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Cross-Border Local Mobility between Luxembourg and the Walloon Region: an Overview

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The strong differentials on both sides of the Belgian-Luxembourger border, both in terms of salaries and housing prices, have stimulated for more than two decades the cross-border links between the two countries. Thus, whereas in 2008 nearly 40,000 residents of Belgium crossed the border each day to work in the Grand Duchy, between 2001 and 2007, more than 2,600 residents of Luxembourg went to live in Belgium, though they remained employed in Luxembourg. These cross-border movements, whether involving daily activities, such as journeys to work, or life cycle, such as moving home, are an indication of the influence of the border on spatial and social interactions.

Keywords: Daily Mobility, Residential Mobility, Belgium, Luxembourg, Border, Spatial Statistics

1. Introduction

European integration, in particular, the Schengen Area, the Euro currency and the abolition of systematic border controls have facilitated the mobility of goods and people. However, the borders have not been erased and this freedom of movement has not resulted in a levelling of socio-economic factors within the European Union. Differentials remain strong, and the Greater Region is a good example. For many years, Luxembourg played an important role in the economy of the Greater Region, as indicated by the huge number of cross-border workers (147,700 in 2009, STATEC) travelling everyday to the Grand Duchy. If these centrifugal movements to Luxembourg are now relatively well known (Gerber, Klein and Carpentier, 2011), we still understand very little about the centripetal movements, that is to say, those from Luxembourg to the rest of the Greater Region. However, cross-border differentials exist in both directions. Indeed, whilst the employment differential, most notably, wages (Berger, 2005), attracts material and immaterial flows to the Grand Duchy, other differentials, such as real estate price, lead to opposite flows. The case of flows of people between Wallonia and Luxembourg is in this context particularly interesting as the creation of the Benelux, as well as various bilateral agreements between Belgium and the Grand Duchy, have somehow anticipated a number of measures subsequently taken by the European Union (e.g. the single currency). Therefore, the main issue of this article is to analyse whether this context of facilitated mobility fosters the development of a more integrated functional space (Sohn, Reitel and Walther, 2009).

This paper will focus on two particular types of flows related to both daily and residential mobilities. Indeed, whilst many authors agree on the need to address simultaneously the daily

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and residential mobility within a system of local mobility (Yapa, Polese and Wolpert, 1971; Baccaïni, 1997), few studies provide concrete application (Van Ommeren, Rietveld and Nijkamp, 1998; Scheiner, 2006; Motte-Baumvol, Massot and Byrd, 2010). The reason is probably because the joint analysis of daily and residential mobility poses a double challenge: a) conceptual – the need to analyse simultaneously two types of mobility with different temporalities; b) methodological – in so far as, despite the link between daily mobility and urban forms (Newman and Kenworthy, 1996), most of the available databases focus on one type of mobility (for example, National Transport Surveys rarely include residential history). Building on previous work (Carpentier and Gerber, 2009), this paper proposes a crossover study of these two forms of local mobility. The aim is to analyse the impact of residential mobility on daily mobility behaviours. Thus, the major issues raised concerns the extent to which the reshaping of the activity space is affected by the national border, and the type of determinants (geographical, social or cultural) that could explain such differentiated changes.

In the first instance, we will turn briefly to the evolution of cross-border flows of people between Luxembourg and Wallonia. Then, the methodological steps needed for the joint analysis of these two types of mobility will be described. Finally, based on original survey data, the impact of moving from the Grand Duchy to Wallonia on commuting and action spaces will be examined using geostatistical analysis and statistical models.

2. Background: cross-border local mobilities between Luxembourg and Wallonia

As we noted earlier, Belgium and Luxembourg have for decades been closely engaged in a collaborative process, particularly illustrated by the Benelux and European Union. For this reason, on the borders of both countries, the process of cross border flows is relatively large and old.

2.1 Daily mobility of cross-border workers

At first glance, daily mobility can be related to journeys to work. The vast majority of these flows are directed from Belgium towards Luxembourg, considering the differentials regarding unemployment rate and wages. From the 1970s, many residents of Belgium, mainly from the province of Luxembourg, worked in the Grand Duchy (Fig. 1). Their number remained relatively stable (around 5,000) up to the mid 1980s, and then rose sharply under the combined effect of increasing unemployment in Belgium and strong growth in the economy of Luxembourg. However, the proportion of workers from Belgium, within the overall phenomenon of cross-border employment in Luxembourg, has decreased due to the dramatic rise of people coming from France and, more recently, Germany.

Currently, the residents of Belgium, with almost 38,000 cross-border workers, represent nearly 10% of jobs held in Luxembourg. This very large flow of people is accompanied by significant car dependence, leading to a modal share of 88% in favour of cars in 2007 (Table 1). Indeed, the wide dispersion of places of origin (home) in the Belgian province of Luxembourg, which is still fairly rural, and the insufficient capacity of cross-border public transport encourage many people to use their cars despite the congestion and high average time of travel. Indeed, whilst residents of Luxembourg spend on average 20 minutes to travel to their place of work, the mean time for Belgian cross-border workers is 44 minutes.

If the availability of jobs and high wages largely explain the importance of cross-border workflow to Luxembourg, and thus daily mobility, what factors motivate flows related to residential mobility? Indeed, on both sides of the border, real estate prices are experiencing strong

differentials. For example, whilst in Wallonia an apartment costs about 140,000 €[2], it is around 300,000 € in Luxembourg[3].

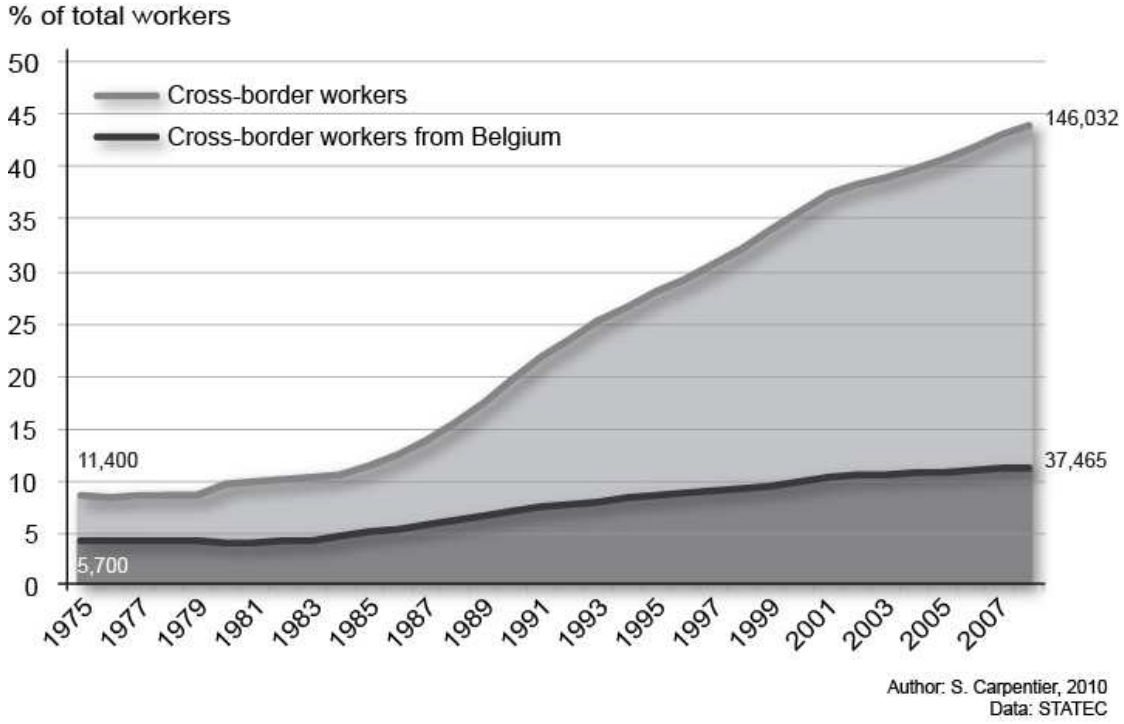

Figure 1. Evolution of cross-border work in Luxembourg (1975–2008)

Table 1. Time, distance and modal split of workers from Luxembourg journeying to work (2007)

Country of residence	Travel time (min.)	Distance (km)	Modal split (%) Car	Public transport	Multimodal	Soft modes
Belgium	44	46	88	3	8	0
Luxembourg	20	12	76	13	2	9

Source: Carpentier and Gerber, 2009

2.2 Cross-border residential mobility of workers

Despite the important differences in housing prices, it is clear that cross-border residential mobility between the two countries is relatively low. However, in spite of the modest volumes, it is interesting to study the net migration of workers moving between both countries (Fig. 2).

As we postulated, considering the bilateral flows with Wallonia, overall, the Grand Duchy loses more inhabitants than it gains. In Luxembourg, the high price of housing and, more generally, the low availability of housing, especially single family houses, encourage some of its residents to relocate across the border. For a third of these people, the new location is Wallonia. The

[2] Direction générale Statistique et Information économique (SPF Économie, PME, Classes moyennes et Énergie), 2009. http://www.economie.fgov.be - http://www.statbel.fgov.be.
[3] Observatoire de l'Habitat (Ministère du Logement, CEPS/INSTEAD), 2009
http://observatoire.ceps.lu/prixenregistres.cfm?pageKw=pe_appart_index

Luxembourgers, however, account for only 15%[4] (compared to 57% of the population of people living and working in Luxembourg), whilst the under 40 age group represents 79% (compared to 54%). Furthermore, these people are less often married (45% vs. 59%) and less wealthy (36% of them earn less than 1.5 times the minimum wage vs. 22%) than the population of people living and working in Luxembourg.

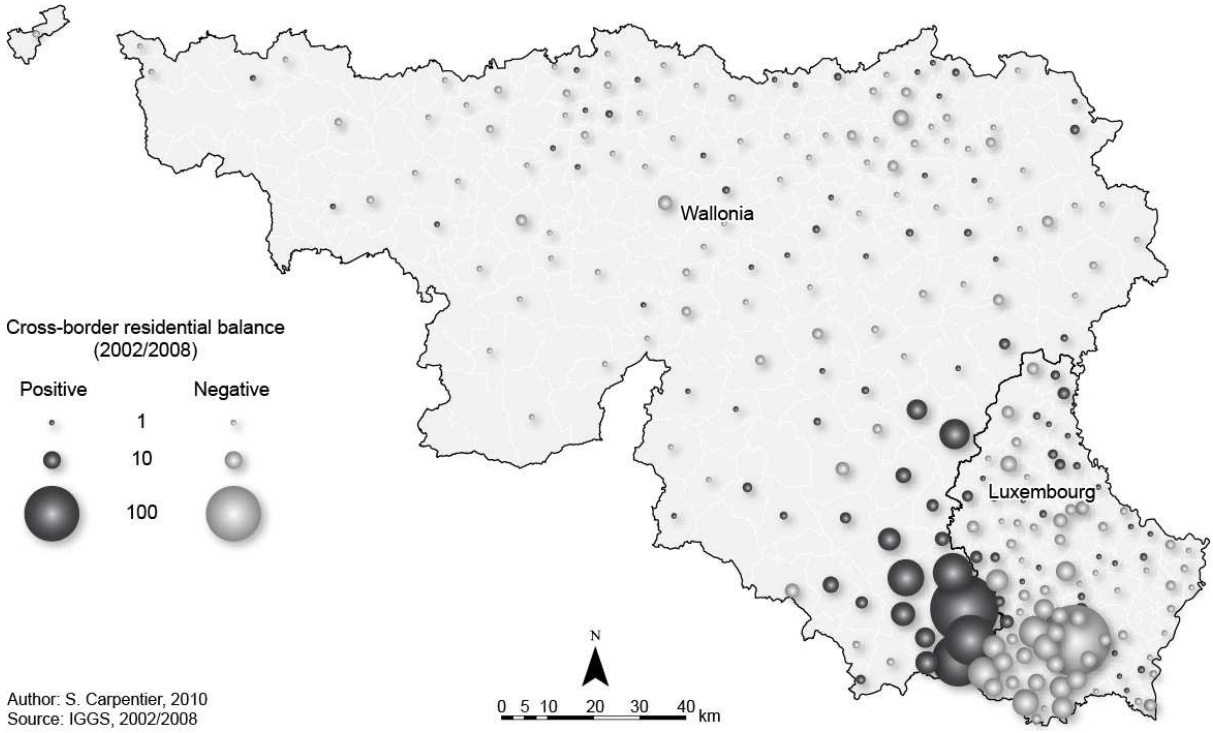

Figure 2. Net migration of workers moving between Wallonia and Luxembourg (2002/2008)

In terms of location, the map shows that the distance from the border seems to be an important factor in residential choice. In fact, most people move to the neighbouring Belgian municipalities.

These preliminary analyses provide evidence of mobility flows of people across borders. Nevertheless, it is further necessary to analyse the daily and residential mobilities jointly instead of separately, as the interactions between residential choice and mobility patterns are strong (Van Ommeren, Rietveld and Nijkamp, 1996). In the following, we will present a methodological approach based on spatial analysis of action spaces, defined as "the area within which persons can undertake activities" (Dijst, 1999, p. 163), for people who move from Luxembourg to Wallonia.

3. Data and methodology

Cross-border residential mobility is a transnational phenomenon. However, the available databases are scattered and hardly comparable. In the face of this lack of adequate data, a survey (by mail) was conducted in spring 2008, of the entire population of employed persons residing in Luxembourg and who had settled in a bordering country between 2001 and 2007. The analysis of the reference population and the building of the contact base, essential for the proper conduct of the survey, were based on the files of the Social Security of Luxembourg (IGSS). This

[4] Source: IGSS, 2001–2007.

administrative database is, in fact, alone in gathering in a single file, with some temporal depth, both the cross-border workers of Germany, Belgium and France and the residents of Luxembourg. The population was restricted to persons who met all the following criteria:

(i) moved from Luxembourg to a Belgian municipality within the limits of the Greater Region.

(ii) worked in the Grand Duchy before and after relocation.

(iii) spent at least six months in Belgium.

(iv) moved between 2001 and 2007.

With 7,715 people contacted in Belgium, Germany and France, and a response rate of almost 25%, the survey provided finally a sample of 1,939 respondents, for which we have successive home addresses, as well as a number of activity places before and after moving from Luxembourg[5]. From this sample, we will analyse in this paper the 628 respondents who moved to Belgium (amongst the 2,623 persons contacted in this country).

The selection criteria correspond to several methodological choices. First, from the data source used, it is not possible to work on "households" as statistical units. Therefore, people were surveyed and the questionnaire still incorporated questions about the structure of households. The decision to limit the investigations to the Greater Region stems from the precise design of residential mobility, which should be distinguished, especially in this cross-border context, from migration (Zax, 1994). In this research, we consider that residential mobility corresponds to an adjustment of the location or of the type of housing, without necessarily involving profound changes of the action space. Thus, we take into account the moves within a radius of around 100 km. Finally, considering the relative uncertainty of the addresses reported in the IGSS database, a stay of at least six months in the host country can effectively filter "false moves" related to administrative errors.

The questionnaire covered housing conditions, living environment and daily mobility and places of activity before and after the move. It was then possible to analyse the impact of this particular residential move on the action spaces.

The main hypothesis of this work is that the reconfiguration of action spaces depends not only on activity location before the move, but also on place attachment of individuals. To test this hypothesis of resilient action spaces resulting from cross-border residential mobility, the analysis is based on a combination of multivariate statistics and geostatistics. To do this, all places of residence and activities of the respondents were geocoded in a GIS, according to two time frames: before and after their residential move. The GIS database was then linked to a relational database containing the socio-demographic data from the survey. At first, action spaces are analysed through spatial statistics indicators (standard distances and central feature). Then, in a second step, all these spatial objects (residential moves, action spaces, distances from border, etc) are combined with individual characteristics (e.g. nationality, age) in regression models so to identify the most relevant determinants of the action space evolution.

4. Border effect and action space inertia

In order to complement the previous descriptive analysis of daily and residential cross-border mobility, it is useful to analyse systematically the action spaces using spatial statistics (Schönfelder and Axhausen, 2003). This will identify the differentiation processes according to the socio-demographic attributes of our respondents.

[5] The respondents were asked to provide the addresses of their main activity places for the following activities (if relevant): work, workplace of spouse, shopping, visit to family, visit to friend, doctor, hairdresser, cinema, sport.

The first indicator used in this analysis is the standard distance (Bachi, 1963), which illustrates the dispersion of the action spaces[6]. The standard distance is given as:

$$SD = \sqrt{\frac{\sum_{i=1}^{n}(xi-\overline{X})^2}{n} + \frac{\sum_{i=1}^{n}(yi-\overline{Y})^2}{n}}$$

Where $\{\bar{X}, \bar{Y}\}$ *are the coordinates of the mean centre and* $\{x_i, y_i\}$ *are the coordinates of the point i (i.e. activity places)*

The standard distance is a synthetic indicator of spatial distributions that can encompass different daily activities leading to more global analysis of action spaces than those focused on journeys to work (Buliung and Remmel, 2008). Moreover, by providing simple and interpretable value, this indicator allows statistical modelling.

The second indicator is the central feature tool of ArcGIS. It is defined as the activity location, which minimises the distance to the others points of the action space.

The main interest of this indicator is that, unlike the more classical mean centre, the central feature is not a "virtual point" but is computed amongst the actual activity places. We thus know, beyond the sole location, which activity is the most central in the action space (especially home or workplace).

The combination of these two indicators reveals both the dispersion and centrality of the action spaces (fig. 3).

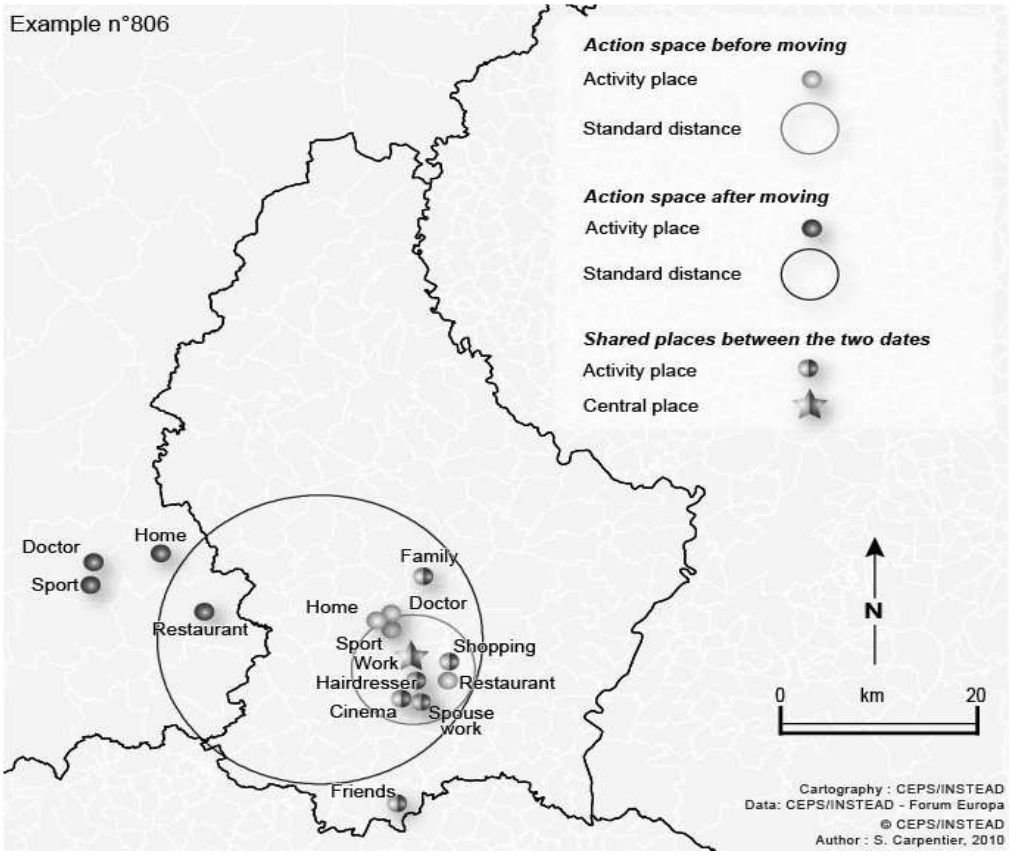

Figure 3. Example of action space indicators (standard distance, central feature)

[6] In this paper, the activity places have not been weighted to compute the standard distance. Indeed, this was a self-reported questionnaire, and in order to minimise the burden of required data, the respondents were not asked the frequency of activities.

This example illustrates the reshaping of the action space after a cross-border residential move. This respondent has moved from Luxembourg-City to a neighbouring Belgian municipality. Before moving, his action space was quite strongly focused in Luxembourg, but after the move, it appears to be more scattered. Some activity places were relocated to Belgium, whilst others remained in Luxembourg. This partial relocation process, finally, results, for this person, in an enlargement of the action space. Moreover, after the residential move to Belgium, this becomes a cross-border action space.

Beyond this particular example, the first general outcome related to the dispersion of action spaces, show that, on average, they lengthen substantially after the cross-border move (Table 2). We switch from an average standard distance of 17.1 km before the move to a distance of 20.9 km after. Respondents are thus on average experiencing a 3.3 km stretch of their action space.

In terms of nationalities, some differences also exist. For the Luxembourgers, the increase in the size of their action spaces is higher (4 km) than those of the Belgians (2.5 km). The significant lengthening observed for Luxembourgers could be linked to a higher propensity to maintain activity places in the Grand Duchy after the move to a neighbouring country.

Table 2. Growth of standard distance (km, Euclidian distances)

	Standard distance before moving (km)		**Standard distance after moving (km)**		**Difference (km)**	
Nationality	*mean*	*median*	*mean*	*median*	*mean*	*median*
Luxembourger	10.4	8.5	14.7	11.7	4.0	2.6
Belgian	21.3	12.2	24.7	17.4	2.5	1.4
All	17.1	9.8	20.9	13.7	3.3	1.9

Source : CEPS/INSTEAD – Forum Europa (n=628)

As noted above, the respondents are all working in Luxembourg. The journey to work is then in principle a structuring element of their daily mobility patterns. It is thus interesting to see how this extension of action spaces is influenced by changes in their journeys to work (Table 3).

For all of the respondents, the journeys to work were lengthened by an average of more than 26 km following the move. Furthermore, this extension led to increasing use of cars. Indeed, whilst 70% of the respondents used their car before moving to Wallonia, about 84% of them chose this mode of transport after.

As the results demonstrate, there is a kind of acceptance of the increase in the distance and travel time of journeys to work in order to make the cross-border residential move and then access the desired type of housing. This process seems to be similar to the classical urban sprawl, but we observe greater distances than expected, in such "small-size" employment areas. However, does this process reveal a border effect?

As a second step, let us review the overall results related to central features. For all respondents, two particular places structure their action spaces, namely home and workplace. Before moving, home and workplace are the central point of the action space for almost 68% of individuals (Table 4). After the move, this proportion is stable (68%), but the relative weight of the workplace increases substantially (from 19% to 32%). Consequently, the share of home places in the central features decreases from 49% to 35%. Thus, we may assume that for a significant number of individuals, there is after the move, a switch of the central feature from home to work. Taking into consideration that the workplace is located for all respondents in the Grand Duchy, there is a switch of the activity linked to the central feature (from home to work), but a preservation of the place (Luxembourg).

Table 3. Modal share, time and distance for the journeys to work

	Private car	Bus	Train	Walk	Other	Multimodal (Car)	Multimodal (Other)	All
Before moving (Luxembourg)								
Modal share	69.9	9.3	1.9	7.1	0.9	8.0	2.9	100.0
	23.8	25.1	38.5	12.0	17.5	21.6	39.4	23.7
Average time (minutes)								
Average distance (euclidian. km)	18.8	9.1	28.2	1.5	8.8	13.2	20.0	16.5
After moving (Belgium)								
Modal share	83.6	1.5	6.5	-	0.6	5.9	1.9	100.0
	41.6	41.5	48.5	-	27.5	48.9	71.5	43.1
Average time (minutes)								
Average distance (euclidian. km)	43.9	30.4	43.2	-	22.5	36.8	45.2	43.2

Source : CEPS/INSTEAD – Forum Europa, 2008 (n=628)

Table 4. Changes of central feature

		Activity corresponding to central feature			
		Home	*Work*	*Family/Friends*	*Other*
Before moving (Luxembourg)	*Luxembourger*	50.4	15.4	0.9	33.3
	Belgian	48.8	19.4	1.2	30.6
	Other	47.3	20.0	2.0	30.7
	All	48.8	18.9	1.3	31.1
		Home	*Work*	*Family/Friends*	*Other*
After moving (Belgium)	*Luxembourger*	23.1	31.6	12.8	32.5
	Belgian	39.3	31.8	4.5	24.4
	Other	32.7	36.0	6.0	25.3
	All	35.1	32.7	6.2	26.0

Source : CEPS/INSTEAD – Forum Europa, 2008 (n=628)

The analysis of the central feature by nationality can refine this observation. Indeed, if for all national groups there is a tendency to increase the share of work as the central place of the action spaces, this trend is particularly strong amongst Luxembourgers (+16%) compared to Belgians (+12%). For the former, whilst the home was the central location of 50% of them, when residing in Luxembourg, only 23% made their new home the central location of their new action space. Conversely, the weight of the workplace doubles from 15%, whilst residing in Luxembourg, to 32% when living in a neighbouring country. This focus is a means of maintaining the central place in the Grand Duchy, reflecting the strong inertia of activity locations. It seems then that for many Luxembourgers the action space remains highly focused on their country of origin. This demonstrates that their residential choice seems to be much more strongly motivated by the housing price than by the desire to leave Luxembourg. As regards Belgians, the share of central feature switching from home to work is much lower. For them, returning to their country of origin implies a refocusing of their action space to their new home place.

This second step of the analysis, regarding the distribution of activity places and central features, as well as their evolution following the move to Belgium, showed a significant reshaping of action spaces, even if some inertia, particularly pronounced in the case of Luxembourgers, was also observed. This analysis appears to show that, in this specific cross-border context, nationality structured behaviour.

The previous analysis highlighted how action space was reshaped as a consequence of residential mobility. To go further in these investigations, we now present two statistical models in order to assess the behavioural determinants that lead to these differentiations, both in terms of dispersion of action space (standard distance) and propensity to maintain its central place in Luxembourg (central feature).

The first model (Table 5) assesses the contribution of different demographic and geographic characteristics to the greater or lesser extension of the action spaces, using as dependent variable the growth of the standard distance.

Table 5. Multiple regression of *standard distance growth*

	t	**Sig.**		**t**	**Sig.**
(Constant)	*-2.400*	**			
Belgian	-0.953	n.s.	Home tenant	-0.089	n.s.
German	-0.315	n.s.	Home "free stay"	0.386	n.s.
French	1.754	*	Home owner	ref.	ref.
Other nationality	0.353	n.s.	Central feature Luxembourg	6.236	***
Portuguese	0.101	n.s.	Workplace Lux.-City	2.216	**
Luxembourger	ref.	ref.	Workplace urban area Lux.-City	-0.365	n.s.
Less than 30 years old	0.536	n.s.	Workplace other municipality	ref.	ref.
From 30 to 39 years old	0.208	n.s.	No spouse work	2.141	**
From 40 to 49 years old	ref.	ref.	Spouse work Luxembourg	2.928	***
50 years old and more	0.146	n.s.	Spouse work Belgium	ref.	ref.
Less than 2.000 €	0.681	n.s.	Move less than10 km	-0.481	n.s.
From 2.000 to 2.999 €	-0.862	n.s.	Move from 10 to 20 km	ref.	ref.
From 3.000 to 3.999 €	ref.	ref.	Move from 20 to 30 km	0.897	n.s.
From 4.000 to 5.999 €	0.287	n.s.	Move higher than 30 km	1.910	**
6.000 € and more	0.283	*	Border less than 2 km	-1.141	n.s.
No child	-0.440	n.s.	Border from 2 to 4 km	-0.828	n.s.
One child or more	ref.	ref.	Border from 4 to 8 km	ref.	ref.
Woman	1.937	*	Border from 8 to 15 km	-0.174	n.s.
Man	ref.	ref.	Border more than 15 km	2.399	**

Source : CEPS/INSTEAD – Forum Europa (n=628)

Dependent: *Growth of the standard distance*

***Denotes that the estimates of the model were significant at 1% level

** Denotes that the estimates of the model were significant at 5% level

* Denotes that the estimates of the model were significant at 10% level

Based on this criteria, it appears that few socio-demographic variables are significant in explaining this more or less strong dispersion of activity locations after the move. Only wages

and gender variables contribute to the model. The richer sample (more than 6.000 €) have less propensity to extend their action space, whilst women experience on average a higher increase.

Table 6. Binary logistic regression of *country of central feature (after move)*

	Sig.	Exp(B)		Sig.	Exp(B)
Nationality			**Size of the standard distance**		
Belgian	***	0.382	Less than 10 km	***	2.494
German	n.s.	1.331	From 10 to 12 km	***	2.152
French	n.s.	0.849	From 12 to 16 km	***	4.120
Portuguese	n.s.	0.855	From 16 to 22 km	***	3.610
Other nationality	*	0.438	More than 22 km	ref	Ref
Luxembourger	ref	Ref	**Work location**		
Age groups			Workplace Lux.-City	**	1.659
Less than 30 years old	n.s.	0.813	Workplace urban area Lux.-City	**	2.076
From 30 to 39 years old	n.s.	0.976	Workplace other municipality	ref	Ref
From 40 to 49 years old	ref	Ref	**Spouse's country of work**		
50 years old and more	n.s.	0.769	No spouse work	***	3.716
Salaries			Spouse work Luxembourg	***	6.599
Less than 2.000 €	n.s.	1.091	Spouse work Belgium	ref	Ref
From 2.000 to 2.999 €	n.s.	0.920	**Length of residential move**		
From 3.000 to 3.999 €	*	0.559	Move less than10 km	n.s.	1.901
From 4.000 to 5.999 €	n.s.	0.650	Move from 10 to 20 km	*	1.943
6.000 € and more	ref	ref	Move from 20 to 30 km	***	2.975
Number of children			Move higher than 30 km	ref	Ref
No child	**	1.609	**Distance to border**		
One child or more	ref	ref	Less than 2 km	n.s.	1.506
Gender			From 2 to 4 km	n.s.	0.700
Woman	n.s.	1.171	From 4 to 8 km	ref	Ref
Man	ref	ref	From 8 to 15 km	n.s.	0.963
Home tenancy			More than 15 km	***	4.314
Home tenant	n.s.	1.229	*Constant*	***	0.049
Home "free stay"	n.s.	1.411			
Home owner	ref	ref			

Source : CEPS/INSTEAD – Forum Europa

Dependent: Central feature in Luxembourg (after move).

If Exp(β) > 1 then variable has a positive effect on the odds of *Central feature in Luxembourg*

If Exp(β) < 1 then variable has a negative effect on the odds of *Central feature in Luxembourg*

***Denotes that the estimates of the model coefficient β were significant at 1% level

** Denotes that the estimates of the model coefficient β were significant at 5% level

* Denotes that the estimates of the model coefficient β were significant at 10% level

However, geographical variables play an important role. First, if after the move the central place is in Luxembourg, this contributes to a greater dispersion of action space, as does working in the Luxembourg capital rather than in another municipality. Second, the location of the spouse's workplace, if any, also helps differentiate the dispersion of action space. Thus, respondents whose spouse works in Luxembourg are more likely to see their action space grow strongly than those whose spouse works in the new country of residence. Finally, both the lengths of cross-

border residential moves, as well as the distance to the grand ducal borders, influence the evolution of the size of action spaces. Unsurprisingly, the more the move is long and/or further away from the border, the more the action space expands. This reflects in particular the impact of the location of the workplace and other activities that are held in Luxembourg, as observed previously.

This first model thus reflects the impact of new residential location and related distances on the greater or lesser increase in the dispersion of activity locations.

The second model (Table 6) looks at the greater or lesser propensity of people to position their central place in the Grand Duchy after the cross-border residential move.

Again, many socio-demographic characteristics appear to have no significant effect. However, nationality plays a dominant role here. Indeed, we find that people from Belgium have a much lower propensity than Luxembourgers to locate their central place in the Grand Duchy. This probably reflects an attachment of Luxembourgers to their home country as well as an attachment of Belgians to theirs. Following the move, if all these people have a cross-border action space, we now understand that the balance is not the same as for those who leave their country or go back to it.

In terms of geographic variables, we find that the propensity to invest the central place in the Grand Duchy depends clearly on the greater or lesser distance to the border, as well as the length of the size of the action space. This indicates that individuals who plan to carry out many more activities in Luxembourg probably tend to minimise their distance, considering that their travel time budget is not stretchable.

Both models seem, therefore, complementary, highlighting the spatial determinants (length of the residential move, distance to the border), the familial determinant (spouse's place of work) and cultural factor (nationality). Two types of action space reshaping appear according to whether one is a native of Luxembourg or of Belgium.

5. Conclusion

The cross-border move allowed many individuals access to a larger home, or even the opportunity to buy one (Gerber and Licheron, 2010). However, the analysis of journeys to work and dispersion of action spaces show that in order to access the desired house, these individuals make, for the most part, a number of concessions in terms of daily mobility. Thus, the remoteness of the workplace, resulting in a doubling of average distances between home and work, strengthens car dependence. This process can be regarded as a kind of cross-border urban sprawl (Gerber et al., 2011).

Moreover, the entire action space is reshaped after the move. There is a twofold process of reconfiguring the location of activity place. However, whilst a number of activities are transferred to the new location, there is certain inertia, resulting in the maintenance of many activities in Luxembourg. This leads to an increase of the dispersion of action spaces. However, the share of activities transferred to the new country of residence, compared to those staying in Luxembourg, varies greatly according to nationality. This is reflected particularly in a stronger inertia of activity places for Luxembourgers. However, people from Belgium, who are returning to their countries of origin, also keep nearly a quarter of their activities in the Grand Duchy, thus demonstrating the importance of the workplace in the structuring of cross-border action spaces (Enaux and Gerber, 2008).

All the analysis reveals two significantly different residential choices. The first, involving more often the Luxembourgers, is to keep many activities in Luxembourg, hence giving to the workplace a structuring role regarding their action space (Van Ommeren, Rietveld and Nijkamp,

1998). In this case, the new residential location is considered in terms of proximity to the Grand Duchy that remains the main activity place. The second choice, which is more common amongst Belgians, results in a greater transfer of activities to the new country of residence (Belgium), with often their home as central place. However, these individuals also still keep a number of activities in the Grand Duchy. As a consequence, the action space is more focused on the host country. In both cases, the actions spaces become undeniably cross-border.

Generally, people face a significant lengthening of distances travelled, leading to increasing use of cars. This process then raises the question of the sustainability of cross-border mobility. Indeed, whilst the Luxembourger authorities have targeted a modal split of 25% for public transportation at the time horizon 2025 (IVL, 2004), such a cross-border urban sprawl may not fit into this strategy. Several tools devoted to counterbalance the negative externalities of this phenomenon could be envisaged. First, reinforcement and development of the cross-border public transport infrastructure, especially the train system, seem necessary. However, such accessibility improvement could also encourage cross-border residential mobility insofar as the travel times for the journeys to work are often cited by the respondents as a factor that could influence a move back to Luxembourg. But beyond the issue of transportation, the specificities of the cross-border housing market are also in question. Thus, in considering the weight of housing prices in the motivations for cross-border residential choice (Carpentier, 2010), stakeholders have to draw incentives that could balance these choices. Finally, the impact of the cultural factors (in particular for the native Belgians) shows that, to some extent, this process does not only rely on the spatial planning issue, but also on more socio-cultural aspects like education or proximity to family and friends.

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