across borders in the sky, national borders remain important.

Keywords: airport choice, conditional logit, border effect, Northwest Europe

1. A border effect in airport choice?

Based on his analysis of airport choice determinants, Gordijn (2015, p. 24) concludes: 'National borders seem to have a negative effect on airport choice'. Paliska et al. (2016) also suspect *a border effect* in airport choice, although they were unable to provide evidence with their models. As explanations for a border effect, Gordijn (2015) mentions potential language barriers, the role of travel agencies, nationally oriented search engines, a lack of awareness and cross-border promotions by airports, and peoples' travel habits. It is difficult to find supporting evidence for these possible explanations, however, as border effects in airport choice are rarely studied.

The presence of a border effect in airport choice is relevant for stakeholders in numerous ways. For one, it is directly related to the effectiveness of national subsidies and taxation rates for air travelers, and as such is highly relevant for policy makers. Moreover, for the development of airports and for climate issues, it matters whether there less demand for air travel or whether people are departing from other countries. A border effect could also indicate a lack of land-sided accessibility. For airport managers, a border effect could indicate that air travelers are unfamiliar with the airports situated just across their borders, as Gordijn already suggested.

In this contribution to ATRS 2019, we endeavor to empirically test whether a border effect exists in airport choice. We aim to quantify the effect and provide possible explanations. We found one previous study that detailed a quantification of the border effect; this study, conducted by SEO Amsterdam Economics (SEO), stated that a border effect does exist, and that the concomitant mental barrier was equivalent to 100 additional kilometers of travel via access mode or an additional 38 euro in generalized travel costs (Boonekamp et al., 2014).

In our study, the main hypothesis – there is a border effect - and three related sub-hypotheses are tested. We used a conditional logit model, with supply side information based on OAG (www.oag.com), and demand side information based on a survey conducted among air travelers in the Netherlands, Belgium and Germany (Zijlstra and Huibregtse, 2018).

This research paper is structured as follows. Section 2 introduces the four hypotheses (one main and three sub-hypotheses). Section 3 discusses the determinants in airport choice, as found in in the literature; these determinants must be included in the model in order to control for differences in access and levels of service, and to rule out other potential explanations for cross-border differences. Method and data are subsequently discussed in Section 5. The results of the models are presented and discussed in Section 6. To conclude, we reflect on our study's main research goal, the four hypotheses, and the added value of this contribution to ATRS 2019.

2. Hypotheses

Our study's main hypothesis (H1) is that foreign airports – as viewed from the traveler's country of residence - have a significantly lower probability of being selected as a departure airport for a flight, and that this also applies when controlling for the foreign airports' relevance and differing degrees of attractiveness. Such control is necessary, because foreign airports may be less attractive owing to the longer trip times required to reach the airport or possibly their limited flight offerings. We discuss the determinants of airport choice (control variables) in Section 3 of this paper.

In addition to the main hypothesis, three sub-hypotheses are tested:

H2) The border effect results from the limited scope of the airports included in the traveler's consideration set;

H3) Personal experience with multiple airports in the region mitigates the border effect;

H4) Young adults and people with higher levels of education experience a lower border effect compared to older and less educated people.

The first sub-hypothesis (H2) was prompted by the previous research findings of Başar and Bhat (2004), who stressed the importance of the consideration set. If people do not consider a certain airport as a point of departure, they are highly unlikely to select that airport as a point of departure for their flights. The 'true' options are actually irrelevant; only those options under consideration count. A border effect can be present in the consideration set of the individual, due to a lack of awareness of cross-border airports. Indeed, we expect the consideration set to be dominated by airports situated in the traveler's country of residence.

Prior personal experience with multiple airports as points of departure could positively affect the number of airports considered, thereby lowering the mental barrier to trying an airport that the person has not used previously. This will mitigate the border effect (H3). Moreover, prior personal experience with multiple airports is a sign of flexibility.

Some of the real and perceived mental barriers that exist between countries include differences in languages and cultures, and a general fear of the unknown (Gordijn, 2015). Consequently, and partly owing to such aspects, we expect young people and those with higher levels of education to experience a smaller border effect (H4), as today's young people have grown up in a global environment, with the internet and a good knowledge of foreign languages. High educational levels are also positively associated with a more cosmopolitan lifestyle.

3. Determinants of airport choice

In order to be able to identify a border effect, it is necessary to isolate that effect from other aspects that influence airport choice. Fortunately, over the past three decades researchers have conducted the requisite airport choice studies. The corresponding starting point is that a direct flight is available to the desired destination and that the destination is axiomatic (and hence not dictated by an airport's available destinations). Virtually all studies only model the cases in which multiple airports offer the same destinations, which also means that many of the choices and trips made are disregarded. In Hess and Polak (2006), for example, only 5,000 of the 21,000 cases were actually modeled. In this study, we avoid such a simplification.

Based on insights derived from previous studies, we conclude that the three main determinants are trip times to airports, frequency of flights for certain origin-destination pairs (OD pairs), and the airfare. *The trip time or distance to an airport* is a fixed factor in airport choice models, and without exception a significantly negative coefficient in the model. People exhibit strong preferences for the nearest airport (Pels et al., 2003, Başar and Bhat, 2004, Hess and

Polak, 2006, Loo, 2008), and hence an airport can be said to have 'a regional monopoly' (Blackstone et al., 2006). A simple explanation for this is the disparity in speed of travel between trips by land and by air. An airport being situated further away already results in a significant increase in trip times via land routes, yet the flight itself is not significantly shorter. Consequently, the reasons for not selecting the nearest airport are therefore also found in other aspects.

The frequency of the number of flights for a certain Origin-Destination (OD) pair often has a positive effect on the selection probabilities (Pels et al., 2003, Başar and Bhat, 2004, Boonekamp et al., 2014, Loo, 2008). This is partly a simple probability distribution, since more flights usually means more available options. Consequently, it is unsurprising that a higher number of flights scores well in studies based on observed choices. However, studies based on 'stated preferences' also reveal a preference for higher frequency (de Luca, 2012). More flights also provide more possible choices and fallback options. Options are available several days per week or sometimes even several flights per day, which also allows people to choose the (desired) part of the day to travel.

The effect of *airfare* is particularly evident in stated preference studies (Hess et al., 2007, de Luca, 2012); in which people clearly express the desire to spend less on airfare. Studies based on actually observed choices have more difficulty revealing the significant negative effect of *airfare* (Hess and Polak, 2006). There are various explanations for these difficulties: airline ticket prices vary widely, up to 700% for the same service (ICF, 2018), yet the ticket price information in models is often aggregated; the information people find about ticket prices depends on the search engine used; and people may not have a complete overview of all options, and therefore not all the modeled options are considered options. More substantively, there could be a discrepancy between the set preferences and actual behavior: people say that price is important, but they do not act accordingly.

In addition to costs, frequency and trip time, these following aspects are of secondary relevance, according to the literature:

- The *number of airlines* serving the desired OD-pair could have a positive effect on the selection probability (Loo, 2008). After all, owing to richer offerings, there is greater diversity, and finding a suitable time may become easier. Based on research and in line with economic theory, we can expect that the more airlines serving a particular route will depress ticket prices: flying becomes cheaper.
- *Low-cost carriers* (LCC) have given aviation a new complexion in recent years. Flying is now affordable for a much larger segment of the population. The presence of LCC or the share of flights provided by LCC has thus become a potentially relevant attribute for an airport choice study (Paliska et al., 2016), and certainly when sufficient price information is unavailable.
- A number of studies reveal a positive effect from the size of the aircraft or the *number of seats per flight* (Hess and Polak, 2006).
- Relatively high *parking costs* may factor into the consideration of those people planning to travel to the airport by car (Blackstone et al., 2006).

- *The presence of a train station* and hence an airport's accessibility by train or high-speed train is of possible importance to people travelling by public transport (Blackstone et al., 2006, Terpstra and Lijesen, 2015).

4. Data: an international survey on the propensity to fly

This research project is supported by a large-scale survey conducted among a sample of the Dutch, Belgian and German populations. In the Netherlands, a full countrywide sample was drawn. In Belgium, the sample was mainly restricted to Flanders, the Dutch-speaking northern region of the country. In Germany, the sample is restricted to regions in the North-West, adjacent or in close proximity to the Netherlands. Note, that more than one airport per country is necessary to estimate a border effect; due to use of the alternative specific constants and control variables in the model (cf. Paliska et al., 2016). Owing to the respondents' considerable geographical distribution in the dataset, it was possible to model 18 airports in this study, with multiple options per country.

Topics covered in the questionnaire included details of the person's last flight, their previous airport experience, number of flights per year, and other topics (see Zijlstra et al., 2017; Zijlstra and Huibregtse, 2018). In total, 8,407 people were successfully surveyed in the Netherlands, Belgium and western Germany.

The data set was enhanced in various ways. The four-digit (or five-digit) postal codes were used to calculate the distances between the residential locations and various airports in the region. A decision was therefore made to use straight-line distances, because it was impossible to make an informed choice between distances travelled by road or public transport: some people travelled by public transport, some by car, and others opted for another modes of transport (Zijlstra and Huibregtse, 2018). IATA codes were used to designate all the destinations of the respondents' most recent flights and were designated for a country and city. All OD pairs were linked to the available options in the region. The flight's origin was thereby designated to the specific airport. The flight's destination was designated to that of main city, close to the airport. In some cases multiple airports serve a single city or metropolis (Derudder et al., 2010), such as the airports situated near Paris or London. In such cases, all the neighboring airports around the city become options for the flight, and not only the actual airport the respondent arrived at.

Only the people who had recently travelled by airplane remained in the final dataset, which already halved the dataset: more than 40 percent of the unweighted sample did not fly recently. Respondents who provided a combination of inconsistent answers, odd answers, missing items and non-differentiated matrix questions were removed from the data. Furthermore, in case there is only one airport is available for the flight destination of the respondent, this case is excluded from the dataset. The final dataset contains 4,083 complete cases.

5. Method: a conditional logit model

To model airport choice we used a conditional logit model, which is a special version of the cox proportional hazard model. Our primary motivation for doing so was the model's ability to model the varying choice sets between individuals. As destinations differ, so too will the set of relevant airports. A more common multinomial logit model (MNL) is only capable of modelling the *same* set of options for each person. Consequently, using a MNL implies a significant limitation to only those destinations served by all airports or the inclusion of irrelevant options in the choice set.

A basic conditional logit model assumes homogeneity of preferences between individuals and equal probabilities for each option. The latter is addressed by adding an alternative specific constant (ASC) to the model. Here we used Amsterdam Airport Schiphol as reference level (ref. = AMS). In order to relax the assumption of homogeneity of preferences, we included interaction effects with covariates, thereby allowing us to account for the various social groups in our sample. These same interactions allow us to test some of the hypotheses. The covariates are inspired by the modelled attributes. The number of flights is linked to the importance of a flight time schedule. The LCC's share is linked to the self-declared importance of airfares.

The dependent variable in the models is a dummy variable for the airport of departure for the last flight the respondent made within a choice set that is limited to the available airports for the OD-pair. The maximum set of options contains all 18 airports covered in this study, while the minimum set contains just two airports with a direct flight to the destination. Table 1 provides a list of the airports included with relevant characteristics of these airports.

Table 1: supply side characteristics of the 18 airports covered in this study

City / Region	Country	IATA code	Carriers*	Destinations*	Flights*	Share LCC*
Antwerp	BE	ANR	3	10	16	56%
Brussels	BE	BRU	60	176	391	32%
Charleroi	BE	CRL	4	93	108	100%
Liege	BE	LGG	3	13	14	71%
Oostende	BE	OST	1	7	10	100%
Bremen	DLD	BRE	11	45	56	45%
Cologne	DLD	CGN	21	104	169	80%
Dortmund	DLD	DTM	9	34	38	89%
Düsseldorf	DLD	DUS	55	175	417	35%
Osnabruck	DLD	FMO	9	18	22	14%
Frankfurt	DLD	FRA	92	270	475	10%
Hamburg	DLD	HAM	44	112	222	44%
Weeze	DLD	NRN	1	41	41	100%
Amsterdam	NL	AMS	81	242	511	25%
Eindhoven	NL	EIN	5	64	76	97%
Groningen	NL	GRQ	4	7	10	60%
Maastricht	NL	MST	4	9	11	91%
Rotterdam	NL	RTM	9	26	36	69%

*) Based on flight schedule Sept 13 – 19 in 2015, source: www.oag.com

The consideration set model is an exception to the above-stated rule. In this model, all 18 airports in the region are possible options for the individual to consider as a point of departure. The dependent variable is a dummy, highlighting the airports denoted by the respondent as possible departure airports. An alternative model specification here would constitute a next step, limiting the choice set to the consideration set and keeping final choice as a dependent variable. This model encounters multiple issues: first, the consideration set is generally very small and often only contains the airport actually selected; and second, some of the considered airports do not offer flights to the individual's desired destination and are therefore irrelevant. The flight destination is considered to be a given fact, and not, for example, the result of the various destinations offered by the nearest airport. Flight destination is understood as a city-region. When a city is not served by an airport in Northwest Europe, this airport becomes irrelevant and is excluded from the choice set. Further, only the destinations within a 4,000 kilometer radius are considered, which strongly increases the chances of an available direct flight. Flights with transfers are excluded from our model, owing to data and modelling issues. The vast majority of flights from the airports in this study is within this 4,000 kilometer radius (Figure 1). In only 13 percent of the cases in our sample, the last flight involved a transfer.

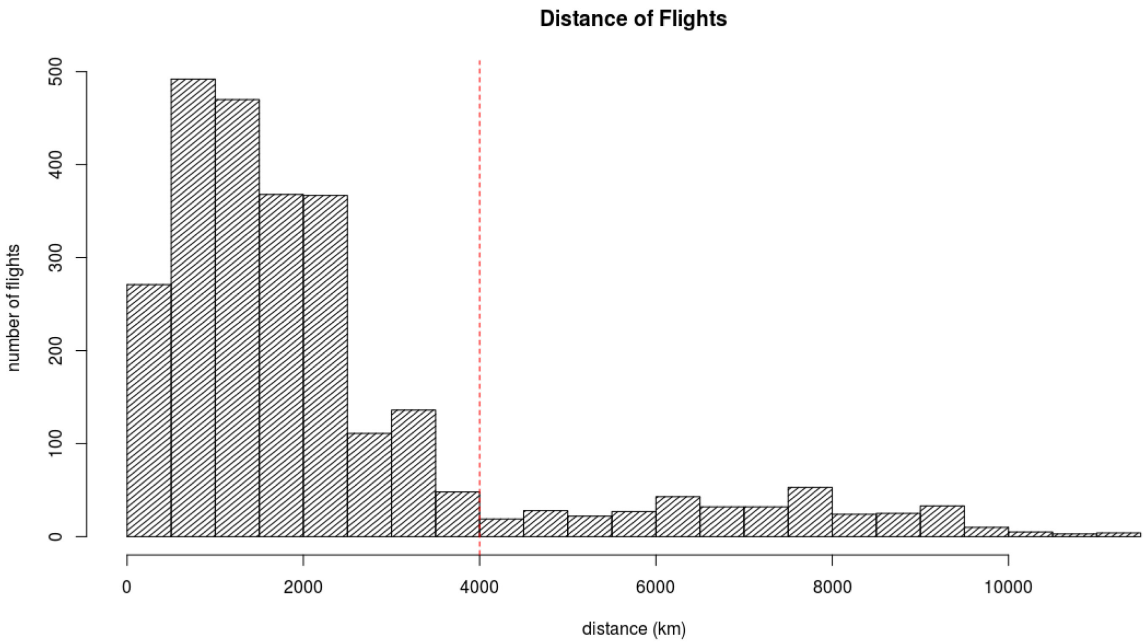

Figure 1: distribution of flight distances from the 18 airports in our model, with cut-off point at 4,000 kilometers

The choice sets among travelers differ considerably: many airports offer popular destinations, while the number of options is more limited for the less attractive or popular destinations. We therefore observe differences in number of options available to an individual. On average, 10.1 of the 18 airports are available options. The most frequently available airports of departure are AMS, FRA, DUS and BRU. AMS is present in 95% of all choice sets. The airports GRQ, LGG, ANR and MST are not applicable in most choice sets. MST is nonetheless present in 17% of all choice sets. Indeed, the high level of connectivity is clearly reflected in our respondents' choice sets (Table 1).

For this research, our model's key independent variable is the choice of opting for an airport in the country of residence or abroad. The dummy variable devised for this purpose is derived from the respondent's country of residence, combined with the countries of the airports in the set and the respondent's alternatives.

The other attributes included in the model are directly derived from the literature (Section 3). As control variables we tested the straight-line distance to the airport, the number of departing flights, the number of airlines per airport serving the destination, total number of seats, average number of seats per flight, LCC's share of flights, LCC's number of seats, accessibility of airport by train, and relative differences in parking costs for seven days parking. Some variables are clearly related to each other, and showed high levels of correlation. Moreover, empirically, not all variables turned out to be relevant. It also proved impossible to include all the explanatory variables in one model. We therefore retained those deemed most important in the final model.

We tested multiple transformations of the determinants. These tests indicate that a log-transformation is most useful for the number of flights and number of carriers, with an additional associated benefit being that the reference level becomes meaningful, as both flights and carriers have a minimum of one (log(1) = 0). A power transformation (square root) is estimated for the distance decay function. This transformation outperforms a linear effect ($\chi^2 = 72.9$) or log-transformation ($\chi^2 = 104.3$). The conditional logit model used is the *clogit*-function from the *survival*-package in *R*.

No actual ticket price information is included in the model. In the survey, we deliberately refrained from asking people about the costs of their airfare, as the assumption was that this would not yield reliable information. The respondents may not have booked the tickets themselves or the booking was perhaps done a long time ago. The prices may differ based on inclusion of baggage, insurance, CO_2-compensation, car parking and other factors. Moreover, we only know the prices of the chosen alternative, not for the other options in the set. In short, every estimate is likely highly inaccurate. Previous studies also reveal that aggregated ticket price information does not contribute to the modeling process, as the effects are insignificant (Hess and Polak, 2006).

6. Results

Based on the descriptive statistics, there already seems to be sufficient proof of a border effect in airport choice (Table 2). 90% to 97% of all flights in the final dataset departed from the respondents' country of residence. These numbers are quite similar to those that Paliska et al. (2016) found in the Upper Adriatic region. Given the lack of cross-border departures (n=314), it will be difficult to obtain significant results for our sub-hypotheses.

Table 2: country of residence and country of departure airport

Country of airport \ Country of residence	Netherlands	Belgium	Germany
Netherlands	1619 (90%)	69 (7%)	27 (2%)
Belgium	56 (3%)	868 (91%)	11 (1%)
Germany	130 (7%)	21 (2%)	1282 (97%)

Table 3 presents the consideration set model and choice model results. In both models, one observes a strongly negative and statistically highly significant estimate for a border effect: -2.05 in the consideration set model, and -1.90 in the choice model. Hence, this study's main hypothesis (H1) is supported: travelers are very reluctant to use departure airports beyond the national borders of their own countries. This border effect is already present in the consideration set: people do not even consider cross-border airports as potential points of departure. This supports our second hypothesis (H2).

That the consideration set's estimate is more negative than the choice set's estimate suggests that if people do consider foreign airports, those airports have a slight competitive advantage, although it must be stressed that both models in Table 3 differ from one another. The choice model includes multiple estimates based on the actual OD-pair. Ultimately, it is difficult to draw such conclusions based on the estimates.

Regarding the other attributes, the following conclusions can be drawn. We observe a strong negative effect for distance in both models presented in Table 3, which is a finding that strongly supports the idea of a regional monopoly. In cases in which people reside close to an airport, they are highly likely to use that airport as point of departure. The total number of flights offered has a strong and significantly positive effect on selection probabilities: the more planes departing from an airport during a given week to the desired destination, the higher the likelihood that this airport is selected as point of departure. For those who state that flight schedule is a key selection criterion, the average estimate for number of flights is twice that of the people who do not deem flight schedules important. Indeed, we found sharp differences among air travelers. As expected, the number of carriers operating from an airport to the destination has a slight positive effect. However, the estimate is not significantly different from zero (p-value = 0.09). The LCC share is important, but only for those who indicate that price is a key selection criterion. Those who do not deem airfares as important have a negative, but not significant, estimate for the share of LCC in the total number of flights. By adding some preference heterogeneity, via the covariates, the model performance is significantly improved: the choice model with covariates clearly outperformed the model without these covariates (χ^2=69.1; df=2).

All the Alternative Specific Constants (ASC) are negative, with some strongly negative, which can be explained by the fact that we used Schiphol (AMS) as the point of reference for these ASCs. AMS is one of Europe's largest airports (Table 1) and a very popular departure airport, also because many of our respondents reside in the Netherlands (n=1,805). Other popular airports include Brussels, Dusseldorf and Frankfurt. Conversely, Groningen, Maastricht, Oostende, Antwerp and Liege have very small ASC; these airports are not popular among our respondents.

Table 3: results from three conditional logit models

Covariate		Consideration	Choice
ASC.RTM		-2.784 (0.088)***	-1.364 (0.13)***
ASC.GRQ		-4.431 (0.182)***	-1.962 (0.39)***
ASC.EIN		-2.070 (0.075)***	-0.904 (0.104)***
ASC.MST		-4.216 (0.154)***	-2.536 (0.439)***
ASC.ANR		-4.888 (0.176)***	-2.326 (0.333)***
ASC.BRU		-0.961 (0.086)***	-0.611 (0.101)***
ASC.CRL		-1.932 (0.098)***	-0.609 (0.135)***
ASC.OST		-3.754 (0.16)***	-1.605 (0.268)***
ASC.LGG		-3.889 (0.153)***	-1.920 (0.344)***
ASC.DUS		-0.732 (0.082)***	-0.531 (0.104)***
ASC.CGN		-1.370 (0.081)***	-0.518 (0.106)***
ASC.DTM		-3.109 (0.115)***	-1.577 (0.207)***
ASC.HAM		-1.735 (0.161)***	-1.065 (0.2)***
ASC.NRN		-3.017 (0.111)***	-1.009 (0.174)***
ASC.BRE		-2.724 (0.152)***	-1.054 (0.202)***
ASC.FRA		-1.247 (0.117)***	-1.110 (0.153)***
ASC.FMO		-2.959 (0.122)***	-0.997 (0.2)***
Distance (square root of)		-0.368 (0.008)***	-0.313 (0.01)***
Cross border		-2.054 (0.056)***	-1.901 (0.076)***
Carriers (log-transform)			0.120 (0.071).
Flights (log-transform)	schedule not important		0.267 (0.067)***
	schedule important		0.510 (0.069)***
Share LCC	price not important		-0.239 (0.137).
	price important		0.605 (0.119)***
number of options		73494	41267
number of individuals		4083	4083
events		6235	4083
concordance (s.e.)		0.944 (0.002)	0.932 (0.003)
R-squared (max)		0.237 (0.353)	0.224 (0.353)
AIC		12140	7507
BIC		12268	7659

Level of significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, . $p < 0.10$

Regarding the remaining hypotheses, we can draw the following conclusions (see Table 4). Previous experience with multiple airports of departure has a strong mitigating effect on the border effect. The more airports people are familiar with, the more the border effect decreases. The estimates significantly differ from one another. Hence, these results support our hypothesis (H3). Moreover, the model that includes experience is the best performing of all models presented in this paper.

Age and education level are seemingly key factors for the border effect. Being highly educated reduces the mental barrier to use a cross-border airport. Likewise, young adults are less reluctant than the elderly to cross national borders to reach an airport for departure. The age-related findings are significant, also because age is modelled linear, consuming just one degree of freedom. The findings for education level do not significantly differ from one another, which is partly owing to a general lack of cross-border departures. However, a clear pattern exists here with low, medium and high levels of education and strong, medium and low border effects.

Table 4: relevant part of model results for H3 and H4

	H3: experience with airports	H4: age and level of education
Used 1 or 2 airports	-2.760 (0.130)***	
Used 3 or 4 airports	-1.694 (0.110)***	
Used 5 or more airports	-0.817 (0.130)***	
Age X Low level of education		-0.045 (0.005)***
Age X Medium level of education		-0.040 (0.002)***
Age X High level of education		-0.035 (0.002)***
concordance (se.)	0.932 (0.003)	0.931 (0.003)
R-squared (max possible)	0.227 (0.353)	0.224 (0.353)
AIC	7,381	7,550
BIC	7,545	7,714

Note: Levels of significance are the same as in Table 3; models are the same as choice model; only relevant estimates are shown

We are unable to use the models to convert the border effect into additional costs, as there are no airfares included in our model. We are however able to translate the border effect into additional kilometers of travel distance to the airport, as the model does include straight-line distance. Via the estimate for distance the border effect can be transformed to 37 additional kilometers. While this might sound like a small barrier in the context of long distance trips, it nevertheless does have a powerful impact on the choices people make. Especially because of the regional monopoly. In a case in which only two airports are suitable - both with direct flights to the destination and exactly the same characteristics, yet with one of the airports situated 37 kilometers further away - the selection probabilities for that most distant airport are three or four times lower (Figure 2). Our observed barrier effect is smaller than the 100 additional kilometers found by SEO, and smaller than the barrier we estimated in the paper detailing our preliminary results (Zijlstra & Gelauff, 2018).

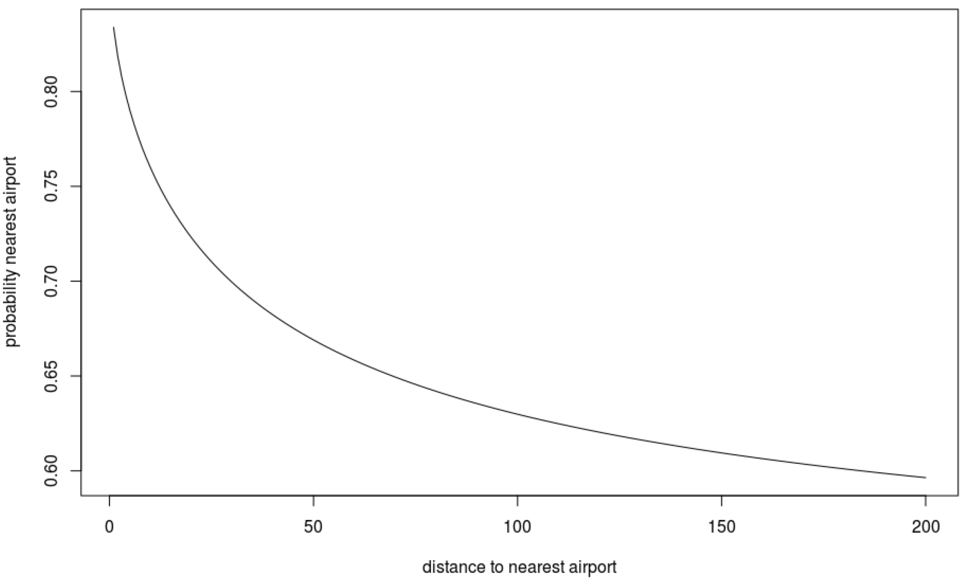

Figure 2: selection probability for two similar airports with 37 km difference in distance

The model's explanatory power is good. The best pseudo Rho[2] is only 0.227, though the maximum possible value is 0.353, according to the model output. The concordance of the best model is 0.944: a perfect score on a scale from zero to one and a starting point of 0.1 (1 out of 10). As based on selection probabilities, the observed choices had a 55% match. When taking a maximum utility approach, we found that in two out of three cases the airport with the highest selection probability was the actual selected airport, which is an excellent performance given the fact that we modelled 18 airports in our study. In a similar type of study, Hess and Polak (2006) were able to predict 68 to 85% correctly; however, they only modelled three airports in the region, which means a random chance of 33%.

7. Conclusions

In this study, we empirically tested the existence of a border effect in airport choice. We used a large-scale survey conducted in the Netherlands, Belgium and western Germany. The final sample contained more than 4,000 cases. We used a conditional logit model to estimate the selection probability of relevant alternatives. One main hypothesis and three sub-hypotheses were tested.

For the main hypothesis (H1), we observed in the descriptive statistics very limited cross-border traffic to an airport of departure in a foreign country. In fact, the numbers are so small that comprehensive statistical tests become difficult. Nevertheless, we found a strong and highly significant negative effect in the choice model, while controlling for other known aspects of airport choice. Hence, there is a border effect in airport choice. H1 is supported.

Further analysis of the consideration set, as stated by the respondents, demonstrates that the border effect is a direct result of a lack of awareness of cross-border airports. In the consideration set model, the cross-border effect is just as strong (H2).

Further analysis of covariates reveals that personal experience with multiple airports has a strong mitigating effect (H3). Younger people and those with higher levels of education are less likely to suffer from the cross-border barrier. However, the effect is significant for age, but insignificant for education level, owing to a lack of observations. Hence, H4 is only partly supported.

Our findings suggest that airports could benefit from cross-border marketing, as people often never consider a foreign airport of departure at all. Air travelers could benefit from additional information about cross-border options as points of departure. Some of the choices made in the current situation are likely to be sub-optimal. National governments could use this study's insights to assess the impact of airport closures, taxes and other interventions. In general, this study has shed new light on the cross-border mental barriers that exist in a European Union without physical borders.

About this contribution

This contribution to ATRS 2019 is based on a study conducted by the Dutch Ministry of Infrastructure and Water Management. The preliminary results on the border effect were presented at CVS 2018 (Zijlstra and Gelauff, 2018). Key improvements were made with respect to data cleaning, number of airports included and model specification.

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