

Advancement in Conceptualizing Cross-Border Daily Mobility: the Benelux Context in the European Union

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Based on specific characteristics of mobility, the cross-border commuter status still has some ambiguities, whether in legal, geographic, economic or more generally in social or cultural terms. This paper aims at providing theoretical advancement to this specific cross-border mobility, especially through the transfer of a theoretical model using a cross-scale analysis based on two complementary concepts. The first corresponds to 'border confirming' and is measured at the macro level, including the economic differentials on both sides of the border. The second concept is called 'border transcending' and focuses on the individual level. It is based on the assessment of the psychosocial barriers that may fade as the daily practices of the border rise. This exploratory approach is tested within the European context of Benelux. The results, although they cannot be generalised due to a lack of comparable data, offer research perspectives. So far, the existence of a cross-border catchment area, tested on the Belgian cross-border commuters working in Luxembourg, is a reality for many.

Keywords: Border transcending, Border confirming, Benelux, Catchment area, Cross-border daily mobility

1. Introduction

At a time of 'general mobility', the growth of the flows of material and intangible assets is often implicitly regarded as a prevailing and positive social aspect (Lannoy, Ramadier, 2007). A complete overview of these diverse and new forms of mobility, which make up a new multidisciplinary paradigm according to Sheller and Urry (2006), is not necessary here, but it is nevertheless obvious that international workforce flows are one of the main aspects of these recent mobilities. Some authors agree that these international flows can be classified into two forms to allow a better understanding of the mobility patterns of these workers (Kondoh, 1999; Pierrard, 2008). One of these types corresponds to (permanent or temporary) international migrations, which induce a residential transnational movement from a poor country to an industrialised state in accordance with numerous and complex economic and social factors such as, to mention the most famous ones, the 'push-pull' models (i.e. Lee, 1966) or the structure of the

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world market (i.e. Sassen, 1988). The second and less-known form pertains to the flows of cross-border commuters, which have been increasing sharply in Europe: there were about 490,000 in 1999/2000 and 660,000 in 2006/2007 in the 15-member EU, which is a rise of 26% (MKW, Empirica, 2009).

This paper will focus on that second form of international flows. Indeed, although numerous writings dealing with these flows are being published, it is necessary to complete the theoretical corpus enabling us to distinguish these two forms of mobility from the spatio-temporal concept of daily mobility. This combination of 'daily' and 'mobility' gives rise to the notion of 'cross-border commuters', which will be developed in the first part. It is nevertheless already clear that cross-border commuting is based on both macroeconomic and psychosocial interactions that do not facilitate the reading as they cross two scales of analysis (Kelly, 2011). The former pertains to a European transregional scale and supposes uneven economic performances among regions, different cultural approaches that often hinder integration and socio-economic cohesion advocated by the European Commission. The latter scale of analysis focuses on the individual, i.e. one person with specific sociodemographic, psychological, symbolical and identity features that relate to the extent to which they feel they belong to their area or country of origin (Churchman, Mitrani, 1997).

Finally, the interactions between these analytical scales provide both the conditions of existence and the growth of the cross-bordering phenomenon, just as they might bring about its downfall. In other words, we shall focus in this paper on cross-border workers commuting to the Benelux in order to show that border-crossing is a phenomenon that requires differentials on a macroeconomic scale in order to be organised and last permanently while facilitating identity-based cohesion on a micro-economic scale (a feeling of belonging...) because of the development of different kinds of interactions and especially the activities carried out in the country of residence and abroad. In order to analyse this paradox (Barel, 2008), in which opposite strategies need to coexist (i.e. macroeconomic differentials versus the cross-border feeling of belonging, a microeconomic differential), an original reading of the border is given in detail in the second part of this paper in order to lay down this conceptual approach, which will be checked against empirical and exploratory analyses based on the Benelux framework in the last part.

2. From mobility to cross-border daily mobility: an overview

The various European institutions often regard the cross-border labour market as one of the major elements building up European social and territorial cohesion, particularly when the purpose is to facilitate workers' mobility, be it migration or cross-border commuting (Pierrard, 2008). Yet, the definitions specifying the characteristics of these cross-border labour mobilities do not explain the complexity of the ensuing journeys, which may or may not make that integration easier. Gijssels and Janssen (2000: 62) put forward a definition contrasting the cross-border labour market with the national labour market: they specify that, in the first case, the firms and workers of one country enter another country's labour market. In this sense, the distance to the working place, rather than a state boundary, hinders the job market. The characteristics linked to the distance and thus the mobility from home to the working place become essential when assessing that cross-border labour market. This will be discussed in the first part. Then, we shall take a closer look at the legal issues dealing with these border-crossing commutes in the second part.

2.1 A spatio-temporal delimitation of mobility

First of all, it is necessary to focus on the meaning of the word 'mobility', which, since the 2000s, has encroached upon other words such as travel or flow solely used in the field of

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

transport economy. Several stages are necessary to clarify the use of that word within our conception of cross-border daily mobility (Gerber, 2008).

So, spatial mobility is only used when dealing with people (for goods, services or capital, the notion of flow is usually used for these movements within other economic and political systems) who travel within a well-defined geographical area (Kaufmann, 2005). In a second stage, the principle of a person's spatial mobility assumes that this person is endowed with a certain 'social quality': the individual is or can be moved (literally) and is thus regarded as a potentiality and a competence. Thus, depending on the social group he or she belong to, that person will be able to and willing to (or not to) move. As a result, spatial mobility becomes socio-spatial mobility or geographical mobility. Finally, and this is the last conceptual stage, Kaufmann's typology (2000) enables us to come up with a relevant distinction by separating different geographical mobilities along spatio-temporal criteria (figure 1).

Table 1. The different geographical mobilities

Spatial \ Temporal	Movement within a catchment area	Movement towards the outside of a catchment area
Cyclic movement	Daily mobility	Travel
Linear movement	Residential mobility	Migration

Source: Kaufmann (2000)

In addition, these criteria enable us to clarify the ambivalent characteristics of the cross-border labour market, which is associated with both cross-border (daily) commuters and cross-border migrants (Janssen, 2000; Shuttleworth, 2007). Thus, the temporal scale contrasts, on the one hand, cyclic journeys that explicitly involve regular repetition and, implicitly, a return to the starting point, and on the other hand, linear journeys, which do not require a return. The former temporality, which is at the core of our contribution, refers to a daily routine, and the latter to the life cycle itself. As for the spatial scale, it contrasts journeys within a catchment area with journeys beyond that area. The INSEE (2003, French National Institute for Statistics and Economic Studies) suggests defining 'catchment area' as 'the smallest possible area within which inhabitants have access to both facilities and jobs'. As a result, that area is an area that may offer activities and housing to individuals, whether they use these facilities in their everyday lives or not. These elements of the definition of geographical mobility tend to bring about the idea that commuting has a spatial and temporal impact. Let us take a closer look at these journeys within a catchment area, and regard them as geographical mobility that is now local (we shall just call it local mobility): what are the relevant thresholds to distinguish it from other types of geographical mobility, the residential migration and mobility of which may also spark off the development of a transnational labour market (Strüver, 2002)?

On a spatial level, Orfeuill (2000) chose to define local mobility as the whole set of journeys that occur within an 80 kilometre Euclidian distance (roughly equivalent to 100 km in real conditions). That threshold is justified by the use of fast means of transport (car, train, etc.) that make it possible to return home every day. In fact, the notion of distance depends on the chosen means of transport, in light of the fact that people devote on average one hour a day to commuting (Zahavi, 1974, even if this concept is discussed: see for example Joly, 2005). This criterion of spatial range seems relevant at first because it allows us to measure the catchment area in real terms, but the emergence of new mobility habits challenges that threshold, particularly since long journeys to work have become common, thanks to daily high-speed trains for example. As far as the Benelux is concerned, the 80 km standard may not be relevant. Indeed, if we focus on Luxembourg and reckon that most cross-border commuters drive or ride more than 40 km to work, and let us not disregard the impact of the East-European TGV that has been developing rapidly since 2007, the delimitations of the now border-crossing catchment area remain vague.

On a temporal level, the distinction between various types of spatial mobility is based on a definition of everyday life. At first, one might say that daily mobility aims at fulfilling everyday tasks, which does not help us in choosing a temporal threshold in order to define that kind of mobility. So, what does everyday life consist of? We may reasonably reject in this context the idea of 'everyday' meaning a daily repetition of activities (Enaux, 2009). Consequently, two arguments are put forward to define everyday tasks: repetition and routine (Ramadier, Lee-Gosselin, Frenette, 2005). Daily activities are repetitive within a short period of time, but it is nevertheless difficult to specify the length of that period. As it is repeated, it is easy for daily activity to become set in people's ways and, as a result, the routine, i.e. a habitual or mechanical performance of an established procedure through time, becomes fixed. Referring to these elements, we may distinguish daily activities from factual ones. The latter might be set in a person's catchment area but their 'exceptional' nature sets them de facto outside the range of everyday life.

As regards residential mobility, it is defined as a relocation of one's residence within the same catchment area. Without considering the reasons for moving, it is nevertheless easy to distinguish it from residential migration. The latter is more often related to a relocation due to a job opportunity in another area, mere sunworshipping or difficult living conditions in one's country of origin (political refugee, etc.). Residential mobilities are much more related to one's life cycle (birth of a child, getting married, etc.), opportunities within the local market for housing in areas that are more or less urbanised, trouble with neighbours or a wish for a new environment, thus following well-defined residential strategies (Bonvalet, Fribourg, 1990). This strategic delineation in any case means that residential mobility involves social, economic and cultural continuity.

If we limit the range of this research study, as specified earlier, to the cross-border labour market, we notice that the concept of daily mobility enables us to distinguish the two aforementioned types of cross-border mobility clearly from each other, that of commuters and that of migrants. By taking into account both conditions, i.e. a distance not exceeding 100 km and a regular activity, these in fact reflect the conditions raised by European states to qualify as a cross-border commuter.

2.2 A jurisdictional delimitation using spatio-temporal characteristics of daily cross-border mobility

A norm for spatial delimitation is used in the clauses of legal standardization of the cross-border commuter. As early as 1938, a convention signed by France and Switzerland established rules for neighbourhood relations stipulating that 'the border regions involved in this convention span a distance of 10 km on either side of the political border'. Later, as part of the Union of Western Europe in 1956, a convention signed by France and Western Germany also circumscribed the zones where exchanges might take place to 10 km on either side of the border. This distance was to be extended to 20 km three years later.

Spatial delimitation came along with a temporal delimitation in the EEC's regulations (1963). The text applied to Franco-German exchanges and specified that the cross-border worker was to return to his/her country of residence every day or at least once a week. As for Switzerland, in accordance with a convention signed in 1958, people might not work across the border unless they had been living in either country for at least six months. Here again, cross-border workers were expected to return to their country of residence every day. Moreover, they were to be in possession of a 'carte de frontalier' (a cross-border worker ID card).

Both these types of delimitations, spatial and temporal, brought forth a legal status of a 'cross-border worker/frontier worker', which was recognized as such within the European Union in 1971 and appeared in a set of EEC regulations no. 1408/71 on the application of social security schemes to employed persons, to self-employed persons and to members of their families moving within the Community: 'frontier worker means any employed or self-employed person who

pursues his occupation in the territory of a Member State and resides in the territory of another Member State to which he returns as a rule daily or at least once a week; however, a frontier worker who is posted elsewhere in the territory of the same or another Member State by the undertaking to which he is normally attached, or who engages in the provision of services elsewhere in the territory of the same or another Member State, shall retain the status of frontier worker for a period not exceeding four months, even if he is prevented, during that period, from returning daily or at least once a week to the place where he resides.'

In spite of the ill-coined phrase 'frontier worker', we may acknowledge that the spatial delimitation here matches that of the European Union, nowadays more particularly that of the Schengen area, while the temporal delimitation corresponds to the characteristics of daily mobility mentioned in the previous section. Thus, whereas 'national workers' pay their national insurance contributions and taxes solely in the country in which they work and live, and also receive welfare allowances there, these European regulations stipulate that these cross-border commuters may benefit from a coordination of social security systems of different member states. The implementing regulation (CEE no. 574/72) has been modified since then, due to numerous cases of legal precedents, be they in the field of taxes or social welfare (Belkacem *et al.*, 2006).

These changes in the implementing rules of the various systems of social allowances and coordination are revealing in regard to the paradox embodied by a cross-border worker travelling routinely beyond the boundaries of his country. That paradox is relevant since, if we transpose Dimitrovova's proposal (2008), a national border, which the member states vouch for, acts both as 'border confirming' and as 'border transcending', among other dimensions that are not detailed here (see Paasi, 1996 or more recently Reitel, 2011). Dimitrovova mentions that distinction respectively for i) European countries of the Schengen area and other countries on the one hand and for ii) European countries within the Schengen area on the other hand. In the case of the Benelux, the part played by the 'border confirming' concept consists of maintaining the differentials, notably the macroeconomic ones (such as wages, property or real estate income) on either side of the borders, whereas 'border transcending' aims at taking part in the process of European territorial cohesion by helping set up zones of interaction, exchanges and homogenisation that would help curb macro- and micro-economic discontinuities. Actually, we might wonder whether the dual aspect that we can find in borders (both an interface and a barrier) might be represented by the cross-border worker's everyday life as well. This issue will be developed in the next part.

3. Cross-border confirming or transcending? The cross-border daily mobility question

A strong desire for European territorial cohesion has only recently been expressed in comparison with the attempt to achieve social and economic cohesion. Whereas the term 'cohesion' appeared in the Single European Act as early as 1986, territorial cohesion was first officially mentioned in the treaty establishing a constitution for Europe in 2004. According to Grasland and Hamez (2005), this adjective has several goals within the legislative context. These goals add up to the part played by cross-border workers, as mentioned in detail previously. Thus, apart from aiming to restrain various disparities among European areas, territorial cohesion means that citizens might have access to services providing basic needs wherever they are located in a given territory; access, more particularly to work, becomes essential, and is all the more so as far as cross-border commuters are concerned. Furthermore, spatial dimensions can be found in the field of territorial cohesion, which ranges from a local scale (urban ghettos are mentioned) to a macro European scale, depending on the different official zoning processes (which are often regional). A priori, all those objectives that are related to territorial cohesion match the process of border transcending, i.e. they play the part of an interface within which the number of interactions and

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

exchanges from one side of the border to the other one might increase. That issue will be part of the first section, and it will be completed with the 'border confirming' concept. Then, in the second section, we will tackle the hypotheses dealing with the measurement of both concepts thanks to the indicators defined.

3.1 On the difficulty of measuring border confirming or border transcending: the set of issues

The growth of cross-border cooperation is regarded as an attempt to make this border-transcending process a reality, thanks to the various levels of territorial agents that have been becoming increasingly involved during the last decades. Thus, after World War Two, the states themselves signed most of the agreements dealing with cross-border cooperation.

Macroeconomic differentials

In 1948, for example, the Treaty of Brussels explicitly mentioned an economic, social, cultural and military collaboration between the United Kingdom, France, the Netherlands, Belgium and Luxembourg. The same year, the latter three countries created the Benelux, the purpose of which was to suppress import taxes for internal reciprocal trade on the one hand and to agree on a common import tax level for non-member countries on the other. Without going through all the stages that led to the creation of the European Union in the second half of the twentieth century (an overview is proposed in Wastl-Walter, Kofler, 2000), one cannot but acknowledge that the decisions have mainly been taken on the spatial scale of the state.

These decisions were intended, among other things, to curb the social, economic and territorial disparities that are due to the presence of state borders. For example, Plat and Raux (1998) specify that traffic flows and exchanges are divided into two because of, among other reasons, the borders existing between the Benelux, France and Germany. They nevertheless point out that urban morphology and road infrastructures, the qualities of which might vary from one side of the border to the other, should also be taken into account. In this case, borders might be considered to be indicators, lines of difference that exist between countries, and are still perceived as physical barriers by the states (in reference to the 'flow approach' see Van Houtum, 2000).

However, the regional scale became involved in the process of integration and cohesion as early as the 1960s, and this was achieved with the support of the European states. Thus, the first Euregio was created in 1958 along the German-Dutch border, around the town of Gronau (it was soon followed by the Rhine-Meuse Euregio and others). However, this process of transregional integration would only become a reality when numerous interregional or transregional cross-border projects were launched, thanks above all to the growth of European funds such as INTERREG in the 1990s, following the European Outline Convention on Transfrontier Cooperation between Territorial Communities or Authorities, which was signed in Madrid in 1980. Thus, this second regional scale is intended to reduce the disparities on either side of a border. This is so because regional agents still perceive the border as an obstacle preventing the success of cooperation and integration (also called the 'cross-border cooperation approach', Van Houtum, 2000).

The main macro-economic causes of the current relative increase in cross-border work are to be found in the combination of the flow and cross-border approaches, that is to say the concomitant presence of economic discontinuities and access to work strengthened by easy transregional exchanges, opportunities for contact and exchanges. This indeed means that, as Pierrard (2008) states in an incomplete way, a cross-border commuter will pass through a border on the condition that 'wage income differentials, employment opportunities and individual risk assessment' are available, and only as long as there is no deterring geographical impediment.

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

Micro and psychological effects

Nevertheless, the conditions leading to the existence of and the increase in cross-border work might sometimes be impeded by specific psychological, social or cultural considerations. Thus, as Strüver (2002: 23) points out, 'the process of European integration has a stimulating impact for cross-border regions - especially economically and politically. But, despite the removal of borders as barriers to trade, investment and labour mobility, sociocultural obstacles to the free movement of employees persist.' Indeed, if we focus again on the first Euregio between Germany and the Netherlands back in 1958, the number of cross-border commuters has not waxed again. That is why we may infer that there must be other barriers related to individuals that interfere with the crossing of borders. This new scale, a psycho-social one, appears at the level of the border confirming process.

More specifically, borders have to be regarded as a human-created mental and symbolical notion. In this new approach, which Van Houtum (2000) now calls the 'people approach', borders are deemed to be constituents of ways of life that differ from one another, depending on which side of the border people are located. This psycho-social distance makes it possible for human beings to shape their own identities thanks to the setting up of mental hierarchies and social distinction (Bourdieu, 2000) and the feeling of belonging to different socio-spatial groups (Moles, Rohmer, 1972). This social and psychological process at work is characterised by the production and reproduction of borders being the very cause of their maintaining: physical barriers disappear and are replaced by particular representations that are related to emotional and mental (Van Houtum, 1999) asymmetrical barriers.

As far as cross-border commuters are concerned, these barriers become blurred since these people cross a border every day to go to work and they mix with wage-earners from their host country. They might even start creating a social network or fulfilling tasks that are not related to work, such as shopping, leisure activities, etc. Starting from the previous definition of a catchment area, since the working place is part of it, a cross-border catchment area is available to the cross-border worker. However, psychosocial barriers might subsist in spite of daily cross-border commuting. These barriers, these representations, can be measured along different indicators.

The cross-border catchment area as a proxy for the border transcending process

When trying to define how cross-border commuters perceive a cross-border catchment area, one has to consider different indicators. Spatial habits are usually analysed in order to determine the extent to which an individual becomes involved in different areas. We must therefore more particularly measure how often an individual frequents specific places. However, such an index of representations is deficient insofar as it does not provide us with all the values that constitute these representations, for instance, the feeling of belonging (I am from here) or the emotional dimension (I feel well in this place). Spatial habits are thus to be completed with other indicators. The suggested approach is based on the concept of attachment (to a place), the dimensions of which have not been established yet, nor has a proper and stable way of measuring them been found (Giuliani, 2003; Kleit, Manzo, 2006).

Thus, the feeling of belonging develops from a set of different elements that interfere either concomitantly or separately. Among these elements, the social relations established within places are significant. Frequenting a place in person and on a regular basis might help acquire a feeling of belonging but that is not enough: social commitment, such as being a member of a club or just making friends, is also required (Gerson, Stueve, Fischer, 1977). According to these authors, social commitment has to bring about satisfaction entailing some stability towards the place. That stability makes individuals refrain from swapping places. Nevertheless, social relations are but one component of the attachment to the place, which corroborates some authors who see border transcending as a source of networking and social exchanges (Axford, Lavenex or Rumford cited

by Dimitrovova, 2008: 62). Another aspect, which is just as meaningful, refers to the identity dimension (Ramadier, 2007). This has to do with the relation between the image of the place as it is perceived and all the images that have been stored by individuals throughout their lives. Consequently, in this context, the word 'identity' is to be understood as a correspondence or an adequacy between a place's characteristics and an individual's values. It may relate to physical elements such as the type of building, cultural elements such as the language, or merely the atmosphere. Actually, these elements are diverse but an individual values them by allowing them to be a frame of reference for identification.

In addition to the identity aspect, these places carry a whole set of symbols. Phrases such as 'business district', 'historical district' or 'country' refer to semantic constructions that were elaborated socially. In this case, once an individual or a social group has assimilated the symbol, there is no need to frequent the place personally for the feeling of belonging to expand. In a way, the symbolic aspect is therefore also based on an identity, but a collective one.

Defined in this way, place attachment becomes a relation that develops through social links, identity links and symbolic links. If it is applied to different locations, it enables us to specify their meaning and, focusing on a cross-border commuter's catchment area, to deduce from them the essence of his/her representation of that area. To an individual's mind, attachment to a place does not rule out a logic of 'multi-attachment'. Different geographical scales may be concerned, from a house to the whole planet, as well as a neighbourhood, a village, a city, a region or a country (Guérin-Pace, 2007; Gustafson, 2005; Moles, Rohmer, 1972). From this point of view, cross-border commuters can be seen as a specific population since their everyday activities span several countries. So, what do these different national parts of their catchment area mean to them? Or, in other words, how do they perceive their cross-border catchment area?

3.2 Hypothesis

By cross-checking these conceptual approaches, which offer a supplementary and paradoxical interpretation of borders, be it on a macro-economic level or on the scale of an individual, we might wonder whether a cross-border commuter might not be the very embodiment of that paradox. Thus, a cross-border commuter would match the representation of the highest degree of European integration, linking the working place to the catchment area. In other words, cross-border commuters, commuting every day, could strengthen European territorial cohesion:

- first by being rational and willing to work on the other side because of macroeconomic differentials (part 3.1) and
- subsequently, by getting to know other people, which entices them to communicate, to consume, in one word, and to be integrated into another national territory thanks to a feeling of belonging, thus merging their working place within their catchment area (part 3.2).

This double hypothesis comes within the macro-economic (differentials) and microsocial (feeling of belonging) scales, which are to be defined through an exploratory and empirical study. Focusing on the Benelux context, which offers suitable surroundings for transborder analyses, these questions might be answered provided comparable and adapted data are available.

4. The Benelux: the macro context and micro level of the daily cross-border mobility

Composed of three countries, the economic potentials of which are relatively different from one another, the Benelux is an appropriate case to study the issue of cross-border commuting. Thus, some pregnant differentials that have been observed regarding these three countries will first be broadly outlined. These differentials will show a real gap between the rate of cross-border

commuters in Luxembourg and the rate in the other two countries. In the second part, we will tackle the method of quantitative analysis that is used as part of a micro-economic approach, the main results of which will be dealt with in the last part.

4.1 The Benelux macro differentials of border confirming: examples

This applies to all transborder interregional analyses: data may not always be properly compared when it comes to economic differentials, which are one of the main causes of cross-border work. However, within the 27-member EU,² the Benelux was the entity hosting the largest number of cross-border commuters in 2006–2007, with more than 211,000 workers involved, amounting to almost half the total EU figure, i.e. 511,222.³ Luxembourg alone gathers nearly 128,000 cross-border commuters, that is, a quarter of all EU commuters and more than half those of the Benelux. A total of 46,611 commuters cross the border to the Netherlands and 37,135 to Belgium.⁴ All in all, their number has increased by 153% within 12 years, from 1995 to 2007.

Table 2. Cross-border commuters in Benelux

Country of origin	Host country	In 1995	In 2007	Progression (%)
France	Belgium	11,006	29,665	169.5
The Netherlands	Belgium	3,600	7,000	94.4
Germany	Belgium	470	470	0
Belgium	The Netherlands	13,256	31,481	137.5
Germany	The Netherlands	1,350	15,130	1,021.7
France	Luxembourg	27,800	64,100	130.6
Belgium	Luxembourg	16,600	34,633	108.6
Germany	Luxembourg	9,800	28,800	193.9
Total		83,882	211,279	152.7

Sources: MKW, Empirica (2009), Direction Générale des Études, Série Affaires sociales - W 16A, Niederlandenet.

This progression can be easily explained at the macro level by taking up the causes developed by Pierrard (2008) and MKW, Empirica (2009), in relation to, among others, the differentials in unemployment and job opportunities. Thus, when examining the percentages of unemployed people in all three countries during the previous decade or the evolution of the GDP per

² Logically, Malta and Cyprus are not taken into account here.

³ Switzerland is not a member state of the EU; therefore, the statistics mentioned in this paper will not include that country, which hosted more than 200,000 cross-border commuters in the years 2006/2007.

⁴ The latter two figures are underrated due to different official sources, taken from Belgian and Dutch social security offices that ignore Dutch citizens living in Belgium, for instance. Thus, if we only take into consideration the MKW source, Empirica (2009), the number of commuters travelling to the Netherlands amounted to 58,115 in 2007/2008.

inhabitant, it is obvious that the annual mean variables bring to light accentuated wealth for Luxembourg, followed by the Netherlands and leaving Belgium behind (cf. table 2).

Table 3. Unemployment and GDP per capita in Benelux

	Unemployment (% active population)				GDP/Inhabitants (in €)		
	1998	2001	2004	2007	2000	2004	2007
Belgium	9.3	6.6	8.4	7.5	24,600	27,900	31,500
Luxembourg	2.7	1.9	5	4.2	50,400	60,000	78,100
Netherlands	4.3	2.5	5.1	3.6	26,300	30,200	34,900

Source: Eurostat (2010), http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

So, in spite of the declared European political desire to attune EU member states at an economic and monetary level (and the Benelux aiming at this goal even earlier), we cannot but note that the differentials have not been eradicated. Grasland and Hamez's study (2005) completes this descriptive analysis thanks to the scrutiny of territorial discontinuities using various economic as well as demographic criteria. As a result, the authors notice, between Luxembourg and Belgium, a 'type-A' gradient, which corresponds to an area much more affluent than the neighbouring one, the latter being marked by a young population and a higher unemployment rate. This configuration greatly encourages cross-border work. On the other hand, Belgium and the Netherlands show a 'type-B' discontinuity, i.e. a relatively high economic differential but convergence at the demographic level. Crossing the border from Belgium to the Netherlands may well be appealing, but the potential of the workforce catchment area, mainly Flemish in this case, is not as abundant as the one between Wallonia and Luxembourg. This is the main reason why fewer Belgians commute to the Netherlands than to Luxembourg.

That Luxembourg hosts so many more cross-border commuters is therefore a special case. These commuters make up more than 45% of the workforce in Luxembourg and are now the subject of demographic projections published by the national institute for statistics STATEC (Langers, Peltier, 2010) in order to be able to respond to the hazards of economic growth. So, the projected number of cross-border commuters, at the base of the scenario being 136,000 in 2010, ranges from 138,957 to 685,454 depending on the predictions resulting from 6 different scenarios anticipated as far as 2060. Economic growth was conjectured diversely in these scenarios and this accounts for the width of that range. However, resident work is not expected to evolve greatly since the figures for workers residing in Luxembourg fluctuate between 293,500 and 349,200 during the same period.

The examples of macro-economic differentials are manifold (the housing market or the salaries are also taken into consideration within these differentials) and they will not all be listed here. However, these few quantified comparisons clearly reveal a border-confirming process that the states hope to retain in order to boost their own economic growth at the expense of the territorial, economic and social cohesion that the European Commission is striving to reach. We must admit that the conditions that could help integrate the different markets have not been brought together yet; protectionism and/or economic nationalism (if we are to use the concepts of a free-market economy) do still exist on the scale of the member states. We might therefore wonder whether a stable and long-lasting solution does not lie in a Europe of the citizens where cross-border commuters would play a role as border-transcending actors.

4.2 Data set, method and results for measuring the micro differentials of border transcending

We shall then focus on a specific approach dealing with the main dimensions of the concept of attachment felt by Belgian commuters working in Luxembourg as a proxy for the border

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

transcending process. When tackling the issue of transnational representations of a catchment area we use the quantitative and representative survey 'Frontaliers' carried out by the Ceps/Instead in Luxembourg in 2003 in face-to-face, a method of execution that has never been practiced before. In total 2,470 cross-border commuters (658 from Belgium) were involved and the survey was conducted along spatial stratification as well as socio-demographic criteria. The survey was divided into numerous sections following a standard operating procedure consisting mostly of closed questions/answers. These sections focused on the following topics: professional training and career, accommodation, daily and residential mobilities, as well as attachment to the place. As far as the latter topic was concerned, the survey followed Churchman and Mitrani's approach (1997), which is to say that commuters were asked in a forthright manner about their attachment: 'Are you attached to ...?' That question was reiterated and dealt with four geographic scales, namely the municipality, the administrative region, the country of residence and the catchment area. In order to avoid various interpretations of the notion of catchment area, the following definition was given to the respondents: 'the group of municipalities within which you can find most of the shops and services that you regularly need'. The respondents were asked to answer each of these levels according to a psychometric scale ranging from 'not attached at all' to 'a bit', 'quite', 'a lot' and 'hugely', as shown in figure 1.

As we can see, the country of residence stands out with nearly 50% of cross-border workers feeling attached 'a lot' and 'hugely' to it, catchment area comes just behind (47%), followed by Wallonia (46%) and lastly the commune of residence (42%).

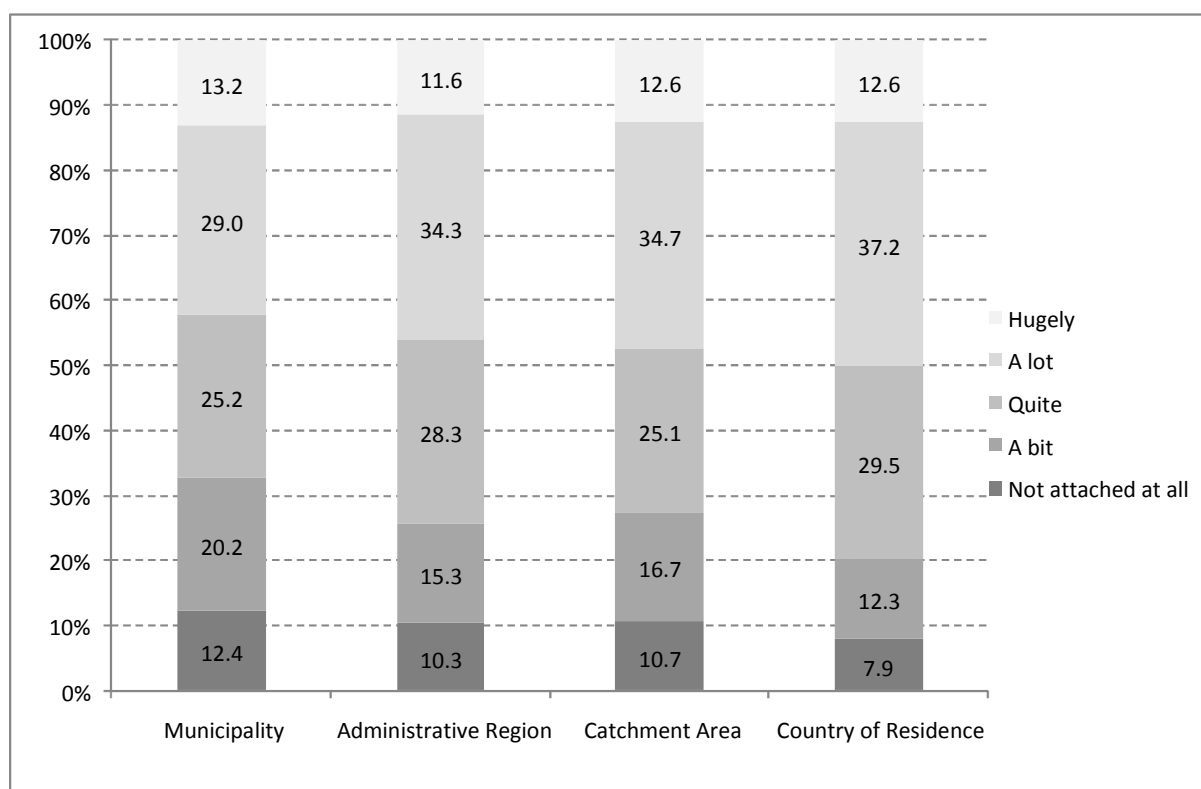


Figure 1. The Belgian-Luxembourgish cross-border workers' attachment to several territorial entities

Source: Cross-border survey 2003, Ceps/Instead (N_{Belgium} = 658)

When respondents said they felt greatly attached (i.e. answered 'a lot' or 'hugely') to the catchment area, they were asked to specify whether they considered their working place to be

part of that area. Of the half of the cross-border workers who reported being attached to the catchment area, 71% of them stated that their workplace is an integral part of this area. This result characterises the existence itself, for these cross-border commuters, of a border transcending process, and with it the possibility of developing stronger interactions on the part of other transnational populations.

This strong attachment exists despite high distance and time journeys to work (i.e. a median of 40 km in one way: see Carpentier, Gerber, 2009). However, aspects of daily mobility can generate differences of interpretation in the transnational representation of the catchment area. For example, there is a decrease in attachment with increasing distance between home and work: 82% of border residents within 30 km of their workplace feel that it is in their catchment area, opposed to only 76% of those who travel over 60 km each way.⁵ This confirms the positive or negative appreciation of the journey to work: among the workers satisfied with their daily mobility, 82% include the workplace in their catchment area; the statistic is 75% for those who are not satisfied. Also, of the car users (nearly nine-tenths of the cross-border commuters), 80% include the workplace in their catchment area. The figure is more than 73% among those who use alternative transportation. Other characteristics are involved in understanding the transnational representation, such as symbolic or identity characteristics and socioeconomic particularities. On the other hand, few socio-demographic aspects differentiate transnational representation of the catchment area (the respondents' age or gender does not give significant results). To prioritize these various causes, these explanatory variables were isolated then structured in four thematic groups: the variables related both to identity and to the set of symbols (1), those qualifying daily mobility and places for activities (2) and, in order to add a more traditional perspective, the socio-economic (3) and socio-demographic (4) variables. They were then subject to particular statistical modelling.

Indeed, these two straight questions about the feeling of attachment show a bond of dependence that has been taken into account when establishing the pattern of the factors contributing to shaping the types of representation of a catchment area (transnational representation vs. national representation). The dichotomous dependent variable is the one related to the working place: the latter may or may not be part of the catchment area, and the pertaining modalities are '1: yes' and '0: no'. This requires the a priori use of a classic probit or logit model. Nevertheless, it gives rise to a problem of selection because the answers were only given by a particular subgroup of the sample, namely the people who said they were 'a lot' or 'hugely' attached to their catchment area (which would mean that all the other commuters are no longer part of the issue). The distribution of this subgroup is probably no longer random in comparison with the original sample and this might well entail bias when it comes to estimating the models insofar as the answers to questions on attachment would be correlated with those on the working place. In order to have unbiased estimators, we use a statistical procedure that was first developed by Heckman (1979) and later by Van De Ven and Van Pragg (1981). It is carried out here within the framework of a simultaneous probit model, also called Heckman's sample selection model or 'probit model with selection' (Askenazy, 2005). This technique considers two equations that are estimated simultaneously (for the implementation of the model and the details of the marginal effects of the different variables, see annex 1 and, for more details, Enaux, Gerber, 2008).

The results are mostly devoted to the economic dimension. Among the Belgian residents, job seeking is a substantial factor impeding the growth of a transnational representation, but social relationships within the country of residence are no longer significant. The language barrier is as consequential, and induces -9 percentage points of probability. The synthetic image resulting from the parameters of the Belgian model indicates that only the level of salaries significantly and

⁵ The few descriptive results presented here are constrained to be significant (by chi-square) at the 10% level or less.

positively contributes to a transnational representation. Thus, the economic dimension seems to be the most influential dimension as far as such a representation is concerned. Such a phenomenon cannot be unrelated to the financial precariousness of the inhabitants of the easternmost part of Wallonia, still a mostly rural area. Conversely, this transnational representation is constrained by a job search reflecting dissatisfaction with the ongoing occupation and, but to a lesser extent, the language barrier, an obstacle often mentioned in the literature (Janssen, 1999). The variables related to daily activities performed in Luxembourg, in turn, give little significance to the analysis, contrary to what the recent concept of 'unfamiliarity' suggests (Spierings, Van der Velde, 2008).

Thus, the quantitative approach to border transcending, built from a measurable indicator, 'working place belongs to the catchment area', brings new insights into this phenomenon. This representation indeed applies to the vast majority of the cross-border commuters, suggesting that the social and territorial cohesion can rely on this particular active population, despite the relatively long distances between home and work. By bringing together many groups of variables mentioned above, in economic terms with the differential incomes, on a cultural level with the language barrier or on a psychosocial level with the belonging of territorial attachment, it is clear that these commuters are undoubtedly one of the populations most likely to promote the cross-border integration desired by European technocrats.

5. Discussion and conclusion

'At present there does not seem to exist a theoretical model that fully explains cross-border commuting' (Gottholmseder, Theurl, 2007: 101). Without claiming to identify a new theory about this subject, the article presented here is more a completion to further the existing corpus conceptually. Thus, the approach is firstly a confrontation between, on one hand, the concept of geographic mobility and its spatio-temporal specificities and, on the other, the legislative aspects of the international labour force in the Schengen area. This confrontation has contributed to clarifying the distinction between a globalized labour market related to residential migration and a cross-border labour market that implicitly assumes the existence of a cross-border catchment area. The application of the concept of mobility was then discussed by a theoretical model transfer of confirming and transcending borders, which ultimately enabled the juxtaposition of two scales of analysis, an interregional and an individual level. These two scales are combined as a partial explanation for the development of cross-border daily mobility.

This research and explanatory position questions the concept of the 'immobility' of the labour force as some European authors argue, in particular for reasons of attachment to the country of origin and an 'attitude of indifference' towards foreign countries (Van Houtum and Van der Velde, 2004). Certainly, as discussed in part one and part three of this paper, these psychosocial characteristics undoubtedly exist for the cross-border commuters from Benelux, and *a fortiori* for other types of workers. Psychological barriers appear in the microeconomic model, while crossing the border daily would suggest that a strong cognitive routine emancipates these barriers, at least partially. Nevertheless, the existence of a cross-border catchment area, a proxy for the socio-spatial feeling of belonging measured through an *ad hoc* quantitative survey, reflects a real social construct for the majority of cross-border Belgian commuters working in Luxembourg. This exploratory analysis indicates at least that the process of border confirming objectively applies to the cross-border commuters.

In addition, at the interregional level, the existence and growth of the cross-border phenomenon can only happen when the macroeconomic differentials on both sides of the border are substantial and qualitatively diverse. In the case of Benelux, these differentials fully justify the observed increase in cross-border work, especially in the small country of Luxembourg. These

differentials do not facilitate European economic harmonization; the European Commission is fully aware of this reality (2001).

Thus, by combining a macroeconomic level and a scale measuring the psychosocial outcome of a micro-individual distance, the cross-border phenomenon is refined while providing new research opportunities and perspectives. Indeed, this overlapping of scales can be seen as a theoretical grid for new quantitative or qualitative surveys.

Located in cross-border regions in comparable geographical and economic contexts, these quantitative surveys would then be applied to cross-border and non-cross-border commuters, in order to compare their psychosocial barriers. By interviewing both active people crossing the border daily and others who practise daily flows on national roads, their perceptions could be compared according to appropriate and homogenized protocols. Also, it would be interesting to include some control variables, including those related to macroeconomic differentials. For instance, the domestic housing, which often reflects major differences on the two sides of the border, could have a real impact on the results at the micro level, while taking into account some macro differentials.

On the qualitative side, we could imagine a more in-depth study in search of a better understanding of the representations of the (cross-border) catchment area, by identifying and measuring some border barrier effects. One perspective is that the participant could draw a map of his action space (Dijst, 1999) through a mental map (Gould, White, 1974). The user would have to reproduce his itineraries during the last two days, for example, assess his route time and specify his stopping places and the activities related to them from his memory. Then, the user would locate (or not) on the mental map the barriers according to his opinion in his action space. From there, the questionnaire design should integrate the relationships existing between the presence/absence of border marks and action space.

Finally, a methodological opening that fits well with the intersection of the micro and macro scales is the multilevel analysis (e.g. De Leeuw, Meijer, 2008). In this framework, individual survey data, constructed to measure the process of transcending a border, would be combined with those of the interregional context (a proxy for the border confirming process). Thus, the exploratory reasoning would be applied simultaneously to the different geographical scales.

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References

- Askenazy, P. (2005). Sur les sources de lintensification. *Revue Économique*, vol. 56, no.2, pp. 217–236.
- Barel, Y. (2008). *Le paradoxe et le système. Essai sur le fantastique social*. Grenoble: Presses Universitaires de Grenoble (1st ed. 1979).
- Belkacem, R., Borsenberger, M. and Pigeron-Piroth, I. (2006). Les travailleurs frontaliers lorrains. *Travail et Emploi*, no.106, pp. 65-78.
- Bonvalet, C. and Fribourg A.-M. (1990, ed.). *Stratégies résidentielles*. Actes du séminaire (Paris 1988). Ed. INED, Plan Construction et Architecture, MELTM, 459 p.

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

Bourdieu, P. (2000). *Les structures sociales de l'économie*. Paris: Éd. du Seuil.

Carpentier, S. and Gerber, P. (2009). Les déplacements domicile-travail: en voiture, en train ou à pied?. *Vivre au Luxembourg*, no.53, 2 p.

Churchman, A. and Mitrani, M. (1997). The role of the physical environment in culture shock, *Environment and Behavior*, no.29, pp. 64-86.

Dimitrovova, B. (2008). Re-making of Europe's borders through the European neighbourhood policy. *Journal of Borderlands Studies*, vol. 23, no.1, pp. 53-68.

De Leeuw, J. and Meijer, E. (2008, ed.). *Handbook of Multilevel Analysis*. New York: Springer.

Dijst, M. (1999). Action space as planning concept in spatial planning. *Journal of Housing and the Built Environment*, vol. 14, no.2, pp. 163-182.

Enaux, C. (2009). Processus de décision et Espace d'activités/déplacements. Une approche articulante routine cognitive et adaptation événementielle, *Cybergeo: European Journal of Geography*, Espace, Société, Territoire, article 453.

Enaux, C. and Gerber, P. (2008). Les déterminants de la représentation transnationale du bassin de vie. Une approche fondée sur l'attachement au lieu des frontaliers luxembourgeois. *Revue d'Economie Régionale et Urbaine*, no.5, pp. 725-753.

European Commission (2001). *New European Labour Markets. Open To All, with Access To All*. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2001:311:0060:0063:FR:PDF> (downloaded in December 2010).

Gerber, P. (2008, ed). *MOBILLUX. Comprendre les interactions entre les mobilités quotidienne et résidentielle au Luxembourg et son aire métropolitaine transfrontalière*. Scientific final report for the FNR (National Research Found), Luxembourg, June 2008, 120 p. Available from http://mobilit.ceps.lu/fichiers/MOBILLUX_rapport_scientifique.pdf. Last access: 6th March 2012.

Gerson, K., Stueve, C. and Fischer, C. (1977). Attachment to place. In Fischer, C. et al. (Eds.) *Networks and Places*. The Free Press, pp. 139-161.

Gijssels, P. de and Janssen, M. (2000). Understanding the Dutch-German cross-border labour market: Are highly educated workers unwilling to move?. *Tijdschrift voor Economische en Sociale Geografie*, vol. 91, no.1, pp. 61-77.

Giuliani, V. (2003). Theory of attachment and place attachment. In Bonnes, M., Lee, T., Bonaiuto, M. (Eds.). *Psychological Theories for Environmental Issues*, pp. 137-170.

Gottholmseder, G. and Theurl, E. (2007). Determinants of cross-border commuting: Do cross-border commuters within the household matter?. *Journal of Borderlands Studies*, vol. 22, no.2, pp. 97-112.

Gould, P. and White, R. (1974). *Mental Maps*. Harmondsworth: Penguin Books.

Grasland, C. and Hamez, G. (2005). Vers la construction d'un indicateur de cohésion territoriale européen?. *L'Espace Géographique* no. 2005-2, pp. 97-116.

Guérin-Pace, F. (2007). Le quartier entre appartenance et attachement: une échelle identitaire? In Authier, J.-Y., Bacqué, M.-H., Guérin-Pace, F. (eds). *Le quartier: enjeux scientifiques, actions politiques et pratiques sociales*. Paris: La Découverte, Coll. Recherches, pp. 127-138.

Gustafson, P. (2005). International migration and national belonging in the Swedish debate on dual citizenship. *Acta Sociologica* vol. 48, no.1, pp. 5-19.

Heckman, J.J. (1979). Sample selection bias as a specification error. *Econometrica*, vol. 47, no.1, pp. 153-161.

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

INSEE (2003). *Structuration de l'espace rural: une approche par les bassins de vie*. Rapport remis à la DATAR. http://www.insee.fr/fr/ffc/docs_ffc/bassins_vie/rapport.htm (Downloaded in October 2010)

Janssen, M. (1999). Obstacles and willingness for cross-border mobility: The Dutch-German border region. In Gijssel P. (de), Janssen, M., Wenzel, H.J., Woltering, M. (eds.). *Understanding European Cross-Border Labour Markets. Issues in Economic Cross-Border Relations*. Marburg: Metropolis, pp. 143-164.

Janssen, M. (2000). Borders and labour-market integration: Where is the difference between interregional and cross-border mobility? In Van der Velde, M., Van Houtum H. (eds.). *Borders, Regions and People*. London: Pion, pp. 47-68.

Joly, I. (2005). *L'allocation du temps au transport – De l'observation internationale des budgets-temps de transport aux modèles de durées*. Lyon: Thèse de doctorat en sciences économiques et économie et des transports, 489 p.

Kaufmann, V. (2000). *Mobilité quotidienne et dynamiques urbaines – la question du report modal*. Lausanne: Presses Polytechniques et Universitaires Romandes, Coll. Science, Technique, Société, 252 p.

Kaufmann, V. (2005). Mobilités et réversibilités: vers des sociétés plus fluides?. *Cahiers internationaux de sociologie*, Vol. CXVIII, Mobilité et modernité. Paris: PUF, pp. 119-135.

Kelly, P. (2011). Space, place and labour. In Leyshon, A., Lee, R., McDowell, L., Sunley, P. (eds). *The SAGE Handbook of Economic Geography*. London: Sage Publications, pp. 149-160.

Kleit, R. G. and Manzo, L. (2006). To move or not to move: Relationships to place and relocation choices in HOPE VI. *Housing Policy Debate*, vol. 17, no.2, pp. 271-308.

Kondoh, K. (1999). Permanent migrants and cross-border workers: The effects of the host country. *Journal of Regional Science*, vol. 39, no.3, pp. 467-478.

Langers, J. and Peltier F. (2010). Projections socio-économiques 2010-2060. *Bulletin du STATEC*, Luxembourg, no.5, pp. 249-290.

Lannoy, P. and Ramadier, T. (2007, ed). *La mobilité généralisée. Formes et valeurs de la mobilité quotidienne*. Louvain-la-Neuve: Bruylant-Academia, 141 p.

Lee, E.S. (1966). A theory of migration. *Demography*, vol. 3, no. 1, pp. 47-57.

Likert, R. (1969). A technique for the measurement of attitudes. In Summers, G. (ed.). *Attitude Measurement*, Chicago: Rand McNally, pp. 149-158.

MKW Wirtschaftsforschung GmbH, Empirica Kft. (2009). *Scientific Report on the Mobility of Cross-Border Workers within the EU-27/EEA/EFTA Countries*. Final Report. Report commissioned by European Commission, DG Employment and Social Affairs, 86 p.

Moles, A. and Rohmer, E. (1972). *Psychologie de l'espace*. Paris: Casterman, Coll. Mutations-Orientations, 162 p.

Orfeuill, J.-P. (2000). La mobilité locale: toujours plus loin et plus vite. In Bonnet M., Desjeux D. (dir.). *Les territoires de la mobilité*. Paris: PUF, collection sciences sociales et société, 224 p.

Paasi, A. (1996). *Territories, Boundaries and Consciousness. The Changing Geographers of the Finnish-Russian Border*. Chichester: Wiley, 353 p.

Pierrard, O. (2008). Commuters, residents and job competition. *Regional Science and Urban Economics*, vol. 38, no. 6, pp. 565-577.

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

Plat, D. and Raux, C. (1998). Frontier impedance effects and the growth of international exchanges: An empirical analysis for France. *Papers in Regional Science: The Journal of the RSAI*, vol. 77, no. 2, pp. 155-172.

Ramadier, T. (2007). Mobilité quotidienne et attachement au quartier: une question de position? In Authier, J.-Y., Bacque, M.-H., Guerin-Pace, F. (eds.). *Le quartier: enjeux scientifiques, actions politiques et pratiques sociales*. Paris: La Découverte, Coll. Recherches, pp. 127-138.

Ramadier, T., Lee-Gosselin, M. and Frenette A. (2005). Conceptual perspectives for explaining spatio-temporal behaviour in urban areas. In Lee-Gosselin M., Doherty S. (eds.). *Integrated Land-Use and Transportation Models: Behavioural Foundations*. Oxford: Elsevier, 306 p.

Reitel, B. (2011). La frontière internationale, objet sémiologique, processus multidimensionnel, interface signifiante, CEPS/INSTEAD Working Paper no. 2011-43: 40.

Sassen, S. (1988). *The Mobility of Labor and Capital*. Cambridge, UK: Cambridge University Press.

Sheller, M. and Urry J. (2006). The new mobilities paradigm. *Environment and Planning A*, vol. 38, no. 2, pp. 207-226.

Spierings, B. and Van der Velde, M. (2008). Shopping, borders and unfamiliarity: Consumer mobility in Europe. *Tijdschrift voor Economische en Sociale Geografie*, vol. 99, no. 4, pp. 497-505.

Shuttleworth, I. (2007). Reconceptualising local labour markets in the context of cross-border and transnational labour flows: The Irish example. *Political Geography* 26, pp. 968-981.

Strüver, A. (2002). Significant insignificance – Boundaries in a borderless European Union: Deconstructing the Dutch-German transnational labour market. *Journal of Borderlands Studies*, vol. 17, no. 1, pp. 21-36.

Van De Ven, W.P.M.M. and Van Pragg, B.M.S. (1981). The demand for deductibles in private health insurance: A probit model with sample selection. *Journal of Econometrics*, vol. 17, no. 2, pp. 229-252.

Van Houtum, H. (1999). Internationalisation and mental borders, *Tijdschrift voor Economische en Sociale Geografie*, vol. 90, no. 3, pp. 329-335.

Van Houtum, H. (2000). An overview of European geographical research on borders and border regions, *Journal of Borderlands Studies*, vol. 15, no. 1, pp. 57-83.

Van Houtum, H., Van der Velde, M. (2004). The power of cross-border labour market immobility. *Tijdschrift voor Economische en Sociale Geografie*, vol. 95, no. 1, pp. 100-107.

Wastl-Walter, D. and Kofler, A.C. (2000). European integration and border-related institutions: A practical guide. *Journal of Borderlands Studies*, vol. 15, no. 1, pp. 85-104.

Zahavi, Y. (1974) *Travel Time Budgets and Mobility in Urban Areas*. Report for US Department of Transportation, Washington DC, 81 p.

Annex 1 – Probit with simultaneous equations modelling: explanations and results

One of the equations regards attachment to the catchment area as a conditional explained variable: the modal operator 0 will be translated as 'not attached' and the modal operator 1 as 'attached a lot or hugely'. The second equation has a dependent variable, which is 'the working place is part of the catchment area'; here 1 applies to 'is part of' and 0 applies to 'is not part of'. We can notice that the second dependent variable is only relevant to the people with modal operator 1 in the first equation. These two equations with binary dependent variables are

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

estimated simultaneously using maximum likelihood, which allows us to estimate the rho correlation between the residual terms of the two equations. If the coefficient is significantly different from zero in the results, this proves the existence of a selection bias that would alter the coefficients estimated when using a classic probit model. However, before discussing that aspect further, we will have a look at a simplified mathematical formalisation of these simultaneous equations. Suppose we have the following coded parameters:

ACA: the variable 'attachment to the catchment area' ($A = 1$ attached, otherwise $A = 0$)

WPBCA: the variable 'working place belongs to the catchment area' ($B = 1$ yes, otherwise $B = 0$);

W: the matrix of the explanatory variables with ACA as a dependent variable;

X: the matrix of the explanatory variables with WPBCA as dependent variable;

U: the vector of residuals for the model with ACA as a dependent variable;

V: the vector of residuals for the model with WPBCA as a dependent variable.

The easiest way to use the censored probit model effectively is to suppose the existence of two continuous latent (i.e. unobserved) variables WPBCA and ACA. These latent variables are supposed to be associated in a linear way with the explanatory variables X and W:

$WPBCA^* = CX + V$ (where C = vector of the coefficients of the parameters X),

$ACA^* = DW + U$ (where D = vector of the coefficients of the parameters W), with

$V \sim \text{Normal}(0, 1)$,

$U \sim \text{Normal}(0, 1)$, and $\text{corr}(V, U) = \text{RHO}$.

We are not observing the latent variables, but the binary variables $ACA = (ACA^* > 0)$, and $WPBCA = (WPBCA^* > 0)$. However, we only observe WPBCA if ACA equals 1.

Thus, the RHO coefficient measures the correlation of errors between the probability of being attached to the catchment area and the estimation of being part of the working place. When the result is a coefficient that is significantly different from zero, it means that there may be a selection bias if each equation is estimated separately. Estimating simultaneously parameters C, D and RHO enables us to avoid that obstacle. When the RHO coefficient is significantly different from zero in the results, Van De Ven and Van Pragg's model corrects the evaluation of the estimators. The explanatory independent variables W and X are structured in four thematic groups (see the table).

		ACA	WPBCA	Number (in %)
Dummies		Marginal effects	Marginal effects	
Identity and symbolic variables	Place of birth < 20 km from Lux. borders	ref.	ref.	40.26
	Place of birth 20-39 km from Lux. borders	0.14*	ns	16.34
	Place of birth 40-79 km from Lux. borders	ns	ns	14.83
	Place of birth 80-149 km from Lux. borders	ns	ns	10.36
	Place of birth 150-399 km from Lux. borders	ns	ns	11.95
	Place of birth > 400 km from Lux. borders	ns	0.11*	6.26
	Linguistic barrier: don't understand Lux.		-0.09**	56.72
	Linguistic barrier: don't speak Lux.		ns	73.27
	Strongly attached to the country of residence	ns		14.48
	Strongly attached to the region of residence	0.05***		9.21
	Strongly attached to the municipality of residence	0.19***		9.80
	Place to live/childhood place < 20 km from Lux. borders	ns	ns	44.63

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

	Place to live/childhood place 20-39 km from Lux. borders	ns	ns	17.90
	Place to live/childhood place 40-79 km from Lux. borders	ns	ns	14.48
	Place to live/childhood place 80-149 km from Lux. borders	ns	ns	9.21
	Place to live/childhood place 150-399 km from Lux. borders	ns	ns	9.80
	Place to live/childhood place > 400 km from Lux. borders	ref.	ref.	3.98
	Resided at least one month in Luxembourg		ns	11.91
Daily mobility and activities variables	Work in Luxembourg City		ns	33.69
	Activities in Luxembourg during journey to work		ns	24.89
	Satisfaction during journey to work		ns	73.73
	During journey to work by car		ns	85.07
	Distance between home and work < 18 km		ns	19.02
	Distance between home and work 19-25 km		ns	21.78
	Distance between home and work 25-31 km		ns	18.10
	Distance between home and work 32-41 km		ns	18.56
	Distance between home and work 42-51 km		ns	9.16
	Distance between home and work > 51 km		ref.	13.38
	Belgian municipality < 20,000 h	ref.		37.47
	Belgian municipality 20,000 to 30,000 h	ns		44.63
	Belgian municipality > 30,000 h	ns		17.90
Socio-economic variables	Current job satisfaction		ns	93.77
	Searching job		-0.29***	9.21
	First employment in Lux < 1989		ns	24.34
	First employment in Lux 1990-1994		ns	17.88
	First employment in Lux 1995-1999		ns	31.06
	First employment in Lux 2000-2003		ref.	26.72
	Wages < €1,500		0.11**	11.33
	Wages €1,500 to 2,000		ns	19.41
	Wages €2,001 to 2,500		ns	22.86
	Wages €2,501 to 3,500		ns	27.82
Wages > €3,500		ref.	18.58	
Socio-demographic variables	Cross-border alone (1-person household)	ref.	ref.	13.60
	Cross-border alone with 1 or several children in charge	ns	ns	2.89
	Cross-border alone with parent(s)	ns	ns	11.40
	Cross-border couple without children (2 are working in Lux)	ns	ns	7.26
	Cross-border couple with children (2 are working in Lux)	ns	ns	9.42
	Cross-border couple without children (1 is working in Lux)	ns	ns	18.70
	Cross-border couple with children (1 is working in Lux)	ns	ns	33.57
	Cross-border and other person(s)	0.08**	ns	3.16
	Man	ns		45.84
	Under 30 years old	ref.	ref.	29.21
	Between 30 and 39	ns		40.14
	Between 40 and 49	ns		22.65
	50 years old +	ns		8.00
	Primary education level	ref.	ref.	16.10
	Secondary education level	ns	ns	40.84
	College educated	ns	ns	43.06
	Owner by construction	ns		22.65
	Owner by acquisition	ns		8.00

Gerber

Advancement in Conceptualizing Cross-Border Daily Mobility:
the Benelux Context in the European Union

	Owner by inheritance	ns		6.72
	Tenants	ref.		26.94
	Free housing	ns		35.69
	Current housing tenure before 1985	ns		15.66
	Current housing tenure 1985-1990	ns		10.58
	Current housing tenure 1991-1995	ns		13.64
	Current housing tenure 1996-2000	ns		31.50
	Current housing tenure after 2000	ref.		28.62
	Number of observations	754	355	754
	RHO	-0.73		
	Wald test	Prob >		chi ² = 0.00

ACA: attachment to the catchment area (selection variable), WPBCA: working place belongs to the catchment area (dependent variable).

Significance threshold: *** < 1%, ** < 5%, * < 10%. Ref.: reference variable. Ns: not significant.