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Spatial integration in European cross-border metropolitan regions: A comparative approach¹

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Abstract

This article analyses the process of spatial integration in ten European cross-border metropolitan regions. On the basis of three indicators, relating to flows of cross-border commuters, gross domestic product and the housing market, it suggests that spatial integration can be viewed as a process of convergence between distinct territories, resulting from the intensification of interaction between social, political and economic actors. Our results allow, firstly, confirmation of the hypothesis that the greater the economic disparities, the greater the level of interactions measured by cross-border commuting. Our work also shows that strong economic interactions have an impact on the cross-border integration of communities, measured by the proportion of residents based on the other side of the border. Finally, this article leads to three models of cross-border integration being proposed: by specialisation, by polarisation and by osmosis.

Keywords: cross-border metropolitan regions; spatial integration; commuters; gross domestic product; housing market; Europe

JEL classification codes: F15, F16, J01, J21, J61, R58

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1. Introduction

The globalisation of economic and cultural exchange, the reduction of the relative role of nation states and the processes of regional integration have led to profound political and economic territorial reorganisation (Brenner 2003, 2004; Jessop 2004), especially within the European border regions (Anderson, O'Dowd, and Wilson 2003; Scott 2006, 2009; Perkmann 2007). This "new regionalism" (Friskens and Norris 2001) is often interpreted in terms of the concept of integration, understood as a process of the intensification of the exchange of goods, services, capital, knowledge and people between distinct territories. This classical functional approach to spatial integration – termed the "flow approach" by Van Houtum (2000) – is analysed most often in terms of its economic dimension (Heimpold 2004; Niebuhr 2008; Petrakos and Topaloglou 2008).

Within the field of border studies, cross-border work is generally considered to be undergoing a process of integration (Hansen and Serin 2007; MOT 2007; Nielsen and Hovgesen 2008). However, certain studies have shown that cross-border integration is not restricted to the economy in general or to cross-border work in particular, but rather includes other political, cultural and social dimensions (Ratti and Reichman 1993; Martinez 1994; Donnan and Wilson 1999; Dear and Burrige 2005; Scott 2005; Brunet-Jailly 2006). In addition, it has been demonstrated that the presence of strong interactions between territories separated by a border does not always indicate any convergence of their territorial characteristics (De Boe, Grasland, and Healy 1999; Topaloglou et al. 2005; Alegría 2009). In other words, the development of cross-border economic relations does not necessarily imply any reduction in disparities or associated increase in territorial cohesion, which is one of the central aims of European spatial planning (European Commission 1999).

On the basis of this observation, this article analyses the process of spatial integration in ten European cross-border metropolitan regions. In this research, the cross-border metropolitan regions are defined as functional urban regions which cross one or more international borders (Herzog 1990; Sohn forthcoming). The first aim of this research is to examine the significance of the concept of cross-border functional integration in the European context, given a broader interpretation than that generally used in the economic literature. On the basis of this analysis, the second aim is to investigate the nature and future of the cross-border metropolitan regions studied.

The first issue is investigated using indicators which are compared within the framework of a comparative approach. In order to underline the multidimensional character of the integration, two comparisons are prioritised. Firstly, the analysis combines the phenomenon of cross-border working with differentials in gross domestic product (GDP) per capita. The underlying hypothesis is that the greater the economic disparities between border regions are, the greater will be the tendency of regional actors to take advantage of these differentials, especially in terms of the cost of living and salary levels, with cross-border commuting being one of the major manifestations of this phenomenon. If this relationship is confirmed, this will therefore signify that economic interactions feed on the disparities between territories and that this form of integration is conditional on the maintenance of cross-border inequalities.

Secondly, the consequences of strong integration of labour markets are examined at the level of the residential choices of residents. Do strong economic interactions have an impact on the cross-border integration of communities? In other words, to what extent will residents of the ten cross-border metropolitan regions reside on the other side of the border, and how is this practice linked to the degree of cross-border integration of the labour market? To test this hypothetical relationship, the indicator of cross-border commuters is compared with an indicator measuring the degree of residential penetration of residents originating in a neighbouring country within a given cross-border region. The underlying hypothesis is that there is a linear relationship between the intensity of cross-border working and integration in terms of the housing market.

While these comparisons of indicators allow the modalities of the concept of cross-border integration to be better understood, they also allow the nature of the cross-border metropolitan regions examined to be investigated. Taking into account the processes shown, how can this emerging spatial object be described? Is it fair to speak of integration within these urban territories which cross an international border? To what extent does the metropolitan dimension of these cross-border regions play a role in determining the details of the process at work? Finally, does use of the concept of integration allow the issues facing these cross-border metropolitan regions to be underlined?

The first section of this article addresses the concept of cross-border integration, demonstrating how it can be understood as both an intensification of interactions and as a process of convergence between the territories in question. The second section explains the methodology used to understand cross-border integration using the indicators of cross-border commuting, GDP and the housing market, and presents the case studies used within Europe. The third section presents the results of the analysis of the indicators at the level of the cross-border metropolitan regions, and then develops three models of integration. The final part examines the working hypotheses and their most general implications for European regional development.

2. The concept of cross-border integration

The concept of “spatial integration” is generally used to refer to the interactions between different territories, whether these relations are international (Dabinett and Richardson 2005), interregional (Armstrong and Vickerman 1995; Anderson and Wever 2003), between cities (Cheshire 1999; van Oort, Burger, and Raspe 2010), or intra-metropolitan (Hansen and Serin 2007; Sohn, Reitel, and Walther 2009). Spatial integration thus reflects “the creation and maintenance of intense and diverse patterns of interaction and control between formerly separate social spaces” (Lee 2009: 398).

These interactions are not necessarily limited to the economic sphere, but rather can also include cultural or political relations or migrations. While these flows are highly important to understanding the degree of spatial integration, certain authors have held that spatial integration can also be considered as a process leading to a reduction in the structural differentials between territories (see De Boe, Grasland and Healy 1999 for an Italian example). According to this point of view, spatial integration is synonymous with convergence, which is to say that the territories in question become increasingly homogeneous. However, the development of cross-border regions shows that the relationship between interactions and convergence is far from being automatic.

Indeed, relations between territories can be highly asymmetrical and based on significant differentials, which leads to strong integration in terms of interactions but to divergence in terms of the internal homogeneity of each region in question. As shown by Topaloglou et al. (2005), the existence of strong relations does not necessarily imply territorial convergence. Furthermore, a process of convergence does not necessarily imply that significant flows are exchanged across the borders; the homogenisation may result from dynamics internal to each of the areas in question. In the case of cross-border metropolitan regions, for example, the legal and regulatory frameworks, and the policies in relation to the labour market, housing and transport remain heavily influenced by national systems, even when these regions form large functional units. These complex relationships between interactions and convergence suggest that spatial integration can be seen as a process of convergence between distinct territories, resulting from the intensification of the interactions between social, political and economic actors (Walther forthcoming).

3. Approach and methodology

To test our hypotheses regarding the complex concept of functional cross-border integration, we have developed an analytical framework which allows the comparison of a certain number of cross-border urban areas, without neglecting features specific to each context. These comparisons make use of statistical data collected from numerous different sources.

3.1. Selection of case studies

The process of comparison is based on the principle of “most similar systems design”, first formulated by Przeworski and Teune (1970) and developed further by Anckar (1993) and Pierre (2005), which seeks to use research objects which are as similar as possible. The cross-border metropolitan regions selected in this study share certain characteristics which allow us to test our empirical hypotheses in a comparative way.

The selection of the case studies is based on the *Study on Urban Functions* (ESPON 2007; see also Vandermotten 2007), which identifies 15 metropolitan and polynuclear metropolitan areas in Europe. These urban regions are very different in nature and size, meaning that it was necessary to further refine the selection, initially using just those 13 regions which can legitimately be described as “metropolitan”, i.e. which include one or more urban centres which are part of globalised economic networks and which exert an influence over their regional or national area (Krätke 2007). Arnhem-Nijmegen and Twente-Nordhorn were on this basis removed from the analysis. Of these 13 urban regions, two had only a very limited cross-border dimension (Milan, Tilburg-Eindhoven); that is, over 95% of the total population of the cross-border area lives in the country in which the main urban centre is located. Finally, it proved impossible to obtain sufficient statistical information to calculate the indicators for the Katowice-Ostrava region, which resulted in us also removing it from the study. Following the selection process, the 10 following metropolises were studied: Aachen-Liege-Maastricht, Basel, Geneva, Copenhagen-Malmö, Lille, Luxembourg, Nice-Monaco-San Remo, Saarbrücken, Strasbourg and Vienna-Bratislava (ESPON 2010) (Map 1).

Map 1. Location of case studies in Europe



Source: Authors, 2010

3.2. Our indicators

The analytical framework is based on the statistical indicators provided by a non-exhaustive overview of the main drivers of functional integration, its amplitude and, ultimately, the repercussions of this integration on the characteristics of the border territories. These indicators have been calculated for the territories which correspond as closely as possible to the functional urban areas of the metropolitan systems in question, subject to the information being available. In the absence of such information, slightly larger territories were examined (NUTS 3 scale for the indicator of GDP per capita for example).

Table 1 shows the different indicators used in this article. The first is the number of cross-border workers, which is frequently used to illustrate the permeability of borders

to exchanges (Heinz and Ward-Warmedinger 2006; MKW Wirtschaftsforschung and Empirica Kft 2009). This indicator is then compared with the other two indicators in order to attempt to see whether or not there is any relationship of dependency between them. The indicator of the differential of GDP per capita between the border territories, produced for 2005 and 2006 in accordance with the availability of the data, is considered to reveal the forces driving the process of functional integration. The values which it provides are often used as an approximation of economic disparities. When a case study consists of more than two countries, we decided to use the highest difference in GDP per capita. The indicator concerning residential integration provided information about the number of residents in a border region holding the nationality of the neighbouring country, at the level of each national area making up the cross-border metropolitan regions. It is considered as an approximation of the territorial homogeneity.

Table 1. Indicators of cross-border integration

Domains	Economic interactions	Economic disparity	Territorial homogeneity
Demography			Residents' citizenship
Labour market	Cross-border commuters		
Economy		Differential of GDP per capita	

Source: Authors, 2010

Producing such indicators for 10 cross-border metropolitan regions in Europe involved a significant number of constraints, associated with the different methods of collecting information, the dates of the data collection and differences in the definitions used by the authorities producing the statistics. We therefore preferred to highlight major trends, by carrying out ordinal discretization allowing the case studies to be grouped in different statistical sub-sets. The ordinal scales have values from 1 (low-intensity) to 5 (high intensity). Thus, a value of 5 indicates that the economic differential between two regions is considerable, that the number of cross-border commuters is high, or that the diversity of nationalities with a cross-border area is high.

In addition to the three indicators calculated in this study, we decided to show the linguistic situation in each case, i.e. whether the border territories share a common language, only some of the territories speak the same language or whether the languages used are different. It seemed to us that this information was especially relevant as the presence of a common language is liable to encourage exchange between regions (MKW Wirtschaftsforschung and Empirica Kft 2009). Luxembourg is considered to have no language barrier because cross-border commuters from France, Belgium or Germany can speak either French or German with local residents in Luxembourg.

4. Results

The use of a single scale allowed all indicators to be included in Table 2. The table provides initial identification of those case studies in which integration appears to be globally favoured, such as in Basel, Geneva, and Luxembourg, and case studies in which integration seems globally less advanced, such as in Copenhagen-Malmo, Strasbourg, and Vienna.

Table 2. Measure of cross-border integration

	Economic interactions	Economic disparity	Territorial homogeneity	Cultural differences
Cross-border metropolitan regions	<i>Cross-border commuters</i>	<i>Differential of GDP per capita</i>	<i>Residents' citizenship</i>	<i>Language barrier</i>
Aachen-Liege-Maastricht	2	2	5	Yes
Basel	4	5	3	Partial
Geneva	4	4	4	No
Lille	3	1	3	Partial
Luxembourg	5	5	5	No
Nice-Monaco-San Remo	3	4	3	Partial
Copenhagen-Malmo	2	2	2	Partial
Saarbrucken	3	1	2	Yes
Strasbourg	1	1	1	Yes
Vienna-Bratislava	1	3	1	Yes

Source: Authors, 2010.

Note: 1 = very weak, 2 = weak, 3 = moderate, 4 = strong, 5 = very strong. Cross-border commuters. Class 5: > 60,000; Class 4: 40,000 to 60,000; Class 3: 20,000 to 40,000; Class 2: 10,000 to 20,000; Class 1: < 10,000. GDP. Class 5: > 30,000 €; Class 4: 20,000 to 30,000 €; Class 3: 10,000 to 20,000 €; Class 2: 5,000 to 10,000 €; Class 1: < 5,000 €).

The following sections describe in more details each of these indicators.

4.1. Characteristics of cross-border commuting in the cross-border metropolitan regions

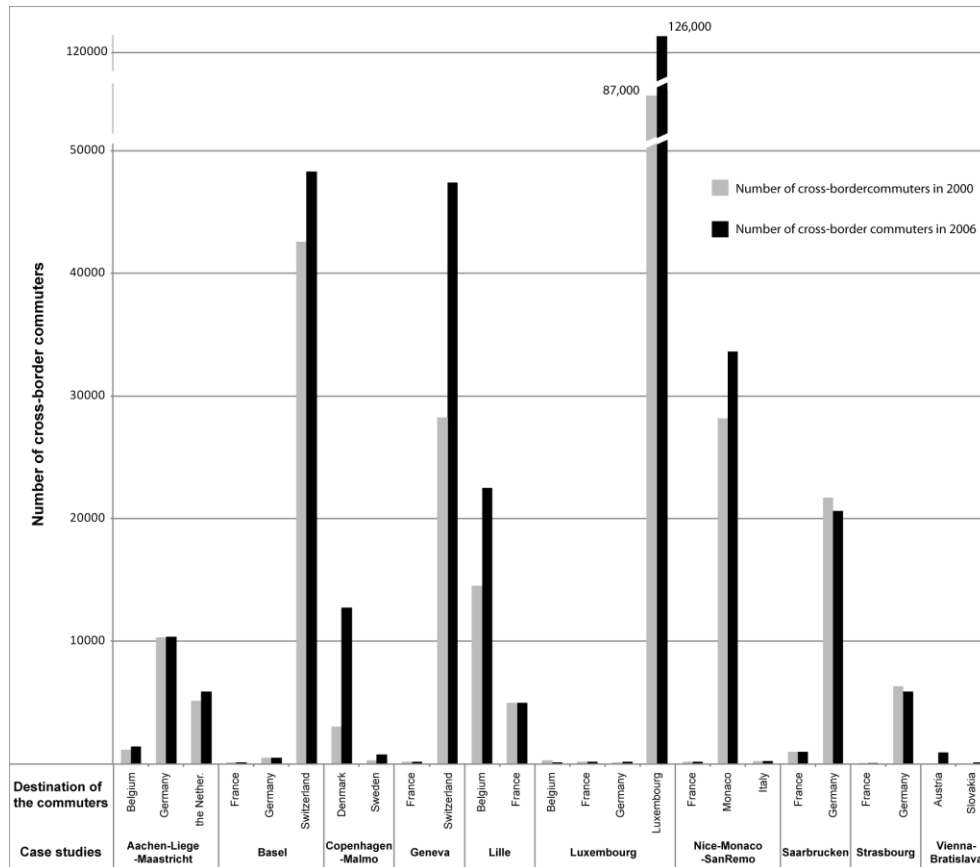
The ten case studies vary highly, as a function of the amount of cross-border commuting, its rate of growth and the asymmetry of flows between border countries. From the demographic point of view, different situations can be observed (Figure 1). With over 127,000 cross-border commuters in 2006, the metropolitan region of Luxembourg is undoubtedly the European border region in which this type of work is most highly advanced, followed at some distance by Basel, Geneva, Nice-Monaco-San Remo and Lille. Saarbrucken, Aachen-Liege-Maastricht and Copenhagen-Malmo have a smaller number of cross-border commuters, while Strasbourg and Vienna-Bratislava are affected to a much lesser extent in numerical terms by this phenomenon.

The majority of the metropolitan cross-border regions which this study examines saw positive annual growth in the number of cross-border commuters between 2000 and

2006, with the exception of Saarbrücken and Strasbourg. The highest annual growth can be seen between Copenhagen and Malmö; the period in question corresponds to the first years after the opening of the bridge-tunnel linking the two cities, separated by the Øresund strait. In Geneva, Luxembourg and Lille, the number of cross-border commuters also underwent significant growth; the phenomenon is at least twice as high here as in the other metropolitan regions.

In the large majority of cases, the economic integration of the cross-border metropolitan regions is highly asymmetrical, in that the flows of cross-border commuters move from the border peripheries towards the main urban centres. This is particularly true for the metropolitan regions of Luxembourg, Basel, Geneva, Nice, Saarbrücken, Copenhagen-Malmö and Strasbourg, where over 90% of the flows are in one direction. What is occurring is thus a form of economic integration which is based on a relation of a centre-periphery type. It is really only in Aachen-Liege-Maastricht and Lille that significant flows can be seen in both directions.

Figure 1. Development of cross-border commuting in Europe's cross-border metropolitan regions (2000, 2006)



Sources: Luxembourg: IGSS, ADEM Eures, BA, INAMI. Basel: OFS, MOT and own estimates. Geneva: OFS and own estimates. Nice-Monaco-San Remo: Principality of Monaco. Lille: Groupe de travail parlementaire franco-belge, INSEE. Saarbrücken: BA, INSEE, IGSS, Observatoire interrégional du marché de l'emploi. Aachen-Liege-Maastricht: Euregio Meuse-Rhin. Copenhagen-Malmö: Öresundstatistik. Strasbourg: CCI Strasbourg et Bas Rhin, Eurodistrict and own estimates. Vienna-Bratislava: Arbeitsmarkservice Austria, OECD and own estimates.

The cross-border metropolitan regions with the highest numbers of cross-border commuters share certain common characteristics. They are heavily influenced by urban centres which have a concentration of higher metropolitan functions despite their modest size. This concerns, in particular, finance in Luxembourg, Geneva and Monaco, and bio-tech and medical technologies in Basel. In addition, these four cities benefit from a particular territorial configuration, as Luxembourg and Monaco are microstates and, in the cases of Geneva and Basel, the Swiss city cantons have large powers. In all of these cases, the territories exercise state sovereignty or quasi-state sovereignty to enact attractive fiscal and regulatory measures (Sohn, Reitel, and Walther 2009), and by necessity make use of qualified foreign labour as this is not available in sufficient quantities within their countries.

Of the other case studies, Copenhagen and Vienna also have a metropolitan position on a European scale (Taylor 2004), but have significantly fewer cross-border commuters due to a different border situation. In the first case, the phenomenon of cross-border commuting is a recent one, as until 2000 crossing the Øresund was done by ferry (Hansen and Serin 2007). In the second case, the border separating Vienna and Bratislava was opened only in 1989 with the fall of the Iron Curtain, while restriction on the entry of Slovakian workers into Austria remained in the form of transitional measures following the former Eastern Bloc countries joining the EU in 2004 (European Commission 2008). While the existence of these restrictions significantly limits the development of legal cross-border working, they also contribute to the development of unofficial working (MKW Wirtschaftsforschung and Empirica Kft 2009).

In the preceding analysis, the intensity of the phenomenon of cross-border commuting appears to be linked to the economic attractiveness of the metropolitan centre, while the presence of barrier effects is liable to act in the opposite direction. The following section seeks to specify this relationship in greater detail: is it not economic differentials, rather than metropolitan characteristics, which constitute the major factors leading to increased cross-border commuting?

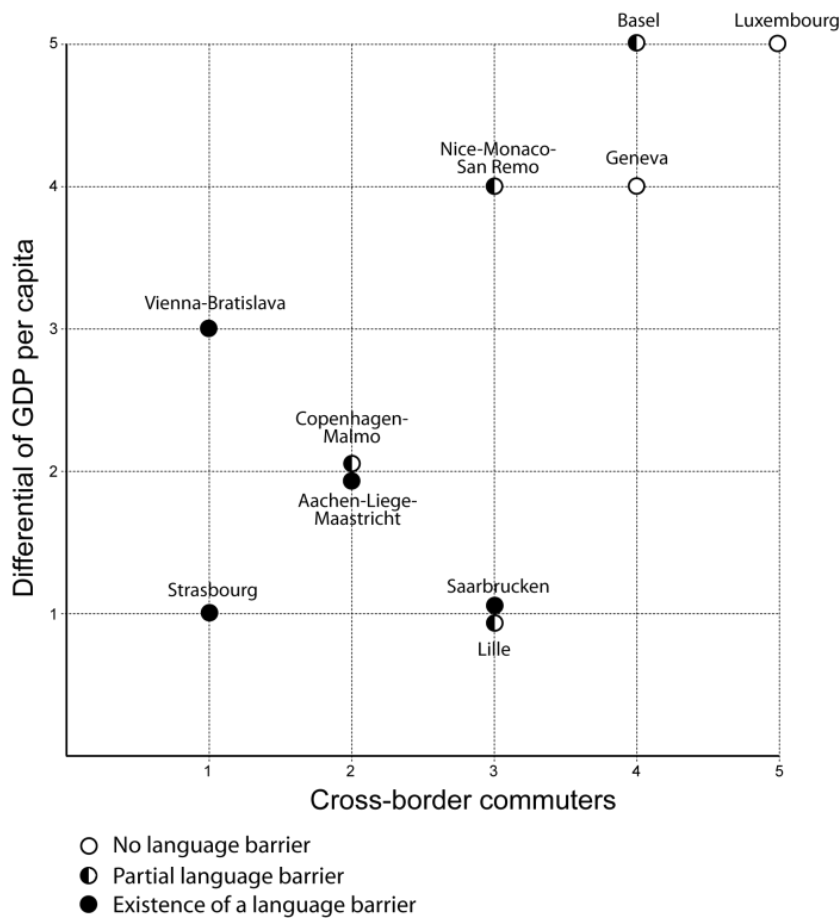
4.2. Economic disparities as a vector of cross-border integration

The comparison of differential of GDP per capita with the intensity of cross-border commuting shows that there exists a certain relationship between the two phenomena (Figure 2). In other words, the greater the differential in terms of wealth between two countries, the more the country with the most favourable labour market conditions will tend to attract a high number of cross-border commuters. As the cities which are best integrated into globalised capital circuits are also those with the highest economic disparities with their surrounding border areas, it is Basel, Geneva, Luxembourg and Monaco which best illustrate this relationship. Correspondingly, when differentials in terms of wealth creation are low (less than or equal to 2), the intensity of the phenomenon of cross-border commuting declines (for example in Strasbourg).

The causal relationship between wealth differentials and cross-border commuting appears, however, to be subject to various limiting factors. Firstly, it must be noted that, apart from income differentials, other factors associated with the labour market are involved in determining professional trajectories which cross the border. As suggested in the report by MKW Wirtschaftsforschung and Empirica (2009), the availability of jobs, their attractiveness, the career progression prospects and the quality of national

social security systems are also taken into account. For Lille and Saarbrucken, where the differentials in terms of GDP per capita are relatively weak yet cross-border commuting is relatively common, one can refer to the existence of a “push” factor, in that these are former industrial areas with especially high rates of unemployment. The workers are thus tempted to widen their job searches to areas on the other side of the border, even if the conditions on offer are not significantly better than those available in their own country. It is also important to emphasise that the data are expressed in absolute terms, independently of the local demographic context. The significance of the phenomenon of cross-border commuting must thus be interpreted in relation to the total population of the cross-border area in question, which further reinforces the importance of the phenomenon for Basel and Geneva, but diminishes it for the example of Lille and Vienna-Bratislava.

Figure 2. Cross-border commuters and differentials of GDP per capita



Secondly, there are a series of barrier effects linked to the presence of international borders, the intensity of which can vary as a function of the regional context. The first barrier effect liable to slow cross-border integration of the labour market is the language, or more precisely the linguistic differences across the border. It is significant in this regard to note that those cases where cross-border integration of the labour market is most advanced correspond to those situations where there is no, or only a very limited, linguistic barrier.

The existence of regulatory restrictions also represents a potentially significant barrier effect. This may involve problems associated with social security, pensions or national restrictions regarding access of foreigners to the labour market. While these types of obstacles have been significantly reduced in Europe over the course of European integration, especially with regard to the free movement of people, certain problems remain. For example, older members of the EU such as Germany and Austria require work permits for those from new member countries joining after 2004, such as the Czech Republic, Slovakia and Hungary, even though these countries are part of the Schengen Area. This type of restriction explains the low number of cross-border commuters between Vienna and Bratislava, despite the high differential in terms of GDP per capita.

This initial consideration of the indicators suggests that functional cross-border integration is still strongly marked by differentials in terms of remuneration and employment opportunities (Pierrard 2008). Can one speak of true cross-border integration when the regional systems of production and regulation are not interconnected but on the contrary support differences, in order to extract an economic benefit from the situation (Krätke 1998)? What long-term perspectives can such a system offer in terms of regional development? As this system is superseded there may be residential appropriation of the cross-border space, leading to a greater cohesion.

4.3. Integration of the labour market and of the housing market

In order to examine the impact of economic interactions on the cross-border integration of communities, the cross-border commuting indicator is compared with the number of residents originating in the neighbouring country for each cross-border metropolitan region.

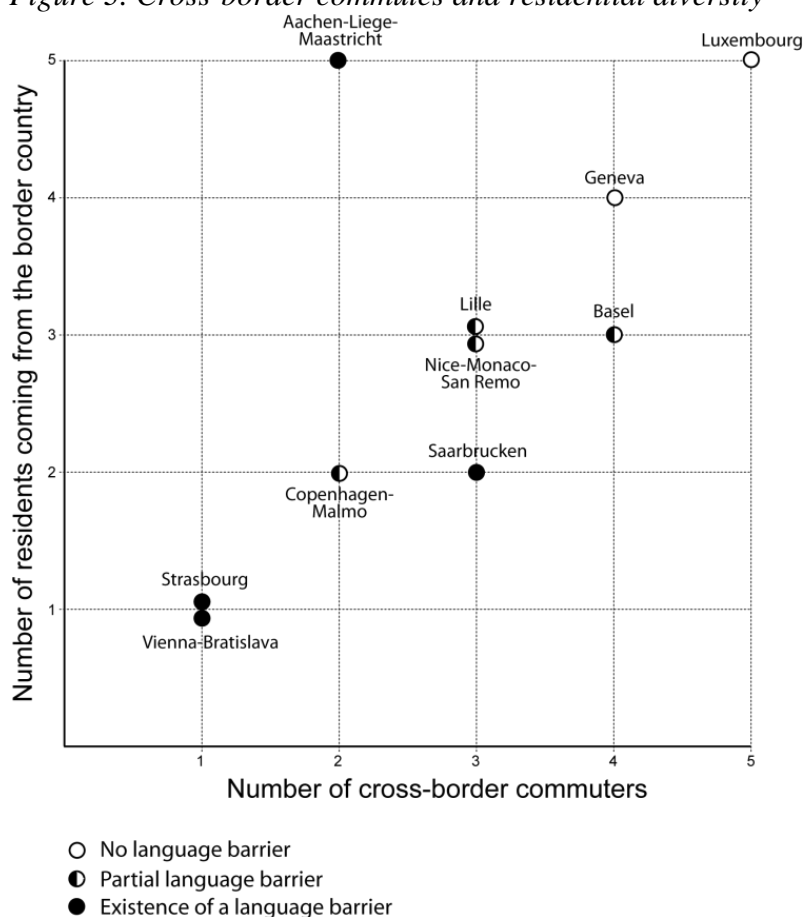
The analysis of results presented in Figure 3 shows that there is an almost linear relationship between the number of cross-border commuters and the diversity of residents in terms of nationality. Thus, Luxembourg is not only the region with the most cross-border commuters but also the region with the most residents originating in a bordering country. At the other end of the scale, Strasbourg and Vienna-Bratislava have weak levels on both measures. This relationship between the integration of labour markets and that of housing markets suggests that home-work mobility and residential choice interact (Carpentier and Gerber 2009). The comparison of the two phenomena remains however sensitive, as daily home-work mobility and residential mobility are subject to different timeframes and processes.

Furthermore, a series of factors, incentives or deterrents according to the context also have an impact. Firstly, certain provisions relating to the taxation of earned income heavily penalise cross-border commuters and thus encourage people to relocate to the country in which they work. In the Aachen-Liege-Maastricht region, “rates and regulation of taxation vary strongly. Many cross-border workers pay income taxes in both countries. They have to fill in forms in both countries and require help which is difficult to obtain” (MKW Wirtschaftsforschung and Empirica Kft 2009: 46). As a result, many Dutch cross-border commuters elect to live in Germany in order to pay less tax, and the same applies to German cross-border commuters. A similar situation is found in the case of Basel, where a high number of German workers have moved to

Switzerland in order to avoid double taxation (+5,900 between 2000 and 2006, according to the authors' calculations).

The housing market also plays an important role in relation to the mobility of workers (Cameron and Muellbauer 1998). In the border regions, the differences between property and land, and rental prices can constitute powerful factors encouraging a change in country of residence for workers (MKW Wirtschaftsforschung and Empirica Kft 2009; Walther forthcoming). In accordance with the theory of urban residential location (Alonso 1964; Muth 1969), the most common situation is that in which the price of accommodation is more attractive in the peripheral border regions than in the metropolitan centre. In fact, in certain cities, such as Copenhagen, Geneva and Luxembourg, more and more residents are deciding to move to the neighbouring country while retaining their job in their country of origin, which makes them commuters into their own country. This is the case for Luxembourg (Carpentier 2010), Geneva (INSEE-OCSTAT 2008) and the Nijmegen-Maastricht region (Van Houtum and Gielis 2006).

Figure 3. Cross-border commutes and residential diversity



Source: Authors, 2010.

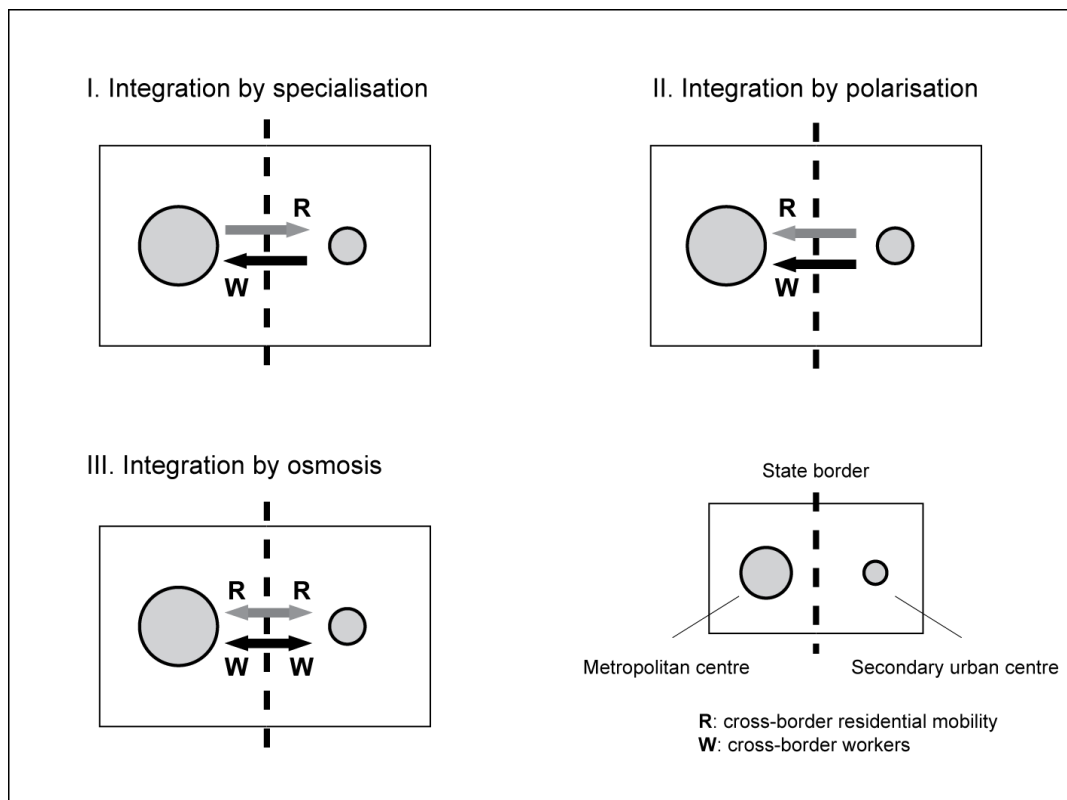
Significant price differentials at the level of the property market do not necessarily lead to corresponding residential displacements. Other factors, such as the attractiveness of the urban centre in terms of quality of life and the composition of the household, as well as the socio-professional status of individuals, can affect the appeal of a price differential. In addition, the degree of linguistic and cultural proximity across a border can also encourage or discourage residential cross-border integration.

Having addressed the orders of magnitude of economic and residential integration, we now turn our attention to the significance of these mechanisms regulating the labour and housing markets for cross-border metropolitan areas where integration is taking place.

4.4. Different types of cross-border metropolitan integration

Simultaneously considering the economic interactions incarnated by the phenomenon of cross-border commuting and residential displacements from one country to another allows three models of cross-border metropolitan integration to be distinguished (Figure 4). Using an ideal type description, the essential characteristics of each model are underlined; insignificant variations and the complex configurations found in reality are disregarded. While each case study can be associated with a model, it need not share all of its characteristics. In addition, the schema proposed does not prejudice the dynamics originating outside of the metropolitan region.

Figure 4. Three models of cross-border metropolitan integration



Source: Authors, 2010.

The first model, *integration by specialisation*, represents the implementation of a cross-border territorial system with crossed flows, in which cross-border commuting, which takes place primarily from the periphery towards the metropolitan centre, is combined with an opposing residential flow towards the periphery. This dynamic, which leads to a process of cross-border suburbanization, involves a process of functional specialisation of space, with the centre concentrating economic activity and jobs while the periphery, which is attractive in residential terms, is relegated to the role of a dormitory area. To the extent that cross-border residential displacements contribute to increasing the flow of cross-border commuters, this type of territorial organisation is based on a cumulative

logic which requires strong and coordinated institutional responses, especially in relation to the management of mobility. Supporting a functional division of space and an increase in home-work mobility, cross-border metropolitan integration by specialisation is not accompanied by a process of territorial convergence, which raises the question of the social and territorial cohesion of the regions in question. However, this type of integration can prove to be especially competitive in economic terms, as it is based on the complementarity of territories and their respective competitive advantages. While they are located at different stages of economic and residential integration, Copenhagen-Malmö and Geneva are the case studies which best illustrate this first model.

The second model of cross-border metropolitan integration is based on a highly attractive metropolitan centre, both in economic and residential terms. In this process of *integration by polarisation*, the flows of labour and the residential displacements both primarily converge on the dominant urban centre. Given the significance of the differentials of property prices between the centre and the periphery, the centripetal residential movements involve primarily wealthy households. Functional specialisation of space which tends to separate economic activity from residential areas is combined with a mechanism of social selection driven by market logic. This model, which is beneficial for the urban centre in economic terms, is however inequalitarian and raises the question of its durability within a larger process of European integration, of which the very idea cannot be dissociated from greater territorial cohesion, a factor promoting stability. It is Luxembourg which best corresponds to this territorial configuration, marked by the domination by the urban centre of its periphery (Sohn and Walther 2009; Sohn forthcoming). Basel and, to a lesser degree, Vienna-Bratislava also exhibit these features; it should be stated that in the case of the Swiss metropolis, there are regulatory constraints which explain the relative attractiveness in residential terms of the centre over its peripheral areas across the borders.

The third and last model, *integration by osmosis*, has bi-directional flows both of cross-border commuting and residential movements. In this model, the integration of labour and housing markets appears to be better balanced and a certain convergence of the border territories interacting appears to be occurring. The fact that the economic differentials across the border are limited can contribute to explaining this situation. It is a type of integration for which the attractiveness of the metropolitan centre is relatively low, or is contested by the peripheral border areas. Thus, it involves cities with lower metropolitan profiles than those involved in the processes of integration by specialisation or polarisation. Lille and Aachen-Liege-Maastricht are the cross-border metropolitan regions in Europe which approximate to this model.

5. Conclusion

On the basis of this comparative analysis of integration in Europe's cross-border metropolitan regions, the following observations can be made.

Firstly, our work allows us to confirm the hypothesis that cross-border commuting is influenced by the existence of economic differentials between the territories on either side of the border, the second phenomenon playing the role of "suction pump" in relation to the former. Consequently, strong cross-border integration in terms of the labour market goes along with the existence of high economic differentials, and the

increase of this cross-border commuting appears to be dependent on these disparities being maintained, which contradicts the idea of a systematic relationship between cross-border commuting and territorial convergence, such as is put forward by the European Union in the *European Spatial Development Perspective*, at least in terms of economic factors. Increased cross-border commuting does however contribute to a transfer of wealth from the country where the work is located to the country of residence, via the remuneration received by the workers. In the case of Luxembourg, this financial transfer is especially significant, as the territories bordering Luxembourg have some of the highest average household incomes in the French Lorraine region (INSEE 2009), while remaining depressed in terms of economic activity. The border regions thus present a paradoxical situation, remaining relatively poor in terms of the public bodies but comparatively rich in terms of their residents benefiting from cross-border commuting.

Secondly, our work suggests that the proportion of residents who have decided to live beyond the borders of their country increases together with cross-border commuting. Heavy integration of the housing market thus characterises certain metropolitan spaces which, like Luxembourg or Geneva, also have high (and increasing) numbers of cross-border commuters. This process, fed in part by the differentials of cost and access to land and property, is now contributing to the suburbanization of the border zones. This leads to particularly delicate planning problems, as the organisation of residential space is not only dependent on the relations between centre and periphery, as in any other metropolitan area, but must also take into account the existence of a national border.

The comparison of these indicators, which reveals not only interactions between actors but also the degree of convergence of the territorial characteristics, allows three models of integration to be distinguished: integration by specialisation, by polarisation and by osmosis. The interest of this approach is that it shows the different spatial forms that cross-border metropolitan integration can take in Europe, and it highlights the underlying principles and issues at stake. In the first two cases, we find dynamic metropolitan centres which exploit cross-border differentials to reinforce their comparative advantages within the framework of centre-periphery type relations; the imperatives of social and territorial cohesion appear difficult to reconcile with the economic and spatial processes in operation. In the third case, the territorial convergence is a result less of shared political will than of the relative weakness of the metropolitan centre in relation to its cross-border periphery. In all cases, the intensity and direction of the flows are heavily influenced by the effects of the benefits granted by certain differentials in the labour and housing markets, and by the barrier effects generated by the presence of national borders.

These dynamics suggest several paths for research in relation to the process of integration in the cross-border metropolitan regions. The first concerns primarily the taking into account of plans and decisions implemented by political and institutional actors. The functional dynamics set out in this study are clearly not independent of the policies implemented by institutional actors in terms of planning the development of the cross-border metropolitan regions. Building on certain work conducted by Sohn and Walther (2009) and Sohn, Reitel, and Walther (2009), it will be of particular interest to compare the indicators examined in this article with other indicators allowing the degree of institutional integration to be assessed. This approach will in particular show to what extent the interventionist approach taken by political actors in certain metropolitan

regions, such as Basel, Copenhagen-Malmö and Geneva for example, has led to different results to those of a laissez-faire approach to regional development.

The second research direction relates to the geographical context. This study limited itself to examining cross-border metropolitan regions primarily located within Western Europe, as a result of the criteria applied to identify relevant cases (metropolitan and cross-border in nature). These criteria are necessary to allow an international comparison on the basis of the principle of most similar design and will need to be retained in subsequent analyses. A stimulating approach could be to extend the study to other cases, especially in North America, where different forms of cross-border integration are seen, whether across the US-Mexico border (Herzog 1990; Martínez 1994; Alegría 2009) or the US-Canada border (Brunet-Jailly 2000; Blatter 2004).

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