ESPON

Co-funded by the European Union

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EUROPEAN RESEARCH PROJECT

Access to Affordable and Quality Housing for All People

Cross-Border Housing Markets — The Case of Luxembourg

November 2025

This case study was conducted within the framework of the ESPON 2030 Cooperation Programme, partly financed by the European Regional Development Fund.

The ESPON EGTC is the Single Beneficiary of the ESPON 2030 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.

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ISBN: 978-2-919839-29-2

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Abbreviations

BE	Belgium
DE	Germany
EU	European Union
FR	France
LAU	Local Administrative Units
LISER	Luxembourg Institute of Socio-Economic Research
LU	Luxembourg
ESPON	European Observation Network for Territorial Development and Cohesion
VAT	Value Added Tax
WL	Wallonia

Executive Summary

The ESPON HOUSE4ALL project seeks to deepen the understanding of Europe's housing crisis — its underlying dynamics, outcomes and the diversity of housing policies to tackle it. In addition to producing European-wide affordability mappings for both the homeownership and rental sectors and compiling a *European Compendium of Housing Policies*, the project has carried out ten case studies. These case studies offer in-depth examinations of local housing policy approaches in selected regions and cities across Europe, as well as comparative analyses of specific funding programmes and broader thematic challenges.

With freedom of movement in the European Union and one third of Europeans living in border areas, housing markets don't stop at national borders but are influenced by the housing and labour markets of neighbouring countries. This has the potential to give rise to affordability issues, since different levels of supply and demand, different costs of living and access to services, different regional income levels, and different transaction costs can lead to disparities in cross-border housing markets.

Luxembourg, a small yet influential country that serves as an international financial centre and the headquarters of European institutions, has a high share of the labour force commuting from surrounding countries. With the highest wages in the European Union, housing costs in Luxembourg are significantly higher in comparison to its neighbouring countries.

Comparing housing affordability on a local income to housing affordability whilst operating on a Luxembourg income, we find strong spillover effects from the Luxembourg housing market. This results in significantly fewer square meters affordable to local workers in comparison to workers operating on a Luxembourg income. Whilst effects on the Belgian housing market are fairly weak, housing affordability in both the French and German border regions is more strongly impacted by spillover effects from Luxembourg. Especially the rental market at the French-Luxembourg border can be characterised by affordability issues arising through spillover effects from the Luxembourg housing market.

Box 1: Case Study Overview

Executive Summary
• **Cross-border markets must be seen in their entirety,** since effects and trends of labour market and policies can have an impact across the border. Especially labour mobility and, following from it commuting mobility leads to cross-border spillover effects. Only looking at national entities, therefore, severely limits understanding. • **Affordability issues can be created in cross-border markets.** Discrepancies in income, housing supply, etc., in combination with cross-border mobility have the potential to make housing unaffordable to the local non-commuting local population. • **Differentiation of housing costs between Luxembourg and its neighbouring countries can be observed.** Both sales and rental prices are significantly higher in Luxembourg than in the neighbouring countries. This is especially true for sales prices. Rental prices in Germany and France exhibit a wider range, with some LAUs in those countries having rental prices reaching and even surpassing Luxembourg price levels. • **Housing affordability on a local income in the Greater Region is on average the lowest in Luxembourg.** This is particularly pronounced in the homeownership market. Looking at rental affordability on a local wage, LAUs in Luxembourg are on average only slightly less affordable in comparison to the neighbouring countries. Again, the range of affordability is a lot higher in France and Germany, with some (more rural) areas being highly affordable, whereas other LAUs are even less affordable on a local income than LAUs in Luxembourg. • **Different countries in the Greater Area exhibit different patterns of affordability.** Belgium displays a fairly homogenous price and affordability pattern throughout Wallonia, with slightly lower affordability towards Brussel and the borders of Luxembourg and Germany. In France, expensive areas and areas of low housing affordability (both for sales and rental prices) are located along the Luxembourg border and along the river Moselle. In Germany, especially the LAUs along the Luxembourg border show display high housing prices and corresponding lower affordability. In Germany, the influence of bigger cities is noticeable both in price and affordability patterns. • **Discrepancies between housing affordability on a local wage vs. a Luxembourg wage exist.** Persons operating on a Luxembourg income can afford significantly more area in neighbouring countries than their local working counterparts. This is especially true and relevant for people living in the border LAUs of France. There, a person renting on an average local income could afford distinctly fewer square metres than a person earning and renting in Luxembourg. • **Rental market hit harder by spillover effects than sales market.** While local workers in neighbouring countries on average can afford more square meters than people working and living in Luxembourg, renters in border regions can afford less space than people living and working at a similar commuting distance to Luxembourg City in Luxembourg.

1 Introduction

Despite its small geographical size, the Grand Duchy of Luxembourg is an influential country in Western Europe. It is known for its rich history, scenic landscapes and castles, and the iron and steel industry of the 19th and 20th century laying the foundation for its current wealth. In the modern era, Luxembourg City is of particular importance to the region, Europe, and the world, as a financial centre and home to several key European institutions. These include the European Commission, the European Parliament's General Secretariat, and the Court of Justice of the European Union. Historically intertwined with its neighbouring countries, Luxembourg is the core of a multinational and multilingual region, referred to as the "Grande Région" (a.k.a. Grand Region), which is characterised by strong cross-border cooperation between Luxembourg and the neighbouring regions of Wallonia (Belgium), Rhineland-Palatinate and Saarland (Germany) and Lorraine (France). A distinctive feature of Luxembourg's working population is the very high proportion of migrants. This can be attributed to the fact that Luxembourg hosts many international institutions and boasts the highest average income of any country in the EU. This makes Luxembourg highly attractive to the population of the border regions of surrounding countries, leading to a high share of the Luxembourg workforce commuting internationally.

Affordability disparities in border regions resulting from differences in local wages has already been widely shown. Recently, the *Luxembourg Institute of Socio-Economic Research* – LISER, dedicated a whole special issue publication to the relationship between housing markets in the border region. They look at both absolute prices and how much space is available in different regions, as well as taking a closer look at the situation at the different borders of Luxembourg. Still, to our knowledge, so far there has not been a systematic take on housing affordability based on local income in the whole Greater Region. For this, we will hark back to housing affordability indicators developed in the *ESPON Cross Border Housing markets in Europe* study, which allow us to analyse affordability between incomes earned by commuters, and those residing in the country where their wages are earned.

The aim of this case study is to complement existing knowledge about housing markets in the Greater Region. We do this by investigating the cross-border housing markets between Luxembourg and its neighbouring countries, as well as assessing housing affordability in more detail by considering the importance of commuting to Luxembourg City. The rest of the report is therefore structured as follows: In a first step, we give a short overview of the scientific literature available on cross-border housing markets. Then we concentrate on Luxembourg and its neighbouring countries, and what is known about housing markets in the border regions of the Greater Region. We will then take a closer look at the housing offers in the Greater Region, using web-scraping of sales and rental offers in 2024 and early 2025. A closer look is given to spillover effects from Luxembourg on neighbouring housing markets, especially through commuters to Luxembourg City, which influences housing affordability in neighbouring countries. Summarising our findings, we finish the report with an overview of the main challenges encountered.

2 Cross-Border Housing Markets

Housing markets are regularly treated as national entities, focusing only on national averages and incomes to determine housing affordability. At the same time, about a third of Europe's population lives in border regions according to the European Commission's Communication on "Boosting Growth and Cohesion in EU Border Region" (European Commission, 2017). Considering this fact, and that freedom of movement is a well-established hallmark of European policymaking, treating European housing markets as single-nation markets does not reflect lived experience. Differences in house prices and cost of living can incentivise people to work in one country, while moving across the border into a cheaper housing market and thus lead to a substantial commuting pattern across the border. Increasing freedom of movement has been shown to increase apartment prices (Dumeignil, 2022).

In this case study, we will operate under the definition for cross-border housing markets offered by Sielker et al. (2022) who define cross-border housing markets as:

"A housing market in which a critical mass of activity has led to a minimum integration where households work and live on different sides of a border. As a consequence, the distribution of jobs and residences across a border form new functional relations"

This definition underlines the importance of a minimum of integration, and therefore accessibility into the territory of the other state, to speak of a cross-border market. This is because there needs to be allowance for the prospect of accessibility, and the proximity of the job market of the neighbouring nation near international borders.

The shape of cross-border markets is formed by and influences many different fields of policy and legislation. Local and national policies and legislation show a strong potential to impact the housing market they are adhering to (Alfalah *et al.*, 2022) and therefore have the potential to create disparities along the border, where heterogeneous housing markets meet. Similarly, for housing suppliers, differences in regulations increase the cost and complexity of cross-border transactions, since companies must adapt to multiple national legislations, which can be costly and time-consuming (Oprescu, 2015; Palm, Jingryd and Kordić, 2019). Levelling these disparities out would require a harmonisation of policies along the border (Grover, 2006).

Looking at the economic aspects, affordability issues that can arise in cross-border markets can be characterised as:

- Different levels of supply and demand leading to house price differentials, which are determined by the dynamics of cross-border movements (Decoville *et al.*, 2013)
- Cost of living and access to services of general interest and overall amenities differ between the different sides of the border (Decoville and Durand, 2016)
- Different regional income levels impact housing prices and cause economic asymmetries (Sohn, 2014)
- Expanding functional regions which cross an international border and interplay with local market prices (Chilla and Heugel, 2022)
- Different transaction costs, having the possibility to impact cross-border purchasing and market integration (Dascher and Haupt, 2011)

For the longest time, cross-border studies and housing market studies were treated as separate entities. Many aspects highlighted in cross border studies, such as an integrated labour market, substantial cross-border flows, regional differences in incomes, and access to certain amenities and services of general interest, have all been shown as motivating factors in causing households to migrate across a border and change their place of residence (Chilla & Heugel, 2022; Claveres, et al., 2020). At the same time, aspects like income-to-rent/debt ratios, disparities in accessibility, changes in population density and market cycles, which play important roles in housing studies (Schwartz and Seabrooke, 2009; Stamsø, 2010; Aalbers, 2016), can be influenced by cross-border movement in border regions. Interlinking housing and cross-border studies is therefore necessary to give the full notion of how border effects play a critical role in housing dynamics in functional cross-border regions, where free-moving inhabitants and their cross-border flows lead to cross-border markets that cannot be fully understood by looking solely at the different national conditions and frameworks.

At the same time, cross-border analysis comes with its own challenges. Differences in regional income levels, in accessibility, in amenities and in market strengths, all have the possibility of impacting the price dynamics for a cross-border housing market. Also, housing data is regularly collected on a national level and therefore stops at the border (Fricke, 2024), creating challenges in combining data collected by different administrative bodies, sometimes even with different underlying definitions. We also find that within border studies, the lack of a common harmonised knowledge base is a common obstacle in international comparison (Chilla and Heugel, 2022)

As shown, cross-border markets can be subject to a plethora of different cross-border flows and display significant border effects. Understanding these effects and characteristics can help policymakers navigate the unique challenges and opportunities presented by these markets.

2.1 Cross-Border Housing Markets in the Scientific Literature

As previously pointed out, while cross-border studies are a well-established field that looks at different aspects of cross-border relations, cross-border housing studies are still an emerging topic. Something that is noted regularly is the importance of labour mobility and, following from commuting mobility, cross-border spillover effects (Ondoš *et al.*, 2017; Chilla and Heugel, 2022; Dumeignil, 2022). Regularly, the term cross-border in housing studies is used when the research is focusing on international effects and differences in the housing market (Duan, Mishra and Parhi, 2018; Duan *et al.*, 2019; Oertel, Willwersch and Cajias, 2020). This is a different approach to what we mean when looking at spillover effects in border regions, a distinctly local phenomenon.

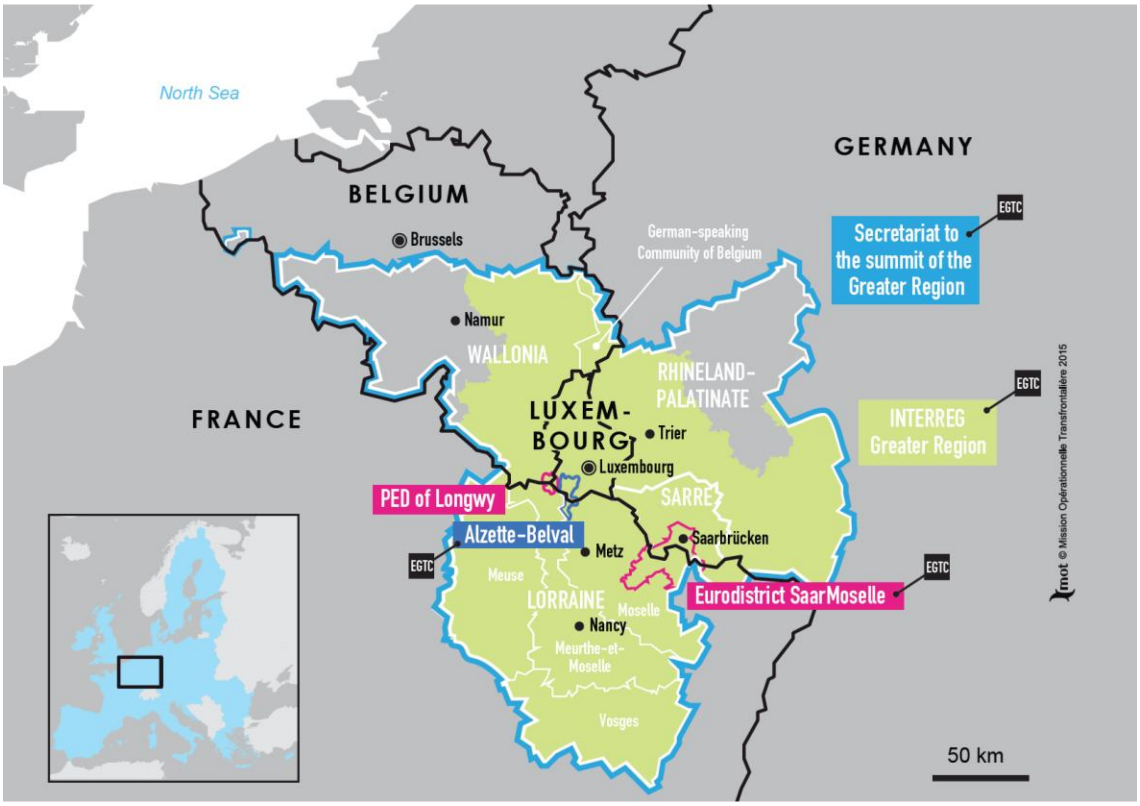
The analysis of cross-border housing markets remains rare. The most encompassing so far is the ESPON study on cross-border housing markets in Europe, using web-scraping data to measure and understand the dynamics in 11 countries. Contrary to initial expectations, they did not find relevant correlations between housing price and level of accessibility throughout each of their case study regions. Instead, they found that price, affordability of housing, cost of living, local culture, services and amenities, and a common lingua franca, as important drivers of housing dynamics in cross-border housing markets (Sielker *et al.*, 2022). One cross-border housing market that has been of interest for a long time is Luxembourg, a city where moving across the border as a way of making ends meet has a long tradition. In the following chapter, this cross-border region will be presented.

2.2 La Grande Région – Luxembourg's Cross-Border Region

Although small in geographical size, Luxembourg is an internationally influential country due to its prime location in the heart of Western Europe, its role as an international financial centre, and as the headquarters of several European institutions. Luxembourg and parts of Wallonia in Belgium, Lorraine in France and Rhineland-Palatinate and Saarland in Germany are commonly referred to as "La Grande Région". Part of the specific nature of the Greater Region is its multilingual and multicultural character, and strong economic, political, and cultural cooperation as one of Europe's key models for cross-border regional integration. The region also shares a history, with parts of Wallonia, Rhineland-Palatinate and Lorraine formerly belonging to the former Duchy of Luxembourg.

Luxembourg's status as an international financial centre and headquarters of European institutions also impacts cross-border employment. With around 43% of cross-border workers in 2024, Luxembourg's workforce is characterised by a high percentage of workers commuting from neighbouring countries (STATEC, 2024). In comparison to its neighbouring countries, Luxembourg shows the highest average and minimum wages across all of Europe (Eurostat, 2024). As a financial centre, financial fluctuations and economic crises affect the Luxembourg labour market, although cross-border workers are more affected than resident workers (Fromentin, 2021). Economic disparities also show themselves when looking at house prices. The neighbouring countries, in general, display lower house prices than Luxembourg. These disparities drive cross-border commuting and residential mobility, with many workers choosing to live in neighbouring countries while working in Luxembourg (Carpentier, Gengler and Gerber, 2011; Carpentier, Epstein and Gerber, 2012).

Figure 1: Map of the Greater Region



Depiction of the Greater Region by mot – Mission Opérationelle Transfrontallière.

Being this interconnected, there are different approaches, both on a policy level as well as an analytical level, to define the cross-border region and interactions. Laying down the strategic guidelines for the cooperation is done at the summit of the Greater Region. As members of the summit, the Prime Minister of Wallonia and the Minister Presidents/ President of the Conseil departmental of the neighbouring regions (Wallonia, Rhineland-Palatinate, Saarland, Meurthe-et-Moselle, Moselle and Meuse) work together with the prefect of the region Grand Est in France and the Minister President of the Federation Wallonia-Brussels and the German speaking community of Belgium (Grande Region, no date). They are advised by the interregional parliamentary council (CPI, no date). As the only cross-border body of representatives from trade associations and social and professional organisations, the Economic and Social Committee of the Greater Region represents interests and needs from both employees and employers (CESGR, no date). In a slightly smaller territorial extent, encompassing only parts of Rhineland-Palatinate and Wallonia as well as the Lorraine Region, Interreg VA funded the implementation of projects in the Greater Region to facilitate cross-border labour mobility (including transport, education and training), ecofriendly lifestyles (eco-technologies, waste treatment, preserving and protecting natural and cultural heritage), health and social care sector (including culture and sport) and research an technological development (Inforegio, no date). Cooperation on housing was not an explicit objective in the Interreg founding. While the Summit of the Greater Region and Interreg are the most influential forms of cross-border cooperation in the region, other forms of cooperation exist as well. These include the SaarMoselle European Grouping of Territorial Cooperation, and the Quattropole city network, encompassing Metz, Saarbrücken and Trier next to Luxembourg City (Hartz, Caesar and Schoen, 2022). The Luxembourg capital has been discussed in literature regularly as a metropolitan region in its own right. (Dautel and Walther, 2014; Durand, 2014; Sohn, 2014; Chen, Gerber and Ramadier, 2021).

No matter which analytical level is used to look at the Greater Region, balancing economic growth with social integration is a challenge, considering the high number of cross-border workers and the resulting demographic challenges (Van Egmond and Wirtz, 2021; Mathä *et al.*, 2024). While the region benefits from the various forms of cross-border cooperation transcending institutional and territorial divides, the lack of a metropolitan-sized organisation governing the cross-border region has been mentioned critically (Sohn, Reitel and Walther, 2007; Durand, 2014; Decoville and Durand, 2016).

While this has at least partly been addressed through the Interreg region , even in 2024 Fricke observes that while the cross-border character is addressed on an informal level in planning among the German border regions, it is still not a part of official planning documents.

2.2.1 The Importance of Cross-Border Commuting for Luxembourg

Luxembourg's labour market plays a significant role in shaping the border regions, with up to 55% of inhabitants of border communities in France, Belgium and Germany commuting to Luxembourg for work (Górczyńska-Angiulli *et al.*, 2024). Given the differences in income between Luxembourg and its neighbouring countries, commuting is a deeply asymmetric phenomenon in the Greater Region. Many more people live in the neighbouring countries and work in Luxembourg than Luxembourgers leaving their country for work (Carpentier, 2012; Carpentier, Epstein and Gerber, 2012; Fromentin, 2021). Looking at the characteristics of cross-border workers in Luxembourg, we see that they, on average, have a markedly higher education level than employed residents of Luxembourg, with 60% of commuters having a high level of education vs only 52% of Luxembourg employed residents (Mathä *et al.*, 2024). Still, on average, cross-border commuters receive a significantly smaller income than Luxembourg inhabitants. At the same time, they still earn a considerably higher income than the national average of their home countries (Mathä *et al.*, 2024), making the Luxembourg labour market very attractive.

Commuting happens mostly by car (84%) and only a minority (16% commute by public transport (Mathä *et al.*, 2024). With the high share of commuters, mobility issues, including urban sprawl and inefficient transport connections, are significant challenges in the Greater Region. Luxembourg is investing in cross-border infrastructure and public transport to address these issues, aiming to improve connectivity and reduce transportation costs for cross-border commuters (Van Egmond and Wirtz, 2021). While cross border workers on average are a lot less content with their commute after moving out of Luxembourg, satisfaction with housing and life quality rises substantially after moving to one of the neighbouring countries (Carpentier, Epstein and Gerber, 2012) Despite the elevated price level in Luxembourg being cited as the primary rationale by cross-border households for not acquiring their primary residency in the country, social and cultural factors also exert a significant influence on the decision regarding the location of settlement within the broader region (Gille and Scalvinoni, 2017; Claveres, *et al.*, 2020).

2.2.2 Housing Markets in the Greater Region

Luxembourg has recently attracted scholarly interest in the context of research examining its housing market and its role in the broader region. An examination of the impact of home ownership on wealth distribution reveals that cross-border households in neighbouring countries to Luxembourg acquire property more frequently and at a younger age than their local counterparts (Claveres, *et al.*, 2020). These elevated price levels are also a driving force in the fact that the median value of real assets is more than twice as high for resident employees in comparison to commuters, while the level of employees owning the household's main residence is approximately equal between cross-border commuters and employed residents in Luxembourg (Mathä *et al.*, 2024).

In their focus on the property market, as part of a dedicated special issue from the Luxembourg Institute of Socio-Economic Research on the problems surrounding cross-border labour markets in the Greater Region (Górczyńska-Angiulli et al., 2024), the authors demonstrate lower prices in the neighbouring nations in comparison to prices in Luxembourg.

As Vollot (2024) shows, current studies have illuminated the recent development of metropolisation in Luxembourg and the North-Lorraine region. Considering the discrepancy between the observed rate of housing production and the projected requirement to accommodate sociodemographic developments in Luxembourg, a situation has emerged whereby market prices have exhibited a marked increase over the period spanning 2005 to 2020. The North-Lorraine region in France has experienced a degree of spillover, manifesting primarily in the form of a significant increase in housing production, particularly within the vicinity of Thionville (Vollot, 2024).

Rents along the Luxembourg-French border exhibit a comparable trend to that observed in purchase prices, characterised by a precipitous price decline once the border of Luxembourg is traversed to France. This dynamic motivates individuals employed in Luxembourg to seek rental accommodation on the French side of the border (Mezaroş and Paccoud, 2024). This particular constellation of circumstances has the potential to enable the accumulation of financial reserves, which in turn may be allocated towards future investment opportunities.

It has been posited that this may constitute a primary factor contributing to the observation that cross-border workers in Luxembourg acquire property at a younger age than their counterparts in their respective national contexts (Claveres, *et al.*, 2020). Simultaneously, Mezaros identifies that this facilitates novel structural challenges in the French border region, with landlords exhibiting a preference for Luxembourg working tenants. An additional identified issue concerns the allocation of social housing in France to Luxembourg workers, despite their income exceeding the upper income limit.

As Lambotte and Bernier (2024) demonstrate, a more nuanced picture emerges when the Belgium-Luxembourg border is considered. The Belgian province of Luxembourg, with the city of Arlon, has been identified as a significant hotspot for house prices in South Wallonia. In contrast, other provinces along the Belgian-Luxembourg border are primarily characterised by an abundance of designated building land and comparatively low housing costs. Notwithstanding this, and with generally lower prices than in Luxembourg, Belgian border regions (notably Arlon and Bastogne) are witnessing an above-average increase in population, particularly with a rapid rise in the number of immigrants (Lambotte and Bernier, 2024).

A similar effect can be observed in the context of the German-Luxembourg border. As would be expected, the highest prices were observed in Trier, the largest city in the German border region under investigation. However, the other districts in the border region, which from a German perspective are rural and peripheral, also show increased property prices and investment volumes. These phenomena can best be explained by their membership of the Luxembourg metropolitan region (Mießner, 2024).

Luxembourg itself exhibits a marked spatial differentiation in housing costs, with lower costs observed in the northern part of the country and higher costs in and around Luxembourg City in the south. While this discrepancy is less evident in the costs of apartments, varying "only" by a factor of 2, the price of building land in Luxembourg City exceeds that in less expensive communes by a factor of 6 (Licheron, 2024). This further reinforces the profound impact of the metropolitan area of Luxembourg on housing affordability within the Greater Region.

While all the studies address the different levels of income and purchasing power in their interpretations, what is still missing is a focused take on housing affordability depending on local incomes in the Greater Region. To date, the analysis of the Greater Region as a cross-border market has also proven challenging. This is due to the fact that official statistical data is dependent on the respective national statistical offices, and prior to our study, there has been an absence of cross-border real estate market data (Fricke, 2024).

3 Housing Affordability in Luxembourg's Border Regions

3.1 Housing Policies and Markets in the Greater Region

While working together administratively in the Greater Region, planning and housing policies are drawn up, defined, and executed separately in France, Belgium, Germany and Luxembourg. When comparing the housing markets in the Greater Region, we find four different starting points. While private rental in Luxembourg and France accounts for just about a quarter of the housing market and therefore plays a more subordinate role, both in Germany and in Wallonia, private renting forms a significantly stronger market segment with 40%-45% of market share. At the same time, despite rental forming a relatively small market segment, Luxembourg is the country with the highest level of rent regulation in the Greater Region and a higher level of Landlord-tenant regulation than both Germany and Belgium (Claveres, *et al.*, 2020). In Luxembourg, France and Belgium, private ownership clearly forms the strongest housing market segment, with market shares of owners living in their own occupation between 58% in France and 69% in Luxembourg. Among the four countries, only Germany forms a clear rental market, where the share of private rental outnumbers the share of owner-occupied housing. Considering the fact that homeownership is heavily subsidised in comparison to the other market segments in Luxembourg (Mezaroş and Paccoud, 2024), it is not surprising that it forms the strongest market segment in the country. While in Luxembourg there is one legal mechanism targeting low- and middle-income renter households, the "Aide au financement d'une garantie locative" with a volume of 7.45 Million Euros (2019), this is vastly outnumbered by the 28.7 Million Euros spent on tax deductibility of mortgage interest ("subvention d'intérêt" and "bonification d'intérêt") (2017), 153 million Euros (2017) spent on tax credit for notary deeds and VAT reduction for homebuyers willing to occupy unoccupied dwellings, amounting to around 209 Million Euros in 2017. (Krapp *et al.*, 2022).

Table 1: Shares Markets Segment in the Greater Region

	Luxembourg	France	Germany	Belgium
Share private rental	28.3%	25.6%	45%	36% (BE), 29.7% (WL)
Share social rental	2%	14.7%	12.3%	7% (BE) 6.5% (WL)
Share owner-occupied	69%	57.5%	42.8%	57% (BE), 63.8% (WL)
Share of „heavy financial burden"	29.3-65.7%	23.4%-44.2%	13.7%-23.1%	22% - 53% (whole BE)

Own depiction, based on (Sielker et al., 2025c)

With a market share of just 2%, social rental is virtually non-existent in Luxembourg. At the same time, Luxembourg is the country where the share of households for whom housing forms a heavy financial burden is, with (depending on the income level) between 29.3 and 65.7%, the highest among the countries of the Greater Region. While Belgium, with approximately 7% has a higher market share of social housing, with between 22% and 53%, it still displays high levels of households, for whom housing is a heavy financial burden. In a similar range of households that experience housing costs as heavy financial burden is France (between 23% and 44%). In contrast to Belgium and Luxemburg, France has a significantly higher share of social rental housing, with 15% market share the highest among the four countries.

In Germany, a country with a fairly high share of social housing of 12%, significantly less households (14%-23%) than in the other countries experience housing as a financial burden. Even among households earning below 60% of the median income (23% heavy financial burden), housing is a financial issue for a smaller share of households than for households earning above 60% of the median household income in the other countries. Considering the strong differences in the share of the social housing segment, it is not surprising that the four countries follow very different approaches to defining what they mean by social housing.

Both France and Germany differentiate between social housing and affordable or intermediate housing. Both in France and Germany, social housing follows a stricter set of rules (and income targets) and is built with the help and funds of the state. Affordable housing in Germany and intermediate housing in France cater more towards the middle classes, who don´t meet the stricter income limits of social housing. Neither Luxembourg nor Belgium differentiates between social and affordable or intermediate housing. Wallonia in Belgium has abandoned the concept of social housing for public housing, residential accommodation that is part of the social policy developed by the region. Luxembourg does not offer social housing, only affordable housing. This describes housing that is sold or rented under affordable conditions. Affordable rent can cater to specific target groups or eligible households. Another form of affordable rent in Luxembourg is private rent under social rental management, where rents are capped, and units are publicly subsidised. Whereas social and affordable housing in Germany and France means rental housing, in Luxembourg, affordable housing can also mean ownership. Still in this situation, the ground on which the housing unit is located on will need to be rented and can only be occupied by the owner.

Although the housing markets in the Greater Region have the potential to highly influence each other, there is only limited official interaction in the policy and planning structures, with no formal regional planning (Schmitz, Hesse and Becker, 2022), also impacting the area of housing. For Germany and France, cross-border effects are not officially included in planning documents, although they are taken into account on a local development level (Fricke, 2024)

Box 2: Overview Definitions of Social Housing in the Greater Region

Luxembourg	
Definition(s) of intermediate/ affordable Housing	Luxembourg does not distinguish between social, intermediate, or affordable housing. For the purposes of the law, „affordable housing" means any housing: • built and intended for affordable sale or built and intended for sale at moderate cost. In both cases, eligible households take ownership of the dwelling but rent the ground (emphyteusis) and must occupy it themselves; • built and intended for affordable rental. The dwelling is either for specific target groups or for eligible households. The affordable rent formula adapts linearly to the standard of living (the household's income and composition). Low-income households have an affordability ratio of 10%, median-income households a ratio of +/- 32%. This is a way of combining social and intermediate housing; or • under social rental management. The dwelling is privately owned, rents are capped, the rental management is non-profit, and the unit is supported by public subsidies.
Definitions(s) of social housing	None
France	
Definition(s) of intermediate/ affordable Housing	'Intermediate housing' in France is housing with regulated rents below market prices. The category was created in 2014 with the ambition of enabling access to affordable housing in tense areas for the middle classes who don't have access to social housing stock. Intermediate housing is defined in the Construction and Housing Code, Article L. 302-16, in terms of public support, income ceilings of beneficiaries, price/rent levels.
Definitions(s) of social housing	Social housing (Habitations à loyer modéré - HLM) is built with the help of the State and is subject to precise construction, management, and allocation rules. Rents are also regulated and access to housing is subject to income ceilings. Since 1979, it is based on an agreement between the social landlord (the person/organisation who builds and manages the social housing) and the State.
Germany	
Definition(s) of intermediate/ affordable Housing	"Affordable rental housing (literally 'third funding route,' Dritter Förderweg) offers a slightly higher priced version of social rental housing. Access is defined according to income limits (higher than those applied for social housing)."
Definitions(s) of social housing	Social housing (Sozialer Wohnungsbau) in Germany is rental housing built using state funds. Social housing must be made available to low-income households in line with regional limits and rented out at a below market rate in accordance with clearly defined rules. A specific characteristic is that housing produced this way is required to have a social function only as long as it takes for state loans used in their construction to be repaid. This 'lock-in' period is typically 15-30 years. Social housing has decreased significantly over time from more than 2 million units in the early 2000s to 1.08 million units in 2021.
Belgium	
Definition(s) of intermediate/ affordable Housing	There is no official definition of affordable housing (WL)
Definitions(s) of social housing	In the Walloon Code of Sustainable Housing, the mention of "social housing" has been replaced by "public housing: housing over which a real estate operator holds real rights, which it manages or rents out, intended for housing as part of the social policy developed by the region."

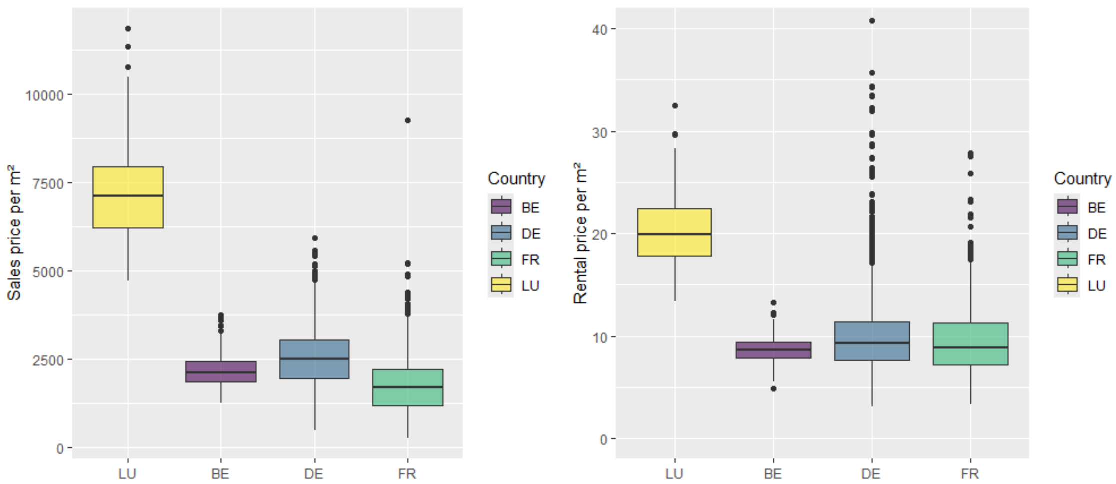
3.2 Housing Costs in Luxembourg and the Greater Region

3.2.1 Sales and Rental Prices in the Greater Region

In the following section, we will take a closer look at housing costs in Luxembourg, the border region of Luxembourg and the Greater Region in general. For this, ESPON HOUSE4ALL web-scraping data will be used. Between March 2024 and March 2025, 95,331 rental offers[1] and 329,969[2] sales offers were web-scraped from the Greater Region according to the extent of the secretaries participating in the summit of the Greater Region (including the entire Lorrain Region in France, the Walloon region in Belgium, as well as the state of Saarland and Rhineland-Palatinate in Germany, and the whole Grand Duchy of Luxembourg). Those prices were then aggregated at the LAU (Local Administrative Unit) level. For graphs, LAUs with less than five listings for sales or rentals were excluded from the corresponding graphs to avoid sample errors. These LAUs are nevertheless depicted in maps.

To calculate housing affordability, HOUSE4ALL income data was used. For sales affordability, the measure used was the number of square metres of space that can be purchased with one-third of an average local income, provided that the residential unit is financed with a 30-year mortgage. Rental affordability was operationalised as the number of square meters that can be rented with one-third of an average local monthly income.

Figure 2: Housing Costs in the Greater Region



Own depiction, based on HOUSE4ALL data.

Looking at housing costs in the Greater Region, we see a stark difference between Luxembourg and its neighbouring countries. It becomes apparent that median sales prices per square meter in Luxembourg are around three times the amount in comparison to the neighbouring countries. While Belgium exhibits a fairly similar median sales price to Germany (BE: 2115 € per m²; DE: 2590 € per m²), the range of sales prices are far greater in Germany with the highest outlier (Battenberg (Pfalz) with 49955 € per m²)[3] approaching Luxembourg price level (7094 € per m²). While some outliers in France reach Luxembourg price levels, buying real estate property is, on average, the cheapest in France (median with 1793 € per m²).

While the difference between rental prices is slightly lower, Luxembourg, with 20.3 € per m² median rents are still around double the rent of the neighbouring countries.

[1] BE: 34,215 offers; DE: 13,607 offers; FR: 39,874 offers: LU: 7,635 offers

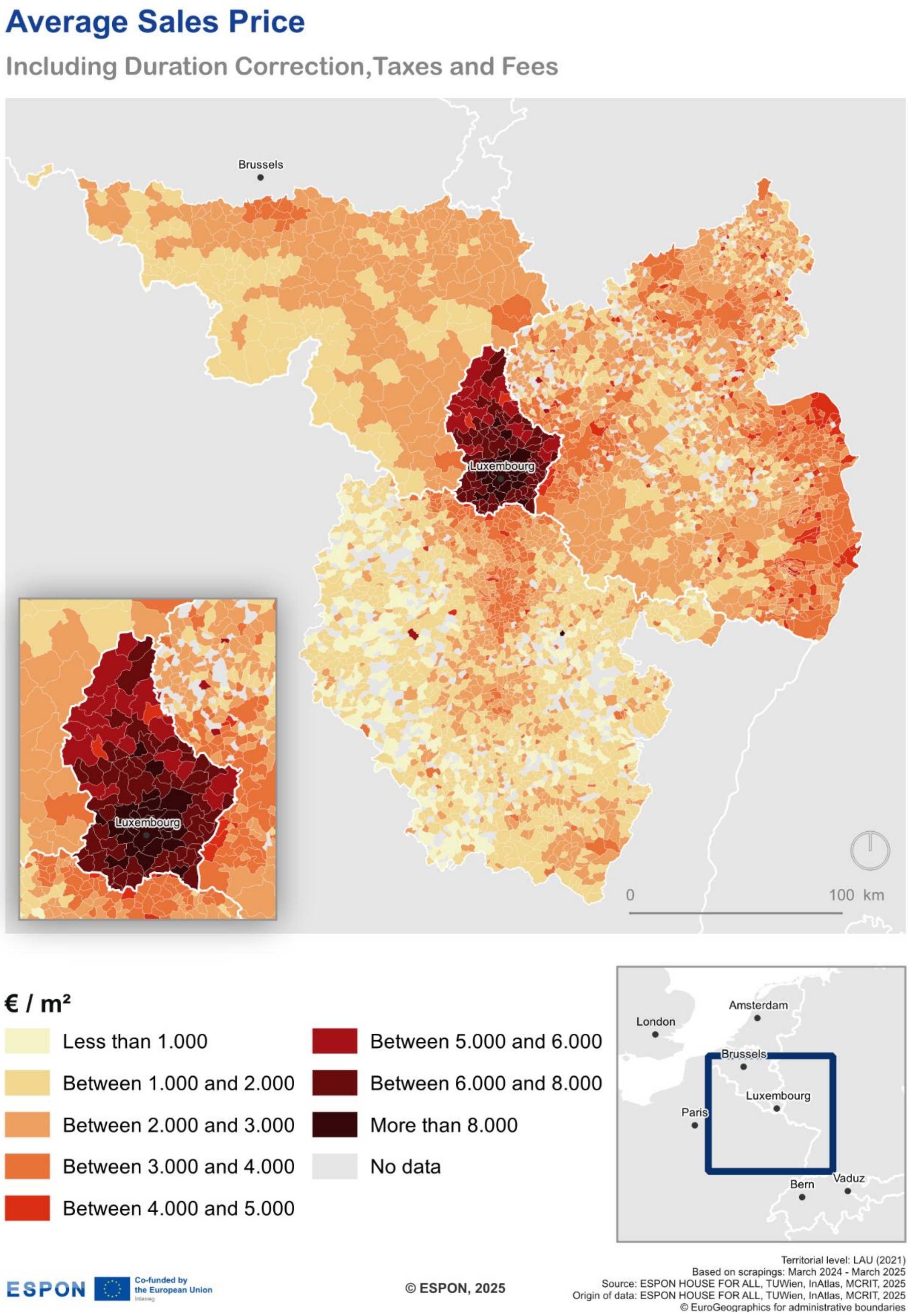
[2] BE: 85,445 offers; DE: 87,480 offers; FR: 124,080 offers; LU: 32,964 offers

[3] At the very border of the greater region already in the vicinity of Mannheim

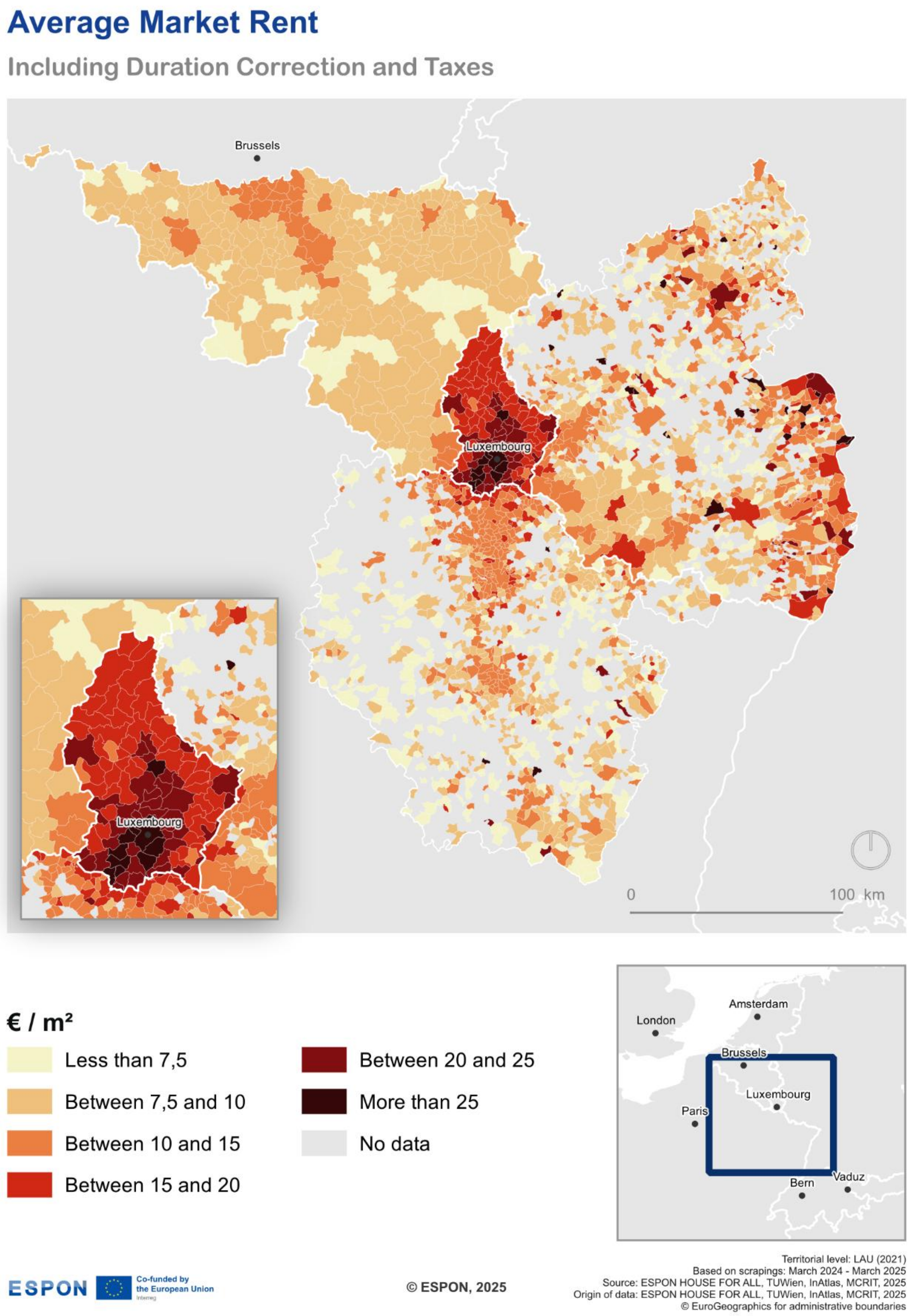
With median rental prices between 8.6 € per m² in Belgium and 10.7 € per m² in Germany, average rents in Belgium, France and Germany are similar, though with different ranges. While Belgian areas display more homogeneous housing costs between 4.8 € and 13.3 € per m², rents in Germany (5.8 €-40.8 € per m²) and France areas (4.3 € 20.7 € per m²) are spread much broader.

In Map 1 and Map 2, we see this differentiation manifested in spatial patterns. Examining sales prices first, in Map 1 in Belgium, we see broad areas of intermediate sales price levels, with some higher specs near the Luxembourg border at Arlon and near the German border, as well as some areas lying close to Brussels. Cheaper areas in Belgium can mostly be found near the French border. In France we see a clear differentiation, with high sales prices along the Moselle -and also motorway- connecting Luxembourg City to Thionville, Metz and Nancy. Another band of high prices in France can be seen in the immediate border region of Luxembourg. Outside of these areas, we find vast areas with low to intermediate priced housing sales. Germany displays a similar differentiation, though to a lesser degree than France. Areas along the border between Saarbrucken and Trier show higher prices. In the middle area of Rhineland-Palatinate, we find more intermediate to low housing prices offered. Then again, at the eastern outermost regions of the Greater Region, another area with higher prices can be observed. These are areas which are then closer to other impactful German regions, Karlsruhe, Mannheim, and Frankfurt. In the northern part of Rhineland-Palatinate, we again find areas of higher prices around the city of Koblenz and near Bonn in North Rhine-Westphalia.

Map 1: Average Sales Housing Costs in the Greater Region



Map 2: Average Rental Housing Costs in the Greater Region



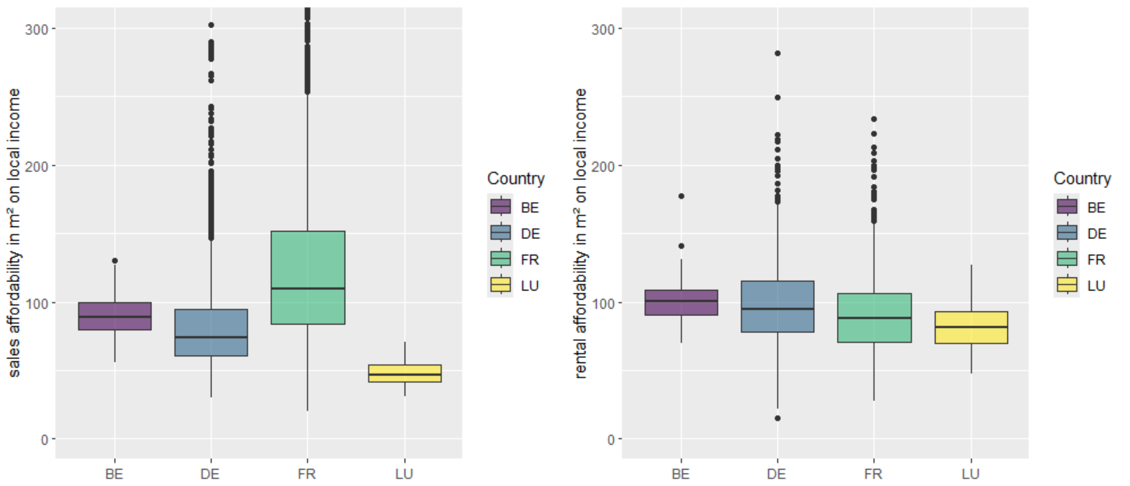
When looking at the rental prices in Map 2, a similar picture emerges to the sales prices. Belgium again displays a fairly homogenous distribution, although the impact of Brussels at the northern limit of the Greater Region becomes more pronounced in comparison to the sales prices. Both in France and Germany, there are vast areas where there are no rentals on offer (mostly in the rural areas, where sales prices are already low).

In France, the area along the Moselle and along the French-Luxembourg border becomes even more pronounced than it was with sales prices, characterised by both higher rental prices and the fact that there is a continuous agglomeration with rentals observable. In vast areas of the French countryside, no rental offers were observed during the study period. On the German side, we find a high-price rental hotspot along the Luxembourg and French borders. Apart from this, we mainly find higher rental prices in and around the cities in the area. Again, the eastern limit of the Greater Region shows pronouncedly higher prices—more in the catchment areas of Karlsruhe, Mannheim and Frankfurt than the Luxembourg border. However overall, similar to sales prices, Luxembourg again displays significantly higher rental prices than the rest of the Greater Region.

3.2.2 Housing Affordability in the Greater Region

When looking at how many square meters can be bought on an average local income on a 30-year mortgage, we see less stark contrasts, compared to looking at the raw prices. With a median value of 101 m² that can be obtained on a 30-year mortgage on an average local income, France is on average the most affordable area in the Greater Region, while also displaying a very broad range of sales prices. Depending on the LAU, an average local income could afford an individual somewhere between 20 m² and 364 m². LAUs in Germany are on average significantly less affordable than in France, with a median value of 71 m² affordable on an average local income. However, the range of values in Germany are similarly broad. Affordability in Germany can range, depending on the LAU, somewhere between 36 m² and 364 m². Both the Belgian and the Luxembourg housing markets exhibit a much smaller range. In Belgium, depending on the LAU, an average local income can provide for between 56 m² and 130 m². With a median of 89 m², it is less affordable on average than France, but more affordable than the average German housing sale. The least affordable country in the Greater Region is its Centre, Luxembourg. The median sale that a single person can afford on a 30-year mortgage on an average local income in Luxembourg is just 47 m². Compared to those in the other countries of the Greater Region, with values between 31 m² and 71 m², the range of average offers is limited for people trying to settle in one of the LAUs of the Great Duchy.

Figure 3: Housing Affordability in the Greater Region



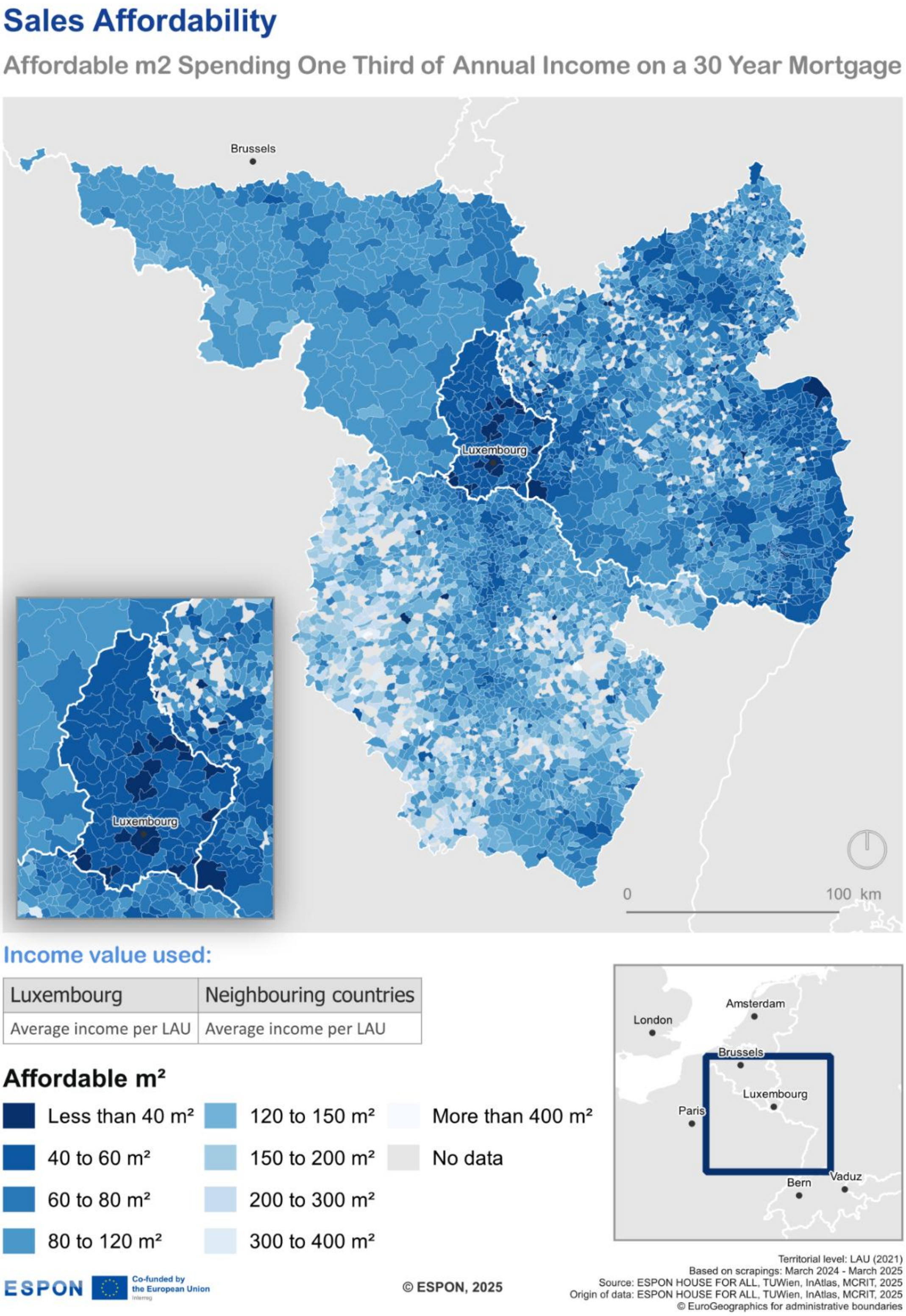
Some outliers are excluded from depiction. Sales affordability is operationalised as the number of square meters that can be bought on a 30-year mortgage, spending one-third of an average local annual income. Rental affordability is depicted as the number of square meters that can be rented spending one-third of an average local income.

Rentals in the Greater Region are more homogeneous than sales prices. Rental affordability is depicted as the number of square meters that can be obtained with one-third of the LAUs average local monthly income spent on rent. On average, with a median value of 101 m², local rental affordability is the highest in Belgium. France (median value 79 m²), Luxembourg (median value 80 m²) and Germany (median value 84 m²) have very similar affordability on an average local income. At the same time, with a range spanning values between 48 m² and 127 m² depending on the chosen LAU, Luxembourg displays a much more homogenous rental market than Germany or France.

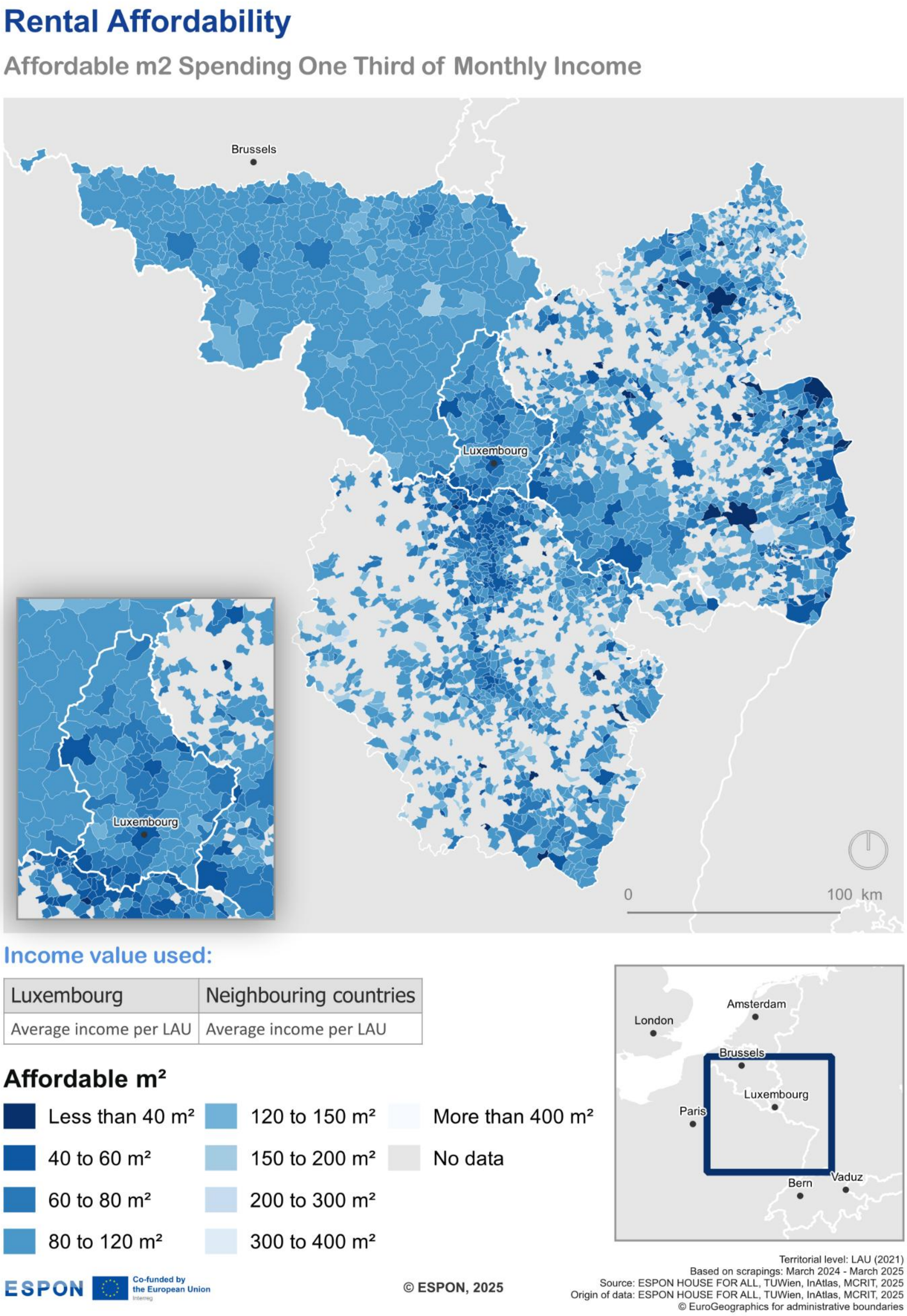
In Germany, the amount of space that can be rented on an average local income varies between 22 m² and 171 m², depending on the LAU. While France stood out as the most affordable Country in the Greater Region while looking at sales prices, renting is less affordable in France. Similar to Germany, France shows a fairly high range of rental affordability. While in the most affordable LAU, an average local income can rent on average 191 m², the average local income of the least affordable LAU can only provide for 42 m² of space. These broad ranges of values in Germany and France hint at the potential of spatial segregation; therefore, in the next step, we will look at how these values manifest themselves throughout the greater region.

Looking at the spatial patterns of sales affordability on the average local incomes in Map 3, the Wallonia area again stands out through its fairly homogenous affordability structure. The amount of square meters living space that can be bought on a single local average annual income on a 30-year mortgage here mostly ranges between 80 m² and 100 m². Luxembourg is clearly the least affordable country in the region; a 30-year mortgage there can afford 71 m² at most, in the vast majority of the country, even less than 60 m², sometimes, especially in and close to Luxembourg City less than 40 m². Around Trier and along the German-Luxembourg border in Germany as well as along the Moselle in France we find areas of similarly low affordability as in Luxembourg. Like the patterns from the raw sales prices, the more rural areas in both France and Germany stand out through the higher numbers of square meters that are affordable on an average local income. Again, in the East and North of Rhineland Palatinate, other urban areas and their impact on housing affordability become more apparent than the proximity to Luxembourg.

Map 3: Sales Affordability in the Greater Region



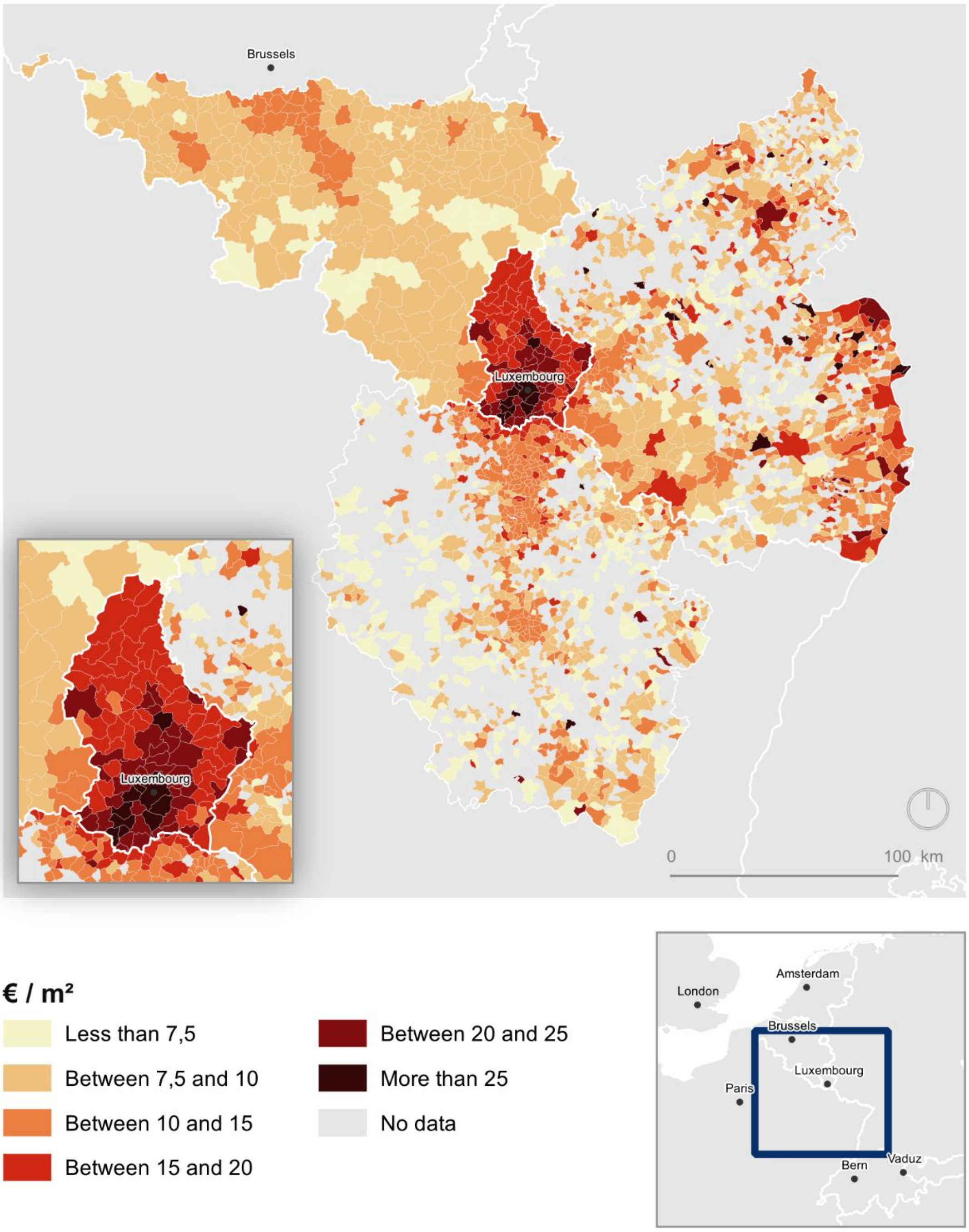
Map 4: Rental Affordability in the Greater Region



When looking at rental affordability in Map 4, we see the spatial manifestation of what we could see on the right side of Figure 3. For renting individuals on average, there is approximately the same space affordable as buying on a 30-year mortgage in France. In the other countries people renting on their average income can afford on average more housing space than people spending the same share of their local average income on a 30-year mortgage. This is mostly due to the fact that in areas where sales are highly affordable, no rental housing is on offer. Prices and affordability on an average local income in areas where rentals are obtainable are more similar throughout the Greater Region. In Belgium, again, we see a fairly homogeneous market materialise with an intermediate to high affordability level. Luxembourg, while with a lower affordability in and around Luxembourg City and towards the French border, also displays some areas towards the North, West and East that are more affordable on the local average income. Germany and France display a very dispersed picture, with vast rural areas, where there are no data for rentals obtained in our period of investigation. It becomes apparent that the border region in France, as well as regions along the Moselle, are often less affordable on an average local French income than living in Luxembourg on an average local Luxembourg income, despite their stark differences in actual price level (see Map 2: Average Rental Housing Costs in the Greater Region

Average Market Rent

Including Duration Correction and Taxes



Territorial level: LAU (2021)
Based on scrapings: March 2024 - March 2025
Source: ESPON HOUSE FOR ALL, TUWien, InAtlas, MCRIT, 2025
Origin of data: ESPON HOUSE FOR ALL, TUWien, InAtlas, MCRIT, 2025
© EuroGeographics for administrative boundaries

ESPON Co-funded by the European Union

3.3 Cross-Border Affordability

Due to the high interconnectedness of the region and differences in housing costs and incomes, living and working in different countries is very attractive in the region. In the next step, we will therefore look at housing affordability based on different national wages. Since Luxembourg has the highest incomes in the Greater Region, we will first look at how much square meters of living space an average Luxembourg income can afford in different areas of the Greater Region in comparison to local affordability. Then we will specifically look at the different border regions to illustrate how the affordability of local incomes varies from country to country. To do this, we will compare housing affordability for people earning the local income with affordability based on an average Luxembourg income (58,403 € per year). We will do this by looking at affordability on the average local income at the level of NUTS2 regions, as well as from the LAUs bordering Luxembourg in the respective countries.

To look at how cross-border spatial affordability patterns manifest, for each country bordering Luxembourg, we will then map four different scenarios for both rentals and sales offers. For Germany and sales affordability in Scenario one, we will map how many square meters a person can afford on a 30-year mortgage on one third of a disposable German income (using the average income of the respective LAUs for Germany and for Luxembourg LAUs, the weighted mean income of Rhineland-Palatinate and Saarland -31,071 €-as a basis). Scenario two maps the affordability on a Luxembourg income, mapping affordability based on the average incomes for each LAU in Luxembourg and based on the weighted average income of Luxembourg Country -58,403 €- for German LAUs. Scenarios one and two are the basis for displaying how much a hypothetical person working in Germany (Scenario one) or Luxembourg (Scenario two) could afford in their own country, as well as if they were to move across the border. Map 3 shows affordability based on the local incomes in both Germany and Luxembourg, as we have used in the previous chapter. The last map displays the reversed affordability in one map to exemplify the difference. In this fourth map, affordability in both countries is shown based on the average income of the other country. Therefore, Germany is displayed on a weighted mean Luxembourg income (58,403 €), and Luxembourg is displayed on an income calculated from the weighted means of the German Greater Region LAUs (31,071 €).

The same four maps are done for the German-Luxembourg border based on rent affordability on one-third of a disposable income. For both Belgium and France, all four maps are done for both sales and rental prices.

3.3.1 Housing Affordability on a Luxembourg Income

When we compare housing affordability in the Greater Region on a NUTS2 basis, it becomes apparent that even in the regions bordering Luxembourg (Luxembourg, Liege, Trier, and Lorraine), the average affordability is the lowest in Luxembourg by a significant margin (see Table 2). While we see that affordability in the NUTS2 border regions is already higher than in Luxembourg on the respective local incomes, affordability on an average Luxembourg income is again significantly higher in the neighbouring countries. Put simply, earning in Luxembourg while obtaining housing in one of the neighbouring countries is therefore a highly lucrative constellation. On a Luxembourg income, sales affordability in the neighbouring countries is between three to five times higher than the average affordability in Luxembourg. For all regions except Brabant Wallon in Belgium, sales affordability on an average Luxembourg income is around twice as high in comparison to affordability on an average local income. In contrast, rental affordability is more similar throughout the Greater Region. Here in the most affordable region (Hainaut in Belgium), a person on an average Luxembourg income could afford three times the living space compared to spending the same share of their income in Luxembourg. All in all, affordability is highest in Belgium. The least affordable region for sales prices there is Brabant Wallon, close to Brussels, followed by Liège, bordering both Luxembourg and Germany. Luxembourg province, closest to Luxembourg City, is in the middle of affordability in Belgium. Hainaut, bordering France, is significantly more affordable than the other provinces regarding sales prices. For rents, a different picture emerges with Luxembourg province being the most affordable and Liège the least affordable region.

In Germany, Trier, the NUTS2 region closest to Luxembourg, displays high rental affordability in comparison to the regions of Rheinhessen-Pfalz or Saarland, but distinctively lower sales affordability than Saarland or Koblenz. Rheinhessen Pfalz, the least affordable NUTS 2 region of the German Greater Region area, is at the same time farthest away from Luxembourg but closer to other important German centres, most importantly Frankfurt am Main. In comparison to Belgium, the German NUTS2 regions are less affordable, both on an average Luxembourg income and the local incomes. Still, throughout the regions, a person operating on an average Luxembourg income could afford around twice the space a person on a local income could for both renting and buying. In comparison to living and working in Luxembourg, a Person earning an average income in Luxembourg and living in Germany could afford to rent slightly more than twice the space in comparison to renting in Luxembourg and around three times the living area in comparison to buying in Luxembourg.

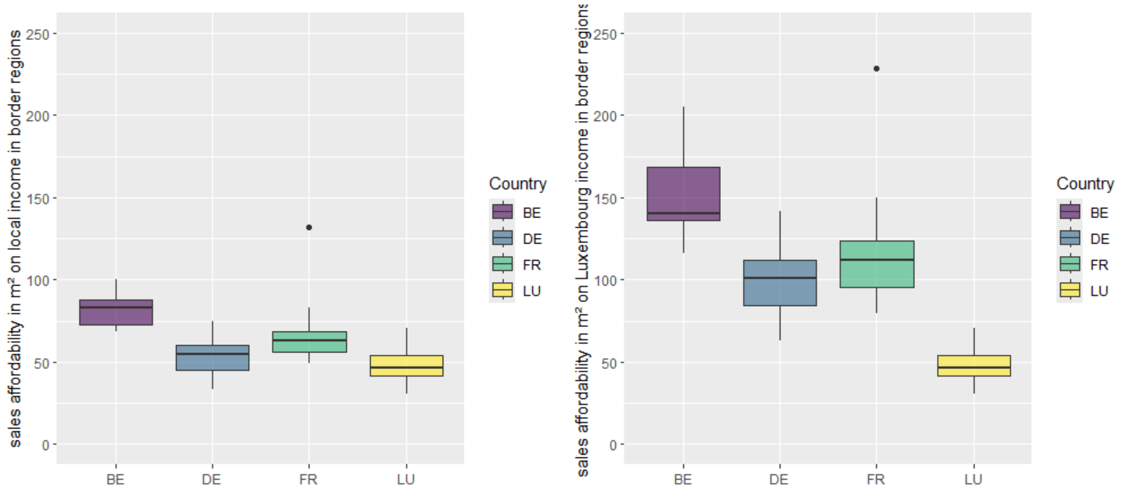
In France the NUTS2 region of Lorrain is the only one under the umbrella of the Greater Region. While sales affordability in France is high even on an average local income (only topped by Hainaut and Namour in Belgium), rental affordability is very low. The only NUTS2 region in the Greater Region where people on a local income can afford to rent less is Saarland in Germany. A person operating on an average Luxembourg income could afford to buy or rent slightly more than twice the living space in comparison to a person buying or renting on the average local income in France. If a person were to earn an average wage in Luxembourg and commute from France, this person could afford to buy more than four times the number of square meters compared to spending the same amount of their income on buying in Luxembourg. For renting, this situation is very different, since a person renting in the Lorrain region while earning an average Luxembourg income could afford just slightly more than twice the amount of space the same person could while renting in Luxembourg.

Table 2: Rental and Sales Affordability in NUTS2 Regions of the Greater Area

Country	NUT2	Average yearly income	Affordability			
			Sales		Rental	
			On local income	On average Luxembourg income	On local income	On average Luxembourg income
LU	Luxembourg	58403 €	40.95 m²	40.95 m²	64.27 m²	64.27 m²
BE	Brabant Wallon	37277.93 €	78.24 m²	122.22 m²	93.49 m²	145.33 m²
BE	Hainaut	28879.36 €	100.45 m²	204.13 m²	91.04 m²	180.61 m²
BE	Liége	29429.51 €	80.49 m²	160.46 m²	85.19 m²	170.85 m²
BE	Luxembourg	31040.17 €	83.956 m²	159.78 m²	94.34 m²	175.19 m²
BE	Namur	30816.01 €	86.97 m²	168.56 m²	87.86 m²	165.36 m²
DE	Koblenz	31577.71 €	71.55 m²	132.19 m²	77.33 m²	142.95 m²
DE	Trier	31151.03 €	63.73 m²	118.16 m²	76.42 m²	144.10 m²
DE	Reinhessen-Pfalz	31638.43 €	60.66 m²	112.12 m²	59.86 m²	112.18 m²
DE	Saarland	29093.09 €	73.43 m²	147.58 m²	67.44 m²	136.44 m²
FR	Lorraine	27426.41 €	85.02 m²	181.08 m²	66.06 m²	142.63 m²

As we have seen, looking at housing affordability on NUTS2 level does not immediately display border effects from Luxembourg. Both in Germany and Belgium, where several NUTS2 regions belong to the Greater Region, other local urban centres (Brussels and Frankfurt am Main) seem to have a stronger impact. Looking at the sales affordability in the LAUs that directly border Luxembourg (Figure 4, left side), we see that on the average local income, France, Germany and Luxembourg have very similar affordability levels and only Belgium displays a higher sales affordability, with the average sales affordability in the border LAUs Belgium allowing nearly twice the square meter affordability in comparison to Luxembourg. Looking at the sales affordability on a Luxembourg income (Figure 4, right side), the differences become clearly apparent. While on the average local income sales affordability was fairly similar throughout the Greater Region, earning an average Luxembourg income, a person working in Luxembourg but living in the immediate border regions could afford twice to three times the living space when buying on a 30-year mortgage. On average, the border regions are less affordable if we are to compare them to the general sale affordability throughout the German, Belgian, and French areas of the Greater Region (compare Figure 3). This is especially true for the French border regions.

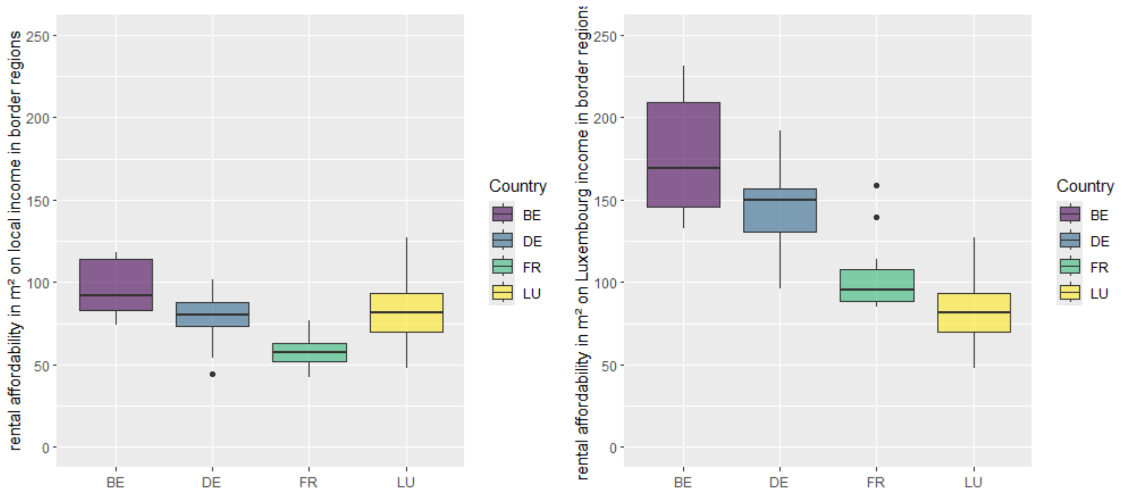
Figure 4: Sales Affordability in Border Regions



For BE, DE, and FR, only data from LAUs bordering Luxembourg is used. Local sales affordability is operationalised as the num ber of square meters that can be bought on a 30-year mortgage, spending one-third of an average local annual income. For affordability based on Luxembourg income, for each LAU it is calculated how many square meters can be bought spending one third of an annual Luxembourg income (58, 403 €) on a 30-year mortgage.

When looking at rental affordability in the LAUs bordering Luxembourg (Figure 5, left side), a slightly different picture emerges. While Belgium still has the most affordable housing offers in our dataset, the difference to Luxembourg becomes smaller. A person operating on an average income in the LAUs bordering Luxembourg could, on average, just afford 10 m² more than the average affordability in Luxembourg. The most notable among the border regions are those in France. Here, a person renting on an average local income could afford distinctly fewer square metres than a person earning and renting in Luxembourg, also spending a third of their respective income on rent. Again, we see that affordability rises if a person were to earn an average Luxembourg income in Luxembourg but rent in one of the border regions in the neighbouring countries (Figure 5, right side). While median affordability in both the German and Belgian border regions on a Luxembourg income is significantly higher, renting in the French border regions on a Luxembourg income, on average, is just slightly higher than renting in Luxembourg, spending a third of the average Luxembourg income on rent. On average, the border regions are less affordable if we are to compare them to the general rent affordability throughout the German, Belgian, and French areas of the Greater Region (compare Figure 3). This is especially true for the French border regions.

Figure 5: Rental Affordability in Border Regions



For BE, DE, and FR, only data from LAUs bordering Luxembourg is used. Local rental affordability is operationalised as the number of square meters that can be bought spending one-third of an average local income on rent. For affordability based on Luxembourg income, for each LAU it is calculated how many square meters can be rented spending one third of an Luxembourg income (58, 403 € per year).

3.3.2 The German Border

After establishing this broad pattern of cross-border affordability between Luxembourg and its neighbouring countries, in the next step, we want to look closer at the spatial patterns of cross-border affordability in the Greater Region. First, we will compare cross-border housing affordability for Germany and Luxembourg. We will start by looking at sales affordability, especially important for people aiming to live in Luxembourg, since it is a predominantly sales market. After that, we will look at rental affordability, the predominant tenure form in Germany.

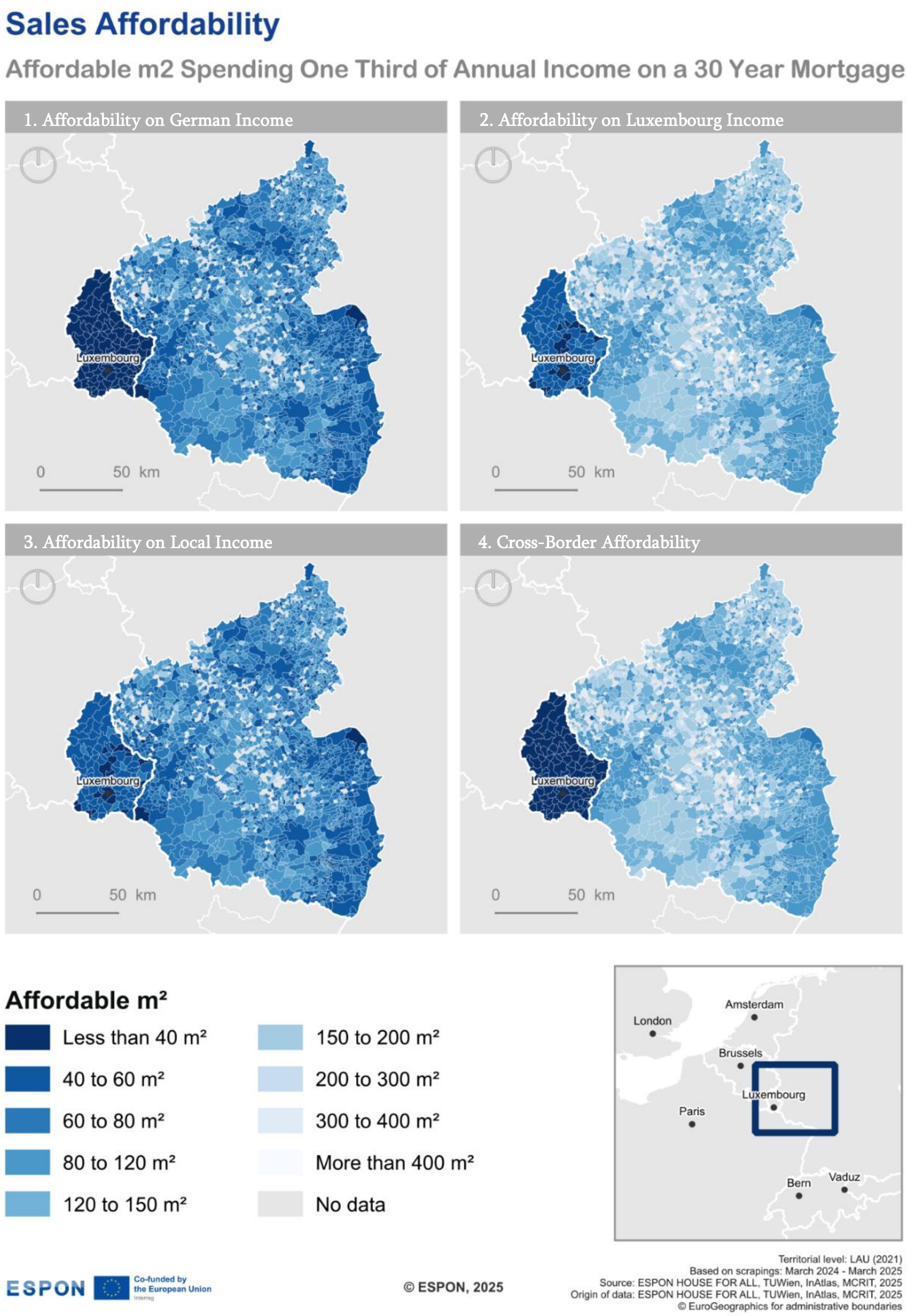
3.3.2.1 Sales Affordability

When we look at sales affordability on a German income (Map 5, top left map), we see that living in many LAUs of the Greater Region, either in Germany or Luxembourg, is not very affordable for people operating on an average income of Saarland and Rhineland-Palatinate. Especially LAUs along the border to Luxembourg (as well as those in the east near Frankfurt am Main, Mannheim and Karlsruhe) stand out through very low affordability, with less than 60 m² affordable and sometimes even less than 40 m² affordable on a single income and a 30-year mortgage, spending one third of the disposable income on housing. While in Germany, in some rural LAUs, sales affordability on a local income is fairly high (with more than 100 m² affordable on one third of an annual income spent on a 30-year mortgage), nowhere in Luxembourg could a 30-year mortgage for a third of an average German Greater Region income (31,071 €) afford more than 40 m². Even on a Luxembourg income (Map 5, top right map), sales affordability in Luxembourg is fairly low, with only few LAUs[4], where people on a local wage can afford between 60 m² to 71 m² on a 30-year mortgage with an average local income. In most of Luxembourg, a single average income can only afford between 40 m² and 60 m². In Luxembourg City, around Mersch and Ettelbruck, as well as some LAUs at the German and French border, a local Luxembourg income can only afford less than 40 m². Looking at the affordability on an average Luxembourg income (58,403 €) in Germany, the picture is very different. Affordability in Germany for people earning in Luxembourg is very high, with few exceptions near Trier, the border and towards Frankfurt am Main, a Luxembourg income could afford at least 80 m² with on a 30-year mortgage. In many of the more rural areas, even more than 150 m².

As analysed previously, housing affordability on the local LAUs on average is higher in Germany than in Luxembourg (Map 5, bottom left map). This is mainly due to the fact that affordability in the more rural areas in Germany is substantially higher than housing affordability anywhere in Luxembourg. In most of the areas directly at the border, though, this is not the case. Affordability here is fairly similar to housing affordability in Luxembourg (see also Figure 4: Sales Affordability in Border Regions). Looking at the reversed map (Map 5, bottom right map), where sales affordability for Luxembourg is displayed on an average German Greater Region income and sales affordability in Germany is displayed on an average Luxembourg income, on a first glance, the huge affordability differences become obvious. Housing affordability in Luxembourg is low, regardless which income is used as a basis. But on a German income on a 30-year mortgage, a person could afford, on average, just 25 m², whereas on a Luxembourg income, on average, 47 m². The bottom right map of Map7 exemplifies that while cross-border commuting can lead to significantly more housing affordability for people working in Luxembourg, for people working in Germany, living in Luxembourg is not attainable on an average German income.

[4] Wahl (71 m²), Putscheid, Betzdorf, Heffingen, Weiler-la-Tour, Maternach, Rosport-Mompach (61 m²)

Map 5: Sales Affordability Germany- Luxembourg



In Maps 1 and 4, Affordability in Luxembourg LAUs is depicted on an average German Greater Region Income: 31,071 €. In Maps 2 and 4, Affordability in German LAUs is depicted on an average Luxembourg income: 58,403 €

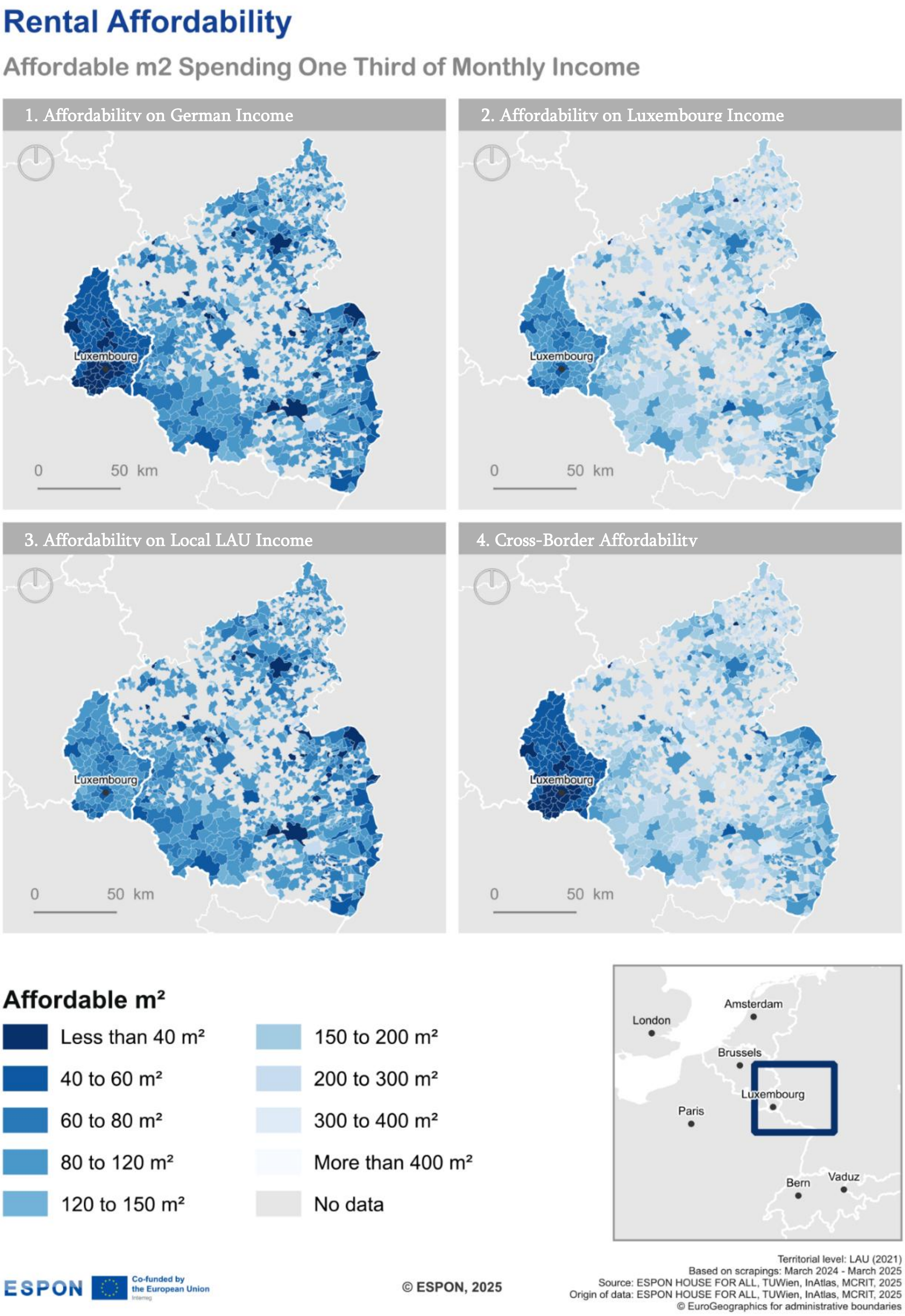
3.3.2.2 Rental affordability

Looking at rental affordability, housing in the greater region seems more affordable, even on a German income. While nowhere in Luxembourg an average German income could afford more than 40 m² on a 30 year mortgage, spending the same third of an average disposable German income on renting (Map 1Map 6, top left map) could afford in many areas of Luxembourg up to 60 m2. The exceptions here are Luxembourg City, the areas around Mersch, as well as areas around and south of Luxembourg, towards the French border and Rambrouch[5] at the Belgian border. Here, a German average income (31,071 € per year) could still just afford less than 40 m². Renting in Germany is also generally more affordable than buying on a 30-year mortgage (see Figure 3). Exceptions here are the Cities, especially Kaiserslautern and Koblenz, as well as LAUs close to Frankfurt am Main. While operating on a Luxembourg income (Map 6, top right), renting in both Germany and Luxembourg becomes a lot more affordable. Again, Luxembourg City, LAUs at the French border, Rambrouch and the area around Mersch stand out through their lower affordability, meaning here that 40 -60 m² are affordable for a single person on a local income. On a local income in Luxembourg, in most areas, a single income can afford 80 -120 m². Rental affordability on an average Luxembourg income (58,403 € per year) in Germany is much higher than on a German income (see Figure 5). Again, the general price pattern is represented in the affordability pattern. In the east of Rhineland-Palatinate, there are areas of lower affordability. Rentals are also less affordable near the Luxembourg border than in the central, rural areas of Rhineland-Palatinate.

Like sales prices (Map 5, bottom left), differences in rental affordability between Germany and Luxembourg on the respective local incomes (Map 6, bottom left) are fairly minimal. While the range of rental affordability is higher throughout Rhineland-Palatinate and Saarland than in Luxembourg (see Figure 3), especially in the immediate border regions, average affordability on a local income is nearly identical in Germany and Luxembourg (see Figure 5). Looking at the reversed affordability map (Map 6, bottom right), the difference in affordability on a German and a Luxembourg income becomes very apparent. While an average German income can afford no more than 56 m² anywhere in Luxembourg, an average Luxembourg income in Germany can afford significantly more. In 75% of German Greater Region LAUs, a Luxembourg income can even afford more than 122 m².

[5] Although there are just 3 rent price listings for Rambrouch in our dataset, so results should interpreted carefully

Map 6: Rental Affordability Germany-Luxembourg



In Maps 1 and 4, Affordability in Luxembourg LAUs is depicted on an average German Greater Region Income: 31,071 €. In Maps 2 and 4, Affordability in German LAUs is depicted on an average Luxembourg income: 58,403 €

3.3.3 The French Border

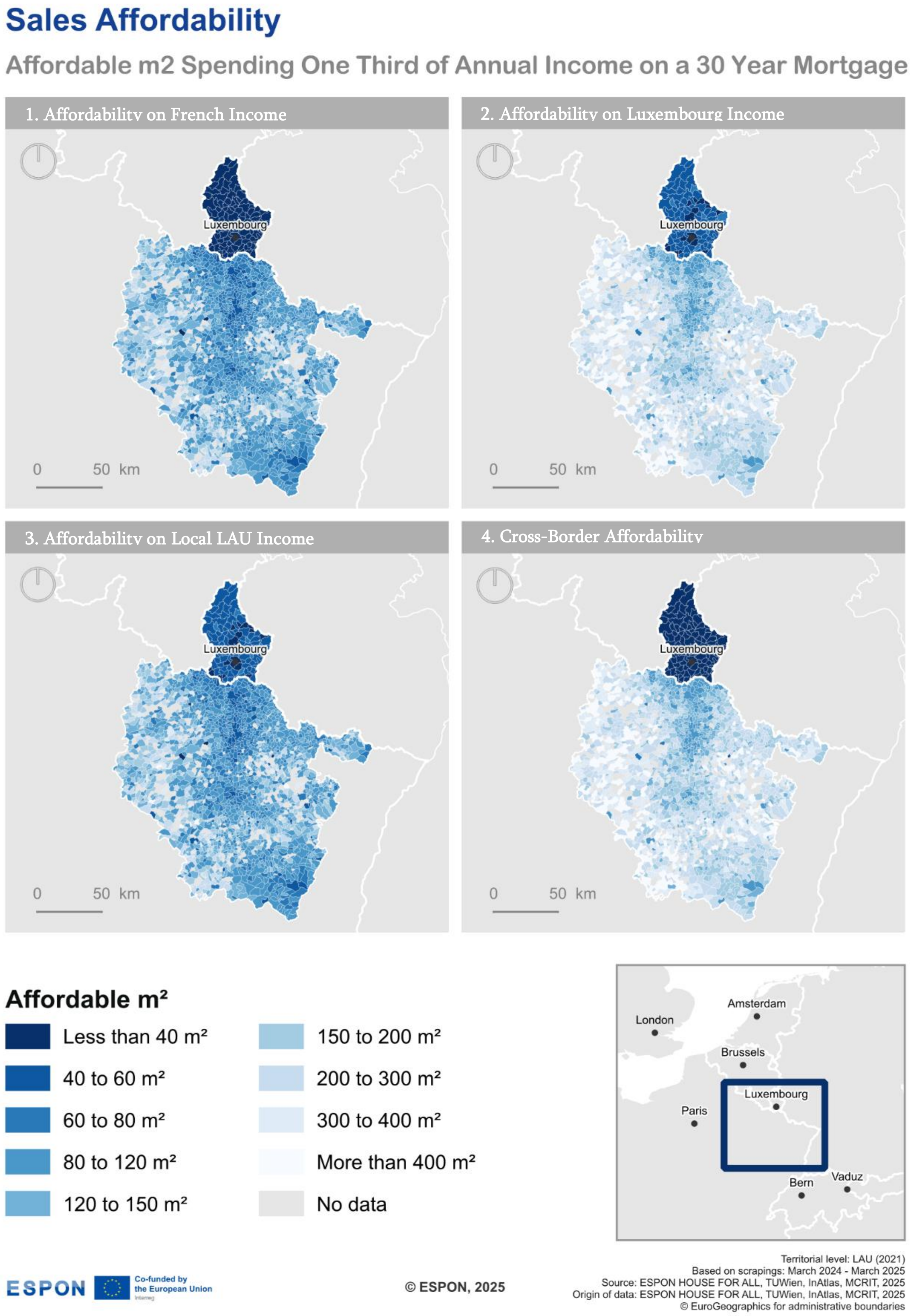
Next, we investigate the Situation between France and Luxembourg closely. Again, we will start looking at the sales affordability based on a 30-year mortgage paid on an average Luxembourg income (58,403 €) or an average Lorraine income (27,426 €), spending a third of one's disposable income on said mortgage.

3.3.3.1 Sales Affordability

While looking at sales affordability based on a French income (Map 7, top left map), it is similar to the situation based on a German income (Map 5, top left map). Nowhere in Luxembourg can an average Lorraine income afford more than 40 m². In France, affordability on a local income is fairly low along the Moselle, especially in and around Metz and Nancy, where a local income can afford only 40 m² to 60 m² on average. In the south, near Strasbourg, affordability is lower again. Affordability in the more rural areas in France is higher in general. In most of these rural areas, on a single local income, a person can afford more than 120 m², often even more than 200 m². Sales affordability on an average Luxembourg income is higher throughout both Luxembourg and France than on a French income (Map 7, top right map). At the Luxembourg border, we see a very sharp decline in affordability. Affordability throughout Luxembourg, even on an average Luxembourg income, is fairly low. As analysed in Chapter 4.3.2.1, with very few exceptions, even on an average Luxembourg income, a person can afford 60 m² at most. Affordability in France on an average Luxembourg income in contrast is high. There are large areas in rural France, where a person working in Luxembourg, spending a third of an average Luxembourg income on a mortgage, could afford 400 m² and more. Even in the less affordable LAUs of France, a single person earning an average Luxembourg income could live very comfortably in an accommodation of at least 80 m², spending a third of their income on a mortgage.

When comparing affordability on the respective local incomes (Map 7, bottom left), we see that while sales affordability on a local income drops at the border, the transition is a lot softer than on either a French or a Luxembourg income. The rural areas of France, which are very affordable in comparison to all Luxembourg LAUs, lead to housing affordability in France being generally higher than in Luxembourg, even on the local income. Our last map again shows revered affordability (Map 7, bottom right). Again, while comparing sales affordability on an average Luxembourg income in France to the sales affordability on an average French income in Luxembourg, it becomes apparent that working in France while living in Luxembourg is not economically feasible under regular market conditions.

Map 7: Sales Affordability France- Luxembourg



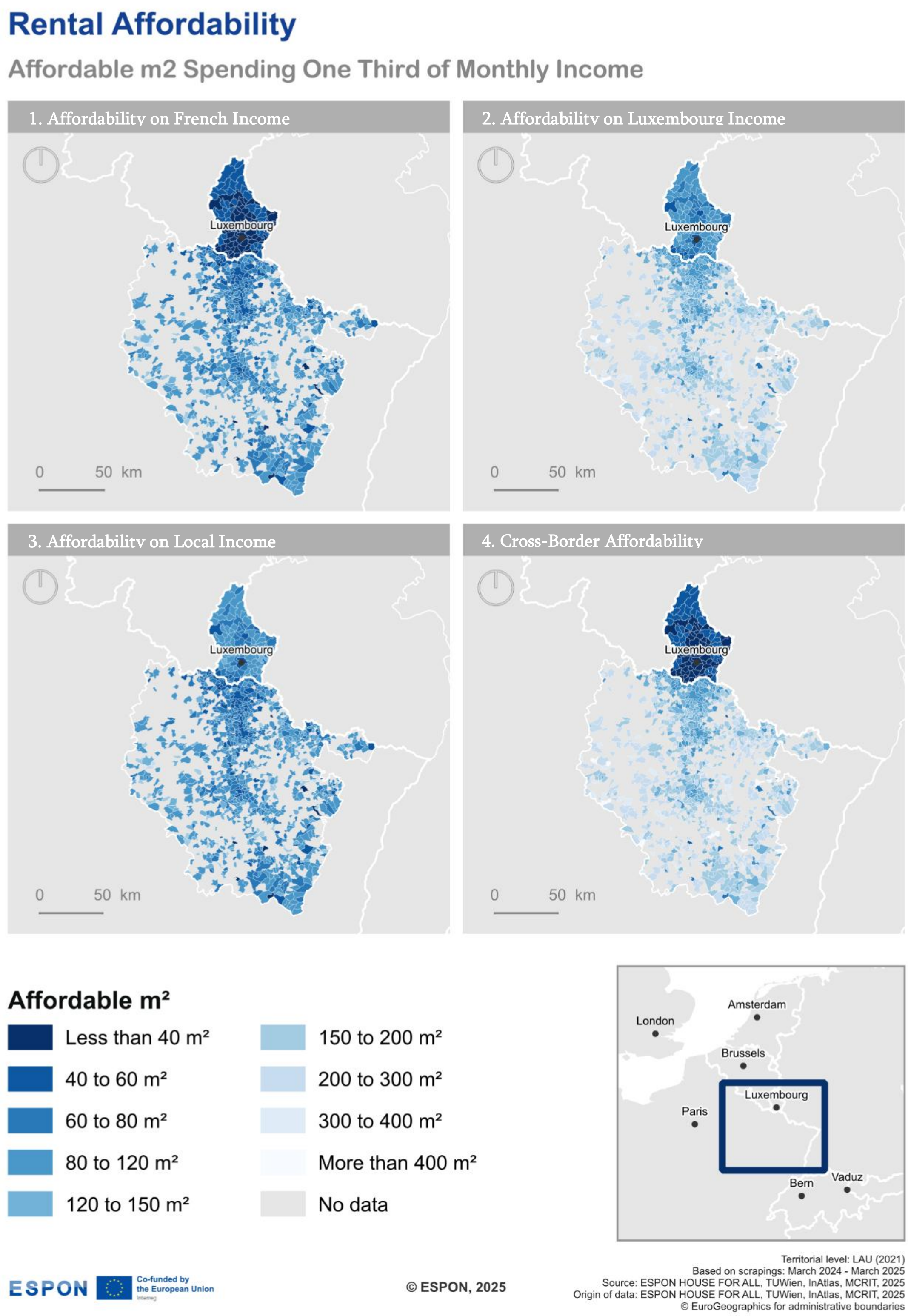
In Maps 1 and 4, Affordability in Luxembourg LAUs is depicted on an average Lorraine Income: 27,426 €. In Maps 2 and 4, Affordability in French LAUs is depicted on an average Luxembourg income: 58,403 €

3.3.3.2 Rental Affordability

Looking at rental affordability in Luxembourg and France on a French income (Map 8, top left map), affordability in Luxembourg is a lot lower than in France. In most areas, especially the south and central areas of Luxembourg, an average French income (27,426 € per year) can only afford 40 m² or less. Only in the northern half of Luxembourg and towards the German and Belgian borders can an average French income afford between 40 m² and 60 m². Similarly to Germany, on the French side of the border in the more rural areas, there are large areas where no rentals are on offer. Along the Luxembourg border and the Moselle, affordability is lower; in these areas, there are mostly just 40 -80 m² affordable on one-third of a local income. In the more rural areas, affordability rises. In those more rural areas, a single local income normally can afford between 80 m² and 150 m², spending one-third of a single income on rent. Looking at affordability on a Luxembourg income (Map 8, top right map), the difference between affordability in Luxembourg and France is less pronounced than it was when looking at sales prices (Map 7, top right map). Still, housing affordability on an average Luxembourg income (58,403 €) is a lot higher than on a French income (Map 8, top left map). Throughout most of Luxembourg, spending a third of the monthly income on rent, a single income can afford 80-120 m². The exceptions here again are in Luxembourg City, as well as LAUs close to the French border. In France, again, the already established affordability levels remain, with lower affordability along the Moselle and towards Strasbourg, and higher affordability in the rural areas, the only difference to affordability on a French income (Map 8, top left map) is that affordability on a Luxembourg income is higher throughout the French part of the Greater Region.

Affordability on the local LAU level (Map 8, bottom left map) shows that rental affordability on the local income is lower in France than in Luxembourg. Again, already established hotspots and patterns remain. The reversed affordability map (Map 8, bottom right map), where affordability in Luxembourg's LAUs is displayed on an average French Greater Region income and LAUs in France are displayed on a median Luxembourg income, clearly displays the strong cross-border differences in affordability between France and Luxembourg. Affordability in Luxembourg on a French income is very low, and a person operating on an average French income could afford nowhere in Luxembourg more than 60 m². In contrast, a person working in Luxembourg and earning an average income can afford at least 60 m² basically everywhere in the Lorraine region (normally significantly more). Cross-border commuting, therefore, is hardly economically feasible for people working in France and living in Luxembourg, while living in France while working in Luxembourg can help people either save money or afford a significantly larger occupation at the same price.

Map 8: Rental Affordability France-Luxembourg



In Map 1 and 4, Affordability in Luxembourg LAUs is depicted on an average Lorraine Income: 27,426 €. In Map 2 and 4, Affordability in French LAUs is depicted on an average Luxembourg income: 58,403 €

3.3.4 The Belgian Border

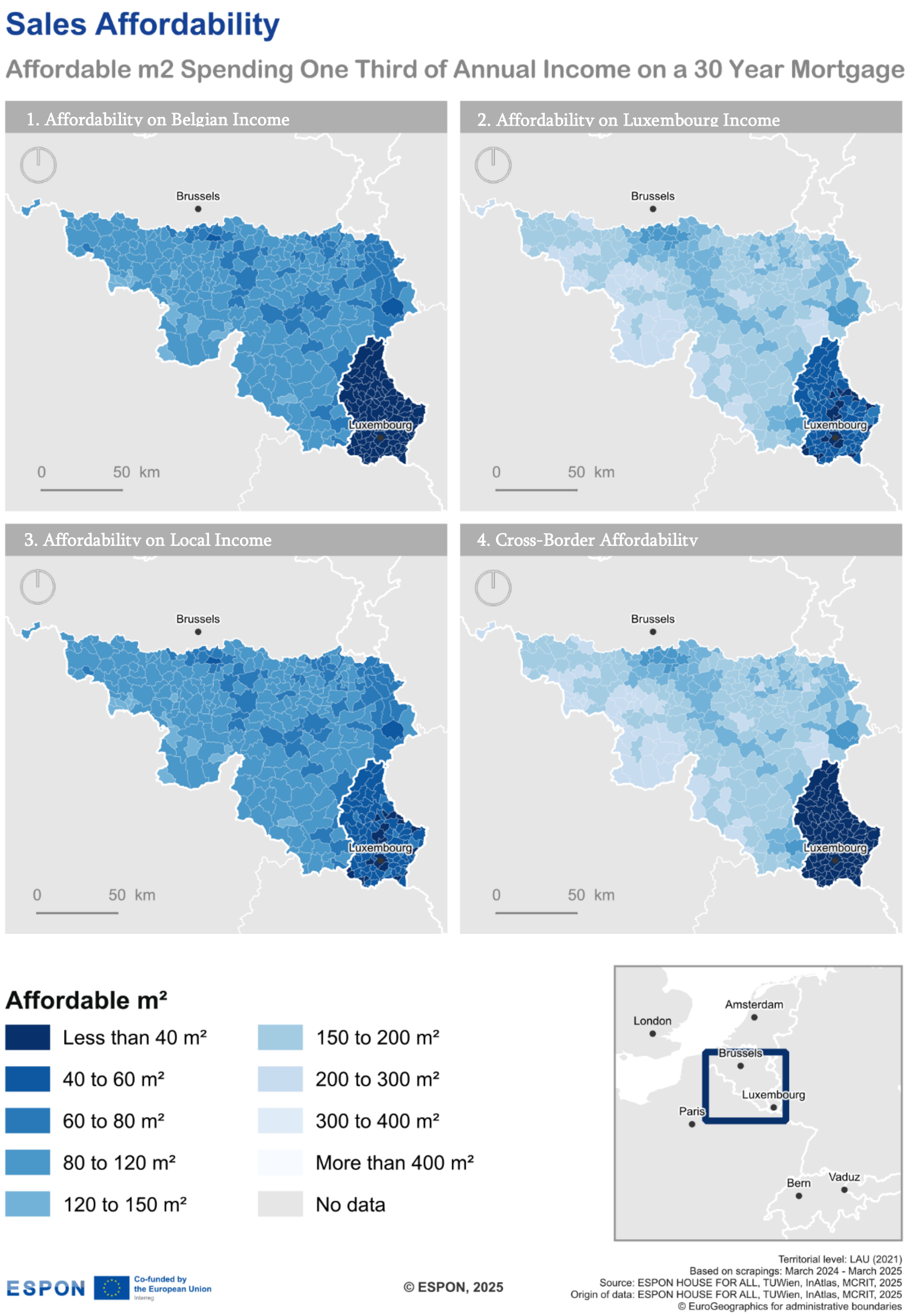
In a third step, we will now examine cross-border housing affordability between Belgium and Luxembourg more closely. Again, we will look at both sales affordability and rental affordability and compare the situation of operating on a Belgian income to operating on a Luxembourg income.

3.3.4.1 Sales Affordability

Looking at sales affordability on a Belgian income (Map 9, top left) what we already saw in Figure 3 becomes apparent: affordability in Belgium is much more homogenous than it was in France or Germany. In most of Wallonia, a local income can afford between 80 and 120 m². Specs of higher affordability are mostly located near the French border in the Ardennes; lower affordability can be found near Brussels and at the German border. At the Luxembourg border, mostly Arlon and Bastogne stand out by being slightly lower affordable. A local income could only afford between 60 m² and 80 m² here. Nowhere in Luxembourg could an average Wallonian income (30,419 € per year) on a 30-year mortgage afford more than 40 m². Affordability on a Luxembourg income (Map 9, top right map), in contrast, is again higher. The previously analysed (Chapter 3.3.2.1and 3.3.3.1) affordability patterns in Luxembourg remain, with a person operating on an average local Luxembourg income and a 30-year mortgage throughout most of the country being able to afford at max 60 m². At the same time, on an average Luxembourg income (58,403 € per year) and a 30-year mortgage, at least 120 m² are affordable in some areas, especially near the French border, even up to 400 m². The exception areas close to Brussels and Amel and St. Vith, close to the German border and Arlon at the Luxembourg border, where sales affordability is lower.

Looking at sales affordability on the average local incomes and a 30-year mortgage (Map 9, bottom left), affordability between Belgium and Luxembourg is more similar; nevertheless, affordability is clearly lower in Luxembourg than in Belgium. While there are very few LAUs in Luxembourg where a single average local income could afford more than 60 m², nearly everywhere in Belgium a single income on a 30-year mortgage can afford more than 60 m² (in most areas even between 80 m² and 120 m²). The reversed affordability map again underlines the economically lopsidedness of cross-border commuting in the Greater Region. Housing affordability in Luxembourg on an average Belgian income is very low (between 15 m² and 37 m²), making working in Belgium and buying an accommodation in Luxembourg on the regular housing market not a lucrative option. For people operating on a Luxembourg income in contrast, Belgium is very affordable. Even in the least affordable regions, a single average Luxembourg income on a 30-year mortgage could afford more than 60 m², often up to 200 m² and more.

Map 9: Sales Affordability Belgium-Luxembourg



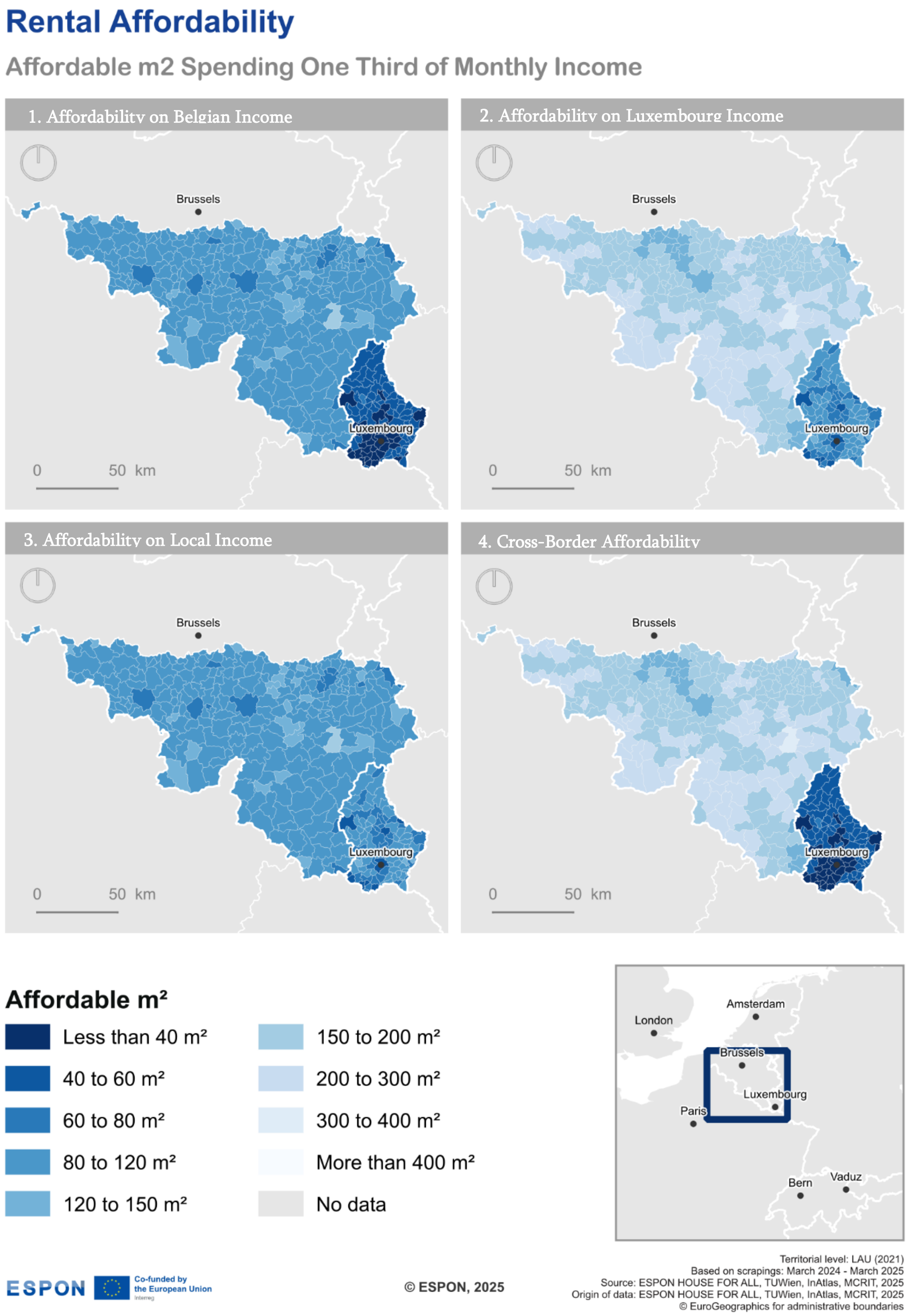
In Maps 1 and 4, Affordability in Luxembourg LAUs is depicted on an average Wallonian Income: 30,419 €. In Maps 2 and 4, Affordability in Belgian LAUs is depicted on an average Luxembourg income: 58,403 €.

3.3.4.2 Rental Affordability

Finally, we will take a closer look at cross-border rental affordability in Belgium and Luxembourg. Focussing on affordability on a Belgian wage first (Map 10, top left), we again see a very homogenous picture throughout Belgium. Nearly everywhere in Wallonia, spending one-third of a monthly average local income can afford between 80 m² and 120 m². In contrast, renting in Luxembourg while spending a third of an average Belgian income (30,419 € per year), could afford a maximum of 60 m². Again, we see the same patterns of lower affordability emerge as in the previous analysis. Rental affordability on a Belgian income is lower around Luxembourg City, and towards the French border and in central Luxembourg, around Mersch and Ettelbruck. Singular LAUs of very low affordability can be found at the Belgian and German border, though at times with very low numbers of observations, making average prices less reliable. Rental affordability on one-third of an average Luxembourg income (Map 10, top right) again is a lot higher than on a Belgian income. Again, we see the already established patterns of rental affordability with lower affordability around Luxembourg city, central areas and the French border and higher affordability, especially in the north. Rental affordability in Belgium on a Luxembourg income (58,403 € per year) is very high. In some LAUs towards Brussels and at the Luxembourg and German border, one third of an average Luxembourg income could "just" afford between 120 m² and 150 m². In most areas of Wallonia, an average Luxembourg income could afford significantly more, even up to 400 m² if the person were to spend one third of their income on rent.

Looking at the affordability based on the local LAU income (Map 10, bottom left), we see a very homogenous picture throughout Belgium and Luxembourg. In most LAUs a local income can afford between 80 m² and 120 m² In Luxembourg, while outside of this category there are mainly areas of lower affordability (as established, along the French border, central areas, and Luxembourg City). In contrast in Belgium, while there are some areas of lower affordability (Charleroi, Namur, Mons), there are also more rural LAUs with higher affordability, leading to higher affordability overall in Belgium on the average local income (see Figure 3). Again, the reversed affordability map (Map 10, bottom right), displaying housing affordability in Belgium on an average Luxembourg income, and affordability in Luxembourg on an average Wallonian income, displays the deep differences in affordability between the two countries. For people working in Belgium and trying to rent in Luxembourg, affordability on the regular rental market is low, since nowhere in Luxembourg could an average Belgian income afford more than 60 m². While renting in Luxembourg and earning one's income therefor is not an affordable option for most, the situation for people earning in Luxembourg and renting in Belgium is reversed. Even in the most sought-after LAUs in Belgium an average Luxembourg income could afford to rent at least as much as in Luxembourg, most of the time significantly more, making this a lucrative option for people earning in Luxembourg.

Map 10: Rental Affordability Belgium- Luxembourg



In Maps 1 and 4, Affordability in Luxembourg LAUs is depicted on an average Wallonian Income: 30,419 €. In Maps 2 and 4, Affordability in Belgian LAUs is depicted on an average Luxembourg income: 58,403 €.

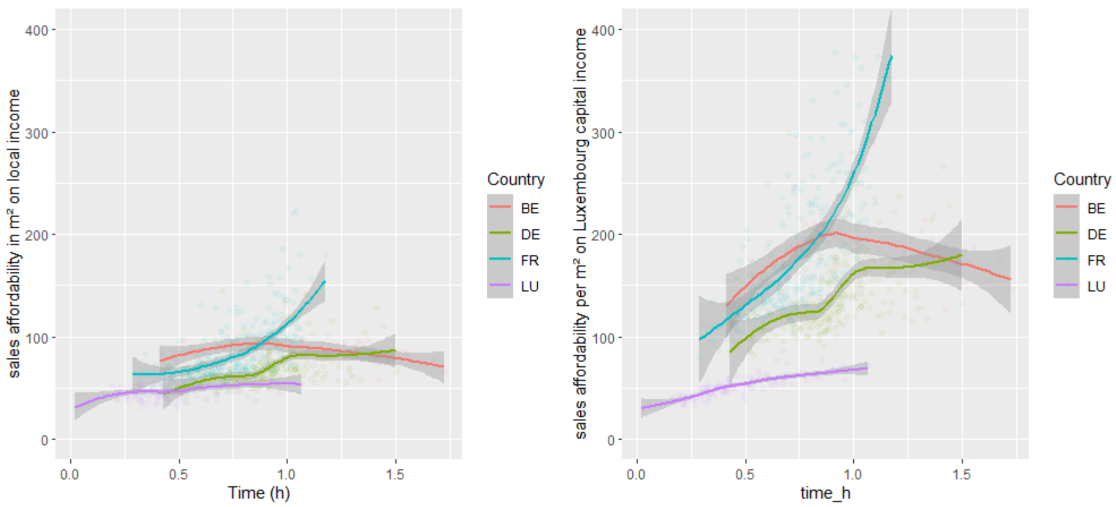
3.4 Commuting and its effect on Housing Markets

While previously we looked at how much space is affordable on an average national income, in the next steps, we analyse how much space can be obtained or rented when commuting to Luxembourg City and operating on its average income. Cross-border commuting has been shown to have an impact on housing costs and wealth distribution in neighbouring countries (Claveres, *et al.*, 2020; Mathä *et al.*, 2024). While the Luxembourg labour market in general is attractive for cross-border workers, in the following section, we will take a closer look at the effects that cross-border workers commuting to Luxembourg Capital have on the housing markets in the neighbouring countries and housing affordability there.

For this, we only take into account LAUs whose closest point to the Luxembourg border is 30km or less. This encompasses a similar, though slightly smaller, area as Górczynska-Angiulli et al (2024) when they define their study area by the fact that more than 1 % of the working-age population works in Luxembourg. This leaves us with 98,536 sales offers and 18,487 rental offers in 852 LAUs across Luxembourg and the border regions in Belgium, France and Germany. For looking at commuting, the commuting time by car from the LAU centres in the border regions to the city centre of Luxembourg City was calculated. This chapter also looks at what is affordable to cross-border commuters in comparison to local workers. For this, we calculate affordability on an average Luxembourg City income (63,421 €), analogous to affordability in the previous chapters. For sales affordability, the measure used was the square metre of space that can be purchased by one person with one-third of an average monthly income from Luxembourg City, provided that the residential unit is financed with a 30-year mortgage. Rental affordability was operationalised as the number of square meters that can be rented with one-third of an average Luxembourg City monthly income. We then compare housing affordability for people who are not commuting and therefore earning the local income to affordability on an average Luxembourg City income in relation to the time it takes to commute from the LAU centre to Luxembourg City. Again, ESPON HOUSE4ALL data was used.

3.4.1 Housing Affordability for Cross-Border Workers

Figure 6: Sales Affordability in the Border Region



For BE, DE, and FR, only data from LAUs in max. 30km distance of Luxembourg is used. Local sales affordability is operationalised as the number of square meters that can be bought on a 30-year mortgage, spending one-third of an average local annual income. For affordability based on Luxembourg capital income, for each LAU it is calculated how many square meters can be bought spending one third of an annual Luxembourg capital income (63, 421 €) on a 30-year mortgage.

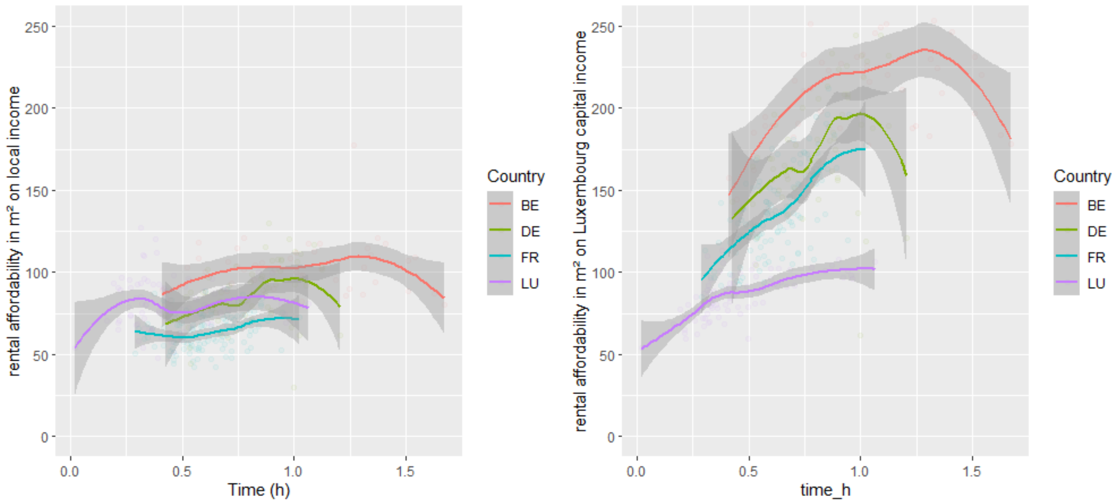
Looking at the sales affordability in the border regions in Figure 6, we find clear differences between the number of square meters a person can afford on a Luxembourg City income (63,421 € per year), vs the average local incomes. Luxembourg shows fairly little variability in the number of square meters that can be bought on an average income. With ~30 m², only very little can be bought in the Luxembourg City centre (with a commuting time of 0). Even in the LAUs with the longest commuting times of ~1 hour, a local income can only buy around 54 m² and even a Luxembourg City income just ~70 m².

Germany displays a fairly similar affordability to Luxembourg on local incomes, while German commuters to Luxembourg City have significantly more housing affordability. When accepting a 30-minute commute to Luxembourg, people living in Germany but working in Luxembourg City could potentially afford around 100 m². In comparison, living in a similar driving distance to Luxembourg City and living on a local German income, a German worker could only afford ~50 m². When accepting commutes up to 1h or even 1.5h, this discrepancy rises even more, where people working in Luxembourg and living in Germany could afford on average 84 m² more than local workers for a 1h commute and 93 m² more for a 1.5h commute. Similarly strong differences can be found when looking at Belgium. Approximately twice the number of square meters can be bought from people living on a Luxembourg City income in the border regions in comparison to people living and working in Belgium in the same region. The steepest increase in affordability can be found in the French border regions. In the closest proximity to Luxembourg City, with just about a 20-minute commute, a Luxembourg City income can already buy around 1.5 times the number of square meters a local income can buy in France. This increases steeply the longer a commute is accepted. When accepting a 1h commute, a Luxembourg Capital income can buy more than twice the number of square meters a French income could buy. While in Germany and France, affordability consistently rises the farther away you get from Luxembourg Capital in the border regions, the same cannot be said in Belgium. This probably can be attributed to the fact that the northern border regions along the Belgian-Luxembourg border are quite far away from Luxembourg's capital and would mean a very long commute. Here, commuting to Liege instead of Luxembourg might be more attractive, which could explain why affordability declines again at the regions farther away from Luxembourg City. It is notable though, that Germany is theoretically in a similar situation to Belgium, with northern borders being at a significant distance from Luxembourg City, yet we don´t observe the same effect here.

As we have seen in Figure 6, there are substantial discrepancies in the affordability of property in the border regions for cross-border workers and households living on a local salary. Throughout, people living and working locally in Belgium, France or Germany can afford at least the same and often more property than Luxembourg workers in Luxembourg could. A different picture emerges when looking at rental affordability in the cross-border regions in Figure 7.

Belgium remains slightly more affordable on local incomes than comparable regions in terms of distance to Luxembourg City. The same cannot be said about Germany and France. Both in France and Germany, people living on a local wage can afford fewer square meters of housing area in comparison to people living in Luxembourg in a similar vicinity to the capital on their local wage. Like we saw with sales prices, people living on a Luxembourg City income (63,421 € per year) can afford substantially more living space than their local non-commuting counterparts. In both Germany and Belgium, commuters to Luxembourg can afford around twice the living space as their locally working counterparts. Germany and Belgium also display a similar pattern that after a certain commuting time (1h for Germany and 1h 15min for Belgium), affordability drops. Since both Countries have borders in the north of Luxembourg, where commuting to the capital takes quite a while, in these regions, other local urban centres probably cancel out the effects of Luxembourg. Commuting can also lead to higher housing affordability in the country of Luxembourg, though the effects are a lot smaller. When accepting a 1h commute, a person working in Luxembourg City could afford on average 25 m² more than a person working locally. If a person is to accept commutes, renting in one of the other countries is still more lucrative than living in Luxembourg on a Luxembourg City income.

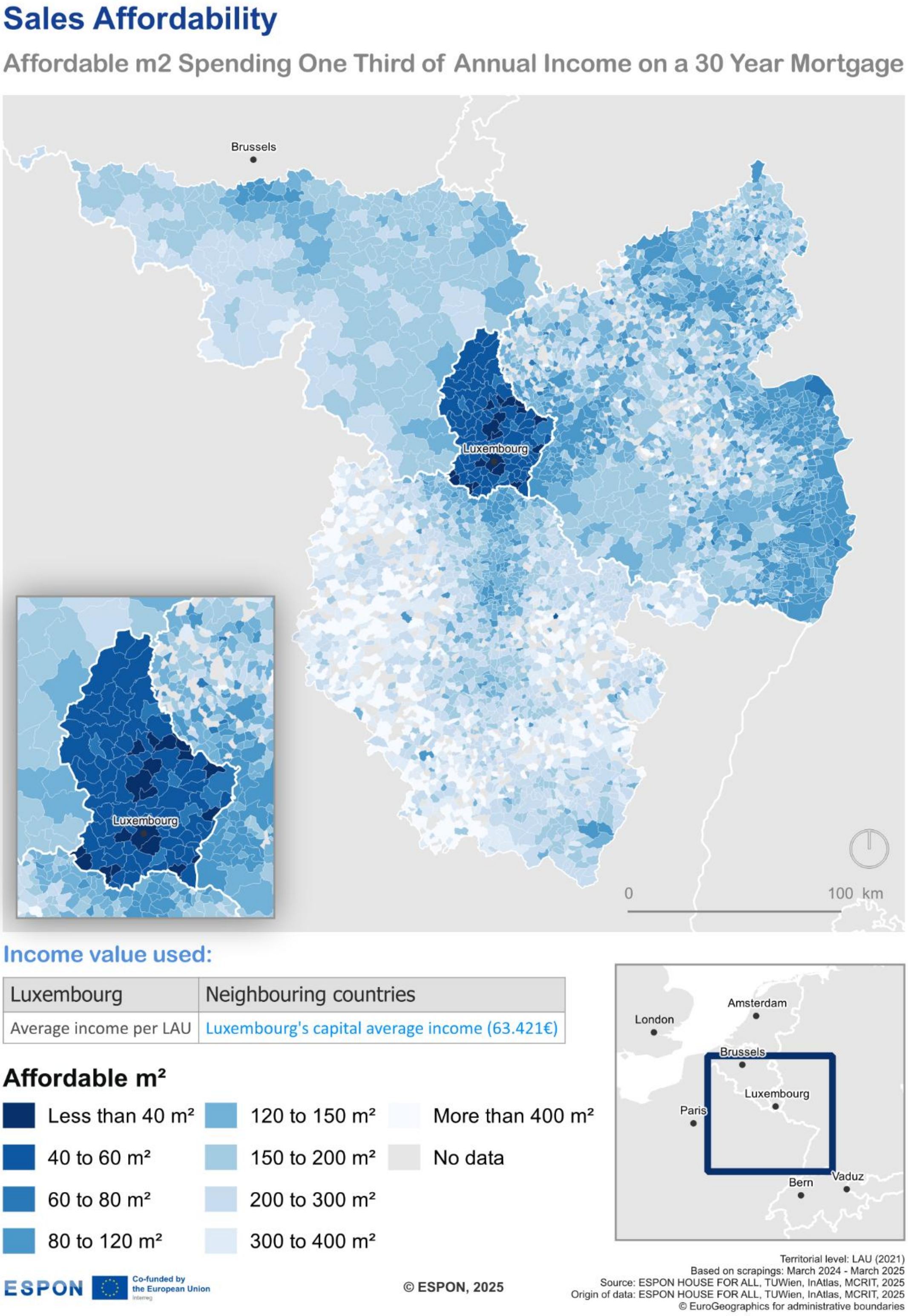
Figure 7: Rental Affordability in the Border Region



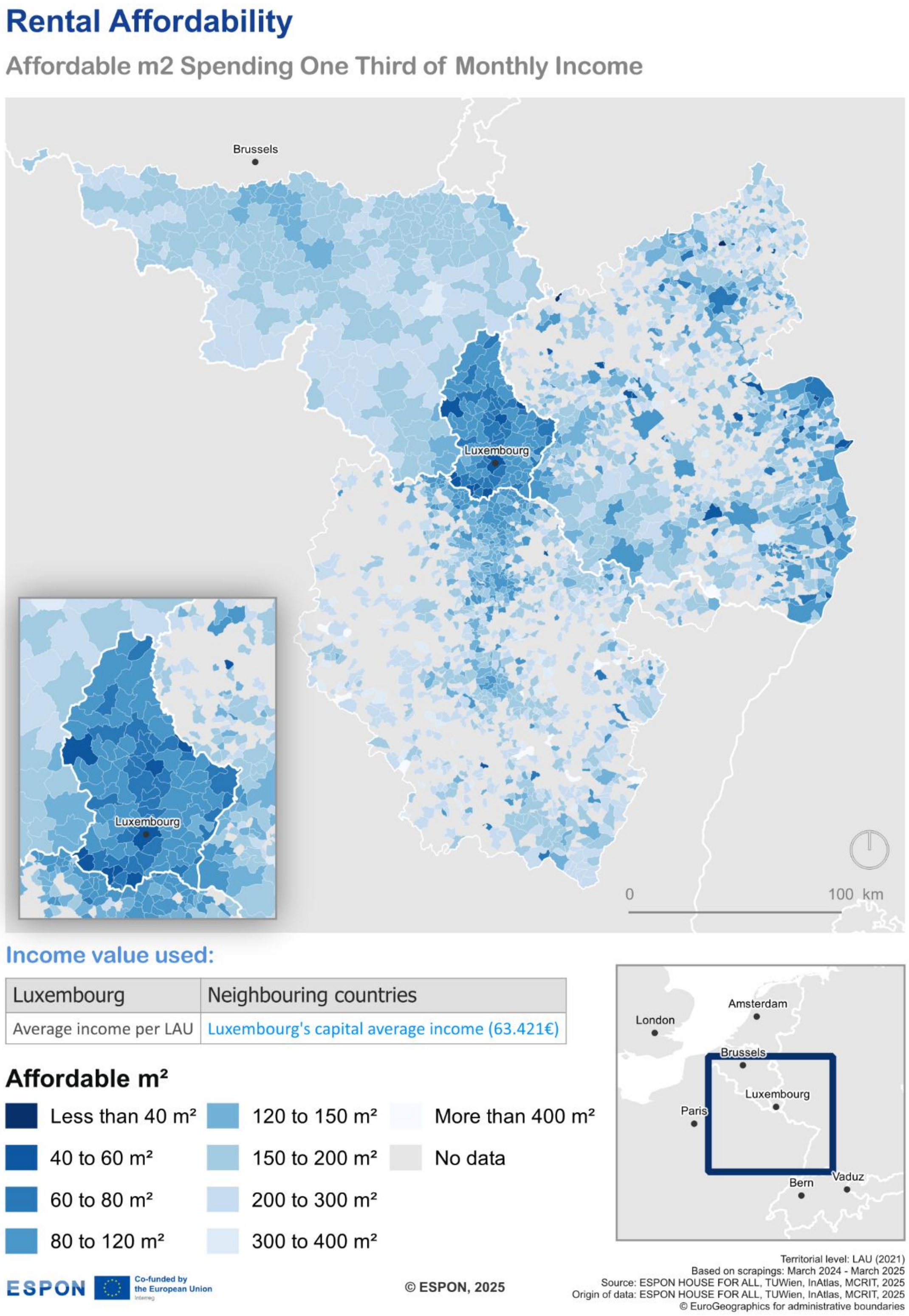
For BE, DE, and FR, only data from LAUs in max. 30km distance of Luxembourg is used. Local rental affordability is operationalised as the number of square meters that can be rented spending one-third of an average local income. For affordability based on Luxembourg capital income, for each LAU it is calculated how many square meters can be rented spending one third of a Luxembourg capital income (63, 421 € per year.)

Looking at how affordability based on a Luxembourg City income manifests itself spatially (see Map 11 & Map 12), we find that it mirrors the maps showing affordability on a Luxembourg Country income (Map 5 - Map 10, top right maps), but with a slightly higher affordability on a Capital income. This is due to the fact that the average income in Luxembourg City was in 2024 approximately 9% higher than the average income of the whole of Luxembourg.

Map 11: Sales Affordability based on Luxembourg City income



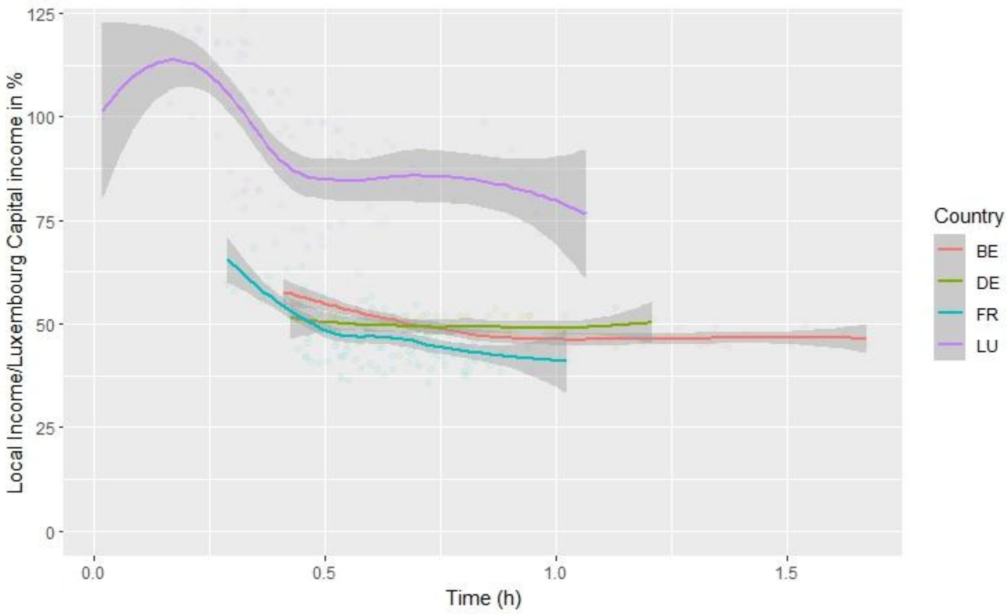
Map 12: Rental Affordability based on Luxemburg City Income



3.4.2 Affordability Issues Through Spillover Effects

When looking at the impact spillover effects from the Luxembourg housing market have, we see spillover effects, especially along the borders in the southern half of Luxembourg, coinciding with the catchment area of Luxembourg City (Map 1 and Map 2). Looking at the Maps, Belgium seems to be influenced the least by the Luxembourg housing market. While we see some areas with less affordability around Arlon and Bastogne, the whole of Walonia is fairly homogenous in price structure. We also find regions with lower prices along the border and next to regions with higher prices. The French border region seems to be impacted the strongest by the Luxembourg housing prices. While sales prices are lower than in Luxembourg and, even on average, local French income, more affordable than living (and working) in Luxembourg, rental prices show a different picture. We see that rental affordability along the French-Luxembourg border and down the Moselle (and the motorway connecting Metz and Nancy to Luxembourg) is particularly low. The German border regions show a differentiated picture. Along the southern part of the border in the catchment area of Luxembourg City, rental and sales prices are fairly high and affordability is therefore low. Along the northern half of the border, a more rural area, there is little on offer when it comes to renting and sales prices are distinctly lower. Looking at a map of the area, it becomes noticeable that nearly all of the areas showing low affordability in the border regions (Trier and Perl in Germany, Arlon in Belgium and the border regions, as well as LAUs along the Moselle) are directly connected to Luxembourg city by motorway. The same also holds true for the more central areas in Luxembourg of Ettelbruck and Mersch. At the same time, the border regions seemingly less affected by spillover effects (the northern half of the German-Luxembourg border and most Belgian border LAUs) are in natural parks, coming together with less dense infrastructure and settlements, making them less attractive housing markets.

Figure 8: Affordability Difference in Accordance to Commuting Distance



Percentage of how much housing a local income can afford in comparison to a Luxembourg Capital income in relation to commuting time.

When we look at the extent of spillover effects (See Figure 8), we see that fairly consistent local incomes in Belgium and Germany can afford about half the square meters that a Luxembourg Capital income can. In France, the LAUs with the least commuting time to Luxembourg City are also those where there is the least difference in affordability. A local income there can afford up to 65% of Luxembourg City´s income. At the same time, due to the very close proximity to Luxembourg's capital, these are also the areas with high shares of commuters, influencing the average income of people living in these LAUs.

4 Complementing the Picture

The results from this study fit neatly into what has already been established in previous studies looking at this region. Luxembourg, as the country with the highest income in the EU (Eurostat, 2024), also has significantly higher housing prices in comparison to its neighbouring regions (compare Górczyńska-Angiulli et al., 2024). Looking at the rental market along the French-Luxembourg border, we see the most pronounced affordability issues for the local population. Buying is still slightly more affordable on an average French income in comparison to a Luxembourg LAU in a comparable distance to Luxembourg City. In contrast, renting displays clear affordability issues for the local population. This fits the trend observed by Mezaroş & Paccoud (2024), where cross-border workers live on the French side of the border in order to profit from lower rentals and accumulate capital to later invest in property. This then leads to affordability issues for the population working and living locally with less purchasing power, and therefore less appeal to landlords, sometimes even in the social housing sector (Mezaroș, 2024). This contrasts with the fact that social housing, theoretically, has upper income thresholds to keep social housing stock affordable (see

Box 1Box 2).

Also, like previous studies, we could observe the differentiation along the German and Belgian borders. Similarly to Lambotte & Bernier (2024) we observe local hotspots of lower housing affordability near the border at Arlon and Bastogne, interlaced with areas of high housing affordability in Belgium. However, we found slightly different results for the housing market in Rhineland-Palatinate. While Mießner (2024) found areas along the northern part of the border among the most expensive rental prices in their study, in our dataset, there are too few observations to draw a conclusion on the rental market in this area. Sales prices in this peripheral and rural area are lower than their counterparts along the southern part of the border in our dataset.

While the drop in prices at the Luxembourg border has been demonstrated before, something new we add to the discourse with our study is showing the immense impact commuting to Luxembourg and especially its Capital can have on affordability in border regions. These affordability differences form a fundamental basis for the wealth distribution in border regions since housing property typically forms a substantial part of middle-class wealth. When comparing maps of housing affordability on local incomes to Luxembourg incomes (see Map 5 - Map 10), the differences in wealth distribution of cross-border workers and local national workers, as observed by Mathä et al. (2024), are not surprising.

While our case study extends the knowledge base of the housing market in Luxembourg through a more detailed picture of affordability in the Greater Region, it likewise confirms existing findings concerning housing in the Greater Region, cross-border housing markets, and general housing studies. Luxembourg's capital has extended its functional metropolitan limits outside its national borders since at least the 1990s (Chen, Gerber and Ramadier, 2021). With its financial centre and high wages, having higher housing prices in Luxembourg city, and declining prices the further one gets away from this central area is in line with what we know about the importance of centrality for housing costs. This also aligns with findings about different regional income levels impacting housing prices resulting in economic asymmetries (Sohn, 2014). This also corresponds to how expanding functional regions across international borders interplay with local market prices of neighbouring countries (Chilla and Heugel, 2022). In consideration of the aforementioned facts, the high housing prices in the border regions are consistent with common scientific knowledge. All of this makes Luxembourg a prime example of the cross-border markets effect under conditions of existing economic asymmetries.

5 Limitations and Further Potential

While this case study was able to add an in-depth analysis of housing affordability based on local and cross-border incomes, there are still unanswered questions when it comes to housing affordability in the Greater Region. One thing we were not able to provide with the ESPON HOUSE4ALL data is an analysis of temporal developments, future prognosis, or a closer look at housing affordability at different income levels. Our web scraping data only allows for an analysis for the timeframe between March 2024 and March 2025, and the income data used is only available as LAU averages.

To account for demographic change or developments in housing markets over time and across borders, harmonised housing and income data are needed. While most countries have one or both datasets, definitions vary and may only be available at different intervals or spatial scales. Therefore, without harmonised data, it is very difficult to conduct international comparative and cross-border studies. Conducting time-sensitive analysis in a cross-border context is especially complicated, since not only do the different national datasets need to be harmonised, but indicators also should be consistent in their definition, spatial scale, and data collection method throughout the period of observation. Currently, this data is not available. Especially difficult to obtain are rental indicators for single countries, let alone as harmonised cross-country time series data.

Having this sort of harmonised data is crucial to analyse cross-border effects. ESPON HOUSE4ALL, with its web-scraping housing dataset, provide the first pan-European trial. At the same time, the ESPON HOUSE4ALL project only covers a very limited timespan of approximately one year. To establish causal relationships, indicators need to be available over time. This, in addition to interlinking the analysis not only with income, but other demographic data, such as age, share of (un-) employment, education, etc and their development in small-scale spatial units, could provide a more secure basis for policy makers to understand and react to cross-border housing market spillover effects.

While we show clear affordability disparities in many border LAUs along the Luxembourg border, it is to be noted that in LAUs with a high share of cross-border commuters, these disparities are likely still too conservative due to the dataset we used. Income data is regularly collected based on the place of residence, not the workplace of people. This is also the case for our income dataset. Similar to income data in general, there is no internationally harmonised dataset of income based on the workplace instead of place of residence at LAU level. Instead of estimating local incomes from other information, like local GDP, we decided to go for LAU income data directly, thereby risking that our estimates are more conservative in border regions. If one were to redo our calculations with data where local income is based only on income from local workplaces, affordability along the border in France, Germany, and Belgium would likely be even worse for the local working populations, since commuters' wages would then be excluded.

Another point that was not included in the analysis, and where the potential of ESPON HOUSE4ALL data still needs to be further explored, is when it comes to the quality of housing. It has been thoroughly established that different characteristics of housing offers relating to quality and sought-after attributes influence house prices. While ESPON HOUSE4ALL data includes information on some of these characteristics (such as number of bathrooms or the availability of a garden, terrace, pool or elevator), currently this information is too incomplete and not processed on the LAU level to allow for including them in this analysis. This also leads to results that have to be interpreted with some precautions. In our study, we are not comparing housing in any measure beyond their square meters and location. It is therefore not possible to say to what extent differences in quality might factor into affordability. Housing in Luxembourg might, on average, be of a higher quality level, accounting for at least some of the affordability difference in comparison to the neighbouring regions. There is also a possibility that housing in border regions of neighbouring countries can be kept at a lower quality level, postponing renewal measures to save costs, since these housing units can be offered at a higher price due to their closeness to the border. Here still lies currently untapped potential to understand the state of housing in the Greater Region in a more nuanced fashion for further analysis.

Throughout the study, we use the availability of square meters while spending a third of an average income on either rent or a 30-year mortgage as our affordability measure; this should not be seen as an imperative that a higher number of square meters is necessarily better. In times of climate change, scarce resources, and soil sealing, stopping and perhaps even reversing the in many places observable trend of increasing living areas per person is generally advisable.

6 Conclusion

Housing markets don't exist in a nationally sealed-off vacuum but have the possibility to influence their neighbouring states. If there is some level of market integration, and households are able to live and work on different sides of the border, we can speak of a cross-border market. Cross-border markets can be subjected to different levels of supply and demand, different levels of living costs and access to amenities and services of general interest, as well as different regional income levels. All of these can cause economic asymmetries and influence the dynamics of cross-border movements. One prime example of this is Luxembourg, the country with the highest wages in the EU and significantly higher housing costs in comparison to neighbouring countries. The Luxembourg labour market is characterised by a very high share of the labour force commuting from the surrounding countries. While Luxembourg is working together with its neighbouring countries on many different levels of policy and cross-border integration, so far, there is no official cooperation between the countries when it comes to housing policies and planning. Luxembourg's borders, therefore, bring together housing markets that are in some cases very different from one another.

While Germany has a housing market that is known for its prominent rental segment, Luxembourg has a very strong segment of owner occupation and subsidises ownership. We also see stark differences in absolute prices between the countries and along the border. Buying housing is, on average, around three times as expensive as buying accommodation in one of the neighbouring countries. While the difference is less in the rental market, still, a person renting in Luxembourg has to pay, on average, around twice the amount of money in comparison to people living in the neighbouring countries. While Belgium and Luxembourg are fairly homogeneous in their price structure, both the German and French parts of the Greater Region display a more differentiated picture, with cheaper rural areas and higher housing costs in and around urban agglomerations.

Considering how much living space a person can afford, spending either a third of an average local income on buying an accommodation on a 30-year mortgage or spending a third of a local income on rent, the differences are a lot less stark than looking at absolute prices only. Still, buying on a local income is on average more affordable in France, Germany or Belgium than buying on the local income in Luxembourg. Differences in rental affordability in comparison are small if one is to take differences in local incomes into account. Still, we can observe a much bigger range of affordability levels in Germany and France than in Belgium and Luxembourg. Border regions are both for sales and rents less affordable than the Greater Region average in the respective countries, especially in France. Housing affordability along the Belgian border is, according to our data, the most affordable of the three countries for both rentals and sales affordability. Only in Arlon and Bastogne can we observe impacts from the Luxembourg housing market. While the northern half of the German border is also more affordable than the southern half of the German border region, all of the French border regions along the Luxembourg border display distinctly low housing affordability.

While looking at housing affordability for commuters to Luxembourg City, it becomes apparent that affordability both for sales and rentals rises the further the commuting distance is. In Belgium, this stops for commutes of approximately 1h for sales and 1,5h for rents. In Germany, the influence from Luxembourg apparently stops for rentals with a commute greater than 1h. Most notably, rental affordability for people living in the French border regions and earning a local income is lower than for people earning and living in Luxembourg in a similar driving distance to the capital. Due to the fact that our income data also counts commuters towards the local income in border LAUs, it has to be noted that housing affordability in the border regions will likely be even lower for the local population than our analysis indicates.

Overall, Luxembourg is a prime example of a cross-border housing market, exhibiting the characteristics commonly described in scientific literature. Differences in housing prices and local incomes make living across the border (especially along the well-connected French and German borders) and working in Luxembourg a highly lucrative option. On the other hand, this has the potential to lead to affordability issues. This is particularly true for the rental market, which is, especially along the French-Luxembourg border, hit stronger by spillover effects than the rental market. Our case study demonstrates again that cross-border markets have to be seen in their entirety, since effects and trends of the labour market and policies can have an impact across the border.

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Co-funded by the European Union
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The ESPON EGTC is the Single Beneficiary of the ESPON 2030 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway, and Switzerland.