



ESPON Big Data for Territorial - Analysis and Housing Dynamics. Wellbeing of European citizens regarding the affordability of housing.

Renaud Le Goix, Ronan Ysebaert, Timothée Giraud, Marc Lieury, Guilhem Boulay, Thomas Louail, Jose J. Ramasco, Mattia Mazzoli, Pere Colet, Thierry Teurillat, et al.

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Renaud Le Goix, Ronan Ysebaert, Timothée Giraud, Marc Lieury, Guilhem Boulay, et al.. ESPON Big Data for Territorial - Analysis and Housing Dynamics. Wellbeing of European citizens regarding the affordability of housing.. [Research Report] ESPON | Inspire Policy Making with Territorial Evidence. 2019. hal-03589161

HAL Id: hal-03589161

<https://hal.science/hal-03589161>

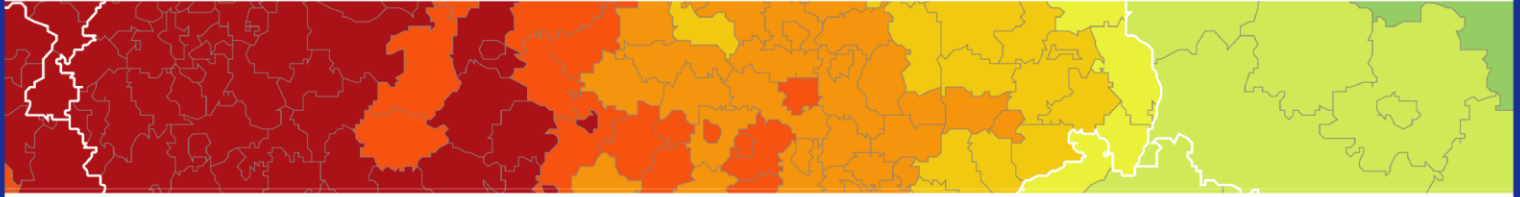
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Inspire policy making by territorial evidence



ESPON Big Data for Territorial Analysis and Housing Dynamics

Wellbeing of European citizens regarding the affordability of housing.

Monitoring and tools

Final Report

Final Report

This monitoring and tools activity is conducted within the framework of the ESPON 2020 Cooperation Programme.

The ESPON EGTC is the Single Beneficiary of the ESPON 2020 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.

This delivery does not necessarily reflect the opinion of the members of the ESPON 2020 Monitoring Committee.

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Contact: info@espon.eu

ISBN: 978-99959-55-99-1

Final Report

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Wellbeing of European citizens regarding
the affordability of housing.

**Final Report
12/11/2019**

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Abbreviations

ESPON	European Territorial Observatory Network
ESPON EGTC	ESPON European Grouping of Territorial Cooperation
EU	European Union
GDP	Gross Domestic Product
ISCED	International Standard Classification of Education
LAU	Local Administrative Unit
FUA	Functional Urban Area
HFR	Housing Finance Regimes
IDS	Internet Data Sources
OECD	Organisation for Economic Co-operation and Development
TOR	Terms of reference
UK	United Kingdom

Executive summary

- Adequate housing is recognised by the United Nations as a fundamental human right. However, in European larger cities, **decent and affordable housing is increasingly hard to get access to**.
 - The Pact of Amsterdam (2016) recognises housing as a key priority of the *Urban Agenda for the European Union*.
 - Housing affects social cohesion and stability in Europe. The *Action Plan of the Partnership on Housing* of the EU Urban Agenda pushes for improved knowledge regarding affordable housing.
- The report investigates how to measure, monitor and analyse spatial patterns of housing affordability in European FUAs, that is to say the ratios between price of rent or property-buying, and several measures of income. The *wellbeing report* provides an analysis across European cities, to give policy makers some insights on the key priority of affordability. We cover case-studies in Poland, Spain, France, Switzerland
- Since the 1990s, housing prices have on average increased faster than the income of residents and buyers in major post-industrial city-regions, but this is not ubiquitous. This report **seeks at informing and mapping the increased and unequal affordability gap**, a critical issue for social cohesion and sustainability in metropolitan areas in Europe, **that impacts the well-being of residents in European cities**. For instance:
 - For prospective homeowners: the increased affordability gap leads to a socially-selective access to housing markets, yielding more spatial exclusion and increased social tensions. Real estate has become an important driver of socio-economic inequalities.
 - The cost of ownership impacts rents, and also the availability of housing to let. The global financial and economic crisis moreover led to decreasing construction activities across Europe, in particular with respect to social housing, as many governments restrained their level of public spending.
 - For owners, real estate has become a major component of household wealth. But local markets are also volatile. Housing prices are therefore unstable and contingent upon the market's continuous restratification within and across neighbourhoods. Real estate influences the local conditions through which household wealth is accumulated or lost. This determines their capacity to sell and buy.
- One major issue is the **lack of harmonised spatial data to map and monitor affordability** in Europe. Eurostat does not provide local indicators on affordability, but there are plenty of institutional, private and national or local data, which are, however,

not harmonised and interoperable. To cope with this data gap, the report brings new insights on how (1) institutional data, such as transaction data, can be bridged with (2) unconventional data (“big data” harvested on line) to provide **a cost-effective and harmonised data collection effort** that can contribute to the analysis of socio-economic cohesion.

- This “**big data**” **methodological framework** used for the report is delivered in formats that allows for **reproducibility**, so that it can be used for policy-oriented projects in further studies. It is possible to extend the study at a European scale, funding permitting. Using **local spatial data** is interesting, because it allows to compare within cities (between neighbourhoods) and between cities, **using various geographical levels** of analysis (1km square-grid, LAU2, FUA).
- The “*Wellbeing of European citizens regarding the affordability of housing*” report presents an account of the data available in Europe to **analyse and map housing affordability**. The report presents:
 - Spatial data structured with harmonised indicators, that allow to **compare between cities and within cities, to examine the unequal spatial patterns of housing affordability**.
 - A survey of databases of relevant data providers, to gather data on housing dynamics and affordability in country (France, Switzerland, Spain, Poland, Norway, Sweden, the UK)
 - 9 case studies that cover both one global and some capital cities, and medium-sized cities. Case studies offer a variegated sample, with several dynamics regarding housing market (gentrification process, tourism presence, housing crisis, etc.). Highlighting these heterogeneous and complementary situations is relevant to carry out a first international and comparative study on housing dynamics in Europe based on local indicators.
 - One cross-border case study focusing on the **Swiss-French region** of Geneve-Annemasse-Annecy, where tensions on housing market and lack of affordability specifically constraints the living conditions.
- The report provides data, maps, analysis and promotes reproducible tools to monitor affordability. All data, maps, analysis and methodology are made available for reproducibility and further analysis.
- Part 4.1 summarises the main findings for each case-studies. These results are more detailed in part 3. All the maps displaying case-study results are available in Annex 5.

- Main results can be summarized as follows :
 - Housing costs exacerbate differences, inequalities and segregation : the affordability gap is detrimental to the wider middle-class, that have to move to the remaining affordable places of functional areas
 - Affordability is not simply structured according to the classical center-periphery structured, but more as a mosaic, that is contingent to local submarkets, local policies, local built environment, local income structure.
 - Moving to suburban and peripheral areas of FUAs, this affordability gap also often locally fuels profitability and housing wealth accumulation. That is the reason why, alongside with affordability, we provide analytics on profitability on the rental market

1 Known facts and policy context on housing dynamics in Europe

1.1 Policy context

Housing is a major policy issue regarding urban well-being, cohesion and sustainability in Europe. The study is framed by the *Territorial Agenda of the European Union for 2020* and deals with the impacts of housing on territorial cohesion, and how to tackle with risks of exclusion. The Pact of Amsterdam (2016) recognises housing as a key priority of the Urban Agenda for the European Union. Housing affects social cohesion and stability in Europe. The *Action Plan of the Partnership on Housing of the EU Urban Agenda* pushes for improved knowledge regarding affordable housing:

“Costs relating to housing are increasingly the most significant item of household expenditure in Europe. In 2015, 11.3% of the EU population lived in households which spent 40% or more of their disposable income on housing. The housing need has not only increased, it has also diversified, affecting population groups across income levels. Overall, housing prices are recovering faster than earnings. (...)

It has been recognised that inequalities in education, health, employment and earnings all combine, resulting in significant differences in lifetime earnings across different population groups. What has not been sufficiently acknowledged is that high housing costs exacerbate these differences and may permanently impede social mobility, sustainable economic recovery and social cohesion. The housing need, however, has not been matched with investment in affordable housing.

Cities are affected by the housing crisis in a specific way. More economically successful cities have higher housing and land prices across housing tenures and therefore seem to exhibit a heightened affordable housing need.

Cities are at the heart of the Urban Agenda for the European Union. However, the housing field has an unusual position within EU policy and regulation. Although the EU has no direct competence in the area of housing, housing issues have gained increasing attention across the Union since the global financial crisis. Indeed, a number of EU policies, strategies and funding streams have had a significant impact on the housing field in Europe. For this reason, their examination is vital.”

In the light of the European priorities in terms of social cohesion and stability, the report addresses several of the highlighted topics. First, **housing prices have increased faster than the income of renters and buyers** in major post-industrial city-regions, and real estate has become an important driver of socio-economic inequalities: “in 2014, approximately 7 % of the EU-28 population faced the situation where housing costs accounted for more than half

of their disposable income”¹. In relation to this policy context, one issue we specifically address is **how housing costs exacerbate these differences**.

Also, EU policies pay attention to how economically successful cities might be more likely to experience an affordability crisis: **it is therefore critical to examine affordability and housing conditions in different cities, to assess this policy posture**. Although the EU has no direct competence in housing and city planning, many EU policies have direct impact on housing, among which monetary policies (quantitative easing and inflow of credit money), and environmental regulations (that direct many aspects of land use and planning) are to be considered.

Along with academic literature, the OECD database on affordable housing shows that increased price and income inequalities exacerbate unequal access to affordable housing (Oecd, 2018).

1.2 A gap between income and housing price

This affordability crisis impacts the well-being of residents in European cities, and has been well analysed at macro-economic levels. As soon as the early 1990s, housing finance (access to credit, mortgage and fiscal incentives for investors) has increased dramatically in the Global North, yielding a continuous inflow of buyers on markets, and a volatile inflation of price: residential mortgage outstanding debt reached in 2006 all-time high levels: 35% (France), 50% (Sweden, Spain, Germany), 80% (US) and 100% (Netherlands, Denmark) of the GDP, according to Schwartz and Seabrooke (2009).

Also, since the early 2000s, a gap between households' income and property price has therefore widened. In Britain, Ireland, the average house-price to income ratio of 3:1 in 1996 has reached values between 4:1 and 5:1 in 2007 (Schwartz and Seabrooke, 2009). A study in 17 countries (14 in Europe, plus USA, Canada, Japan) showed that the homeownership rates ranges between 50 to 83% in 2010². In many countries, homeownership has skyrocketed until the 1990s then stabilized, housing makets switched to another dynamic: data shows a growth of mortgage debt without growth of ownership “in [a] majority of countries, recent decades, particularly in the 2000s, were marked by a growth of mortgages per GDP not paralleled by a growth of homeownership, which either grew much less than before or even declined” (Kohl, 2018, p. 185). This results for an unprecedented inflation : in 1985-2010 price-to-income ratio has increased from + 13% up to +28% in France, 44% in the UK, except in Germany and Japan (Aalbers, 2016). In France as well, the affordability ratio, calculced by dividing housing prices by level of wealth (income generally), this last decade (or real estate purchase power)

¹ 2016 Eurostat Urban Europe report.

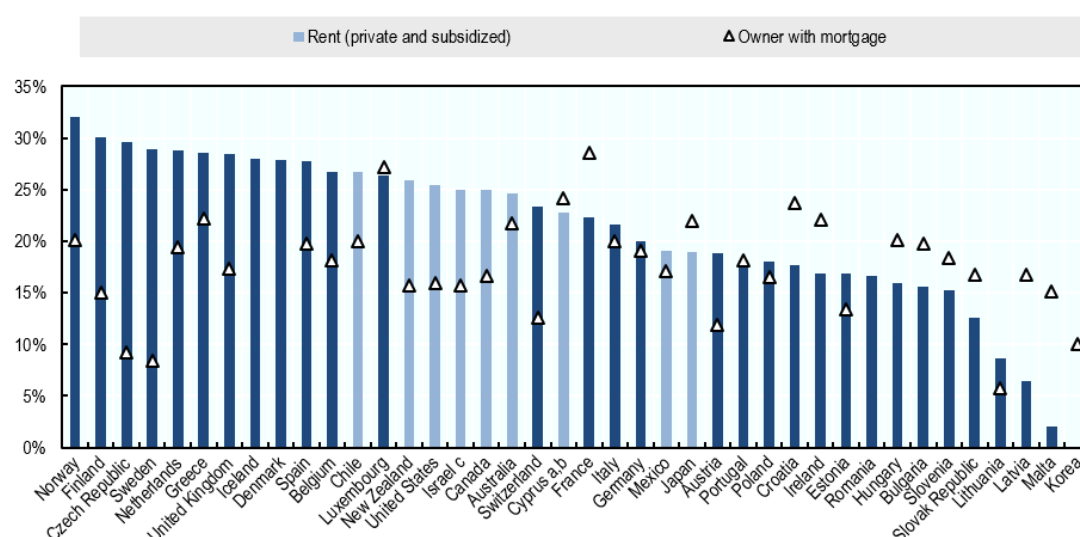
² The study compares 2010 Eurostat data and 2006 UN data from Fernandez, R. and Aalbers, M., B. (2016) Financialization and housing: Between globalization and Varieties of Capitalism, *Competition & Change*, 20(2), pp. 71-88 (<https://doi.org/10.1177/1024529415623916>) DOI: 10.1177/1024529415623916..

has dropped at its lowest historical level (Friggit, 2017), because of a +70% increase of the actual cost of real estate since 2000, while households benefited from lower interest rates and longer credit range to offset this price inflation and maintain purchase power. This is not, however, the case in every European country, as demonstrated in a study by Beresewicz (2015), where data show a depreciative trend on the secondary market in Poland after 2008.

Figure 1.1 – A view of housing cost burden in the OECD, 2014 (reproduced from OECD Affordable Housing Database, 2016, online: <http://www.oecd.org/social/affordable-housing-database.htm>). ESPON countries are displayed in dark blue.

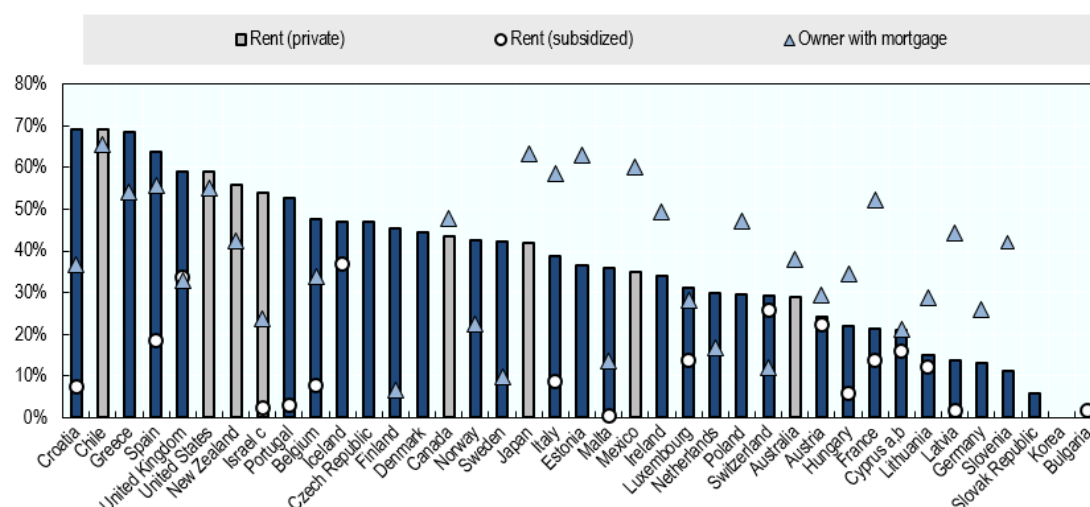
A. Households' housing cost burden (mortgage and rent cost) as a share of disposable income, 2014 or latest year available

Median of the mortgage burden (principal repayment and interest payments) or rent burden (private market and subsidized rent) as a share of disposable income, in percent



B. Housing cost overburden rate among low-income owners (with mortgage) and tenants (private rent and subsidized rent), 2014 or latest year

Share of population in the bottom quintile of the income distribution spending more than 40% of disposable income on mortgage and rent, by tenure, in percent



This affordability problem spreads across property markets, with unequal effects (André and Chalaux, 2018; Kemeny, 2001). The OECD *Affordable Housing Database* (AHD) characterises the various conditions existing on European markets, as on **Error! Reference source not found..A**. Data show that in many European countries, the average mortgage or rent burden tops up the 25% critical threshold, in Norway, Finland, Czech Republic, Sweden, the Netherlands, Greece, the UK, Denmark and Spain as for rents. For owner-occupied households, this is measured by means of the cost of mortgage, and it reaches the highest levels of disposable income in France, in Luxembourg, Ireland and Croatia. Among lower-income owners, covering all individuals with a net income below 50% of median income of total population (OECD, 2018), the situation shows critical threshold of debt (50%) in 14 countries of the OECD study. Data show that the threshold of 50% of disposable income is reached for low-income renters in 9 countries of the OECD among which Croatia, Greece, Spain, the UK, Portugal (**Error! Reference source not found..B**). And in general terms, households that spend more than 40 % of disposable income on housing are considered overburdened (OECD, 2019).

For this OECD database André and Chalaux (2018) summarise the findings and identify four groups among a set of OECD countries, showing how the dimensions of the affordability issues is highly multifaceted, according to the local conditions of the market :

« A group named “Northern”, as it covers mainly Northern Europe, including Germany, features extended private rental and generally high household debt. A “Western” group, which includes France and the United Kingdom, has higher homeownership rates and more social housing. “Southern-Central” and “Eastern” groups gather European countries, where outright homeownership is prevalent, but housing conditions are poorer. » (André and Chalaux, 2018, p.1).

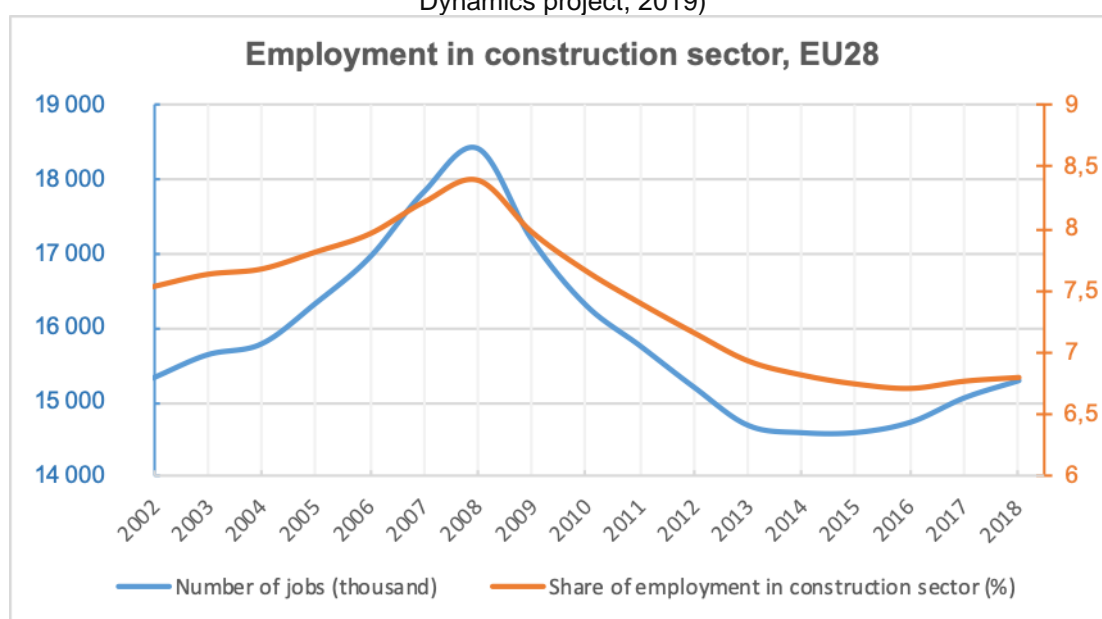
One policy implication is that no single recommendation can be issued at a European level regarding the affordability crisis, with regards to the diversity of market conditions in Europe. Furthermore, the condition vary across the different categories of markets. Generally speaking:

- For prospective homeowners: increased affordability gap leads to a socially-selective access to housing markets, yielding more spatial exclusion and increased social tensions. Real estate has become an important driver of socio-economic inequalities.
- The cost of ownership impacts rents, and also the availability of housing to let. The global financial and economic crisis moreover led to decreasing construction activities across Europe, in particular with respect to social housing, as many governments restrained their level of public spending. The **Error! Reference source not found.** highlights namely the effects of the crisis on the construction sector: In 2008, the construction sector was

composed of 18,4 million jobs (8.4 % of total employment). In 2018, it represents 15.2 million jobs and 6.8 % of total employment.

- For owners, real estate has become a major component of household wealth. But local markets are also volatile. Housing prices are therefore unstable and contingent upon the market's continuous restratification within and across neighbourhoods. Real estate influences the local conditions through which household wealth is accumulated or lost. This determines their capacity to sell and buy.

Figure 1.2 – Employment evolution in the construction sector (sector F in the NACE) at EU28 level(source : Eurostat, 2019 (tables lfst_r_lfe2en1 and fst_r_lfe2en2 / Realisation : Housing Dynamics project, 2019)



1.3 Prices, homeownership, and housing finance regimes

For property markets and prospective homebuyers, a continuous increase in property prices and a steady increase of homeownership was analysed **as a new price regime** (Tutin, 2013), **conditioned by the financialisation of housing markets**.

This situation is linked with financial and macroeconomic parameters like monetary policies and credit affordability (national policies): **25 States in the OECD promote homeownership by the means of subsidies and fiscal incentives to first-time property owners and/or fiscal incentives to offset the cost for individual buyers** (André and Chalaux, 2018). This shows how advanced economies have shifted toward an asset-based welfare model, yielding a regime linking an ideology of ownership, credit affordability and house price often subsidised by the State and local governments (Rolnik, 2013; Ronald, 2008).

Topalov (1987) has well established how the homeownership regimes shifted from a rentier-system to a credit-based massive homeownership. These shifts have been regulated by converging public policies (to increase household solvency and provide incentives to homeownership), banking industry, market players' strategies (among which developers have been preeminent), and preservation of assets strategies by households (Bonneval and Robert, 2013; Topalov, 1987). Some scholars describe a path dependency-shift in almost every nation-state influenced by global World Bank policies (Rolnik, 2013), after the 1993 report *Housing: Enabling Markets to Work* (World Bank, 1993) summarised assessment, best practices and recommendations on how important the housing sector could be for the economy, including guidelines and suitable policies for governments. In a political economy perspective, some argue that despite significant differences, a gradual shift across national models has occurred (Fernandez and Aalbers, 2016), described as “the partial integration of *national* systems of housing-centered financialisation in *global* financial markets” (Aalbers, 2016). Scholarly works describe housing asset-based welfare, a rising ideology of homeownership across modern-industrialised societies and a path dependency in housing policy reforms (Malpass, 2011), characterised by liberal-economic ideologies and market mechanisms driven by policy-measures, socio-ideological frameworks (Ronald, 2008) and finance-led accumulation regimes (Boyer, 2009).

More specifically, theories link the high proportion of capital investment that housing represents for households and the ways welfare states are organised and reformed (Kemeny, 2001), the pursuit of owner-occupancy promotion being viewed as a superior form of tenure, while privatising social housing (Van Gent, 2010). Many changes have affected this regime since the 1980s but have not been thoroughly characterised in France, with regards to the literature in Spain (Kutz and Lenhardt 2016; Vorms, 2009), in the US (Aalbers, 2009; Langley, 2006; Le Goix, 2016; Le Goix and Vesselinov, 2013), in South-East Asia (Aveline, 2008), or exploring the recent expansion of housing finance in the Global South (Pereira, 2017; Soederberg, 2015). Many stratifying effects of market devices exist. The effects of redlining, and racially targeted “exploitive greenlining” on households vulnerability to risky mortgages has been investigated (Newman and Wyly, 2004), as well as the impact of market devices on stratification, s.a. the scoring system in the credit industry (Fourcade and Healy, 2017), but the socio-spatial effects of homeownership requires investigation. We undertake a systematic mapping of the spatial dynamics of the financial effort of households and the unequal dynamics of local affordability. In France, the link between residential markets and social segregation (measured with socio-occupational categories) has mainly been seen through the lenses and explained by socio-demographical factors, such as the increase of executives in metropolitan areas or the acquisitions by retired workers (Cusin, 2016; Cusin and Julliard, 2012). This approach tends to minimise the role of other factors and, more importantly, how different categories of households are impacted by the evolution of housing prices.

Trajectories are therefore highly dependent upon national frameworks, and the state enables households to act as investors, engaging through markets with prospects of

future gains, while exposed to greater risks (volatility of price, loss of property values, risks of bankruptcy and foreclosures, etc.), raising questions of individual and systemic risks, and therefore vulnerabilities of households (Schwartz, 2012). But such trajectories are also embedded in local contexts of accumulation vs. vulnerability.

Therefore, real estate has become an important driver of inequalities, for at least two reasons. First, increased property prices sort out buyers and renders access to housing highly dependent of assets and unequal access to credit (because of income, assets, social stratification, credit scoring). Second, the flows of household real estate investments are instrumental to the dynamics of asset capitalisation for households (Piketty, 2013). Both access to housing (affordability) and assets (value of the property) directly affect social inequalities and spatial segregation patterns of residents and buyers. The dimensions of these socio-spatial inequalities derive from a decrease of housing affordability, *i.e.* a widening gap between property prices and households' income (Friggit, 2017). To describe it as a feedback loop, this can be seen as a systemic relationship:

“Prospective homeowners employ diverse forms of purchasing power defined by their income level, credit score, current assets and embedded knowledge of market opportunities (1). Buyers and sellers operate on a market that spatially structures their differential inclusion in the market (2). Housing prices are therefore unstable and contingent upon the market's continuous restratification within and across neighbourhoods. This stems not only from the effects of urban development cycles, but also from different policy decisions taken in regard to housing supply (public incentives and restrictions) (3), which influence the local conditions through which household wealth is accumulated or lost (4). This, in turn, shapes the structure the property's value in the market, where supply and demand interface (5) through the purchasing power of households (1).” (Le Goix *et al.*, 2019a, p. 2)

1.4 Contribution of the well-being report to policy issues

To analyse in depth how purchase power and affordability are conditioned by the different issues systematically connecting housing finance regimes, inflation, ownership and local markets (supply, demand, provision, incentives, restrictions), a first research step consists in informing the relationships between income, price and market conditions (well-being) in European FUAs. However, one major issue is the **lack of harmonised spatial data to map and monitor affordability** in Europe. In this research, ESPON interest in the methodology is policy oriented: to “what degree new ‘big data’ collection approaches can be used to enrich existing territorial policies and provide up-to-date evidence”³.

³ ESPON EGTC, 2017, *ToR Big Data for Territorial Analysis and Housing Dynamics*

Our research brings new insights on how to use unconventional data to gather valuable information, to provide a cost-effective and harmonised data collection and contribute to the analysis of socio-economic cohesion.

Starting from the issues highlighted in European policy priorities, known facts and in-the literature review, our contribution also aims to provide a methodology to make housing-data more widely available at a European level, as our survey of available data showed that current Europeans databases lack information. Indicators derived from Eurostat databases on housing issues cover Functional Urban Areas and Core Cities. Unfortunately, the harmonised Eurostat information only foreplay a “global picture” of the housing phenomena. All studies stands that the appropriate level of observation of housing inequalities is located at infra-urban micro-scales, within the cities. This is the reason why this project aims at enhancing the geographical granularity to collect data (down to X/Y location for real estate values, LAU2 units or 1 km grid for income data). Secondly, even if the housing issues have been identified as relevant by the European Commission and Eurostat (some indicators are available for FUAs), it seems that the data collection process is not yet implemented, since the Eurostat data portal returns no values for these indicators.

Therefore, by the means of bringing together conventional and unconventional data, institutional data and harvested real-estate data, the policy relevance of the study can be described according to the following goals:

- To better inform and map the increased affordability gap, a critical issue for social cohesion sustainability in metropolitan areas in Europe.
- To monitor unequal access to housing markets.
- To monitor increased inequalities stemming from declining affordability (i.e. higher price to income ratio)
- To monitor the spatial effects of pro-ownership policies on socio-economic inequalities, and the attendant risks of market-based exclusion.
- To analyse the spatial patterns of inequalities stemming from unequal capitalisation of housing wealth in some areas, vs. vulnerability of households in others.
- To make available relevant data sources, *ad-hoc* methodologies and analysis to build harmonised indicators, and propose a reproducible framework of analysis, in order to extend possibly the study at a European scale.

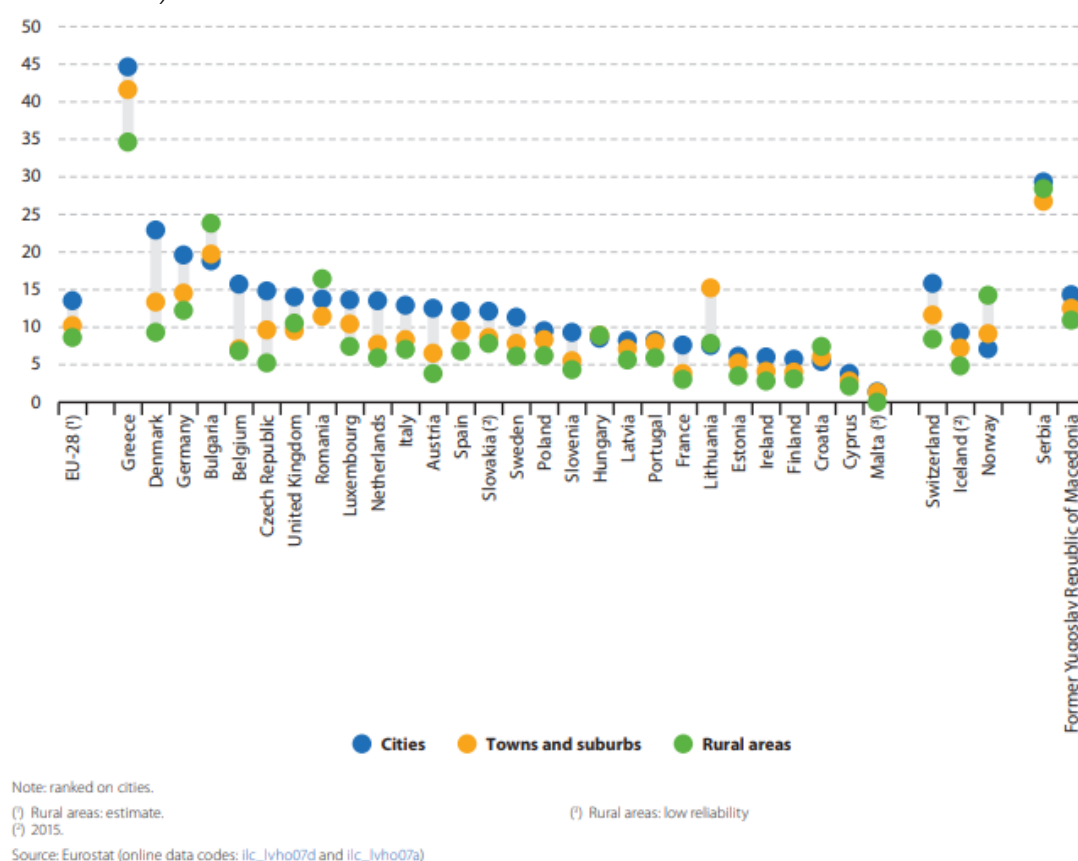
2 Main findings on data availability

2.1 Existing European databases on housing issues

Eurostat and European statistics provide some key figures summarising the importance of housing in the total consumption expenditure. The Eurostat regional statistics in focus 2018 reminds that *housing is often the largest single item in a household budget, irrespective of whether the occupants are paying off a mortgage/loan or renting a property* (Eurostat, 2016).

As on Figure 2.1, in the EU28 more than 10 % of households in cities and towns spent more than 40 % of their disposable income to housing costs (housing cost overburden rate definition). These statistics derived from the *EU-SILC survey* highlight also significant differences between countries: average housing cost overburden rate is above 15 % in Greek, Danish, German, Bulgarian and Belgian cities. Moreover, data show also significant differences according to the geographical location of the households (cities, towns and suburbs, rural areas). Generally speaking, people living in cities paid a premium for centrally.

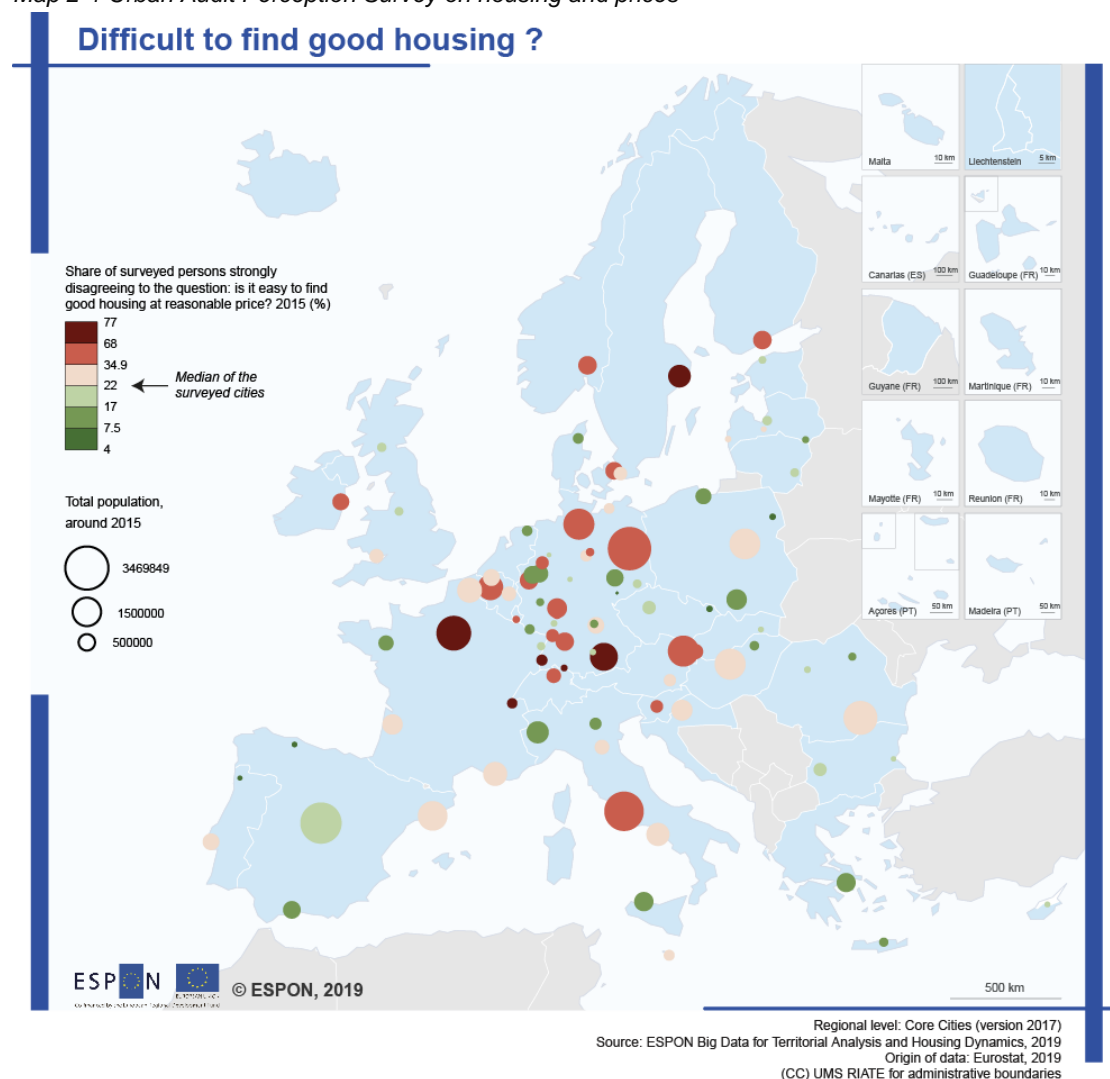
Figure 2.1 - Housing cost overburden rate, by degree of urbanisation, 2016 (source: Eurostat Regional Yearbook 2018)



Another interesting existing EU data source is the perception survey held by the *Urban Audit*. It allows since 2004 to catch the perception of residents on various thematic for 79 cities and the 4 larger cities in the European Union and EFTA countries (Switzerland, Norway, Iceland). This survey includes all national capital cities (except for Switzerland), and between one and

six more cities in the larger countries. In each city, around 500 citizens were interviewed (Eurostat, 2018) on various topics.

Map 2-1 Urban Audit Perception Survey on housing and prices



On housing topics, results are available for the following question: “in the city, is it easy to find good housing at reasonable price?”. Map 2-1 displays some interesting patterns when comparing the main European urban areas (higher disagreement in Paris, Geneva, London, Stockholm, Hamburg, München and in other EU capital cities) but results are limited, and *results are derived from a wide and rather imprecise question*: what do we consider as a “good housing”? The question is fuzzy, and do not capture the variegated dimensions of housing to be fully analysed, s.a. location of the housing in the city, size of the household, wealth of the person who answer to the question, etc.

Second, the number of geographical objects (86) does not cover the entire urban hierarchy: i.e., France is only covered by a sample of 6 cities (Paris, Strasbourg, Bordeaux, Lille, Rennes, and Marseille). It is consequently difficult to cover the variegated dimensions of the perception of the housing aspect without taking into consideration the situation of missing important cities (Nice, Lyon, Toulouse, Grenoble, Nantes, etc.) and medium-sized cities in the

urban hierarchy, as it is not the same to pay for a similar dwelling (such as a 2 rooms apartments) in different cities.

To compare housing situations between European cities, Eurostat provides some indicators mainly derived from national censuses under the Eurostat theme “living conditions”. Eurostat provides basic distinctions between houses and apartments, housing type (households owning their dwelling, households in social housing). It also provides partial data on describing the average price for buying a house or renting an apartment and average income. Annex 2 displays map outputs of indicators relevant for analysing housing dynamics currently available for city object: Functional Urban Areas and Core cities.

Using existing databases raises several shortcomings that this project will address to test and implement some solutions : (1) Definition and harmonisation between datasets; (2) Having more information on housing market segments; (3) Time frame of the reference datasets and (4) Adapted geographical levels for analysing housing inequalities and (5) spatial coverage.

2.2 How this project addresses these shortcomings

The analysis of available information on housing topics on Eurostat’s portal leads to a series of conclusions that is important to take into account for analysing housing dynamics in Europe:

2.2.1 Definition and harmonisation between datasets

The listing of available statistics on Eurostat resources displays some available resources on housing topics. Eurostat provides an overview of the distribution of housing conditions across the European urban hierarchy. Two shortcomings should be highlighted: (1) a lack of information regarding the definition and harmonisation between datasets; (2) the market segment and spatial coverage for which the aggregated information is relevant. These are common problems when harmonising national census definitions and highlight the heterogeneity of national censuses led in each country in Europe. It raises the issue of the data source to be considered for filling databases on housing dynamics. To some extent, **it is not obvious how administrative data derived from national censuses appear as a relevant primary data source to produce harmonised data and information on housing in Europe.**

2.2.2 Market segments

One of the shortcoming of Eurostat data at city level relates to the absence of breakdown of variables s.a. price by type of structure (apartments / individual home), surface, age of the structure built. Moreover, the database is incomplete: the quality of the database is best for EU census reference year (2011), with an average degree of completeness of 51 %. It well summarises the differences of indicators targeted for the census at local level (LAU2) country by country in Europe. As a consequence, we can suspect heterogeneity concerning the methodology used to aggregate these indicators between each country in Europe. It is indeed

quite ambitious to consider this data source as a reference for grounding a comparative study on housing dynamics in Europe, with comparable data across time and between cities. **A full-scale survey of market conditions and living conditions therefore requires a careful construction of harmonised variables.**

2.2.3 Time frame of data available

Data exploratory analysis has revealed that most of the available data are available in European census (2011). Even if most of the national statistical institutes now provides yearly census data, it is not everywhere the case. It is a problematic issue to understand the dynamics of housing market, which requires consolidated time-series and spatio-temporal analysis. Time-series are, however, often produced for large spatial aggregates, and rarely describe fine grain local geographies.

2.2.4 Geographical granularity

The lower territorial level of analysis in Europe is LAU2. It corresponds to detailed territorial units in some countries such as municipalities or equivalent units. Housing markets are however organised at an even more local scale (neighbourhood, street, down to the address), and mapping / spatial representation of housing markets shall take into account the actual geography. We methodologically framed the data collection effort to deliver data and visualisation at the local level. This to better describe markets-based inequalities, and deliver datasets in geographies that best fit the needs of policy-makers.

2.2.5 Spatial coverage: data interpolation and estimation

From a policy point of view, we had a methodological focus on data collection, but also data aggregation, sampling issues and interpolation, because such methods allow to deliver datasets that match local geographies that are relevant for policy-makers (local bodies of governance, metropolitan stakeholders, and governments). Indeed, data have been extracted, scraped and harvested from various datasets that are delivered with spatial definitions that are not compatible (some at LAU2, some with latitude and longitude, some at the ZIP code level), some at the parcel level, depending on the local and national context. We adopted strategies of estimation, interpolation, that do not derive from inferential statistics (as census or surveys), but from spatial statistics. In reproducible research, it is crucial to provide a methodological framework that can work with different heterogeneous data sources. **Data are delivered at various level of aggregation that are useful to map and analyse inequalities:** the 1km grid to map fine-grain inequalities and perform local analysis, LAU2 and FUA because these are the usual spatial units that are used for other policy-oriented studies, to allow external referencing to other socio-economic issues.

To explain our focus on local data **from a more theoretical point of view**, the methodology relies on an interpolation of discrete socioeconomic phenomena. Interpolation is a classical problem: in many cases, the problem consists in mapping or visualising a continuous surface (temperature, wind) where the phenomenon can be accurately estimated in all points, with a small number of actual measures. But the usual methods of spatial interpolation (e.g.

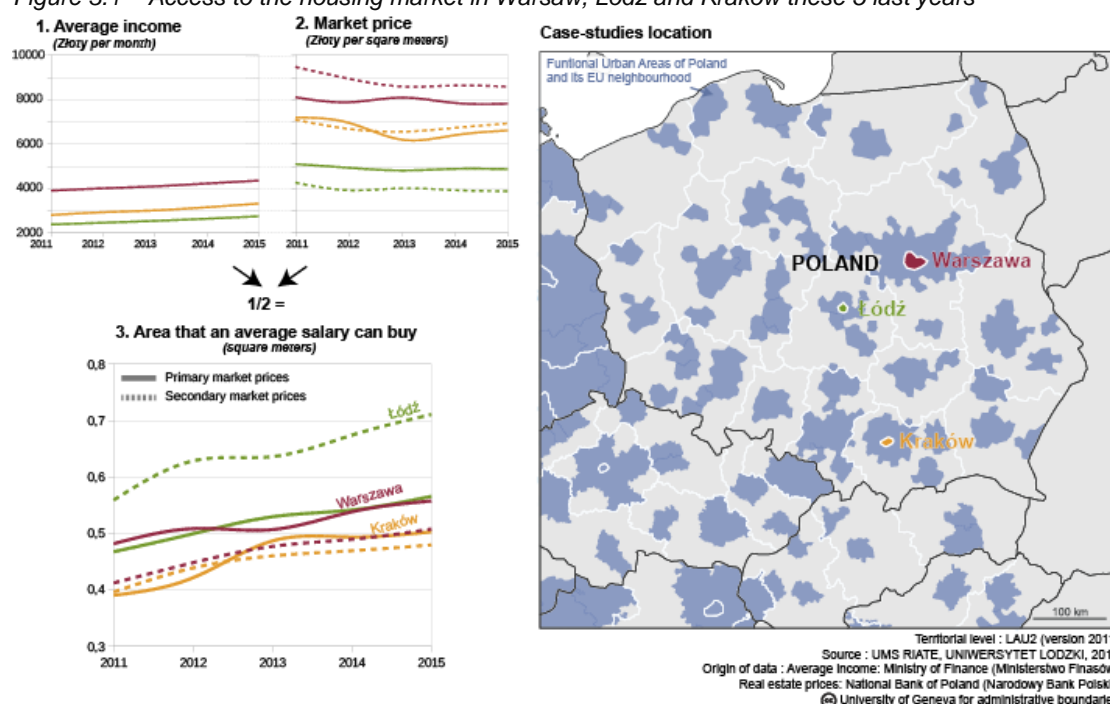
triangulation, kriging, all based on sampling theories and inferential statistics) are unfit in the specific case of discrete phenomena (Grasland *et al.*, 2000). **Our hypothesis stems from a “real world” problem:** market actors (i.e. real-estate agent, sellers and buyers) need to gather information on nearby transactions and homes to accurately price the advertised property, to efficiently negotiate the transaction, to publicise the listed properties, and for the sellers and buyers to engage in residential mobility. “Nearby” transactions do not correspond to a municipal average (LAU2): we consider that systemically averaging values at the LAU2 level does not always render the most appropriate spatial summary of the available information on property markets. If we consider the industry's solution to "real world problems", the mapping engine of a website such as *meilleursagents.com* renders a continuous surface of price at a smaller scale. But, when zooming on a specific suburban neighbourhood either averages the property values at the municipal geographical level, or discretises the information mixing different geographies on the same map : parcel / neighbourhoods and municipal levels, depending on the significance of samples of sold properties (for example, in Versailles and its vicinity: <http://www.meilleursagents.com/prix-immobilier/versailles-78000>). We adopt a similar approach of the geographical problem, and link issues of *spatial sampling* and fine *grain local geographies* to properly aggregate and estimate data. We therefore focus on disaggregated spatial information first, and then produce the appropriate local estimation by means of aggregation (LAU2), or spatial interpolation (Grid). Interpolation methodology is explained in the *Guidance Document*, section 3.6.

3 Project inputs

3.1 Building harmonised indicators with relevant data sources

A 2019 workshop organised by the JRC (Joint Research Center) and the City of Amsterdam (Amsterdam, Feb 18-19, 2019, “EU cities and the financialisation of the housing market”) gathered European experts and offered insights on how to study, compare and propose coherent indicators on affordability in Europe. This panel of policy experts and data analysts agreed that, after Friggit (2017), statistics such as **price-to-income are among the most valuable harmonised indicators to elaborate policies on unequal housing markets**, as they present many advantages. One of these advantages is the combination of a numerator related to housing prices (ownership or rental) and a denominator related to wealth or socio-economic situation of the population (income). It allows to build very significant indicators from a policy point of view, such as price-to-income ratios or time of work required to buy/rent 1 square meter, which is usually considered as very meaningful indicators. A second advantage for analysing housing markets is that it allows for relevant and harmonised comparisons between cities, and even under data availability, affordability monitoring over time, as demonstrated in Figure 3.1 on Polish core cities. Indeed, it is quite clear that the housing market prices in Warsaw, Lodz, Paris, Barcelona or other cities in Europe are quite correlated to the level wealth of the population. Producing these harmonised indicators using income indicators as denominator make possible valuable comparisons between the cities on housing market issues.

Figure 3.1 – Access to the housing market in Warsaw, Lodz and Krakow these 5 last years



The creation of this harmonised information is however not an easy process and must follow specific methods and procedures. A major issue consists in defining an adapted methodology for **combining conventional and unconventional data sources**.

Conventional data are provided by traditional statistical offices for public, demographic use and policies. This information, usually collected at the individual scale and disseminated at several geographical aggregates, is disseminated as a quality-controlled data source, subject to complex processes of estimation and validation. Conventional data are usually realised through vintages (like censuses), but rely on robust surveys, samples and well-established inferential statistics methodologies.

Unconventional data comes from data various platforms and sources, and are often named “big data”. Some might come from institutions, and are datasets collected for various administrative, fiscal reasons, but that were not originally designed for socio-economic research. Many data are harvested, made available by internet service providers (ISPs) by the means of Application Programming Interfaces (APIs), or scraped. Such unconventional data are often viewed as interesting proxies to measure, and better understand spatial behaviors and territorial dynamics (Gallotti *et al.*; Kitchin, 2013), and also as a means of providing higher spatio-temporal resolution data when compared to institutional data sources (FP7 EUNOIA final report, 2015). Prior to relying upon the unconventional data sources, it is important to assess their reliability, and if they provide accurate information when compared to the long established, statistically robust information collection data. Studies address the representativeness of Internet Data Sources (IDS) compared to conventional data sources (Beresewicz, 2015; Le Goix and Vesselinov, 2013).

3.2 Identifying possible data sources: a survey

In a first step, we have identified in different countries the availability of possible sources to *locally* analyse the geography of housing under a regime of unequal affordability. This step has highlighted the difficulty of the task at hands to offer a European comparative perspective on housing and affordability.

In this report, we also provide a review of relevant conventional and unconventional data sources, delivered for a selection of countries that cover a variety of situations in Europe as *Annex 3 – Data sources by country* (transactions, data harvesting, and income data). This data review has been realised by available team member country experts (Switzerland, Norway, Sweden, France, Spain, Poland, United Kingdom), its purpose being to highlight the main characteristics of these data resources (spatial coverage, time coverage, available indicators...). We also used as source of information a recently published report by Julliard and Gusarova (2019).

As shown in the data sources review (Annex 3) the overall situation regarding the availability of real-estate market that include price can be described as follows:

- **Switzerland** has official statistics on rents and new builds (Census, Statistics Federal Office) and new builds but not on property prices (buying-selling prices). Several private companies collect and distribute property data for Switzerland, such as *CIFI*⁴ or *Fahrländer Partner*⁵. In this project the most accurate (spatial coverage, number of transactions registered) has been considered: *Wuest&Partner*⁶.
- In **Norway**, private sources are the predominant producers of real estate data. *FINN.no*, an advertisement online market place, registers almost all sales and rent listings. Another private provider, the Norwegian realtor brokerage association (*Eiendomsverdi AS*) maintains a full database of transaction records. In this case, paying for database access, or a massive webscraping effort, would be required.
- **Sweden** is probably a good example of an open real-estate data policy : according to Julliard and Gusarova (2019) : “the public authorities in Sweden opened up their real estate data as far back as the mid-1980s. More specifically, the country’s land register (*Lantmäteriet*, Ministry of Industry) supplies its data not only to administrations and local authorities but also to authorised researchers and private firms who request it. The accessible data can be aggregated or be individual. It is available for a fee which depends on the request”. Many market places offer also access portal to price asked and rent information.
- **France** has a long-standing well established tradition of nationally collecting statistical information on transactions. Given a costly fee (even for researcher of public institutions), transaction data are made available commercially by the Paris Chamber of Notaries database (*BIEN* database⁷). This database covers Ile-de-France real-estate transactions., For the rest of France, the same type of data are commercially made available by French notaries as *PERVAL* database⁸. These Chamber of Notaries databases provide a wide range of information related to transactions: price, very detailed characteristics of the property, as well as extra information such as the socio-economic characteristics of the seller and the buyer (age, employment category), or the contracted debt of the buyer. It must be noted that the government has *recently* made available, in the course of writing this final report, property values declared to for land property taxation. This fiscal database (*Demandes de valeurs foncières datasets, DVF*) is available free of charge. It however does not exactly covers transactions on the housing markets, but individual parcels and buildings known values. The problem being that one transactions is in many cases composed

⁴ <https://www.iazicifi.ch/fr/>

⁵ <https://www.iazicifi.ch/fr/>

⁶ <https://www.wuestpartner.com>

⁷ <https://basebien.com/>

⁸ <https://www.perval.fr/>

by several parcels (s.a. one apartment and one garage ; one house, a piece of land, and sometimes a garage and an outbuilding). Furthermore, many online platforms coexist, that provide different entry-points. The most popular one, that has been chosen for the case-study, being Leboncoin.fr market-place, that advertise properties to buy and properties to let, either by real-estate agents or by individuals. Many other sources are also available online : “property sale prices are supplied by the Fnaim (Fédération nationale de l’immobilier, a real estate agent trade association set up in 1995), meilleursAgents (an intermediation platform linking individuals and real estate agents set up in 2008), LPI-Seloger (Les Prix de l’immobilier Seloger, an observatory partnership set up in 2009) and Yanport (a start-up offering competitive watch tools for real estate agents and property developers set up in 2015). Together they cover existing properties more specifically but also offer reference data on new builds. The rental market, meanwhile, is specifically covered by Clameur (a private observatory set up in 2006) and by the network of local public observatories (since 2014)” (Julliard and Gusarova, 2019). InsideAirbnb (harvested Airbnb data) is also an important data source available in Paris, Bordeaux and Lyon.

- Except the existence of an aggregated price index, **Spain** has no national transaction detailed local data available from public institutions. Some cities publish transactions data (*Barcelonatan*), otherwise price estimates are available through companies and private providers. Spain is a national context in which it is convenient to harvest data online: Fotocasa and Idealista are websites and interactive online platforms that collect property ads it registers. Such tools provides sale and rental prices. *InsideAirbnb* (harvested *Airbnb* data) is available for 6 Spanish cities: Madrid, Barcelona, Malaga, Mallorca, Sevilla and Valencia.
- In **Poland**, a variety of datasets are available: for some cities the transaction price can be obtained through notarial acts (down to the address), (Lodz). Some datasets are also collected by the National Bank of Poland (LAU2 units). The online real-estate market place *domiporta.pl* is a widely used resource, that provides real-estate advertisement: it is a harvestable source for price asked and rent asked. *Airbnb* advertises properties in many cities, but the insideAirBnb harvesting platform is not available.
- In the **UK**, HM Land Registry publishes the UK House Price Index, and publishes data on properties and on transaction. It covers only England and Wales. This website provides free online access to its database. Data is available on individual transactions and is geocoded, but very little information regarding the property is available. Many online market-places and real-estate listings are available online and could be candidates for data harvesting, resources permitting. The most interesting ones being large data aggregators such as *Rightmove* and *Zoopla*. *Airbnb* advertise

properties in major cities, and *InsideAirbnb* collects data in London, Edinburg, and Greater Manchester.

Table 3-1 offers an overview of potential data sources available for surveyed countries.

Table 3-1 – Potential data sources available for case studies, a synthesis

Country (<u>case study</u>)	Institutional data on transactions (land registry, notaries...)	Market place platforms and real estate websites harvesting opportunities	Census
<u>Switzerland</u>		X	X
Norway		X	
Sweden	X	X	
<u>France</u>	X	X	
<u>Spain</u>	Some cities	X	
UK	X	X	
<u>Poland</u>	Some cities	X	

Note : Countries underlined corresponds to case-studies of the project (associated to data collection). Countries which are not underlined have been surveyed only in term of potential data sources.

3.3 The process of data collection, harmonisation, aggregation

Based on data sources identified in the survey (Annex 3), and within the context of housing dynamics analysis, the process leading to the combination of unconventional and conventional data sources to produce innovative information may be summarised as demonstrated below. This process is fully documented in the *Guidance Document*, detailed as a narrative of the code produced with the R programming language, which demonstrates this overall data processing.

- 1) Data collection – institutional data** for housing prices (price paid, price asked, etc.), this information can be provided by unconventional institutional data sources (such as Paris Chamber of notaries database in France, which contains information related to the transaction). However, such data have not been produced for aggregated territorial analytics and monitoring. It is often dedicated to local / segmented econometrics.

For wealth of the population (income indicator), this information is provided by institutional “conventional” data sources (national statistics and census at local level) in most of the cases. At European level, the EU-SILC survey provides also comparable datasets on national levels of income, which is available by time-series and by quantiles for all the countries of the ESPON Area.

- 2) Data harvesting** (websites scraping). In fact for most of the countries in Europe, institutional database on housing transactions simply does not exist. Harvesting real-estate websites can be considered in such cases as the only solution to properly gather data on housing market and advertised prices on real estate offers or rental. The key issue consists in identifying the most relevant real estate platforms for each

country (representativeness of the real-estate market, recognition by the customers and the professionals, etc.). Data harvesting raises methodological, ethical and legal questions, which are very important to have in mind and are further described in Annex 1.

- 3) Data cleaning up:** databases or websites providing information related to housing prices are characterised by a high heterogeneity in term of data quality. The evaluation of this quality depends both on the spatial (accuracy of the geocoding) and statistical dimensions (extraordinary values, missing data, quality of the sample, etc.). It requires to set up specific procedures to make the data usable for producing accurate analyses.

4) Data harmonisation, between conventional and unconventional data sources.

The reliability of 'big data' when compared to institutional sources is indeed a complex question which does not have a single and clear answer. Some researchers have also focused on precisely assessing the sampling bias of various ISP data sources, whether socio-demographics or spatial coverage quality assessment – i.e. statistical and spatial representativeness (Longley *et al.*, 2015; Ruths and Pfeffer, 2014; Shelton *et al.*, 2015). Such cross-checking studies have been conducted case by case, and the literature currently lacks references that quantitatively review, for a given spatial information task, the pros and cons of different types of big data when compared to traditional sources, by systematically comparing the picture one obtains with different sources. Beresewicz (2015) specifically addresses the question of comparing the representativeness of Internet Data Sources (IDS) compared to conventional data sources to analyse the secondary real estate market in Poland. They also stress the existence of this institutional database on transactions allows to compare with harvested big data sources (real estate websites, open data sources and warehouses, Airbnb...). They also evaluate which extent this kind of online resources can be considered for estimating quantitative information of the housing market.

- 5) Data aggregation and interpolation in grids.** Large geographical aggregates (LAU2) poorly perform if the question is to circumscribe the effects of urbanisation, peri-urbanisation and local effects on the housing market and living conditions, because of the local heterogeneity of spatial patterns. A more geographically detailed analysis is required to perform accurate data. Another issue is, obviously, the quality of spatial information for sampling. For spatial analysis purpose, two final issues had to be dealt with: (a) the weakness of samples, when using small local geographies, and (b) the fragmented structure of the built environment, for instance subdivisions, large tract housing development, but also detached houses scattered in semi-rural landscapes.

To offset these limitations, a combination of a suitable grid and techniques of

interpolation of point data is a satisfactory solution to be used (Guérois and Le Goix, 2009; Le Goix *et al.*, 2019b; Pecout *et al.*, 2016). The grid and interpolation of data allows to resolve several issues altogether. Firstly it allows to overcome the question of data secrecy, privacy control and legal and/or ethic requirements regarding the confidentiality of individual transactions: Many data providers require that individual data cannot be reconstructed from aggregated data by the means of reverse engineering. Secondly it provides solution to overcome the MAUP (modifiable areal unit problem) issue related to the spatial distribution of transactions and aggregation. Finally, the spatial sampling issues and missing data, grid interpolation allows to estimate a potential price in adjacent cells, with some assumptions regarding the spatial autocorrelation of price and other market variables.

- 6) Production of harmonised indicators and comparison.** When combining prices and wealth indicators, and processing the required data harmonisation, it is possible to build comparable indicators such as price-to-income ratios, to analyse affordability; or dept-to-value ratio, a proxy for inequalities stemming from equity capital availability of households. With this harmonised information, it is possible to propose systematic and comparable analysis between cities, and between countries. Finally, some geographical units concentrate a high number of housing transactions / offers. Typically in these cases, it is important not to consider only the median prices, but also the lowest ones (Q25) and the highest ones (Q75). Table 3-2 summarises the targeted indicators which can be gathered, processed, harmonised and disseminated for analysing housing market in Europe according to conventional and unconventional data sources. This data review is the result of the data sources surveyed and data availability (more details in Section 3.2).

Table 3-2 – List of harmonised indicators which can be built from several data sources

Transaction data	Price / rent asked Data harvesting	Wealth indicators	Possible harmonised indicators
Institution unconventional data sources	Non-institutional Unconventional data sources	Institutional and conventional sources / census ⁹	
1 – Total number of transactions	1 - Advertised price for properties (sum, Q25, Q50, Q75, IQR)	Income (by quantile and at several geographical levels)	Dept to price paid (institutional data only) ¹⁰
2 – Price paid (sum, Q25, Q50, Q75, IQR ¹¹)	2. Advertised price for properties rentals (sum, Q25, Q50, Q75, IQR)		Price paid / income (average, Q25, Q50, Q75),
3 – Surface of property (sum, Q25, Q50, Q75, IQR)	3 – Surface of property (sum, Q25, Q50, Q75, IQR)		Price asked / income (average, Q25, Q50, Q75), advertised or transactions for price

⁹ For this study and for harmonization issues (heterogeneity of income definition according to European National Statistical Institutes), choice has been made to use Eurostat statistics at national level (EU-SILC survey) for the denominator. This indicator, available by quantile and by country, allows to raise relevant questions such as: how much time a European citizen must work to buy 1sq meters apartment in the North of Paris; or how much time the 10% poorest French must work to buy 1 sq. meters apartment in Avignon?

¹⁰ When data available, very scarce in Europe.

¹¹ IQR : InterQuartile range. Sum is made from transaction level to aggregated levels (grid, LAU2) to make possible the calculation of averages for harmonised indicators (price-to-income ratios, price per square meters, etc.)

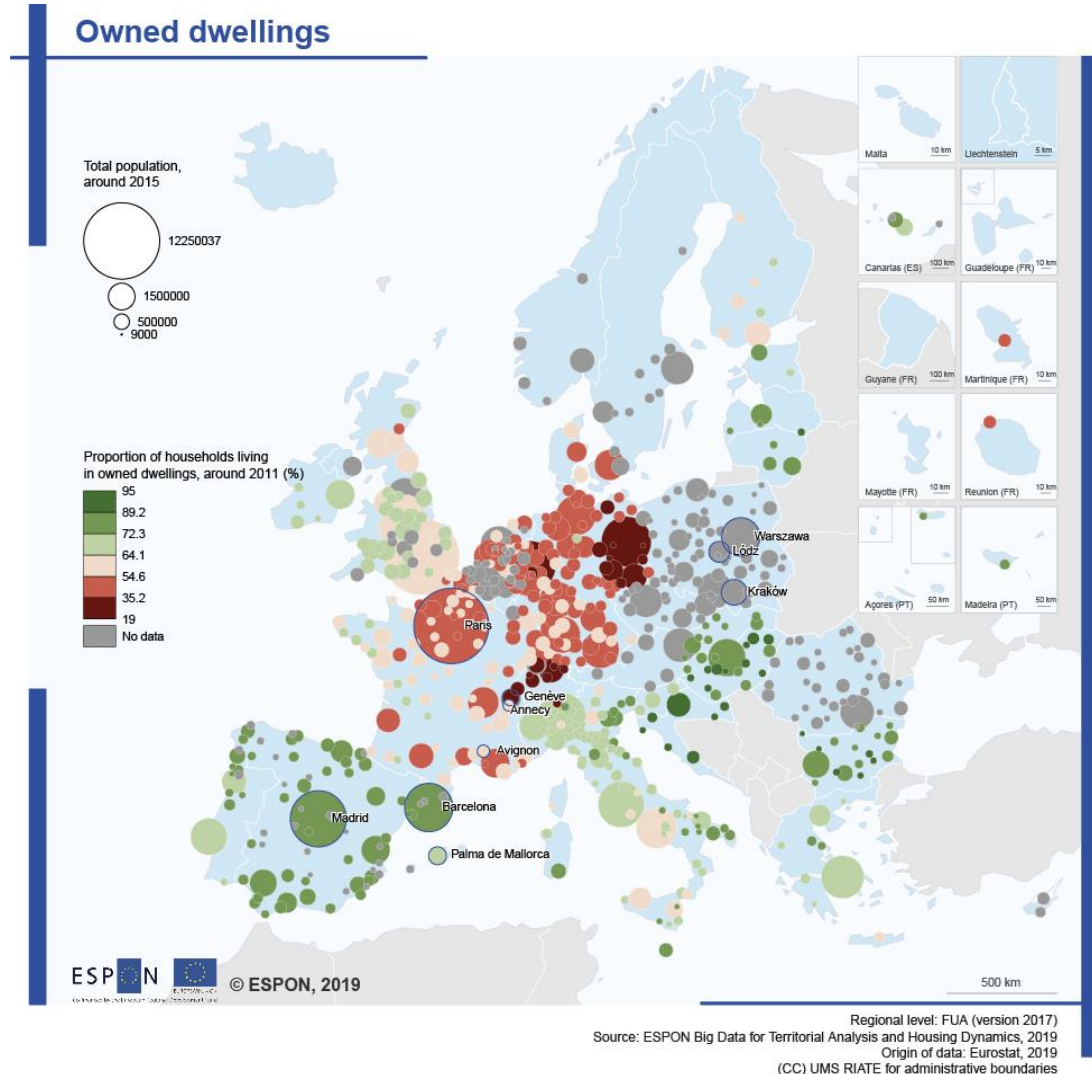
4 – Number of rooms (sum, Q25, Q50, Q75, IQR)	4 – Number of rooms (sum, Q25, Q50, Q75, IQR)		Time required to buy a 1 sq. meter (by income quantile), institutional and harvested data.
5 – Dept contracted to buy a property (sum)			Density of transactions, institutional and harvested data

3.4 Case-study results

3.4.1 Selection and presentation of case-study through European statistics.

10 case-study cities have been selected, covering 4 countries of the ESPON Area, and one cross-border region: *Geneva* (Switzerland), *Annecy-Annemasse*, *Avignon* and *Paris* (France), *Madrid*, *Barcelona* and *Palma de Majorca* (Spain) and *Warsaw*, *Lodz* and *Cracow* (Poland), highlighted in blue on the *Map 3-1*.

Map 3-1 Presentation of case-study FUAs



Case-studies used for the project have been selected according to the following hierarchised considerations:

- Relevance of the comparison from a thematic and policy points of view: the selected case-studies cover both global cities and medium-sized cities, they are characterised by several dynamics regarding housing market (gentrification process, tourism presence, housing crisis, etc.). Highlighting these heterogeneous and complementary situations are relevant to carry out a first international and comparative study on housing dynamics in Europe based on local indicators.
- Existence of available databases of interest for analysing housing dynamics for each case-study in a comparative way, as demonstrated in the survey of available data in targeted countries (Table 3-1)
- Presence of at least one expert in the project knowing the relevant data sources and familiar with the housing dynamics in her/his own country for interpreting the outputs that the project will produce.

The selected case-studies correspond to various positions in the urban hierarchy: the spectrum ranges from 3rd tier cities functional urban areas (276 000 inhabitants for Annecy, 320 000 for Avignon or 670 000 for Palma de Majorca), up to larger cities (3.1 million inhabitants for Warsaw, 4.9 for Barcelona, 6.6 for Madrid) and includes on global city (11.9 M in Paris FUA). In addition, one cross-border area has been identified: *Geneva-Annemasse-Annecy*, where housing stakes are really important to be considered, and not yet studied in term of data harmonisation.

Our selection of case studies also covers a variety of socio-economic situations, to better include a wide spectrum of European cities. Some variables available relevant for analysing housing dynamics on Eurostat are summarised in Table 3-3 (FUAs) and Table 3-4 (core cities). It delivers a global picture of what is currently available on this thematic in 2019, and also how our case study stand in comparison of other cities and ESPON area aggregates. Most of these indicators are not directly linked to the housing dynamics, but provide socio-economic context useful to understand the differences observed in the housing market in each of the case-study cities.

In term of socio-economic characteristics and as regard to Eurostat data currently available, selected case-studies correspond to diverse housing situations. From a demographic perspective, some are FUAs where young populations are over-represented as regards to the others (Geneva, Annecy, Paris) ; some are FUAs where young active population are over-represented (all the FUAs excepted Avignon) ; other are FUAs more characterised by an over-representation of older populations (Lodz, Avignon and Barcelona, to some extent). From a housing perspectives, Spanish FUAs for instance are more characterised by the average size of households (number of persons), and by an over-representation of homeowners. As regards to socio-economic characterisation, all FUAs selected have a relative high level of employment in real estate activities, that highlights the interest of an

analysis of housing market activities. However, many case studies are also characterised by a high unemployment rates (Annecy and Geneva set aside).

Table 3-3 - Socio-economic characteristics of case-studies as regards to the other FUAs of the ESPON Area

FUAs	Name	POP_2015 Population	POP024_2	POP2544_	POP4564_	POP65_20	HOUSEHO	HOUSEHO	SINGLE_H	OWNED_	UNEMP_2	EMP_IND	EMP_HOT	TATE_201	EMP_RES	WF_HIGH
			015	2015	2015	15	LD_AREA	LD_SIZE	OUSEHÖL	DWELLIN						
			2011	2011	D 2011	GS 2011	014	S 2014	ELS 2014	4						
			Demographic characteristics				Household characteristics				Socio-economic characteristics					
CH002L2	Genève (not transnational) - CH	570 222	27.85	29.41	26.62	16.12	38.61	2.3	38.5	20	9.6	8.6	23.68	2.12	42.72	
FR048L2	Annecy - FR	276 793	30.22	27.15	25.91	16.72	43.3	2.3	33.8	61.3	9	15.9	22.32	1.39	37.97	
FR039L1	Avignon - FR	320 670	30.12	24.21	26.73	18.94	44.25	2.3	32.4	55.5	16.8	10.4	27.15	1.5	29.63	
ES001L3	Madrid - ES	6 643 994	25.32	31.81	26.35	16.52	35.26	2.7	25.4	77	21.9	7.1	27.98	1.68	41.36	
ES002L2	Barcelona - ES	4 913 865	24.76	30.74	26.2	18.3	34.09	2.6	25.7	74.1	18	12.5	30.22	2.23	37.46	
ES010L2	Palma de Mallorca - ES	670 128	25.8	32.64	26.27	15.29	41.23	2.7	26.3	72.1	18.8	5.4	33.5	2.12	29.78	
FR001L1	Paris - FR	11 926 122	32.45	29.19	24.56	13.81	36.95	2.3	35.7	47.7	12.4	7.9	23.08	2.03	42.37	
PL001L2	Warszawa - PL	3 100 844	25.14	32.85	25.46	16.55	30	3.01*A	21.7*A	71.9*A	11.4**A	17.1**AB	NA	NA	NA	
PL002L2	Lodz - PL	923 985	22.22	30.01	28.67	19.1	26.1	2.85*A	23.9*A	68.1*A	12.2**A	27.5**AB	NA	NA	NA	
PL003L2	Krakow - PL	1 395 838	26.09	32.56	25.55	15.8	26.3	3.3*A	19.3*A	83*A	9.7**A	22.9**AB	NA	NA	NA	
ESPON Area min		55 517	17.44	20.09	20.98	9.32	15.17	1.7	15	19	1.1	2.5	12.98	0.13	11.64	
ESPON Area 1st quartile		141 027	24.05	24.98	26.23	16.02	28.1	2.1	27.7	53.75	5.8	10.1	21.6	0.95	23.04	
ESPON Area median		235 323	26.17	27.09	27.66	18.3	40.12	2.3	32.2	64.1	9.65	13.65	24.3	1.2	28.68	
ESPON Area average		492 655	26.47	27.42	27.62	18.49	36.65	2.31	32.53	63.21	11.47	15.16	25.53	1.3	28.99	
ESPON Area 3rd quartile		434 256	28.98	29.99	28.97	20.73	44.29	2.5	37.7	73.62	15.6	18.8	28.42	1.53	34.13	
ESPON Area maximum		12 250 037	39.62	39.35	34.45	30.37	50.53	3.6	50.3	95	45.8	53.5	49.3	5.3	56.98	
data completeness (%)		100	99.71	99.71	99.71	99.71	68.73	82.89	82.74	70.21	81.71	59.29	58.55	58.55	70.5	
*	data from National Census, 2011			Case-study between the minimum and the 1st quartile of the ESPON Area FUAs												
*	data from Central Statistic Office, 2014			Case-study between the 1st quartile and the median of the ESPON Area FUAs												
A	data for poviats			Case-study between the median and the 3rd quartile of the ESPON Area FUAs												
B	Share of employment in industry and con			Case-study between the 3rd quartile and the maximum of the ESPON Area FUAs												

With respectively: **POP_2015**: Total population, around 2015 / **POP024_2015**: Share of population aged 0-24 years (%), around 2015 / **POP2544_2015**: Share of population aged 25-44 years (%), around 2015 / **POP4564_2015**: Share of population aged 45-64 years (%), around 2015 / **POP65_2015**: Share of population aged above 65 years (%), around 2015 / **HOUSEHOLD_AREA_2011**: Share of single households (%), around 2011 / **HOUSEHOLD_SIZE_2011**: Average persons per household, around 2011 / **HOUSEHOLD_SINGLE_2011**: Share of 1-person household, around 2011 / **OWNED_DWELLINGS_2011**: Share of owned dwellings (%), around 2011 / **UNEMP_2014**: Unemployment rate (%), around 2014 / **EMP_IND_2014**: Share of employment in industry (%), around 2014 / **EMP_HOTELS_2014**: Share of employment in restauration, hotels and transports (%), around 2014 / **EMP_RESTATE_2014**: Share of employment in real estate activities (%), around 2014 / **WF_HIGH_EDU_2011**: Proportion of population aged 25-64 years qualified at level 5 to 8 ISCED, around 2011

Origin of the data: Eurostat, Polish National Statistical Institute, 2019.

Table 3-4 - Socio-economic characteristics of case-studies as regards to the other core cities of the ESPON Area

Core cities	Name	POP_2015	POP024_2015	POP2544_2015	POP4564_2015	POP65_2015	HOUSEHOL_D_AREA_2011	HOUSEHOL_D_SIZE_2011	SINGLE_H_OUSEHOLD_2011	OWNED_D_WELLINGS_2011	UNEMP_2014	EMP_INDS_2014	EMP_REST_2014	EMP_HOTE_LS_2014	ST_HIGH_EDU_2011	WF_HIGH_EDU_2011	NIGHTS_2011	BEDS_2011	HOUSING_EASY_2015	HOUSING_DIFFICULT_2015
		Population	Demographic characteristics				Household characteristics				Socio-economic characteristics						Tourism characteristics		Well-being (housing)	
CH002C1	Genève - CH	191 557	23.73	34.33	25.65	16.29	37.37	2	50.8	6.1	11	3.3	3.2	20.83	114	46.7	10.4	53.7	1	71
FR047C2	Annemasse - FR	88 276	30.47	32.57	23.39	13.57	42.34	2.1	39.4	49.8	16	11.9	1.75	30.9	5	31	5.5	28.1	NA	NA
FR048C1	Annecy - FR	146 154	29.59	27.75	24.57	18.09	42.53	2.1	40.1	54.1	10.1	13.7	1.55	22.57	51	40.4	7	44.6	NA	NA
ES001C1	Madrid - ES	3 141 991	22.52	30.36	26.63	20.49	33.47	2.5	30.6	73.2	16.2	3.8	1.79	24.3	69	48.6	5.5	27.6	12	19
ES002C1	Barcelona - ES	1 604 555	21.31	31.18	25.89	21.62	33.96	2.4	31.3	64	13.5	4.9	2.58	28	112	49.1	10.3	44.1	6	24
ES010C1	Palma de Mallorca - ES	400 578	25.49	33.61	25.66	15.24	38.34	2.7	26.4	69.5	20.9	4.6	2.07	32.29	53	30.8	20.8	108.4	NA	NA
FR001C1	Paris - FR	2 220 445	27.68	32.79	23.78	15.75	34.66	1.9	51	33.1	11.8	4.2	2.83	21.49	144	58.3	17.6	77.2	1	68
FR039C2	Avignon - FR	180 619	30.66	24.02	26.11	19.21	43.7	2.2	36.1	50.8	19.1	7.8	1.84	27.99	54	31.2	10	80	NA	NA
PL001C1	Warszawa - PL	1 735 442	22.33	33.75	25.3	18.62	29.4	2.2	37.1	37.9*	3.7**	9.1	3.04	24.93	202	45.5	2.4	14	3	27
PL002C1	Lodz - PL	706 004	21.09	29.96	28.93	20.02	25.4	2.2	33.6	37.2*	11**	22.9	2	21.7	148	28.2	0.9	7.4	NA	NA
PL003C1	Krakow - PL	761 873	23.31	33.63	25.46	17.59	25.2	2.3	35.1	54.9*	4.8**	15.1	1.57	23.63	270	39.3	4.5	35.8	5	17
ESPON Area min		9 081	17.01	20.3	15.31	5.8	15.2	1.5	10.4	4.8	1	0.7	0	7.87	0	8.5	0.0	0.0	0	4
ESPON Area 1st quartile		82533.75	23.78	25.65	25.16	15.32	28.45	2.1	26.2	47	5.9	7	1.01	21.31	23	25.8	1.1	10.3	2	16.75
ESPON Area median		125 744	26.42	28.1	26.86	17.71	38.13	2.3	31.7	62.4	9.2	10.9	1.37	24.97	59	32	2.2	18.2	5	22
ESPON Area average		205122.8	27.03	28.43	26.69	17.85	35.48	2.31	33.16	58.68	11.71	12.9	1.47	26.31	76.14	33.35	4.2	37.5	7.17	28.07
ESPON Area 3rd quartile		215678.25	30.16	30.61	28.38	20.33	42.51	2.5	39.3	71.5	16.25	16.02	1.77	30.26	107	39	4.1	31.7	10.5	35.5
ESPON Area maximum		3 469 849	40.94	45.2	32.85	31.07	50.22	3.4	67.7	91.1	46.7	61.1	5.59	54.82	579	82.4	188.7	874.5	27	77
data completeness (%)		100	100	100	100	100	67.84	93.88	93.98	74.38	85.79	79.67	79.98	80.08	86.72	89.11	76.0	75.9	9.44	9.54

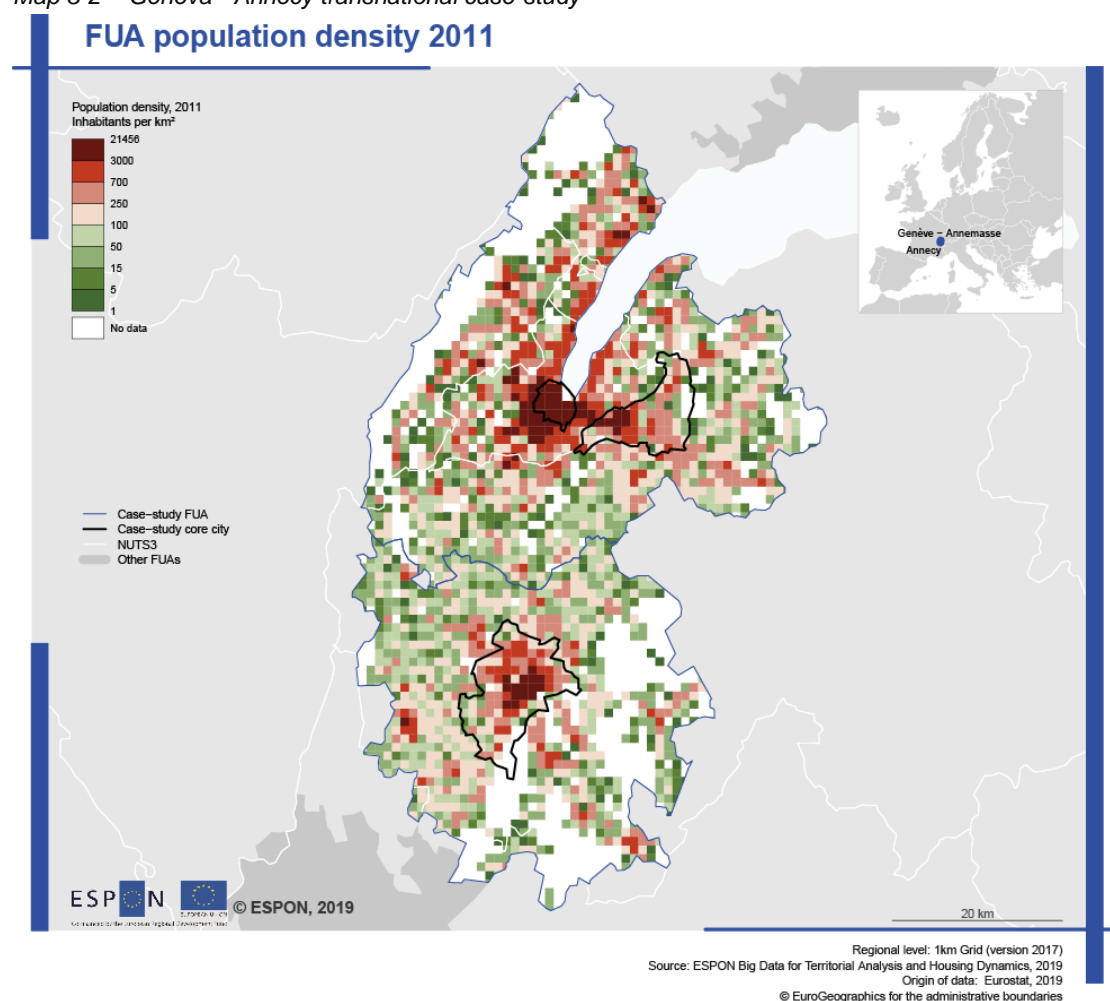
With respectively: **POP_2015**: Total population, around 2015 / **POP024_2015**: Share of population aged 0-24 years (%), around 2015 / **POP2544_2015**: Share of population aged 25-44 years (%), around 2015 / **POP4564_2015**: Share of population aged 45-64 years (%), around 2015 / **POP65_2015**: Share of population aged above 65 years (%), around 2015 / **HOUSEHOLD_AREA_2011**: Share of single households (%), around 2011 / **HOUSEHOLD_SIZE_2011**: Average persons per household, around 2011 / **HOUSEHOLD_SINGLE_2011**: Share of 1-person household, around 2011 / **OWNED_DWELLINGS_2011**: Share of owned dwellings (%), around 2011 / **UNEMP_2014**: Unemployment rate (%), around 2014 / **EMP_INDS_2014**: Share of employment in industry (%), around 2014 / **EMP_RESTATE_2014**: Share of employment in real estate activities (%), around 2014 / **EMP_HOTELS_2014**: Share of employment in restauration, hotels and transports (%), around 2014 / **ST_HIGH_EDU_2011**: Share of students in higher education (ISCED 5-6) (per 1000 persons), around 2011 / **WF_HIGH_EDU_2011**: Proportion of population aged 25-64 years qualified at level 5 to 8 ISCED, around 2011 / **NIGHTS_2011**: Total nights spent in tourist accommodation establishments per resident population, around 2011 / **BEDS_2011**: Number of available beds per 1000 residents, around 2011 / **HOUSING_EASY_2015**: Share of persons answering "Strongly agree" to the question of the Urban Audit : is it easy to find good housing in your city ? 2015 Survey / **HOUSING_DIFFICULT_2015**: Share of persons answering "Strongly disagree" to the question of the Urban Audit : is it easy to find good housing in your city ? 2015 Survey.

Origin of the data: Eurostat, 2019, Polish National Statistical Institute, 2019.

3.4.2 Geneva transnational functional urban area

Geneva FUA area is part of the 'Leman metropolitan territory' (métropole lémanique), a territory mixing municipalities from two cantons (Geneva and Vaud), which has ranked the most dynamic area in economic and demographic terms in Switzerland these last years. The Geneva FUA population, above the threshold of half a million inhabitants in 2016 (579 227: Eurostat), represents up to 7% of the Swiss population, not counting the transnational French part of Geneva¹². 40% of all Geneva canton residents (489.5 thousands) is of foreign nationality (OFS, 2018). Geneva is geographically very closed to several French medium-sized cities: Annemasse (88 000 inhabitants, 10 km by road) and Annecy (146 000 inhabitants, 42 km from Geneva center).

Map 3-2 – Geneva - Annecy transnational case-study



With a total active population of 252 947 (5.8% of Swiss rate) (Eurostat), the city hosts an International Financial and Trade Center and many international organisations headquarters: employment is highly specialised in the higher service sector in Geneva (83% of total employment), characterised by high income (median income above 6000 euros by month for

¹² If we add the transnational LUZ area, the population makes 874'581 residents in 2015 (Eurostat).

the Lemanic area (cantons of Geneva, Vaud and Valais) in 2014 (OFS, 2018). Unemployment, around 5%, is relatively low as compared to other European cities. It is however above the national average (3-3.5%).

Housing prices in Geneva are among the highest in Switzerland. The housing market in Switzerland is mostly structured as a rental market, since Switzerland has one of the world's lowest rate of home-ownership (43.8% in 2016). This phenomenon is even more striking in urban centers, such as in Geneva where 91.4% of the population rent its household in 2016. Moreover, the vacancy rate of 0.5% and high rental prices in Geneva core city (19 euros per square meter in 2018 – Statistique du canton de Genève) reflects the existence of a pressurised housing market in this specific area.

Apartments average prices in the Geneva commune have grown from 1.407 million Francs Suisses in 2010 to 1.446 million FS (1,28 million euros) in 2017. High property prices however slightly decreased, the cantonal mean price for a villa have decrease from 2.487 million Francs Suisses to 2.045 million (1,77 million Euros) in 2017.

The housing market of Geneva is structured as a cross-border market, where commuters and employment market spreads across the Annemasse-Annecy urban areas. As economically attractive cities, cross-borders commuting from France to Switzerland is high: in 2015 the share of cross-border employment corresponds to 44.5 % of the total in the Genevois Français employment area (INSEE, 2019). The cross-border commuting is moreover growing in this area: 318 000 French commuters working in Geneva canton in 2010, 341 900 in 2015.

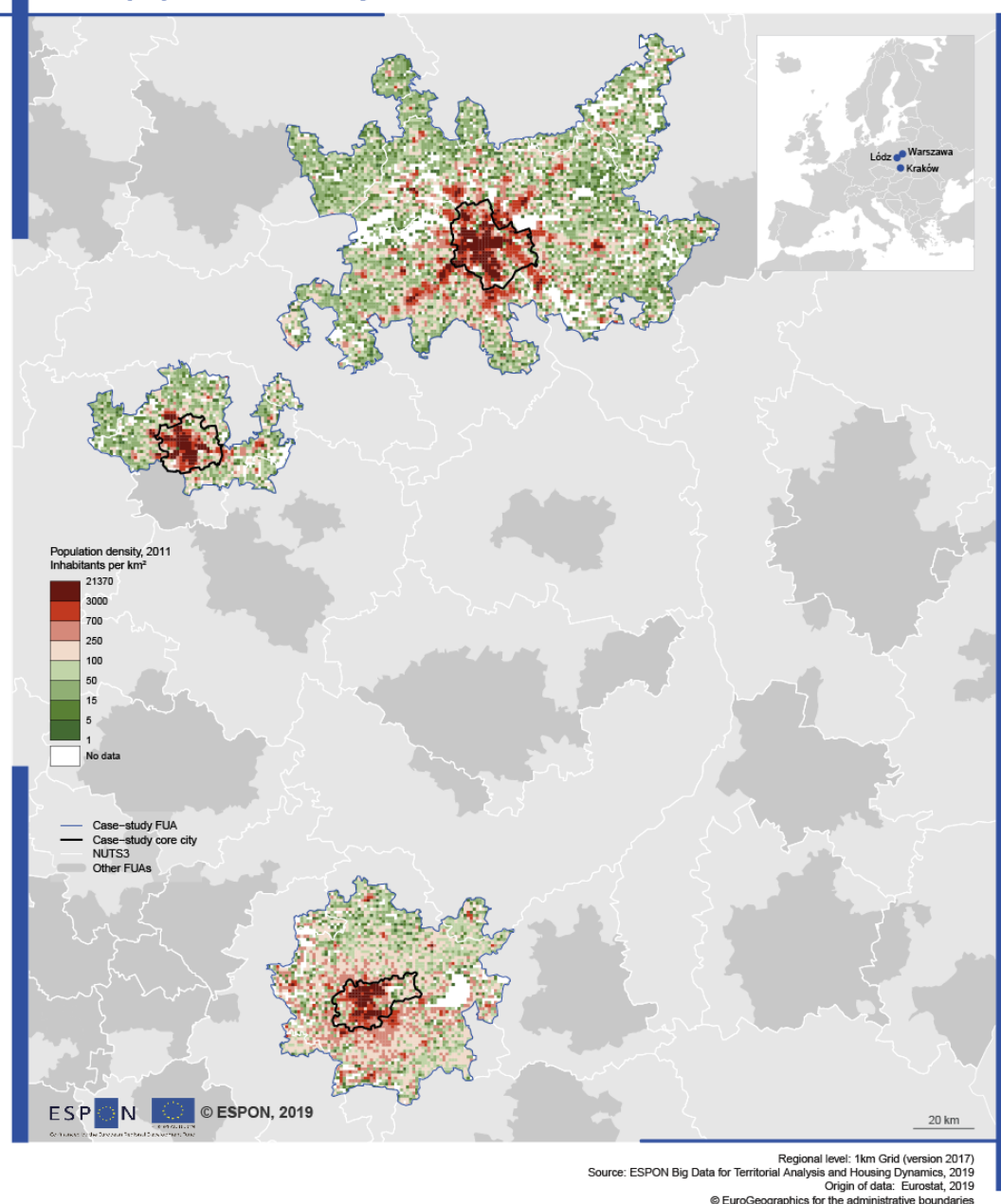
From the other side of the border, the “border effect” has been these last years increasingly structured by Swiss citizens moving to French neighbouring communes to reside, where both housing rent and ownership are cheaper. This has in the same time contributed to boost the construction sector in the Annemasse area and Annecy FUA. Reversely, the Geneva cantonal and communal authorities have been quite slow to react by supporting the construction of new housing. In 2017, only 451 new housing units (both villas and flats) came on the market in the canton of Geneva

3.4.3 Warsaw – Krakow – Lodz (Poland)

The case cities (FUAs) from Poland very well reflect divergent paths of demographic and economic development in the last three decades, and thus different housing demand-and-supply contexts. Put differently, our cases cover three distinctive examples of the problem of housing availability. The differences in the economic performance of these cities is well reflected by the differences in average incomes: the salaries are significantly lower in Lodz (the average salary of 4230 PLN in 2016) comparing to 5740 PLN in Warsaw or 4630 PLN in Cracow.

With the national capital, **Warsaw**, as the primary center, the Warszawski region stands for the largest labor market and the largest real estate market, in Poland. Its economy is

FUA population density 2011



diversified and growing up, and the region has been concentrating the majority of foreign direct investments since the mid-1990s. The unemployment rate in Warsaw (3,7%) is among the lowest in Poland. Also the share of university graduates (45,5%) is very high comparing to the other major cities in Poland. Warsaw's population has been growing since the downfall of socialism; nonetheless, the city's population has been ageing. Finally, single family households constitute nearly 30% of the total number of households. Unlike the majority of large cities in Poland, Warsaw's population has been growing since the downfall of socialism: the region is an interesting example of the variegated dynamics (growth and shrinkage) observed in post-socialist urban contexts in Europe. The capital city and its region that have grown demographically since 1990. Salaries are the highest there and the region (especially)

its core city belongs to most expensive and rapidly developing housing markets in Poland. This case allows to investigate the issue of housing affordability in the context of population growth and strong economic development.

The **krakowski** region represents a strong second-tier functional urban area. Cracow, currently the second largest city in Poland, can be dubbed as a 'winner' in the post-socialist transition. With its well preserved medieval city centre, Cracow is also a significant tourist destination. The economy has diversified and developed for the last two decades. The development of the IT sector has been especially prominent in the last decade, the same applies to the tourist sector. The latter is very important for the city's economy. Accordingly, the unemployment rate in Cracow is below 5%. Comparing to the other two case cities, Cracow has the youngest population, and it is generally of higher social status (nearly 40% of residents completed higher education). To sum up, housing is expensive there, economy is strong, and the core city (Cracow) is one of the main touristic destinations in Poland. This case allows to study housing affordability in a regional (NUTS2) capital with favorable demographics, fast economic growth, and pressures on the housing market stemming from touristification.

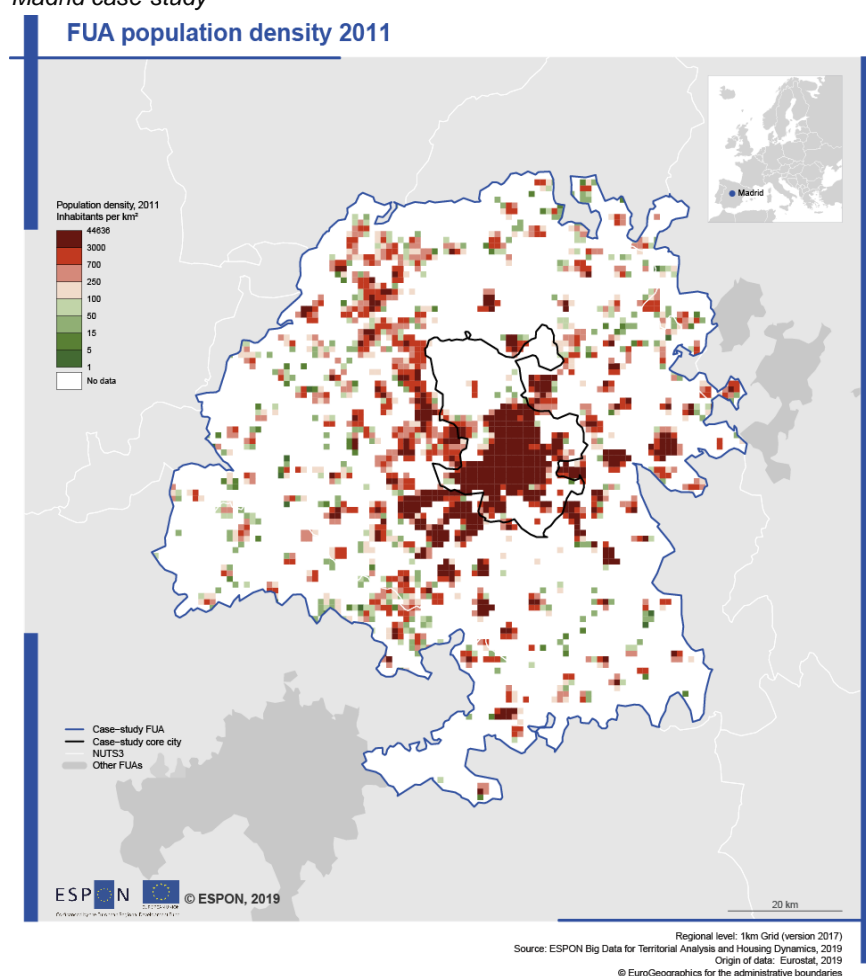
Indeed, compared to Warsaw, the **łódzki** FUA can be coined as a 'loser' (shrinking city) in the systemic transition. The now third largest city in Poland, a former mill-town almost solely relying on the textile industry, has been hit hard in the 1990s, and Łódź became one of the fastest shrinking city in Poland. The city lost more than 100 000 inhabitants after the collapse of socialism. Moreover, irrespective of rapid and significant suburbanisation in the 2000s, also the suburbs are shrinking. Lodz's population is also ageing, and one-fifth of residents are older than 65 years. Interestingly, although the population of Lodz and its region has been declining for the last 25 years, the economy has been developing relatively fast for the last decade; yet slower than the other major cities in Poland. Contrary to Cracow and Warsaw, the industry still plays an important role in the city's economic base (employment in this sector is exceeding 20%). The unemployment rate is relatively high (11%) – actually it is twice as high as in Cracow, and nearly three times higher than in Warsaw. This case allows to analyse housing affordability in the context of population decline and slow economic growth.

3.4.4 Madrid – Barcelona – Palma de Mallorca (Spain)

Madrid, the capital of Spain, is the first city of the homonym autonomic region. The municipality covers an area of 605 km² and has more than 3.1 million inhabitants. Madrid registers 1.5 million housing units, 153 000 (10%) of these being empty, as a syndrome of the housing crisis the province has gone through. The province of Madrid annual GDP is 27 700 000 thousands of euros. The city is experiencing a period of urban renewal of some districts. These zones where typically multicultural and immigrant neighbourhoods, often expression of social hardship and exclusion, and are now transformed to popular night life

destinations. In the recent years, local residents are suffering a strong increase in house prices due to the raising amount of entertainment sector activities located there like bars, pubs and clubs. As a consequence, they are incentivised to move towards more peripheral areas of the city, giving rise to a process of gentrification, as for example in Lavapiés and Malasaña, which are now the centers of the "Movida". The local administration is planning to implement a special measure to contain the AirBnb phenomenon by imposing an upper limit of ninety days to the renting period of touristic apartments in the city. Madrid looks differently depending on whether we look at its city center, or at its outer peripheries influence area. Referring to generational composition, it is only similar to Palma when looking at it at the FUA level and it is similar to Barcelona in the core city. Middle-aged (25-65) people account for 58.2%, 25.3% of persons younger than 24 and 16.5% of persons older than 65. At the city center instead, people older than 65 are more abundant (20.5%), while younger people are more scarce (22.5%). A similar age structure has only been observed in Lodz (Poland). This is due to the older nature of the buildings in the center and also to a strong price increase in the area occurred in the last decades. Moreover, Madrid has seven public universities, all of these campuses are placed out of the city center, i.e. Alcalá, Leganés, Getafe and the northwestern urban area, pushing students to live in the peripheral and more economically accessible areas.

Map 3-4 – Madrid case-study



Dwellings average surface is 35.3 m² per person in the FUA, against only 33.5 square meters per person in the core city. The average number of people per households is 2.7 at the FUA and 2.5 in the Core. This may be explained by the older composition of people living in the city center, while families and students are staying more in the periphery. Actually, the share of single households is lower in the FUA area (25.4%) and higher in the city center (30.6%). The share of owner-occupied dwellings is 77% in FUA and 73.2% in the city center, the highest percentage among the cities considered. The share of people answering "Strongly agree" to the question of the Urban Audit: "is it easy to find good housing in your city?" is 12% against a 19% of people answering "Strongly disagree". Here, like in Barcelona, it seems that the increase of house prices prevented younger generations, students and families with children, from accessing the central households.

The unemployment rate tops at 21.9% in the FUA peripheral area, the highest record among our case-studies, while it decreases considerably to 16.2% in the core city. The percentage of workers employed in the industrial sector, as expected, is higher in the FUA than in the core city (7.1% versus 3.8%). Those employed in the hotel, restaurant and transport industries account for the 28% in the influence area, against only 24.3% in the core city. The real estate sector employs 1.68% in the FUA peripheral area, against 1.79% in the city center. The city is characterised by a highest level of qualification compared to Palma and Barcelona: 41.4% of the population aged 25-64 years is qualified at ISCED (International Standard Classification of Education index created by UNESCO to rank the various educational degrees in the world) level 5 to 8 in the FUA; and 48.6% in the core city.

Compared to other cities in case studies, tourism in Madrid is structured by short stays and weekends. The total nights spent in tourist accommodation per resident population is 5.5, while the number of available beds per 1000 residents is 27.6, almost the same as in Annemasse (France).

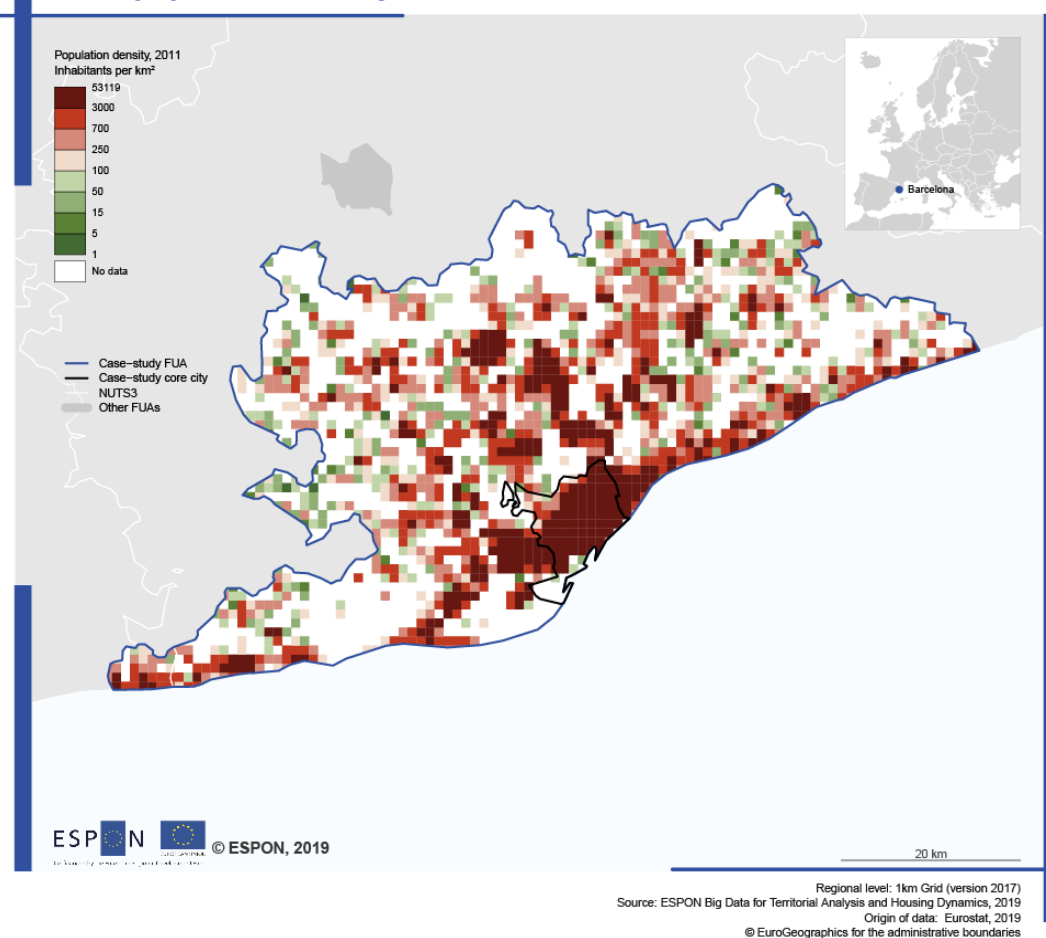
Barcelona is the second city of Spain by population and the first of Catalonia. The municipality covers an area of 101.4 km² with 1.6 million inhabitants. Barcelona registers 811 000 housing units, among which 88 000 (10.9%) are empty. The city is experiencing a process of mass-touristification, especially transforming some popular neighbourhoods in the city center. This is pushing local residents outwards, especially in peripheral districts, because of housing price increase and the other local effects of touristification. The local administration has implemented a special measure to limit the development of new touristic apartments by requiring a special license to be obtained by household owners in order to rent in AirBnb and other online platforms.

Barcelona generational distribution is very similar to the one observed in Warsaw at the FUA, with a lesser part aged between 45-64 (26.2%) and a higher proportion of persons aged 25-44 (30.7%). At the core city level, the situation is similar with the situation in Madrid: people living in Barcelona center is older than its peripheral areas. More than 64 years old. account

for 21%, way over the average situations, and only 21% of the population is younger than 24. It seems that in Madrid and Barcelona a strong increase in the house price have prevented younger generations, students and families with children, from accessing the central households.

The average household area is 34 m² per person, while the average number of people living in households is 2.6 at FUA level versus 2.4 within the core city. Consistent with touristification and short term rental pressure, the density of permanently occupied dwelling is higher in peripheral areas than within the core city. At the FUA level, data show that Barcelona share the same trends as Madrid does, regarding single-person households: only 25.7% live alone in the overall FUA area. Also, people living in owner-occupied structures are still a lot, 74.1%, as a signature of the preeminence of the traditional ownership model for families. Within downtown Barcelona, shares of ownership and people living alone are within the average profile of other European core cities. We observe less people living in owned dwellings are more people living alone, sign that younger inhabitants and singles are more likely to be found within the city, probably students or workers living in single rented flats, coops and apartment sharing (roommates). The share of people answering "Strongly agree" to the question of the Urban Audit: "is it easy to find good housing in your city?" is 6% against a 24% of answering "Strongly disagree".

FUA population density 2011



The unemployment rate is significantly higher in the FUA area, 18%, than in the core city, 13.5%, illustrating a big gap between the city and its neighbouring areas, at least in terms of job opportunities. The composition of the work force is pretty singular in Barcelona: data show an average share of industrial workers (12.5%) but higher shares of workers in the tourism and real estate sectors (30.2% and 2.2%). Hence Barcelona has developed a functional touristic sector together with a prosperous real estate market, without a decline of productive and manufacturing industries, as it has occurred in Mallorca. Of course, things are different at the core city level, where industry employed workers are only the 5%, similar to Palma and Paris, sign of a peripheral displacement of manufacturing areas. The proportion of population aged 25-64 years qualified at ISCED level 5 to 8 in the FUA area is 37%, like Annecy. At the core city level, it tops at 49%, sign of a more qualified work force living in the city center, more dedicated to the tertiary sector.

Regarding tourism indicators, Barcelona ranks second between Palma and Madrid regarding the total nights, spent in tourist accommodation establishments per resident population with an average 10, while the number of available beds per 1000 residents is 44.1.

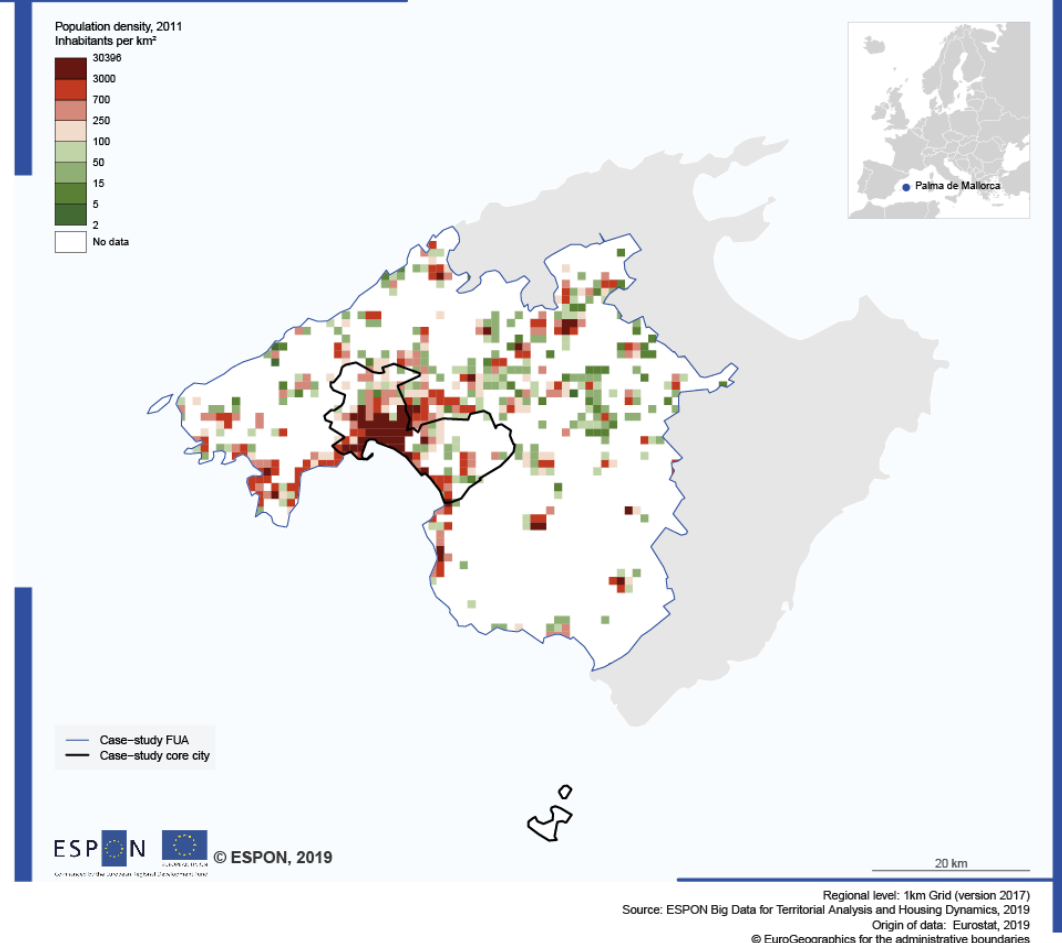
Palma de Mallorca, the capital of the Balearic Islands, hosts a total of 401,270 inhabitants in 209 km² within the limits of the municipality. Palma is located in the Island of Mallorca

(3,640.11 km² and 860,000 inhabitants), which forms together with Ibiza, Menorca and Formentera the Balearic Archipelago and the region of the Balearic Islands. 182,244 dwelling units are registered in Palma, 16,349 of which have been declared empty in the census of 2011 (9%). The autonomous region attracts every year an average of 12 million tourists, this industry being the major economic activity. The annual GDP of the Islands is 27,338,000 thousands euros, i.e. 24,750 euros per capita, which is significantly less than Barcelona and Madrid. The Balearic regional government has recently passed a law regulating the renting market. This has narrowed the conditions for residents to rent their private houses to tourists using online vacation services such as AirBnB, Homestay or Booking. In a nutshell, only isolated houses can be rented in all the territory to avoid disturbances to the immediate neighbours. Apartments or rooms in block buildings can be only rented in areas of the islands where the density of tourism does not threaten the access to the real estate market of the local population. In all the cases, the Balearic Government must grant a permission to the owner who wants to rent his/her property online. Nonetheless, the city of Palma is also suffering the raising of housing prices in specific districts, especially in the renting for residents.

The common wisdom represents Palma as a place for families and young people. At the FUA level, 32.64% of Palma residents are aged 25-44, 26.3% for 45-64, and 25.8% less than 24. Only 15.3% of the residents are older than 65. This trend seems idiosyncratic compared to other Spanish and European cities. The same scenario also applies at the core city level, so that data does not indicate discrepancies in age distribution between the city center and the peripheral and rural areas.

With regards to dwelling units and households, at the FUA level the average area per person is 41.2 m². In the core city of Palma instead, the average surface decays to 38.3 m² per person. The average number of people occupying the units in the FUA sums up at 2.7, the same as in the core city, which is higher than the average in Europe. The share of single households at both FUA and core city levels is only 26.3%, and the share of multiple owned dwellings is 72.1% in the FUA versus the 69.5% at the core city. Data show that 70% of people are living in owned properties, which is more or less the scenario we also observe in Barcelona. The percentage of people living in owner-occupied dwellings is high, with some of these apartments entering the rental market only in the summer season. Even if Palma is considered to be an international place, still many locals live in the city.

FUA population density 2011



The unemployment rate is relatively high both in the FUA (18.8%) and in the core city (20.9%). Even if some famous shoes and furniture brands and factories are native of the Islands, the manufacturing sector has almost disappeared. Indeed, only the 5.4% of workers are employed in manufacturing industries (FUA), 4.6% in the core city. The most important sector of the Island is tourism, and Palma stands as a unique example in our study, with 33.5% of workers employed in the hotel, restaurants and transport industry in the FUA area (32.3% at the core city). Notice that tourism is not at all limited to the inner city, as this might be the case in Paris or Barcelona. About 2% of workers are employed in the real estate sector. Palma is the only one among our cities to have this particular socio-professional structure, with few manufacturing workers and an overwhelming share of tourism employees. This depiction extends to the average low level of qualification of employees: the proportion of population aged 25-64 years qualified at ISCED¹³ level 5 to 8 stands at 29.8% in the FUA area, 30.8% in the core city, one of the lowest with Avignon, Lodz and Annemasse.

¹³ Higher levels of the International Standard Classification of Education, corresponding to post-secondary education. It is commonly understood as academic education but also includes advanced vocational or professional education. It comprises ISCED levels 5, 6, 7 and 8, which are labelled as short-cycle tertiary education, Bachelor's or equivalent level, Master's or equivalent level, and doctoral or equivalent level, respectively.

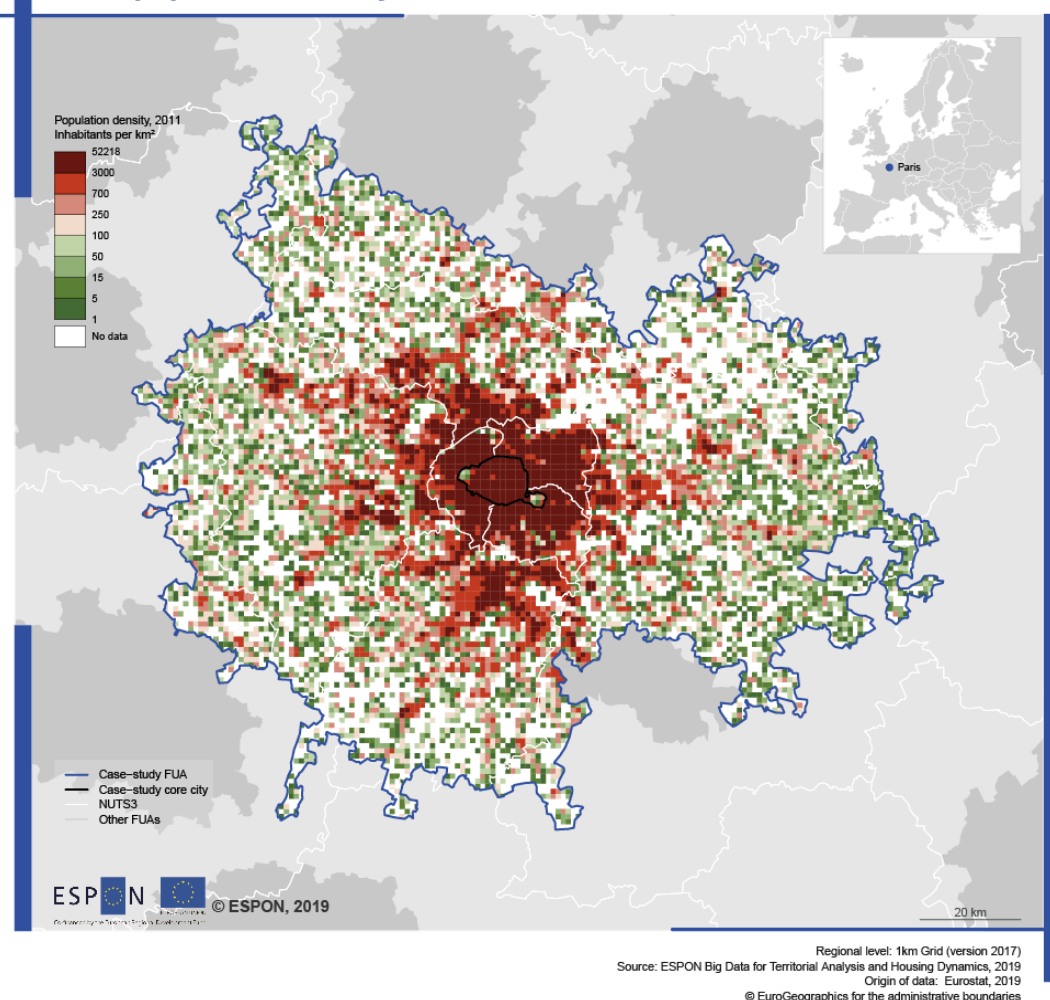
For tourism alone, in the core city, the number of available beds per 1000 inhabitants is of 108.4. This concurs with an active speculative activity that strongly undermines the apartment market, to the extremes of renting beds on balconies in summer (!), as reported by the local press in 2018. Nonetheless, tourists usually come in summertime and prefer long stays, the tourist pressure is preeminent: 20.8 is the total amount of nights spent in tourist accommodation establishments per resident population. These two variables are out of the standard compared to other cities, this can give an idea of the touristic pressure on the population during summer.

3.4.5 Paris – Avignon (France)

The **greater Paris region** (Ile-de-France) is an administrative region of 12.2 million inhabitants (19% of total population in metropolitan France). Housing has been characterised since the 1990s by continuous tensions on housing markets: small units (50 m² average for rental units) for the 5 million primary residencies, more than 545,000 secondary homes, 49.7% are occupied by renters, and 26.6% are single family homes. The price index has been multiplied by a factor two for apartments between 1997 and 2017; and by 3.5 for homes. Tensions on the market are not limited to the inner city of Paris; housing is mostly renter-occupied, with a shortage of affordable supply in the inner districts, while the 4 administrative districts (départements) of the outer-suburbs, Yvelines, Val-d'Oise, Seine-et-Marne, and Essonne, a sub-region of 5.4 million inhabitants in 2013, are structured by a mix of apartments and a majority of dwelling in single family home (51.6%), 60 % being owner-occupied dwellings.

As thoroughly discussed in current academic work, socioeconomic segregation and property housing markets in the Paris metropolitan region are structured as a bipolar divide, *i.e.* a class-based segregation between executives, managers and higher-order management neighbourhoods, and workers, *i.e.* the inertia of the 19e century divide (Clerval, 2016; Clerval and Delage, 2014; Le Goix *et al.*, 2019b; Préteceille, 2016). This bipolar divide has been however rearranged with the rise of employees (29.5% of the active population), intermediate occupations, the decline of blue collars (now 16.5%) and the restructuring of employment (part-time) and mass unemployment. The dynamics of the market are impacted by the lack of affordable and available units: 1 household out of 10 moves in or out each year, most of them within Paris or the inner suburbs: short range residential mobilities are preeminent. The weakness of the new structure buildings and cost have deterrent effects on households residential mobility.

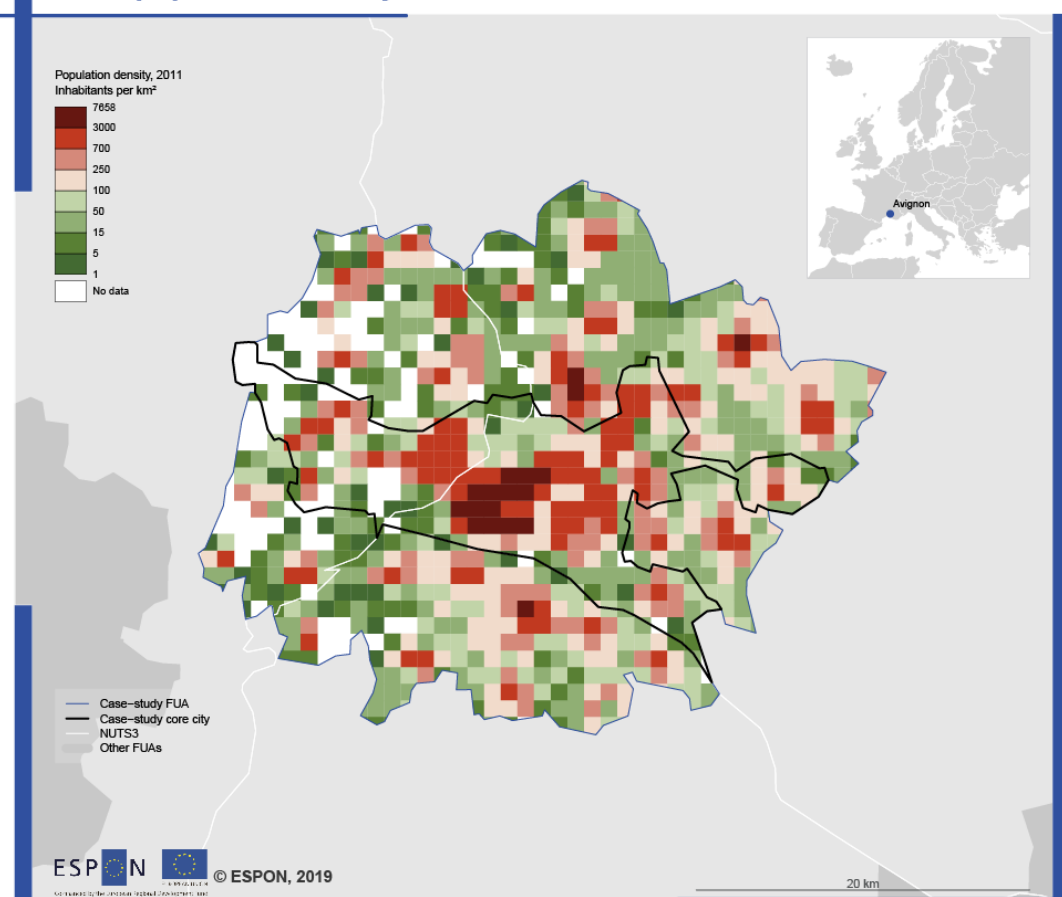
FUA population density 2011



Avignon belongs to the demographically growing regions of France. Its demographic increase is slightly superior to the national one but the population is clearly marked by a lower socio-economic status. Moreover, this urban area is also characterised by a deep socio-spatial segregation (for example, the suburbs are respectively among the lowest income decile and the richest one at a national scale). This clear socio-economic break feature enables further study of statistically robust representation of spatial discontinuities, which is a key issue for mapping real estate markets.

The FUA is highly polarised between some affluent suburban municipalities (the western municipalities of Villeneuve-lès-Avignon, Pujaut or Les Angles and the eastern municipalities of Châteauneuf-de-Gadagne, Velleron or Pernes-les-Fontaines) and a poor inner-city. This spatial pattern is supported by the proximity of highly valued touristic zones in the South-Eastern part of Avignon (Alpilles, Luberon, and L'Isle-sur-Sorgue).

FUA population density 2011



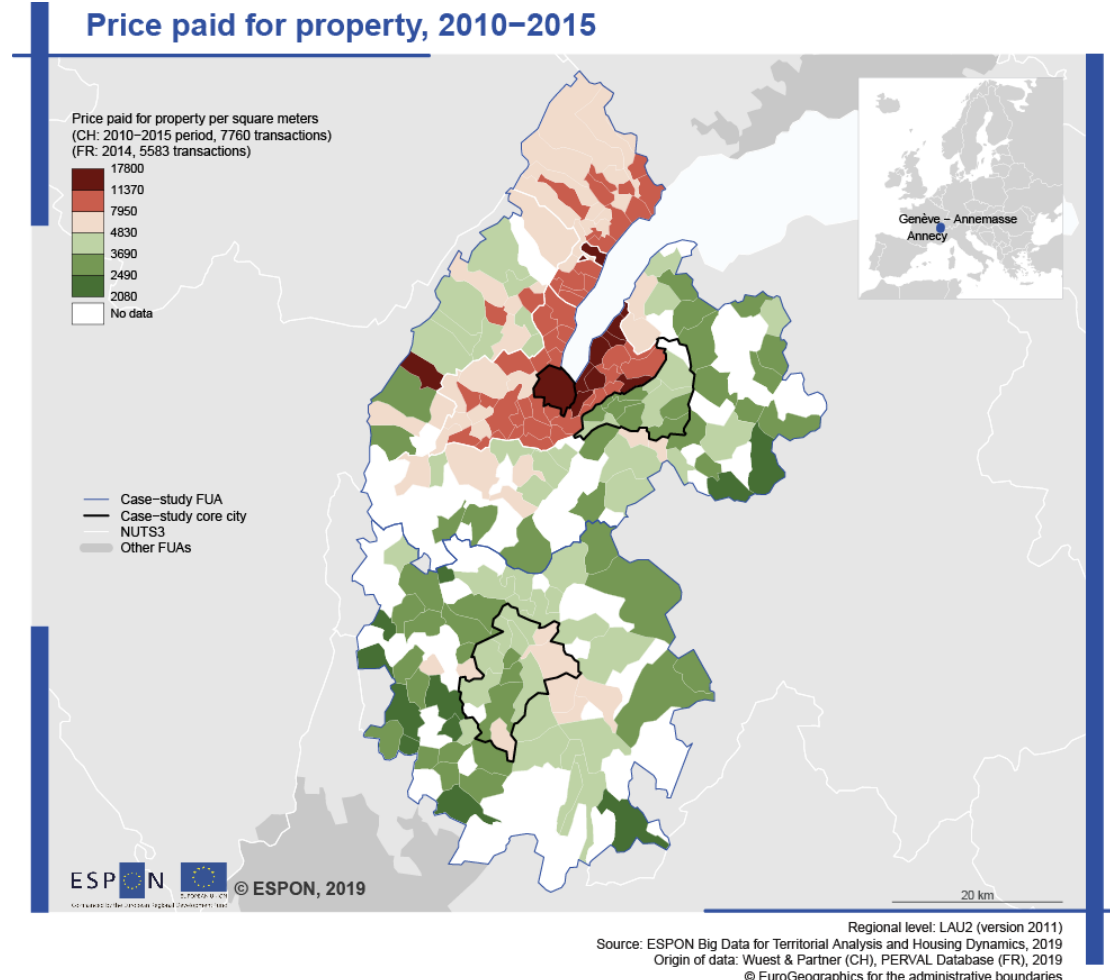
Regional level: 1km Grid (version 2017)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Eurostat, 2019
© EuroGeographics for the administrative boundaries

3.5 Harmonised indicators on housing dynamics

This section highlights the main results for each case-study, along with selected visualisation and maps. All maps produced for each case-study are annexed to this report (Appendices 5 to 9).

3.5.1 The Geneva - Annecy - Annemasse cross-border region.

Map 3-9 – Price paid for property, 2010-2015 (Geneva)



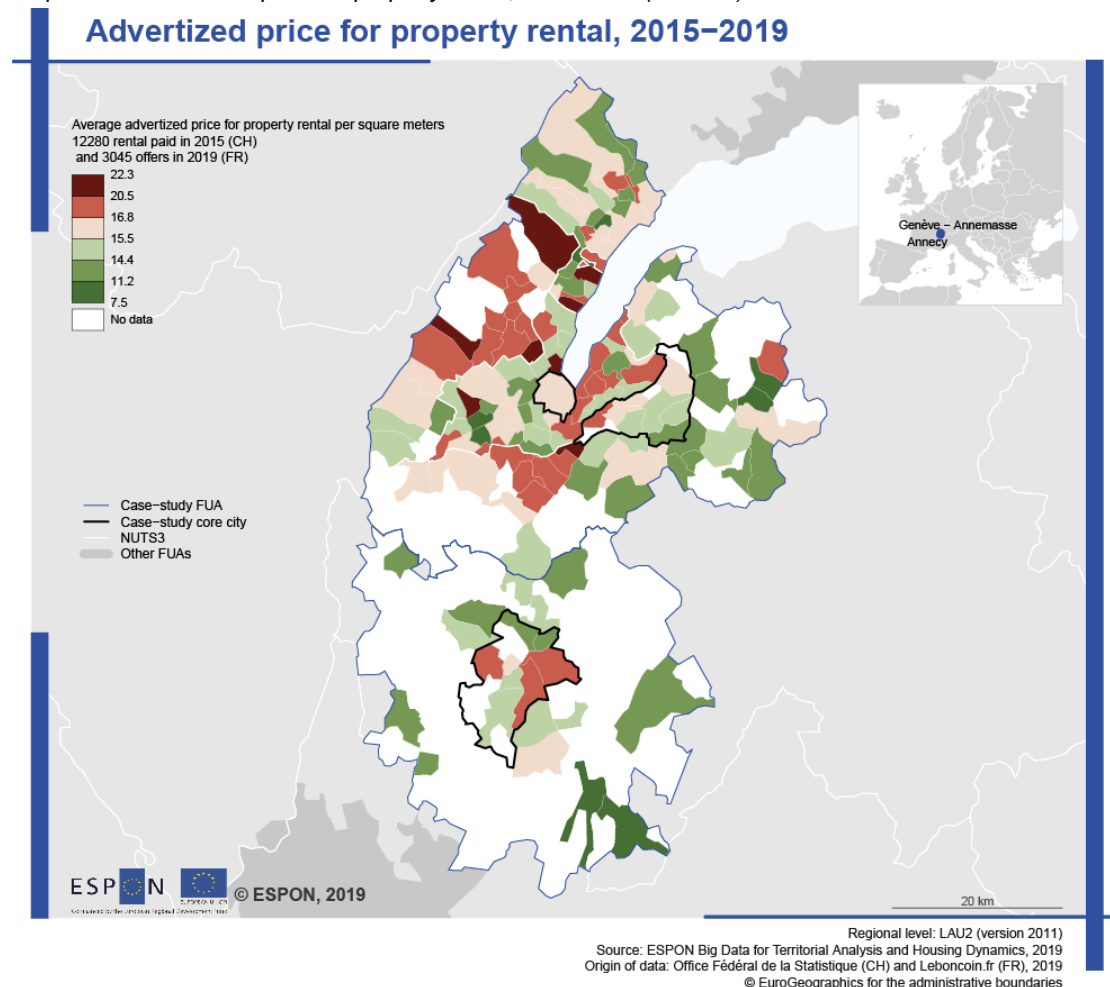
Generally speaking, the real-estate markets structures and dynamics of the international FUA Geneva-Annecy area are featured by respectively the “border effect” and the “centrality effect”. The border effect relates to institutional and socio-economic differences and inequalities between the two countries. At first look, high property prices (Map 3-9) would reflect the high level of average local income (cf. Map 0-32 in Annexes, 45 600 euros a year) in Switzerland. The centrality effect of Geneva is very strong. On the French side, Annecy stands as a secondary center in some extent since property prices are relatively high in comparison to the surrounding municipalities (Map 3-9: between 4 830 and 7 950 euros per square meters).

There is a clear differential gradient rent effect extending from the city center of Geneva to the surrounding Swiss and French townships. Despite some exceptions related to high income communes on the Léman South shore, such as Cologny, Collonge-Bellerive, Corsier or Anières, property prices decrease from the commune of Geneva to the peripheral communes while there is at the same time a clear gap between Switzerland and France. This gap (or discontinuity) between the two countries is even more striking, with a closer look at Annemasse and neighbouring French communes. In French communes located in the Southern and Western areas next to Geneva canton, prices are relatively higher than in the more peripheral French localities of the FUA. In Swiss communes however, property prices stand relatively high, whatever the distance to the center. Communes by the lake shores and located on the Geneva-Lausanne axis are mostly residential places, with a few exceptions like Nyon or Gland, where a significant share of the working population is employed in the Geneva canton/city. In terms of affordability, the centrality effect is also confirmed since property prices, both for Geneva and Annecy, decreases from the core city to the outskirts (cf in the annexes, Map 0-34 and Map 0-41).

From a general point of view, property prices in Geneva reflect the relatively high level of income in Switzerland and the strength of the local economy, as an international financial center, and advanced producer services and international organisations cluster. Moreover, property prices decrease with the distance from the center, with a strong border effect, while at the same time, hedonic prices would include, next to centrality, key features such as the proximity to the lake, the view (on the lake and on the mountains) and the level of local income in various communes.

The housing market of Geneva-Annecy FUA is also structured by a very segmented and heterogeneous rental market. Switzerland is a country of tenants, while the ownership rate is significantly higher in France (59.9% in Savoie). The central structure of Geneva does not clearly structure the spatial distribution of rent: the average rent in the city center of Geneva is below rental prices in the surrounding communes on the Swiss side (Map 3-10). Higher income communes located on the south coast of Lemman lake (Cologny, Collonge-Bellerive, etc.) show in contrast higher prices: these are the locations the least affordable (Annex Maps 0-42 and 0-43). Rentals are also more expensive in the French peripheral areas located on the Jura foothills (Pays de Gex: Divonne-les-Bains, Gex, Cessy, Sergy), and also on the Southern border, in the well connected, highly accessible, areas (highways) between France and Switzerland (St-Julien-en-Genevois). Rental prices in Annecy, by contrast, are more or less distributed according to the classical center-periphery gradient.

Map 3-10 – Advertised price for property rental, 2015-2019 (Geneva)



The results are counter-intuitive, as the tense situation of the rental market in Geneva city has often been commented over the last decade. However, a main explanation for relatively “low” rental prices in Switzerland is due to the institutional protection regarding tenants and rental prices evolution. The market of rental prices is highly regulated: the prices are based on the mortgage rate which has decreased during the last decade, and also on cost-of-living price index that refers to basic households expenses such as for food, leisure, clothing, etc. (*indice des prix à la consommation*). In this regard, rental prices can only modified by landlords to catch up with inflation on the local average market prices, when people move out and new tenants settle down. Thus, this system has so far protected long term tenants, whom are likely to benefit from relative low rental prices in comparison to market prices. The rental profitability map (Map 0-47) highlights this situation for Switzerland, and for Geneva in particular. The related regulation regarding the significance of rental housing in Switzerland is the main key to understand the relative low level of rental prices in Switzerland since other factors such as social housing policies and the emergence of cooperatives would not provide convincing explanations for the Geneva case. However, this would need a further and more detailed research focused on the sub-segments and local stratification of housing in the commune of Genève, and an understanding of local housing policies.

This difference in the ownership structure between the two countries is also well reflected in the difference of incomes. In terms of rental affordability, rental prices in Switzerland represent a relatively smaller share of the local income than in France (cf Map 0-44 and Map 0-45 in the annexes). The differences between local and national income, both for the rental and property markets, are weaker in Switzerland than in France. This relates to the economic and demographic weight of Geneva in Switzerland. As the second largest city in Switzerland, local incomes in Geneva city and canton are above the average or median national income while in Annecy and Haute-Savoie local incomes are slightly above the median national income.

3.5.2 Warsaw, Lodz, Krakow

Price, market structure and geography

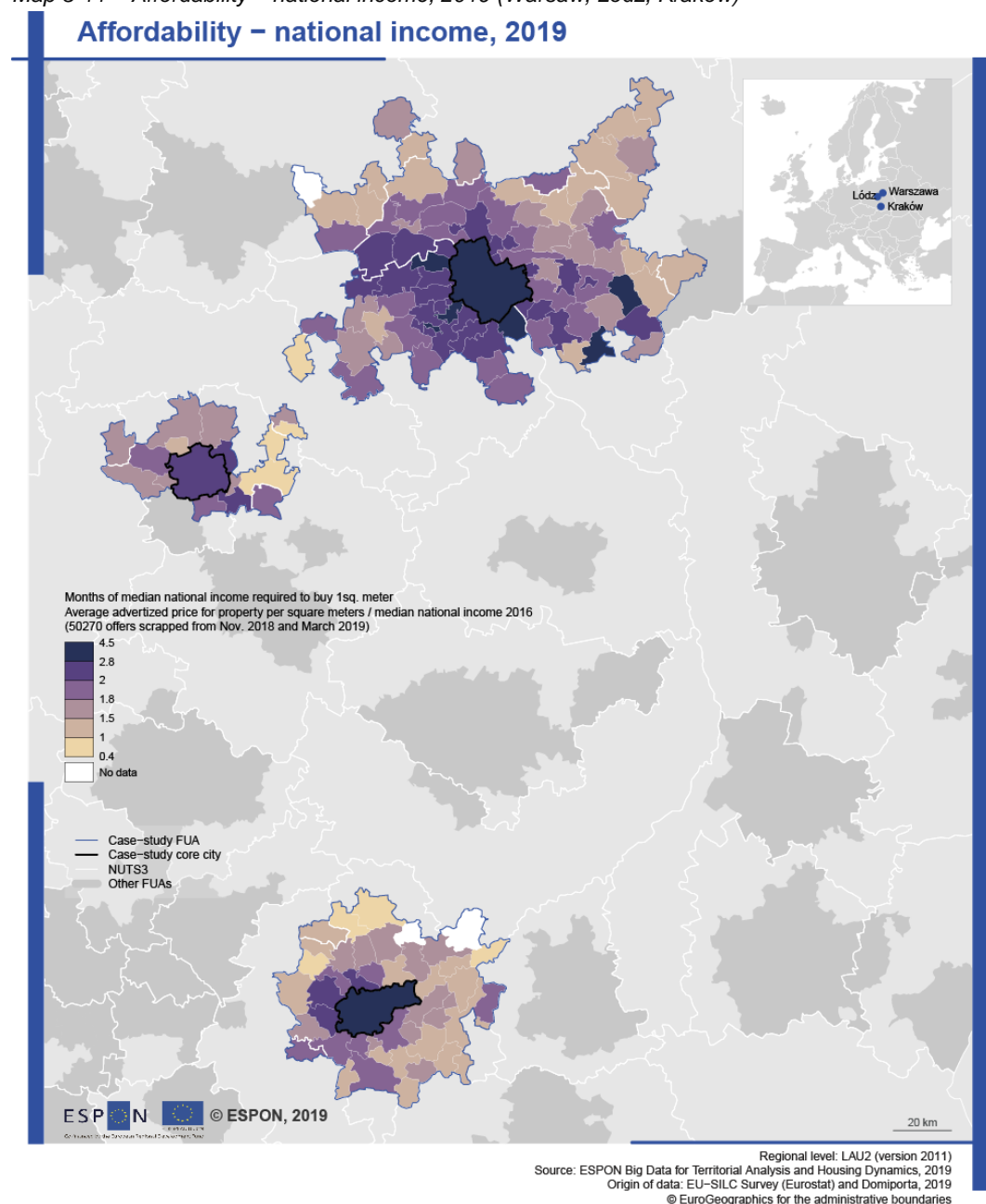
First, the structure of the housing market is characterised by the imbalance between rental and property markets: there are more apartments and houses for sale than for rent. This is especially evident in the suburban zones of the three FUAs. Moreover, the real estate market in Warsaw is definitely the most developed; we noted the lowest number of offers of both types in Lodz. Moreover, with the exception of a few municipalities in the Warsaw region, the rental market is virtually confined to the core cities. The density of rental and sale offers generally follows the spatial patterns of residential density. Concerning the price differences, they are the starkest between the core cities and suburbs, especially in Cracow and Warsaw. But in each region under study it is easy to distinguish municipalities (LAU2 areas) with expensive housing for sale. With the highest offered prices in the core city, the price gradient generally lowers with the distance; somewhat less so in Lodz. The finer spatial resolution of the grid sheds further light on the geography of price differences. Whereas housing from different price segments is scattered over Lodz, in the case of Warsaw and Cracow it is hard to deny that the most expensive housing is virtually confined the inner-cities; the outer zones, including large housing estates from the socialist era, and the closest suburbs also belong to the more expensive areas.

Affordability

The level of housing affordability generally reflects the geography of real estate offers, with lower availability in the municipalities with more expensive offered for sale and rental housing (Map 3-11). It is also important to mention that the housing on the rental market is largely more affordable than the units for sale. As to spatial inequalities in housing affordability, intriguingly, it is difficult to distinguish one common pattern for the three case cities/regions. Whereas in the Cracow region the lowest housing affordability (sales and rentals) characterises the core city, suburban locations seem to be the least affordable in Lodz and Warsaw. The low housing affordability of some suburban locations is even easier to detect in the rental markets' spatial structure (Map 3-12). As the effect of suburban locations appears

to be less clear when the median national income is used, we suspect that the lower housing affordability in some suburban

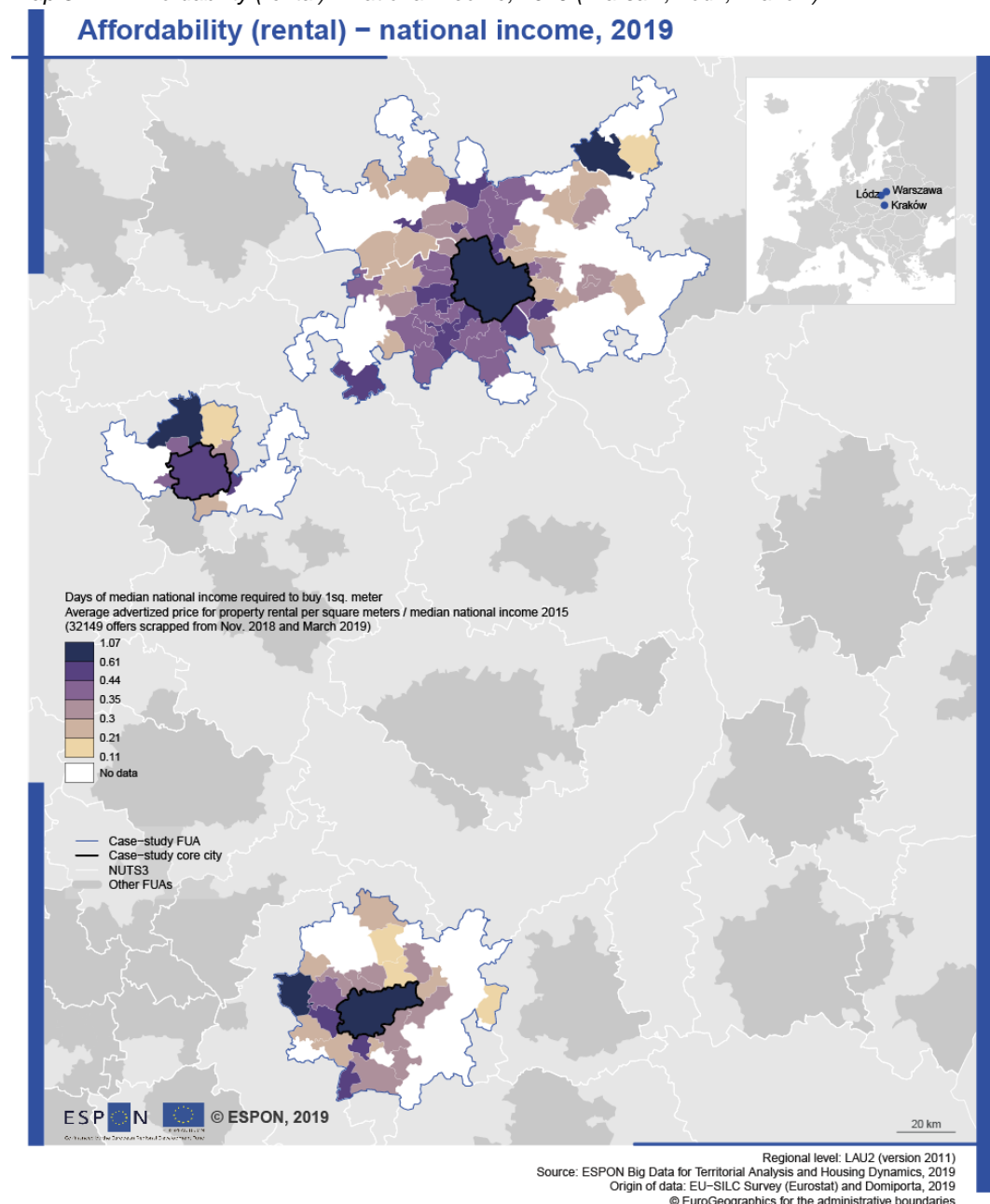
Map 3-11 – Affordability – national income, 2019 (Warsaw, Lodz, Krakow)



municipalities may be caused by the specific relationship between the relatively low incomes of the sitting population and the new wave of suburbanisation bringing new housing further away from the core city. Moreover, in most cases, it is single family housing that is offered for sale in the suburbs. As such offers include not only the price of the house but also the price of a parcel/plot, the might be simple higher than the prices of apartments; land itself is usually very expansive in attractive suburban locations. Nonetheless, compared to the median income in Poland, housing seems to be the least affordable in large cities, but there are exceptions to this trend. To conclude, being at the low level in the three core cites, the

patterns of housing affordability appear not to form any zones and/or sectors. The way spatial inequality in housing affordability manifests within the three functional urban areas rather approximate to a mosaic structure; but some clusters of high and low values could also be distinguished.

Map 3-12 – Affordability (rental) – national income, 2019 (Warsaw, Lodz, Krakow)



Limitations

- The data from scraping was collected for just a couple of months and it may not very well reflect the dynamics of the rental market.
- Concerning the apartment and houses for sale, offered prices are generally upward biased (there is a gap between the price offered and the price that was actually paid), and the magnitude of this gap may differ in particular cities.

3.5.3 Madrid – Barcelona – Palma de Mallorca

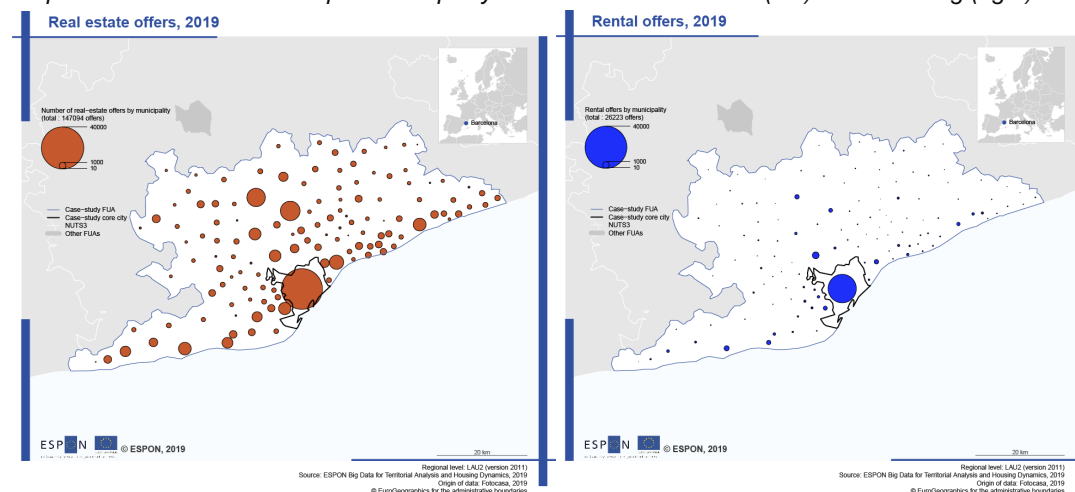
Barcelona FUA has been for years an area with an income over the national average, so housing prices have traditionally ranked higher in comparison to other Spanish cities. Real estate prices dramatically increased during the bubble of the decade of 2000s, with a mild decrease after 2009 crisis and a renewed expansion in the last seven years, especially focused on renting prices. The same price dynamics have been observed in the rest of FUA, with slight adjustment delays with respect to the core city trends. In general, housing in coastal municipalities is more expensive mainly in those located to the South of Barcelona as Viladecans, Gavà, Castelldefels, etc., as it is also the case for areas of the city close to the Tibidabo mountain (San Cugat), normally composed of single family houses, and that host a wealthier population.

The relation between house renting and buying as in the rest of Spain has been strongly influenced by the increased accessibility to mortgages. From the perspective of the local resident and given the low interest rates, the two options (buying and renting) are in a tight draw. With the renting market increasing prices, this may change in the near future.

Density of transactions

The purchase/selling offers concentrate similarly to the population in the core city, along the sea and in the cities at the other side of the Tibidabo mountain range (Sabadell and Terrassa) as can be seen in the Map 3-13. The rental market, on the other hand, concentrates in the city core and the contribution of the other municipalities is comparatively less important. The main advantage of our results is that they allow for a quantification of the offer in space and a direct comparison between different areas. The differences in terms of rental offer in space may be caused by the diversity in approach to the housing market across the FUA. While the market is rather international in the core city, including the presence of large hedge funds, it remains more local in the other municipalities, especially those in the interior. These are areas where the selling offers dominate over the renting ones showing a market structure where locals prefer buying over renting, hence rental prices are low. In coastal communities, on the other hand, touristic short-term renting is an important factor all the year around and this marks a difference in the rental price distribution.

Map 3-13 – Number of offers per municipality in the real estate market (left) and in renting (right).

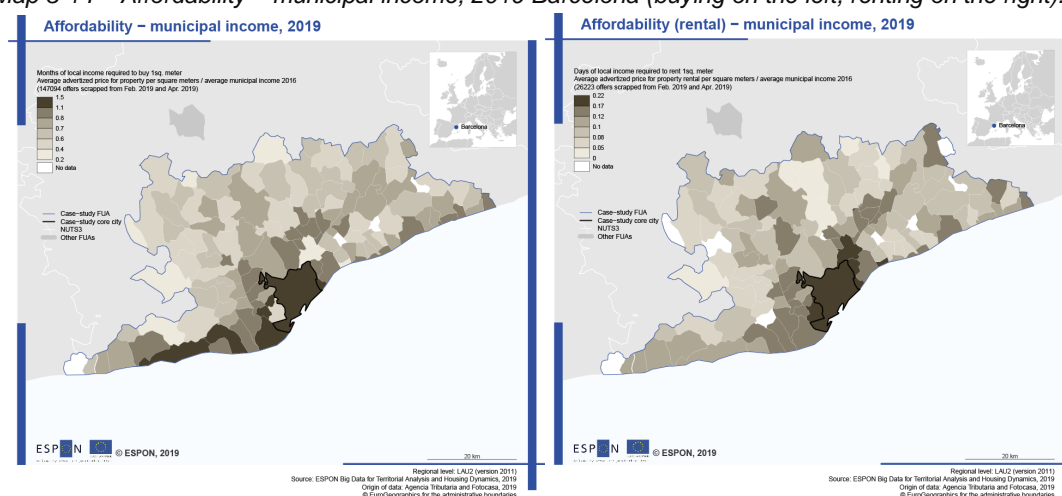


Affordability (price to income ratio / rent to income)

Affordability is clearly easier for locals since their average income is higher than the national standards, at least in most of the FUA. As on Map 3-14, it takes as much as 1.5 months of local income to buy 1 square meter of a flat in the center of Barcelona, while with a standard Spanish income it takes 4 months (see Map 0-84). Hence the differences at income level between the city FUA and Spain are high, this is also reflected by the average cost of life in Barcelona.

Regarding local residents, affordability maps evidence the difficulties to acquire or rent housing concentrate in the core city (see Map 3-14). The municipalities towards the South of Barcelona show very high indices regarding home buying, but they are more affordable in terms of renting even though they also concentrate a good part of the tourist interest (short term rental). In the case of renting, some of the interior municipalities show higher affordability indices likely caused by the little offer.

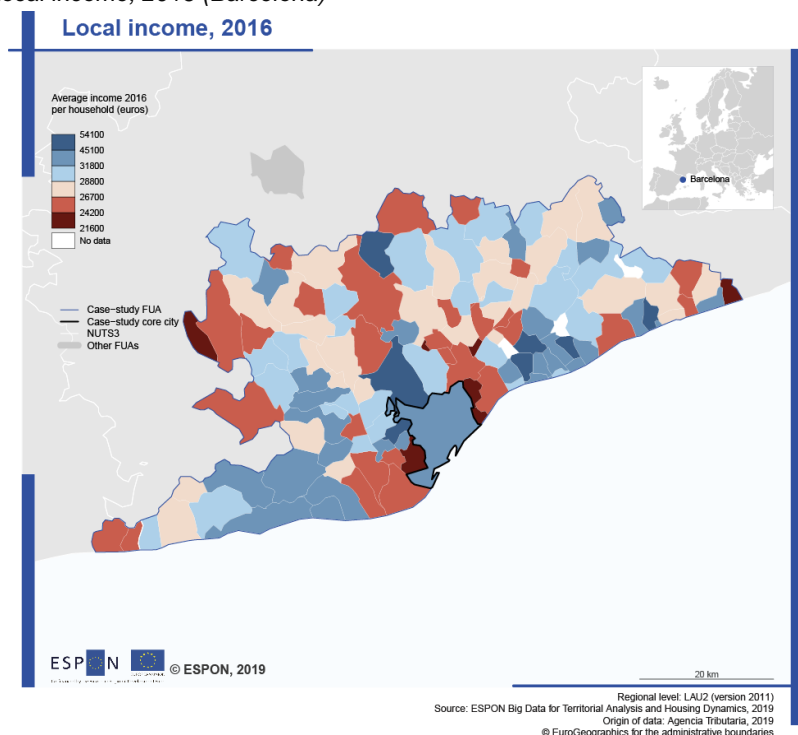
Map 3-14 – Affordability – municipal income, 2019 Barcelona (buying on the left, renting on the right).



Inequalities

As can be seen in Map 3-15 on local income spatial distribution, the wealth distribution is highly heterogeneous in the FUA. It is remarkable how next to Barcelona core city, which is one of the richest spots, we find two of the poorest areas in the FUA forming what is known as the “red belt”. This is the symptom of a clear economical segregation process occurring since the 1960’s, in which people coming from the rest of the country settle down in those neighbourhoods to work in the then pushing industries. The change in the nature of the main economic activity toward services in the last decades did not help to improve the income indexes. In the city core, a gentrification process has been taking place in the last decade as well, pushing locals out of the city center due to a raise in the housing prices.

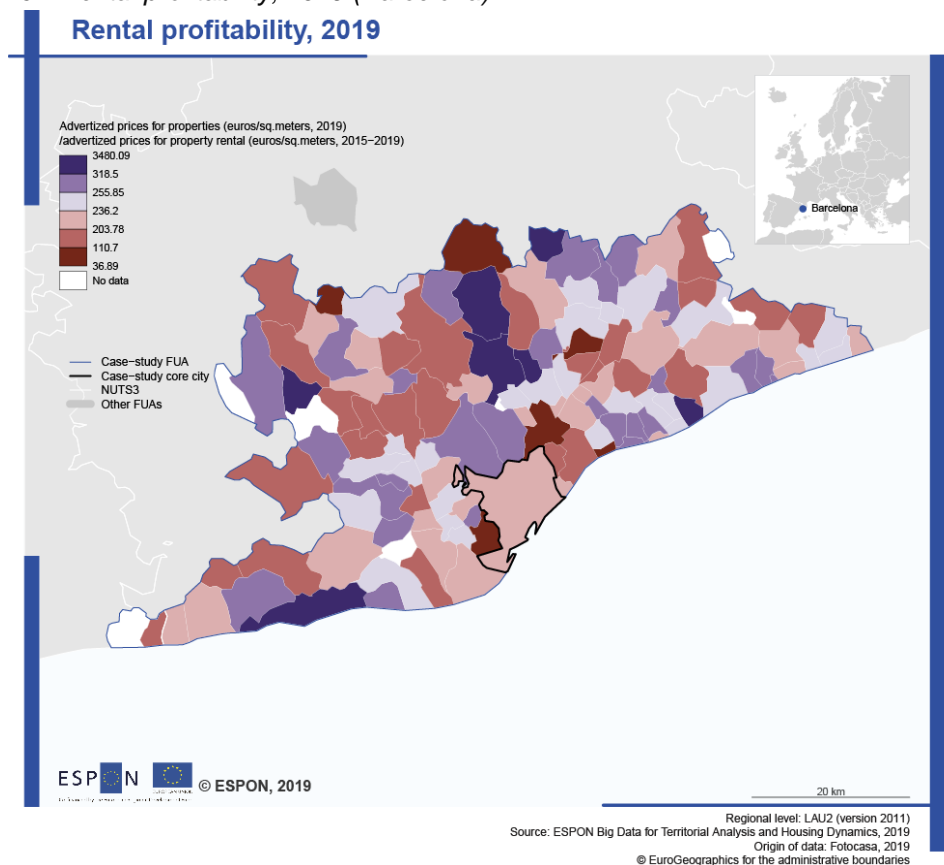
Map 3-15 – Local income, 2016 (Barcelona)



Rent to price

The relationship between rental and property prices is clearly highlighted on Map 3-16. Basically, data show a more active market in locations where the rental profitability is higher. This is visible on Map 3-13, where the dot maps show the places with the highest number of transactions, relatively to rental and real estate market. This indicates that higher rental profitability leads to a stronger activity in the rental market, except for the core city where high renting demand is likely rising the rental prices and making buying a slightly better option. To understand well these maps it is necessary to take into account the structure of the housing market in each area. Richer neighbourhoods tend to contain mostly single houses and villas, with very high purchase prices but more affordable renting ones. In the core cities, on the other hand, the offer is dominated by apartments for which the ratio selling and renting can be closer to a tie.

Map 3-16 – Rental profitability, 2019 (Barcelona)



The information available at this stage is not very clarifying given that it only covers the core city area. However, the impact that tourist renting has in the central zones of the city like the historical gothic quarters, Gràcia, etc. is the subject of a strong debate from the urban planning perspective. Since in these areas, the tourist demand remains unabated all year along, the profit produced by vacation renting is much higher than the longer term renting to residents. This also leads to a gentrification process, expelling local residents out of these areas, as well as changes in the economic activities in the neighbourhoods, etc. Several neighbourhood associations have been pushing the city hall to limit vacation renting or to tax it more heavily (See *Guidance Document*, last section).

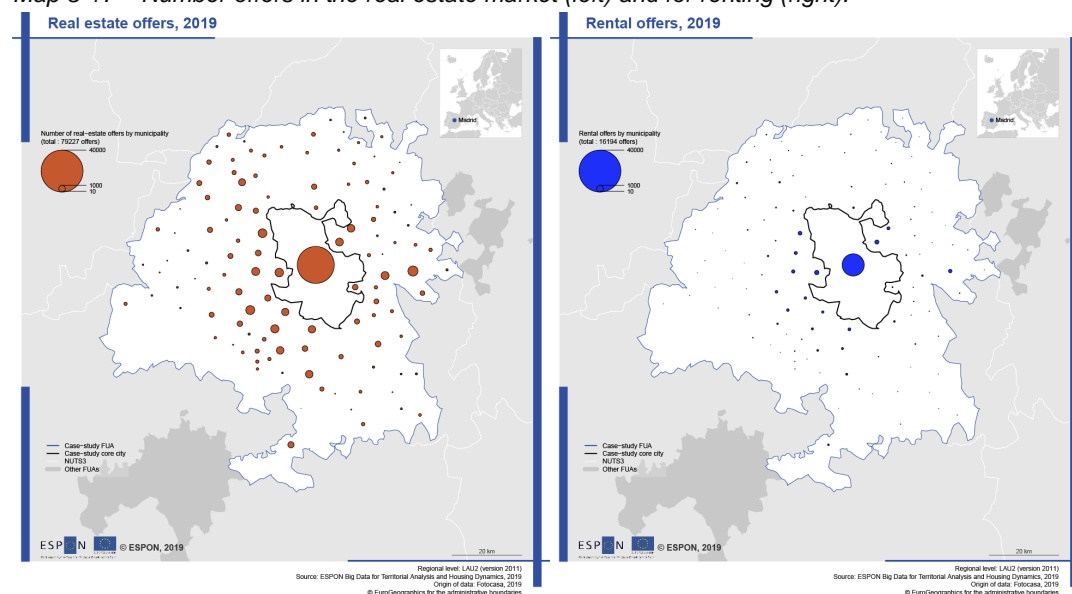
Madrid has an income per capita well over the national average, including in the FUA the wealthiest municipality of Spain (Pozuelo de Alarcón). The positioning of the FUA in the national top ranking levels in income has remained stable in the last two decades. This has led to real estate prices higher than the Spanish standards. Within the core municipality itself, the prices tend to be higher in the central area around Castellana, Gran Vía, etc., and in some nearing neighbourhoods such as the Salamanca or Serrano. There is a North-South divide, with the Northern neighbourhoods having higher prices and host wealthier populations. The further the distance from the central Castellana area the lower the prices on average, with a few exceptions on the municipalities in the Sierra (the mountain range to the North), where second residences in single houses are concentrated. The Southern belt includes some of the suburb neighbourhoods such as Vallecas, Puente de Vallecas, Coslada, Alcorcón, Getafe,

where prices can be more accessible. Again a few exceptions to the South are Valdemoro and Aranjuez, where the expansion is very recent, the average income per capita is high and so are the housing prices as well.

Density of transactions

The offer in the real estate market, as observed in Barcelona, is concentrated in the core city. Outside downtown Madrid, the suburban municipalities also show a classical distance decay of housing offers. The municipalities to the West of the capital are expansion areas, and, therefore, it is possible to observe an unbalance in the offer between East and West. Concerning renting, the main offer is located as well in the core city with some contribution from the expansion areas to the West. The renting and purchase markets seem to be strongly correlated in space.

Map 3-17 – Number offers in the real estate market (left) and for renting (right).



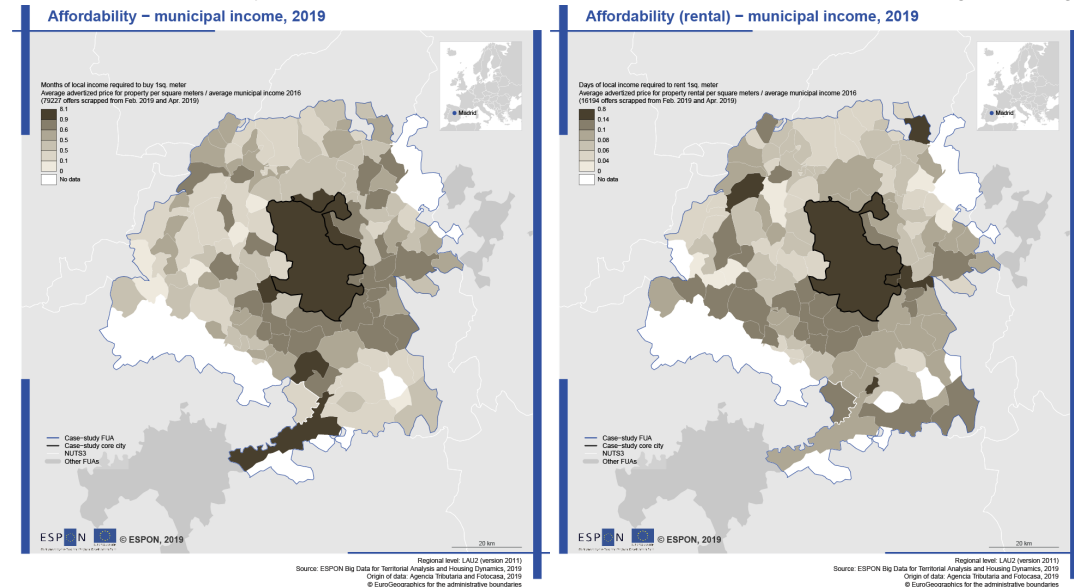
Affordability (price to income ratio / rent to income)

Affordability is clearly easier for locals especially in the northern area since their local income is high despite the lower estate and rental prices: with only 0.1 months of their average income they manage to buy 1 square meter. This turns to be the contrary when looking at the Southern side and the capital, where lower incomes highly affect the affordability of houses for locals both for buying (up to 8 months of their income needed to buy 1 square meter) or renting activities (Map 3-18).

Looking at the affordability maps for a standard national income, the picture of advertised prices is simply reflected (Advertised Price Maps), since in this case affordability does not depend on the local economic level. If in Barcelona we registered up to a relation of 1:5 between the average Spanish income and the local ones when looking at estate affordability, in Madrid we register as much a relation of 1:2. Hence the months needed for an average Spanish worker are almost doubled everywhere, with respect to local Madrid FUA workers.

Renting and purchasing accessibility seem spatially correlated except for few cases in the Sierra and the South of the FUA. This discrepancy could be related to the distribution of offer, with locations with low renting offer having higher prices.

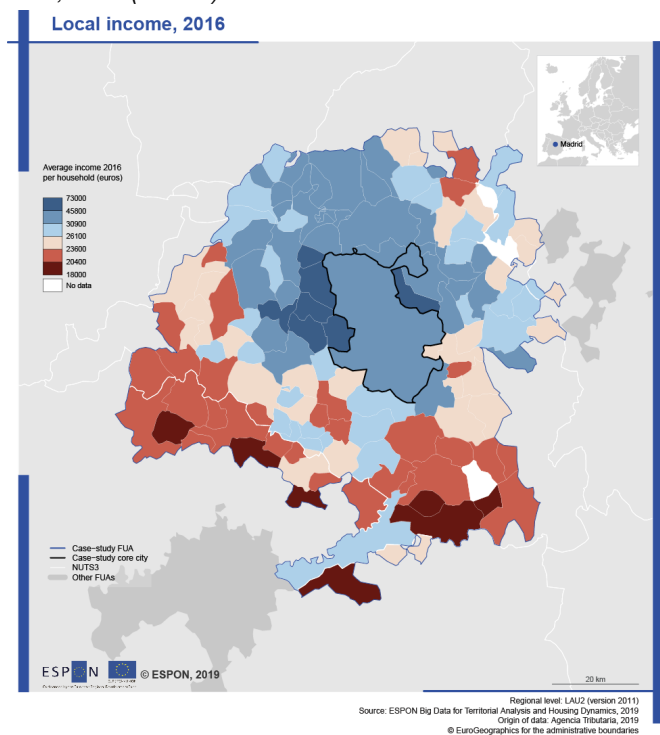
Map 3-18 – Affordability – municipal income. On the left, real estate market and, on the right, renting.



Inequalities

Economic inequalities in the Spanish capital are clearly distributed in space. Looking at Map 3-19 (Local Income) we see the wealthiest population is in the North of the FUA next to the Sierra of Madrid, the nearest mountains to the city, including the capital itself with almost no exceptions. There are some housing developments in this area, like La Moraleja, which are widely known for concentrating wealthier individuals, and it also includes Pozuelos de Alarcón. Several of the main companies headquarters as banks (Santander and BBVA) or ITs as Telefonica are also located in the Northern part of the city. People working there tend to live nearby and typically to the North of the city. The population with lower income per capita concentrates in the South of the city-core, where the main economic activities include industry and services. The only exceptions are some zones in the South where local universities opened campuses like Getafe and Leganés. This also includes expansion areas of the city like Valdemoro and Aranjuez.

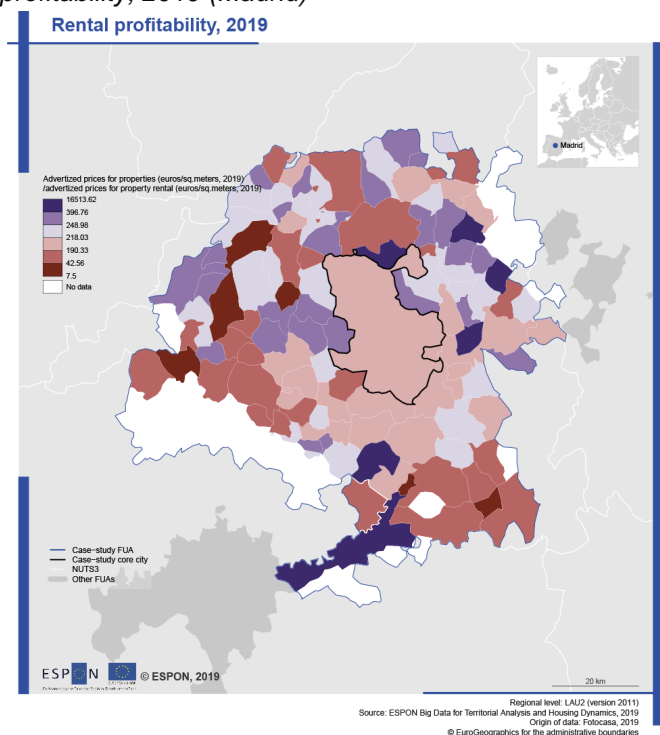
Map 3-19 – Local income, 2016 (Madrid)



Rent to price

Rental profitability is not really marking a clear spatial pattern, in fact it is highly affected by the local specificity of each municipality. In Madrid, more than in Barcelona, we find that rental profitability is higher where big country houses and villas are easier to appear, hence countryside and mountains, where the average real estate price is high.

Map 3-20 – Rental profitability, 2019 (Madrid)

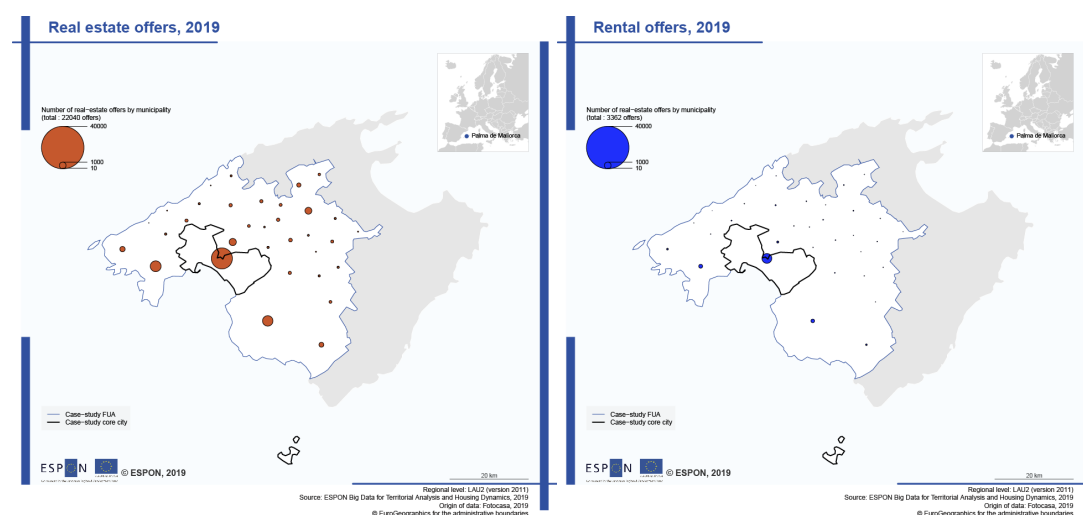


Short time and vacation rental

The map showing the Airbnb offer correlates with the main metro lines, which facilitate the access to the central area of the city. Vacation renting have also triggered a gentrification process in some of the central neighbourhoods of Madrid. The regional government passed recently a law trying to regulate this market forbidding short-time renting of apartments without the consent of the neighbour community with the only exception of apartments with separate entrances for hosts and residents. These measures have been taken so recently that it is still unclear whether they will be effective.

As for Madrid and Barcelona, most of the real estate offer concentrate in the core city. Other municipalities also count with an important offer but at a lower scale than the one in **Palma**. Furthermore, areas like Calvià, Marratxi and Llucmajor, which are second, third and fourth in real estate offer volume are located around the core city. The offer in the rental market mimics the spatial distribution of the real estate offer. This is normal taking into account that the rental platform under study addressed resident population only and not tourists.

Map 3-21 – Number offers in the real estate market (left) and for renting (right).



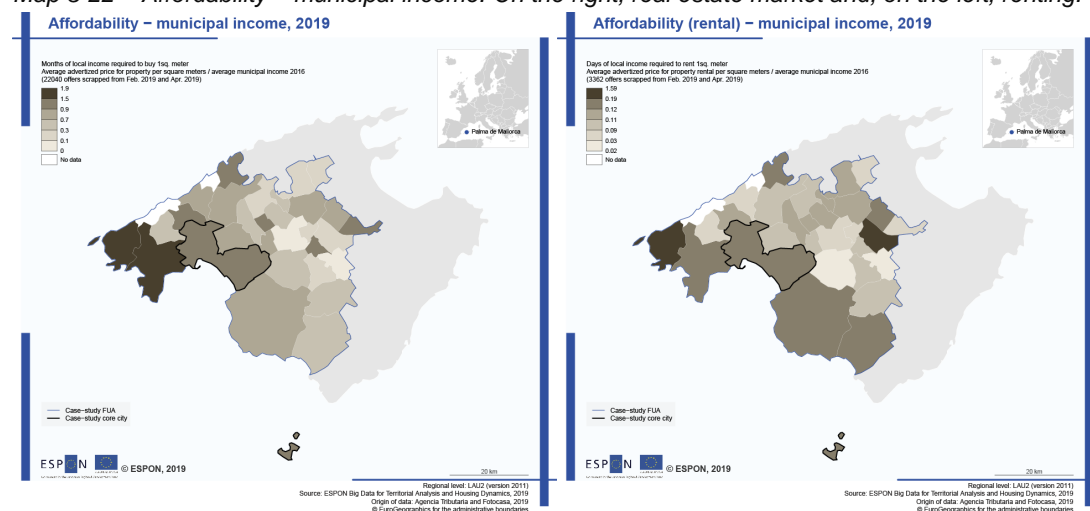
Affordability (price to income ratio / rent to income)

Similarly to Madrid and Barcelona, Palma is one of those areas in Spain where the average income per capita is over the national average. This implies that the real estates located in the FUA are more accessible to locals than to citizens from the rest of the country. An interesting case to mention is the area around Calvià-Magaluf on the coast to the West of Palma de Mallorca. As shown from Map 3-23, local income per capita is very high but not enough as to cover for the real estate average advertised price. This zone includes residential areas inhabited by residents of British origin, normally with a high purchase power. A good part of real estate offers has targeted this market, the announcements are many times directly written in English and the prices are adapted to conditions not corresponding to the local

population alone. This can be confirmed by the differences between the coast and the inland, where the prices correlate better with residents' average income per capita.

In the case of rental, the spatial patterns are similar. There are very few municipalities in which rental affordability does not match with the acquisition affordability. Since they are in the interior, in more rural areas, the volume of the renting offer can also play a role.

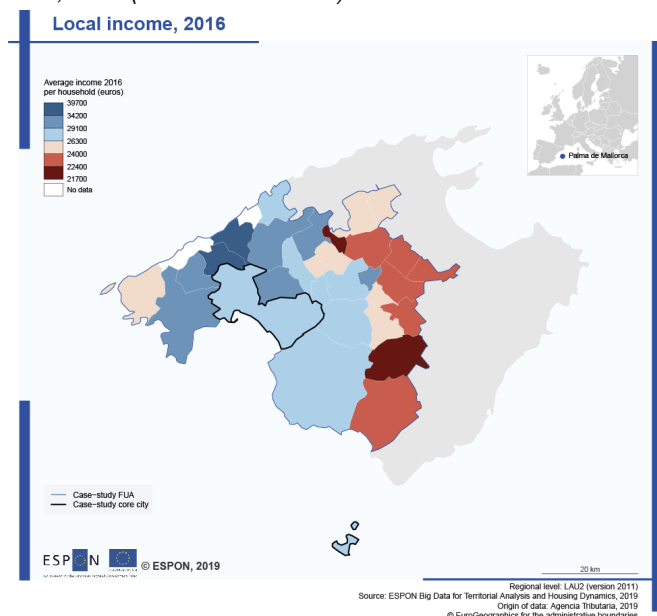
Map 3-22 – Affordability – municipal income. On the right, real estate market and, on the left, renting.



Inequalities

The distribution of income per capita in the Island of Mallorca follows very marked spatial patterns. The most demanded touristic areas (Calvià, and areas in the Sierra de Tramontana, a mountain range to the North of the island) are also the wealthiest in terms of resident population (Map 3-23). These areas have experienced a growth of high-standard tourism with more expensive prices and better returns in income per investment than other areas of Mallorca. Two examples are the municipalities of Valldemossa and Esporles in the North of Palma, which have the largest income per capita of the island. Then it comes Palma and the municipalities to the South with similar level of income per capita and, finally, the most rural areas to the East and to the interior where the income is lower (for example, Campos municipality). Inside the Core-city, there are important differences as well between the income per capita in the neighbourhoods. Typically, the wealthiest are either in the sea front, the old city and up in the mountain range to the West of the center. The lowest incomes are concentrated in the neighbourhoods to the interior-East of the city center.

Map 3-23 – Local income, 2016 (Palma de Mallorca)

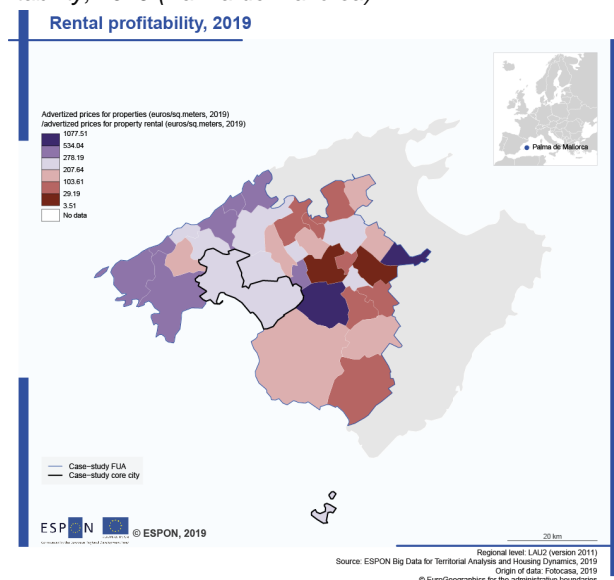


Rent to price

The relation between real estate and rental prices is displayed in Map 3-24. Data show that Palma's rental market is highly fragmented, without a systematic spatial pattern. The most touristic places are generally more profitable for renting, including the Serra de Tramuntana and Algaida, next to Palma to the East. In these areas the main residential typologies are single houses with a garden and small land around. The selling prices of these properties are very high, while renting them can be comparatively accessible. This phenomenon affects the rental profitability in these municipalities, leading them to the highest positions in the Island.

Affordability on the rental market in terms of average national income is still higher than in Madrid (see Map 0-91), while affordability on the real estate market on the same income is half of the highest one in Madrid (see Map 0-90).

Map 3-24 – Rental profitability, 2019 (Palma de Mallorca)



Short time rental and Airbnb

Being such a touristic attraction, Mallorca owners have quickly adopted online technologies such as Airbnb, Homeway, etc., to rent their properties to tourists. This has introduced a strong perturbation in the rental market for residents significantly reducing the offer. Even though the tourist season in Mallorca is centered around summer, this practice is still profitable when compared with a standard all-year rental contract. This has occasioned difficulties for locals to access the rental market. The situation is even more acute in other islands such as Ibiza where the offer is more limited and the prices can multiply those of Mallorca for a factor two on average. This is the reason why the Balearic Government has passed a law to regulate online vacation renting. The law was passed last year so it is still soon to judge its effects. The Airbnb offer follows the distribution of touristic attraction sites: Calvià coast, the center of the city of Palma and the beach along its South-East coast. In the interior, there are offers in rural and more natural areas, concentrating next to the Tramuntana range.

3.5.4 Paris

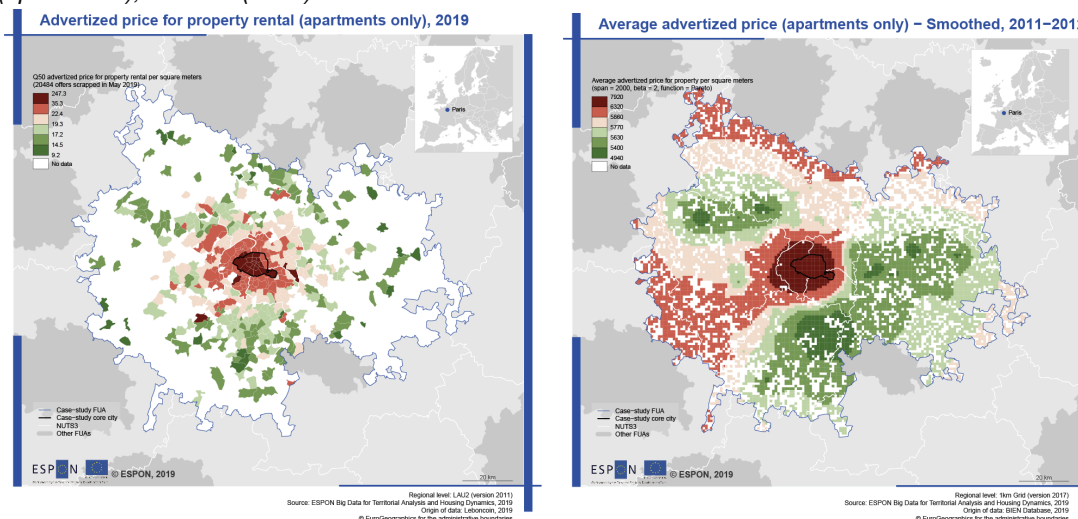
Price, market structure and geography

In the sample of case studies, Paris stands as the most expensive city as on Map 3-25, for rentals as well as for properties. The core-periphery classical spatial structure of prices, between 2011 (price paid), and 2019 (advertised prices) shows clear patterns of accumulation driven by high property prices in the center of Paris, as well as in the western inner suburbs of the city. Data also show that the former “red belt”, a first ring of blue-collar inner suburbs are also driven by high-prices. In these central markets, the stock of apartments is very heterogeneous, and ranges from lower-end smaller apartments, to higher-end haussmanian suites with a view. One major fact has been the homogeneisation of inner-suburbs submarkets, that caught-up with the higher prices of more central local. Driven by the new subway construction effort around the core area, going on until the 2030s, this trend is currently strongly reinforcing.

In outer suburban areas, the prices decrease strongly with the distance from the core area, yielding a strong discontinuity effect between the areas better connected to public transportations (inner ring / subway system), and peripheries. This is true on average for rents, but more nuanced for properties: price-distance decay follows a steeper slope to the East and North East of Paris, as on grid Map 3-25. But the actual detailed geography of sub-centering strongly structure property prices for apartments, with a strong effect of locational advantages in *Villes Nouvelles* (new towns), where mass-transit and strong transportation interconnections exist, as well as a variety of local jobs offers, in the service sector, commercial sector, and advanced producer services (Marne-la-Vallée to the East, Cergy-Pontoise to the North, and Saint-Quentin en Yvelines along the South-Western corridor. This polycentric structure of the housing market is well highlighted by the dynamics of the rental

and property markets: beyond the limits of the core-area, the density of apartments to buy or to let (advertised properties on the market-place website) is clustered following the accessibility structure (transportation corridors), as on annexed maps 0-119 and 0-123.

Map 3-25 – Advertised price for property rental (apartments), 2019 (Paris), and grid transaction price (apartments), 2011-12 (Paris).



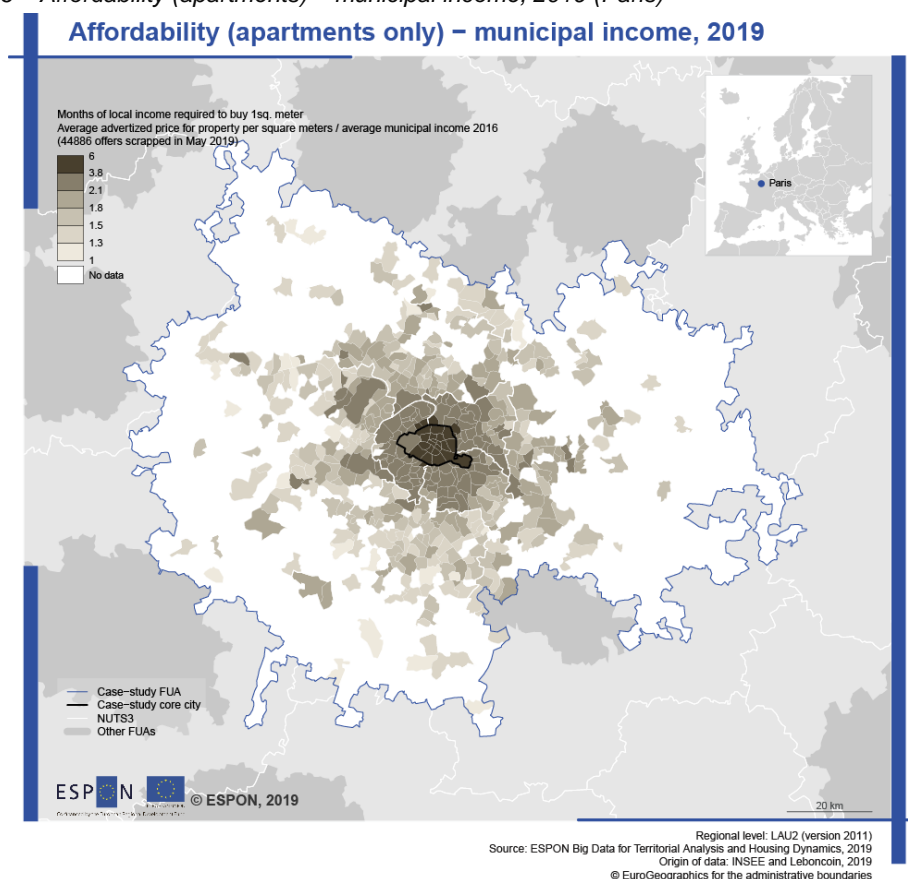
Affordability (price to income ratio)

The spatial structure of affordability shows clear unequal patterns. The spatial distribution of unequal access to housing for prospective buyers (apartments) on Map 3-26 and the two different ways of measuring affordability show contrasting results. While affordability measured with reference to local income shows that buying an apartment downtown Paris will cost *at least* 3.8 months of full income by sq. meter, this is not true in the wealthiest part (16th district), where local income offset the cost of housing. This is a resulting pattern of price homogenisation: the inflation of property prices has been more likely to impact prices in lower-end neighbourhoods (to the East of the inner-city), than in the already very high prices of the western side, yielding a very unequal affordability crisis. Beyond the strong discontinuity line of the inner-city limits, affordability quickly drops below the 3.8 months threshold in the inner-suburbs (first ring), and the distance decay eases up the pressure after the limits of the denser inner suburbs. This depiction of unequal affordability is however strongly driven by the effects of local income, *i.e.* the municipal job and income structure: with lower income in the North-East of the city, the structure of housing is more and more inaccessible to local residents.

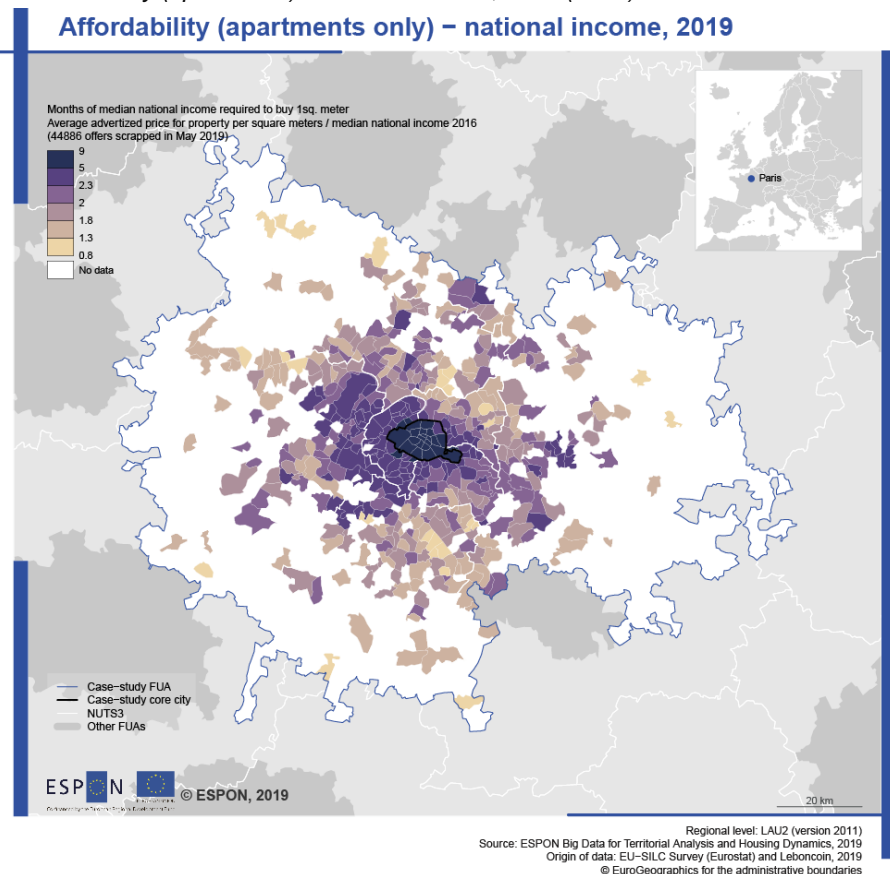
When compared to national income (to what extent one “average income household” living anywhere in France would have the income-based purchase power to access one neighbourhood in Paris FUA), the picture is very different (Map 3-26) : the entire western corridor is very unaffordable (> 2 months of income by sq. m.), while the North-East and South-East sections of the FUA correspond to areas where apartments would cost between 0.8 to 1.8 months / sq. m. This differential accessibility is clearly demonstrated on Map 3-28:

while most of the Western side is unaffordable, and out of reach for an average household based on national income; part of the region remains affordable to an average household, while it is not affordable anymore to local residents. This price-to-income spatial structure highlights how property markets pressurises the potential of ownership and decent access to housing in the inner ring of the region, in former blue-collar and now gentrifying neighbourhoods especially.

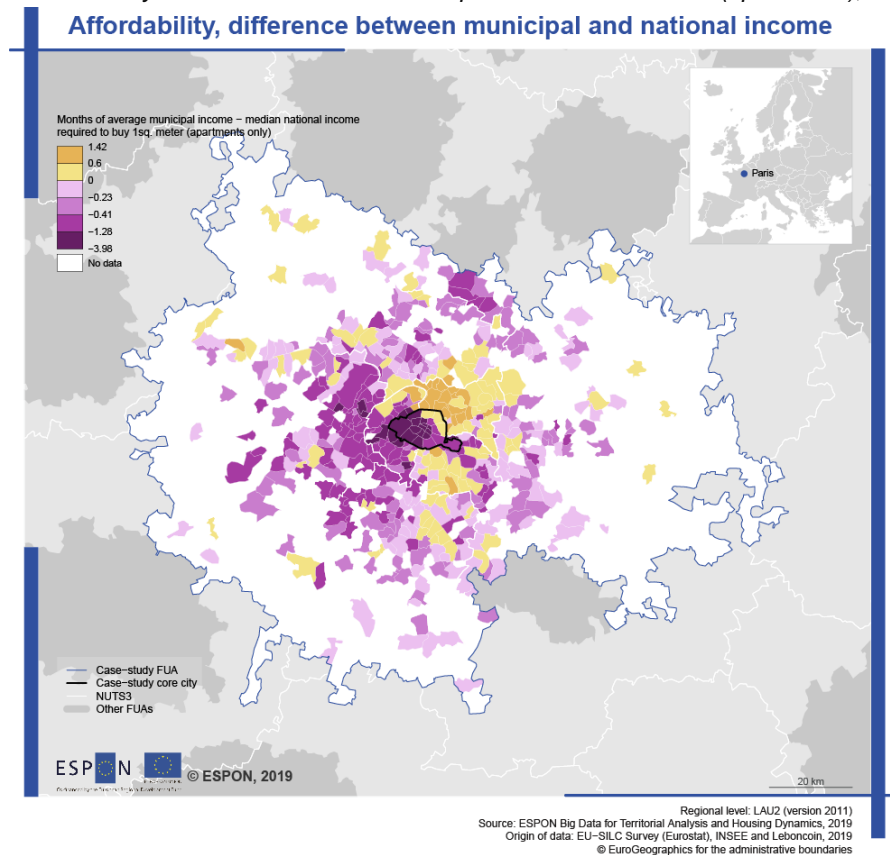
Map 3-26 – Affordability (apartments) – municipal income, 2019 (Paris)



Map 3-27 – Affordability (apartments) – national income, 2019 (Paris)



Map 3-28 – Affordability – difference between municipal and national income (apartments), 2019 (Paris)

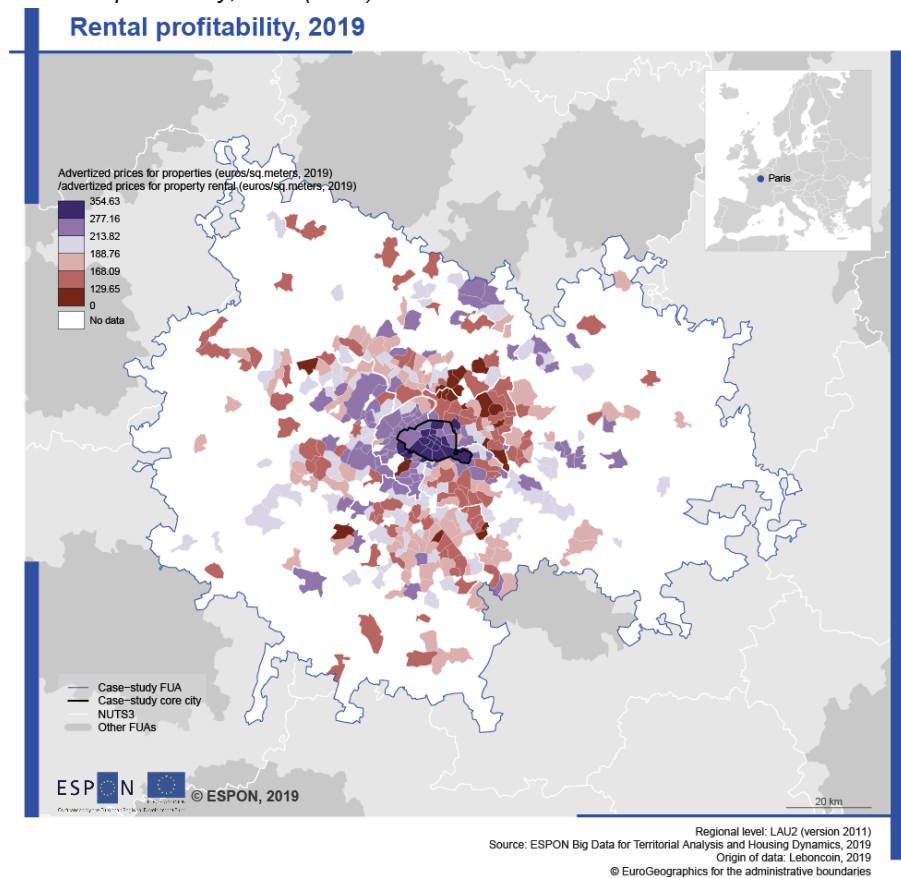


The enduring unequal patterns of accumulation and housing unequal access

Many regimes of housing coexist in Paris and its FUA: lower-end rental apartments, higher-end property condominiums, single and young professional entry-market ownership in central locations, suburban owned single family homes, rental investments, etc. With the documentation gathered for this *wellbeing report*, some of them can be discussed in terms of their effects on affordability, and more specifically :

- The rental market shows a clean-cut divide in terms of profitability (Map 3-29). The ratio yields a value that can be interpreted as “how much is invested by the landlord for 1 euro of rent paid”. Although the center of Paris demonstrates a lower profitability due to the higher cost of properties, the profitability of the private rental sector structure the housing market in the North-East quadrant as well as to the South-East corridor, along the Seine river. **To a certain extent, the lower the income profile of residents (Map 0-112), the highest the profitability of the rental market.** This pattern of profitability extends to the furthest suburbs, to the South and to the West of the FUA.

Map 3-29 – Rental profitability, 2019 (Paris)



- For some subsets of the apartments segments (1-2 bedrooms more specifically), this impeded rental profitability of downtown Paris is correlated with **a substitute in rent-seeking strategies by landlords, a shift toward short-term rentals** (Airbnb, especially in central locations (Map 4-1).
- On the other-end of the market, the higher prices found in the Western suburbs, and the differential between local income structure and the national average income structure, **contributes to the fostering of a housing local regime that is out of reach for average income inward mobility** (Map 0-115). Such a regime is mostly characterised by (very) high income residents (Map 0-112), operating in an owner-occupied apartments market, very able to capitalise on housing wealth (*i.e.* households are on average operating in market segments where one can sale one apartment and buy another one, mobilising assets in the transaction). This regime is self-reinforcing and favors **the accumulation of housing wealth for local owners**.

3.5.5 Avignon

The **Avignon's** real estate market is characterised by low prices. The average FUA prices are similar to those of smaller French FUA or to those FUAs of similar demographic weight but located in less attractive regions (e.g. Metz or Amiens). The property market of Avignon is also characterised by a deep spatial segmentation due to an important urban sprawl: the vast majority of the apartment market is concentrated in the central (and less expensive) part of the FUA (municipalities of Avignon, Le Pontet) while the suburban municipalities, whether expensive or not, host an important market for houses.

Density of transactions

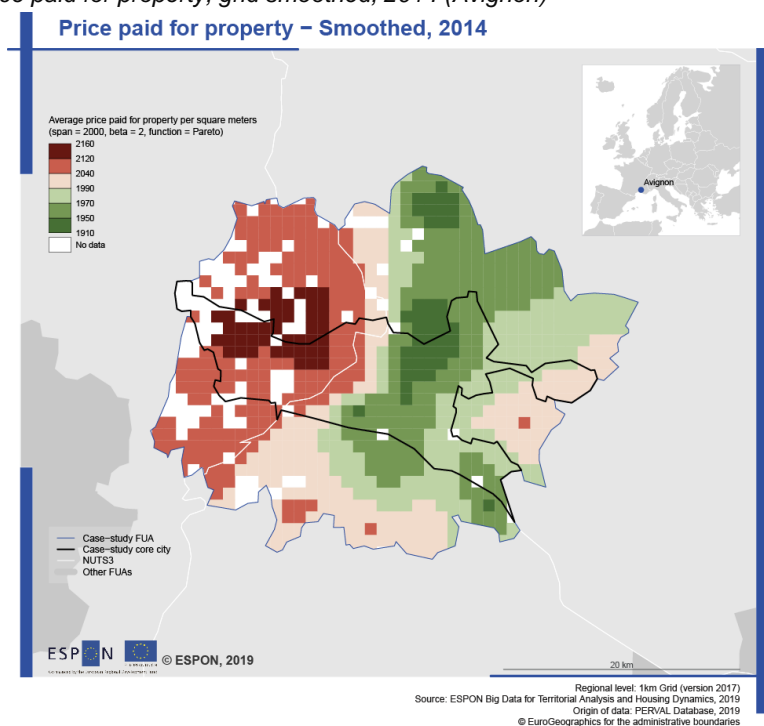
The map of the density of transactions largely reflects both the spatial and the real estate market structures. While the main municipality (Avignon) accounts for more than 30% of the FUA population, it accounts for a relatively low part of the real estate transactions (less than 20%). By consequence, many suburban municipalities are relatively important house markets (whether expensive – Villeneuve-lès-Avignon – or not – Monteux). Yet the same does not apply to the rental market, which is over-represented in the municipality of Avignon (we may assume that situation relates to combined effects of centrality such as the presence of the University).

Affordability

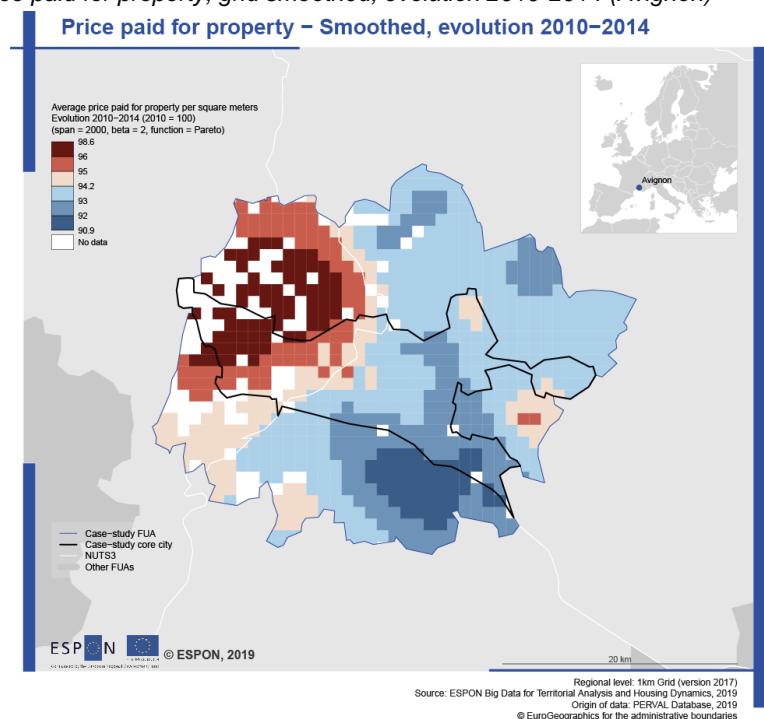
The average local income is low, especially in the dense, central area of the FUA (municipalities of Avignon, Le Pontet, Sorgues). The rest of the FUA is characterised by significant spatial discontinuities as shown by the maps: although tempered by the municipal scale, the differences in average income per household are often pretty strong (for instance, the neighbouring municipalities of Avignon and Villeneuve-lès-Avignon belong respectively to the lower and the higher class of the local income discretisation). As a result of the spatial

association between real estate prices and local incomes, the price to income ratios are not that differentiated in the FUA of Avignon.

Map 3-30 – Price paid for property, grid smoothed, 2014 (Avignon)



Map 3-31 – Price paid for property, grid smoothed, evolution 2010-2014 (Avignon)¹⁴



¹⁴ In warm colors are presented evolution above the FUA average (94.2). This map shows that in Avignon the prices have globally decreased (index below 100, but with not the same intensity across the study area).

Yet it is worth noticing that in both less and more expensive zones we find relatively affordable housing (e.g. Les Angles or Courthézon) and relatively expensive housing (e.g. Pujaut or Avignon). Thus the spatial differentiation of real prices cannot be explained solely by the average socio-economic level of the municipalities.

Note finally that the statistical dispersion of price to income ratios in the FUA of Avignon remains reduced: if we use the median national income as a basis for a comparison, the more expensive parts of the FUA of Avignon correspond for instance to the first-tier municipalities of the FUA of Paris.

Inequalities

The FUA of Avignon is characterised by an over-representation of below-the-threshold-of-poverty homeowners. This salient feature combines with the high socio-spatial segmentation of the property market to produce an unequal process of real estate market based spatial polarisation. The maps clearly highlight strong dynamics of real estate polarisation: the more expensive parts of the FUA became even more expensive (e.g. Châteauneuf-de-Gadagne) while the less expensive (e.g. Monteux) became even less expensive than before. In a context of unprecedented low real estate purchase power for French households, these kinds of process mean that real estate market dynamics may sharpen the wealth inequalities between poorer and wealthier households.

Rent to price

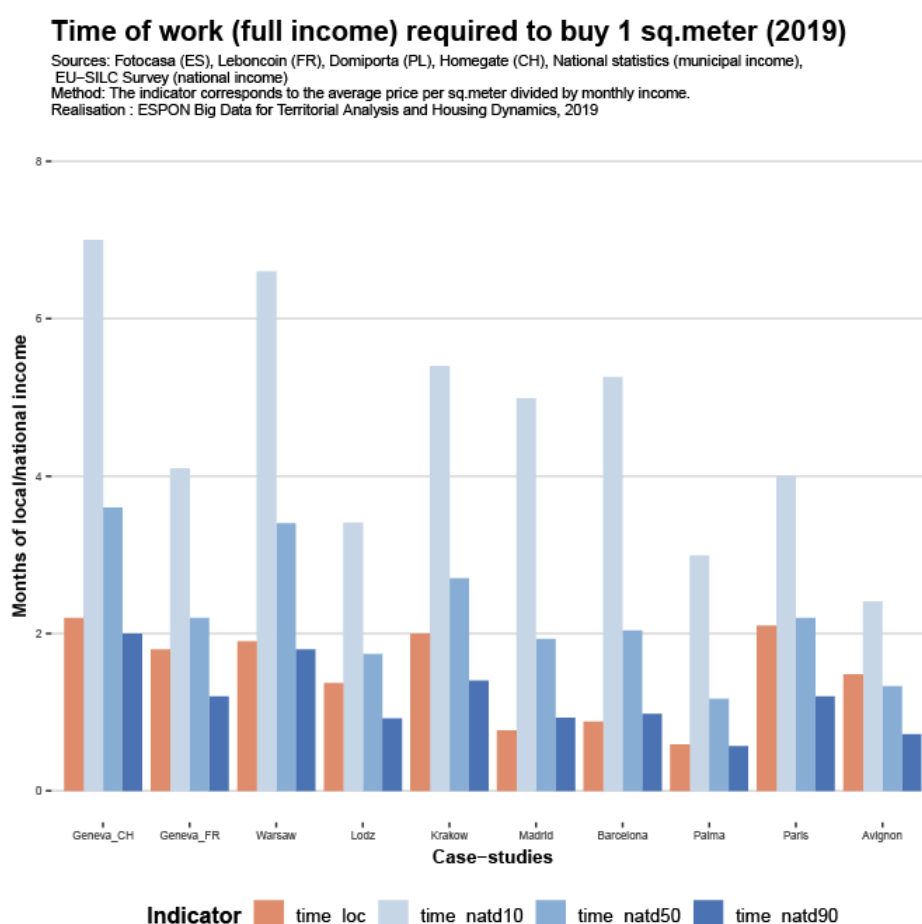
The rental market of the FUA of Avignon differs radically from the home-ownership market. While the property market of Avignon remains relatively cheap, the rental market in the inner city is much more valued. This may be largely due to typical features of central parts of urban areas such as higher rates of population turnover or over-representation of single households. This might be related to more specific, cultural characteristics too: houses are traditionally highly valued in Provence and most of the suburban municipalities have been playing the suburbanisation card for decades, thus limiting the apartment production to very specific, central parts of the FUA.

3.5.6 Comparing housing markets between FUAs: key findings on affordability

One major input of the study derives from the definition of a set of standardised indicators, among which the several variables describing affordability (price-to-income and rent-to-income) is preeminent, and prefigures the interest of systematising such a study at the European level. Using the most recent harvested data, **Error! Reference source not found.** and **Error! Reference source not found.** provide a summary and a comparison based on the time of work¹⁵ (number of months of full income) required to rent or buy housing, according to the local municipal income (orange), and 3 relevant national income thresholds (blue), to highlight the patterns of affordability between FUAs D10 (10% lowest income), Q50 (median) and D90 (10% highest income).

Figure 3.2 – Time required to buy 1sq. meter (2019) – Webscraped data

With: **time_loc** (number of months of case-study income / municipal income required to buy one square meter), **time_natd10** (national income, first decile), **time_natd50** (national income, fifth decile / median), **time_natd90** (national income, ninth decile).



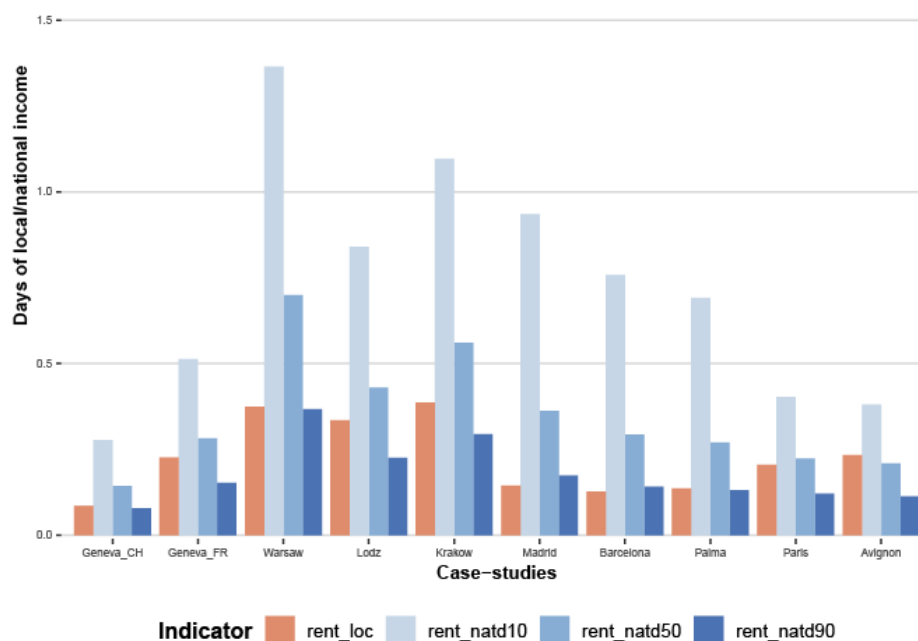
¹⁵ Based on the heuristic fiction of spending a household's full income in housing. Shall we consider the usual 33% threshold of a household's income as max cost of housing in the spending structure, the "time of work" estimates are to be, simply, multiplied by a factor 3.

Figure 3.3 - Time required to rent 1sq. meter (2019) – Webscraped data

With: **rent_loc** (number of months of case-study income / **municipal income** required to rent one square meter).
rent_natd10 (**national income, first decile**), **rent_natd50** (**national income, fifth decile / median**), **rent_natd90** (**national income, ninth decile**).

Time of work (full income) required to rent 1 sq.meter (2019)

Sources: Fotocasa (ES), Leboncoin (FR), Domiporta (PL), Homegate (CH), National statistics (municipal income), EU-SILC Survey (national income)
 Method: The indicator corresponds to the average price (rental) per sq.meter divided by daily income.
 Realisation : ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019



The results show very distinctive trends between the different FUAs, that highlight the contingency of affordability, structured by the national and local structure of the housing provision system (subsidised household debt, pro-ownership policies, rent control, housing vouchers and family benefits...), the local structure of the built environment (quality, size, categories of the housing markets), as well as the socio-professional structure and the income distribution of the population. Not to mention the various definition of income across UE countries.

A first striking result is that, based on local income, the affordability ratios are on average similar in Geneva, Warsaw, Krakow, Paris, around the threshold of 2 months of local income / sq. m., with minor fluctuations. On the other end of the spectrum, Palma, Barcelona, Madrid appear as the most affordable cities. Lodz and Avignon, both being shrinking markets, stands in median values. As for rents, this perspective is almost reversed: compared to local average income, Warsaw, Lodz, Krakow are the least affordable, Paris, Avignon, the French side of the Geneva FUA ranking in middle-range affordable. This perspective is to a certain extent biased by the contingency of the local level of income. As a disclaimer, this measure allows for a comparison between cities in the same country, but is subject to safeguards in interpretation, due to the heterogeneity of household's income computation between each

national statistical institute. These results are only a global picture, with possible national bias in interpretation.

Estimates based on national income distribution offer a very contrasting view.

- **For lower-income households**, below the first decile threshold, Geneva, Warsaw, Krakow, Madrid and Barcelona are by far the least affordable FUAs for ownership, end for apartments rentals, and for ownership only in Paris and Geneva FR. On French markets, the rental structure is more affordable for lower income than in many other cities, another example of the effect of the housing provision system and its regulation.
- **For median national income reference**, roughly defining the pivotal middle-class, the least affordable cities are Geneva, Warsaw, and Krakow, and to some extent Paris, for ownership applicants. Rental is the least affordable in Polish and Spanish cities.
- It does not actually translates into an issue of affordability for the 10% of the wealthiest households, but to some extent, Geneva, Warsaw, Krakow and Paris are the most exclusive markets for the wealthier part of the population, regarding ownership.

Table 3-5 – Harmonised indicators – transaction data

	STATISTICS	Geneva (CH)	Geneva (FR) / Annecy (FR)	Warsaw (PL)	Lodz (PL)	Krakow (PL)	Madrid (ES)	Barcelona (ES)	Palma de Mallorca (ES)	Paris (FR)	Avignon (FR)
Reference year(s)		2011-15	2014	NA	2017	NA	NA	2012	NA	2011-12	2014
Transactions		7760	5198		7100			2726 ¹⁶		85	1581
Surface	Q25	99.3	53.2		38.0			81.2		37.97	62.05
	Q50	124.6	71.7		48.4			97.8		52.45	81.94
	Q75	154.4	92.7		63.1			124.3		69.08	101.11
	AV.	133.2	75.7		54.1			106.2		48.42	83.3
Rooms	Q25	3.7	2.4		NA			2.02		1.83	2.75
	Q50	4.4	3.3		NA			2.53		2.58	3.54
	Q75	5.3	4.2		NA			3.05		3.36	4.48
	AV.	4.6	3.45		NA			2.63		2.62	3.64
Price (thousands euros)	Q25	910.1	188.7		29.8			242.7		180.5	110.6
	Q50	1 170.6	254.1		41.6			302.7		253	158.6
	Q75	1 552.6	336.2		59.0			370.6		359	213.0
	AV	1 345.2	276.9		49.6			342.3		285	172.3
Price per sq. meters	Q25	NA	3066.3		NA			2488		4 573	1595
	Q50	NA	3708.4		NA			3127		5 230	1988
	Q75	NA	4395.4		NA			3752		5 935	2557
	AV	10099	3661.0		917			3222		5 889	2068
Price to income	LOC	20.4	10.4		6.56			10.5		12.05	9.01
	Q10¹⁸	65.5	23.5		16.32			64.6		25.26	14.61
	Q50	34.0	12.9		8.35			25.0		13.84	8.04
	Q90	18.5	7.0		4.39			12.0		7.30	4.34
Time required to buy 1sq. meter (month)	LOC	1.8	1.65		1.46			1.2		3.49	1.30
	Q10	5.9	3.73		3.62			7.3		5.71	2.10
	Q50	3.1	2.05		1.85			2.8		3.13	1.16
	Q90	1.7	1.11		0.97			1.4		1.65	0.63
Debt to value	AV	NA	0.24		NA			NA		0.16	0.66

¹⁶ The data is coming from the city tax that people has to pay when they buy an apartment or a house (prices declared).

¹⁷ Sample, apartments only.

¹⁸ 10% of the lowest income by country (EU-SILC Survey).

Table 3-6 – Harmonised indicators – harvested data (properties)

	STATISTICS	Geneva (CH)	Geneva (FR) / Annecy (FR)	Warsaw (PL)	Lodz (PL)	Krakow (PL)	Madrid (ES)	Barcelona (ES)	Palma de Mallorca (ES)	Paris (FR)	Avignon (FR)
Year of reference		2019	2019	2019	2019	2019	2019	2019	2019	2019	2019
Number of offers		1096	10801	39293	1595	9382	79227	147094	22040	44886 ¹⁹	5397
Surface	Q25	132.1	71	73.4	73.6	66.3	94.55	93.57	103.4	47.4	76.5
	Q50	186	82	104.2	103.2	87.7	143.33	132.61	145.9	62	98.5
	Q75	276.1	123.5	165.7	160.0	130.5	226.25	199.13	230.4	77.5	141.1
	AV.	374.3	105.1	140.9	137.5	116.6	234.57	190.13	401.7	74.8	119.9
Rooms	Q25	NA	3.2	2.5	2.55	2.5	NA	2.74	NA	2.3	3.57
	Q50	NA	3.9	3.5	3.53	3.4	NA	3.33	NA	3	4.44
	Q75	NA	4.8	4.5	4.54	4.4	NA	4.16	NA	3.8	5.61
	AV.	7.6	4.1	NA	NA	NA	3.37	3.52	3.38	3	4.65
Price (thousands euros)	Q25	1 184	282.9	116.1	62.3	89.7	209.3	233.7	242.1	209.1	167.8
	Q50	1 863	373.6	168.5	872.7	117.5	334.4	334.4	360.5	274.9	233.0
	Q75	3 076	500.4	280.8	143.4	178.0	590.7	507.8	587.3	371.3	344.8
	AV	4 460	400.2	234.6	118.65	158.4	516.7	441.8	554.8	307.9	283.8
Price per sq. meters	Q25	NA	3584.5	NA	NA	NA	1897.6	2193.6	1940.5	4138	1925
	Q50	NA	4133.6	NA	NA	NA	2550.5	2722.8	2552.3	4764	2404
	Q75	NA	4682.9	NA	NA	NA	3299.7	3388.9	3364.3	5474	2820
	AV	11915	4002.8	1665.3	863.2	1357.8	2202.9	2324	1381.1	4118	2366
Price to income	LOC²⁰	67.8	15.7	22.0	15.69	19.1	15.05	14.01	19.6	12.8	14.7
	Q10²¹	217.1	35.7	77.1	39.0	52.1	93.17	79.67	100.04	25.2	24.1
	Q50	112.7	19.6	39.5	19.96	26.6	36.38	31.11	39.1	13.9	13.3
	Q90	61.4	10.6	20.7	10.48	14	17.67	15.11	19.0	7.6	7.2
Time required to buy 1sq. meter (month)	LOC	2.2	1.8	1.9	1.27	2.0	0.77	0.88	0.59	2.1	1.48
	Q10	7.0	4.1	6.6	3.41	5.4	4.77	5.03	2.99	4	2.41
	Q50	3.6	2.2	3.4	1.74	2.7	1.86	1.96	1.17	2.2	1.33
	Q90	2.0	1.2	1.8	0.92	1.4	0.90	0.95	0.57	1.2	0.72

¹⁹ Apartments only

²⁰ Price to income at LAU2 level, municipalities of the FUA area (be careful to heterogeneity of income definitions among EU countries).

²¹ Price to income at national level, first decile (EU-SILC Survey).

Table 3-7 – Harmonised indicators – harvested data (rentals)

	STATISTICS	Geneva (CH)	Geneva (FR) / Annecy (FR)	Warsaw (PL)	Lodz (PL)	Krakow (PL)	Madrid (ES)	Barcelona (ES)	Palma de Mallorca (ES)	Paris (FR)	Avignon (FR)
Year of reference		2015	2019	2019	2019	2019	2019	2019	2019	2019	2019
Number of offers		12280	3045	26490	361	5298	16194	26223	3362	20484	2247
Surface	Q25	NA	40.3	55.7	50.9	45.2	71.5	73.5	89.2	27.6	36.3
	Q50	NA	54.9	77.8	67.0	56.1	100.2	98.7	117.1	39.0	50.7
	Q75	NA	74.9	121.3	93.2	75.7	177.1	143.4	168.4	53.5	68.7
	AV.	82.2	62.0	113.5	87.3	73.8	147.8	170.7	159.7	71.8	56
Rooms	Q25	NA	1.79	2.09	2.07	2.05	NA	2.23	NA	1.30	1.56
	Q50	NA	2.41	3.1	3.07	2.07	NA	3.09	NA	1.95	2.41
	Q75	NA	3.23	4.1	3.09	3.07	NA	3.36	NA	2.6	3.23
	AV.	3.4	2.6	NA	NA	NA	2.61	2.89	2.84	2.02	2.47
Price (rent per month, euros)	Q25	NA	735	685	390	440	979	1105	1031	694	489
	Q50	NA	937	915	471	525	1293	1394	1318	860	588
	Q75	NA	1192	1535	652	695	1934	2014	1844	1085	726
	AV	1279	1027	1292	611	674	2005	1878	1678	969	689
Price per sq. meters	Q25	NA	15.2	NA	NA	NA	11.3	12.8	9.85	20.3	10.1
	Q50	NA	17.4	NA	NA	NA	13.8	15.3	11.8	23.7	12.1
	Q75	NA	20.3	NA	NA	NA	16.8	18.9	14.2	28.4	15.1
	AV	15.6	16.6	11.38	7.00	9.13	13.6	10.1	10.5	13.5	12.3
Price to income	LOC	0.0194	0.0384	0.116	0.08	0.0781	0.0584	0.059	0.0595	0.0404	0.0359
	Q10²²	0.0623	0.0872	0.425	0.200	0.2216	0.3616	0.339	0.3026	0.0792	0.0585
	Q50	0.0323	0.0480	0.217	0.1028	0.1134	0.1412	0.1322	0.1182	0.0439	0.0322
	Q90	0.0176	0.0259	0.114	0.054	0.0596	0.0686	0.0642	0.0574	0.0238	0.0174
Time required to rent 1sq. meter (days)	LOC	0.0862	0.2261	0.374	0.3345	0.3863	0.1442	0.127	0.1359	0.2055	0.2337
	Q10	0.2767	0.5132	1.365	0.8405	1.0963	0.8930	0.723	0.6916	0.4026	0.3806
	Q50	0.1436	0.2825	0.699	0.4301	0.561	0.3487	0.282	0.2701	0.2232	0.2096
	Q90	0.0798	0.1526	0.367	0.2259	0.2947	0.1693	0.137	0.1312	0.1209	0.1132

²² 10% of the income the lowest by country (EU-SILC Survey).

4 Key findings on case-studies and policy relevance of the results

4.1 Key findings on case-studies

This comparative analysis, based on the detailed analysis of case-studies and the synthetic tables that deliver univariate values for each indicator (Table 3-5; Table 3-6; Table 3-7), yield the following key-findings interpretation, that structure a comparative perspective (Table 4-1).

Table 4-1 – Key findings on case-studies

Case-study	Key findings on housing affordability
Poland (Warsaw – Krakow – Lodz)	<ul style="list-style-type: none"> The level of housing affordability differs within functional urban regions and its spatial pattern generally derives from the classical monocentric model: the level of housing affordability grows with the distance from the core city. Housing on the rental market is generally more affordable than apartments and houses for sale. Housing affordability is sensitive to the socio-economic and demographic conditions of the core city: it is lower in more rapidly developing cities with stronger economies. Rental and offer prices reveal the distinctive and highly unequal spatial patterns that are sensitive to local contexts: while most expensive housing offers are scattered over Lodz, a clear clustering of housing offers are observed in the historical cores of Cracow and Warsaw.
Geneva- Annecy- Annemasse CH-FR cross- border region	<ul style="list-style-type: none"> Strong contrasts in housing and affordability stem from the border effect exists between Switzerland and France. Geneva stands on standardised indices as a less affordable area than French cities in the FUA: jobs and occupational structure yields higher incomes and higher property prices than in France. Centrality effect: Geneva is the main economic and demographic center of the cross-border FUA. Prices decrease with the distance from the center of Geneva. This affects property prices in the surrounding cross-border French municipalities, with relatively higher prices. However, prices in Annemasse and other nearby municipalities show distinctive patterns, and do not clearly depend on classical center-periphery assumptions, s.a. the distance from Geneva. Other things being equal, more affordable rental prices in Switzerland are due to the importance of rental housing in Switzerland and to institutional protection against rising market prices.
Barcelona	<ul style="list-style-type: none"> Very profitable for real-estate owners to rent in rich areas.

(Spain)	<ul style="list-style-type: none"> • Housing/real estate hardly affordable along the coast, with some exceptions on the north side. • In a context of high heterogeneity of income measured at individual income level. • The income per capita in the city is on average higher than the national standard.
Madrid (Spain)	<ul style="list-style-type: none"> • High affordability spatial segregation between core city and suburbs. • High levels of segregation along a North-South transect for income. • On average richer areas top above national standards. • Very heterogeneous rental profitability.
Palma de Mallorca (Spain)	<ul style="list-style-type: none"> • Economic segregation triggered by touristic demand. • On average areas with larger income per capita than national standards. • Very high property prices on points of interest. • Fragmented / polycentric spatial patterns of profitability.
Avignon (France)	<ul style="list-style-type: none"> • A “donut structure”, typical of a shrinking market in core-areas. • Avignon’s real estate market is characterised by lower prices. • Avignon is characterised by an overrepresentation of below-the-threshold-of-poverty homeowners. • Avignon real estate market is characterised by high spatial discontinuities and a higher level of heterogeneity • Avignon combines a high level of socio-spatial segmentation of the property market, and an unequal process of real estate market based spatial polarisation.
Paris (France)	<ul style="list-style-type: none"> • A core-periphery classical spatial structure of prices, with strong discontinuities, mitigated in the suburbs by a sub-centered structure of submarkets. • Data show the resulting effects of two decades of homogenisation of neighbourhoods towards higher prices (catching up dynamics). • A significant part of the region is highly unaffordable, and out of reach for an average household based on national income; part of the region remains affordable to an average household, while it is not affordable anymore to local residents. • A very selective / filtered ownership access, by income, now constrained also in the inner ring of the region, in former blue-collar, now gentrifying neighbourhoods. • An almost dual regime of housing provision, between exclusive unaffordable homeowner’s neighbourhoods, and lower-end lower-income rental and very profitable neighbourhoods.

4.2 Policy relevance of the results

4.2.1 Access to decent and affordable housing in European cities: the increased and unequal affordability gap

Accessibility to real estate, both for renting and buying, has become a major issue in many urban areas. Estimates based on national income distribution offer very contrasting views.

- For lower-income households, Geneva, Warsaw, Krakow, Madrid and Barcelona are by far **the least affordable FUAs** for ownership, and for ownership only in Paris and the French part of the transnational Geneva Functional Urban Area. **This lack of affordability is mitigated by the rental structure** in Geneva, Paris and Avignon, because of regulations of the rental provision systems.
- For median national income reference, roughly defining the pivotal middle-class, the least affordable cities are Geneva, Warsaw, and Krakow, and to some extent Paris, for ownership applicants. **Rental is the least affordable in Polish and Spanish cities.**
- It does not actually translates into an issue of affordability for the 10% of the wealthiest households, but to some extent, Geneva, Warsaw, Karkow and Paris are **the most exclusive markets for the wealthier part of the population**, regarding ownership.

Generally speaking, inequalities for owners and renters manifest in two spatial scales: inter-urban and intra-urban. Regarding the former, housing affordability is lower in cities/regions with stronger economy and population growth. In Paris, major parts of the region are unaffordable, and out of reach for an average household based on national income. This has been the effects of two decades of continuous price increase, since the mid-1990s, and a growing disconnection between prices and income. The metropolitan processes at stake (deindustrialisation and growth of advanced producer services, job markets, increased reliance of the economic growth over the investment, financialisation of real-estate markets), have contributed in such an affordability gap in many cities. This trend is true also in a capital city like Warsaw, where the amplitude of unaffordability reaches a striking level. Indeed, the results from the three largest cities in Poland clearly suggest that housing affordability is spatially uneven.

The urban area of Barcelona offers a good example of the effect of renewal and urban entrepreneurialism over the last decade. The last major urban transformation leading to the current city structure has been launched for the opening of the 1992 Olympic Games (Degen and Garcia, 2012). A significant part of the city centre has been restructured and renovated, transitioning from depressed neighbourhoods to some of the most expensive areas of the city with the exception of some areas in El Raval and Ciutat Vella. In parallel, Barcelona became a tourist attraction centre at a global level. The tourism concentrates in the central area of the city, Ramblas, Plaza Catalonia, Gothic Quartier, Montjuic, Gràcia and all the way to the Parc Guell and Tibidabo. Housing prices have increased in the last two decades with a real estate

bubble between 2002 and 2008, a light depression afterward and a subsequent expansive phase in the last seven years. Following the crisis, the conditions to access to mortgages have become very restrictive and, as a consequence, a good part of the demand has been deviated to the rental market leading to price increases.

As in the case of Barcelona, Madrid has experienced an important growth in population since the 1960's when people from other parts of the country moved to the cities in search for better labour conditions. This large inflow marked the building of denser neighbourhoods in the former peripheries of the city and the growth of the suburban populations. The economic development of the 1990's and the boom of the real estate bubble in the early 2000's have progressively restructured the city beyond the traditional suburbs, along with the requalification of the central areas (Vorms, 2009 #1883). In central neighbourhoods, prices have increased and favoured a gentrification process. After a strong decrease in price between 2007 and 2013 (-60%), price rose an average 30% in Madrid between 2013 and 2019²³.

4.2.2 How housing costs exacerbate differences, inequalities and segregation?

Data from our study also show how housing and unequal affordability exacerbates class-based segregation, to some extent. In Paris, for instance, the West-East classical divide between the “golden ghettos” of the most affluent neighbourhoods and lower-end neighbourhood did not fade away, amid the price homogenisation process. Inflation has been ubiquitous during the last two decades, but the hierarchy of neighbours has been maintained, and extended to the inner suburbs. The core-periphery classical spatial structure of prices, with strong discontinuities around the core area of Paris, is also very unequal, only mitigated in the suburbs by a sub-centered structure of local submarkets with peak-values nearby outersurbs transportation centers and “new towns”. This ranking between neighbourhoods leads to a strong, very selective / filtered ownership access, by income, now constrained also in the inner ring of the region, in former blue-collar. The gentrification process in such neighbourhoods is now very well advanced and irreversible, as for the changing structure of income distribution and eviction processes of the lower-income households. This process is reinforced by a dual regime of housing provision, between exclusive unaffordable homeowner's neighbourhoods, and lower-end lower-income rental and very profitable neighbourhoods

In Poland also, the study shows, at the intra-urban scale, to what extent housing (buying it or renting) is significantly less affordable in the central districts, and in the core cities in general. Such form of spatial inequalities may have strong implications for the development of

²³ Source : House Price Index, Madrid, according to <https://www.kyero.com/data/en/data/spain/community/madrid/house-price-index>

socioeconomic segregation patterns. Essentially, if the spatial gap in housing affordability develops further, the access of lower income groups to the core cities may be limited and the suburbanisation of poverty may become an issue. By the same token, the process of gentrification will be sustained or accelerated further. As the core cities remain the main pools of jobs, increasing commuting costs could further worsen the economic situation of those less affluent household that will be 'pushed' to the suburbs/periphery of urban regions. The lowering housing affordability could also aggravate the housing situation of other groups of population in the city, as people with lower (or even medium) incomes may not be able to improve their housing conditions, even such need arises from the family life-cycle.

At larger scales (intra-urban), among the important processes, gentrification and touristification are preeminent, but many factors can be highlighted:

- *Urban dynamics and growth.* Such urban development dynamics occurred in Spain, as shown in the present urban organisation of Palma de Mallorca which was planned during the expansion following the arrival of important tourist flows at the end of the 1960's. During the 1970's and 1980's the city grew both toward the interior and along the present seafront line in an explosive way. The last decades have not seen a large urban development but an intensive redevelopment of the previously constructed areas with the exception of the Marratxi municipality, which expanded in 1980' and 1990's. This trend was more marked during the real estate bubble of the 2000's with some new constructions toward the suburbs of the city in the interior and municipalities near Palma that act as satellites (Llucmajor and Marratxi). The rest of the FUA is eminently rural although a significant fraction of farms has been transformed into second residences or rural hotels. The main economic activity of the city has been tourism and services for decades.
- *Local contingencies in the structure of submarkets.* In Avignon, for instance, the rental market in the inner city is much more expensive, in relative terms, than the owner-occupied segment, because of higher rates of population turnover or over-representation of single households.
- *Investment-driven and the financialisation of housing.* There is clearly an effect of how the investment is driven by public policies and ordinary financialisation (*i.e.* increased access to cheap credit, expansion of the credit, privatisation of social housing, and private investors and households investing in the rental sector with tax incentives and deduction). This is highlighted, indirectly, in our data, by how ownership structures the wider market, because of the many incentives towards individual ownership. This leads for instance in Avignon to an overrepresentation of below-the-threshold-of-poverty homeowners, living in the outsuburbs, where individual single-family housing are the most preeminent built environment. The Paris FUA is also unaffordable in vast areas, and out of reach for an average household based on national income. A typical households would require both assets (housing

wealth or intergenerational transfer) to purchase a property, as well as credit. This trend can also be indirectly observed through the relative affordability of homebuying, compared to renting, in many places. From this, the structure of private sector rental is deeply unequal in many contexts, as highlighted by the rental profitability index: it is often the case that the lower income areas are the more profitable for landlords.

To sum up, bearing in mind that the income inequalities in Poland or Spain are among the highest in Europe, the spatial inequalities in housing affordability could eventually jeopardise the right to (live in) the city for significant groups of population. This problem will be especially acute in the largest cities. Finally, given the differences between the urban regions and within them, policy responses to the problem of housing affordability should be tailored to the local demographic and economic context of the city and its region.

4.2.3 An overview of some policy issues related to affordability

Public and social housing

In many cities in Europe, social and public housing is being restructured under the pressure of neo-liberal policies and the on-going restructuring of the welfare state (Aalbers and Holm, 2008; Fields and Uffer, 2014). In France, and not only in Paris, many branches of public housing provision are currently being restructured by legislation. Some major institutional renters s.a. *Caisse des Dépôts* have sold their portfolio of social housing to developers. In Barcelona, the city government intends to promote public renting, which is now marginal, to reach the standards of other EU countries. City and regional governments implemented a public rental housing pool but this service was shut down following the aftermath of the 2009 economic crisis and most of the housing pool was sold to private investment funds. In Spain, the political agenda of several parties includes the recovery of the public renting as well as the regulation of the vacation rental, which although is not as intense as in Barcelona and Palma, it is already causing some gentrification in the most traditional neighbourhoods of the central area, such as Lavapiés. The implementation of this policy and others discussed such as the limitation of renting prices depends upon the aftermath of the local elections celebrated on May 26, 2019.

Policies regarding short term rental housing

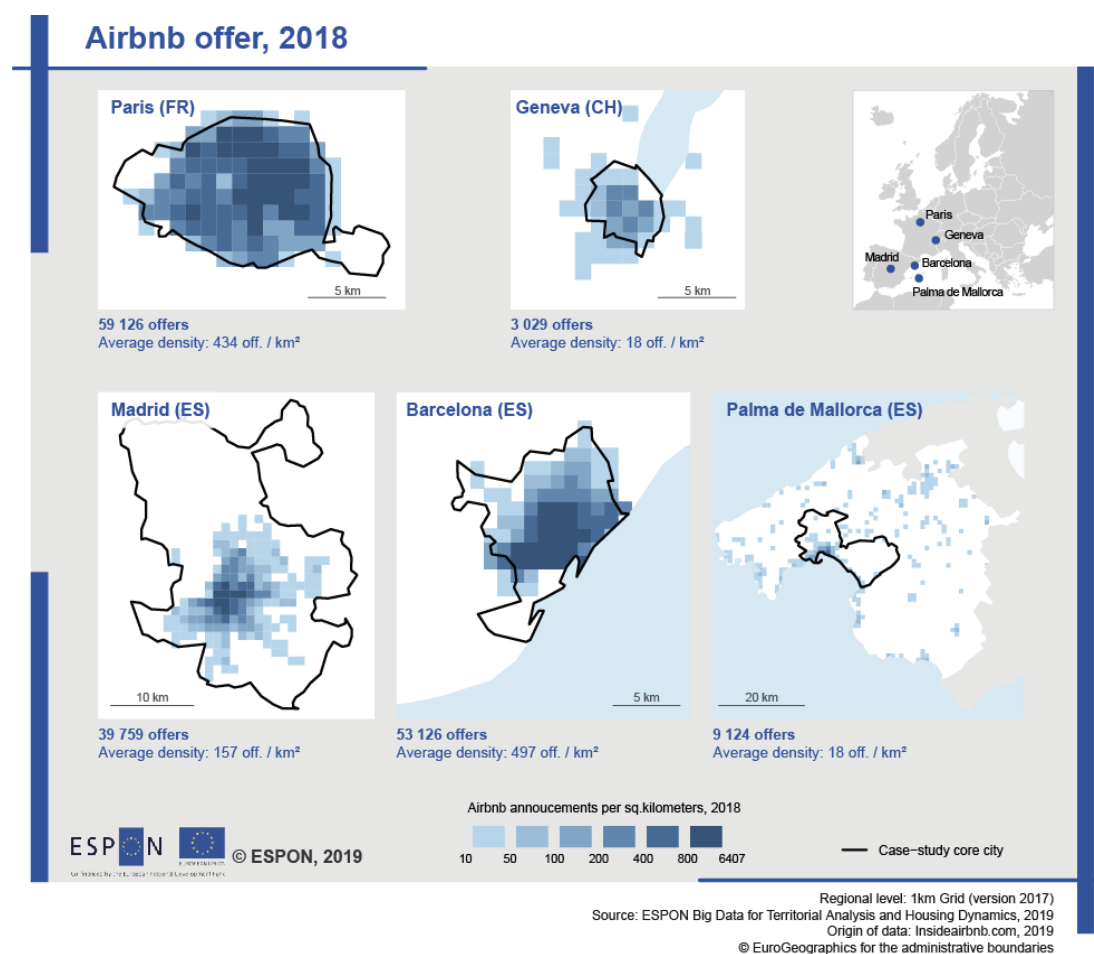
In Barcelona as well as in Paris, tourist housing enhances the pressure on the rental market, in central areas (Map 4-1). In fact, the effect of tourist short-term housing (s.a. Airbnb) in the growth of rental prices for local citizens is one the main issues of public discussion nowadays: this is not an ubiquitous phenomenon. In Paris, the city has been regulating for the last two years, the authorisation to rent on short terms rentals, to avoid professional renters and limit

the Airbnb platform to permanently occupied apartments. This strategy, however did not limit the expansion of rental markets.

This makes accessibility to housing strongly dependent on the trends in the tourism sector. The last years have witnessed the arrival of the online vacation rental platforms. This has coincided with notable renting price increases. In Barcelona, the regional government has implemented a law to regulate this market, dividing the metropolitan area in areas with a range of restrictions from zones where vacation renting is allowed to others where it is limited to single houses. Since this law was passed only one year ago, its consequences are still to check.

To bring new tools and visualisation methods, so as to analyse how short term rental housing puts pressure on residential property markets, the last section of the Guidance document offers methodological insights, for what appears in many cities an important, yet very localised markets in the core areas (Map 4-1).

Map 4-1 Airbnb density offer: Barcelona, Madrid, Palma de Mallorca, Geneva and Paris



How to maintain the right to the city for the middle class?

Granting housing accessibility is a delicate political issue given the relation between income and prices. This issue is currently addressed by city governance, and city officials have to cope with local movements that occupy vacant buildings, mostly office spaces (Jeudi Noir in Paris ; Okupas in Barcelona). In Paris and Ile-de-France region, access to affordable housing is mostly regulated by pushing for more provision of housing, under the assumption that more provision will help control the prices. This is not, however, always the case, as more housing has been produced in the most expansive areas (Casanova Enault, 2017; Grandclement and Boulay, 2015). In Barcelona, the still city major Ada Colau having played a relevant activist role in the platform PAH²⁴ created precisely as a response to the growth of evictions following the 2009 economic crisis.

One issue would probably be to closely monitor the effect of incentives towards more household's debt and the expansion of credit has been at the same time a solution to, and instrumental in, sustained inflationist trends.

4.3 Next steps

Several directions for policy-oriented analysis derive from this work that delineates a methodological proposal for the collection, comparison and harmonisation of a mix of conventional and unconventional data to characterise housing inequalities and well-being.

First, such a methodology, conducted in several cities in Europe will allow us to monitor the spatial effects of pro-ownership policies on socio-economic inequalities, and the attendant risks of market-based exclusion. The time-frame and the resources of the project did not allow to expand the analysis to time-space dynamics of affordability, as it would require to collect and harmonise price and income across time, and not only across space. This is seen as the most urgent step to take to expand this analysis.²⁵

Second, with this methodological proposal, the data collected should allow to analyse the spatial patterns of inequalities stemming from unequal capitalisation of housing wealth some areas, vs. vulnerability of households in others. The collection of case-studies, their variety as well as the data collected and harmonised indicators proposed will help to compare and characterise some of the inequalities that structure access to housing in European cities. The *price-to-income* ratio, i.e. pressure on income linked to the cost of housing is an interesting

²⁴ Plataforma de Afectados por la Hipoteca, or Mortgage credit Victims Platform in English, is a Spanish association acting for the right to housing, founded in February 2009 in Barcelona and active in the whole Spain. Its creation took place in the context of the Spanish property crisis of 2008-2013, consequence of the bursting of the real estate bubble of the country, and the subsequent protest movements of 2011-2012. Online : <https://afectadosporlahipoteca.com>

²⁵ This analysis is currently being conducted with a mixed methodology (spatial analysis and local surveys of housing provision and housing finance regimes), in Paris, Lyon and Avignon, under a funding scheme provided the French national agency for research (ANR) : *Wealth Inequalities and the Dynamics of Housing Market* <https://anr.fr/Project-ANR-18-CE41-0004>

variable to spatially analyse inequalities of access to ownership, whereas public policies sees it as a superior form of tenure.

Finally, a critical issue for social cohesion and sustainability in metropolitan areas in Europe is to better inform and to map the increased affordability gap. This is why we are committed to explore unconventional web-based data (IDS), and to be able to benchmark their interest and relevance compared to institutional data such as transactions.

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Annex 1 - Legal aspects of harvesting and webscraping

According to a recent survey conducted by Rey-Coyrehourcq (2018)⁵ : “The World Wide Web is the biggest collection of information ever built by humans. However, so far social scientists and economists have used it only very superficially to support their empirical research. There are obviously sources of very different quality. While the content of the internet platforms has various status, private, public, open sourced or crowdsourced (internet users themselves write and post information, e.g. about housing or travel experience in the case of Airbnb), it has a complicated legal status: the information is publicly available in pieces on the website, but its automated collection is forbidden in most cases, and can give rise to serious legal issues (see the LinkedIn vs. Doe case).”

The legal risk for harvesting real-estate data has been assessed. Well-known recent examples that by-passed the threats from platforms include InsideAirbnb, whose data have sustained numerous analysis by scholars and data-journalism, at the origin of an important media coverage of the concrete effect of Airbnb on the housing market in a number of European and US cities (Pecout et al. 2016).

Legal feasibility of data harvesting however lays in grey areas. In Europe and in France, implementation of GDPR however opened the possibilities for scraping and harvesting data for research, subject to **six derogations** listed in article 6 of GDPR. The provisions of article 6 of GDPR require:

- An explicit and clear scientific objective for data harvesting must be defined
- Finality **cannot change** during the project.
- The finality drives the data collected.
- The finality determines the duration of conservation of data

Furthermore, it has been assessed that no personal data has been collected for the preparation of this report (Article 9).

Annex 2 – European maps on indicators relevant for analysing housing dynamics

This annex aims at displaying the European maps of the indicators presented in Table 0-1 and delivered. It proposes consequently a synthetic view of Eurostat indicators available at FUA and core city levels, which are “the most” relevant for analysing housing dynamics.

All the maps have been produced both for core city and FUA urban objects²⁶. The size of the circles are proportional to the population and are comparable between these 2 urban definitions. This the reason why the size of the circles for core cities are quite small, as compared to the FUA, which are largely more populated.

No estimations have been made. However in some situations, the indicators are displayed for a given year for some countries, and other year of reference for other countries. The idea was to try to obtain a maximum of information, without estimating missing values. In that order, the tables below display the year of reference of the indicators gathered by country of the ESPON Area.

Table 0-1 – Year of reference by indicator and by country used for mapping the results (FUA)

Country	POP_2015	POP024_2014	POP2544_2014	POP4564_2014	POP65_2014	HOUSEHOLD_AREA_2011	HOUSEHOLD_SIZE_2011	SINGLE_HOUS_EHOLD_2011	OWNED_DWEL_LINGS_2011	UNEMP_2014	EMP_INDS_2014	EMP_RESTATE_2014	EMP_HOTELS_2014	WF_HIGH_EDU_2011
BE	2015	2015	2015	2015	2015	n/a	2014	2011	n/a	2015	n/a	n/a	n/a	n/a
BG	2015	2015	2015	2015	2015	2011	2011	2011	2011	2015	2011	2011	2011	2011
CZ	2014	2014	2014	2014	2014	2011	n/a	n/a	n/a	2011	n/a	n/a	n/a	2011
DK	2013	2013	2013	2013	2013	n/a	2010	2011	2011	2012	2011	2011	2011	2011
DE	2017	2017	2017	2017	2017	2010	2012	2012	2010	2014	2014	2014	2014	2011
EE	2015	2015	2015	2015	2015	2011	2011	2011	2011	2015	2015	2015	2015	2011
IE	2011	2011	2011	2011	2011	n/a	2011	2011	2011	2011	2011	2011	2011	2011
EL	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	n/a	n/a	n/a	2011
ES	2015	2015	2015	2015	2015	2011	2015	2015	2011	2015	2015	2015	2015	2011
FR	2014	2014	2014	2014	2014	2011	2011	2011	2011	2014	2014	2014	2014	2011
HR	2016	2016	2016	2016	2016	2016	2016	2016	2016	2016	2016	2016	2016	2015
IT	2015	2015	2015	2015	2015	2011	2011	2011	2011	2016	n/a	n/a	n/a	2011
CY	2011	2011	2011	2011	2011	n/a	2011	2011	n/a	2011	n/a	n/a	n/a	n/a
LV	2015	2015	2015	2015	2015	2015	2016	2011	2016	2015	2015	2015	2015	2015
LT	2015	2015	2015	2015	2015	2011	2011	2011	2011	2015	2015	2015	2015	2011
LU	2009	n/a	n/a	n/a	n/a	n/a	n/a	2009	n/a	2009	n/a	n/a	n/a	n/a
HU	2015	2015	2015	2015	2015	2016	2016	2016	2016	2016	2011	2011	2011	2016
MT	2015	2015	2015	2015	2015	n/a	2014	2014	2014	2015	n/a	n/a	n/a	2015
NL	2015	2015	2015	2015	2015	n/a	2015	2015	2011	2015	n/a	n/a	n/a	2011
AT	2014	2014	2014	2014	2014	n/a	2013	2013	n/a	2014	n/a	n/a	n/a	n/a
PL	2014	2014	2014	2014	2014	2011	n/a	n/a	n/a	n/a	2011	2011	2011	n/a
PT	2015	2015	2015	2015	2015	n/a	2011	2011	2011	2011	2015	2014	2014	2011
RO	2015	2015	2015	2015	2015	2012	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SI	2015	2015	2015	2015	2015	2011	2011	2011	2011	2014	2014	2014	2014	2011
SK	2015	2015	2015	2015	2015	2011	2011	2011	2011	2011	2011	2011	2011	2011
FI	2015	2015	2015	2015	2015	2011	2012	2012	2015	2015	2015	2015	2015	n/a
SE	2017	2017	2017	2017	2017	2011	2017	2017	n/a	2017	2017	2017	2017	2017
UK	2016	2016	2016	2016	2016	n/a	2016	2016	2011	2015	2016	2016	2016	2011
NO	2013	2013	2013	2013	2013	n/a	2012	2012	n/a	2009	2009	n/a	n/a	2011
CH	2015	2015	2015	2015	2015	2014	2013	2013	2011	2014	2014	2014	2014	2011

With respectively:

- **POP_2015**: Total population, around 2015
- **POP024_2015**: Share of population aged 0-24 years (%), around 2015
- **POP2544_2015**: Share of population aged 25-44 years (%), around 2015
- **POP4564_2015**: Share of population aged 45-64 years (%), around 2015
- **POP65_2015**: Share of population aged above 65 years (%), around 2015
- **HOUSEHOLD_AREA_2011**: Share of single households (%), around 2011
- **OWNED_DWELLINGS_2011**: Share of owned dwellings (%), around 2011
- **UNEMP_2014**: Unemployment rate (%), around 2014
- **EMP_INDS_2014**: Share of employment in industry (%), around 2014
- **EMP_RESTATE_2014**: Share of employment in real estate activities (%), around 2014
- **EMP_HOTELS_2014**: Share of employment in restauration, hotels and transports (%), around 2014

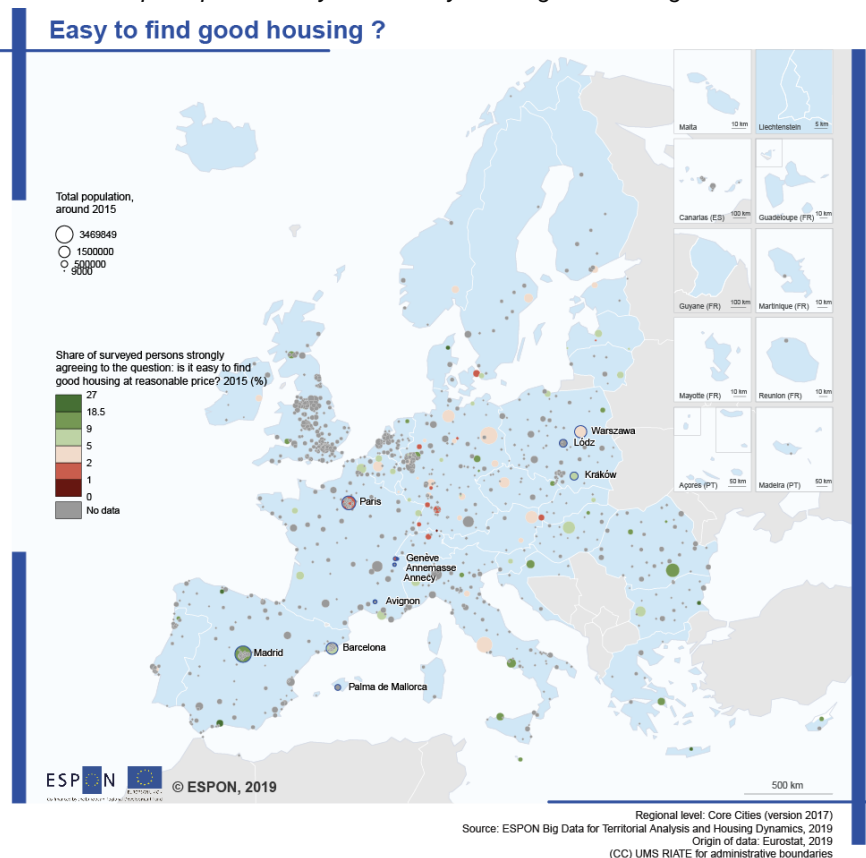
²⁶ Excepted data on the level of education of students, tourism data and the results of the labour force survey, which are only available at core city level.

- **ST_HIGH_EDU_2011:** Share of students in higher education (ISCED 5-6) (per 1000 persons), around 2011
- **WF_HIGH_EDU_2011:** Proportion of population aged 25-64 years qualified at level 5 to 8 ISCED, around 2011
- **NIGHTS_2011:** Total nights spent in tourist accommodation establishments per resident population, around 2011
- **BEDS_2011:** Number of available beds per 1000 residents, around 2011
- **HOUSING_EASY_2015:** Share of persons answering "Strongly agree" to the question of the Urban Audit : is it easy to find good housing in your city ? 2015 Survey
- **HOUSING_DIFFICULT_2015:** Share of persons answering "Strongly disagree" to the question of the Urban Audit : is it easy to find good housing in your city ? 2015 Survey.

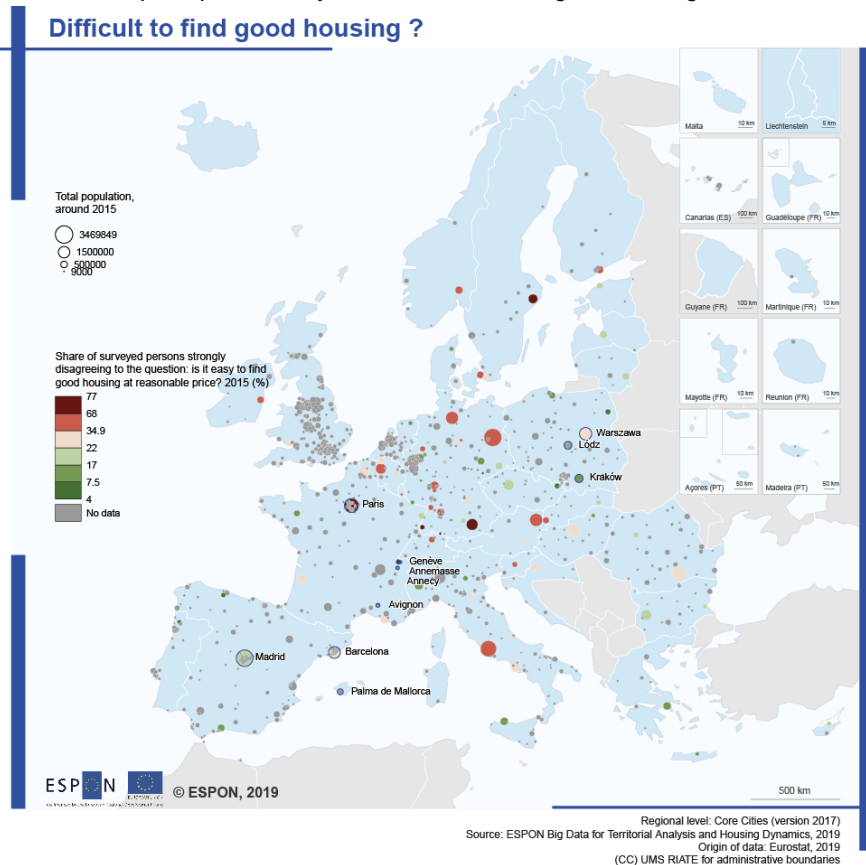
Table 0-2 – Year of reference by indicator and by country used for mapping the results (Core cities)

Country	POP_2015	POP024_2015	POP2544_201	POP4564_201	POP65_2015	HOUSEHOLD_	HOUSEHOLD_	SINGLE_HOUS	OWNED_DWEL	UNEMP_2014	EMP_INDS_20	EMP_RESTAT	EMP_HOTELS	ST_HIGH_EDU	WF_HIGH_EDU	NIGHTS_2011	BEDS_2011
			\$	\$		AREA_2011	SIZE_2011	EHOLD_2011	LINGS_2011		14	E_2014	2014	2011	2011	2011	2011
BE	2015	2015	2015	2015	2015	n/a	2013	2011	n/a	2015	2015	2015	2015	2011	n/a	2011	2011
BG	2015	2015	2015	2015	2015	2011	2011	2011	2011	2015	2011	2011	2011	2011	2011	2011	2011
CZ	2015	2015	2015	2015	2015	2011	2011	2011	2011	2011	n/a	n/a	n/a	2011	2011	2011	2011
DK	2013	2013	2013	2013	2013	n/a	2010	2011	2011	2012	2011	2011	2011	2011	2011	2011	2011
DE	2015	2015	2015	2015	2014	2010	2012	2012	2010	2014	2014	2014	2014	2011	2011		
EE	2015	2015	2015	2015	2015	2011	2011	2011	2011	2015	2015	2015	2015	2011	2011	2011	2011
E	2011	2011	2011	2011	2011	n/a	2011	2011	2011	2011	2011	2011	2011	2011	2011	n/a	n/a
EL	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
ES	2015	2015	2015	2015	2015	2011	2015	2015	2011	2015	2015	2015	2015	2015	2015	2011	2011
FR	2014	2014	2014	2014	2014	2011	2011	2011	2011	2014	2014	2014	2014	2011	2011	2011	2011
HR	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015
IT	2015	2015	2015	2015	2015	2011	2011	2011	2011	2011	n/a	n/a	n/a	2015	2015	2011	2014
CY	2011	2011	2011	2011	2011	n/a	2011	2011	n/a	2011	n/a	n/a	n/a	n/a	n/a	n/a	n/a
LV	2015	2015	2015	2015	2015	2011	2011	2011	2011	2015	2015	2015	2015	2011	2011	2011	2011
LT	2015	2015	2015	2015	2015	2011	2011	2011	2011	2011	2015	2015	2015	2011	2011	2011	2011
LU	2011	2011	2011	2011	2011	n/a	n/a	n/a	n/a	2016	n/a	n/a	n/a	n/a	n/a	2008	n/a
HU	2015	2015	2015	2015	2015	2016	2016	2016	2016	2015	2011	2011	2011	2015	2016	2015	2015
MT	2015	2015	2015	2015	2015	n/a	2014	2014	2014	2015	n/a	n/a	n/a	2015	2015	2015	2015
NL	2014	2014	2014	2014	2014	n/a	2011	2011	n/a	n/a	2011	2011	2011	2012	2012	2011	2011
AT	2014	2014	2014	2014	2014	n/a	2013	2013	n/a	2011	n/a	n/a	n/a	2013	n/a	2013	2013
PL	2014	2014	2014	2014	2014	2011	2011	2011	n/a	n/a	2011	2011	2011	2011	2011	2011	2011
PT	2015	2015	2015	2015	2015	2011	2011	2011	2011	2015	2014	2014	2014	2011	2011	2011	2011
RO	2015	2015	2015	2015	2015	2012	n/a	n/a	n/a	2011	n/a	n/a	n/a	2011	n/a	2013	2013
SI	2015	2015	2015	2015	2015	2011	2011	2011	2011	2015	2014	2014	2014	2011	2011	2011	2011
SK	2015	2015	2015	2015	2015	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011	2011
FI	2015	2015	2015	2015	2015	2011	2012	2012	2015	2015	2015	2015	2015	2011	2011	2013	2013
SE	2017	2017	2017	2017	2017	2011	2017	2017	n/a	2017	2017	2017	2017	2011	2017	2017	2017
UK	2016	2016	2016	2016	2016	n/a	2016	2016	2011	2016	2016	2016	2016	2011	2017	n/a	n/a
NO	2011	2011	2011	2011	2011	n/a	2011	2012	n/a	n/a	n/a	n/a	n/a	2012	2011	2011	2011
CH	2014	2014	2014	2014	2014	2014	2013	2013	2011	2014				2011	2011	2011	2011

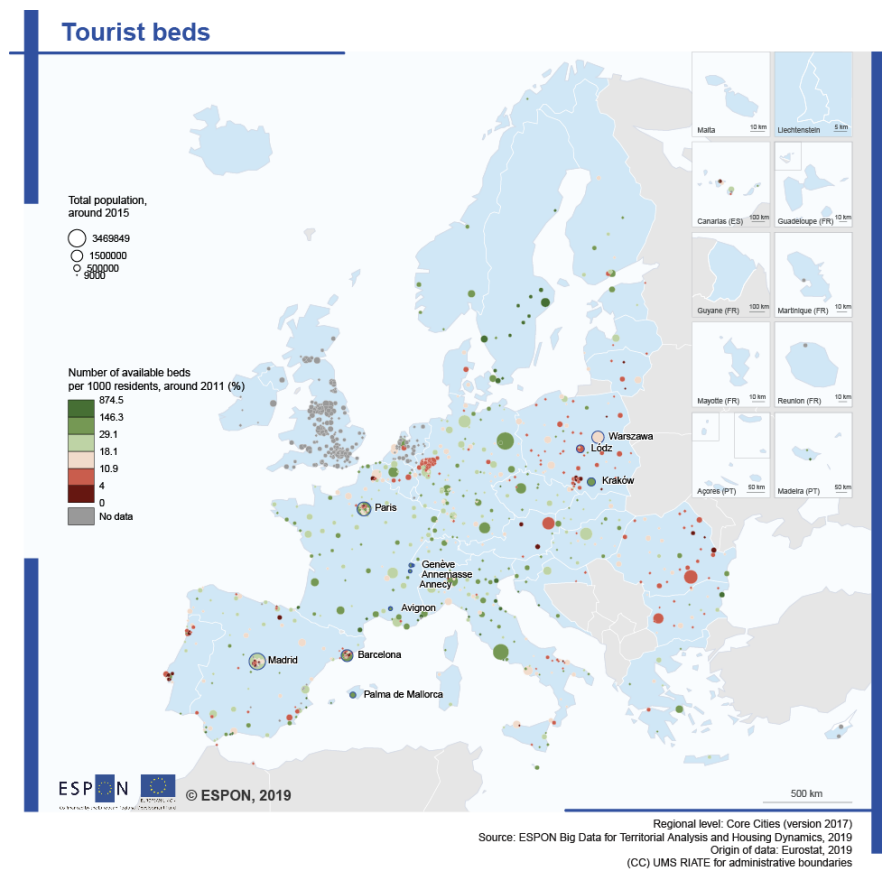
Map 0-1 – Result of the perception survey – Is it easy to find good housing? Core cities



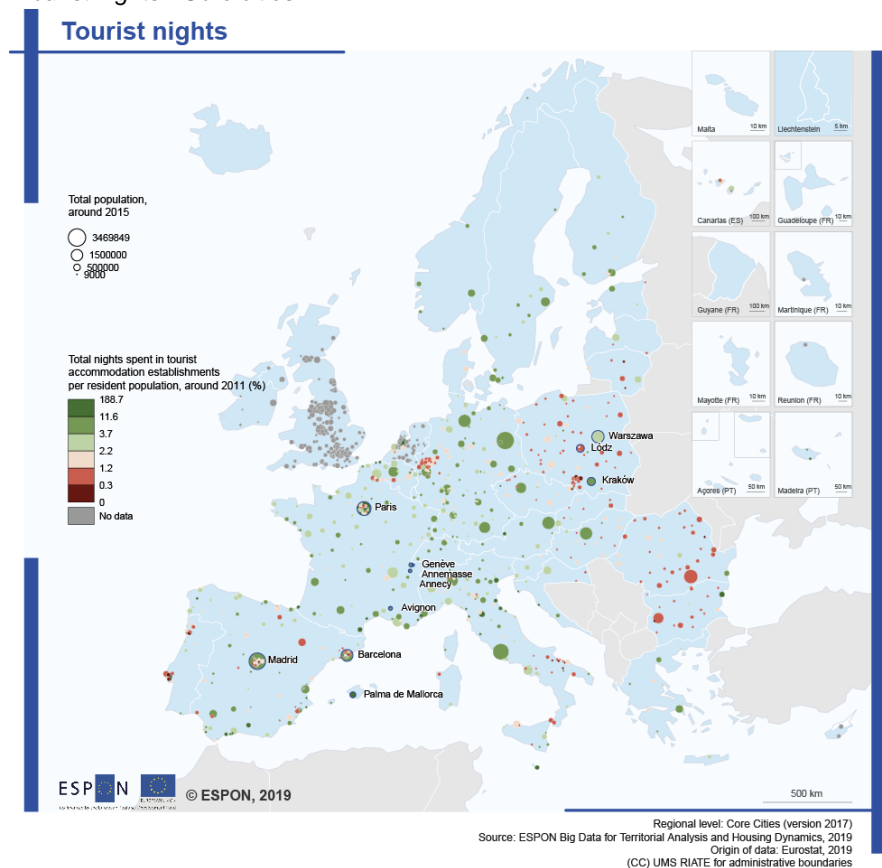
Map 0-2 – Result of the perception survey – Is it difficult to find good housing? Core cities



Map 0-3 – Tourist beds available - Core cities

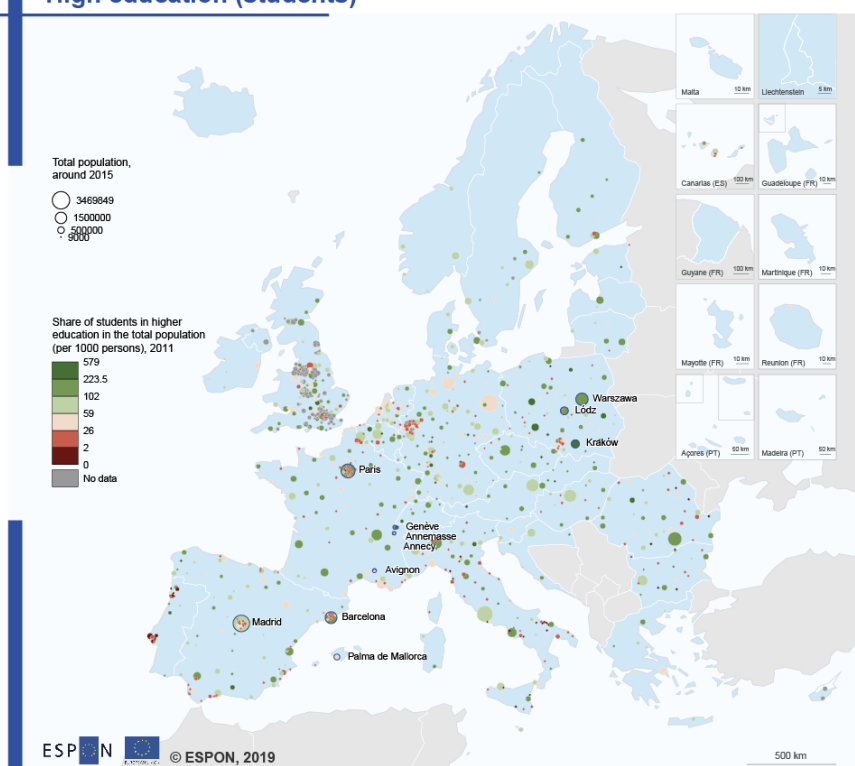


Map 0-4 – Tourist nights - Core cities



Map 0-5 – High education (students) - Core cities

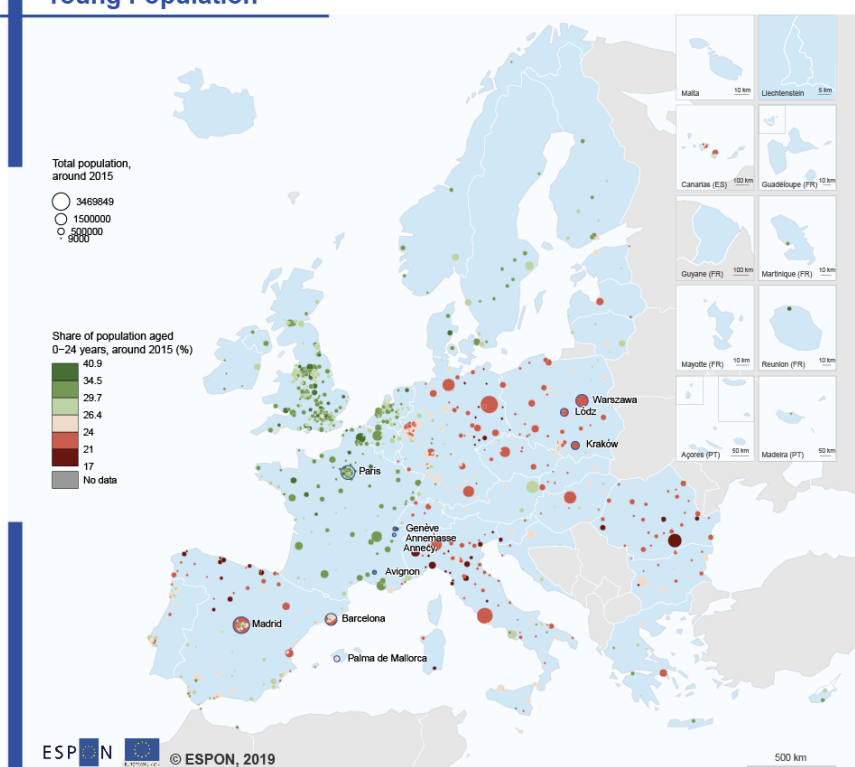
High education (students)



Regional level: Core Cities (version 2017)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Eurostat, 2019
(CC) UMS RIATE for administrative boundaries

Map 0-6 – Young population - Core cities

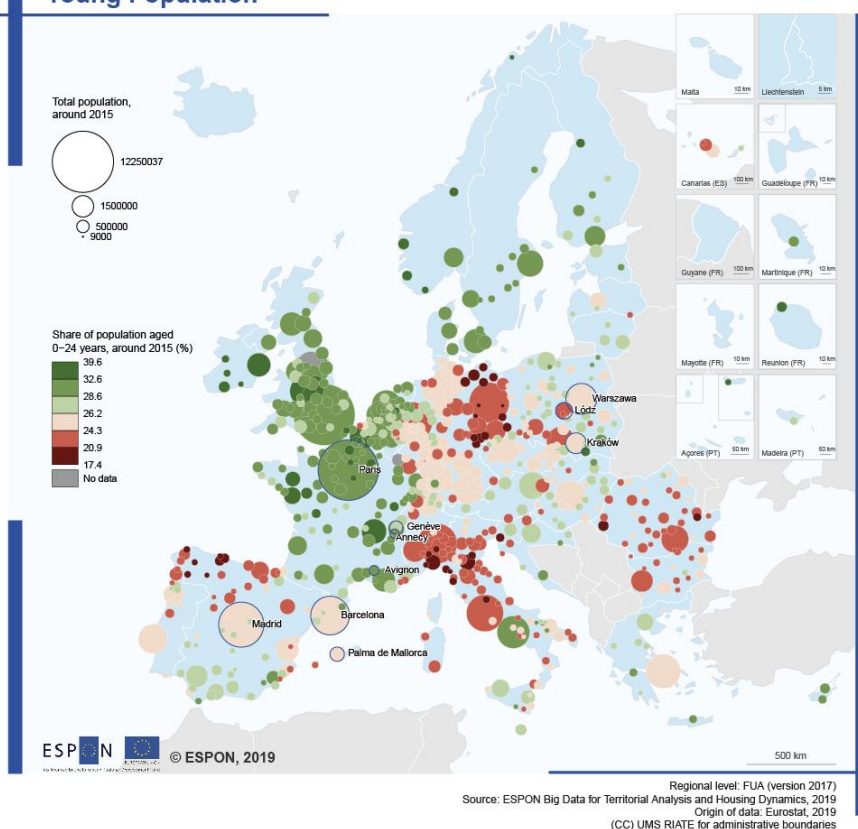
Young Population



Regional level: Core Cities (version 2017)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Eurostat, 2019
(CC) UMS RIATE for administrative boundaries

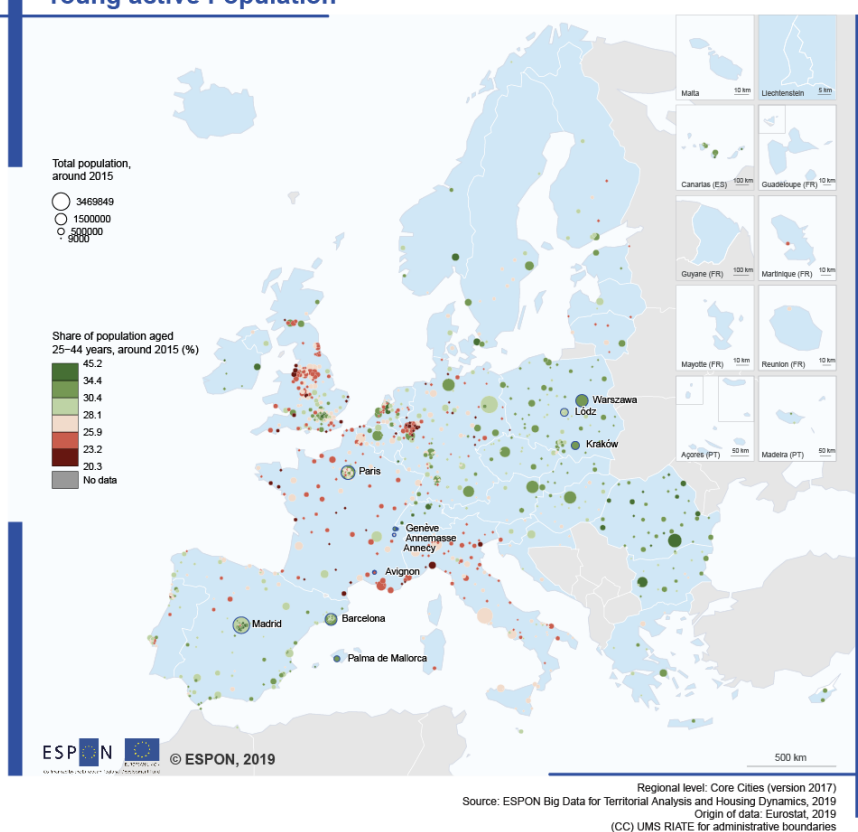
Map 0-7 – Young population – FUA

Young Population



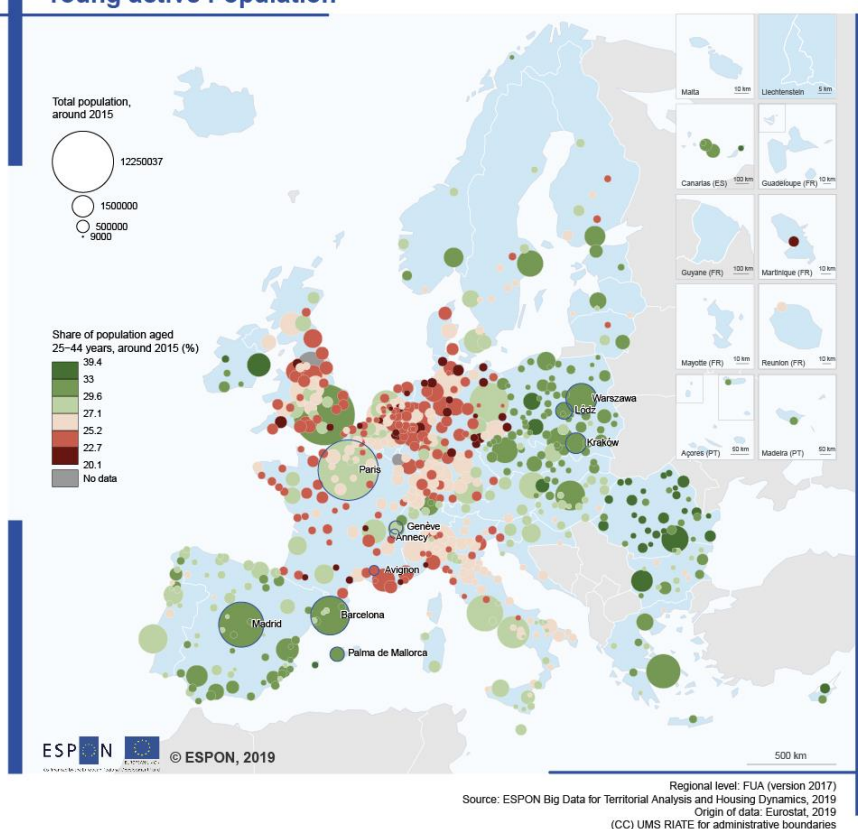
Map 0-8 – Young active population – Core Cities

Young active population



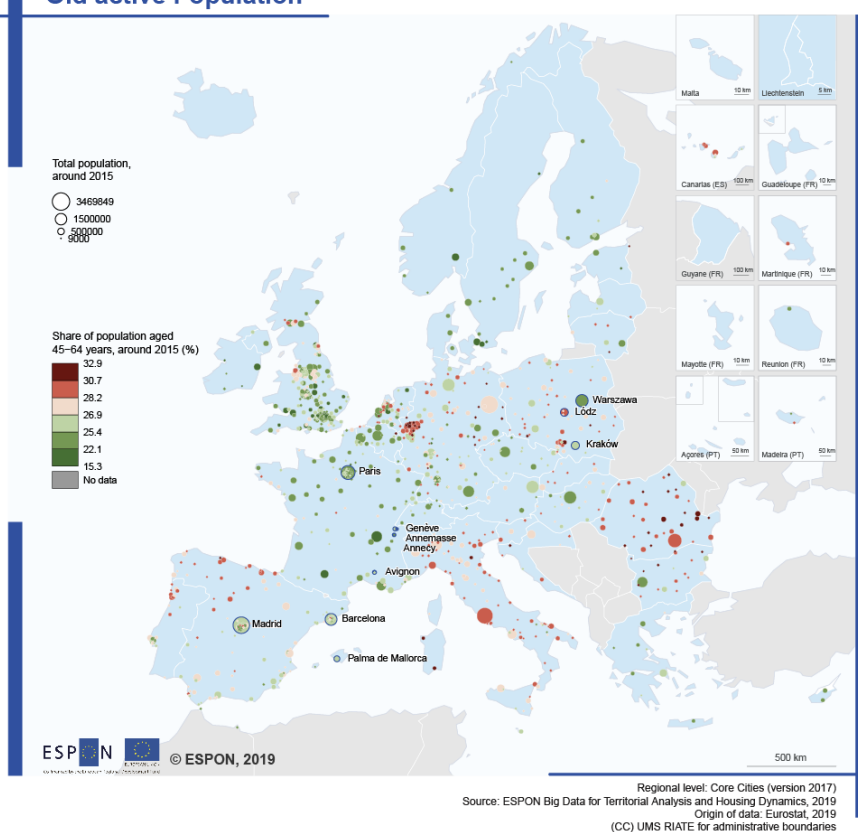
Map 0-9 – Young active population – FUA

Young active Population



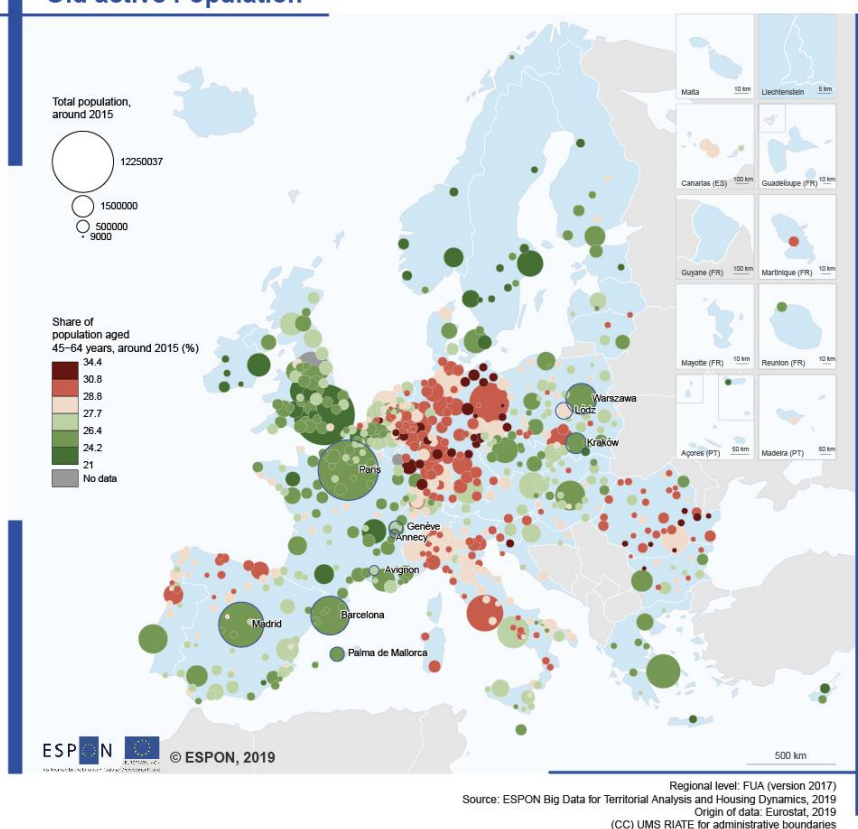
Map 0-10 – Old active population – Core cities

Old active Population



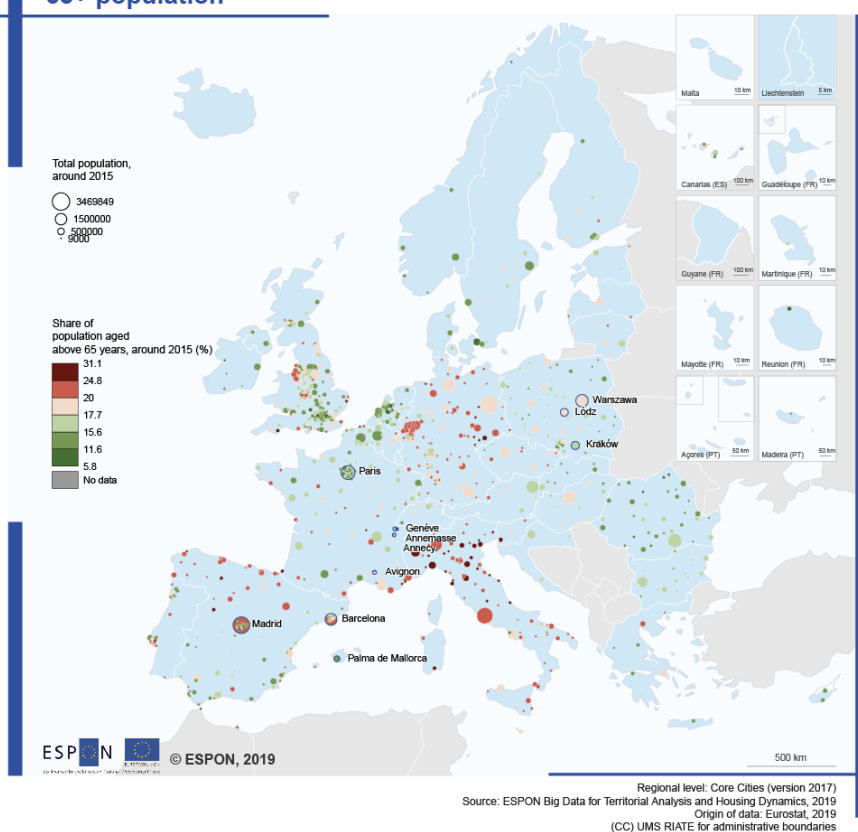
Map 0-11 – Old active population – FUA

Old active Population



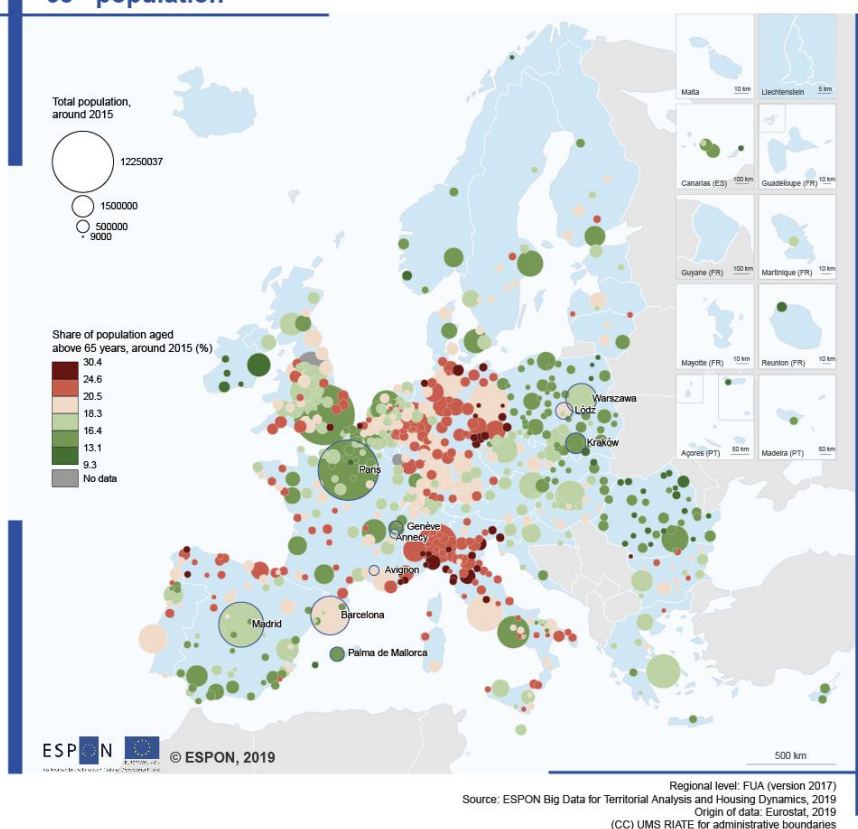
Map 0-12 – Old population – Core cities

65+ population



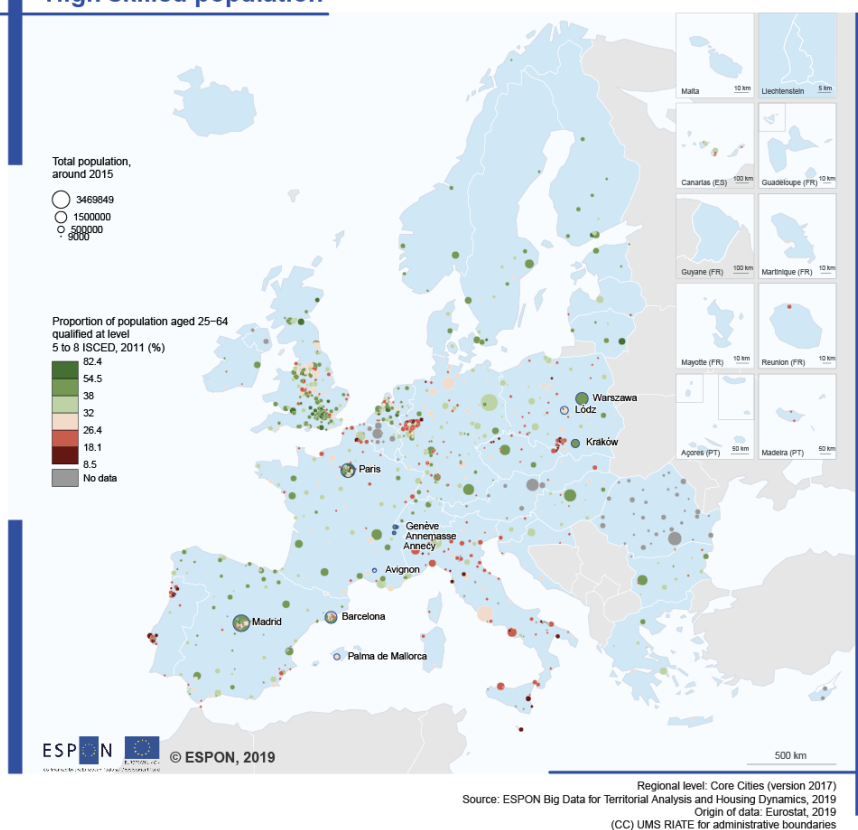
Map 0-13 – Old population – FUA

65+ population



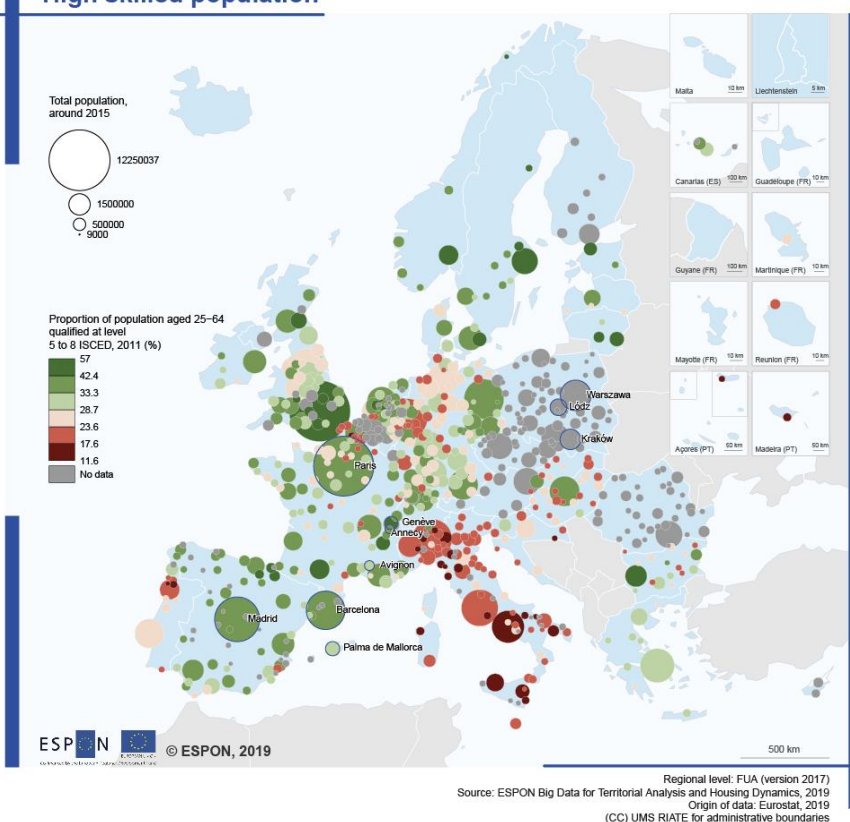
Map 0-14 – High skilled population – Core cities

High skilled population



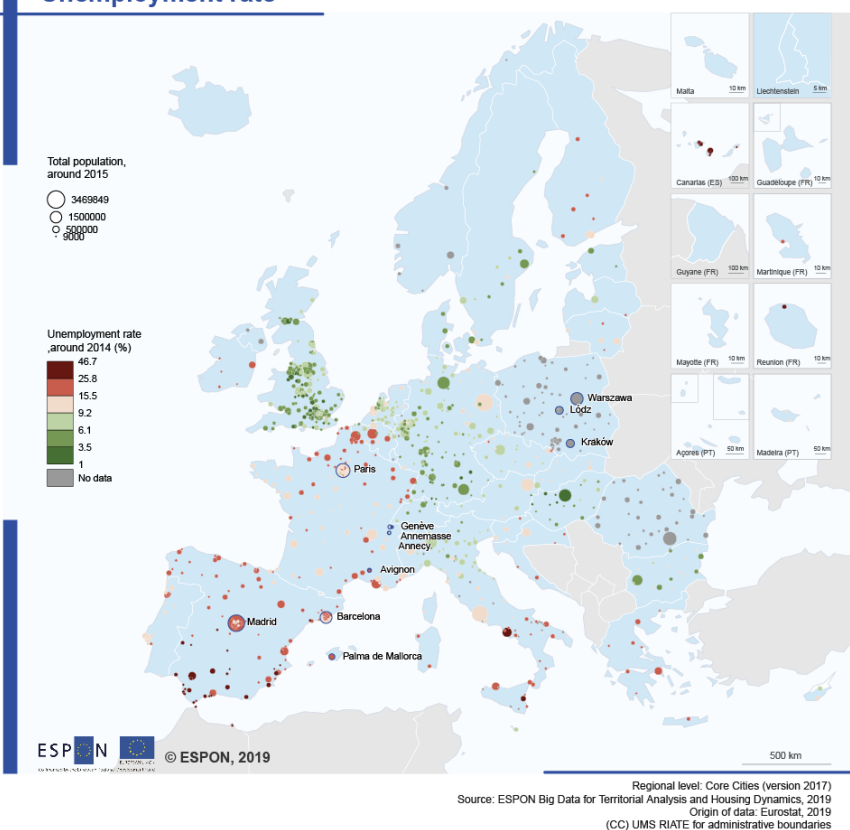
Map 0-15 – High skilled population – FUA

High skilled population



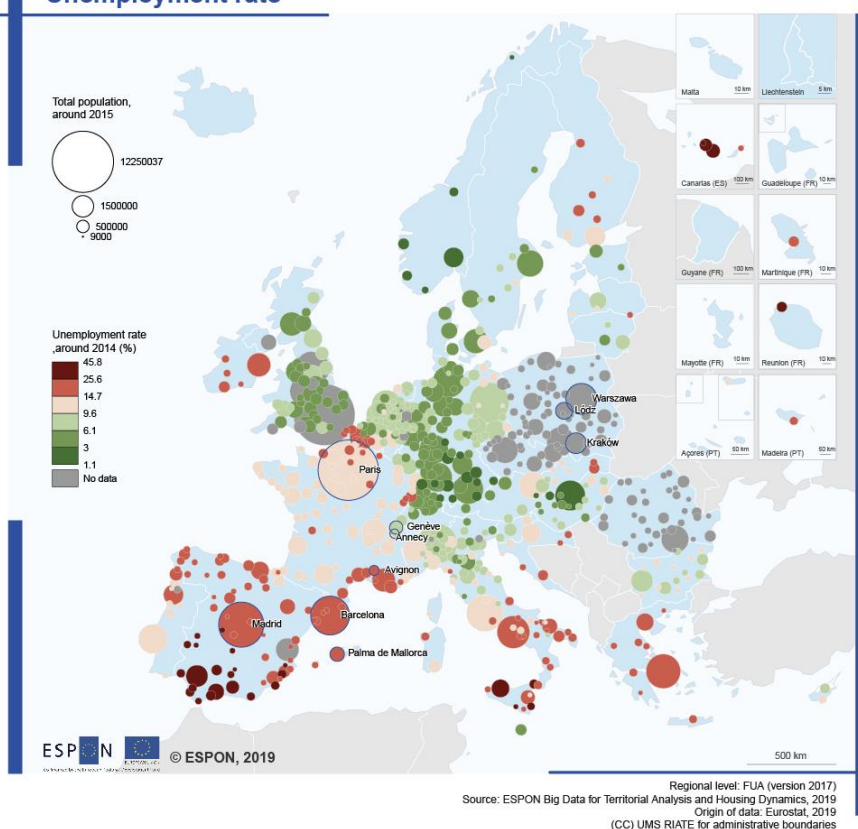
Map 0-16 – Unemployment – Core cities

Unemployment rate



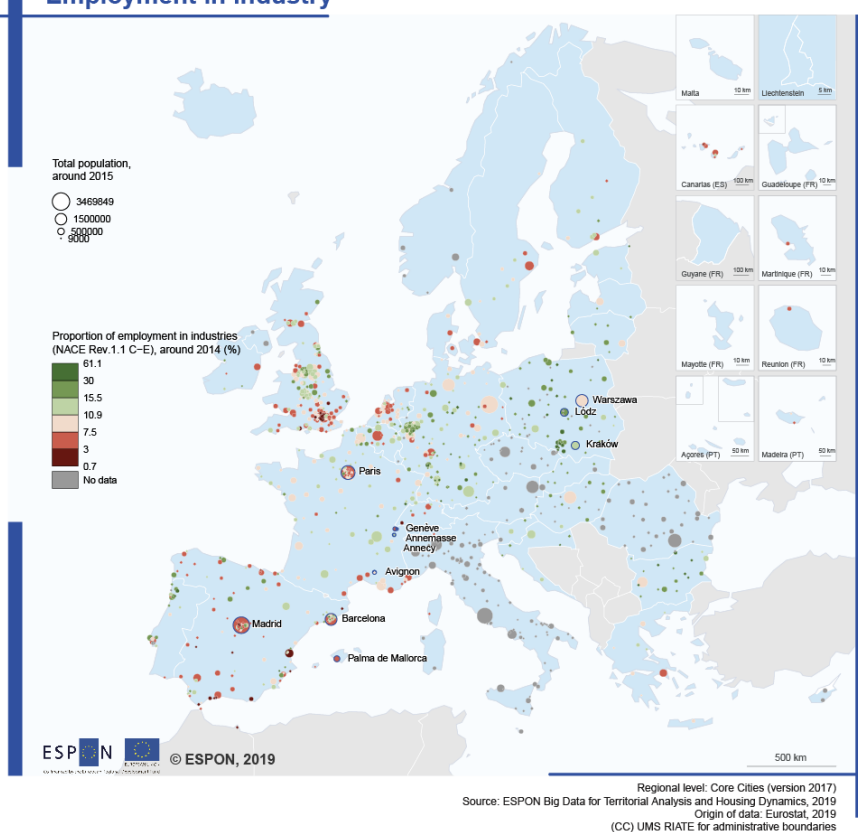
Map 0-17 – Unemployment – FUA

Unemployment rate



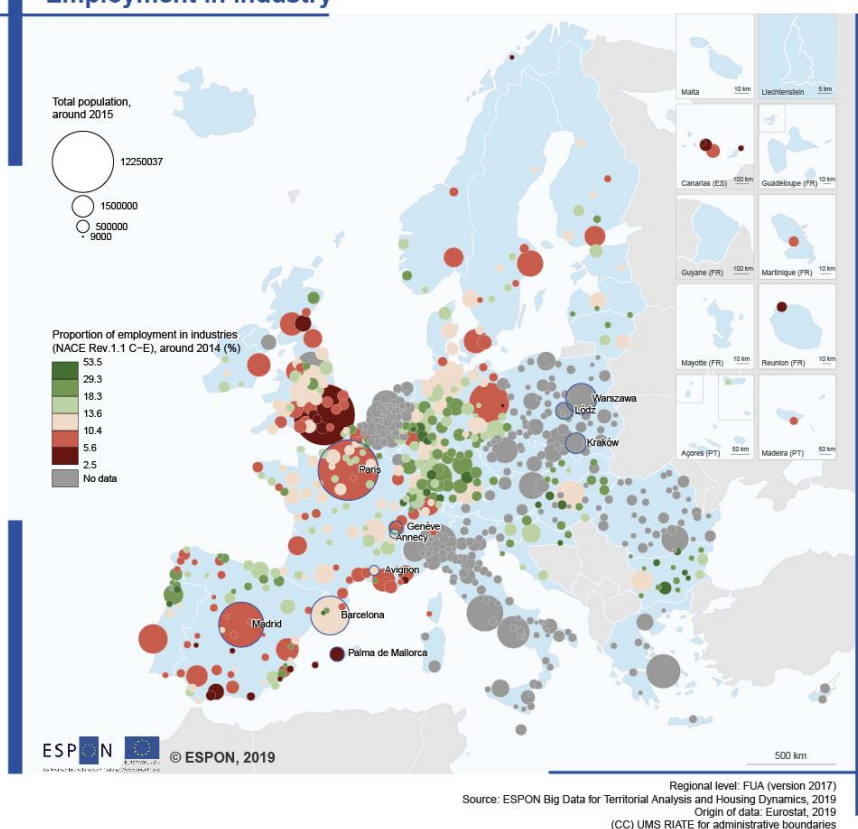
Map 0-18 – Employment in industry – Core cities

Employment in industry



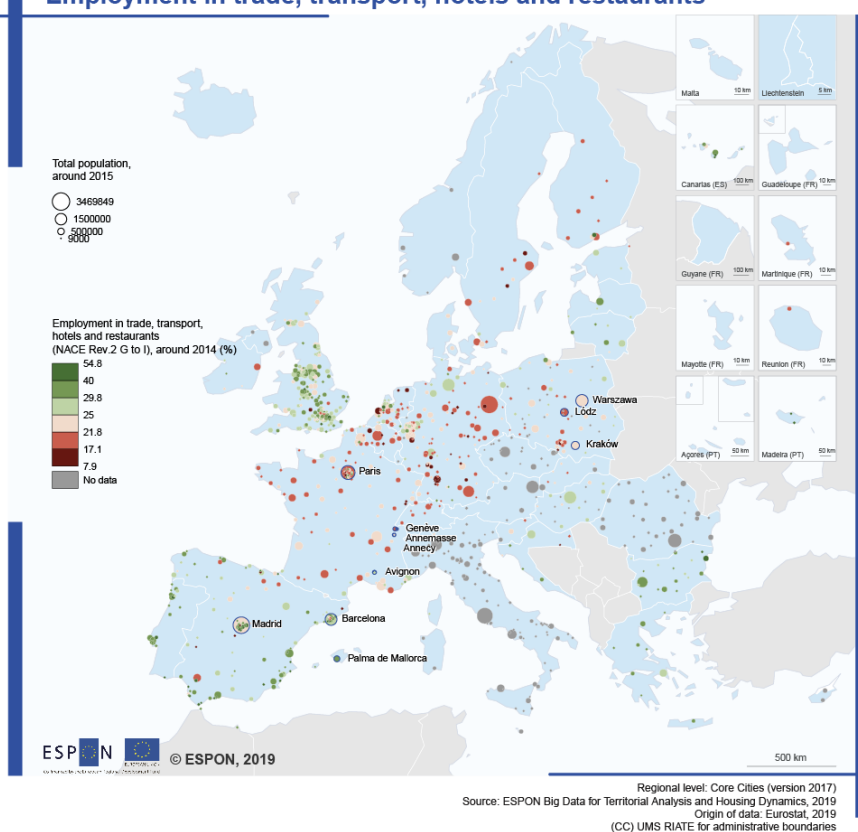
Map 0-19 – Employment in industry – FUA

Employment in industry



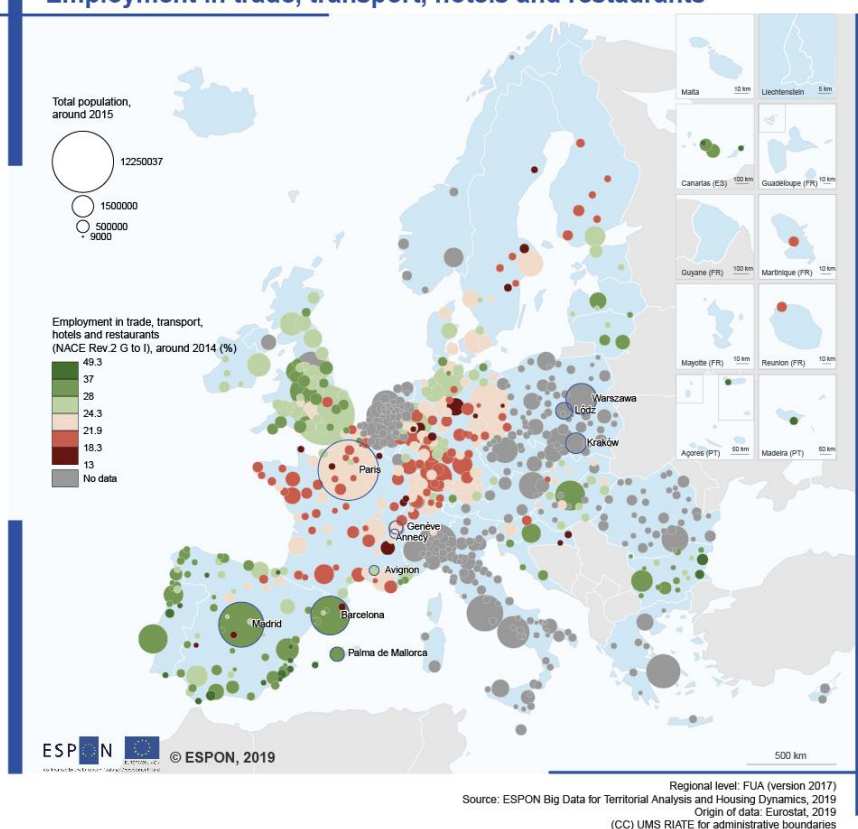
Map 0-20 – Employment in trade, transport, hotels and restaurants – Core cities

Employment in trade, transport, hotels and restaurants



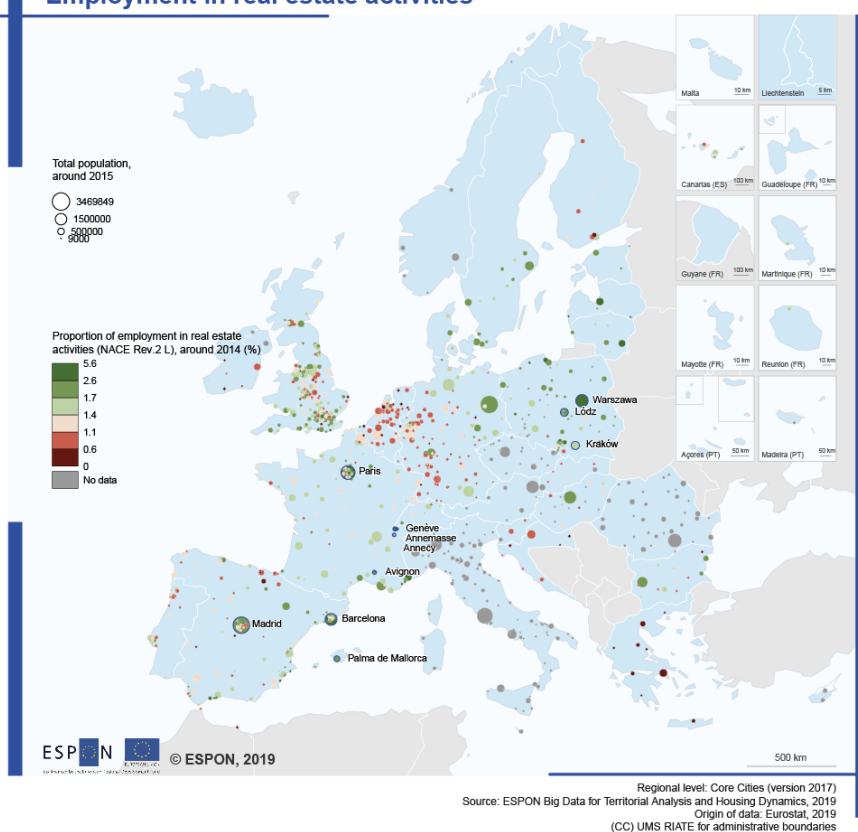
Map 0-21 – Employment in trade, transport, hotels and restaurants – FUA

Employment in trade, transport, hotels and restaurants



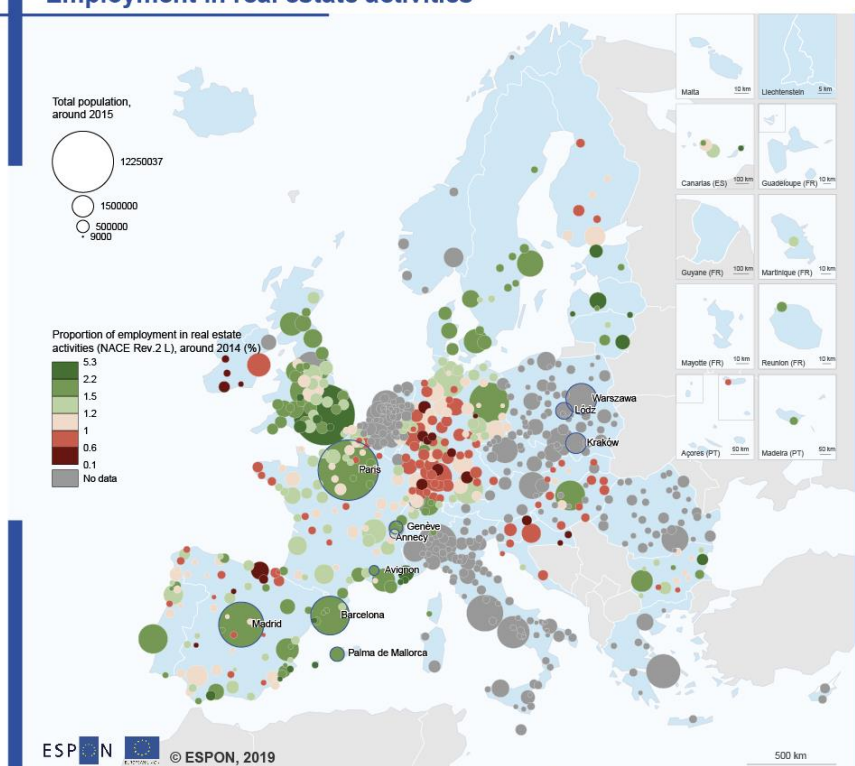
Map 0-22 – Employment in real estate activities – Core cities

Employment in real estate activities



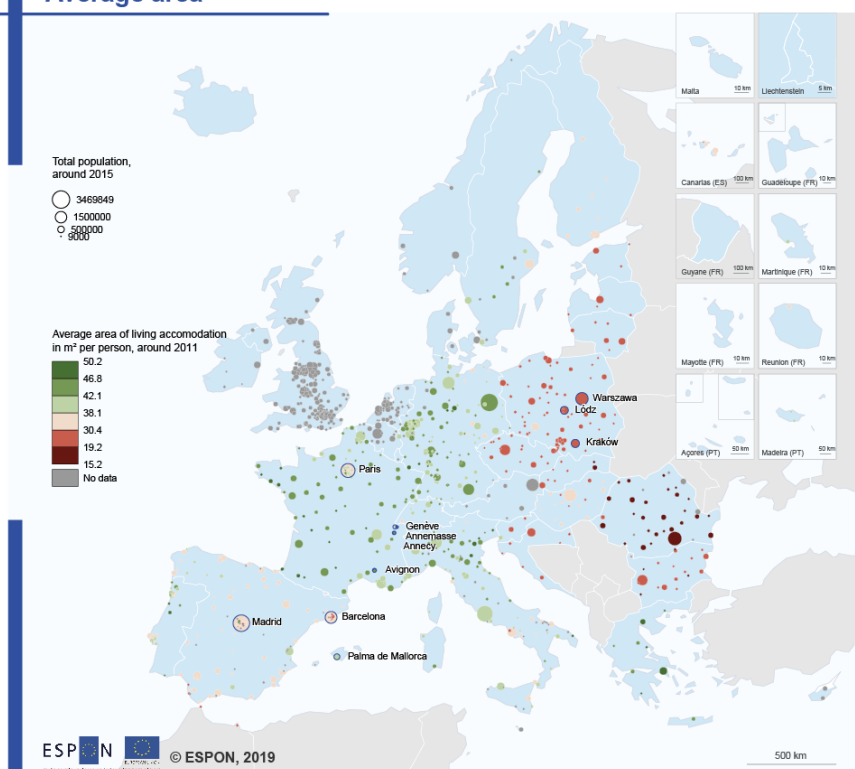
Map 0-23 – Employment in real estate activities – FUA

Employment in real estate activities



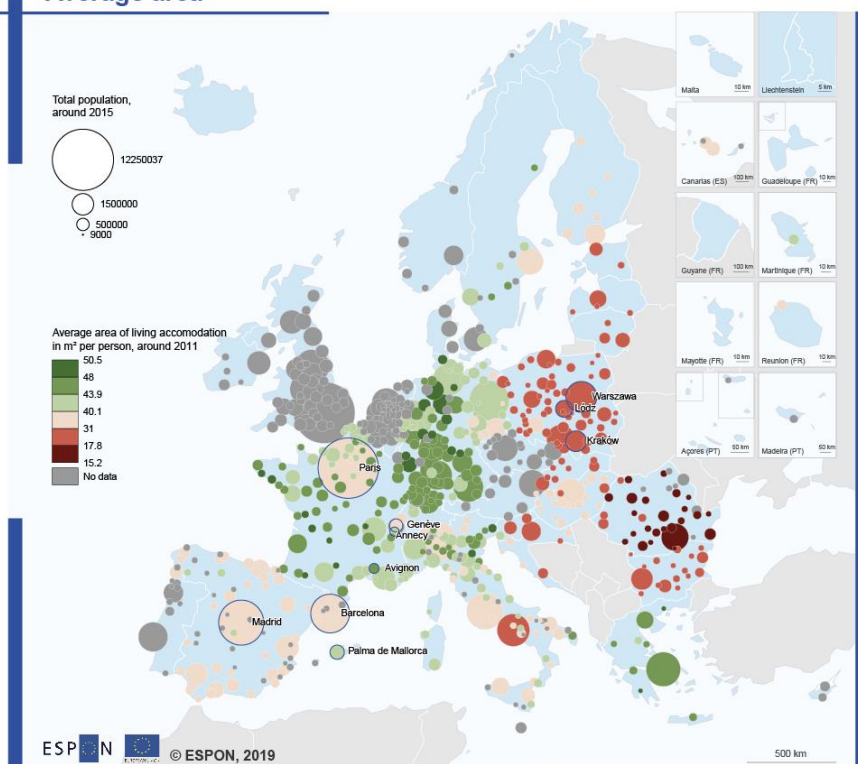
Map 0-24 – Housing average area – Core cities

Average area



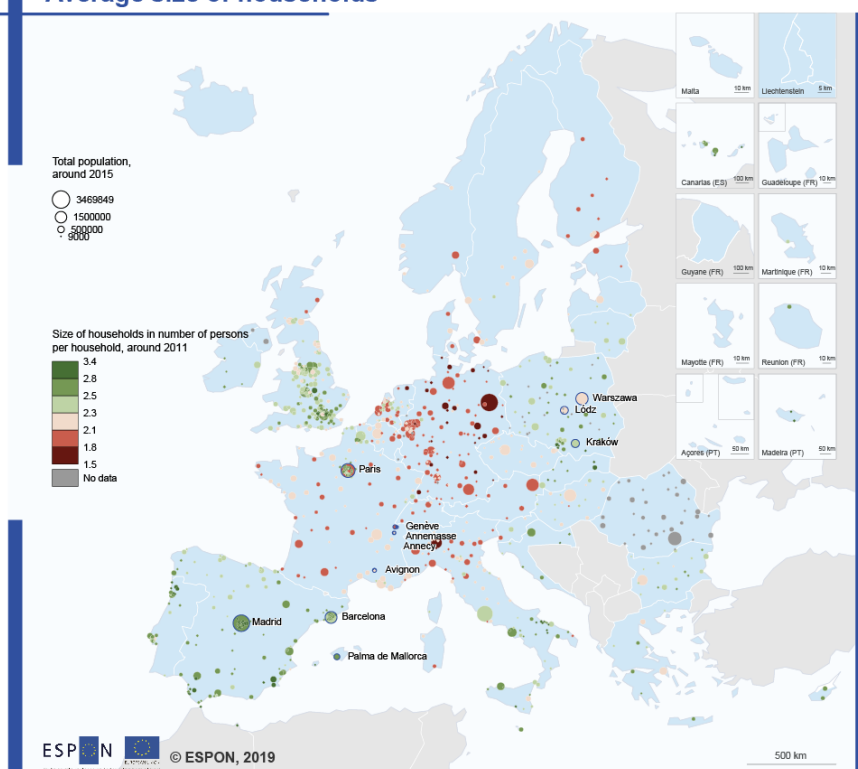
Map 0-25 – Housing average area – FUA

Average area

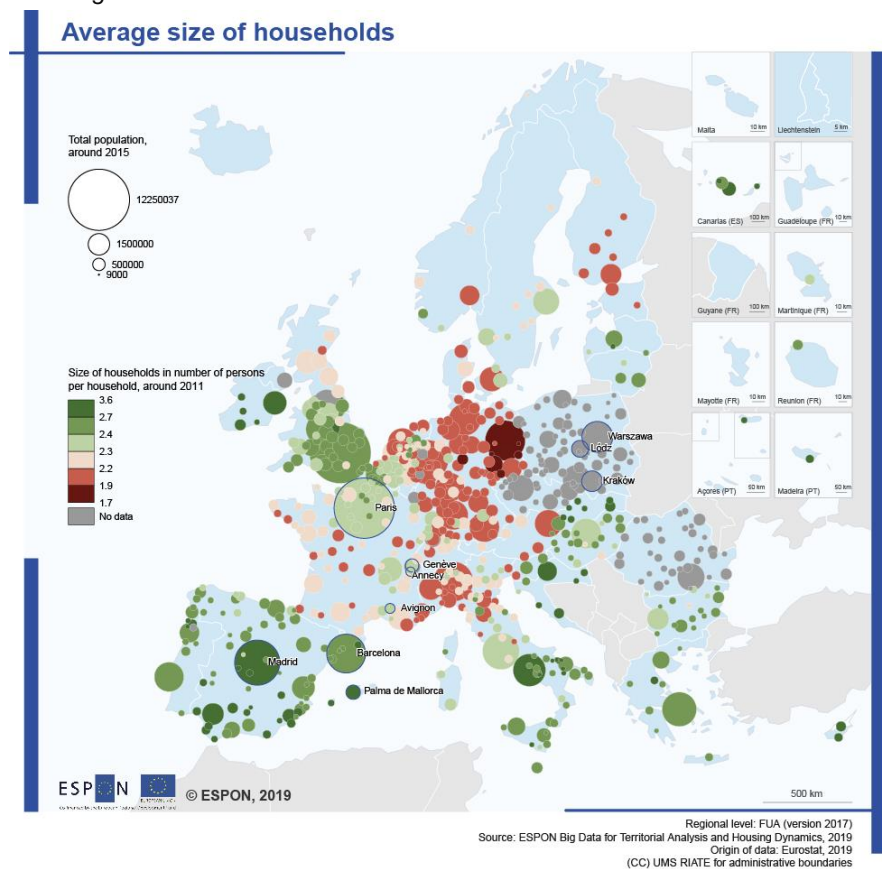


Map 0-26 – Average size of households – Core cities

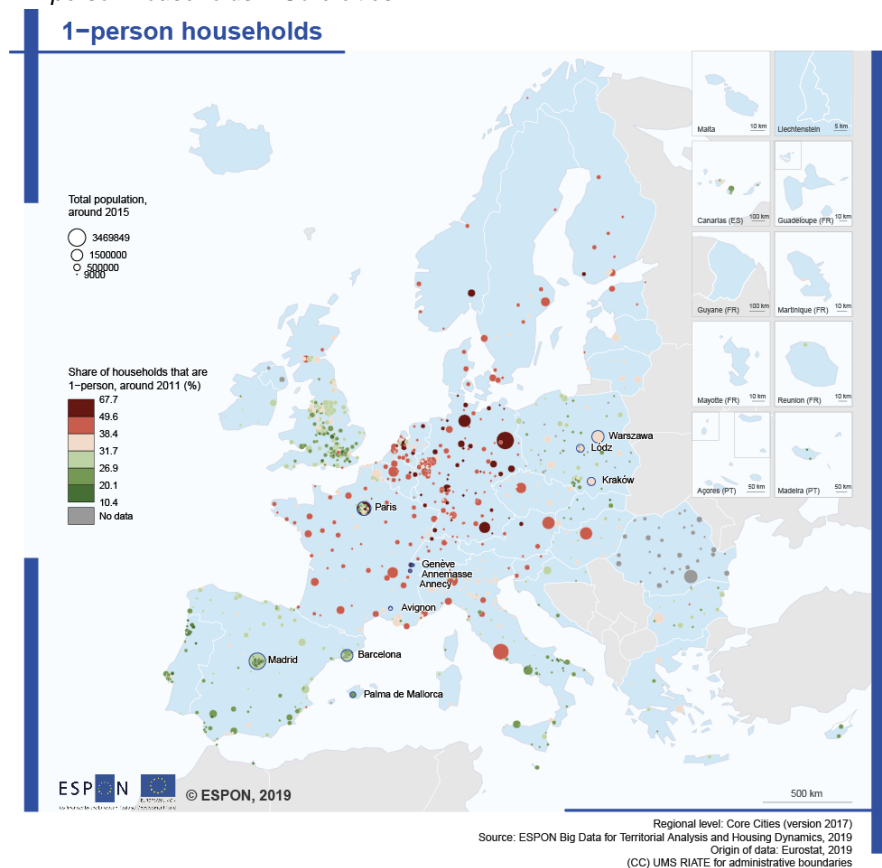
Average size of households



Map 0-27 – Average size of households – FUA

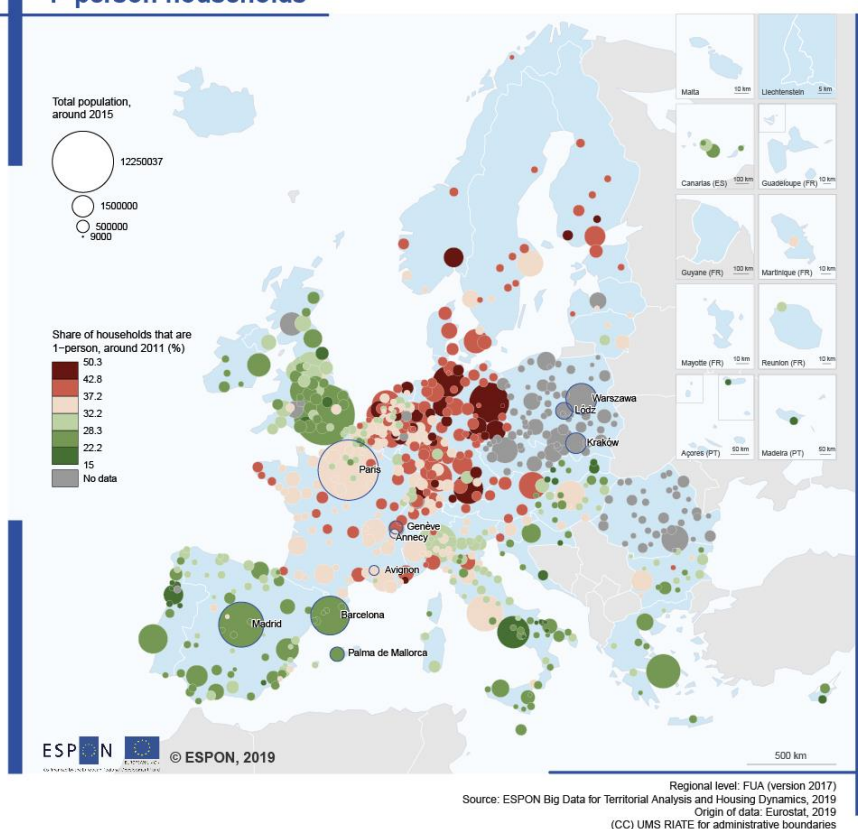


Map 0-28 – 1-person households – Core cities



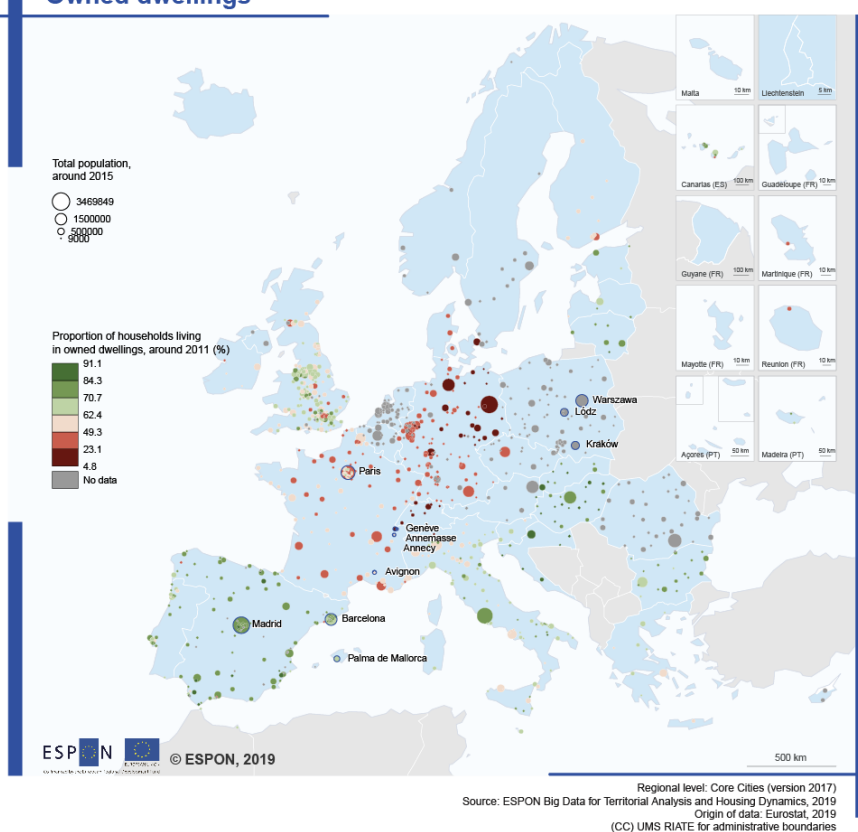
Map 0-29 – 1-person households – FUA

1-person households

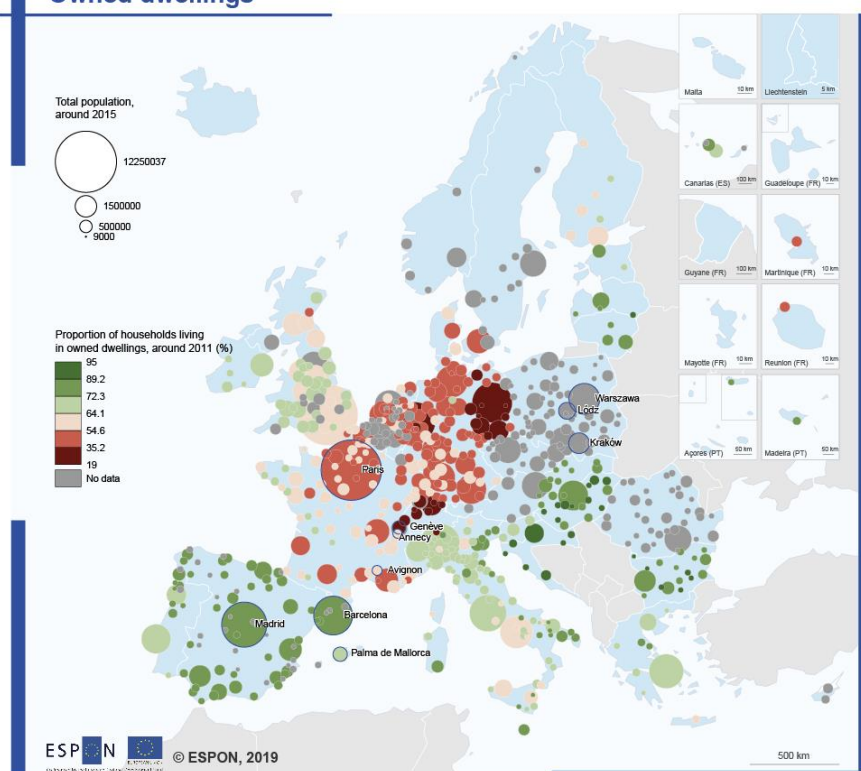


Map 0-30 – Owned dwellings – Core cities

Owned dwellings



Owned dwellings



Annex 3 – Data sources by country

These county files summarise the relevant data sources by country (transactions, data harvesting, income data). This data review has been realised by available country of expertise (Switzerland, Norway, Sweden, France, Spain, Poland, United Kingdom). It highlights the main characteristics of these data resources (spatial coverage, time coverage, available indicators...)

COUNTRY: Switzerland

	OFFICE FÉDÉRAL DE LA STATISTIQUE				Land registry	FSO/OFS	Wuest&Partner	InsideAirbnb	Eurostat
DATA PROVIDER CHARACTERISTICS	Type	Census	Census	Census	Census	Data harvesting	STATENT: firms census	Data harvesting	Survey
	Cost	3650 CHF (2011-2017)	Related to Structural survey and STATENT	Free	Free		4630 CHF	Data harvesting	Free
	Provider	FSO/OFS	FSO/OFS	FSO/OFS	FTA (federal tax administration)	Land registry		Wuest & Partner	Airbnb
	Description	Structural survey	Buildings and dwellings statistics	Housing construction statistics	Tax	Canton	Census	Full database of transaction records	Online collection of Airbnb scrapped datasets
	Condition of use	Private database	Public database	Public database	Public database	Public database	Private database	Public domain	Income distribution by quantile. Income definition harmonized.
	URL	https://www.bfs.admin.ch/bfs/fr/home.html	https://www.bfs.admin.ch/bfs/fr/home.html	https://www.bfs.admin.ch/bfs/fr/home.html	https://www.estv.admin.ch/est/en/home.html		https://www.bfs.admin.ch/bfs/fr/home.html	https://www.wuestpartner.com/?language=en	http://insideairbnb.com/get-the-data.html
SPATIO-TEMPORAL DIMENSION	Geographical Object	Points (X,Y locations)	Points (X,Y locations)	Municipalities	Municipalities	Points (X,Y locations)	Points (X,Y locations)	Municipalities	Points (X,Y locations)
	Time coverage	2011-2017		1995-2018	2001-2015		2011-2017	2000-2018	2018
	Geographical coverage	All Switzerland	All Switzerland	All Switzerland	All Switzerland	Cantons - All Switzerland	All Switzerland	All Switzerland	Geneva
TARGETED EUROPEAN HARMONISED INDICATORS	Price paid							x	
	Price asked								
	Rent paid	x							
	Rent asked								x
	Surface of apt	number of rooms	number of rooms and surface			x		x	x
	Surface of built structure					x			
	Approx building date	x	x			x		x	
	Surface of gardens and land					x			
	Property characteristics	houses-apartments				x		x	some
	Dwelling info					x			
	Income	x			x				
	Credit / mortgage						x		
	Time on market								
	Literal description of the property	no				yes		no	yes
	Other variables of interest for the contract / Additional information								https://ec.europa.eu/eurostat/cache/metadata/en/ilc_esms.htm

COUNTRY: Norway

		Statistics Norway	Eiendomsverdi AS	FINN.no	Boligbasen	Eiendomspriser.no	Airbnb	Eurostat	
DATA PROVIDER CHARACTERISTICS	Type	Census	Data harvesting	Data harvesting	marketplace	Data harvesting	Data harvesting	Data harvesting	Survey
	Cost	Free (API)	Depending on product	Depending on product	Free	Free	Free	Data harvesting	Free
	Provider	Statistics Norway	Eiendomsverdi AS	Eiendomsverdi AS	finn.no	ambita	siste.no	siste.no	Airbnb
	Description	Census	Full database of transaction records	Data gathered from finn.no (marketplace) and some agents	Marketplace which covers almost all sales and rent listings in Norway	Website reporting some kadaster data	Website reporting some listing prices	Website reporting some scrapped datasets	Income distribution by quantile. Income definition harmonized.
	Condition of use	Public database	Private database	Private database	Private database	Private database	Private database	Public domain	Public database
URL	https://www.ssb.no	https://www.eiendomsverdi.no	https://www.eiendomsverdi.no	https://www.finn.no	https://www.dn.no/boligpriser/ and several others	siste.eiendomspriser.no	siste.eiendomspriser.no	http://insideairbnb.com/get-the-data.html	http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di01
SPATIO-TEMPORAL DIMENSION	Geographical Object	City districts	Aggregated at "any" level; Points (X,Y locations)	City districts (and address)	Points (address)	Points (address)	Points (address)	Points (address)	Points (X,Y locations)
	Time coverage	2005-2016	2002-2018	2018(?)	Present -	2010 - present	1990 - present	Present -	2018
	Geographical coverage	All Norway	All Norway	All Norway	All Norway	All Norway	All Norway	All Norway	Oslo
TARGETED EUROPEAN HARMONISED INDICATORS	Price paid		x		x		x		
	Price asked		x		x			x	
	Rent paid			some	x				
	Rent asked			x	x				x
	Surface of apt		x	x	x				x
	Surface of built structure		x		x				
	Approx building date		x		x				
	Surface of gardens and land		x		x				
	Property characteristics		x		x				some
	Dwelling info		x	some	x				
	Income	Median income							
	Credit / mortgage		possibly partial						
	Time on market		x		indirectly				
	Literal description of the property		maybe	maybe	yes	no	no	no	yes
	Other variables of interest for the contract / Additional information	API access	Energy label. Monthly transaction price indices at city district level. Age of buyers and sellers for most of the transactions. Direct access to data not possible.	Monthly rent price indices. Direct access to data not possible.	Probably not possible to legally harvest directly	Map interface. Only name of sellers and buyers	Map interface. Only name of sellers and buyers	Map interface. Only some listings: Prices asked and links to listings	https://ec.europa.eu/eurostat/cache/metadata/en/ilc_esms.htm

COUNTRY: Sweden

		Statistics Sweden	Hemnet	BostadsPortal	Airbnb	Eurostat
DATA PROVIDER CHARACTERISTICS	Type	Census	Market place	Market place	Data harvesting	Survey
	Cost	Free (API)	Free	Free	Data harvesting	Free
	Provider	Statistics Sweden	Hemnet	BostadsPortal	Airbnb	Eurostat
	Description	Census	Marketplace which covers almost all sales and rent listings in Sweden	Marketplace which covers almost all sales and rent listings in Sweden	Online collection of Airbnb scrapped datasets	Income distribution by quantile. Income definition harmonized.
	Condition of use	Public database	Private database	Private database	Public domain	Public database
	URL	https://www.scb.se	https://www.hemnet.se	https://bostadsportal.se	http://insideairbnb.com/get-the-data.html	http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di01
SPATI O- TEMP	Geographical Object	Municipalities	Points (address)	Zip code	Points (X,Y locations)	Countries
	Time coverage	1991-2016	Present	Present	2018	1995-2018
	Geographical coverage	All Sweden	All Sweden	All Sweden	Stockholm	EU28 + EFTA countries
TARGETED EUROPEAN HARMONISED INDICATORS	Price paid		x			
	Price asked		x	x		
	Rent paid			x		
	Rent asked			x	x	
	Surface of apt		x	x	x	
	Surface of built structure		x	x		
	Approx building date		x			
	Surface of gardens and land					
	Property characteristics		x		some	
	Dwelling info		x	x		
	Income	x				x
	Credit / mortgage					
	Time on market		indirectly	indirectly		
	Literal description of the property		yes	yes	yes	
	Other variables of interest for the contract / Additional information	API access	Probably not possible to legally harvest directly	Probably not possible to legally harvest directly		https://ec.europa.eu/eurostat/cache/metadata/en/ilc_esms.htm

COUNTRY: France

		BIEN DATABASE	Demande de Valeur Foncière (DVF)	Le Bon Coin	Meilleurs Agents	InsideAirbnb	INSEE	Eurostat
DATA PROVIDER CHARACTERISTICS	Type	Transactions	Transactions	Data harvesting / web scrapping	Data harvesting / web scrapping	Data harvesting	Census	Survey
	Cost	40000 euros for the Ile-de-France sample.	Free	Data harvesting	Data harvesting	Data harvesting	Free	Free
	Provider	Paris Notaires Service, Chamber of the notaries	Direction Générale des Finances Publiques	Le Bon Coin	Meilleurs Agents	Airbnb	INSEE	Eurostat
	Description	Full database of transaction records	A database of transaction records for the 5 latest years.	Real estate classified posts	Real estate classified posts	Online collection of Airbnb scrapped datasets	Census	Income distribution by quantile. Income definition harmonized.
	Condition of use	Proprietary data. Limited to the Coord. partner. UMS RIATE and Geographie-cités, via LabEx DynamiTe 2014-2017 (Sample of transactions on the period 1996-2012).	Public domain	Public website	Public website	Public domain	Public database	Public database
	URL	https://basebien.com/	https://www.data.gouv.fr/en/datasets/demandes-de-valeurs-foncieres/#_	https://www.leboncoin.fr	https://www.meilleursagents.com/	http://insideairbnb.com/get-the-data.html	https://www.insee.fr/fr/information/1303416/l-lau2 https://www.insee.fr/fr/statistiques/2520034?geo=FRANCE-2	http://appsso.eurostat.ec.europa.eu/mui/show.do?dataset=ilc_di01 https://ec.europa.eu/eurostat/cache/metadata/en/ilc_esms.htm
SPATIO-TEMPORAL DIMENSION	Geographical Object	Points (X,Y locations)	Points (X,Y locations)	Zip codes. Some addresses	Zip codes. Some addresses	Points (X,Y locations)	LAU2 units and INSPIRE GRID	Countries
	Time coverage	1996-2019	2014-2019	present	present	2015 to 2018	31 december 2010 for the grid, 2012-2015 at LAU2 level	1995-2018
	Geographical coverage	Paris – Ile de France	All France (excepted Alsace-Moselle)	All France	All France	Inner cities of Paris, Bordeaux and Lyon	All France	EU28 + EFTA countries
TARGETED EUROPEAN HARMONISED INDICATORS	Price paid	x	x					
	Price asked			x	x			
	Rent paid							
	Rent asked			x	x	x		
	Surface of apt	x	x	x	x	x		
	Surface of built structure	x	x	some	some			
	Approx building date	x		some	some			
	Surface of gardens and land	x	x	some	some			
	Property characteristics	x		some	some	some		
	Dwelling info	partial	partial					
	Income						x	x
	Credit / mortgage	partial						
	Time on market							
	Literal description of the property	no	no	yes	yes	yes		
	Other variables of interest for the contract / Additional information	The PERVAL database, also disseminated by the Chamber of Notaries, provide the same of information for the rest of France. It is also proprietary data.					Median income of households at LAU2 level, sum of income for grids (France). To take into account the impact of differences in household size and composition, the total disposable household income is "equivalised". The equivalised income attributed to each member of the household is calculated by dividing the total disposable income of the household by the equivalisation factor. Equivalisation factors can be determined in various ways. INSEE (since 2012) and Eurostat applies an equivalisation factor calculated according to the OECD-modified scale first proposed in 1994 - which gives a weight of 1.0 to the first person aged 14 or more, a weight of 0.5 to other persons aged 14 or more and a weight of 0.3 to persons aged 0-13.	

COUNTRY: Spain

		BarcelonaTran	Idealista	Cadaster	Fotocasa	InsideAirbnb	Airbnb	AEAT	Eurostat
DATA PROVIDER CHARACTERISTICS	Type	Tax on transactions	Data harvesting	Data harvesting	Data harvesting	Data harvesting	Data harvesting	Official Tax Declarations	Survey
	Cost	Free (agreement)	Data harvesting	Data harvesting	Data harvesting	Data harvesting	Data harvesting	Free	Free
	Provider	Barcelona City Hall	Idealista	Cadaster	Fotocasa	Airbnb	Airbnb	AEAT (National Tax Agency)	Eurostat
	Description	Full database of transaction records	Online collection of Idealista scrapped datasets	Census	Online collection of Fotocasa scrapped datasets	Online collection of Airbnb scrapped datasets	Online collection of Airbnb scrapped datasets	Average income data at municipality level	Income distribution by quantile
	Condition of use	Proprietary data, obtained under a research agreement in a previous project.	Public Website	Public API with certain protection	Online collection of Fotocasa scrapped datasets	Public domain	Public Website	Public database	Public database
URL			http://www.idealista.com	http://www.catastro.meh.es/esp/sede.asp	https://www.fotocasa.es/es/	http://insidea...the-data.html	http://www.airbnb.com	https://www.agenciatributaria.es/AEAT/	http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di01
SPATIO-TEMPORAL DIMENSION	Geographical Object	quarters	areas and, sometimes, address	depends on the information with property values only averages per quarter, others up to the single household	areas and very likely (x,y, locations)	Points (X,Y locations)	areas and very likely (x,y, locations)	Municipalities with at least 1000 inhabitants	Countries
	Time coverage	2010-2014	2017-2018	Present	2019-...	2015-2018	2016-2017	2016	1995-2018
	Geographical coverage	Bacelona municipality, not all FUA	All Spain	All Spain	Madrid, Balears, Barcelona	Mallorca, Barcelona, Madrid, Malaga, Sevilla, Valancia	Mallorca, all Palma FUA	All Spain	EU28 + EFTA countries
TARGETED EUROPEAN HARMONISED INDICATORS	Price paid	x							
	Price asked		x		x				
	Rent paid								
	Rent asked		x		x	x			
	Surface of apt	x	x	x	x	x			
	Surface of built structure	x	some	x	some		some		
	Approx building date			x					
	Surface of gardens and land		some	x	some		some		
	Property characte-ristics	x	some	x	some	some	some		
	Dwelling info								
	Income							x	x
	Credit / mortgage								
	Time on market		indirectly				indirectly		
	Literal description of the property	no	yes	no	yes	yes	yes		
	Other variables of interest for the contract / Additional information			the info includes land use parameters, it goes beyond housing				https://www.agenciatributaria.es/AEAT/Contenidos_Comunes/La_Agencia_Tributaria/Estadisticas/Publicaciones/sites/irpfmunicipios/2016/rubik1ef468a251d390b847ce88908aaafc743028fb8d.html#	https://ec.europa.eu/eurostat/cac/he/metadata/en/ilc_esms.htm

COUNTRY: Poland

	Ministry of Finance	Notarial acts	National Bank of Poland	domiporta.pl	Airbnb	Eurostat
DATA PROVIDER CHARACTERISTICS	Type	Census	transactions	transactions	Data harvesting	Survey
	Cost	Free	Free	Free	Data harvesting	Free
	Provider	the Ministry of Finance (MF)	Notariusz Centrum	the National Bank of Poland	domiporta.pl	Airbnb
	Description	Data on average income for municipalities (gminas)	Full database of transaction records. mortgage and accounting court	Data on average prices of apartments	real estate posts	Online collection of Airbnb scrapped datasets
	Condition of use	available on request from MF	Limited	Public domain	Public domain	Public database
	URL		http://www.notariusz-centrum-warszawa.com.pl	https://www.nbp.pl/publikacje/rynek_nieruchomosci/ceny_mieszkan.xls	http://insideairbnb.com/get-the-data.html	http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di01
SPATIO-TEMPORAL DIMENSION	Geographical Object	gminas (LAU2)	Points (X, Y coordinates)	cities (LAU2)	Points (X,Y locations)	Points (X,Y locations)
	Time coverage	2011-2015 (extension possible)	2002-2013. Newer information should be possible to obtain	2006-2018	2018	2018
	Geographical coverage	Poland	Lodz FUA. Theoretically, it should be available for other cities too.	major cities in Poland plus poviats (counties)	Lodz, Cracow, Warsaw, and other large cities FUA	Lodz, Cracow, Warsaw, and other large cities
TARGETED EUROPEAN HARMONISED INDICATORS	Price paid		x	x		
	Price asked				x	
	Rent paid					
	Rent asked				x	
	Surface of apt		x		x	
	Surface of built structure		x			
	Approx building date				x	
	Surface of gardens and land				x	
	Property characteristics				some	some
	Dwelling info				some	
	Income	Average income				x
	Credit / mortgage					
	Time on market				such variable could constructed	
	Literal description of the property		no		x	yes
	Other variables of interest for the contract / Additional information		Plot size and basic information on sellers and buyers (physical and legal persons)			https://ec.europa.eu/eurostat/cache/metadata/en/ilc_esms.htm

COUNTRY: United Kingdom

	Land registry	Zoopla	Rightmove	Foxtons	Our Property	InsideAirbnb	Eurostat
DATA PROVIDER CHARACTERISTICS	Type	Land registry	Data harvesting	Data harvesting	Data harvesting	Data harvesting	Survey
	Cost	Free	Data harvesting	Data harvesting	Data harvesting	Data harvesting	Free
	Provider	HM Land Registry publish the UK House Price Index on behalf of Office for National Statistics, Registers of Scotland and Land and Property Services Northern Ireland	Zoopla	Rightmove	Foxtons	Our Property	Airbnb
	Description	These datasets are provided in comma-separated value (csv) and linked data formats, with Price Paid Data also available as a text file. These datasets can be downloaded in full by accessing our Public Data.	Get sold house prices and current estimated values for any UK property	Search properties for sale and to rent in the UK	London and Surrey Estate Agent Foxtons listing London property for sale. Leading UK real estate agents in London dealing with properties for sale, long lettings, ...	Provide synthesis regarding scrapped datasets	Income distribution by quantile. Income definition harmonized.
	Condition of use	Price Paid Data is released under the Open Government Licence (OGL). Under the OGL, HM Land Registry permits you to use the Price Paid Data for commercial or non-commercial purposes. However, OGL does not cover the use of third party rights, which we are not authorised to license.	Public website	Public website	Public website	Public website (with restricted access)	Public domain
	URL	http://landregistry.data.gov.uk/app/qonsole	https://www.zoopla.co.uk/house-prices/	https://www.rightmove.co.uk/house-prices.html	https://www.foxtons.co.uk/living-in/england/house-prices/	https://www.ourproperty.co.uk/	http://insideairbnb.com/get-the-data.html
SPATIO-TEMPORAL DIMENSION	Geographical Object	Address and parcel	address and post code, city	address and post code, city	address and post code, city	address and post code, city	Points (X,Y locations)
	Time coverage	data available per month since 1995	Present-	Present-	Present-	?	2015 to 2018
	Geographical coverage	All UK	All UK	All UK	London	UK without Northern Ireland	Inner cities of Edinburgh, London, Manchester and Greater Manchester
TARGETED EUROPEAN HARMONISED INDICATORS	Price paid	x					
	Price asked		x	x	x		
	Rent paid						
	Rent asked		x	x	x	x	
	Surface of apt		number of rooms	number of rooms	x	x	
	Surface of built structure						
	Approx building date						
	Surface of gardens and land						
	Property characteristics					some	
	Dwelling info	x	Just location based and type				
	Income						x
	Credit / mortgage						
	Time on market						
	Literal description of the property	yes	yes	yes	yes	no	yes
	Other variables of interest for the contract / Additional information	Property characterization includes: property type (detached, semi-detached, terraced, flat/maisonette, other); if it is a new built or not; estate type (freehold, leasehold); transaction category	Produces valuations based on location, produces property history, property prices sold, and price comparison reports		Focus on present moment house prices being asked	Produces house values by address, and propertyowner records / data aggregated by roads	https://ec.europa.eu/eurostat/cache/metadata/en/ilc_e sms.htm

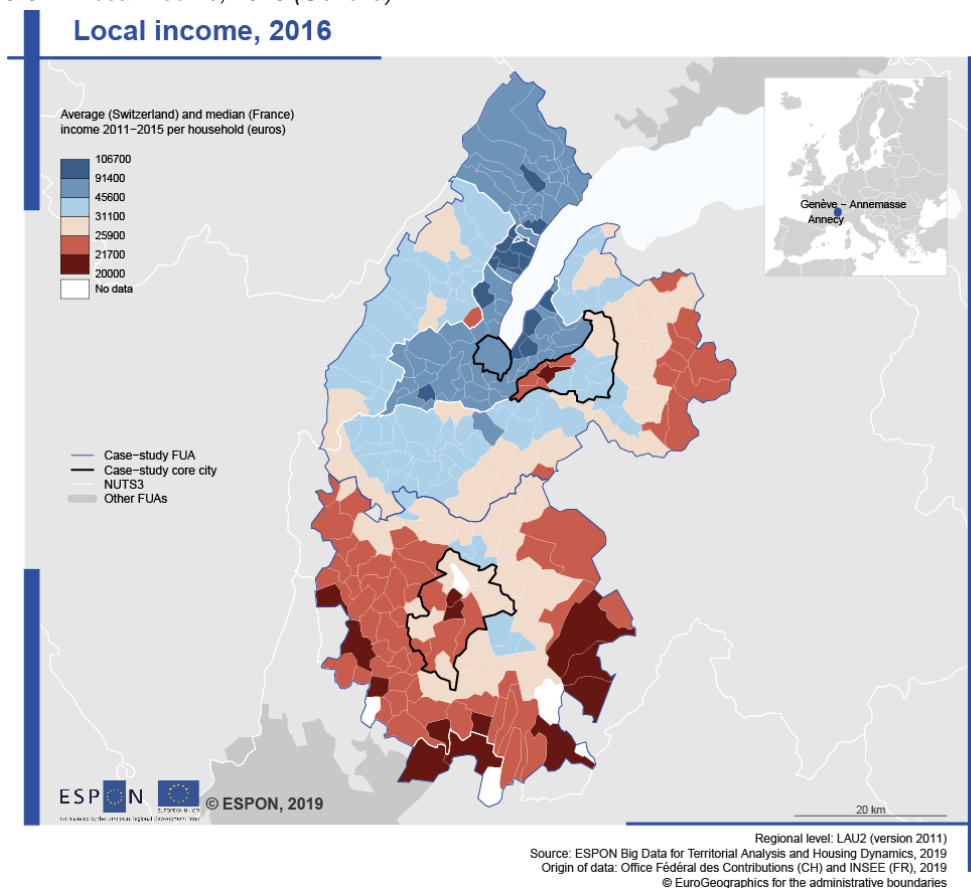
Annex 4 – Data collected in the ESPON Housing project

	Local income		Transactions		Scraping real-estate		Scraping – Rental		Others
	LAU2	1 km grid	LAU2	1km grid	LAU2	1km grid	LAU2	1km grid	
Krakow – Lodz - Warsaw	Yes	No	for Lodz only (time-series 2012-2018)	No	Yes, houses and apartments combined	Yes, houses and apartments combined	Yes, houses and apartments combined	Yes, houses and apartments combined	
Barcelona – Madrid – Palma de Mallorca	Yes	No	For Barcelona only (Barcelona metropolitan area)	No	Yes, houses and apartments combined	Yes, houses and apartments combined	Yes, houses and apartments combined	Yes, houses and apartments combined	Airbnb data also available for the 3 core cities.
Geneva (Swizz part)	Yes	No	Yes, houses and apartments separately (2010-2015)	No	Yes, houses and apartments combined	No	Yes, houses and apartments combined	No	Airbnb data also available for the core city.
Geneva (French part)	Yes	No, but possible (2012)	Yes, houses and apartments separately (2010-2014)	Yes, houses and apartments separately (2010-2014)	OK, houses and apartments separately	No	Yes, houses and apartments separately and combined	No	
Avignon	OK	No, but possible (2012)	Yes, houses and apartments separately (2010-2014)	Yes, houses and apartments separately (2010-2014)	OK, houses and apartments separately	No	Yes, houses and apartments separately and combined	No	
Paris	OK	No, but possible (2012)	Yes (2011-2012)	Yes (2011-2012)	OK, houses and apartments separately	No	Yes, houses and apartments separately and combined	No	Airbnb data also available for the core city.
Summary	Available globally at LAU2 level but high heterogeneity in term of indicator definition (median income, average income, etc.). Out of the scope of the project to harmonise this.				For French case-studies, need further researches to get X/Y locations of real estate and rental offers.		For French case-studies, need further researches to get X/Y locations of real estate and rental offers.		

Annex 5 – Case-study maps on housing dynamics - Geneva

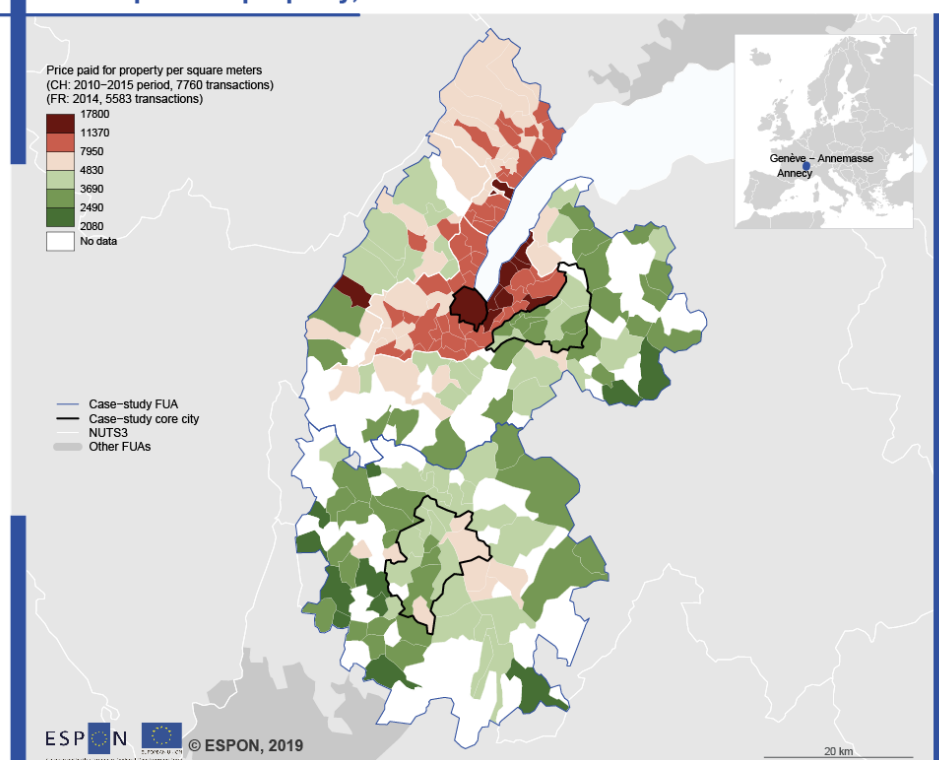
Note: All the maps displayed with 2 colour palettes are based on the same discretization method: “q6”, which uses the following quantile probabilities: 0, 0.05, 0.275, 0.5, 0.725, 0.95, 1. In other terms, the threshold displayed between the 2 colour palettes corresponds to the median of the indicator.

Map 0-32 – Local income, 2016 (Geneva)



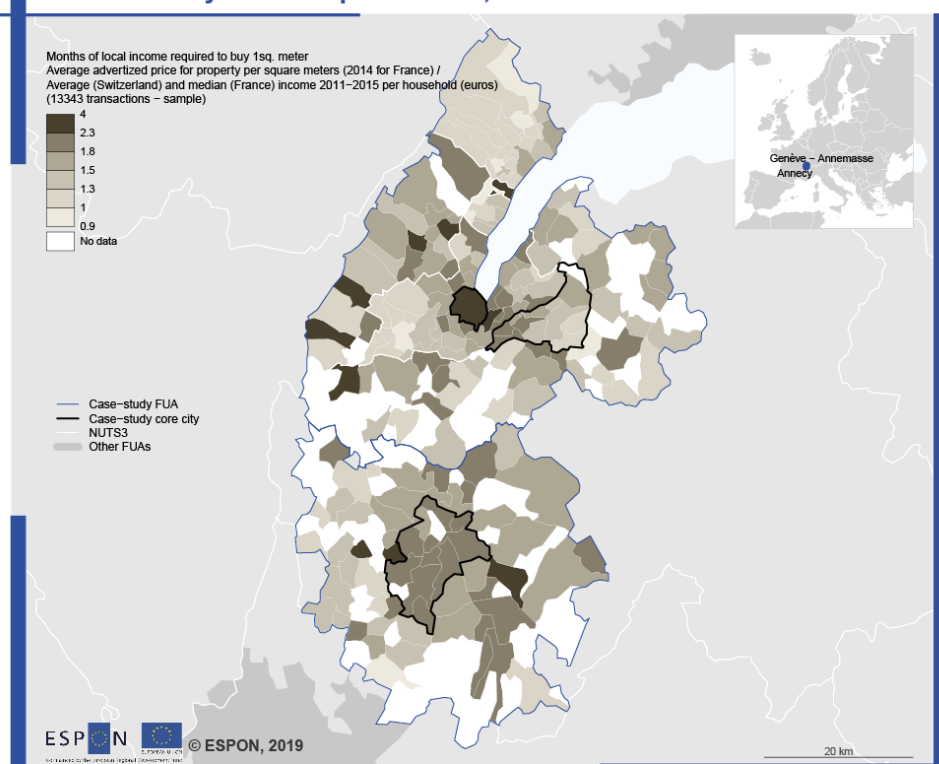
Map 0-33 – Price paid for property, 2010-2015 (Geneva)

Price paid for property, 2010-2015



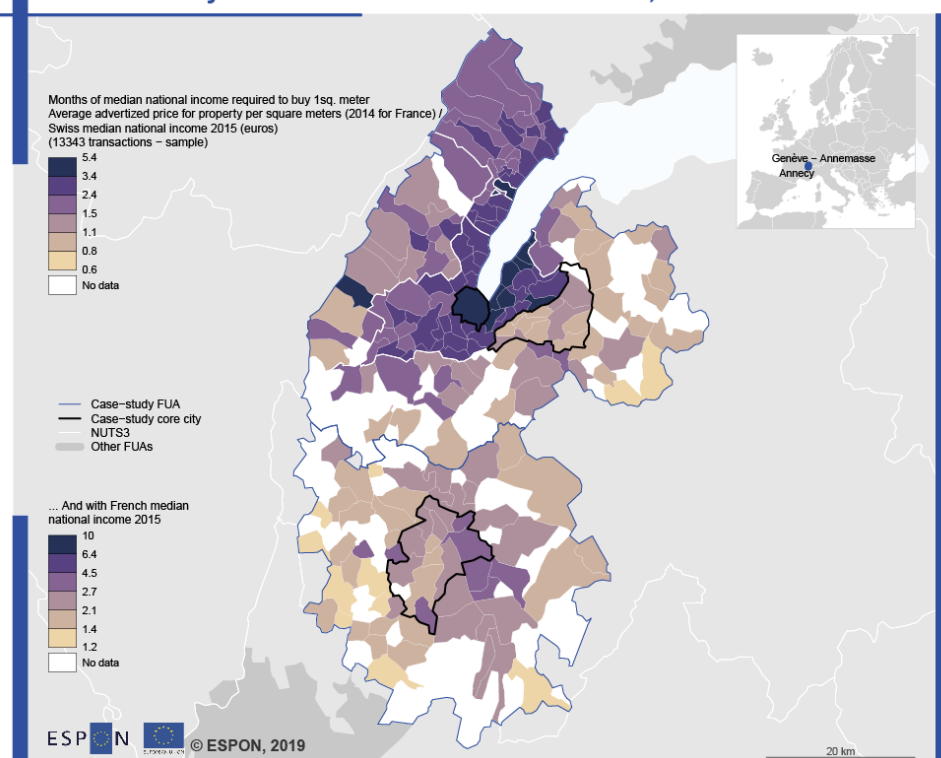
Map 0-34 – Affordability – municipal income, 2010-2015 (Geneva)

Affordability – municipal income, 2010-2015



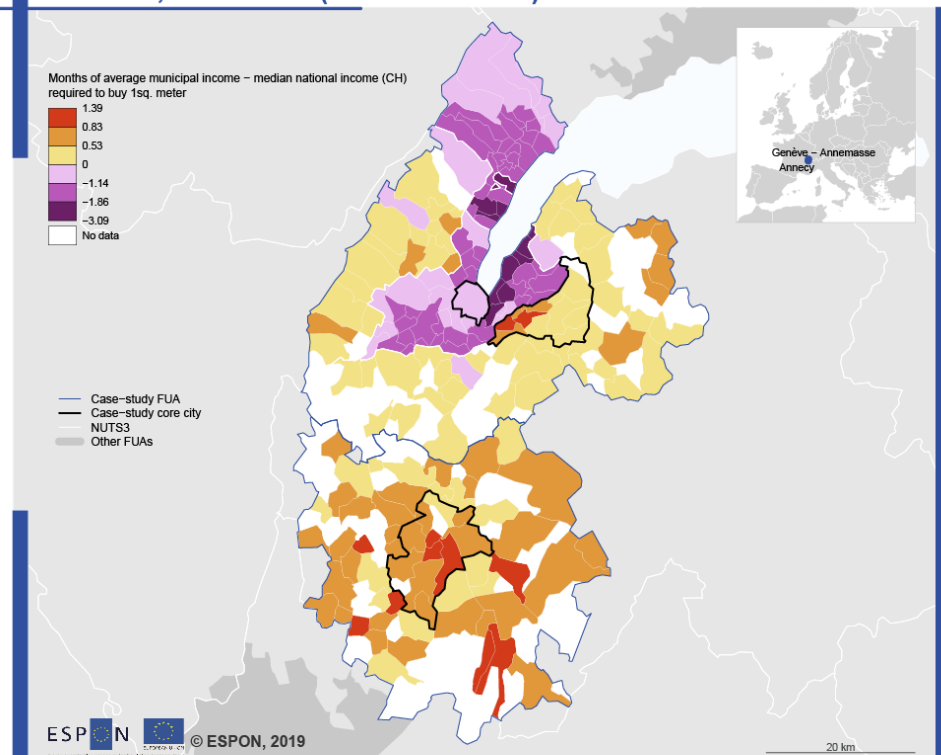
Map 0-35 – Affordability – national income, 2010-2015 (Geneva)

Affordability – Swiss/French national income, 2010–2015

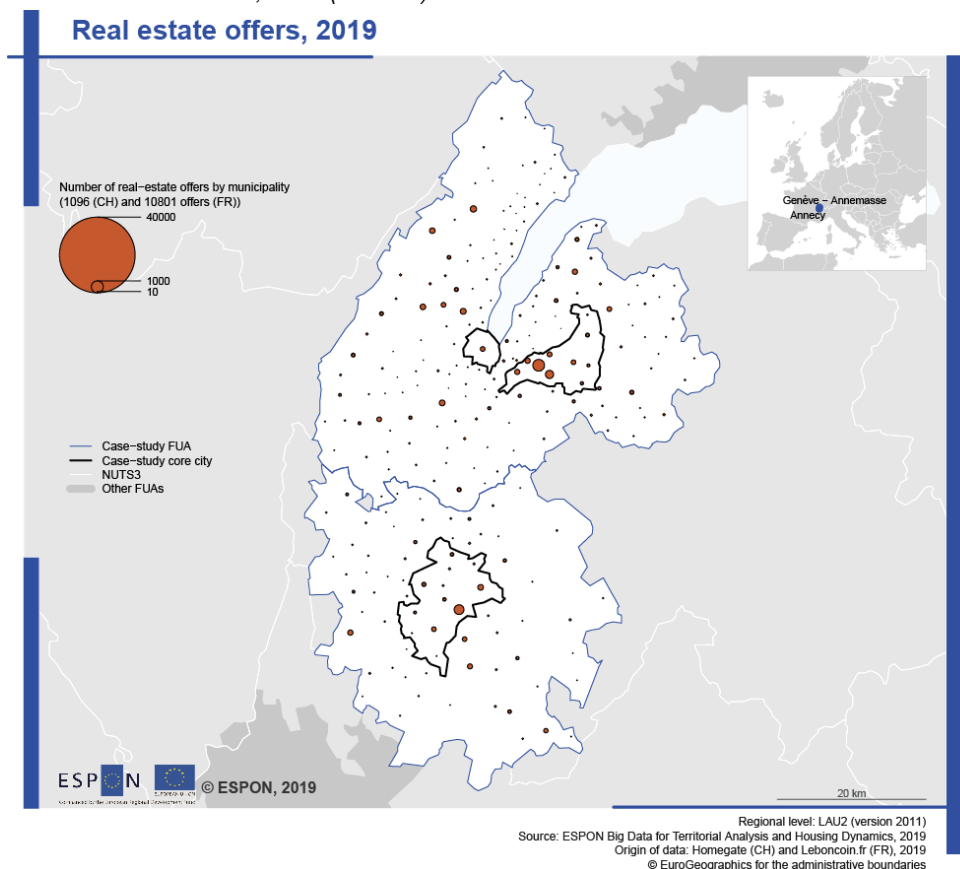


Map 0-36 – Affordability – difference between municipal and national income, 2010-2015 (Geneva)

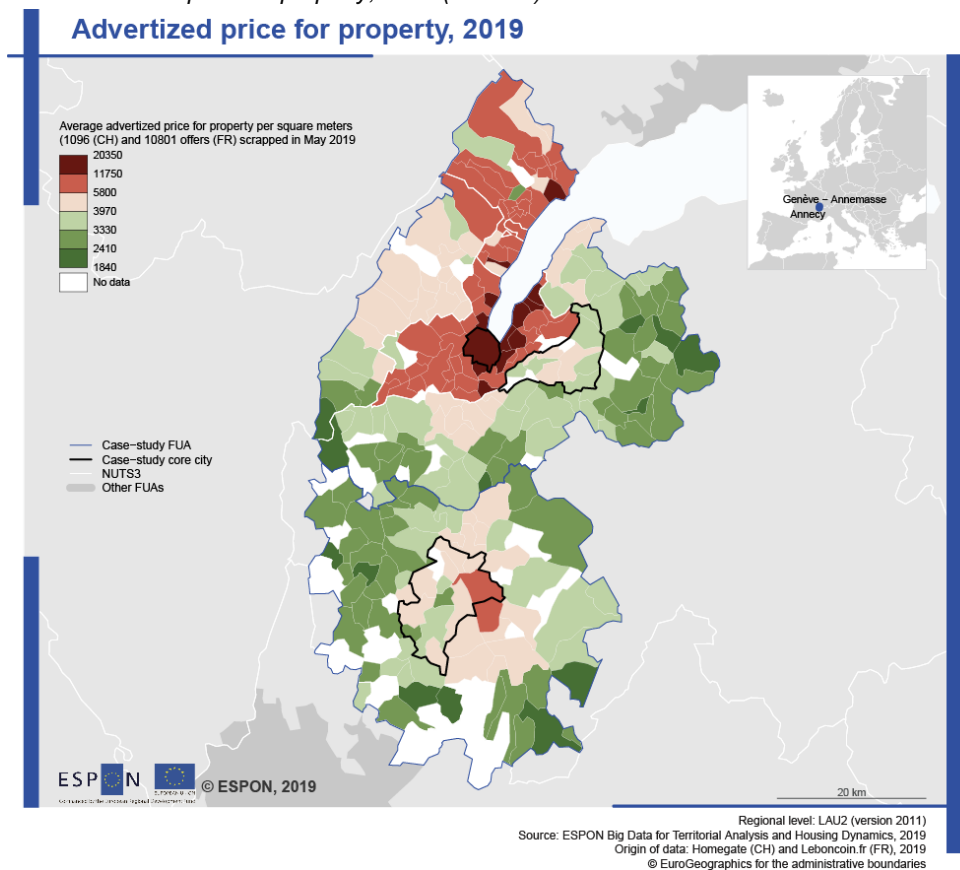
Affordability, difference between municipal and Swiss national income, 2010–2015 (2014 for France)



Map 0-37 – Real estate offers, 2019 (Geneva)

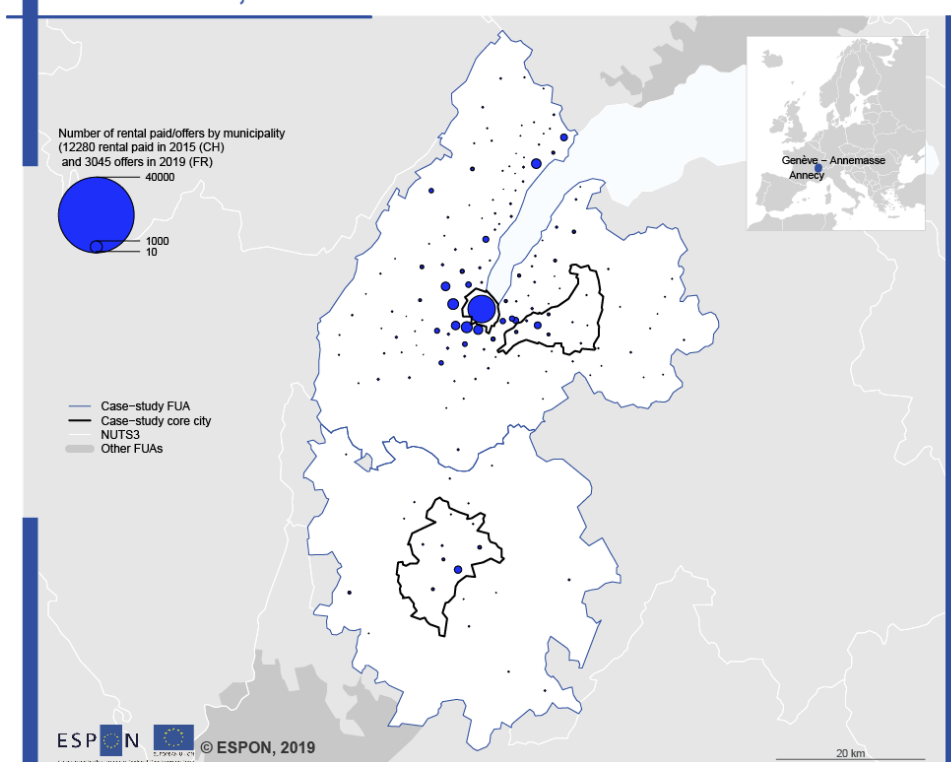


Map 0-38 – Advertised price for property, 2019 (Geneva)



Map 0-39 – Rental offers, 2015-2019 (Geneva)

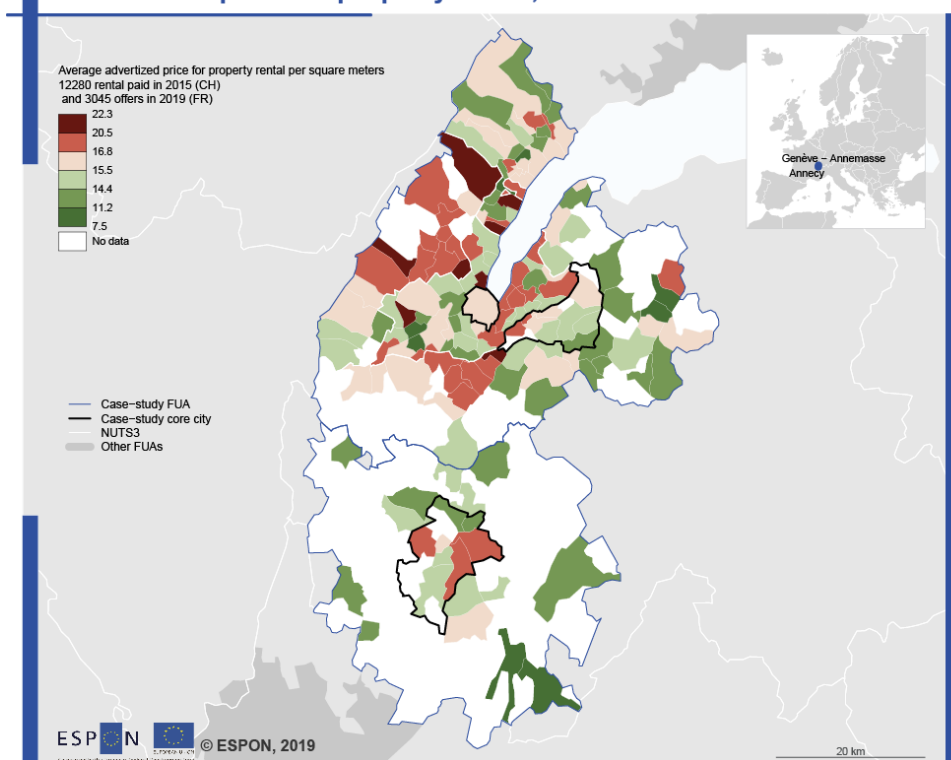
Rental offers, 2015-2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Office Fédéral de la Statistique (CH) and Leboncoin.fr (FR), 2019
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Map 0-40 – Advertised price for property rental, 2015-2019 (Geneva)

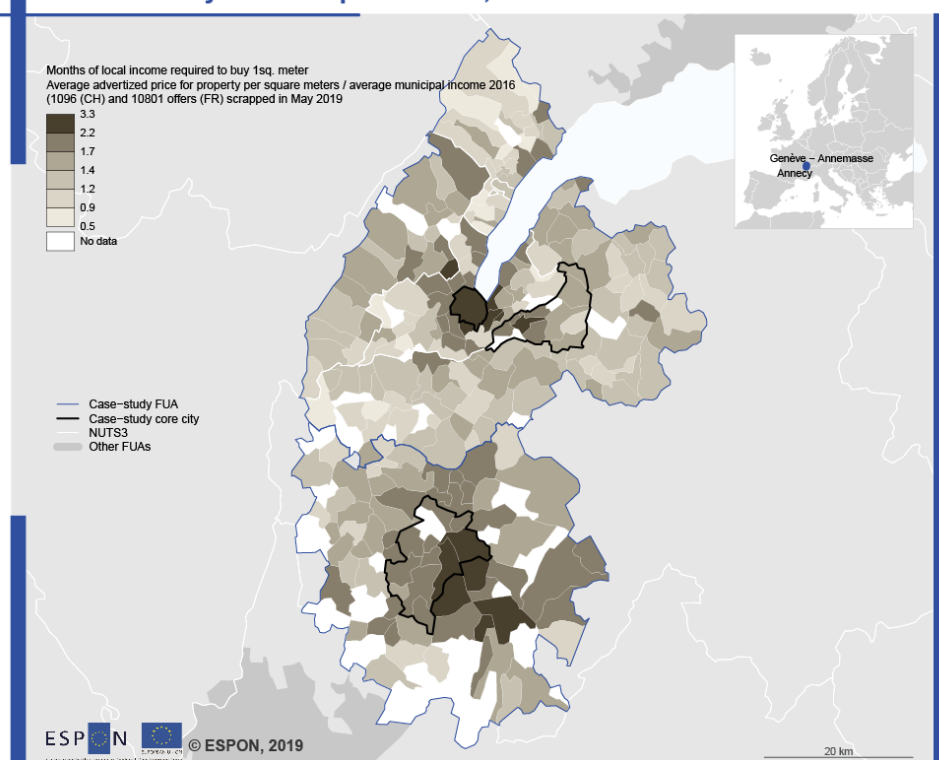
Advertized price for property rental, 2015-2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Office Fédéral de la Statistique (CH) and Leboncoin.fr (FR), 2019
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Map 0-41 – Affordability – municipal income, 2019 (Geneva)

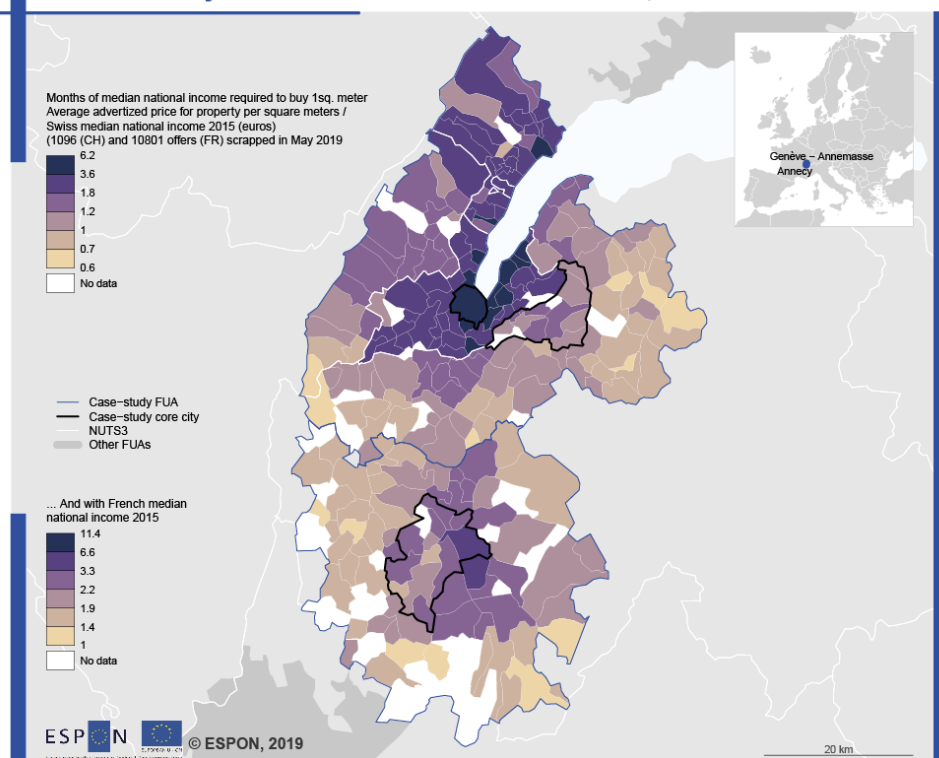
Affordability – municipal income, 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Office Fédéral des Contributions (CH) and INSEE (FR), Homegate (CH) and Leboncoin.fr (FR), 2019
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Map 0-42 – Affordability – national income, 2019 (Geneva)

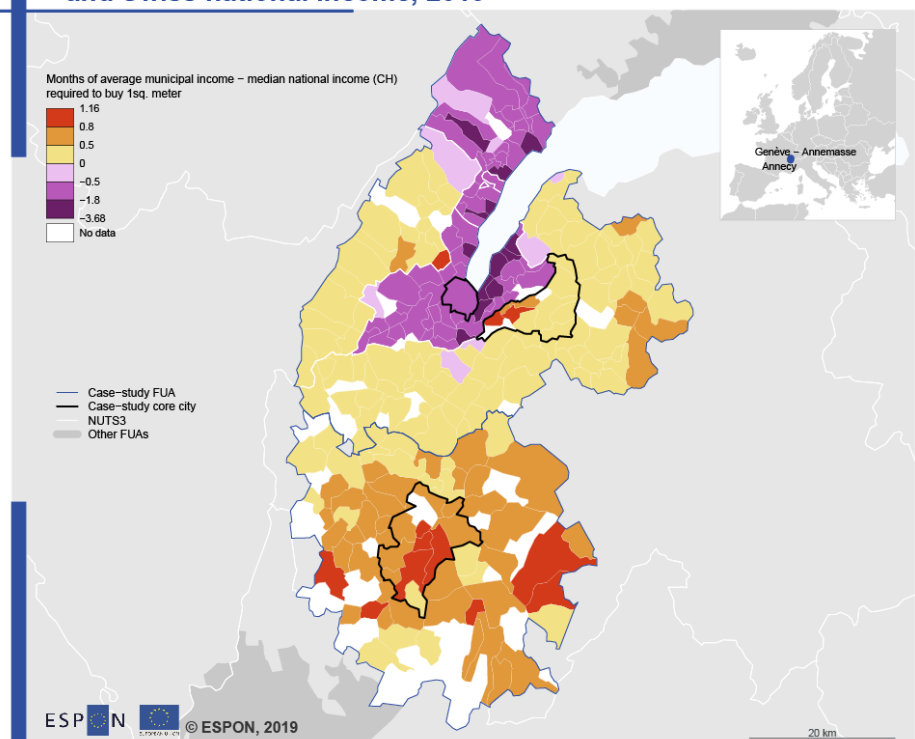
Affordability – Swiss/French national income, 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: EU-SILC Survey (Eurostat), Homegate (CH) and Leboncoin.fr (FR), 2019
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Map 0-43 – Affordability – difference between municipal and national income, 2019 (Geneva)

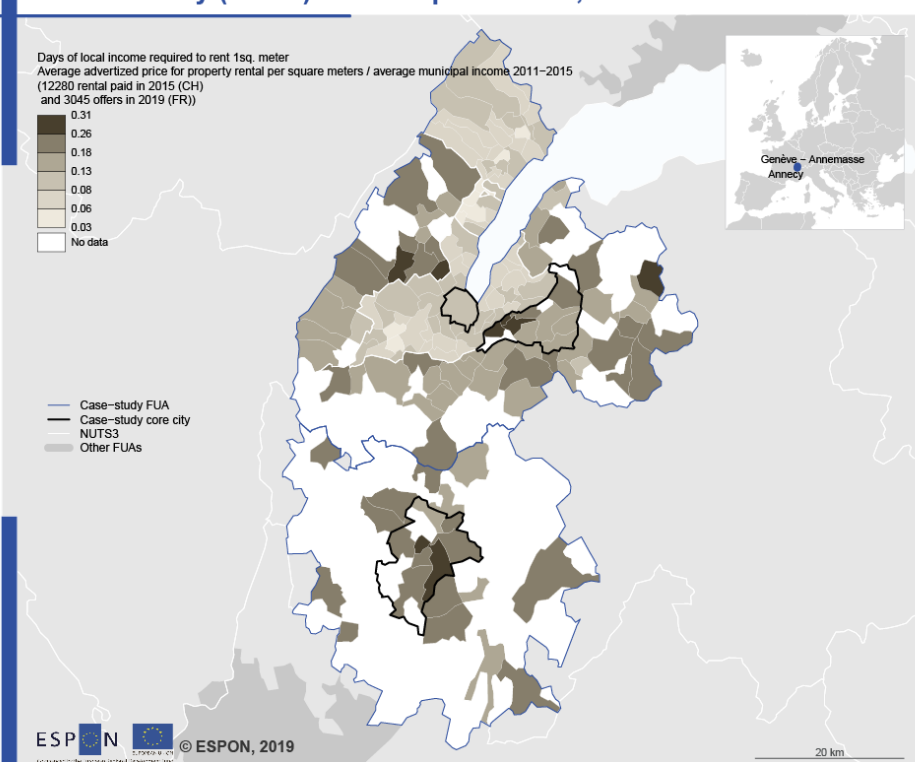
Affordability, difference between municipal and Swiss national income, 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: EU-SILC Survey (Eurostat), Office Fédéral des Contributions (CH) and INSEE (FR), Homegate (CH) and Leboncoin.fr (FR), 2019
© EuroGeographics for the administrative boundaries

Map 0-44 – Affordability (rental) – municipal income, 2015-2019 (Geneva)

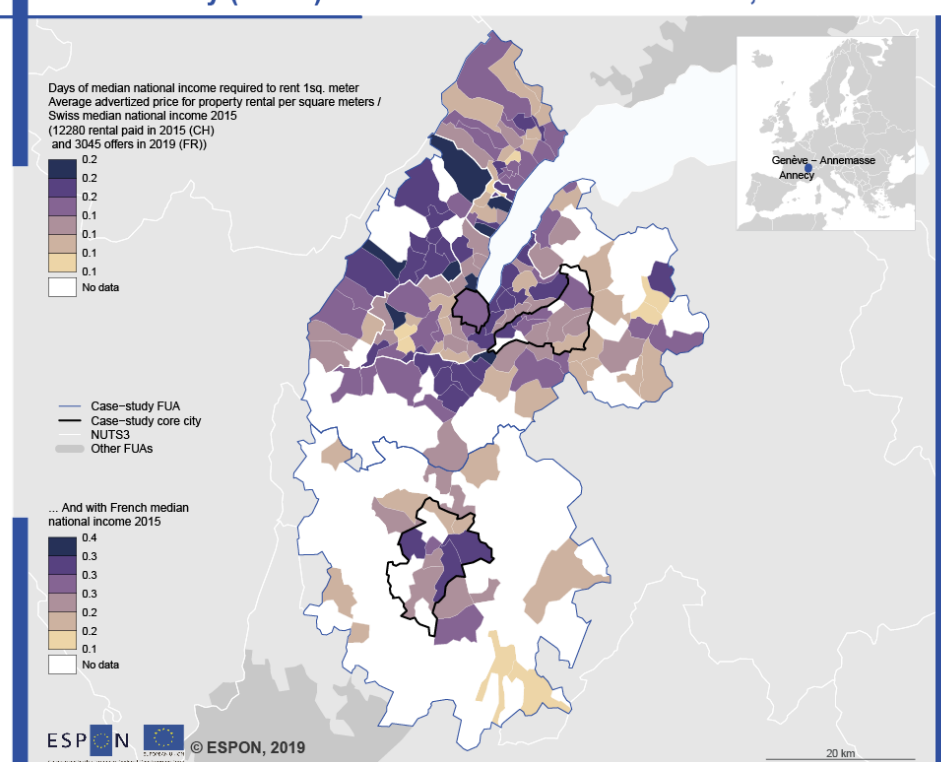
Affordability (rental) – municipal income, 2015-2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Office Fédéral des Contributions (CH) and INSEE (FR), Office Fédéral de la Statistique (CH) and Leboncoin.fr (FR), 2019
© EuroGeographics for the administrative boundaries

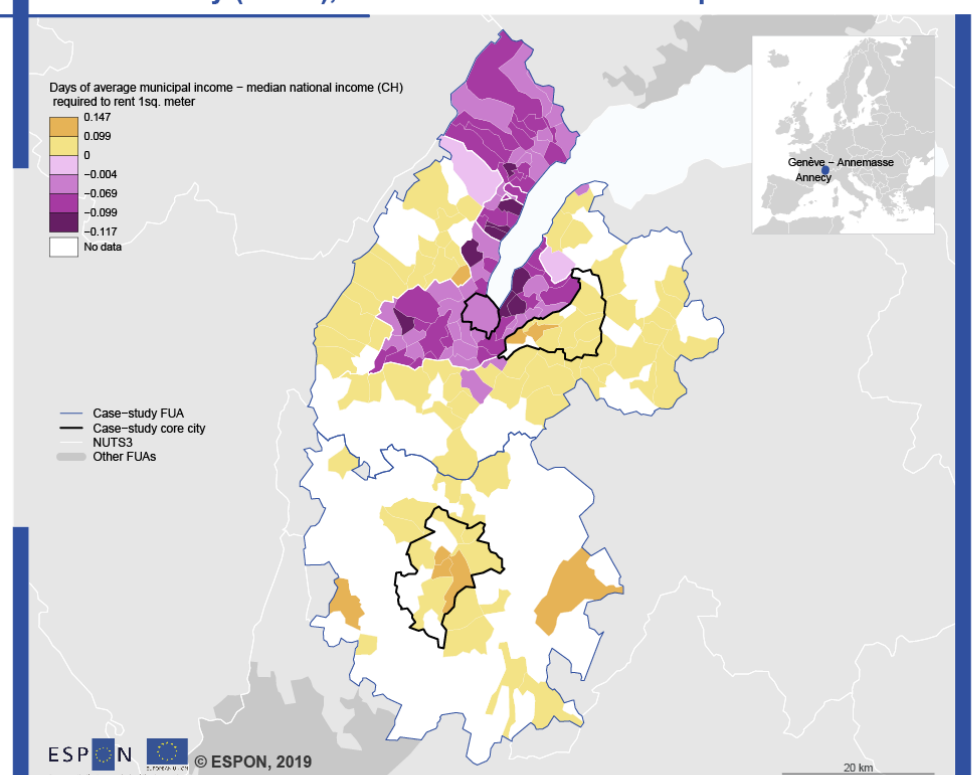
Map 0-45 – Affordability (rental) – national income, 2015-2019 (Geneva)

Affordability (rental) – Swiss/French national income, 2015–2019



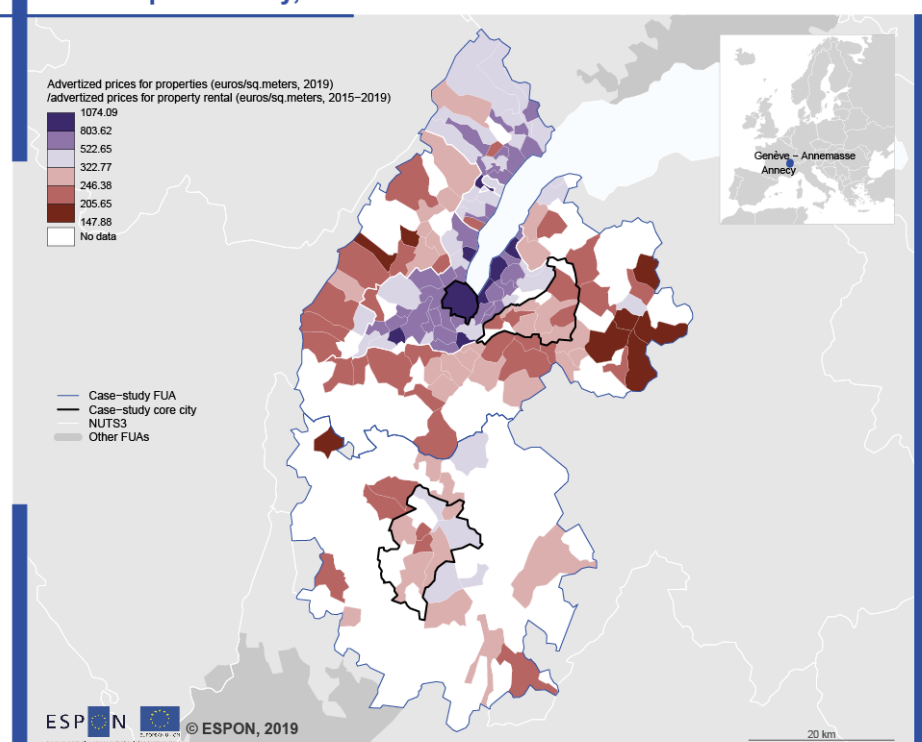
Map 0-46 – Affordability (rental) – difference between municipal and national income, 2019 (Geneva)

Affordability (rental), difference between municipal and Swiss national income



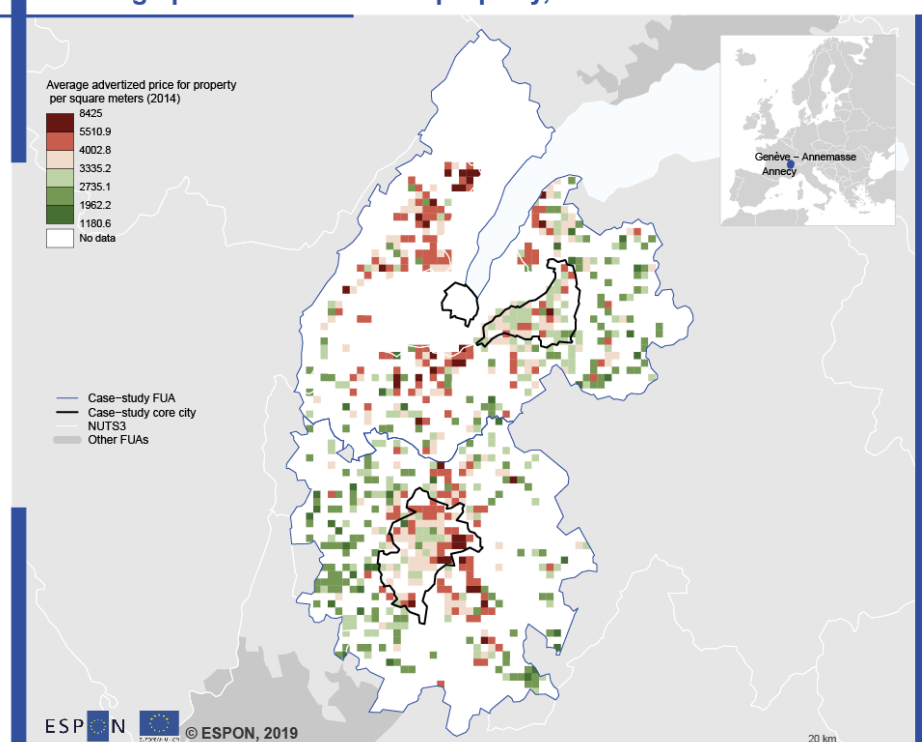
Map 0-47 – Rental profitability, 2019 (Geneva)

Rental profitability, 2019



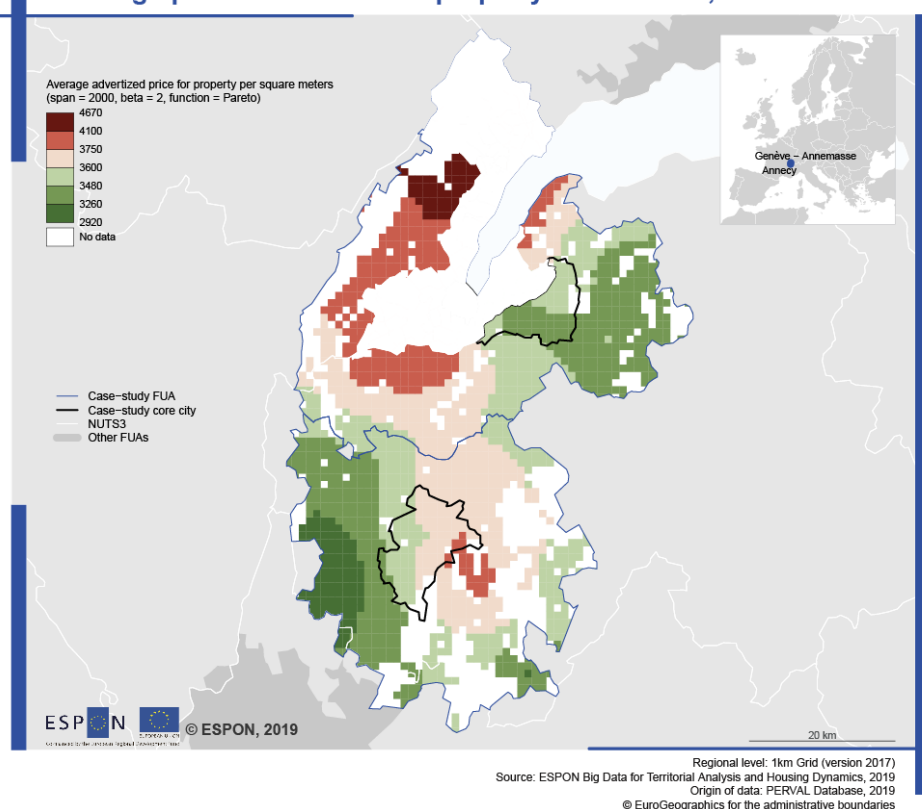
Map 0-48 – Price for property, grid non smoothed, 2014 (Geneva - FR)

Average price for real-estate property, 2014



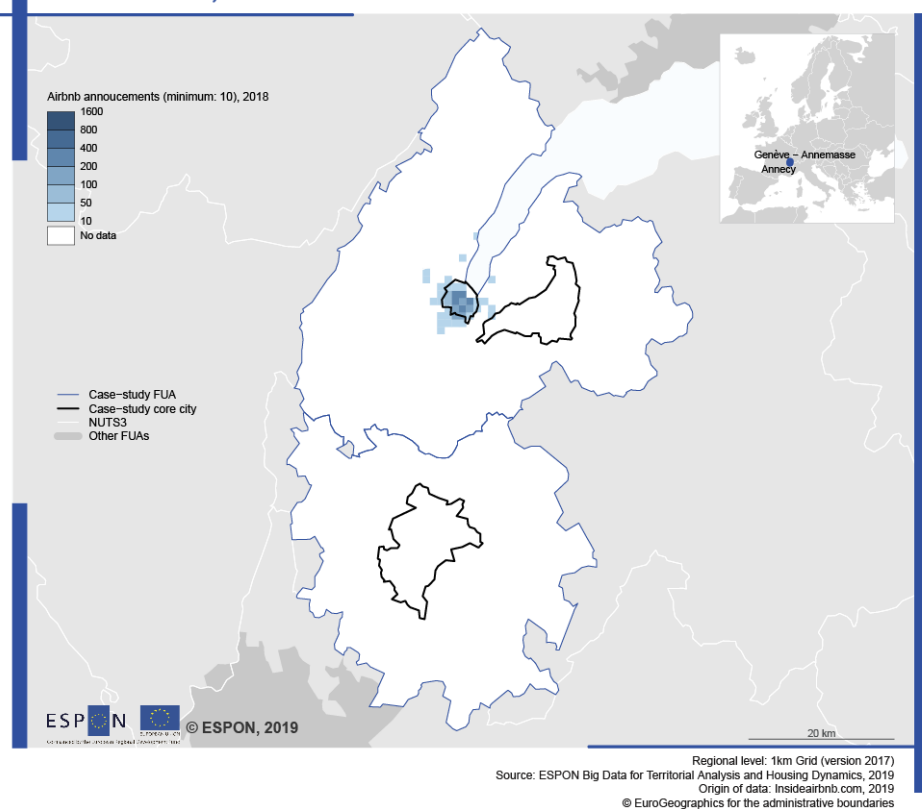
Map 0-49 – Price paid for property, grid smoothed, 2014 (Geneva - FR)

Average price for real-estate property – Smoothed, 2014



Map 0-50 – Airbnb offer, 2019 (Geneva)

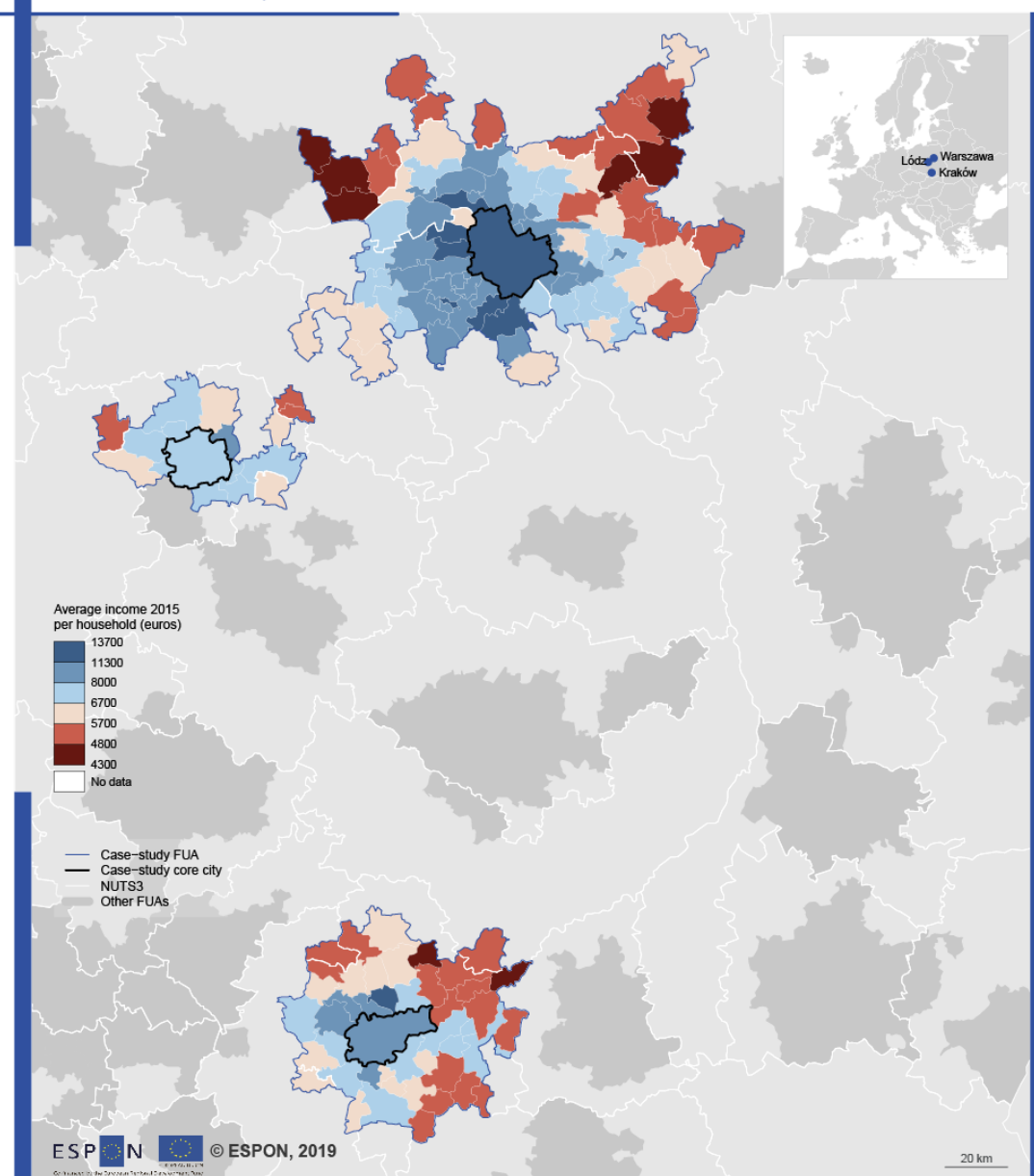
Airbnb offer, 2018



Annex 6 – Case-study maps on housing dynamics – Warsaw, Lodz and Krakow

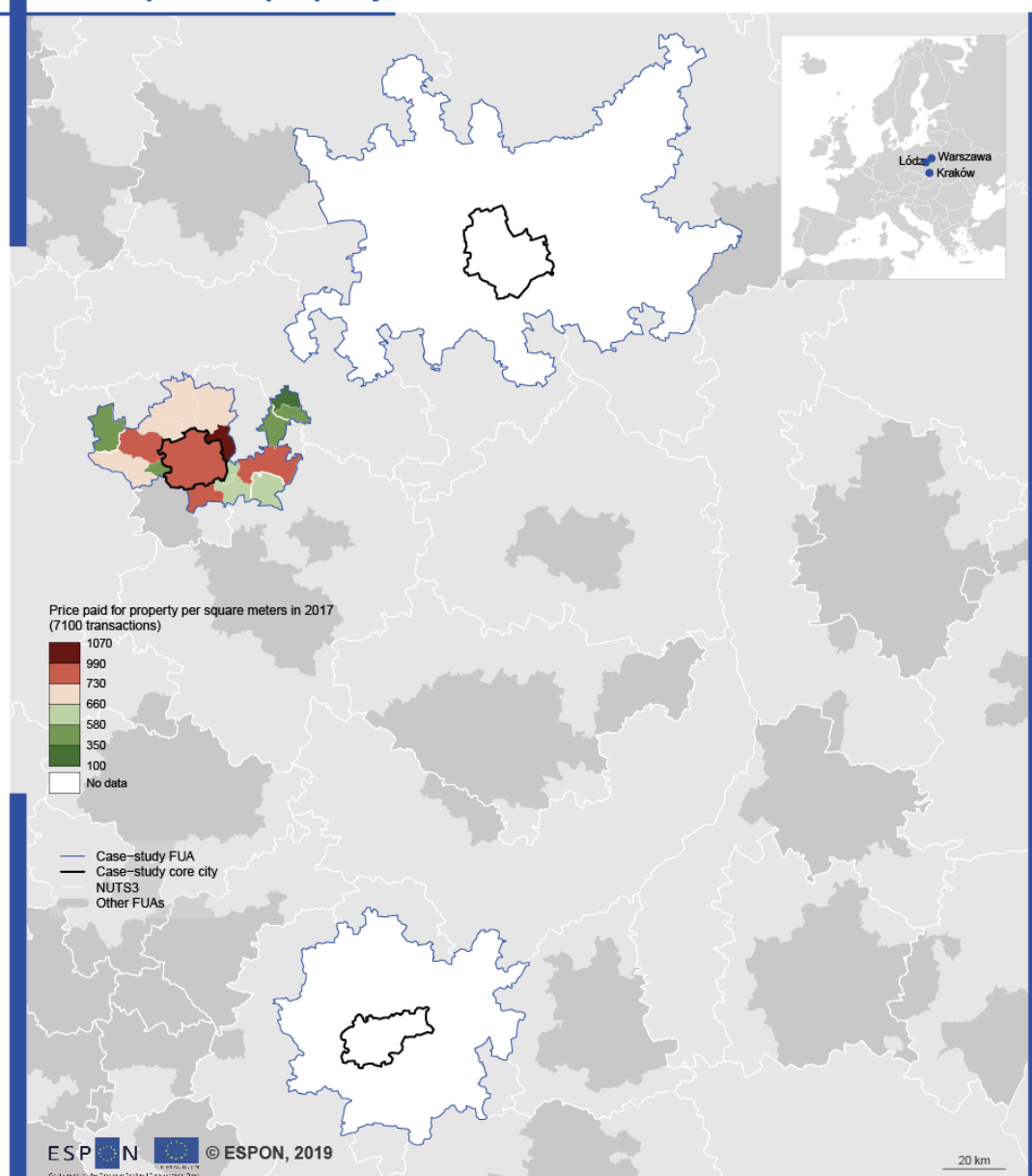
Map 0-51 – Local income, 2015 (Warsaw, Lodz and Krakow)

Local income, 2015



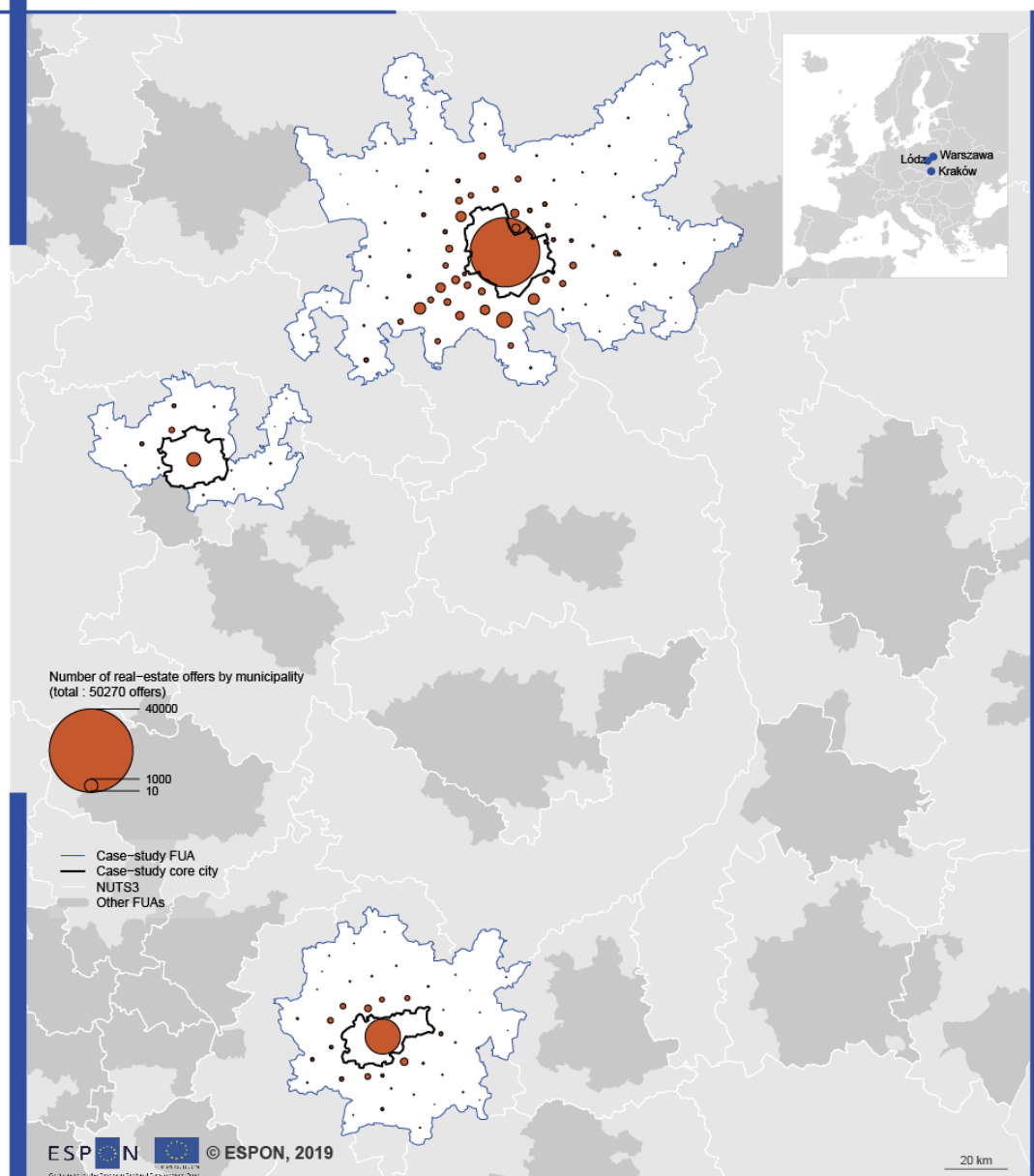
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Ministry of Finance (Poland), 2019
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Price paid for property, 2017



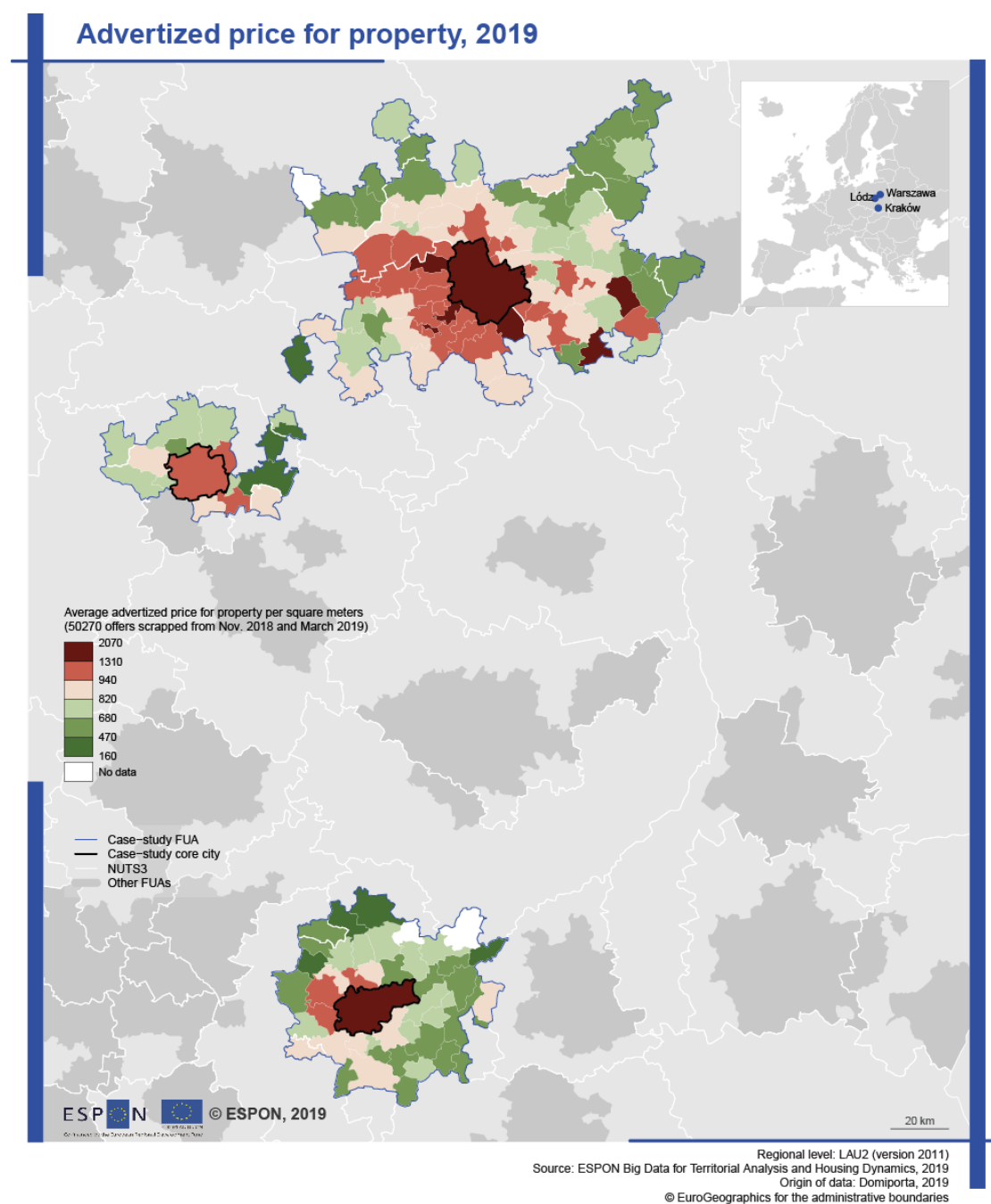
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Real estate price register, 2019
© EuroGeographics for the administrative boundaries

Real estate offers, 2019

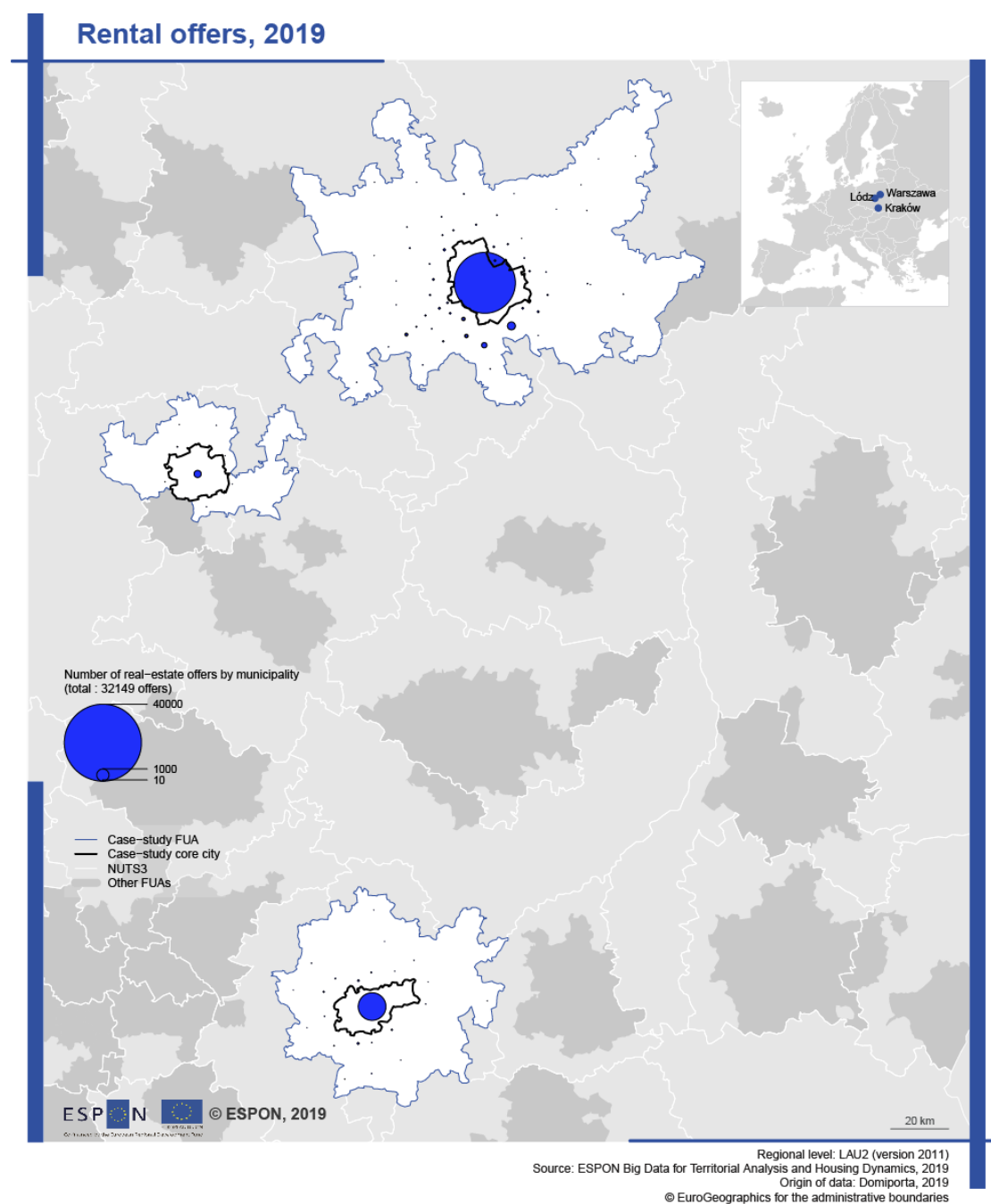


Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Domiporta, 2019
© EuroGeographics for the administrative boundaries

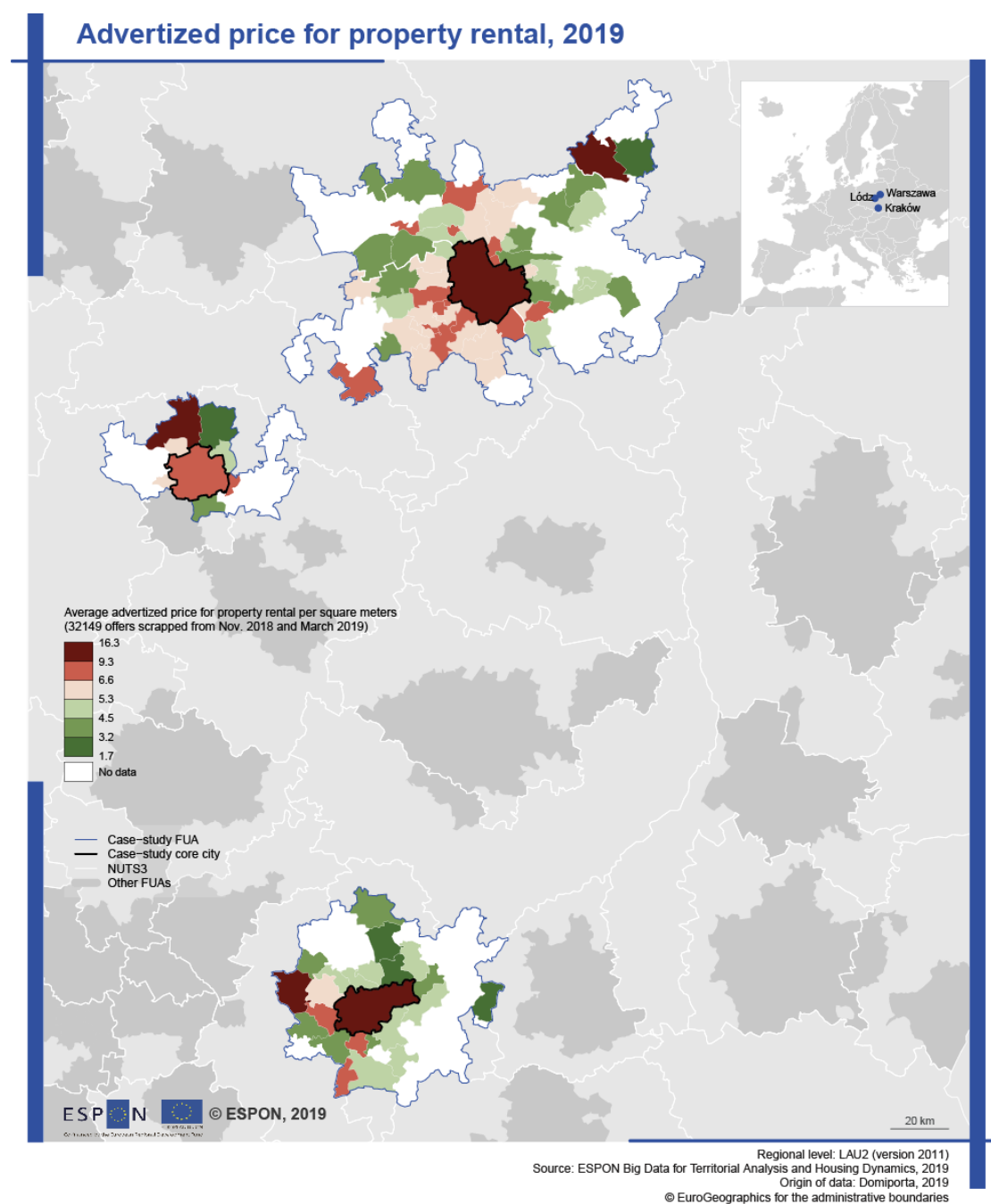
Map 0-54 – Advertised price for property, 2019 (Warsaw, Lodz, Krakow)

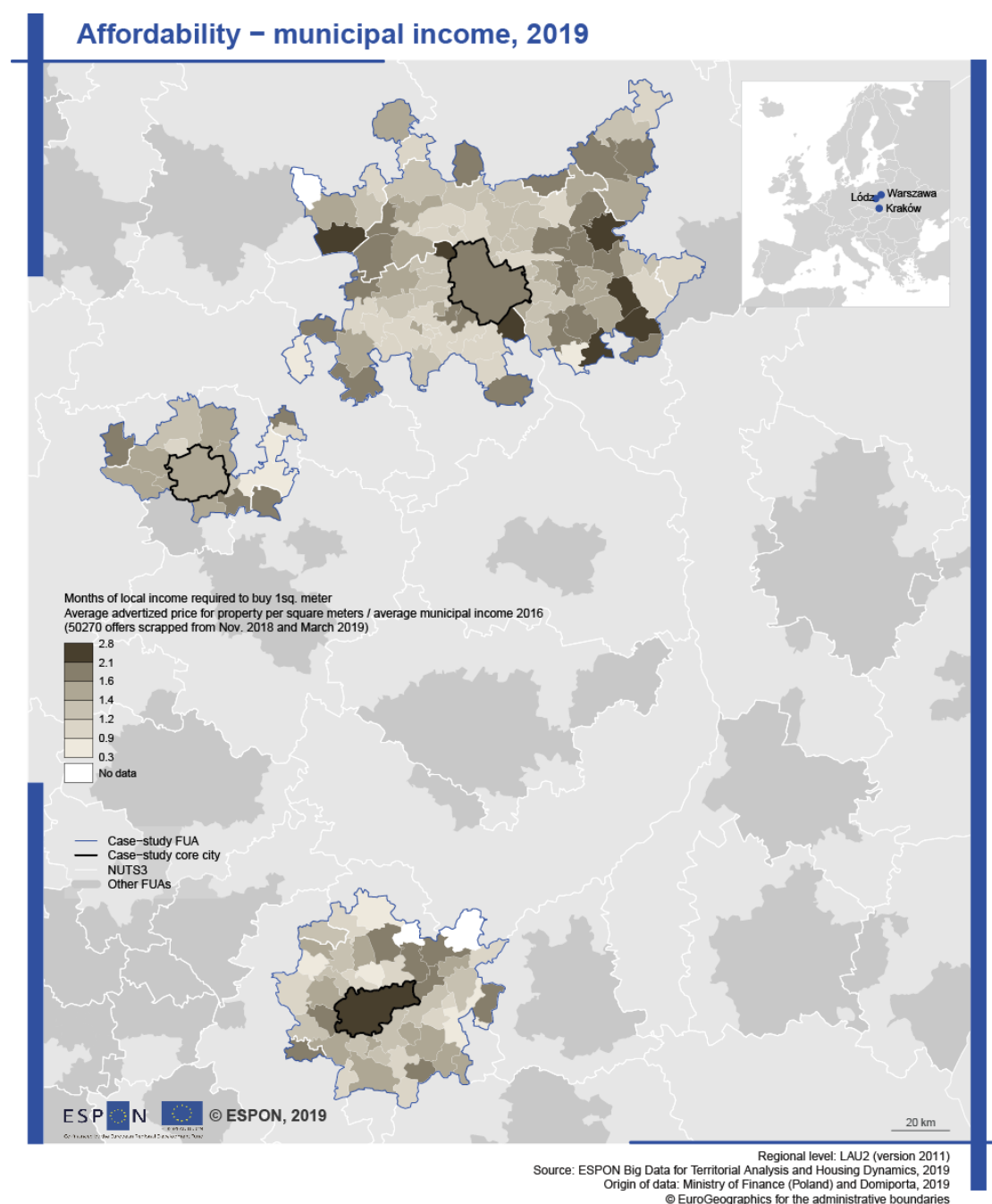


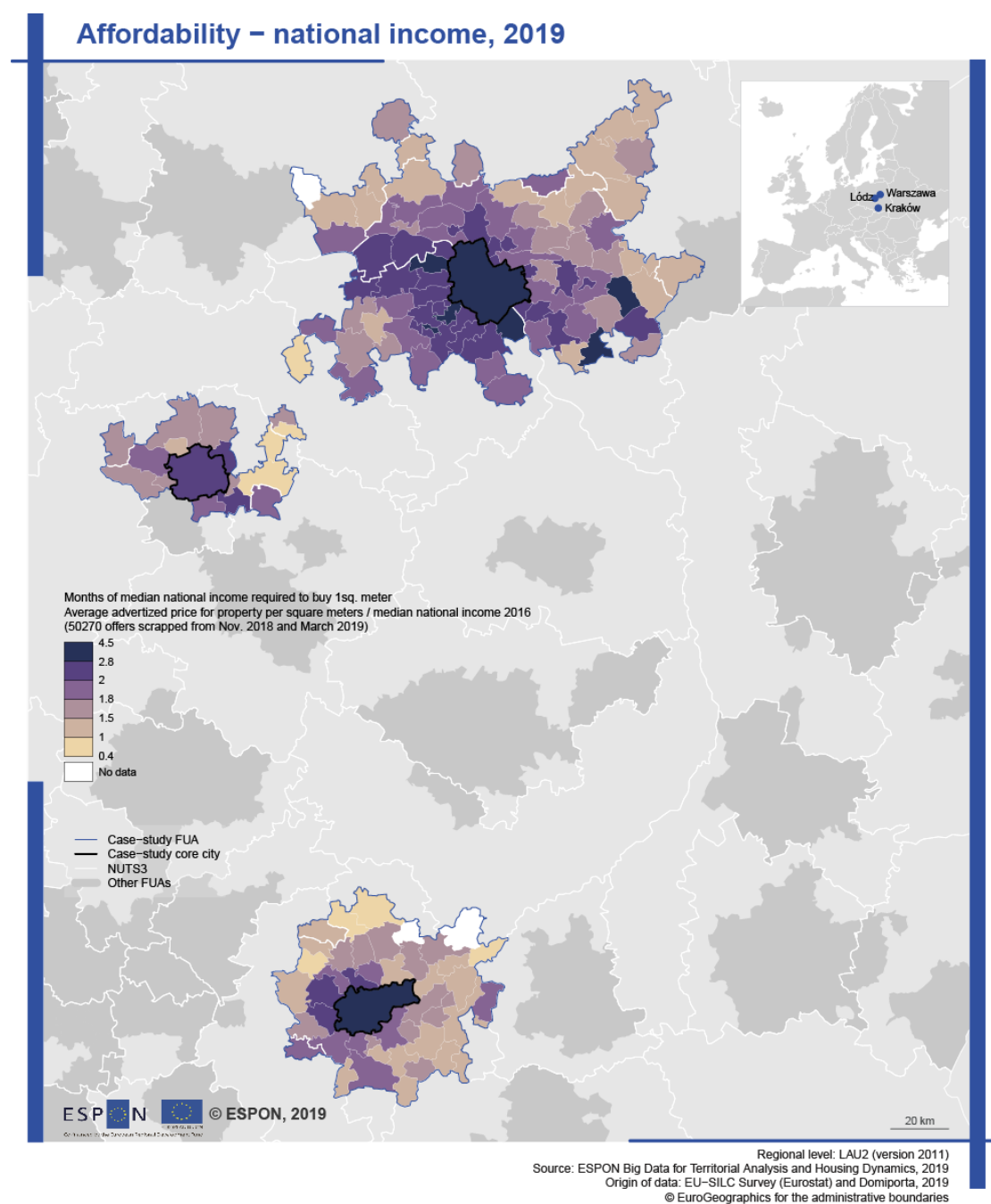
Map 0-55 – Rental offers, 2019 (Warsaw, Lodz, Krakow)



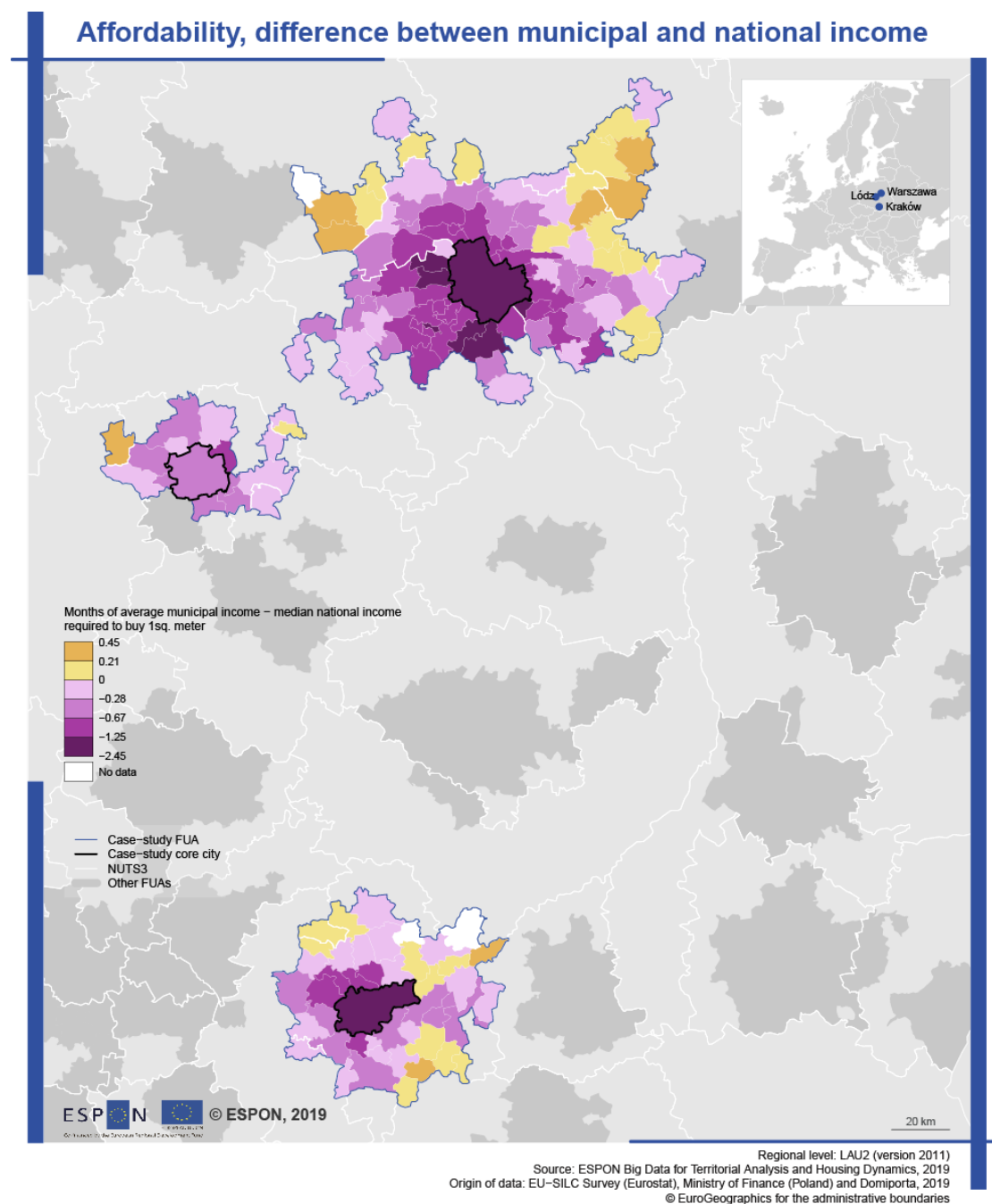
Map 0-56 – Advertised price for property rental, 2019 (Warsaw, Lodz, Krakow)

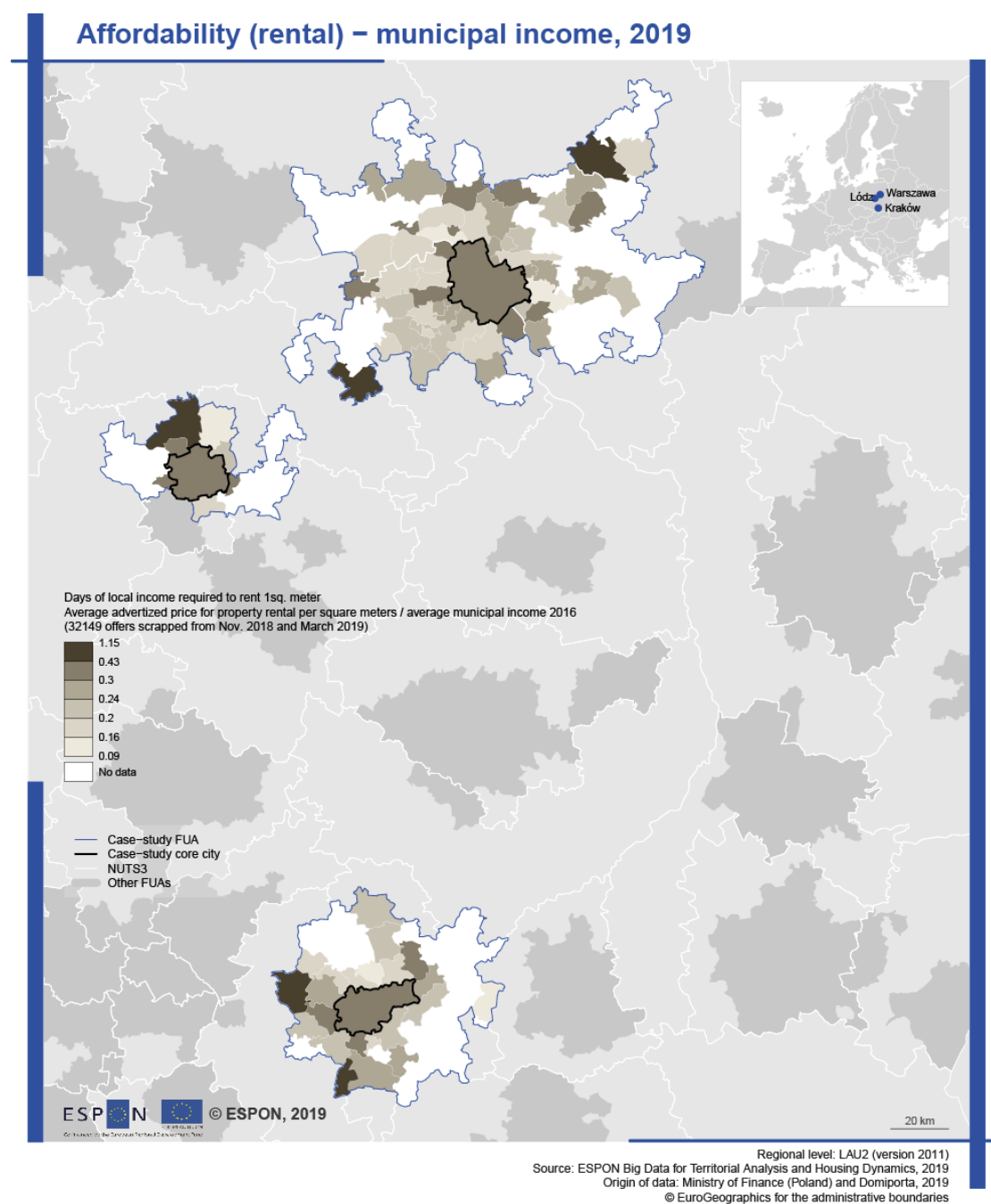


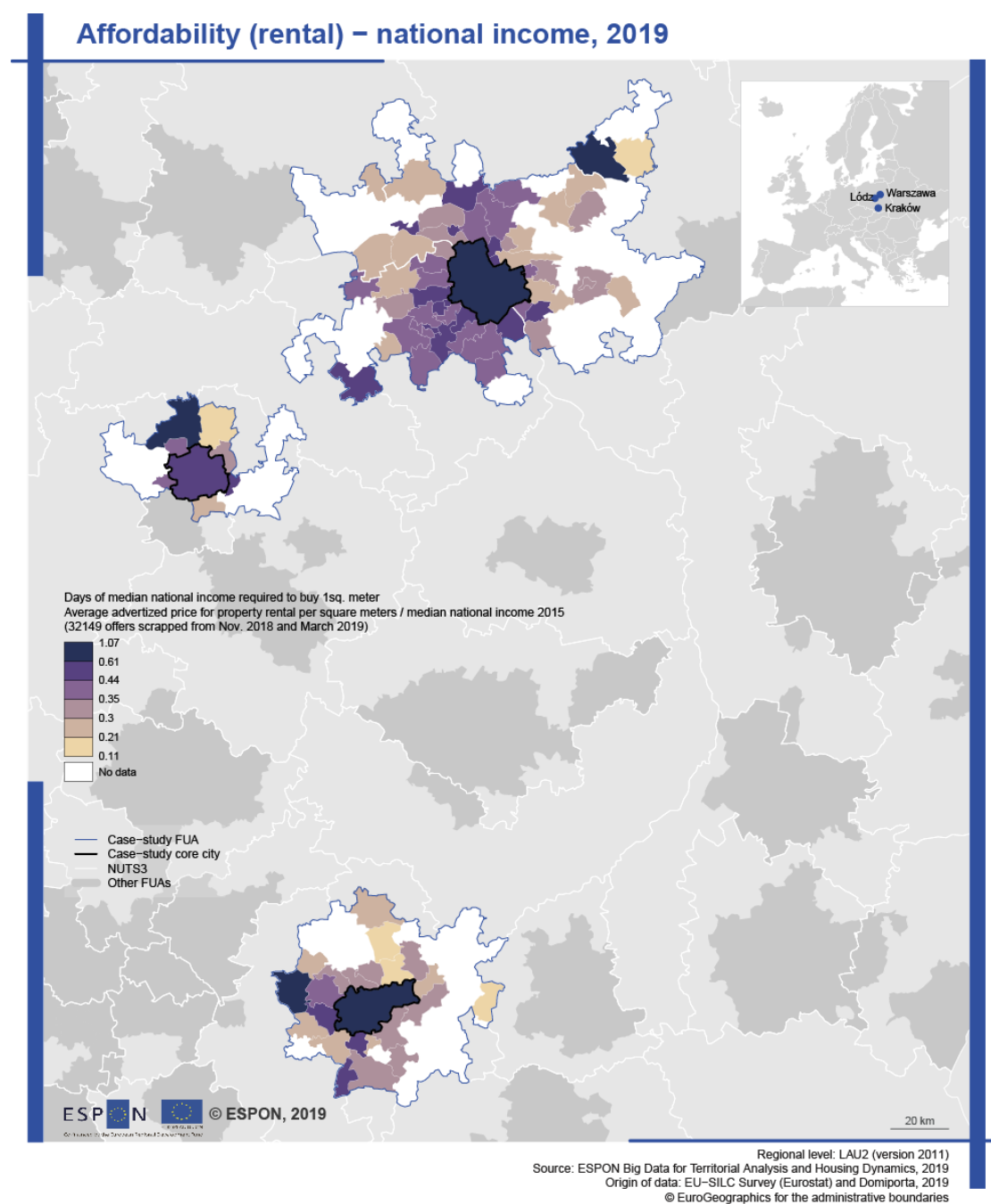




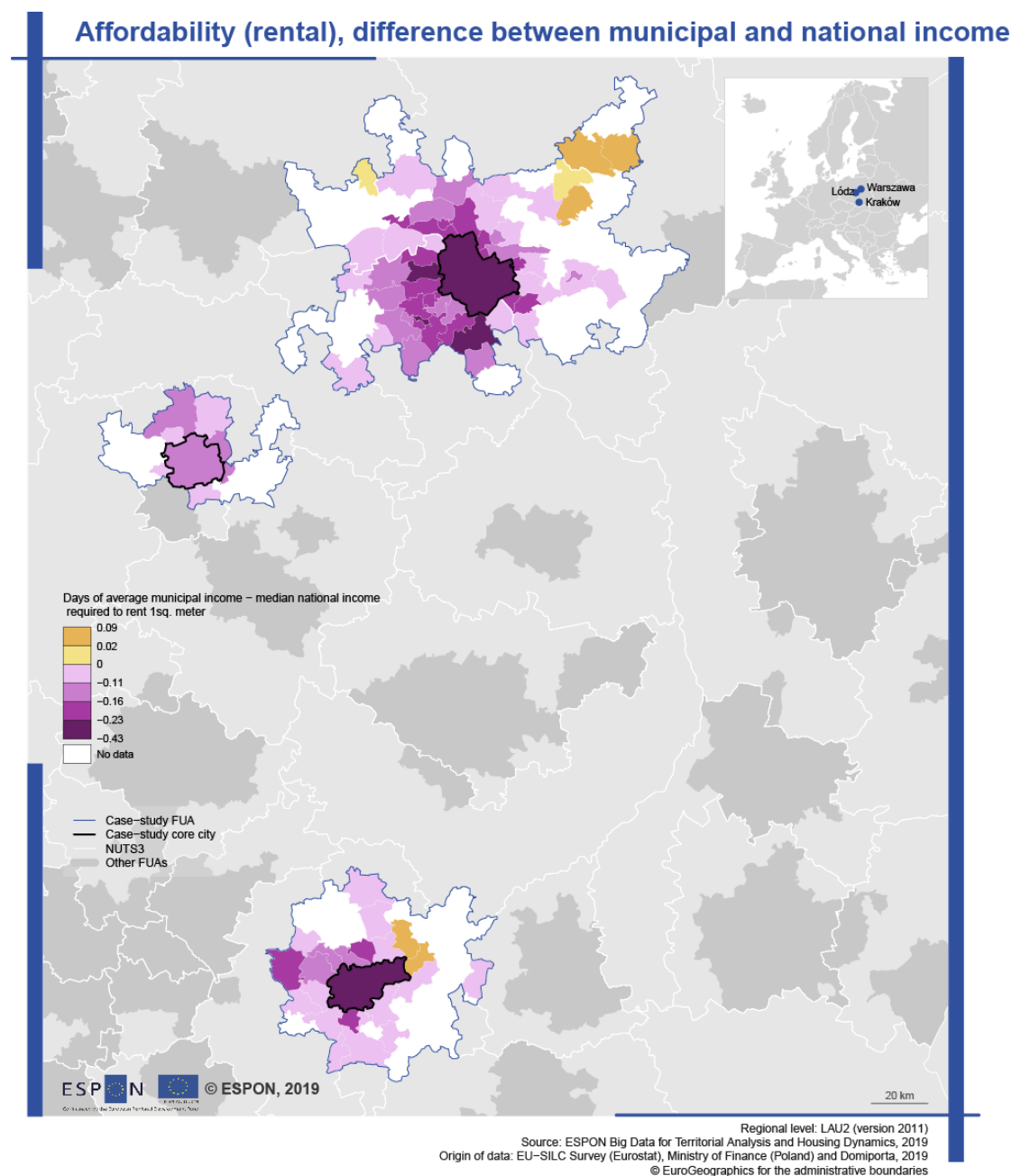
Map 0-59 – Affordability – difference between municipal and national income, 2019 (Warsaw, Lodz, Krakow)

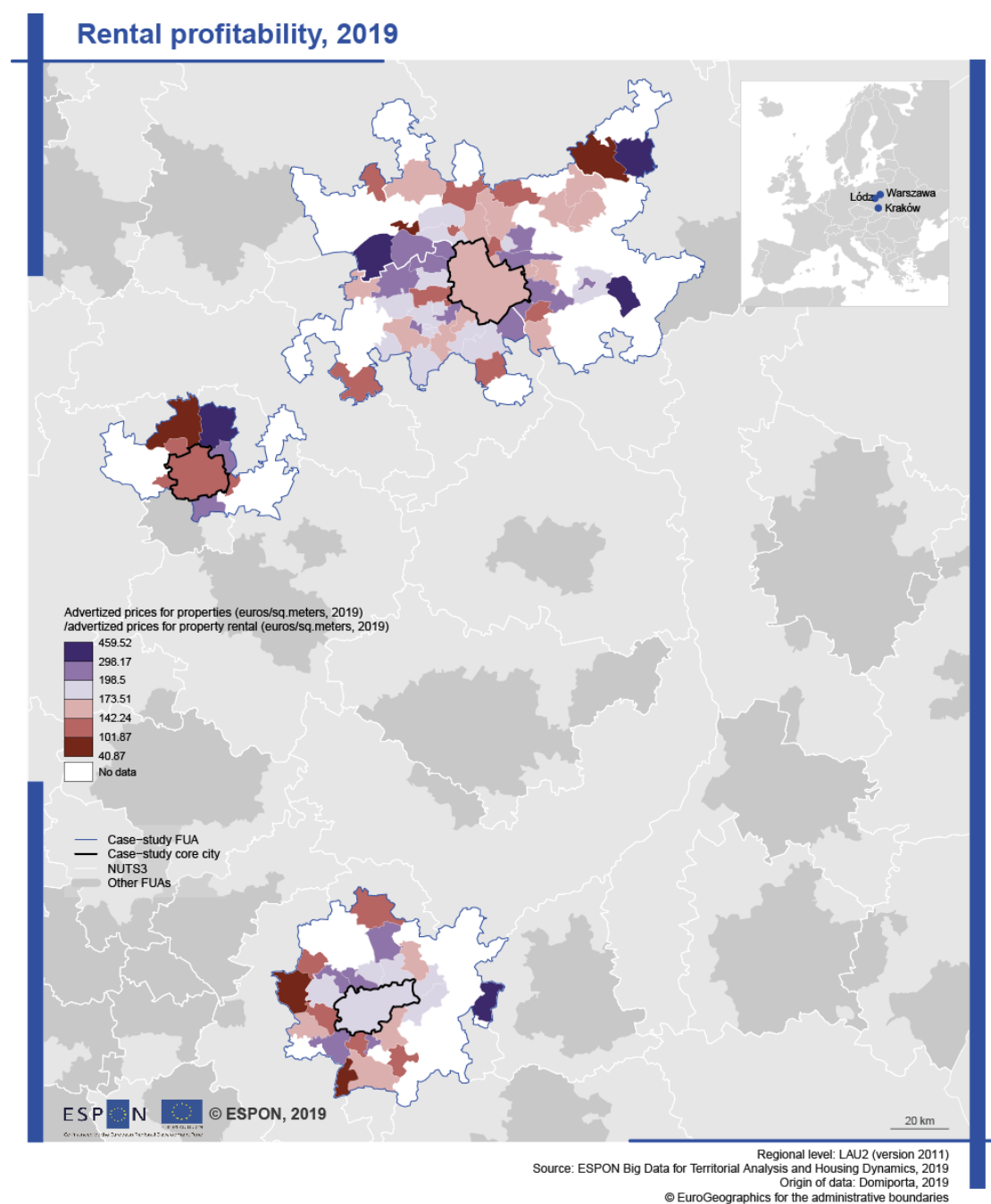


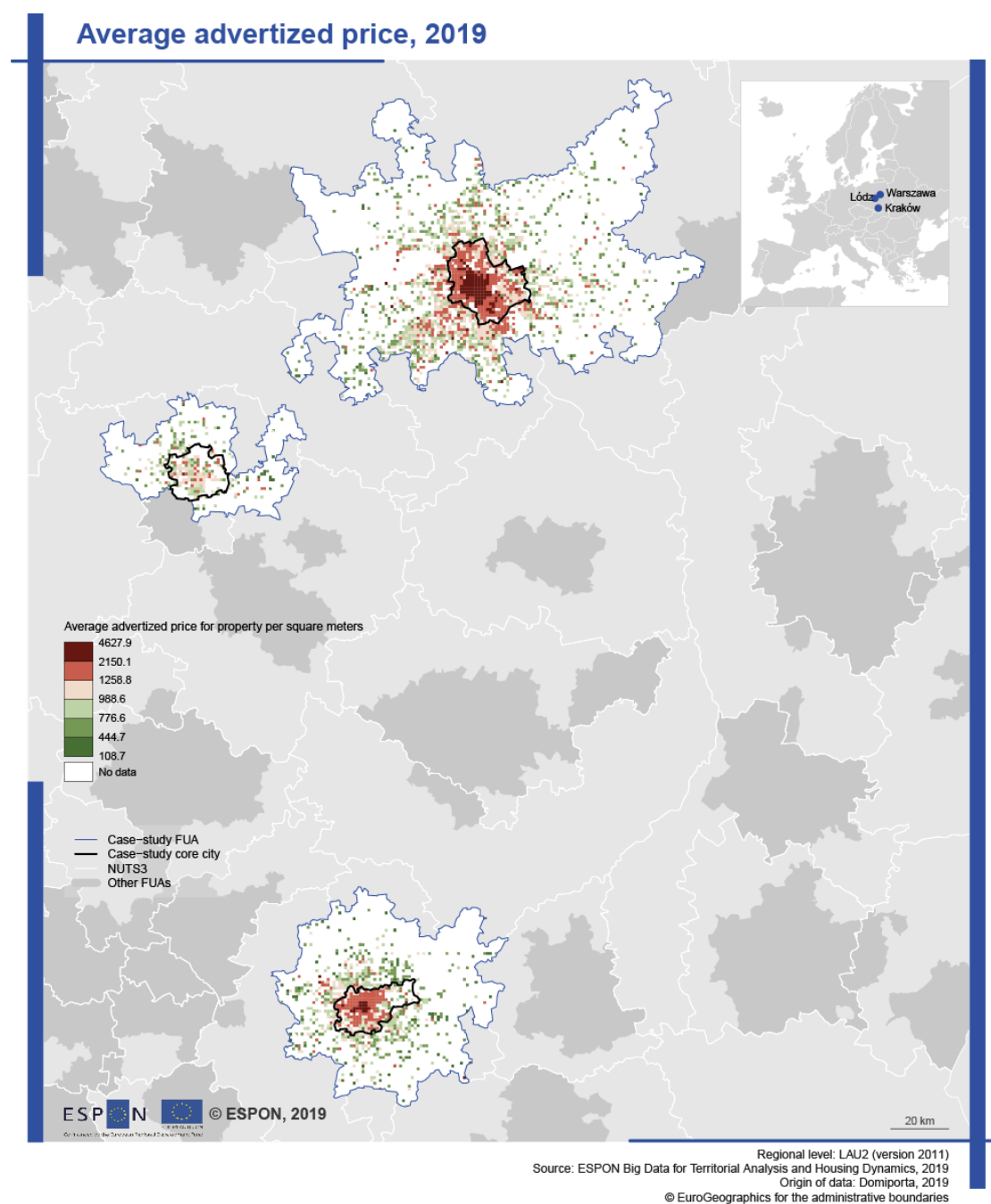




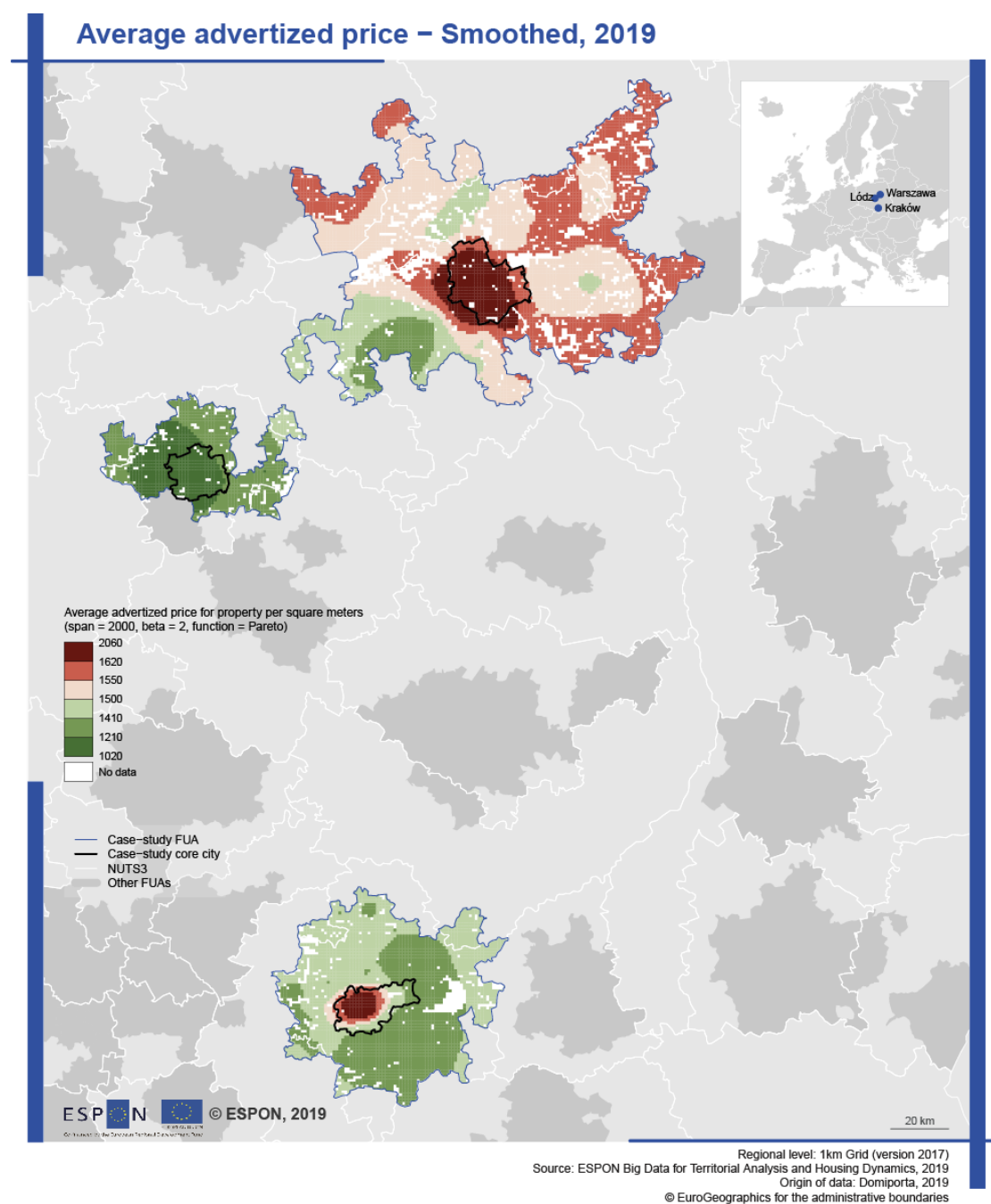
Map 0-62 – Affordability (rental) – difference between municipal and national income, 2019
(Warsaw, Lodz, Krakow)





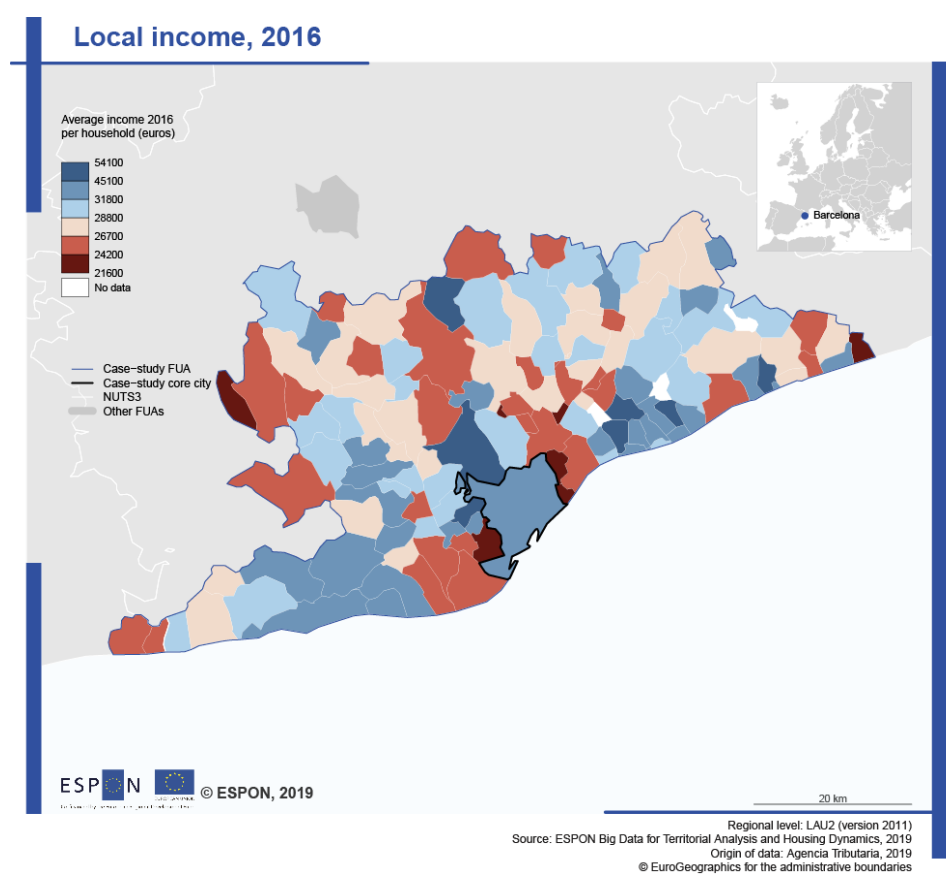


Map 0-65 – Average advertised price, grid smoothed, 2019 (Warsaw, Lodz, Krakow)

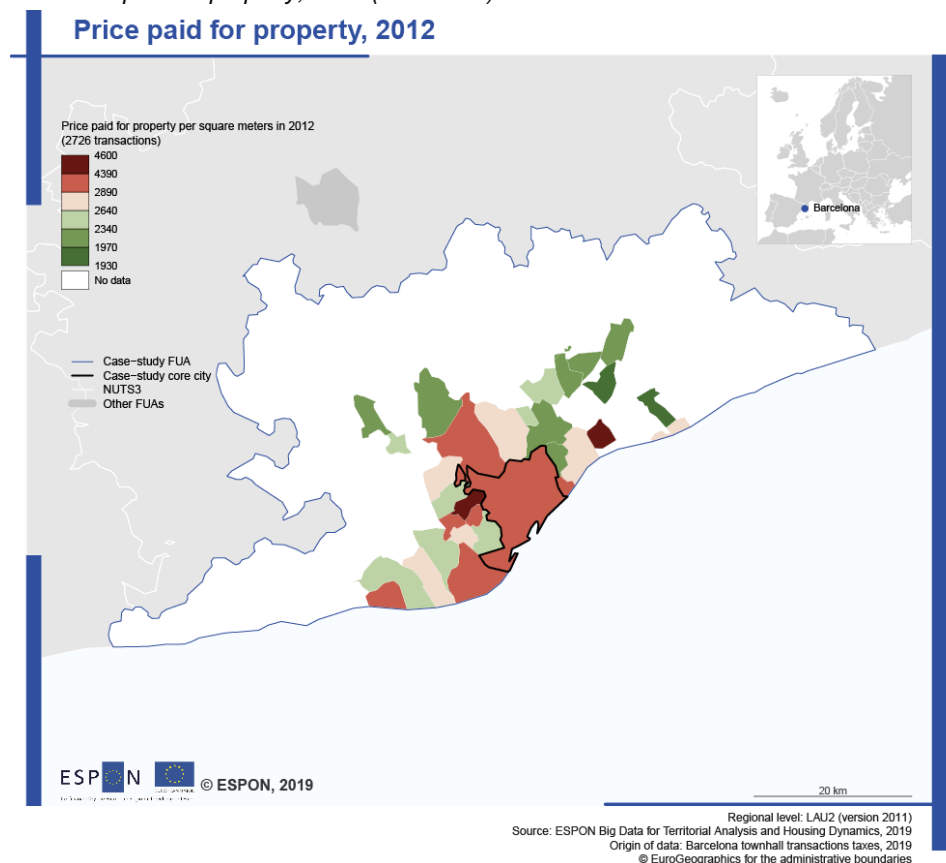


Annex 7 – Case-study maps on housing dynamics – Barcelona

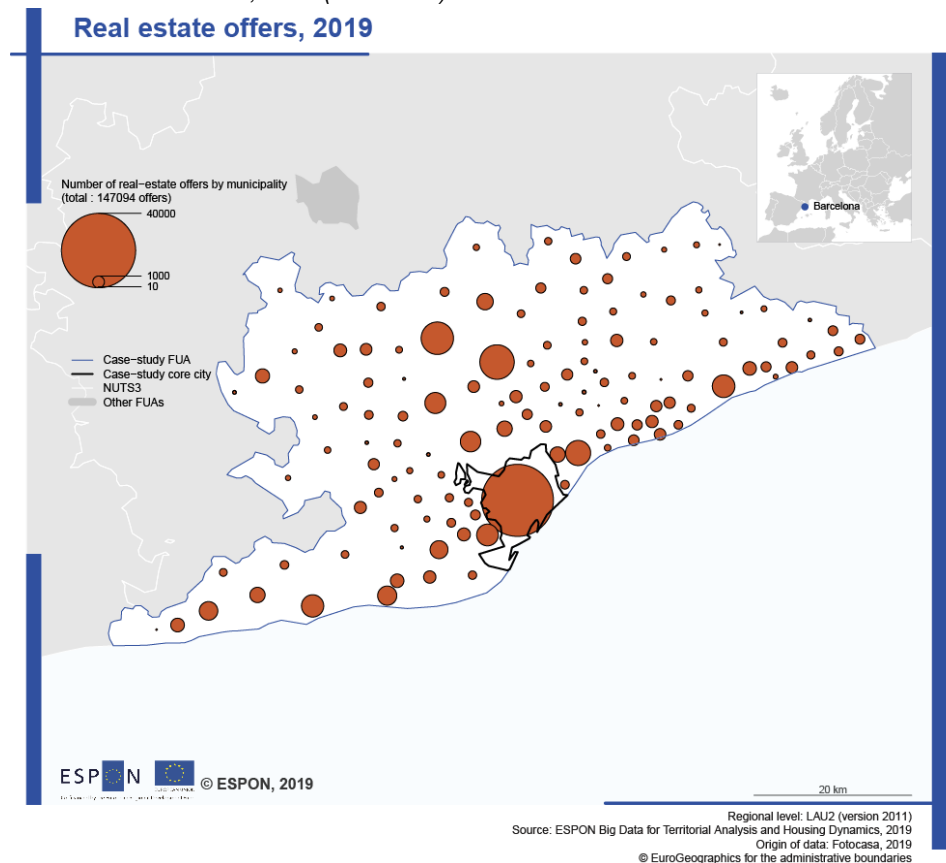
Map 0-66 – Local income, 2016 (Barcelona)



Map 0-67 – Price paid for property, 2012 (Barcelona)

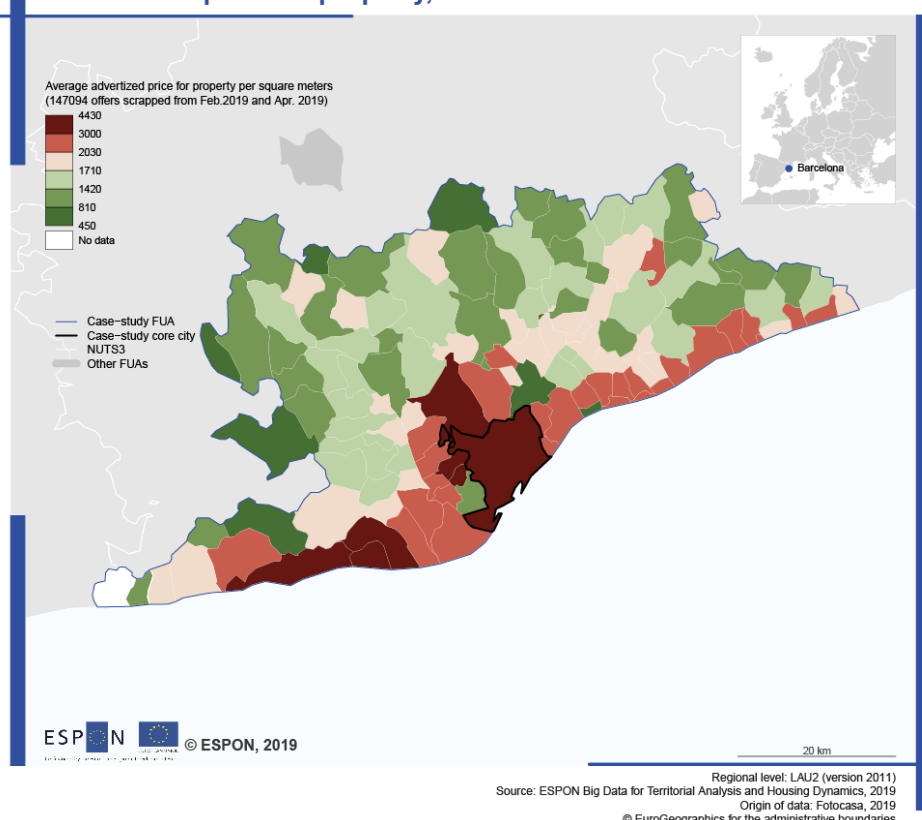


Map 0-68 – Real estate offers, 2019 (Barcelona)



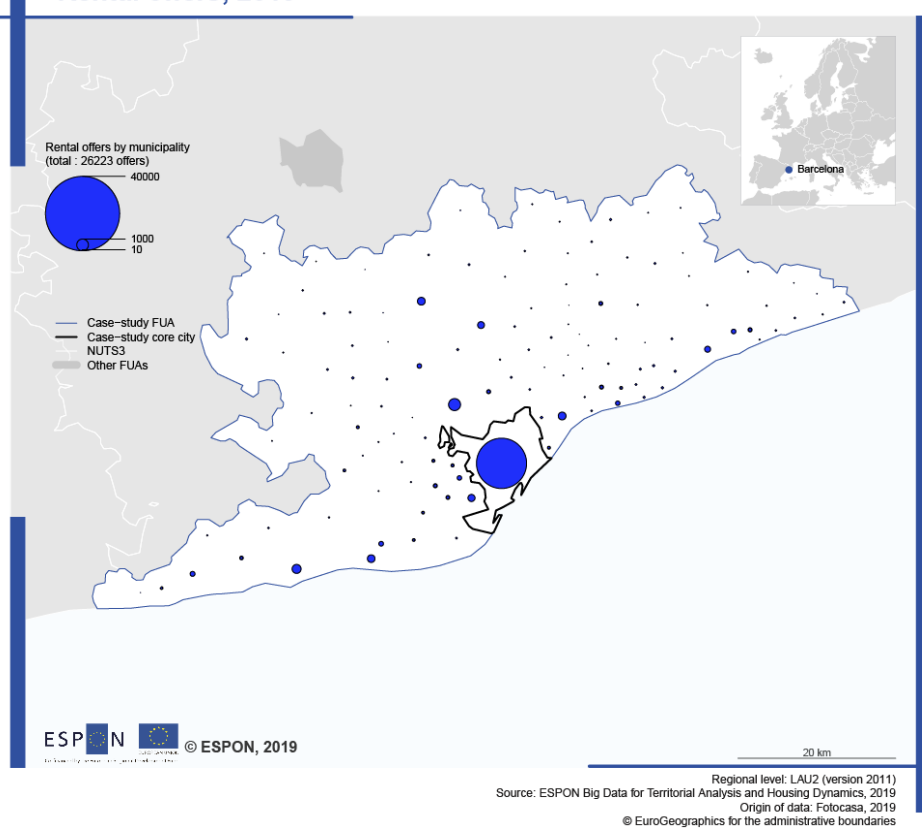
Map 0-69 – Advertised price for property, 2019 (Barcelona)

Advertized price for property, 2019



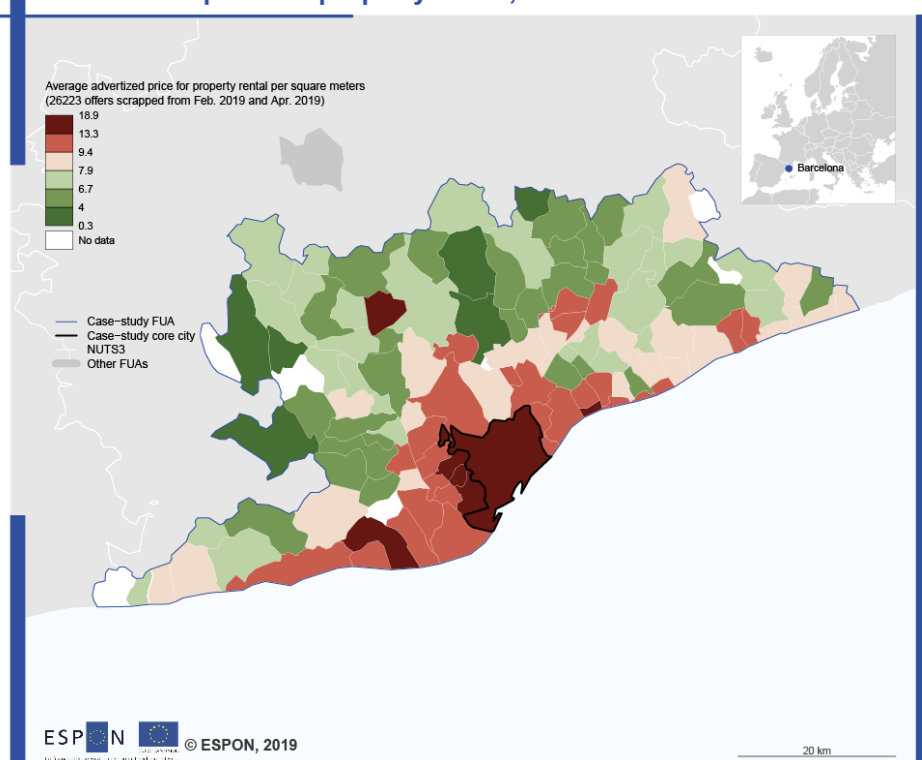
Map 0-70 – Rental offers, 2019 (Barcelona)

Rental offers, 2019



Map 0-71 – Advertised price for property rental, 2019 (Barcelona)

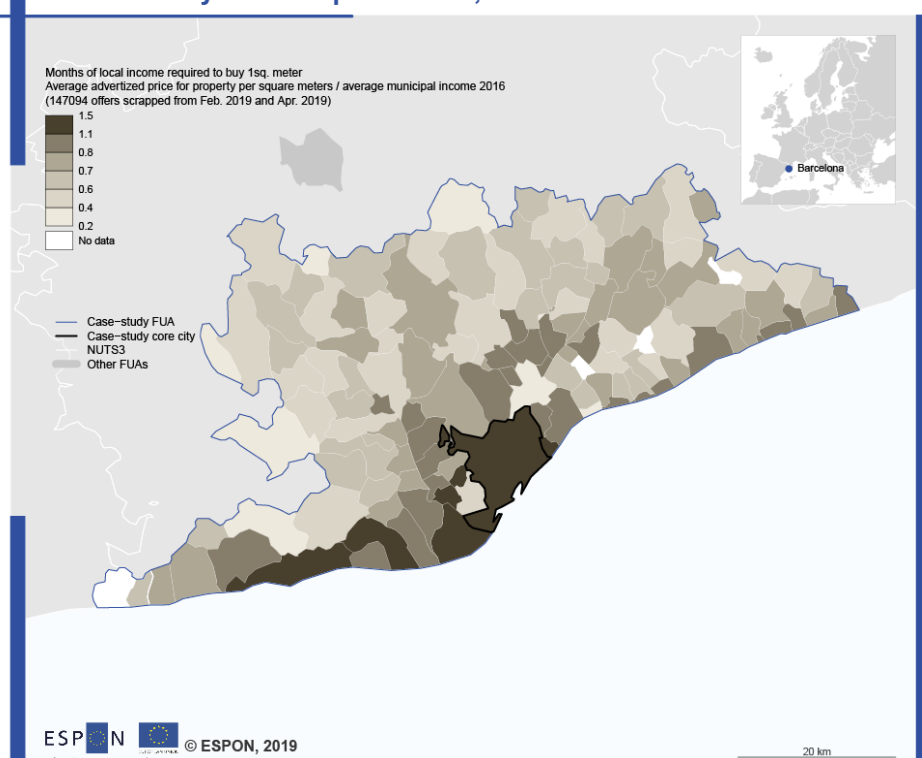
Advertized price for property rental, 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Fotocasa, 2019
© EuroGeographics for the administrative boundaries

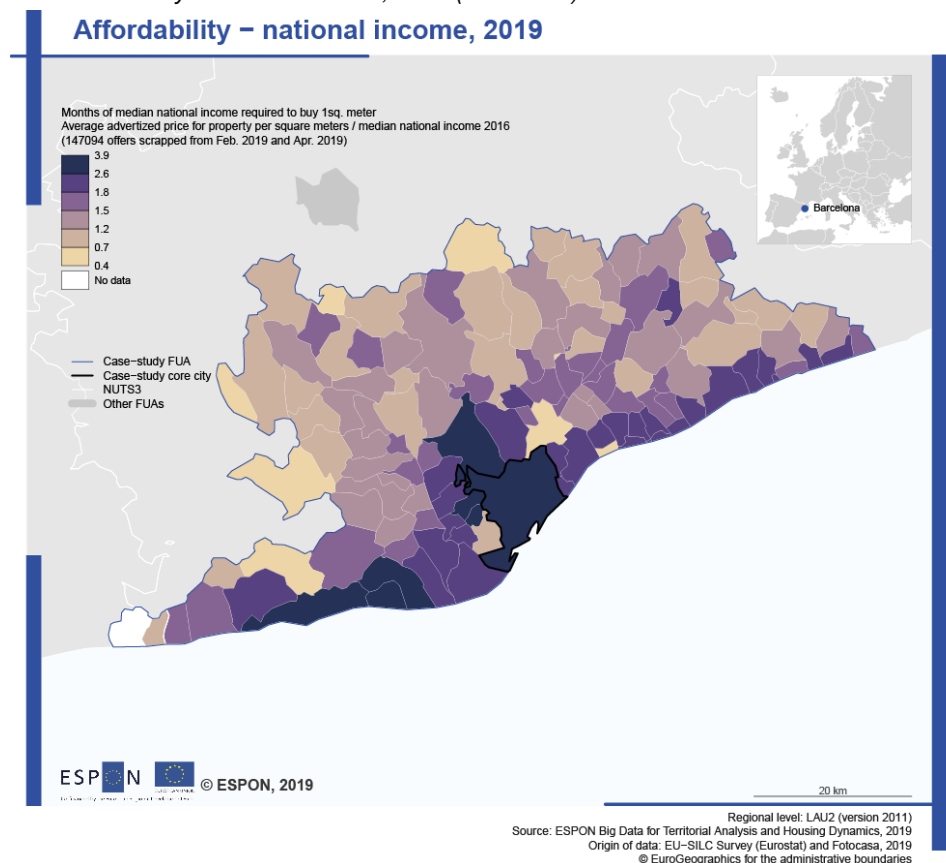
Map 0-72 – Affordability – municipal income, 2019 (Barcelona)

Affordability – municipal income, 2019

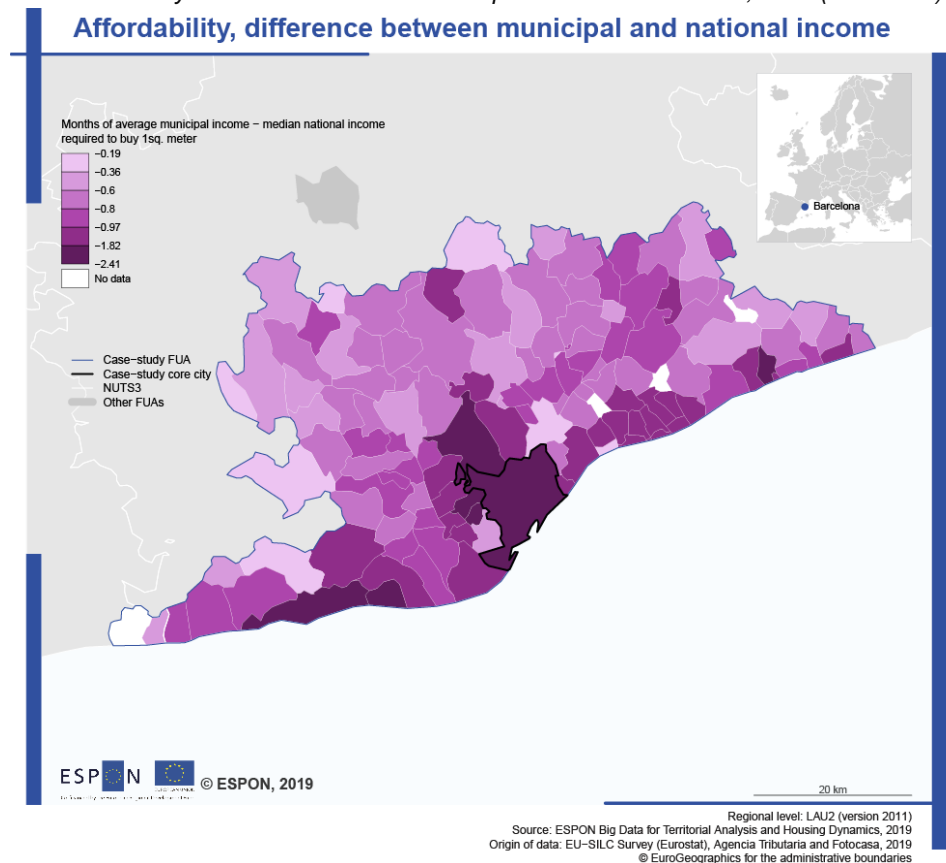


Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Agencia Tributaria and Fotocasa, 2019
© EuroGeographics for the administrative boundaries

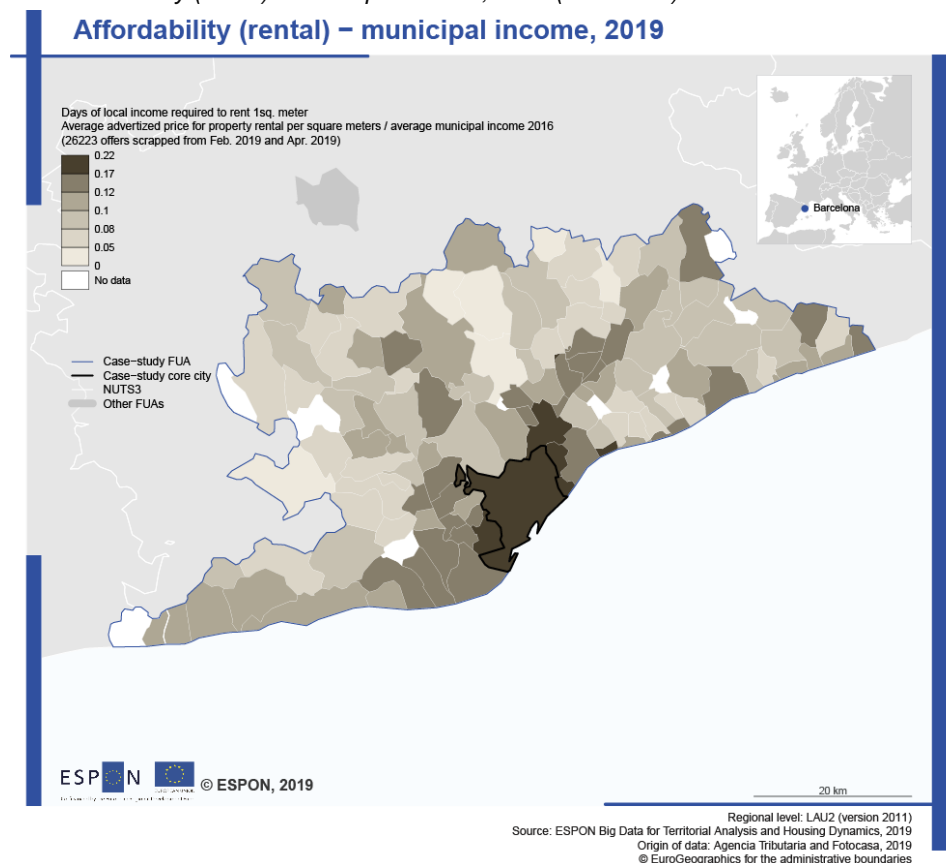
Map 0-73 – Affordability – national income, 2019 (Barcelona)



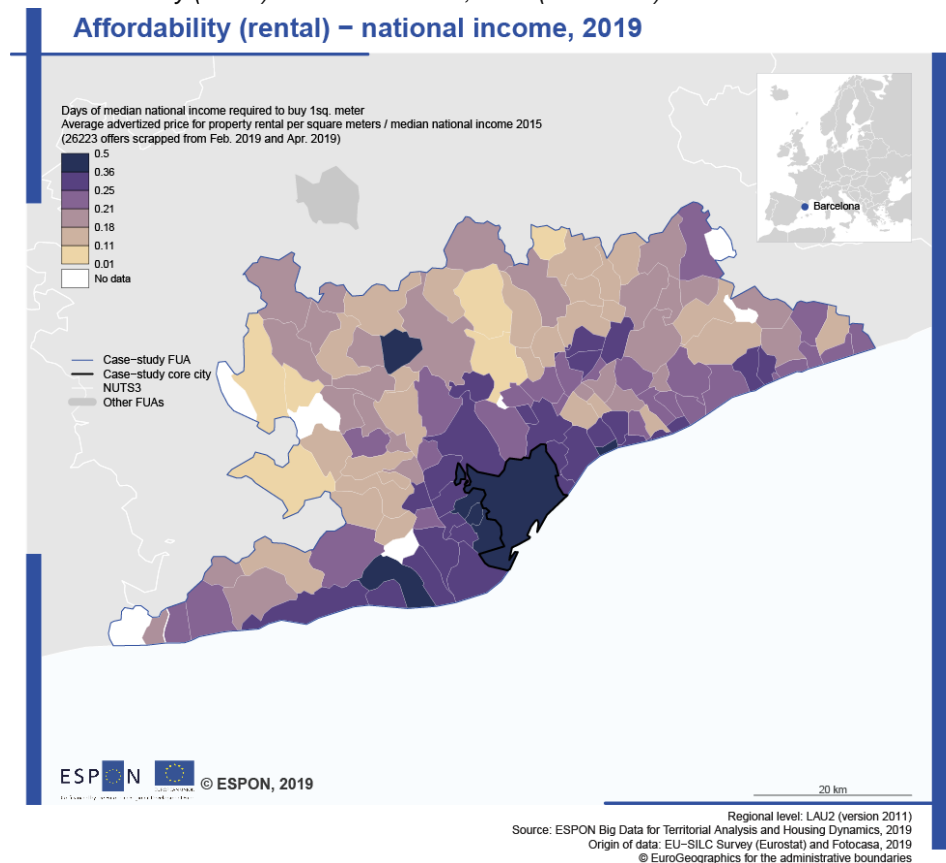
Map 0-74 – Affordability – difference between municipal and national income, 2019 (Barcelona)



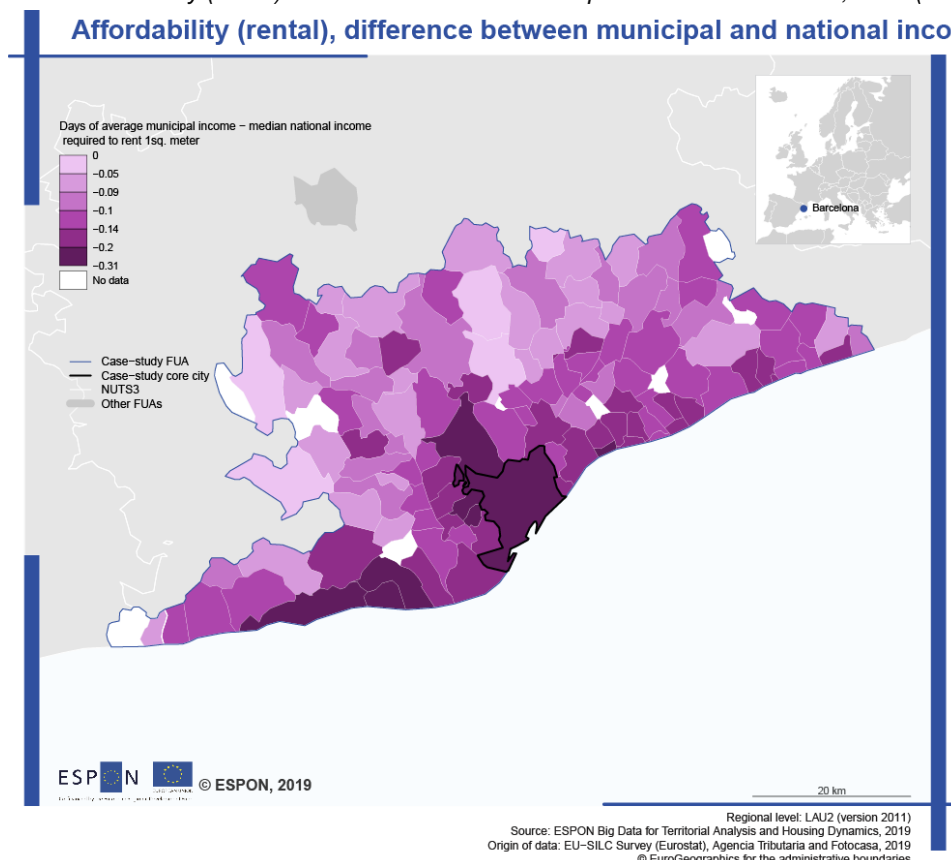
Map 0-75 – Affordability (rental) – municipal income, 2019 (Barcelona)



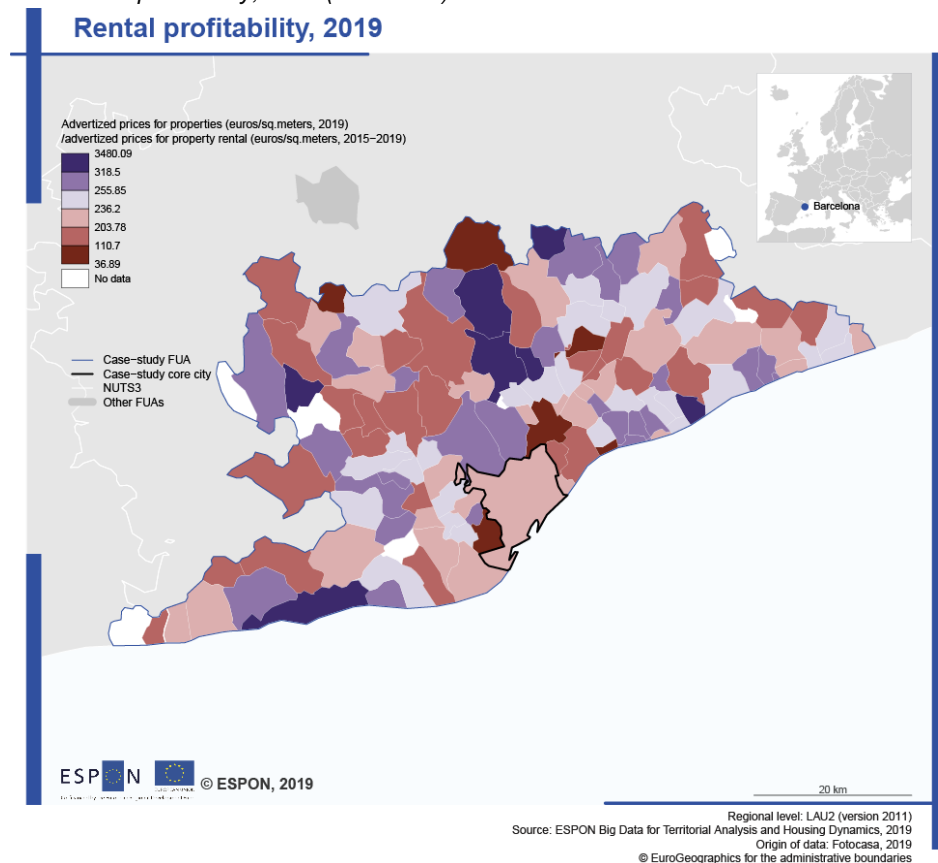
Map 0-76 – Affordability (rental) – national income, 2019 (Barcelona)



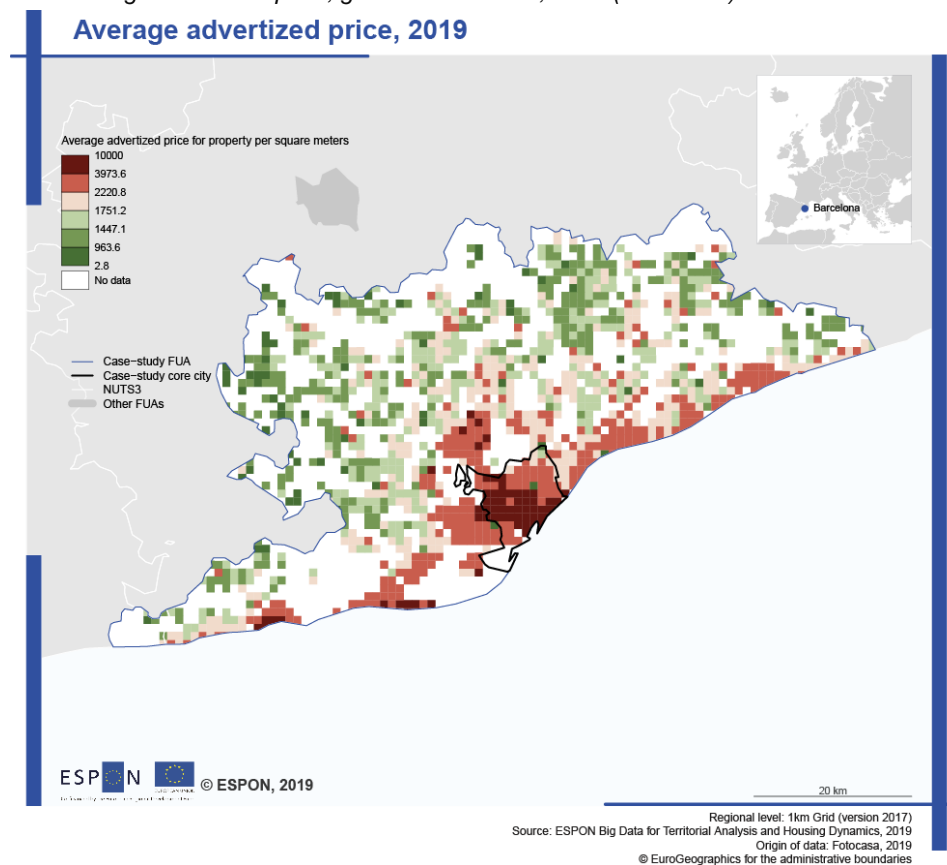
Map 0-77 – Affordability (rental) – difference between municipal and national income, 2019 (Barcelona)



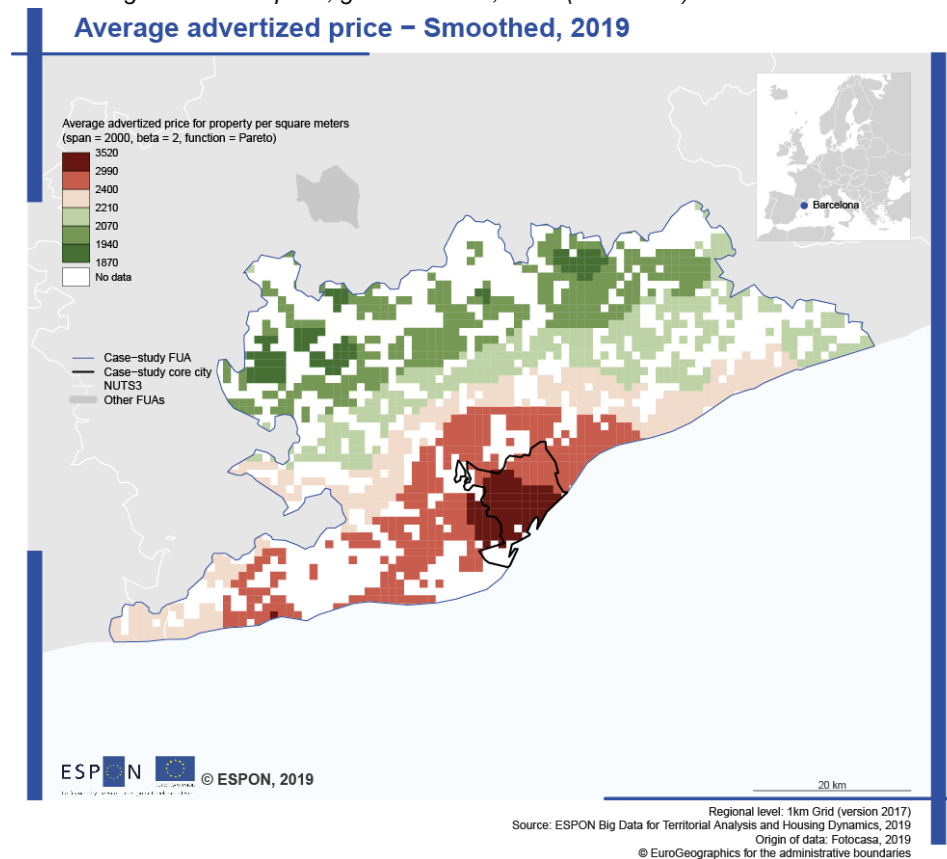
Map 0-78 – Rental profitability, 2019 (Barcelona)



Map 0-79 – Average advertised price, grid non smoothed, 2019 (Barcelona)

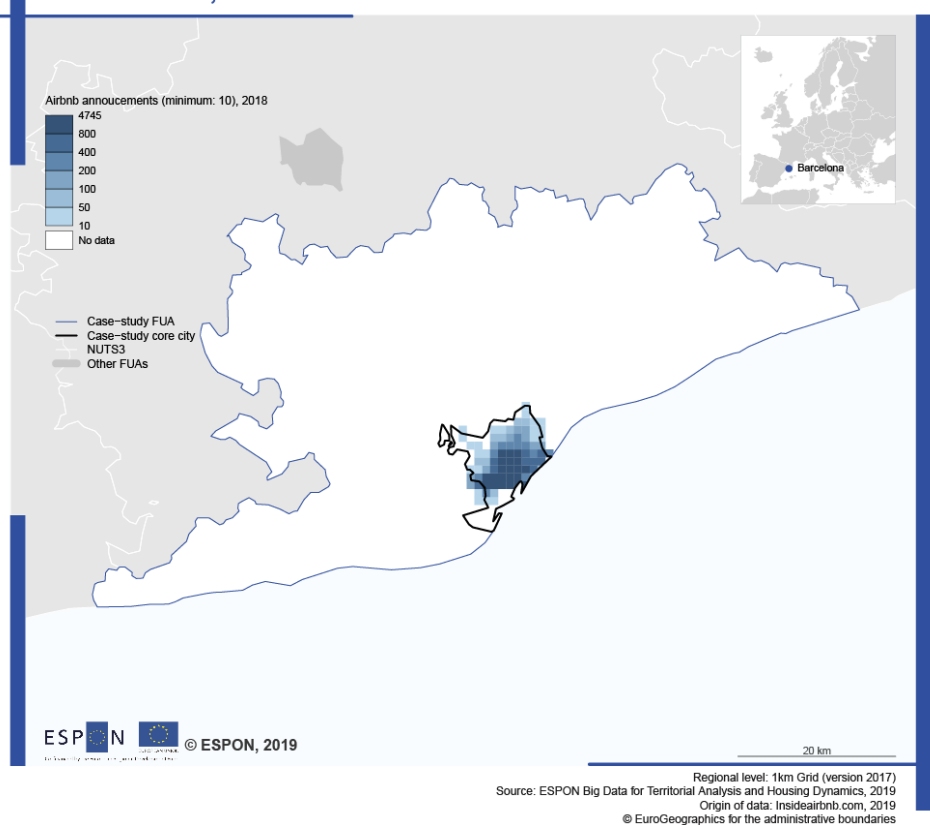


Map 0-80 – Average advertised price, grid smoothed, 2019 (Barcelona)



Map 0-81 – Airbnb offer, 2019 (Barcelona)

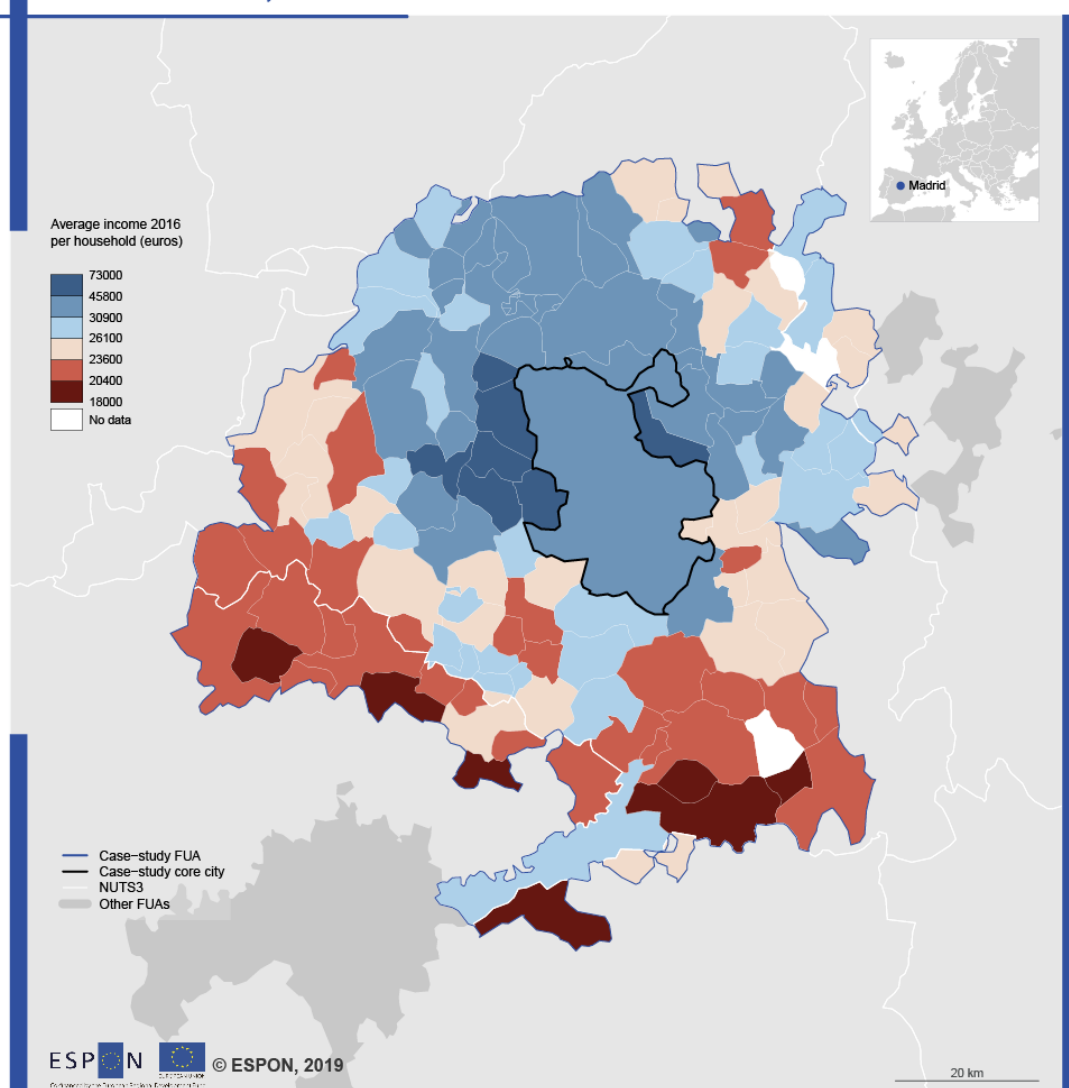
Airbnb offer, 2018



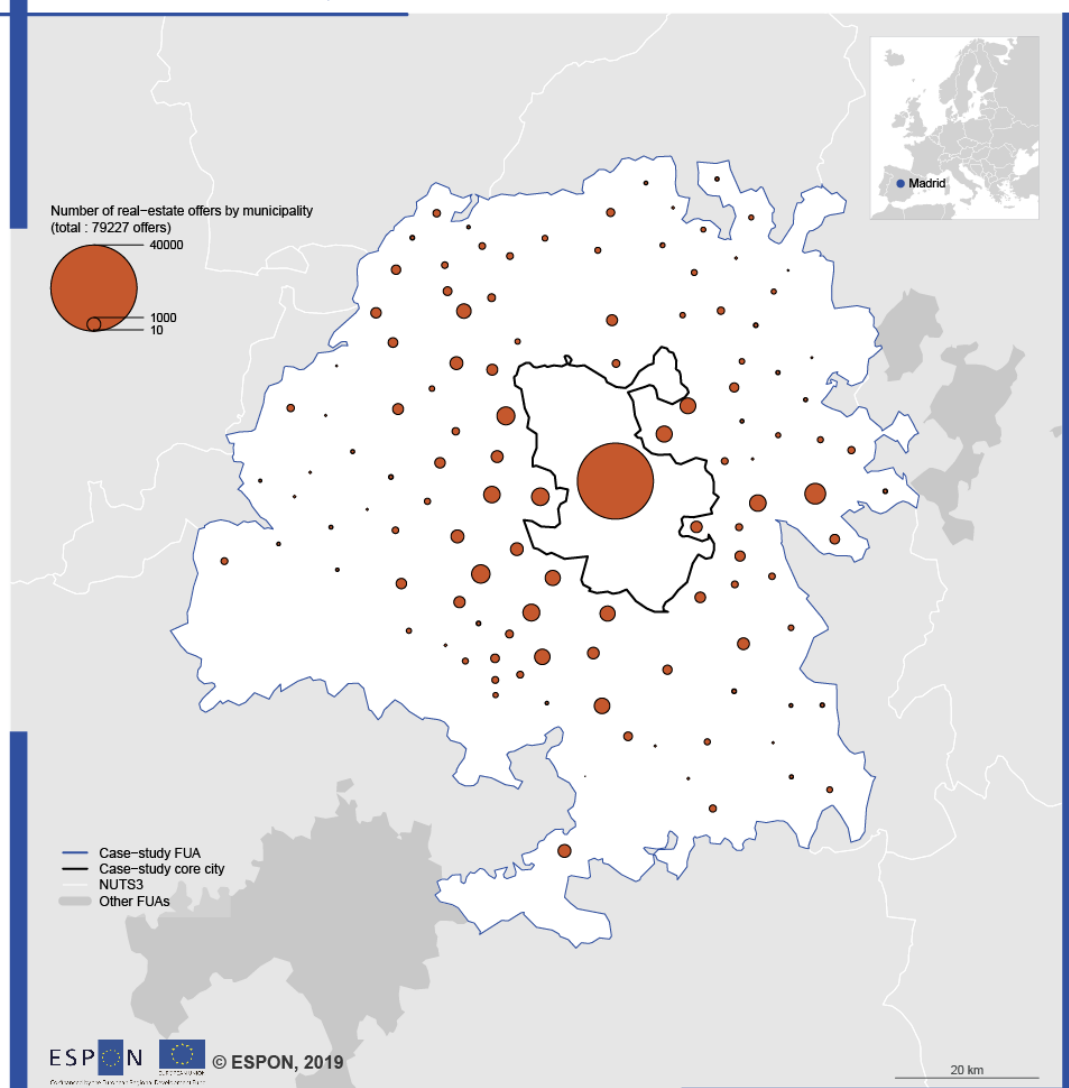
Annex 8 – Case-study maps on housing dynamics – Madrid

Map 0-82 – Local income, 2016 (Madrid)

Local income, 2016

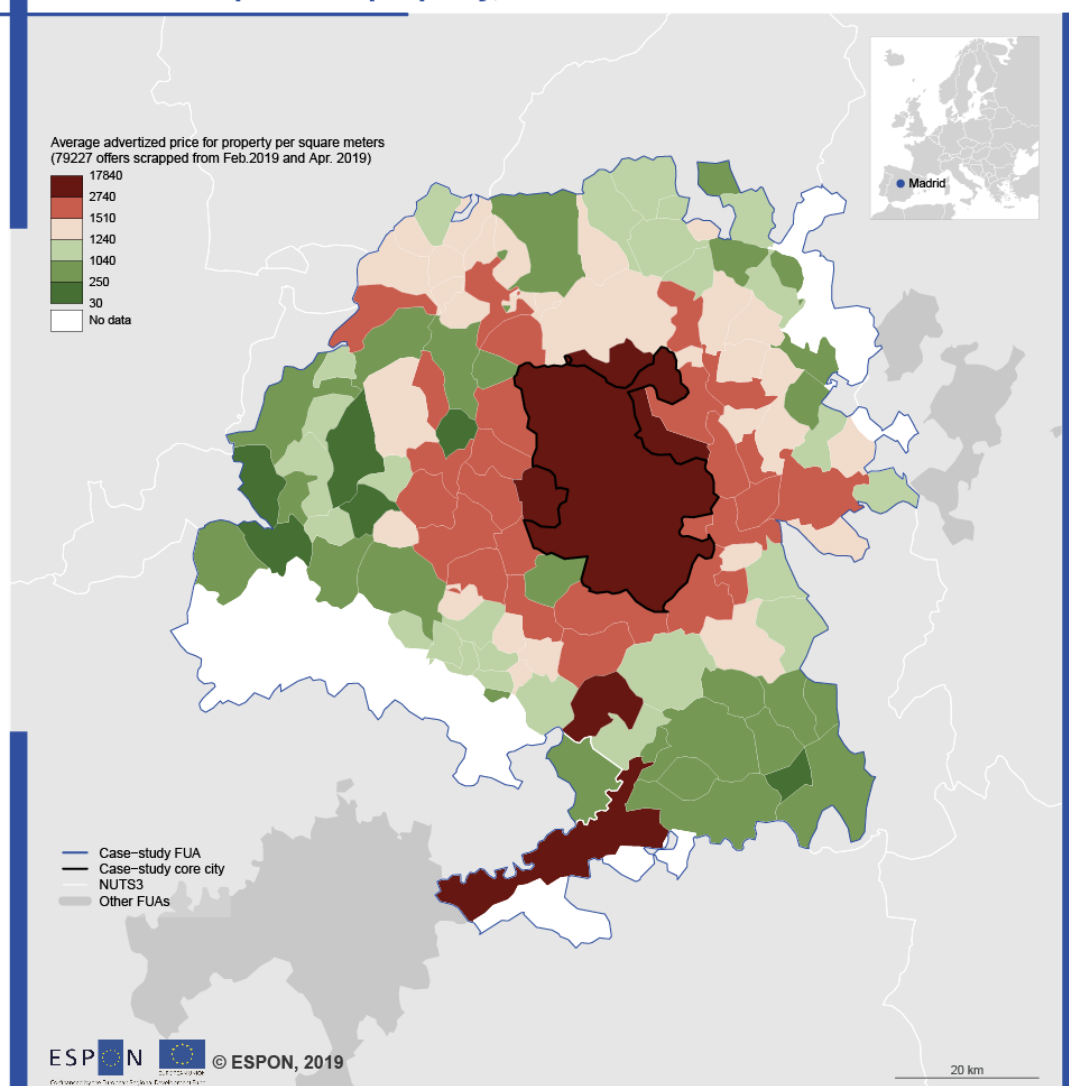


Real estate offers, 2019



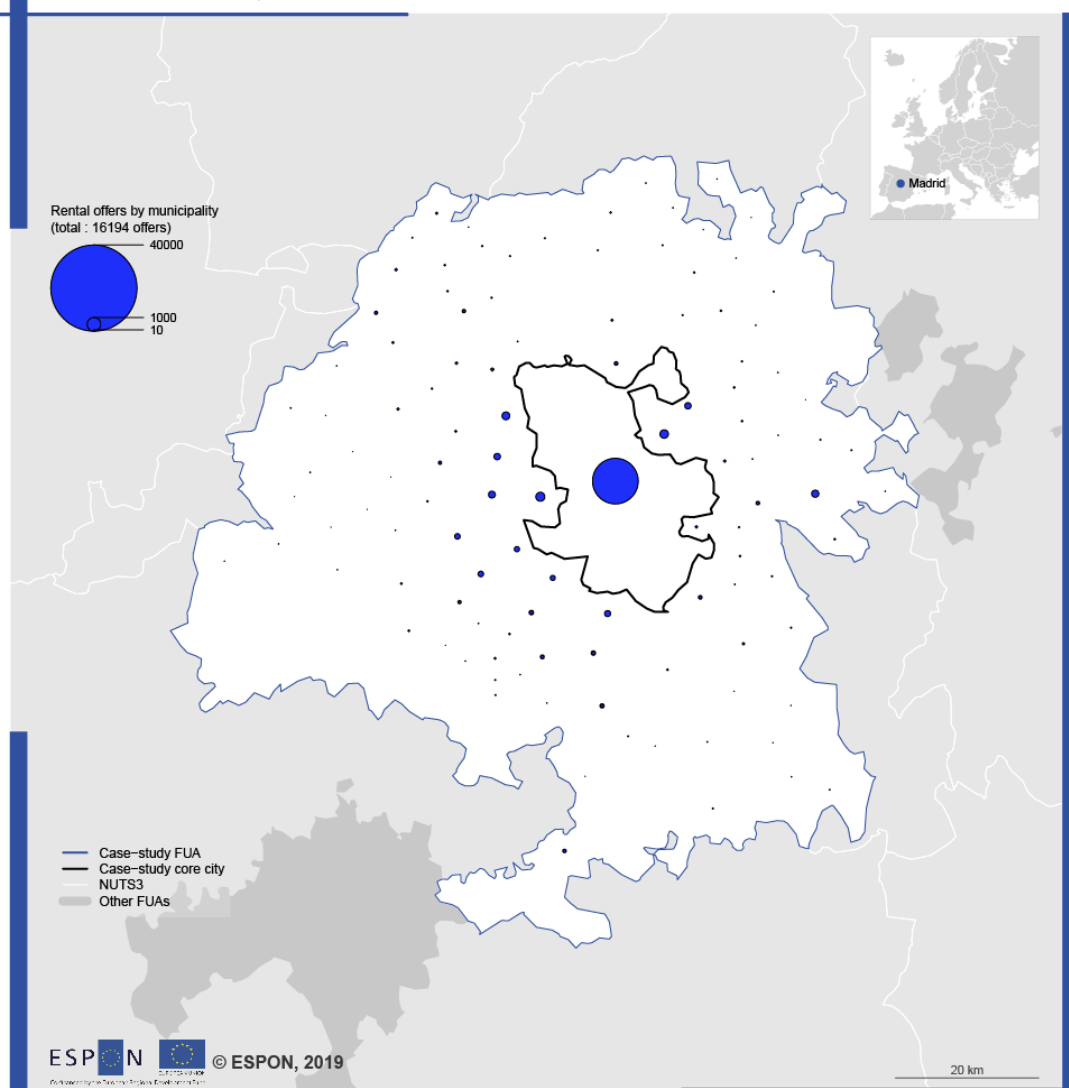
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Fotocasa, 2019
© EuroGeographics for the administrative boundaries

Advertized price for property, 2019



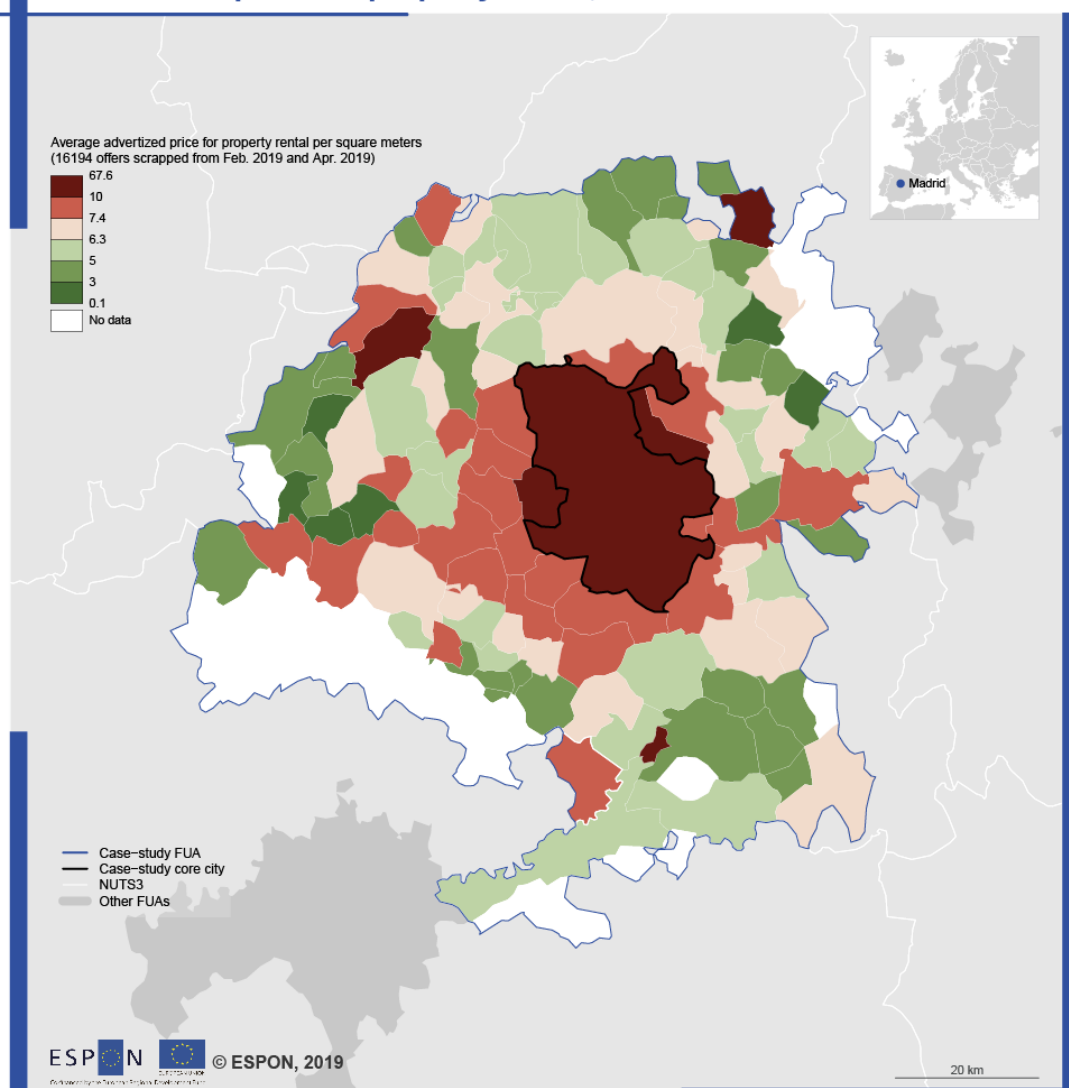
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Fotocasa, 2019
© EuroGeographics for the administrative boundaries

Rental offers, 2019



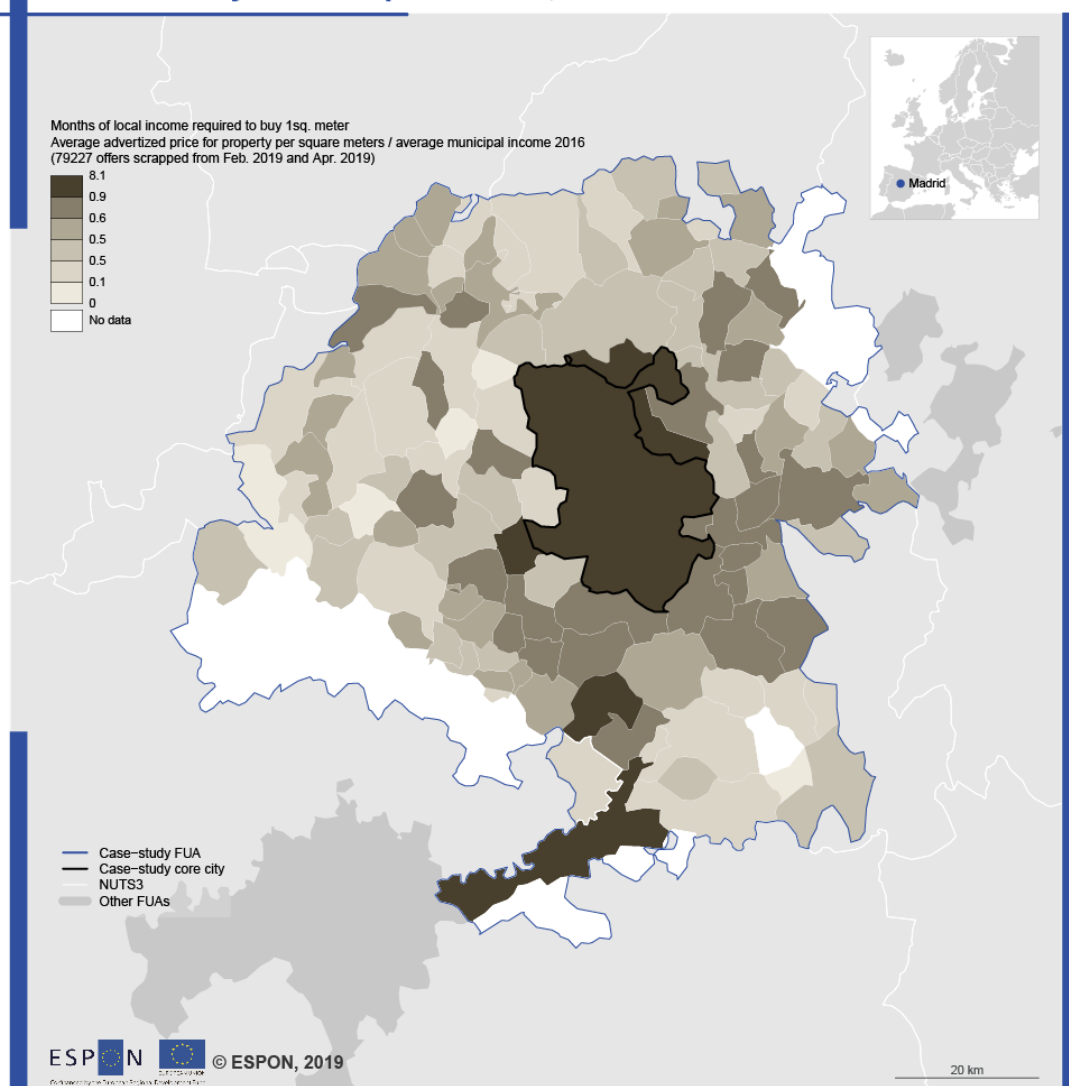
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Fotocasa, 2019
© EuroGeographics for the administrative boundaries

Advertized price for property rental, 2019



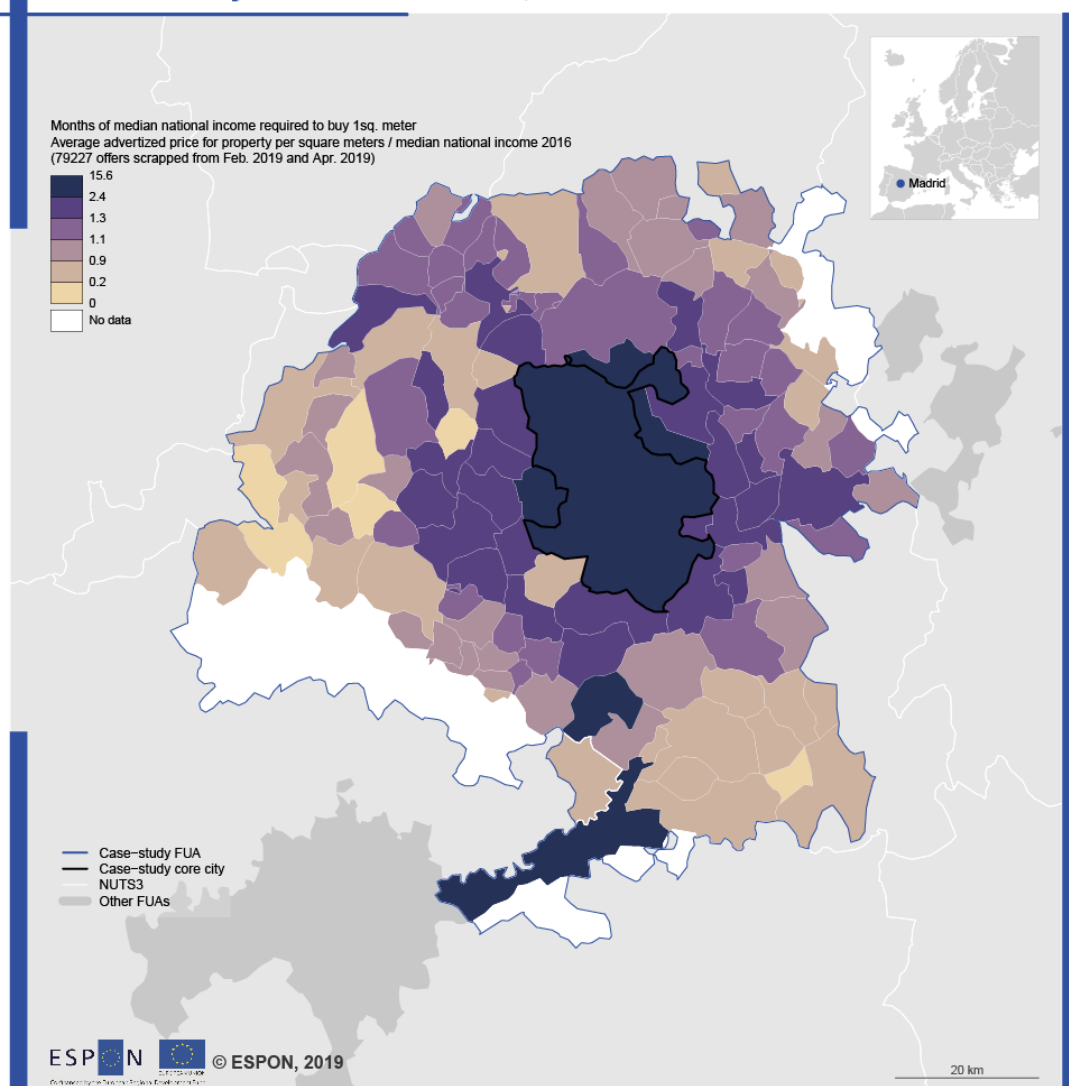
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Fotocasa, 2019
© EuroGeographics for the administrative boundaries

Affordability – municipal income, 2019



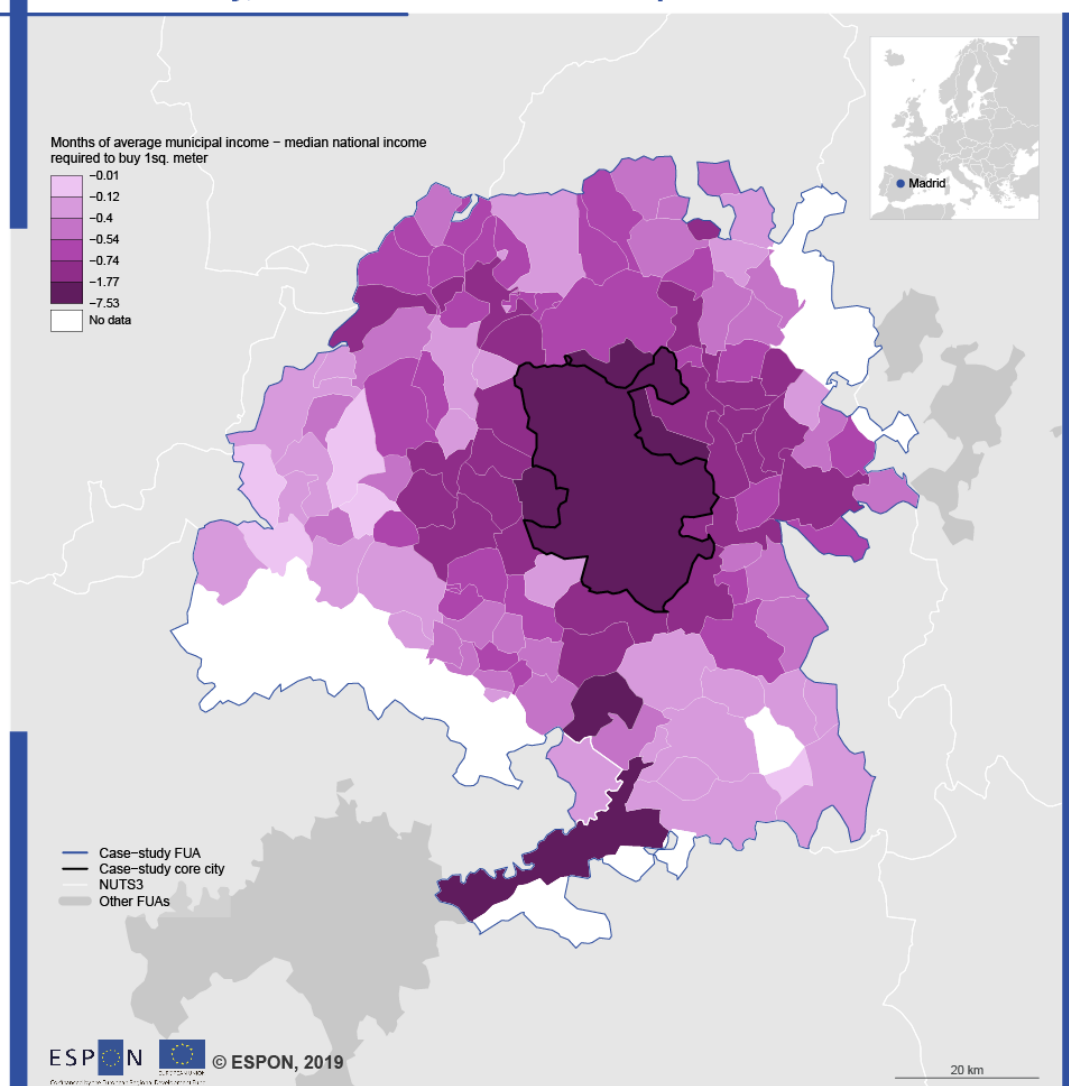
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Agencia Tributaria and Fotocasa, 2019
© EuroGeographics for the administrative boundaries

Affordability – national income, 2019

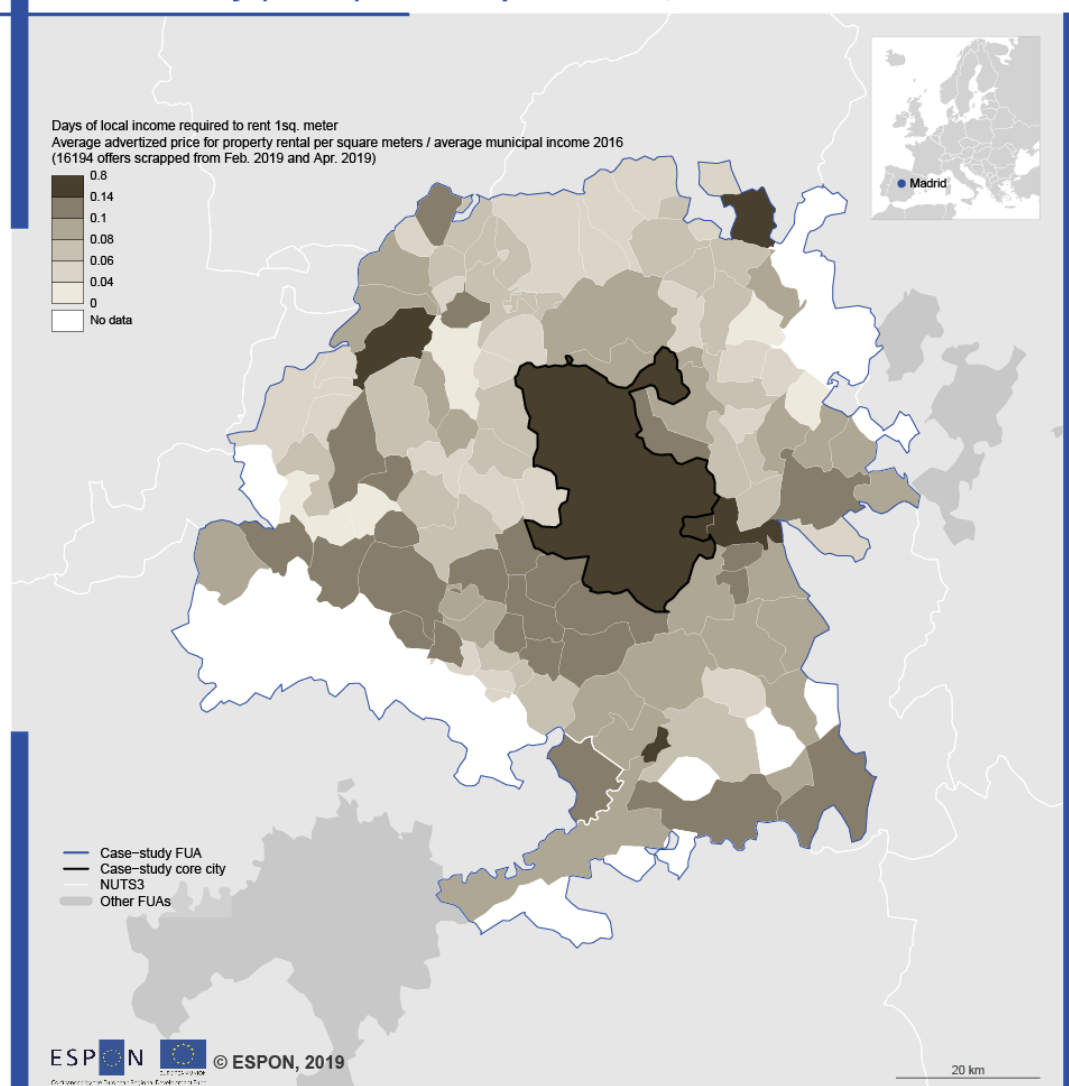


Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: EU-SILC Survey (Eurostat) and Fotocasa, 2019
© EuroGeographics for the administrative boundaries

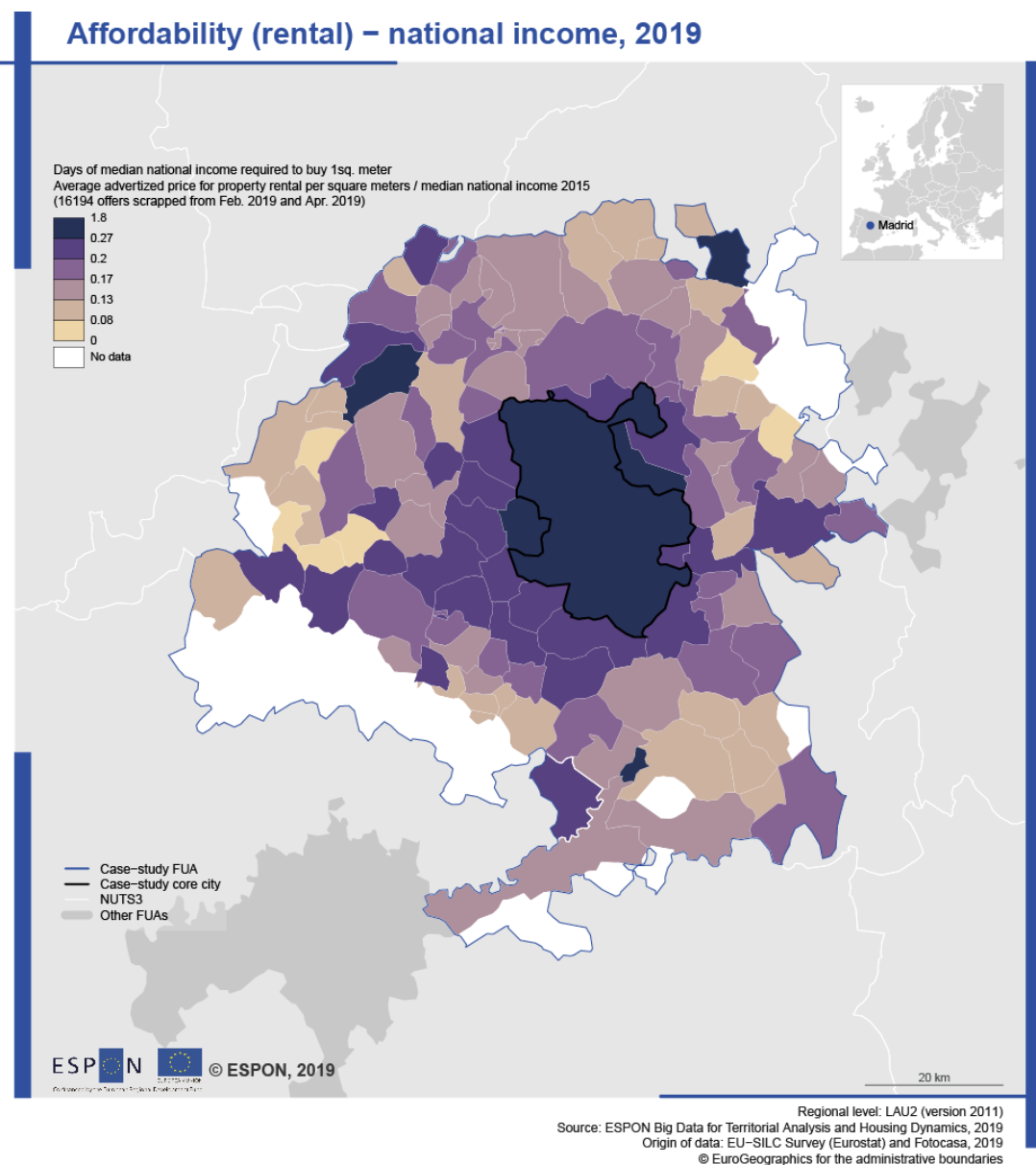
Affordability, difference between municipal and national income



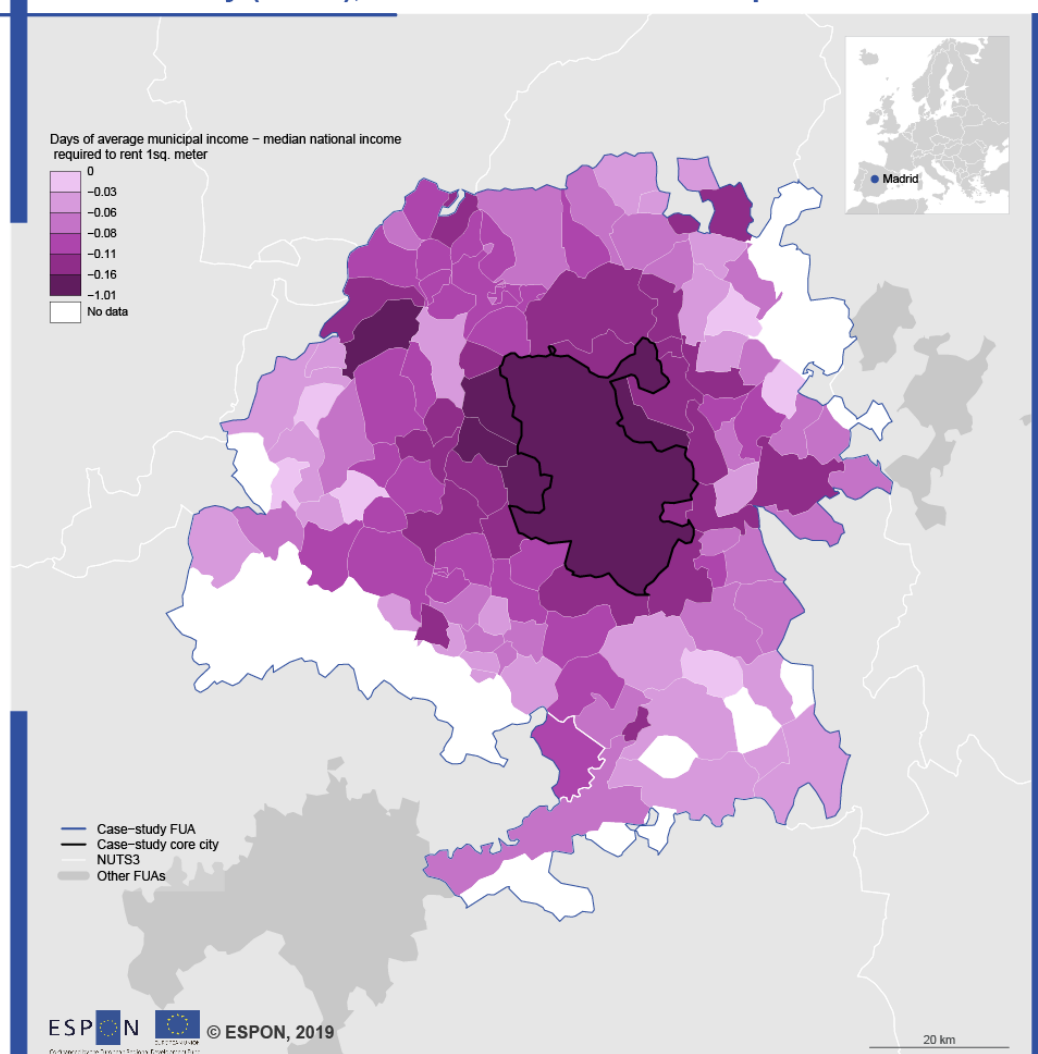
Affordability (rental) – municipal income, 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Agencia Tributaria and Fotocasa, 2019
© EuroGeographics for the administrative boundaries

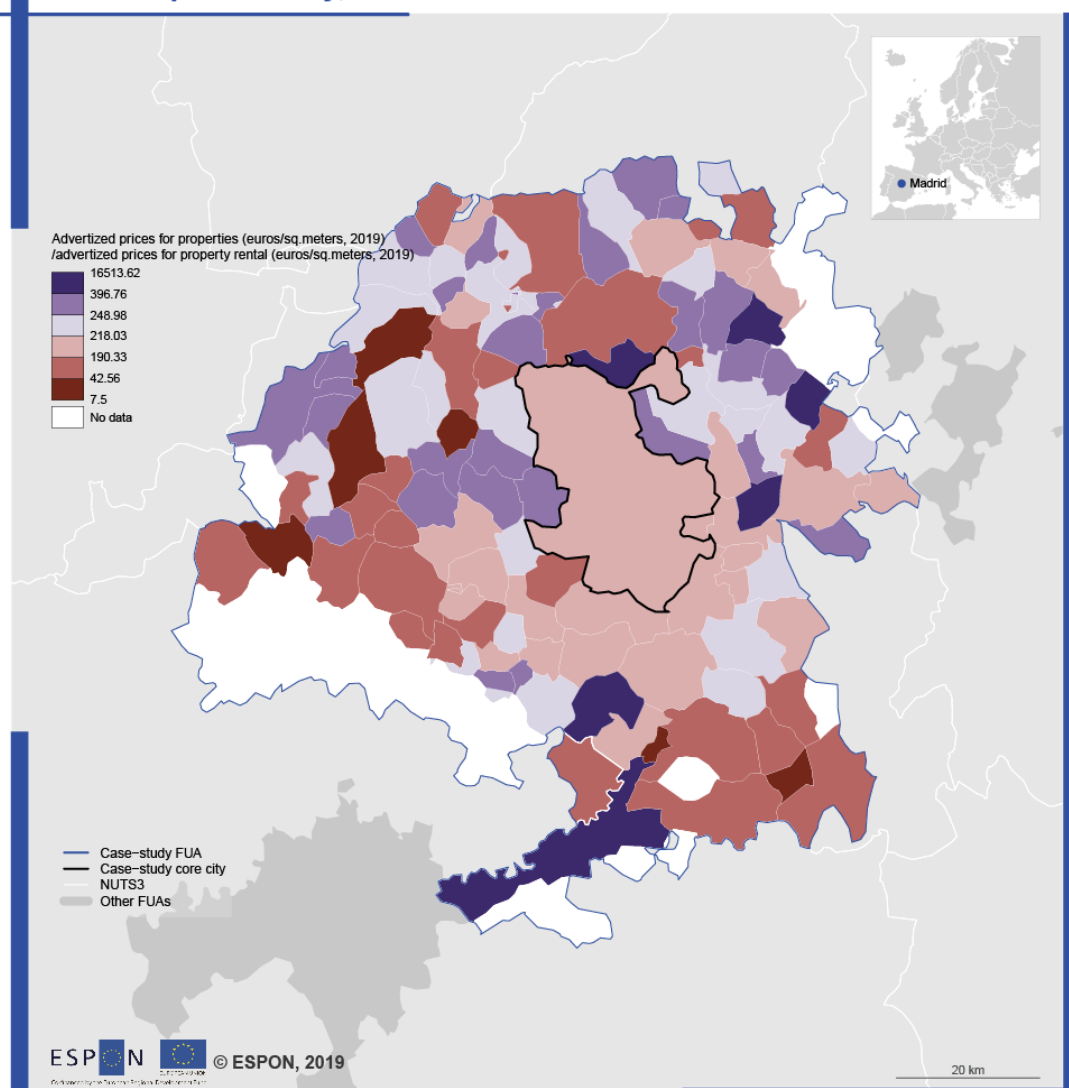


Affordability (rental), difference between municipal and national income



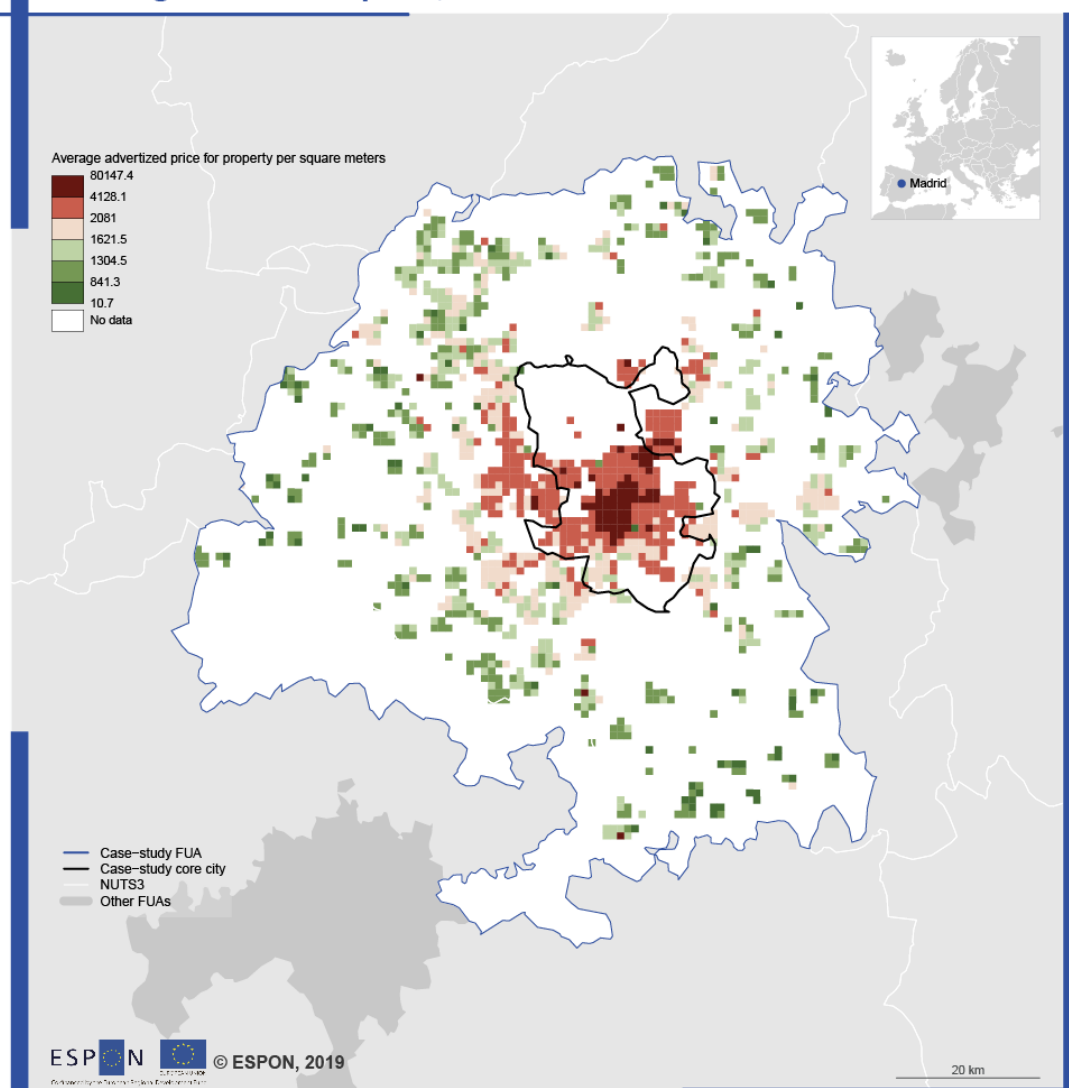
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: EU-SILC Survey (Eurostat), Agencia Tributaria and Fotocasa, 2019
© EuroGeographics for the administrative boundaries

Rental profitability, 2019



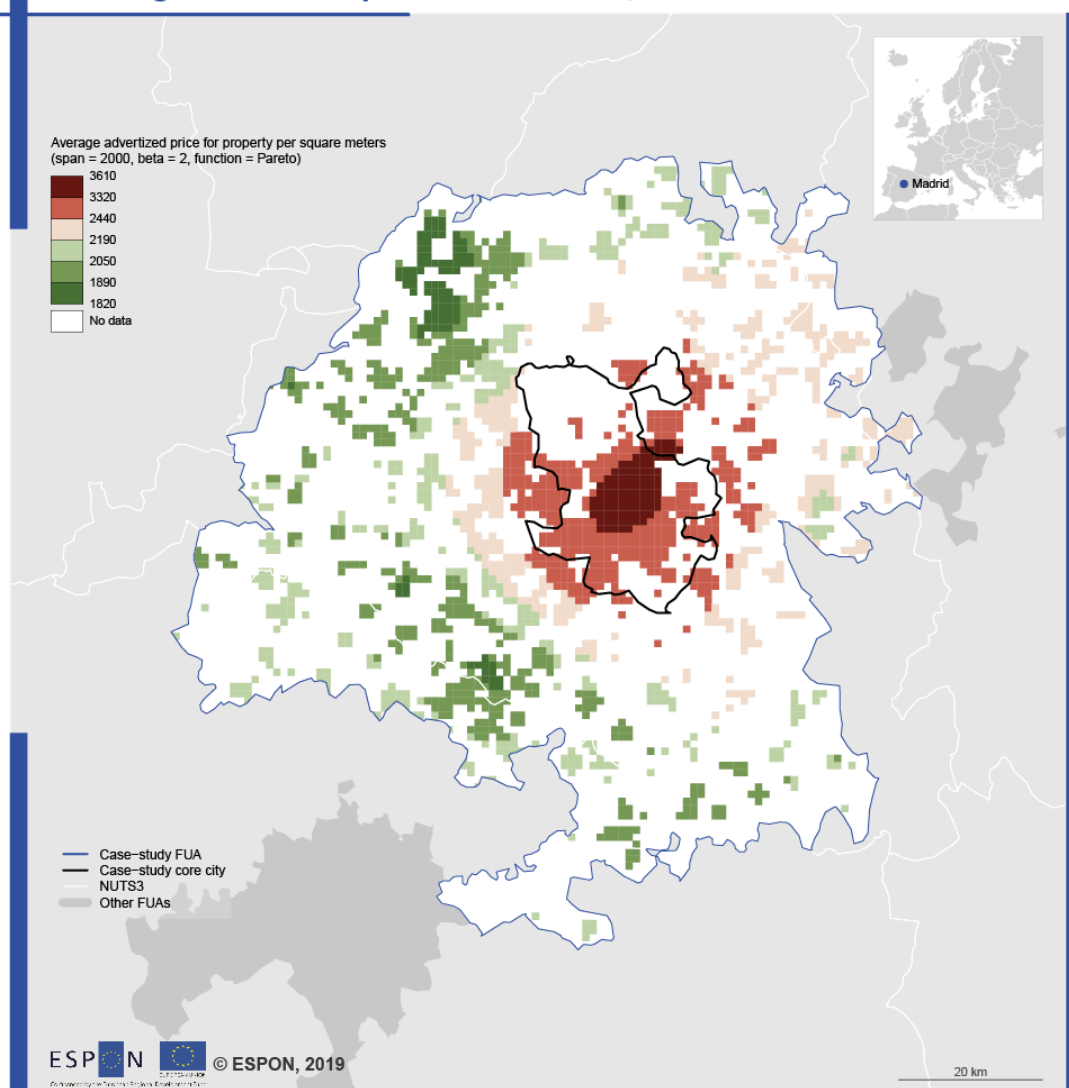
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Fotocasa, 2019
© EuroGeographics for the administrative boundaries

Average advertised price, 2019



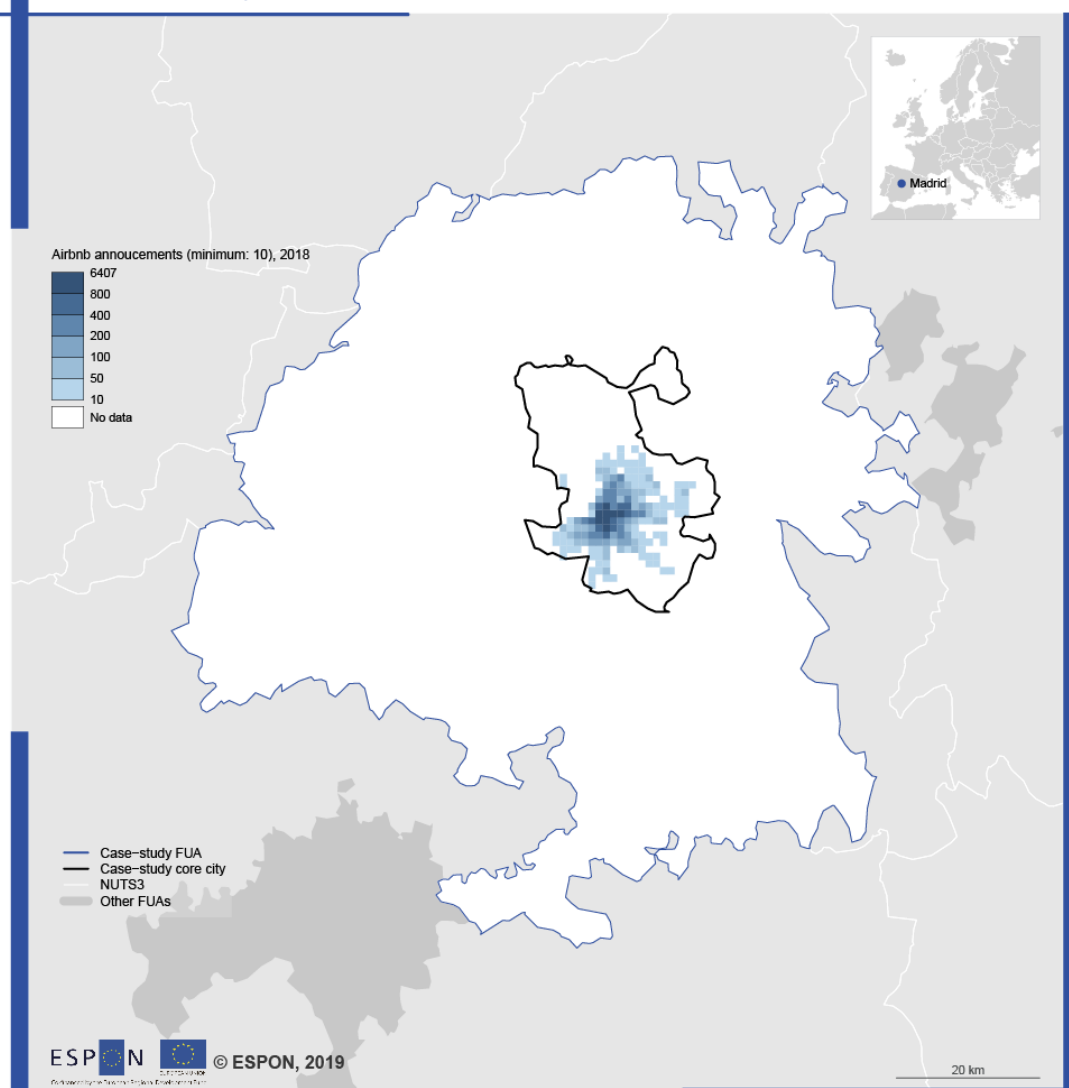
Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Fotocasa, 2019
© EuroGeographics for the administrative boundaries

Average advertised price – Smoothed, 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Fotocasa, 2019
© EuroGeographics for the administrative boundaries

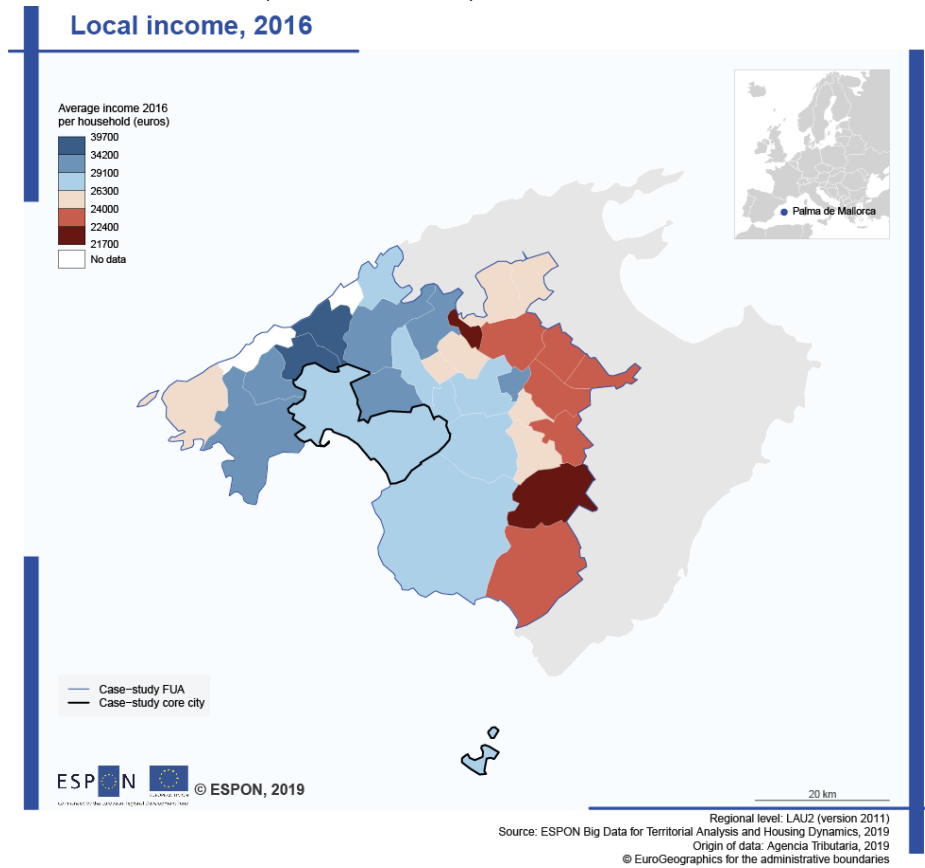
Airbnb offer, 2018



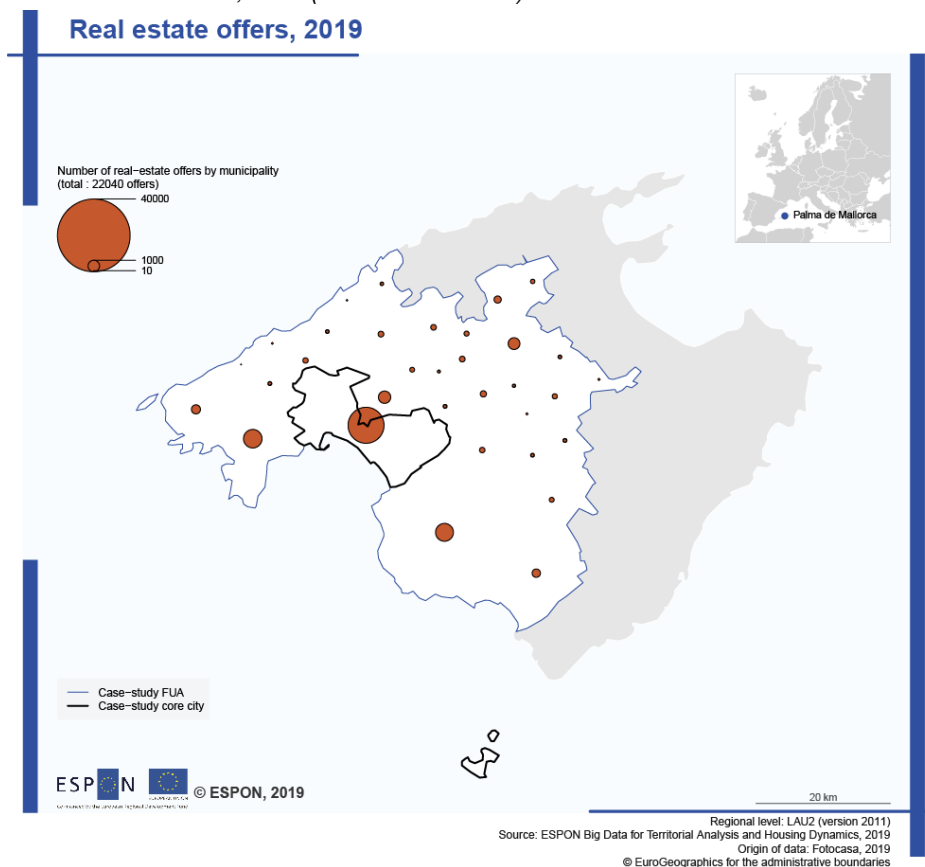
Regional level: 1km Grid (version 2017)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Insideairbnb.com, 2019
© EuroGeographics for the administrative boundaries

Annex 9 – Case-study maps on housing dynamics – Palma de Mallorca

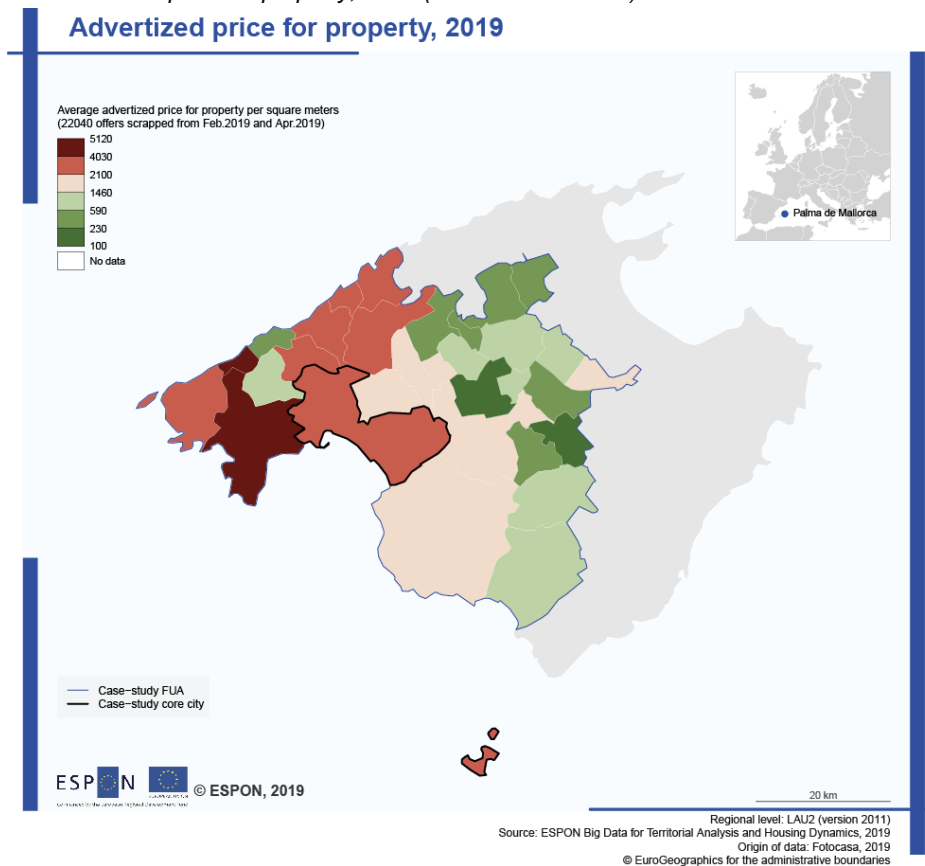
Map 0-97 – Local income, 2016 (Palma de Mallorca)



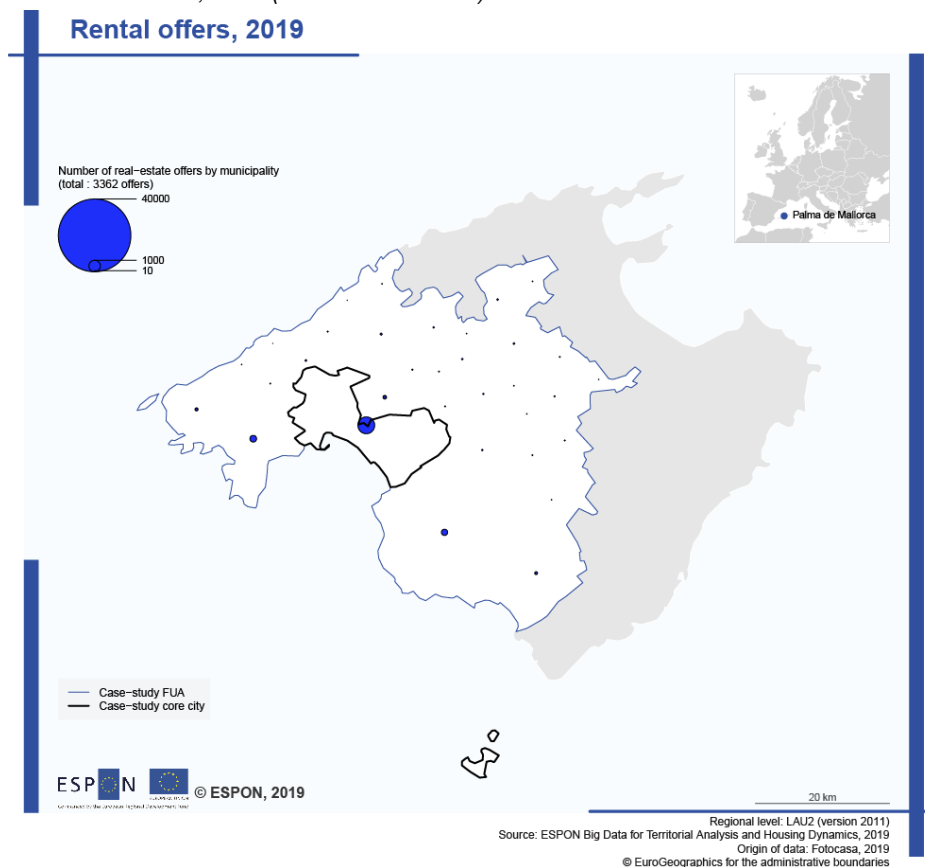
Map 0-98 – Real estate offers, 2019 (Palma de Mallorca)



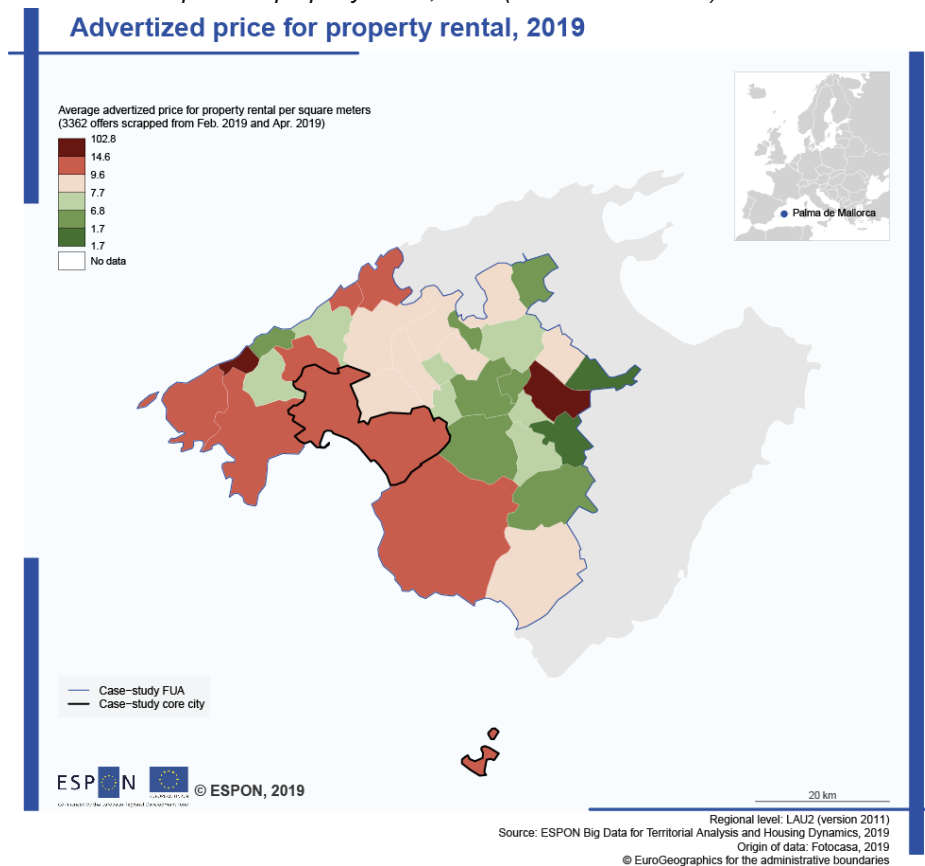
Map 0-99 – Advertized price for property, 2019 (Palma de Mallorca)



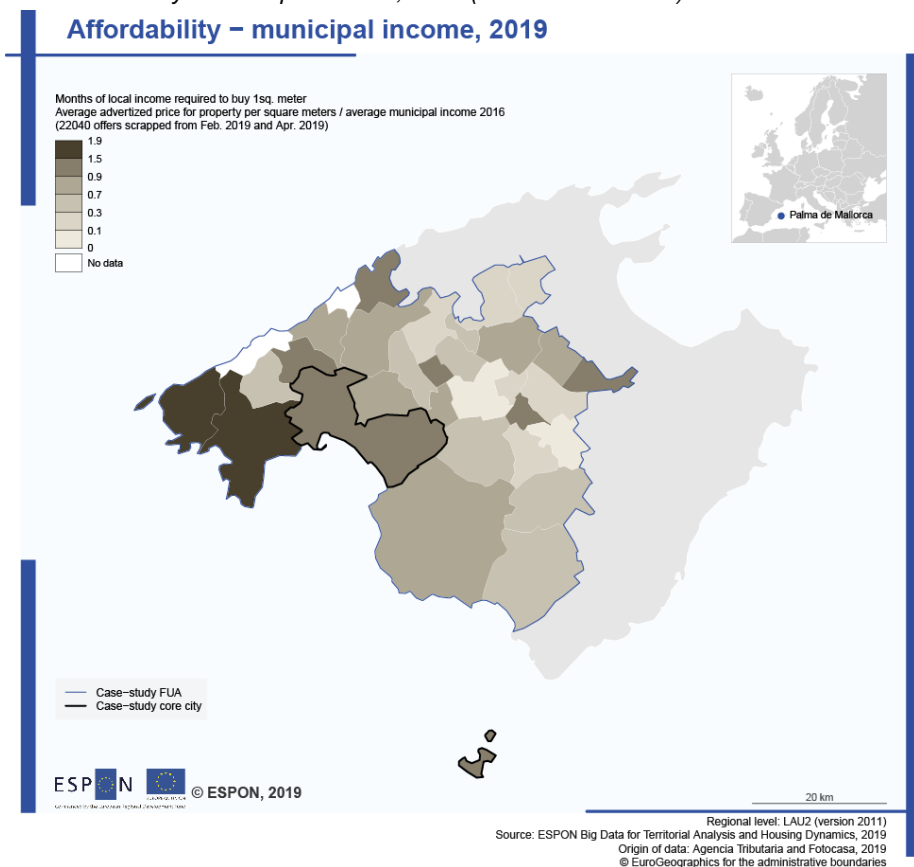
Map 0-100 – Rental offers, 2019 (Palma de Mallorca)



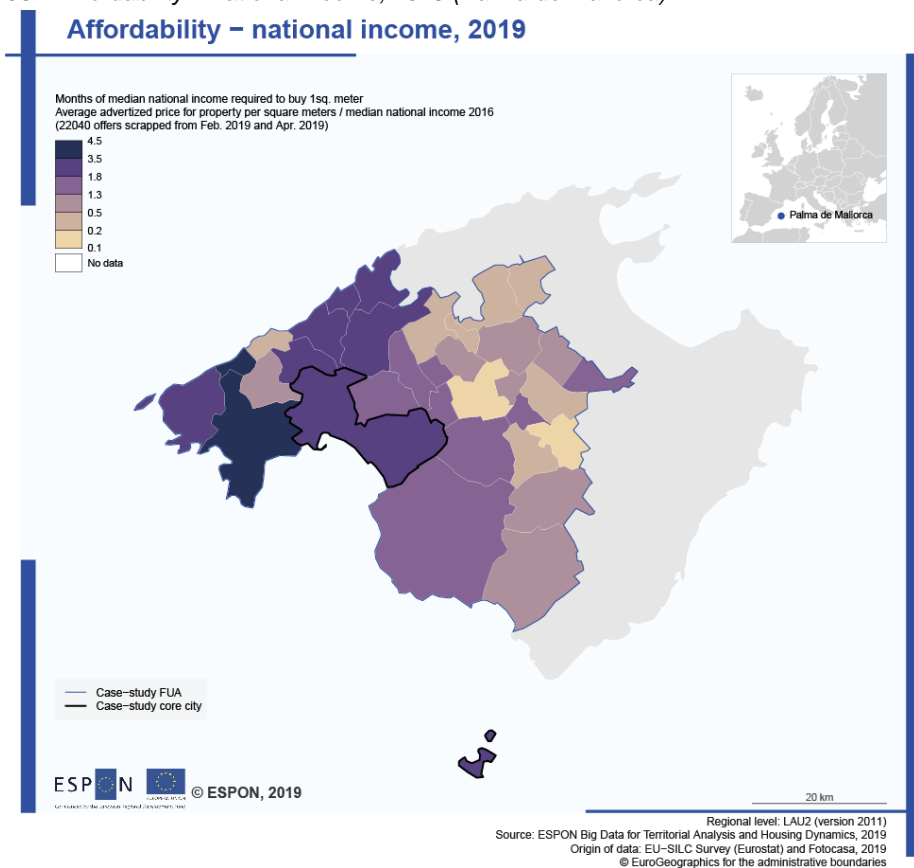
Map 0-101 – Advertized price for property rental, 2019 (Palma de Mallorca)



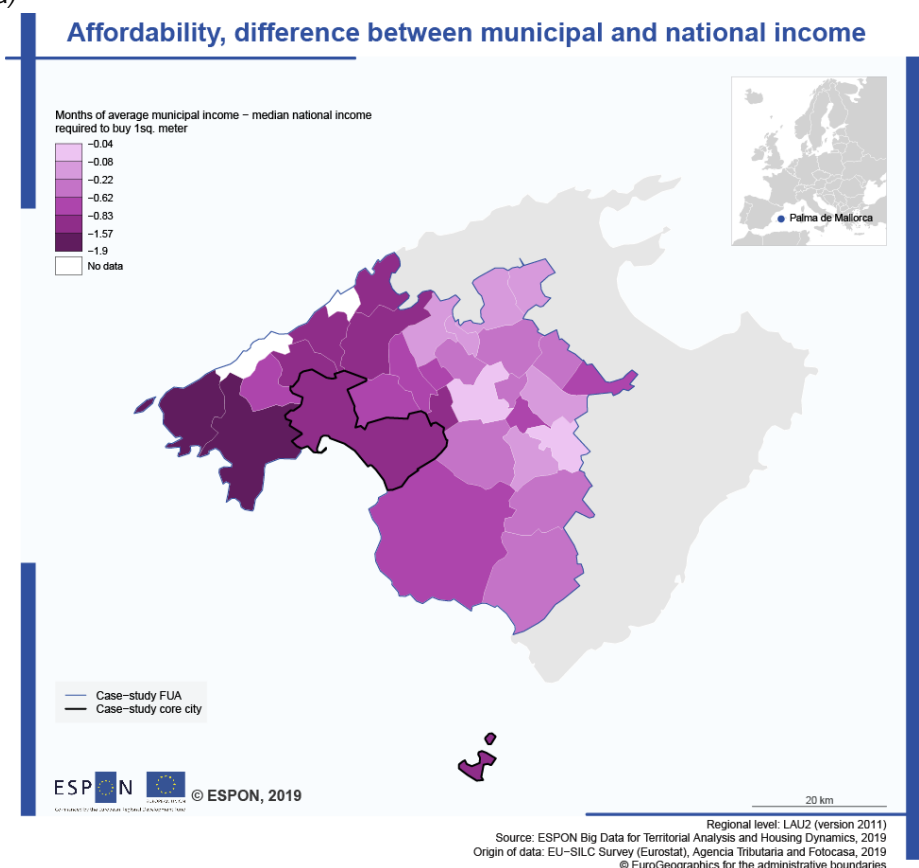
Map 0-102 – Affordability – municipal income, 2019 (Palma de Mallorca)



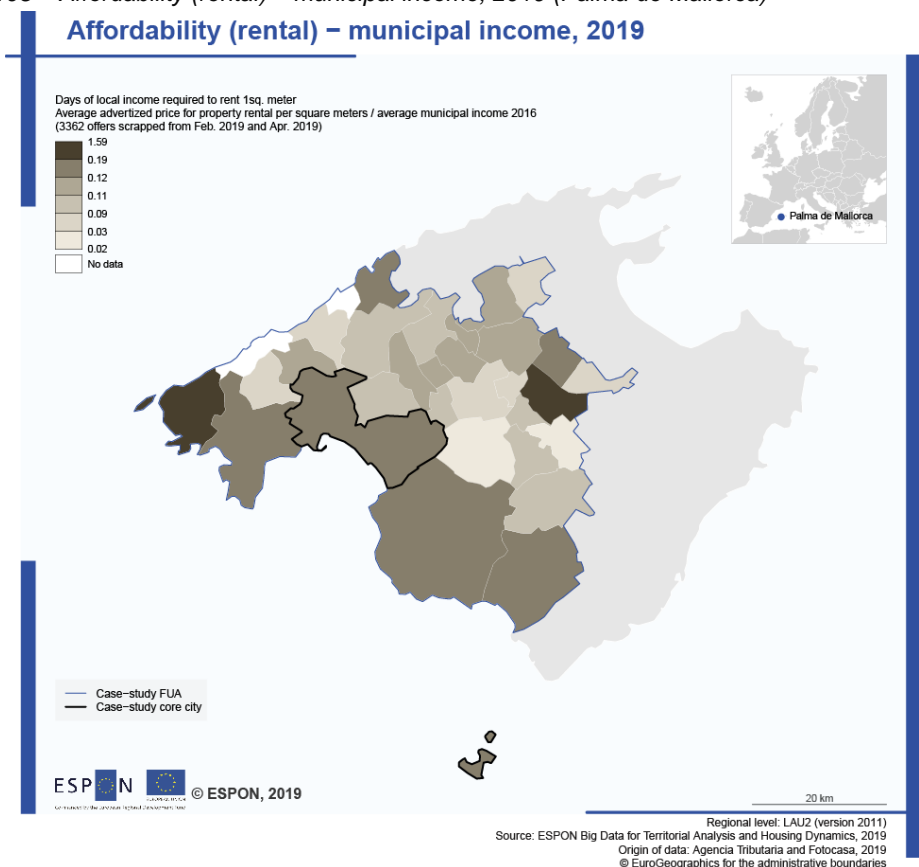
Map 0-103 – Affordability – national income, 2019 (Palma de Mallorca)



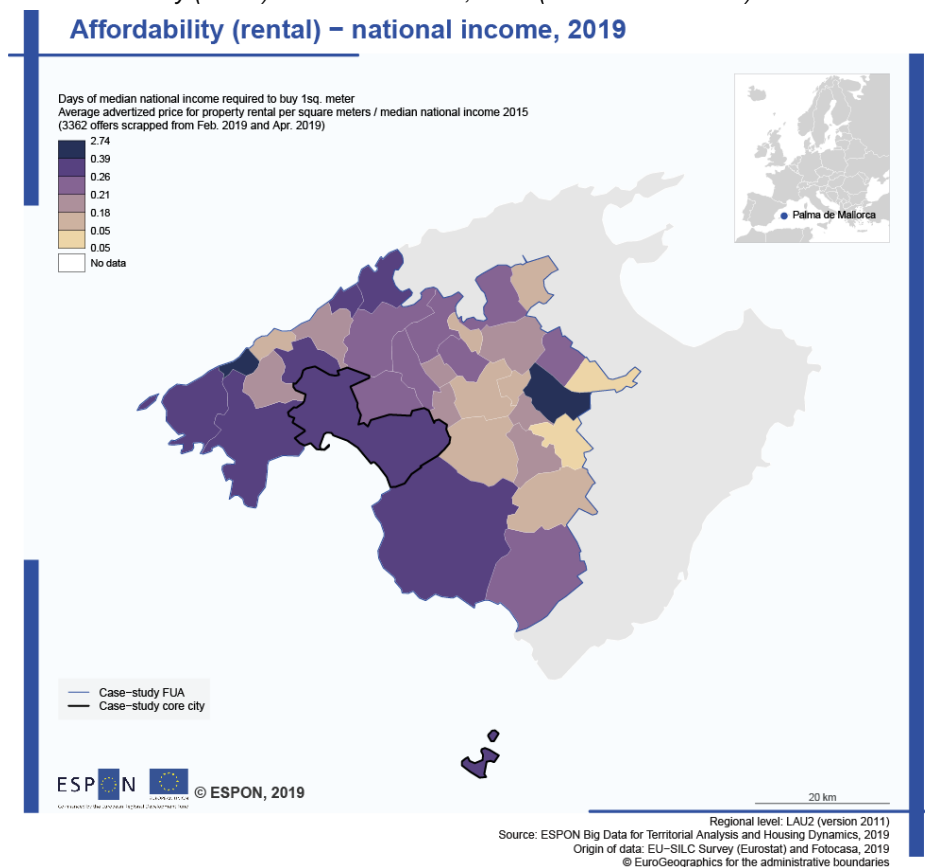
Map 0-104 – Affordability – difference between municipal and national income, 2019 (Palma de Mallorca)



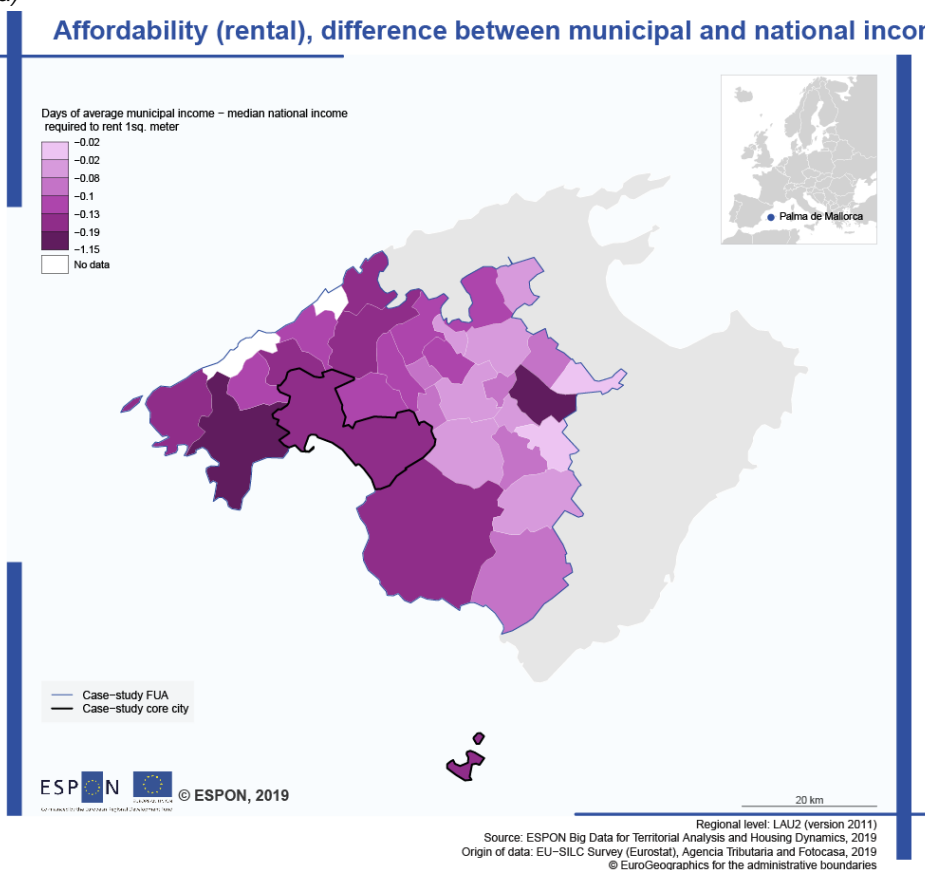
Map 0-105 – Affordability (rental) – municipal income, 2019 (Palma de Mallorca)



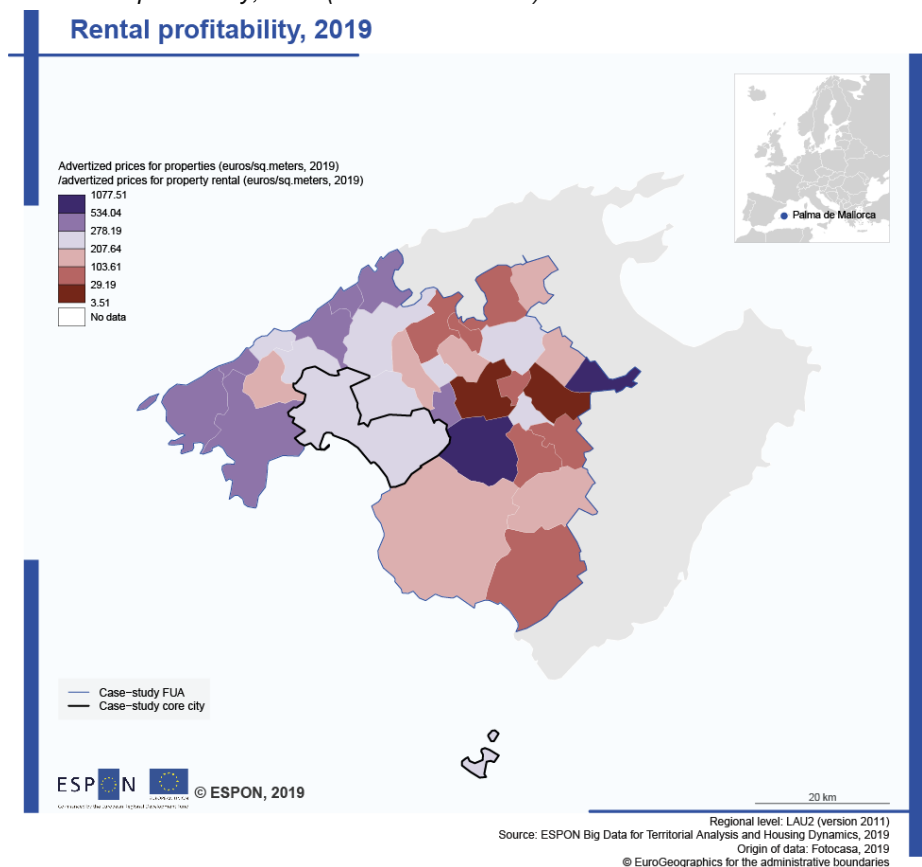
Map 0-106 – Affordability (rental) – national income, 2019 (Palma de Mallorca)



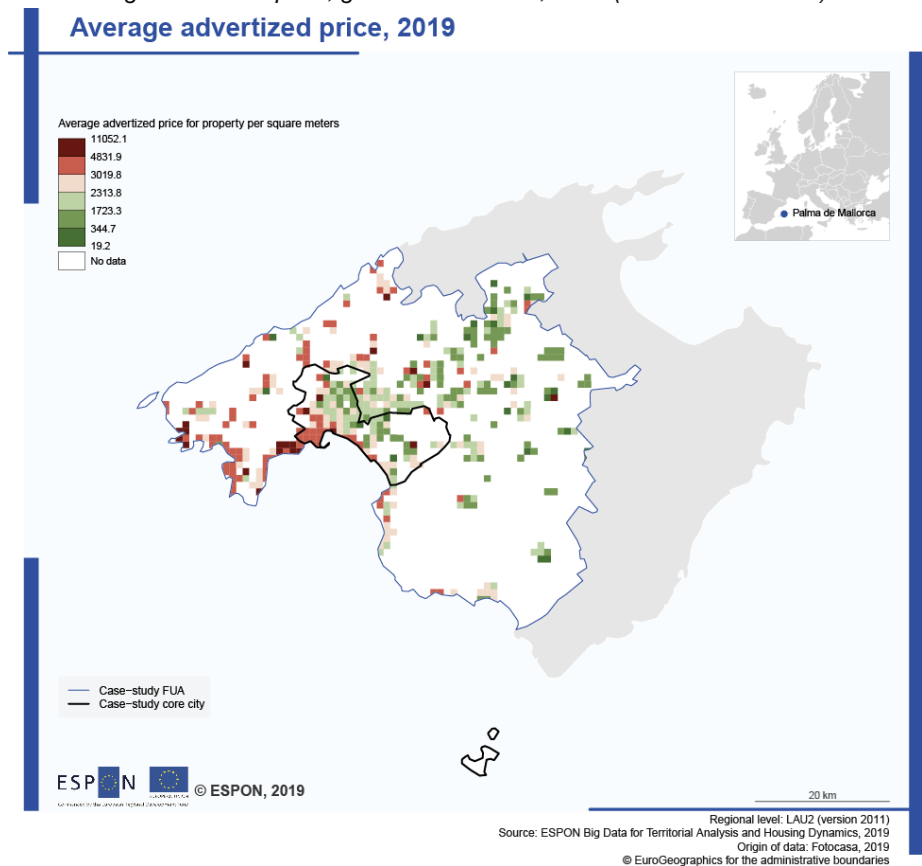
Map 0-107 – Affordability (rental) – difference between municipal and national income, 2019 (Palma de Mallorca)



Map 0-108 – Rental profitability, 2019 (Palma de Mallorca)



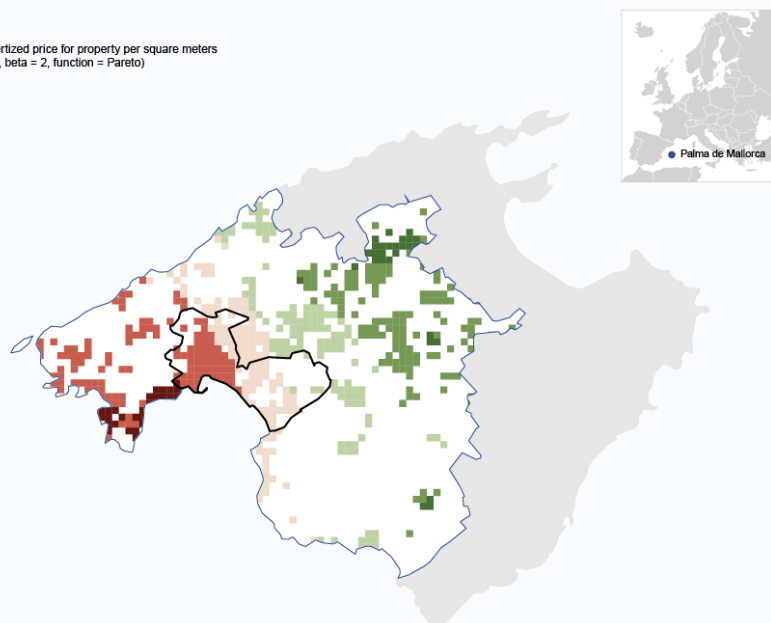
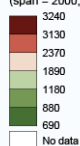
Map 0-109 – Average advertized price, grid non smoothed, 2019 (Palma de Mallorca)



Map 0-110 – Average advertised price, grid smoothed, 2019 (Palma de Mallorca)

Average advertized price – Smoothed, 2019

Average advertised price for property per square meters
(span = 2000, beta = 2, function = Pareto)



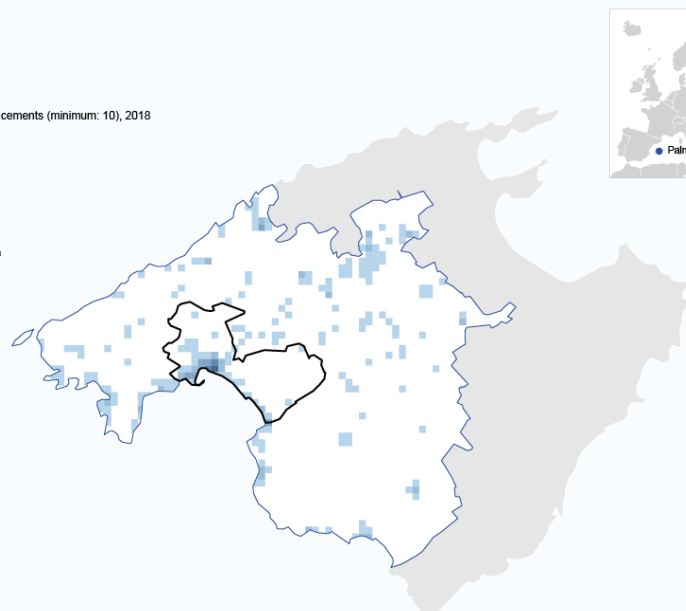
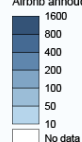
ESPON © ESPON, 2019

Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Fotocasa, 2019
© EuroGeographics for the administrative boundaries

Map 0-111 – Airbnb offers, 2018 (Palma de Mallorca)

Airbnb offer, 2018

Airbnb annougements (minimum: 10), 2018

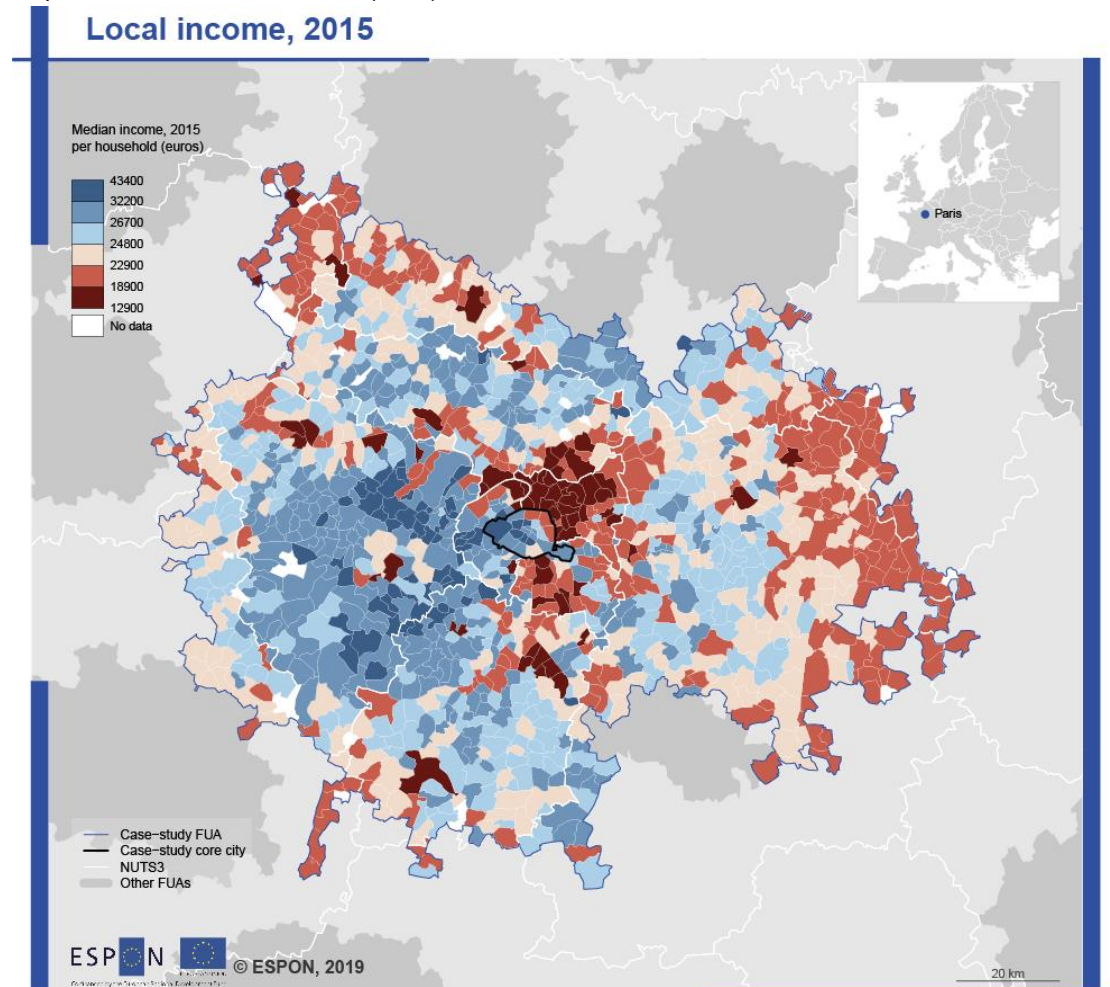


ESPON © ESPON, 2019

Regional level: 1km Grid (version 2017)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Insideairbnb.com, 2019
© EuroGeographics for the administrative boundaries

Annex 10 – Case-study maps on housing dynamics – Paris

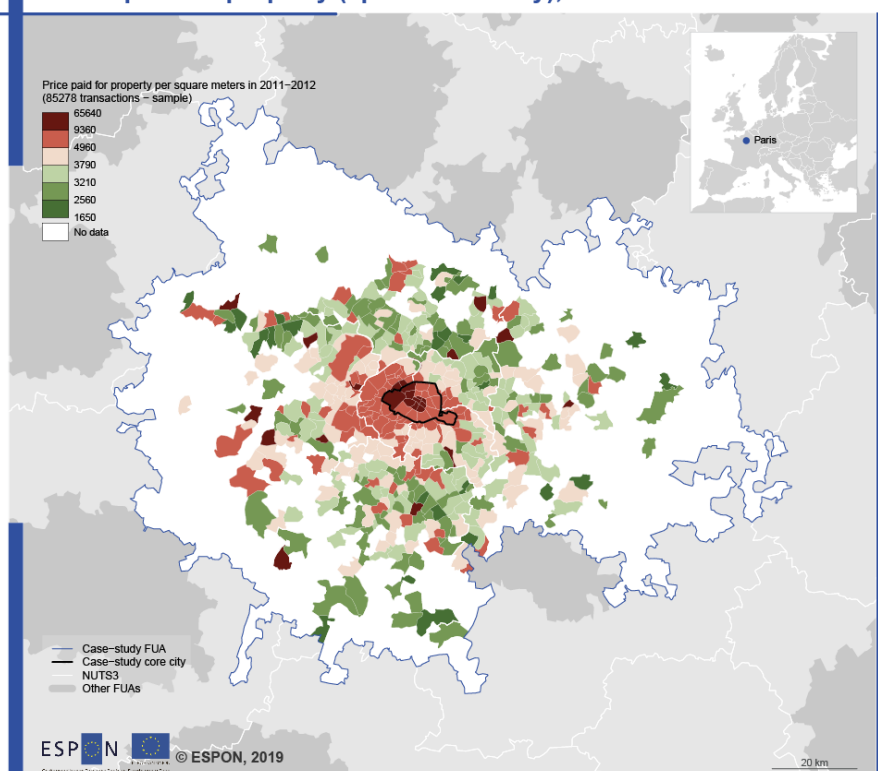
Map 0-112 – Local income, 2015 (Paris)



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: INSEE, 2019
© EuroGeographics for the administrative boundaries

Map 0-113 – Price paid for property (apartments), 2011-2012 (Paris)

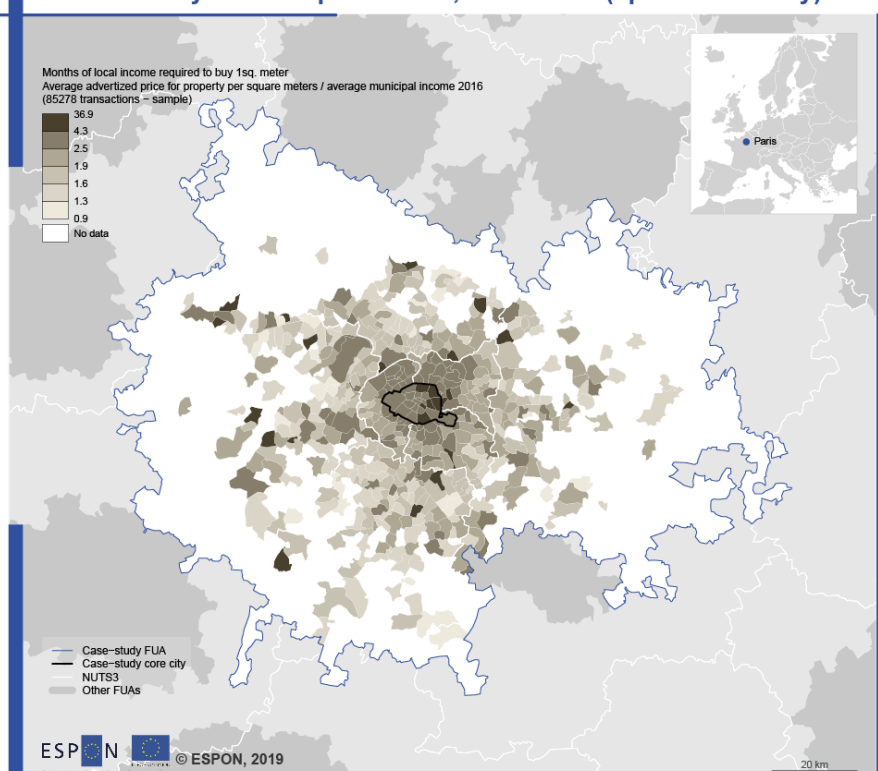
Price paid for property (apartments only), 2011-2012



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: BIEN Database (Sample), 2019
© EuroGeographics for the administrative boundaries

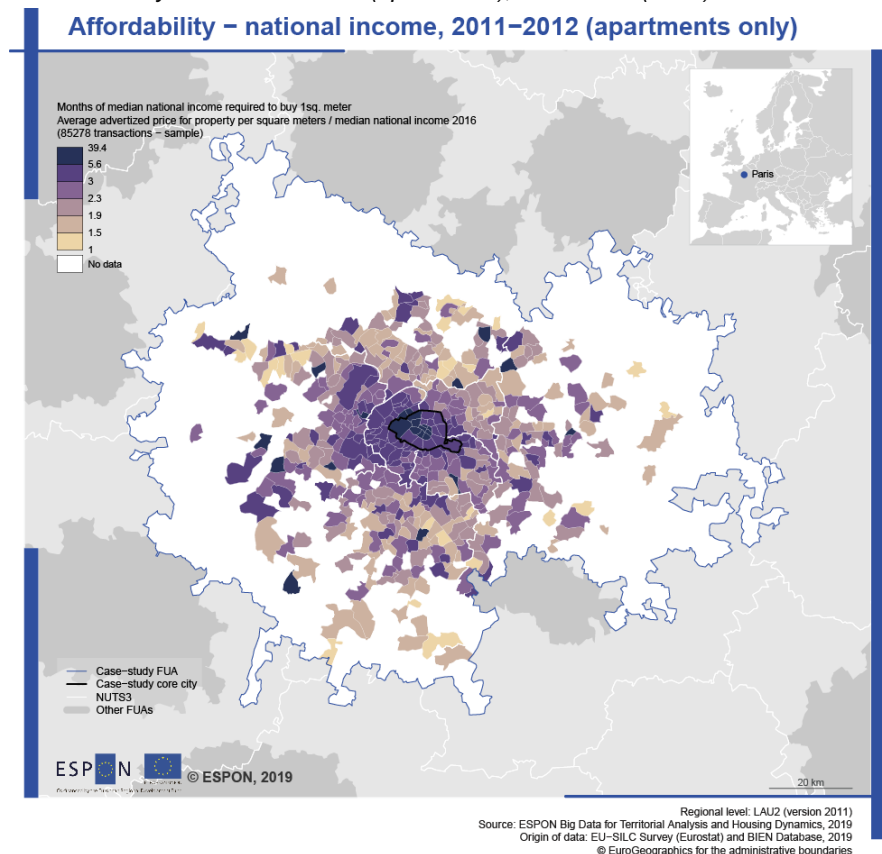
Map 0-114 – Affordability – municipal income (apartments), 2011-2012 (Paris)

Affordability – municipal income, 2011-2012 (apartments only)

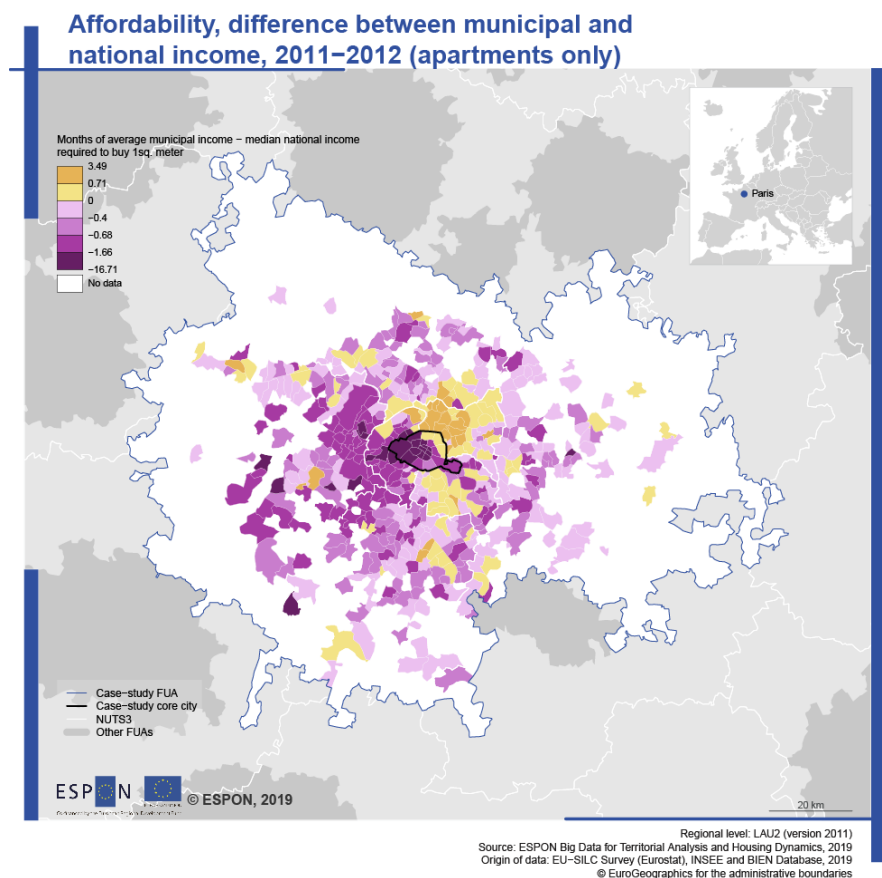


Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: INSEE and BIEN Database, 2019
© EuroGeographics for the administrative boundaries

Map 0-115 – Affordability – national income (apartments), 2011-2012 (Paris)

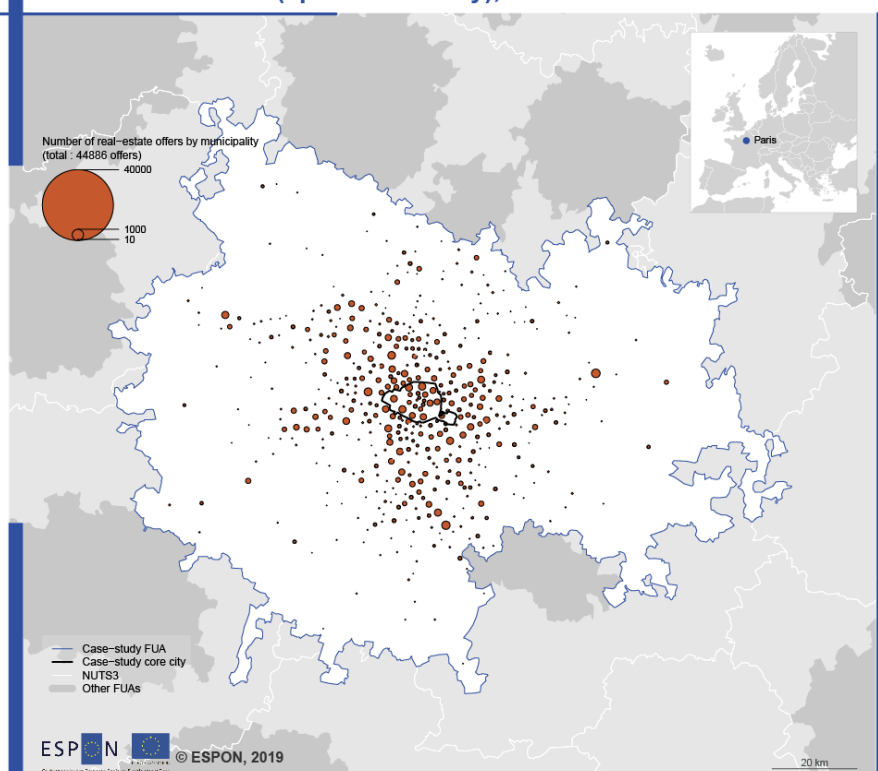


Map 0-116 – Affordability – difference between municipal and national income (apartments), 2011-2012 (Paris)



Map 0-117 – Real estate offer (apartments), 2019 (Paris)

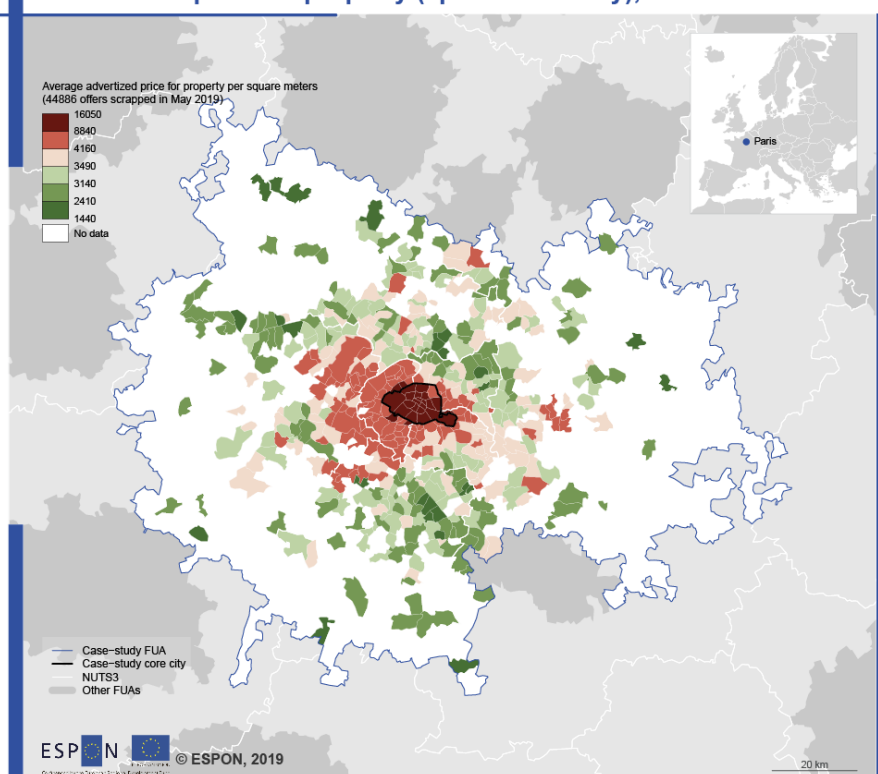
Real estate offers (apartments only), 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Leboncoin, 2019
© EuroGeographics for the administrative boundaries

Map 0-118 – Advertised price for property (apartments), 2019 (Paris)

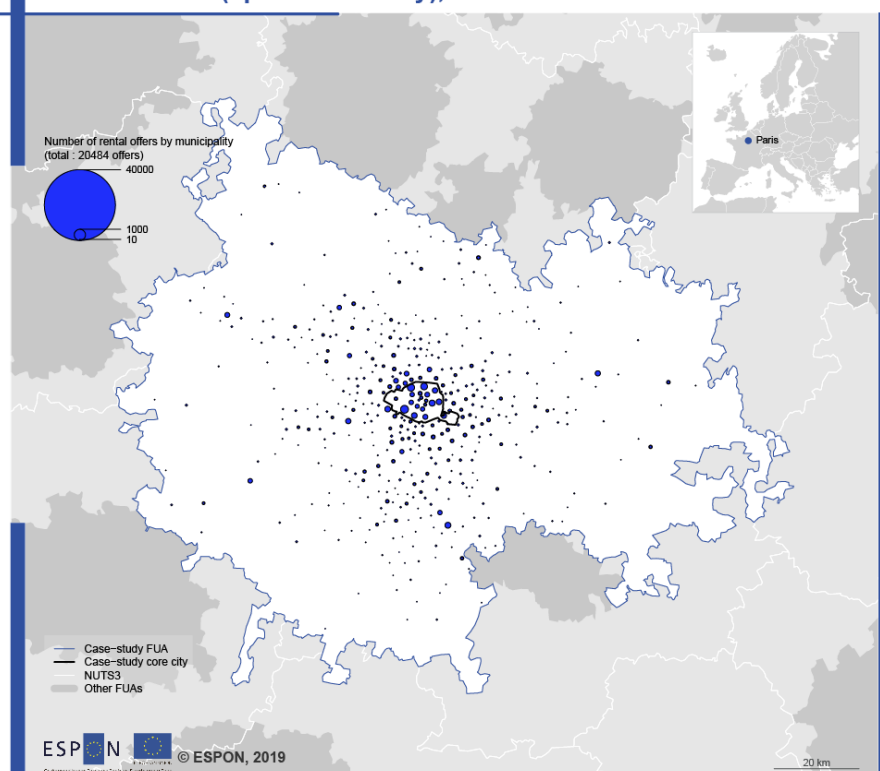
Advertized price for property (apartments only), 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Leboncoin, 2019
© EuroGeographics for the administrative boundaries

Map 0-119 – Rental offer (apartments), 2019 (Paris)

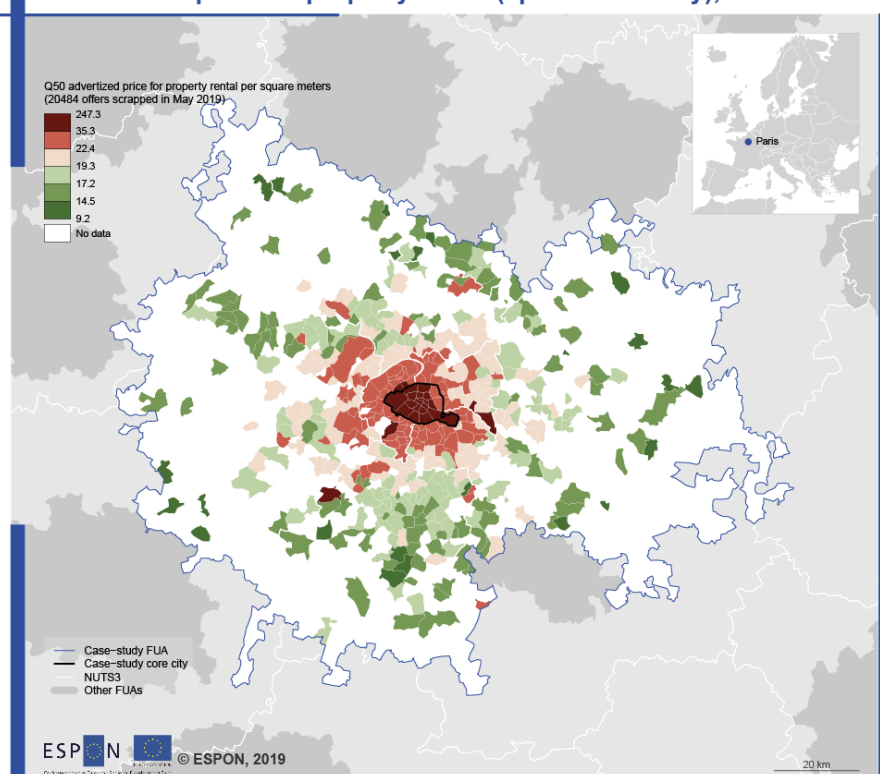
Rental offers (apartments only), 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Leboncoin, 2019
© EuroGeographics for the administrative boundaries

Map 0-120 – Advertised price for property rental (apartments), 2019 (Paris)

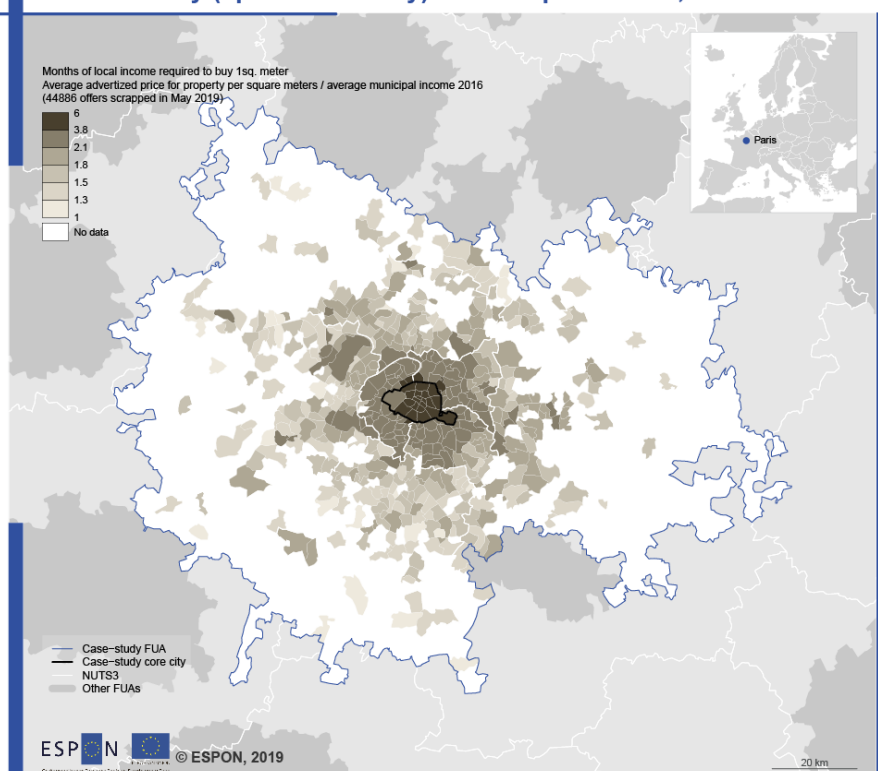
Advertized price for property rental (apartments only), 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: Leboncoin, 2019
© EuroGeographics for the administrative boundaries

Map 0-121 – Affordability (apartments) – municipal income, 2019 (Paris)

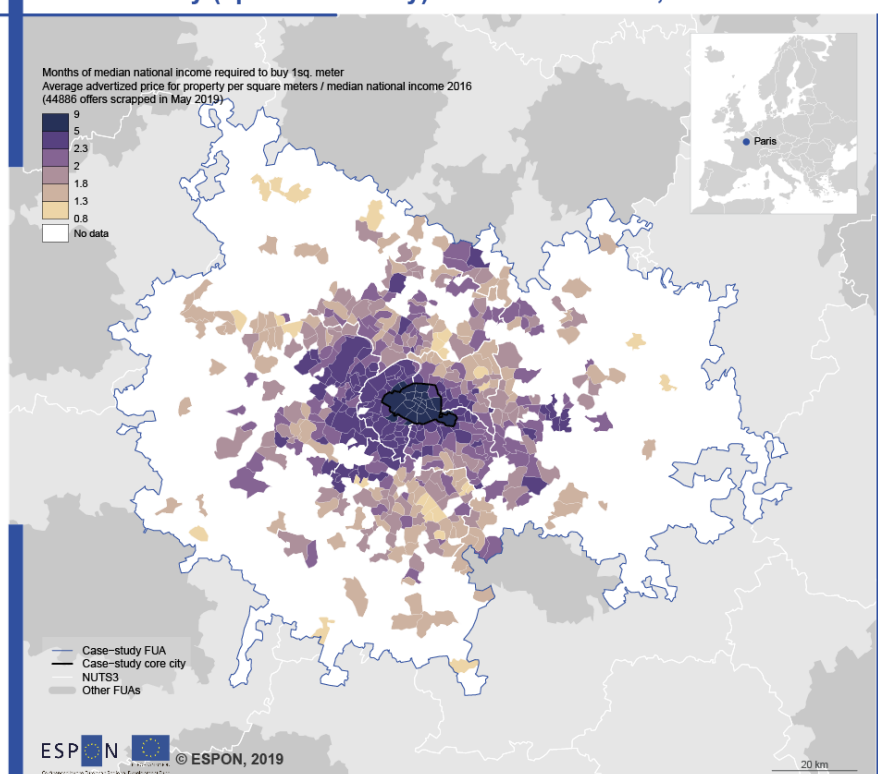
Affordability (apartments only) – municipal income, 2019



Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: INSEE and Leboncoin, 2019
© EuroGeographics for the administrative boundaries

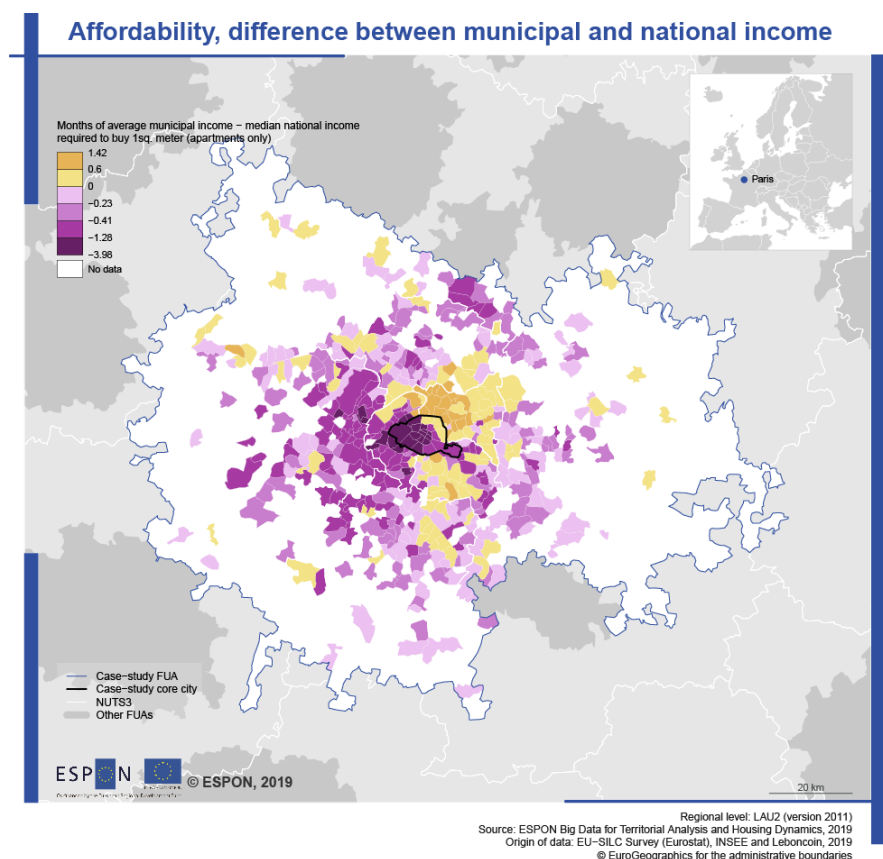
Map 0-122 – Affordability (apartments) – national income, 2019 (Paris)

Affordability (apartments only) – national income, 2019

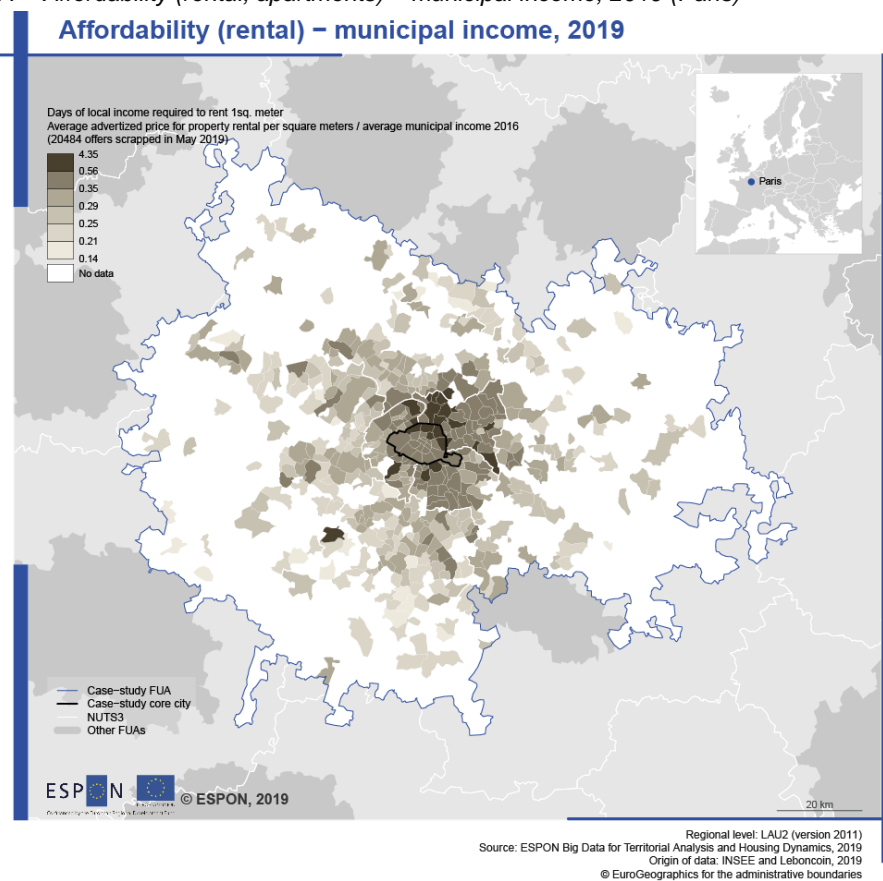


Regional level: LAU2 (version 2011)
Source: ESPON Big Data for Territorial Analysis and Housing Dynamics, 2019
Origin of data: EU-SILC Survey (Eurostat) and Leboncoin, 2019
© EuroGeographics for the administrative boundaries

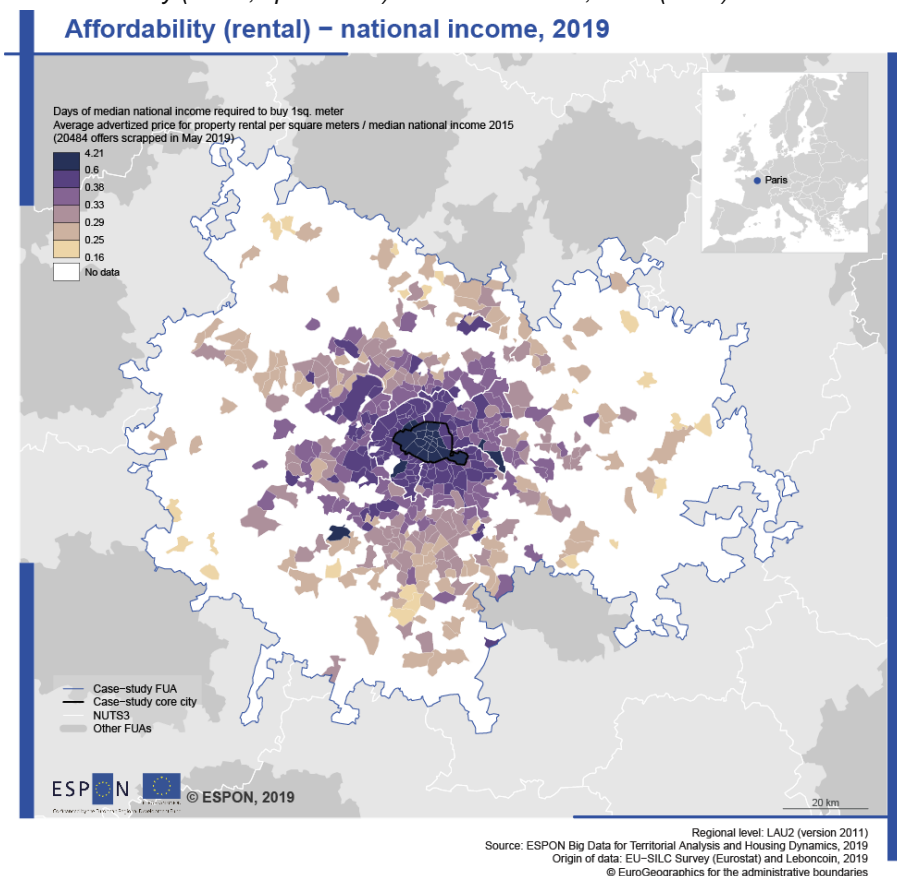
Map 0-123 – Affordability – difference between municipal and national income (apartments), 2019 (Paris)



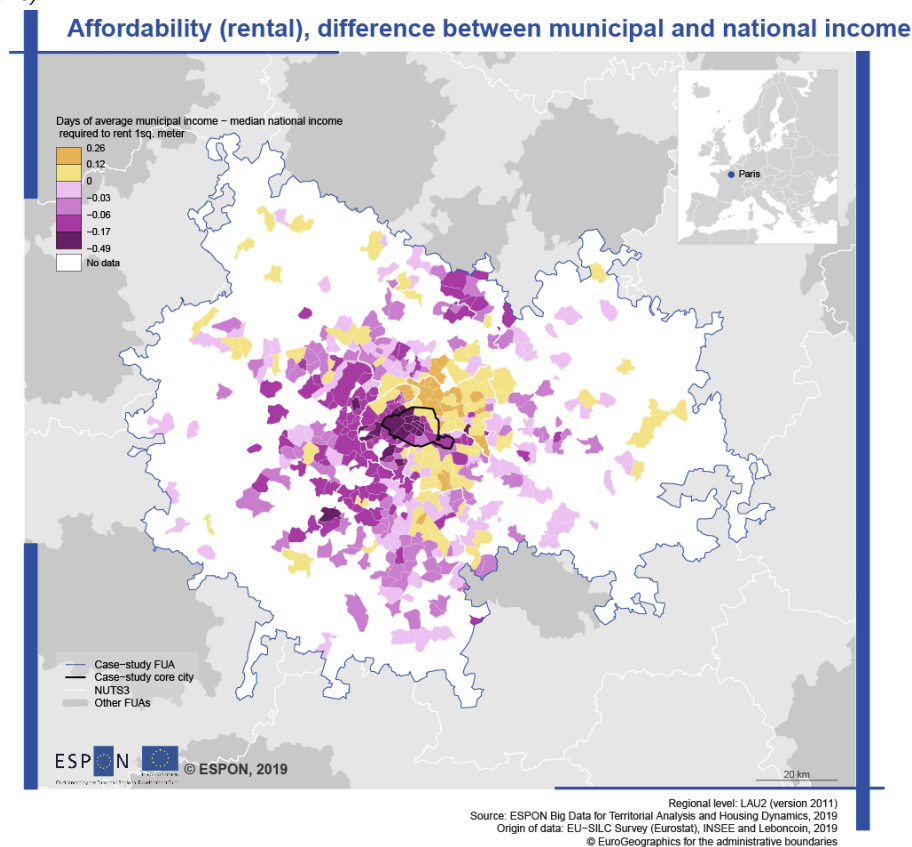
Map 0-124 – Affordability (rental, apartments) – municipal income, 2019 (Paris)



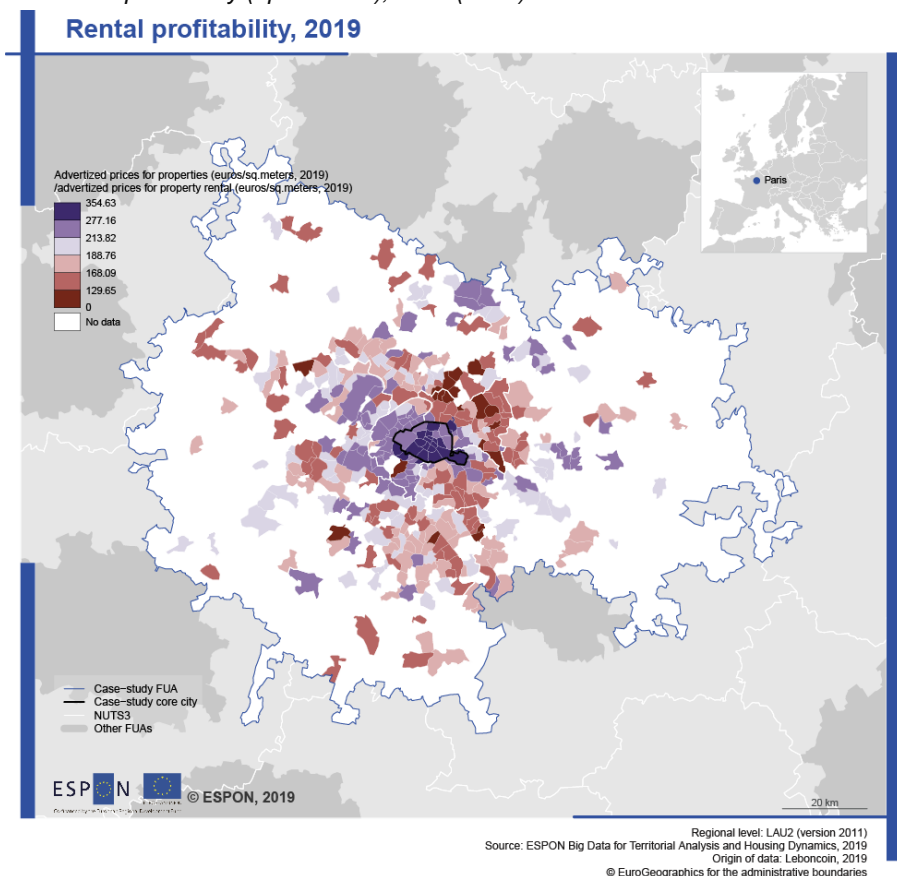
Map 0-125 – Affordability (rental, apartments) – national income, 2019 (Paris)



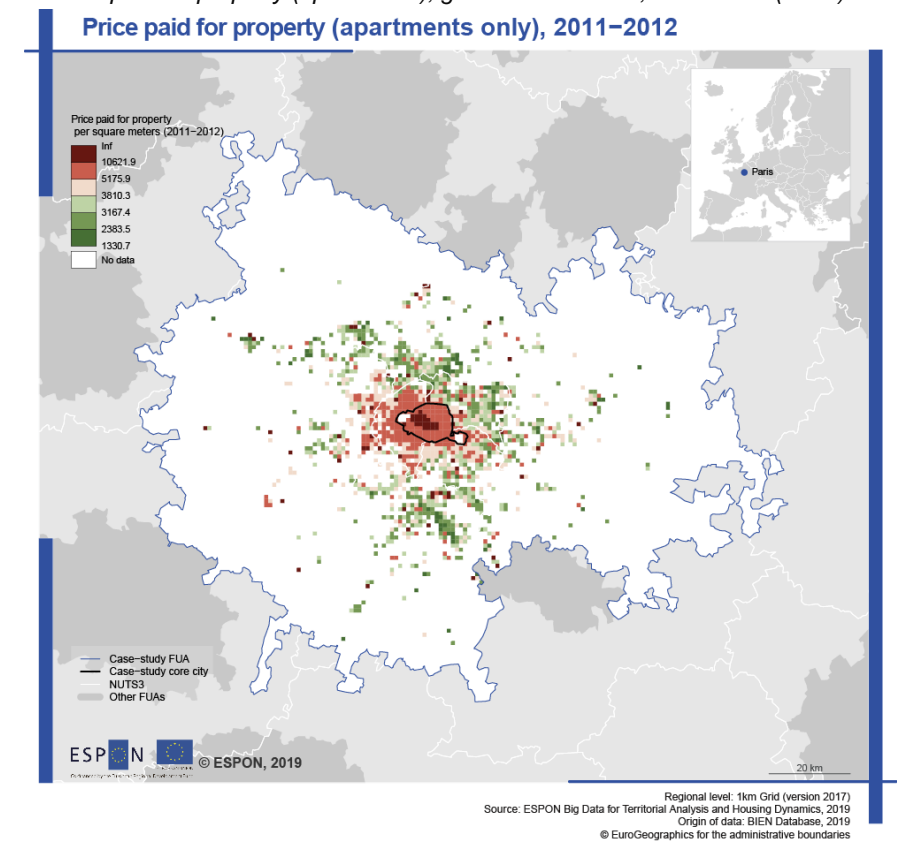
Map 0-126 – Affordability – difference between municipal and national income (rental, apartments), 2019 (Paris)



Map 0-127 – Rental profitability (apartments), 2019 (Paris)

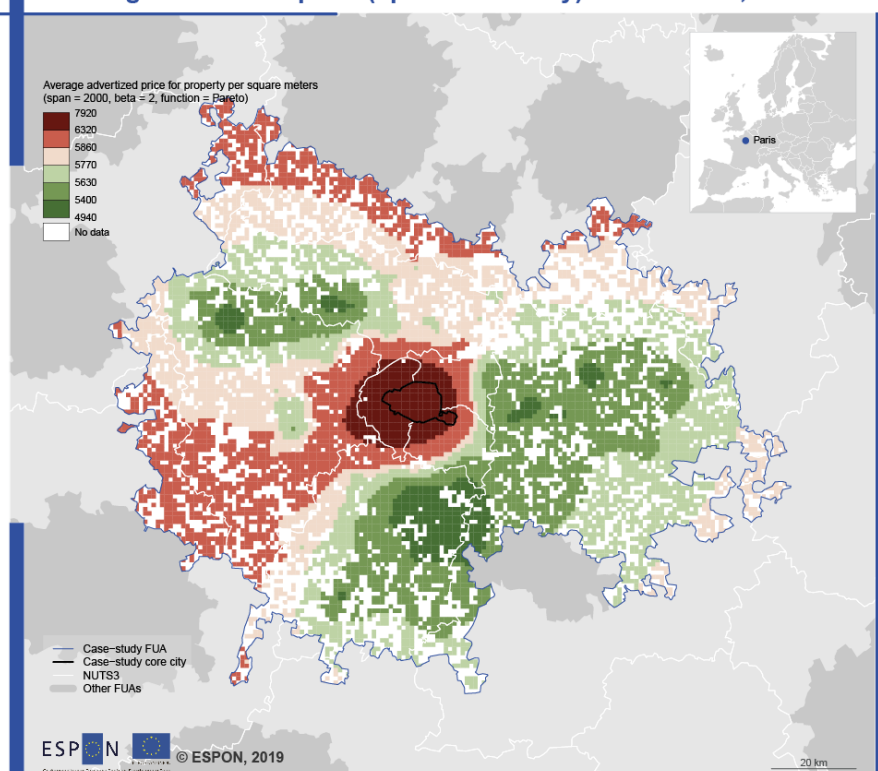


Map 0-128 – Price paid for property (apartments), grid non smoothed, 2011-2012 (Paris)



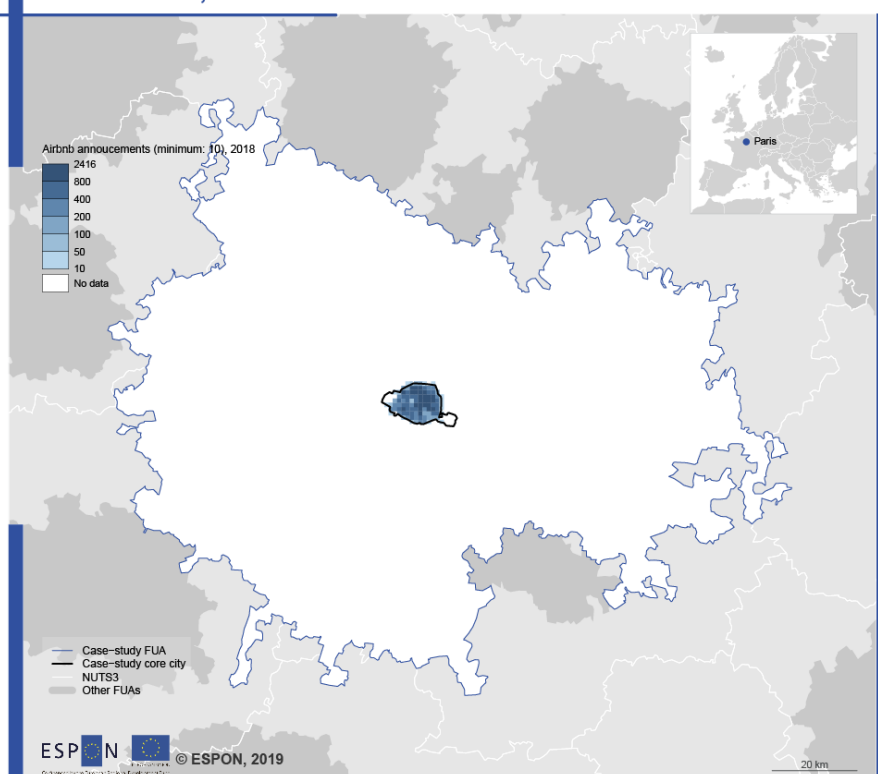
Map 0-129 – Price paid for property (apartments), grid smoothed, 2011-2012 (Paris)

Average advertized price (apartments only) – Smoothed, 2011-2012



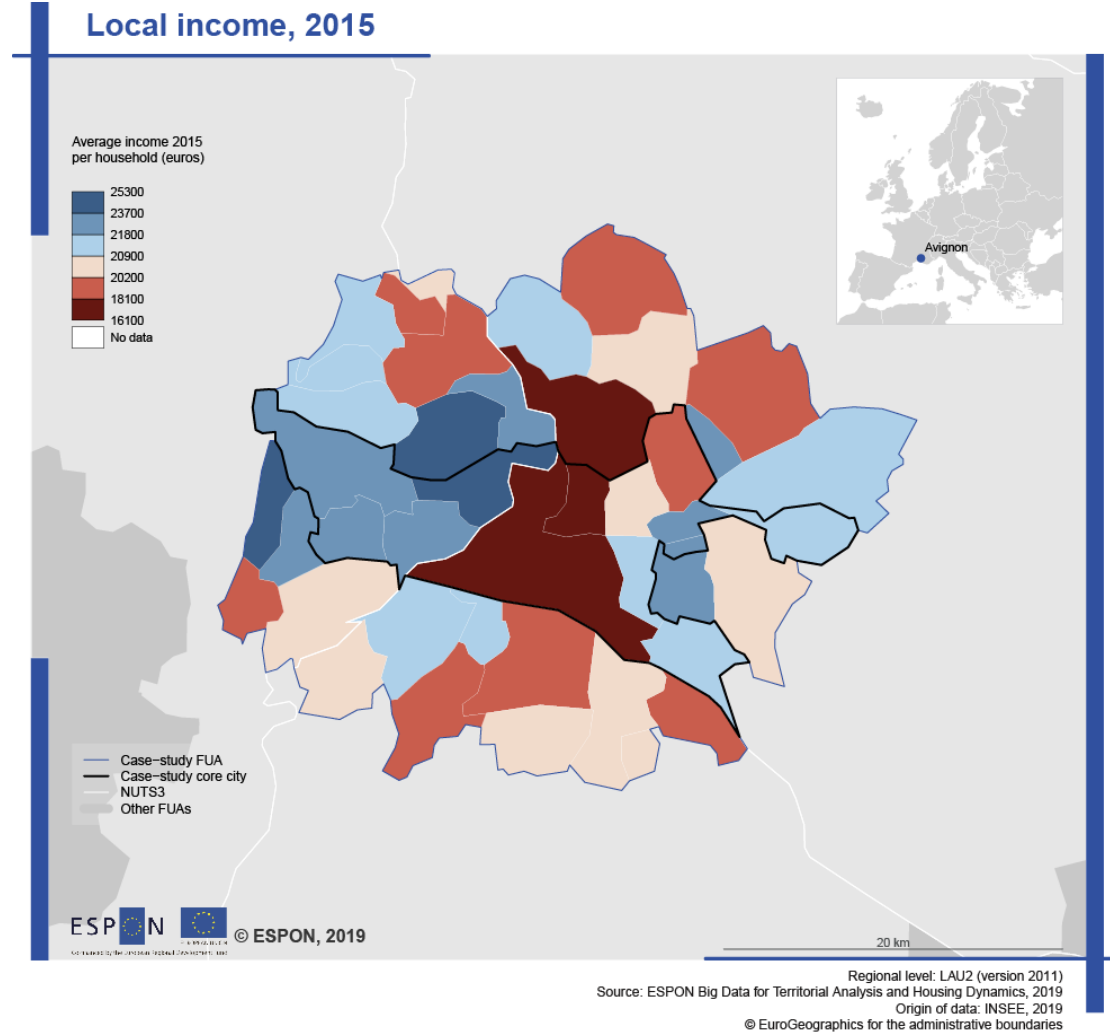
Map 0-130 – Airbnb offer, 2018 (Paris)

Airbnb offer, 2018

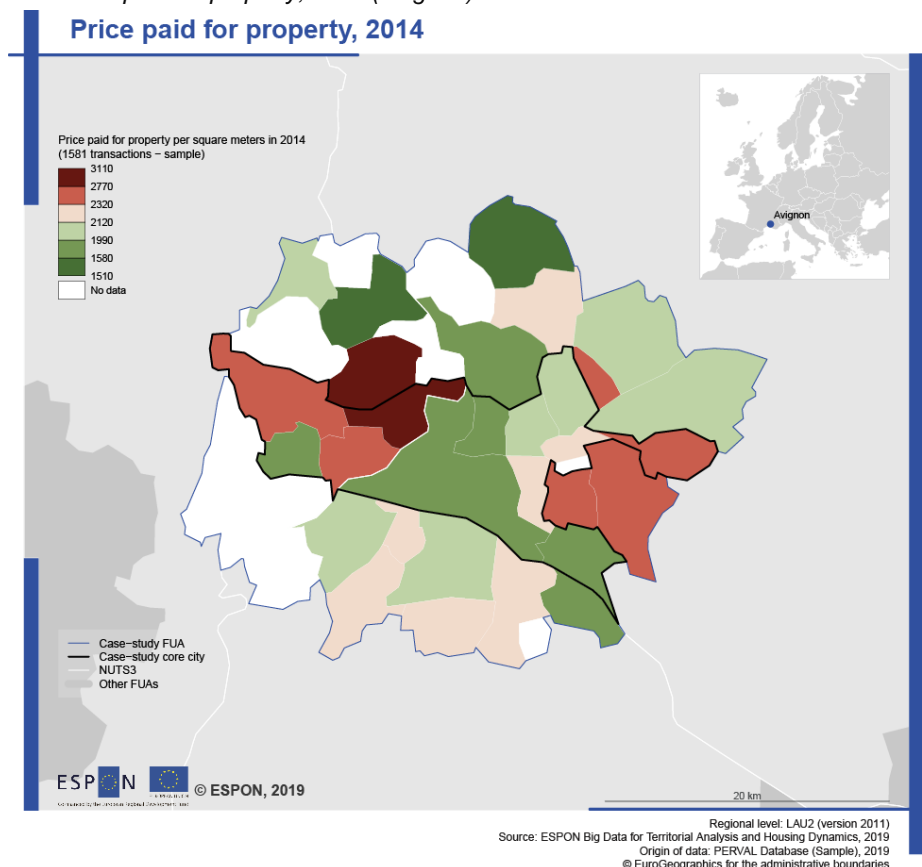


Annex 11 – Case-study maps on housing dynamics – Avignon

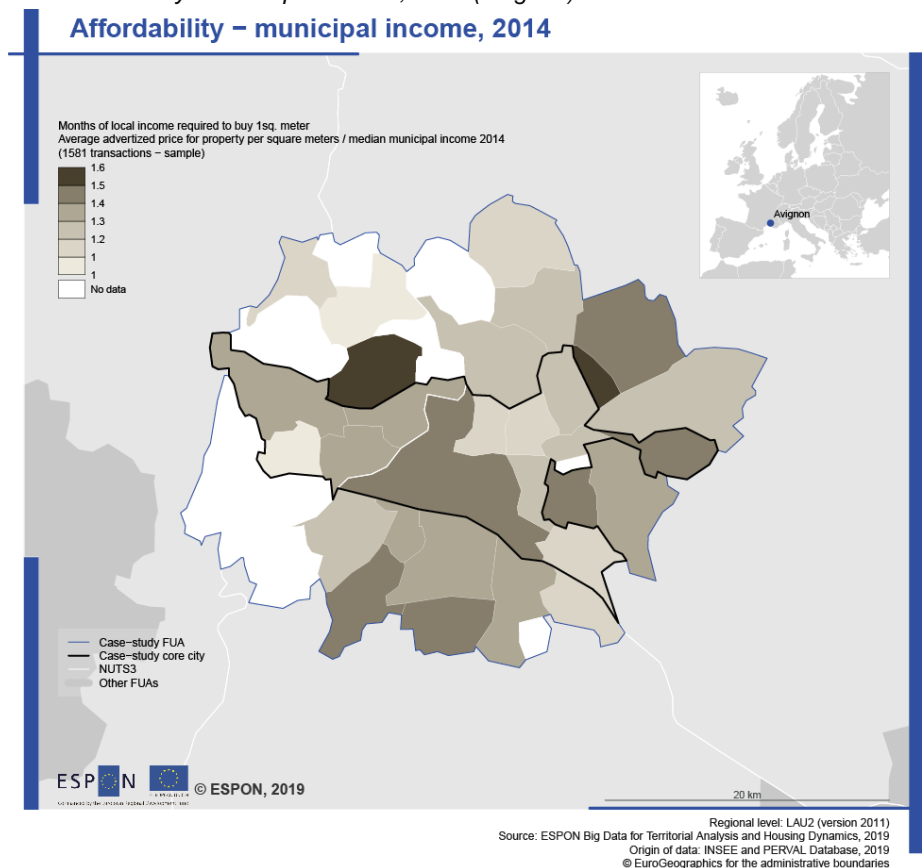
Map 0-131 – Local income, 2015 (Avignon)



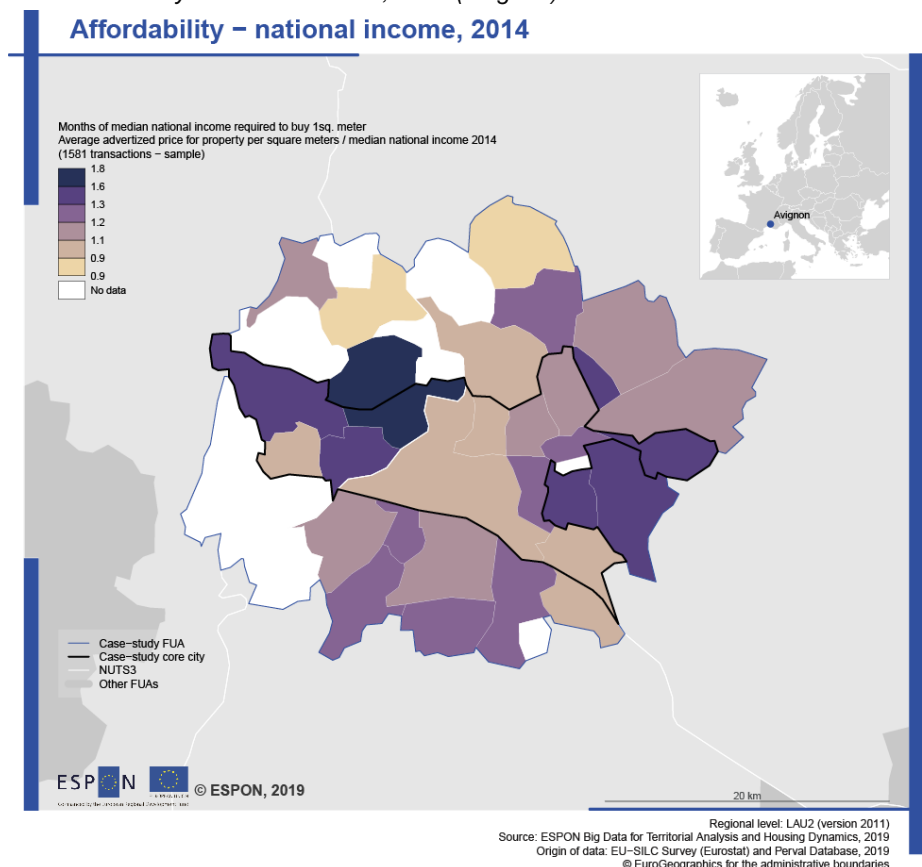
Map 0-132 – Price paid for property, 2014 (Avignon)



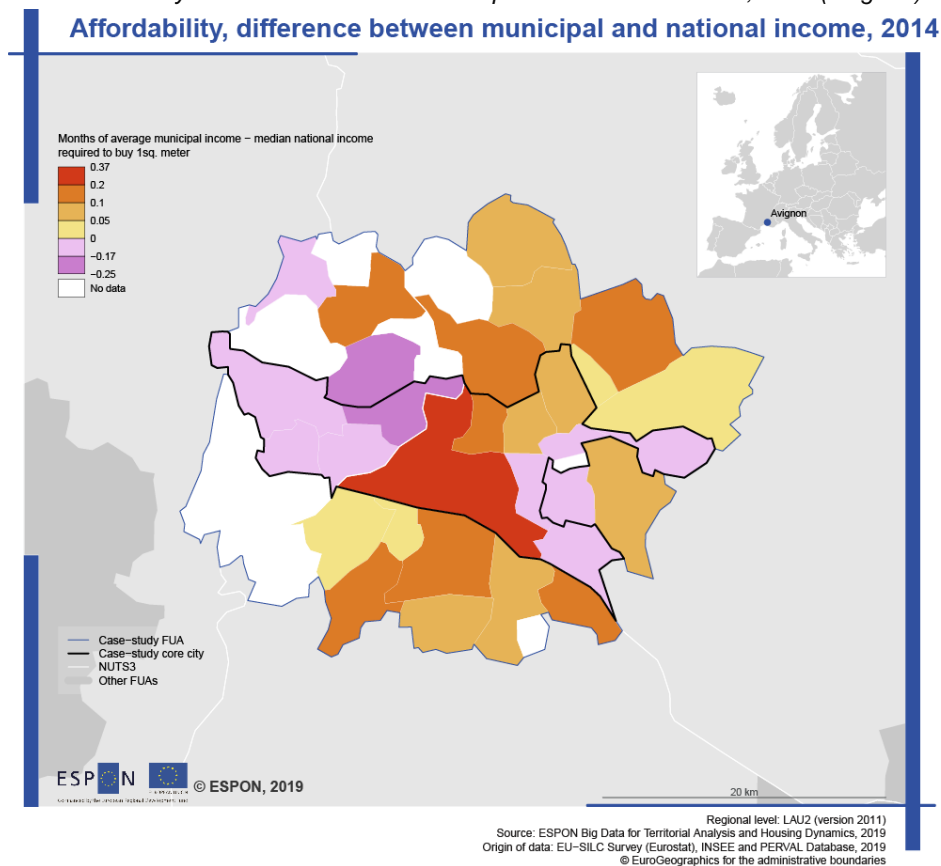
Map 0-133 – Affordability – municipal income, 2014 (Avignon)



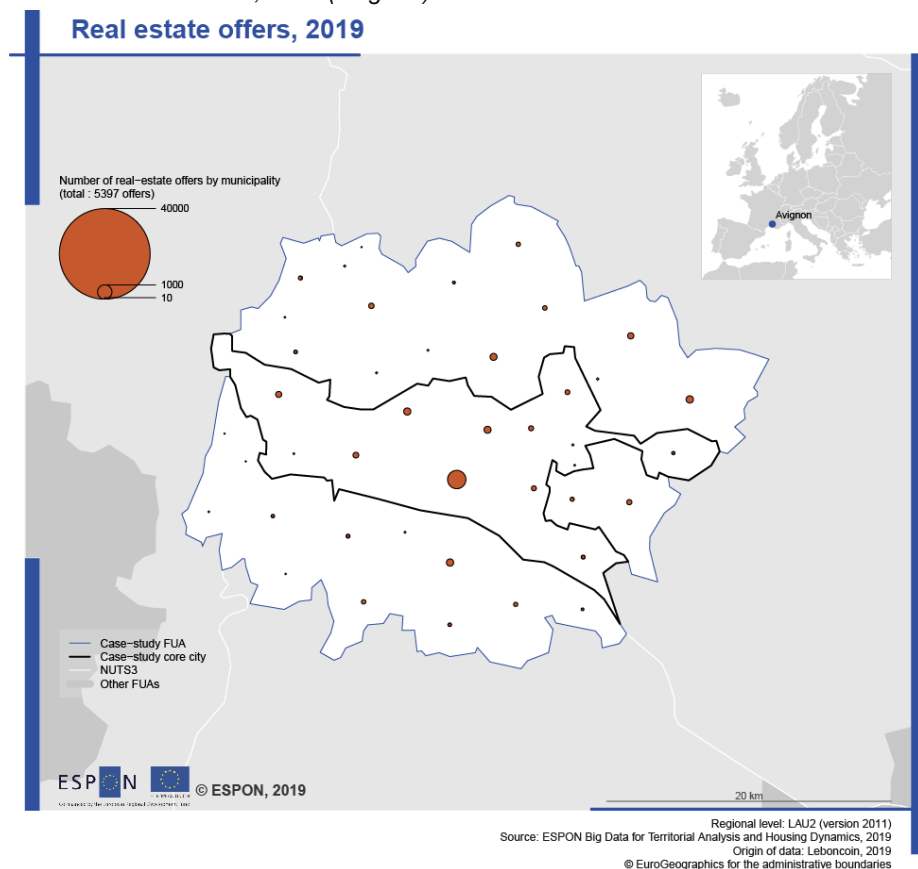
Map 0-134 – Affordability – national income, 2014 (Avignon)



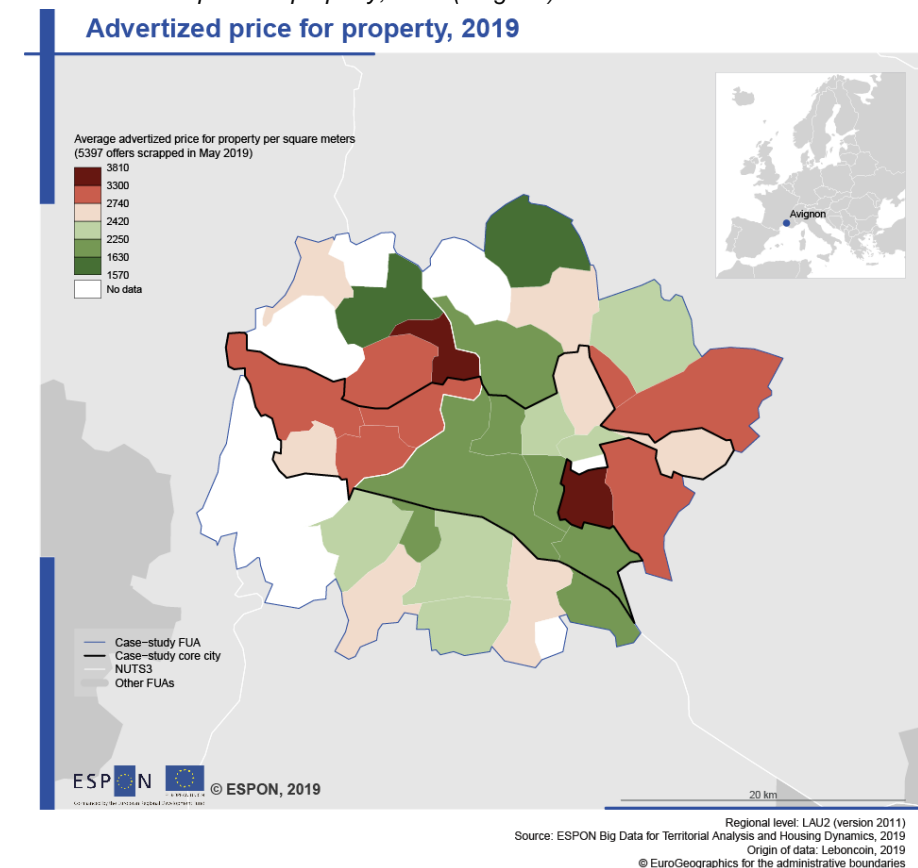
Map 0-135 – Affordability – difference between municipal and national income, 2014 (Avignon)



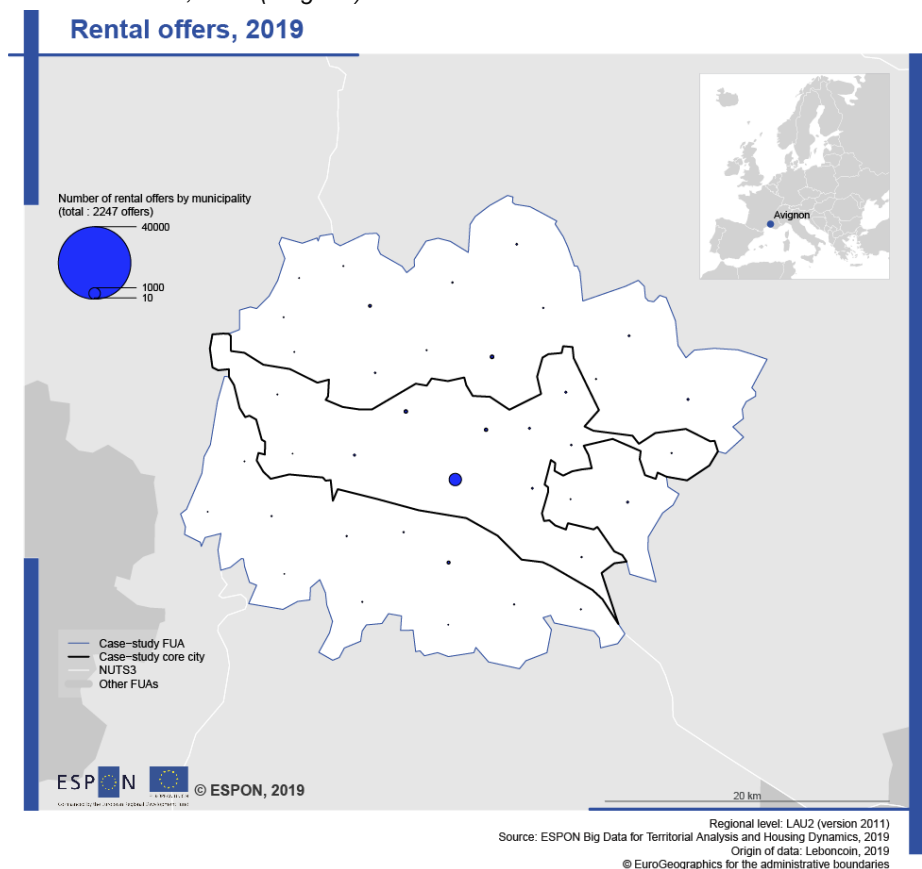
Map 0-136 – Real estate offer, 2019 (Avignon)



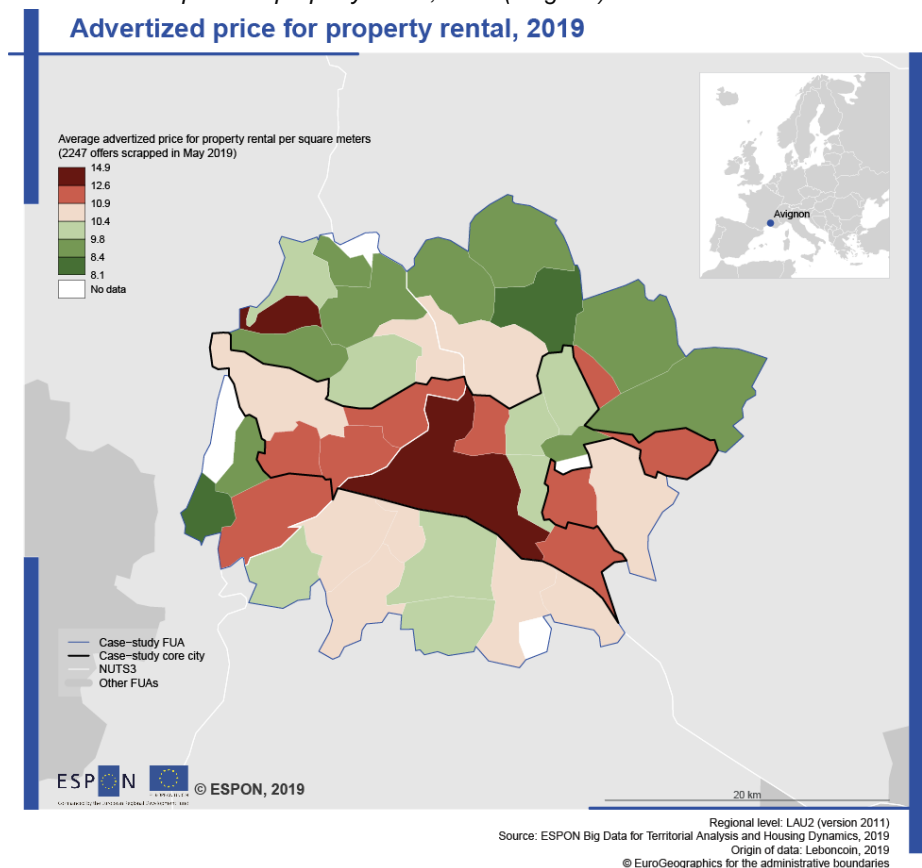
Map 0-137 – Advertized price for property, 2019 (Avignon)



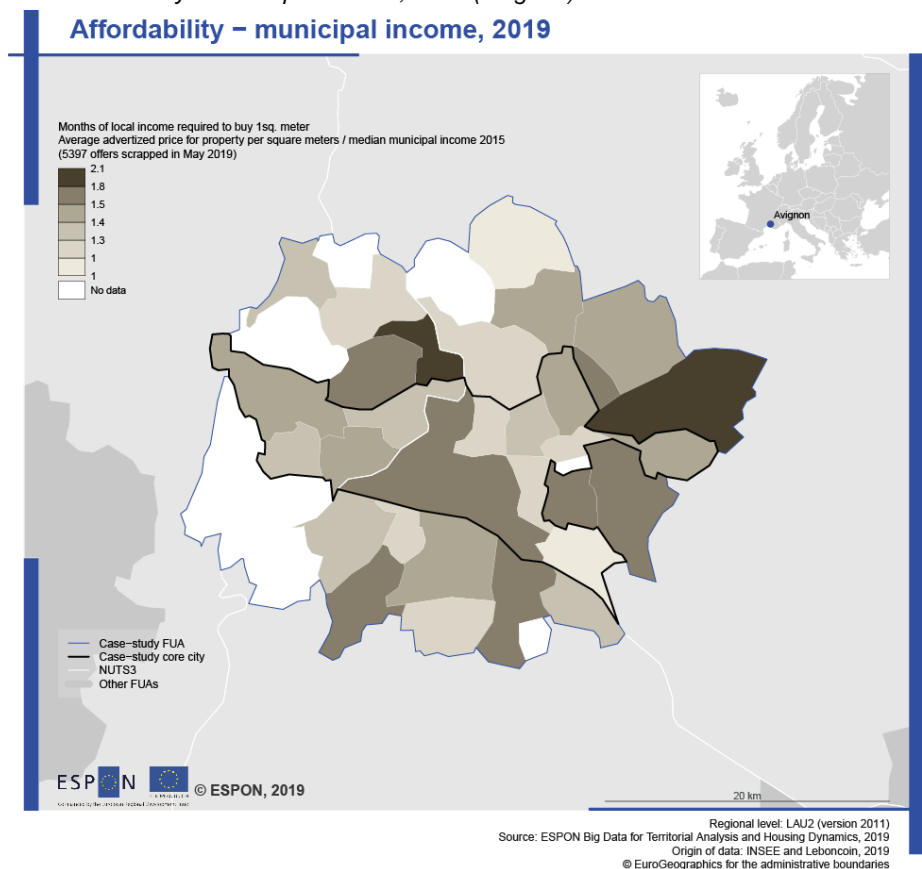
Map 0-138 – Rental offer, 2019 (Avignon)



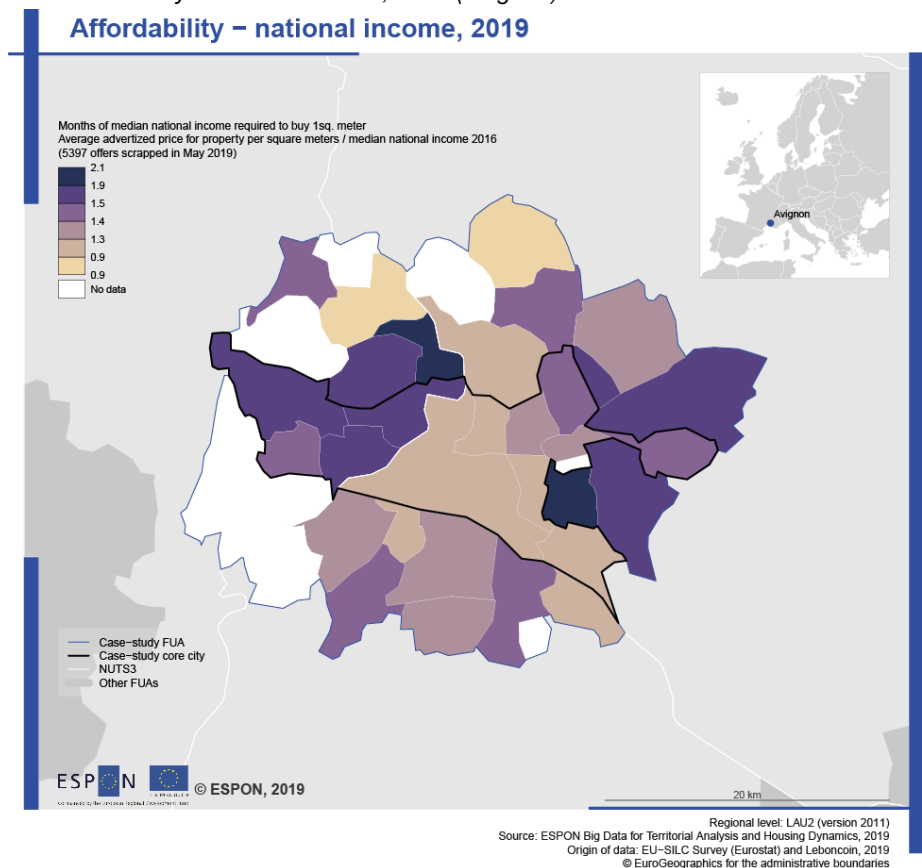
Map 0-139 – Advertised price for property rental, 2019 (Avignon)



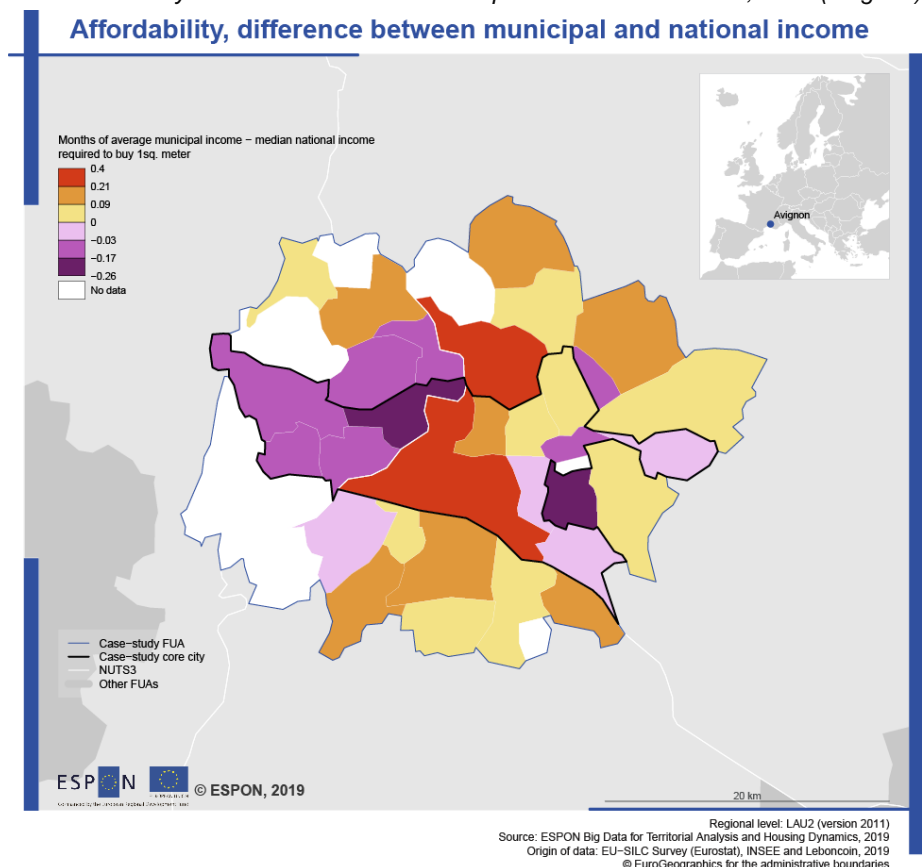
Map 0-140 – Affordability – municipal income, 2019 (Avignon)



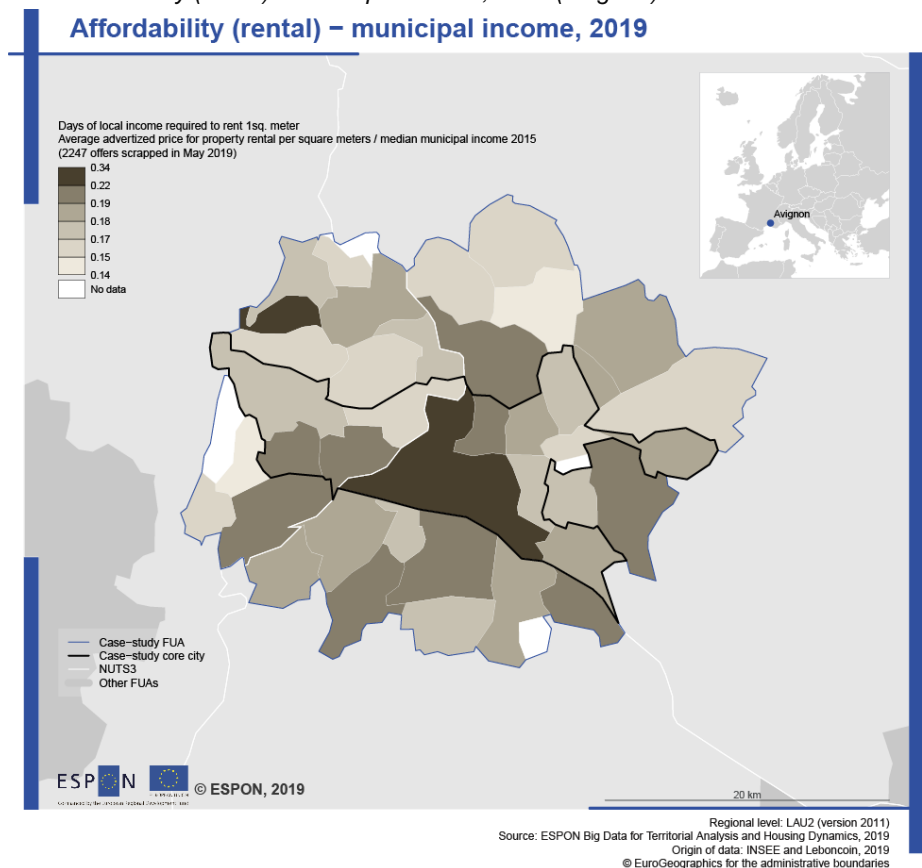
Map 0-141 – Affordability – national income, 2019 (Avignon)



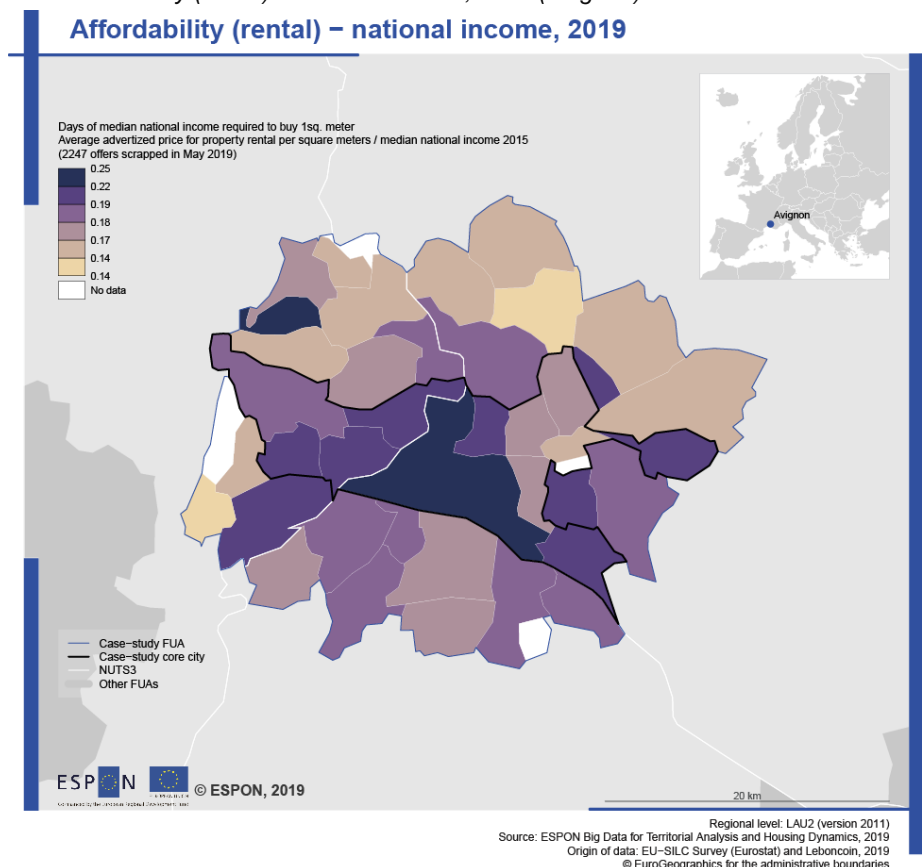
Map 0-142 – Affordability – difference between municipal and national income, 2019 (Avignon)



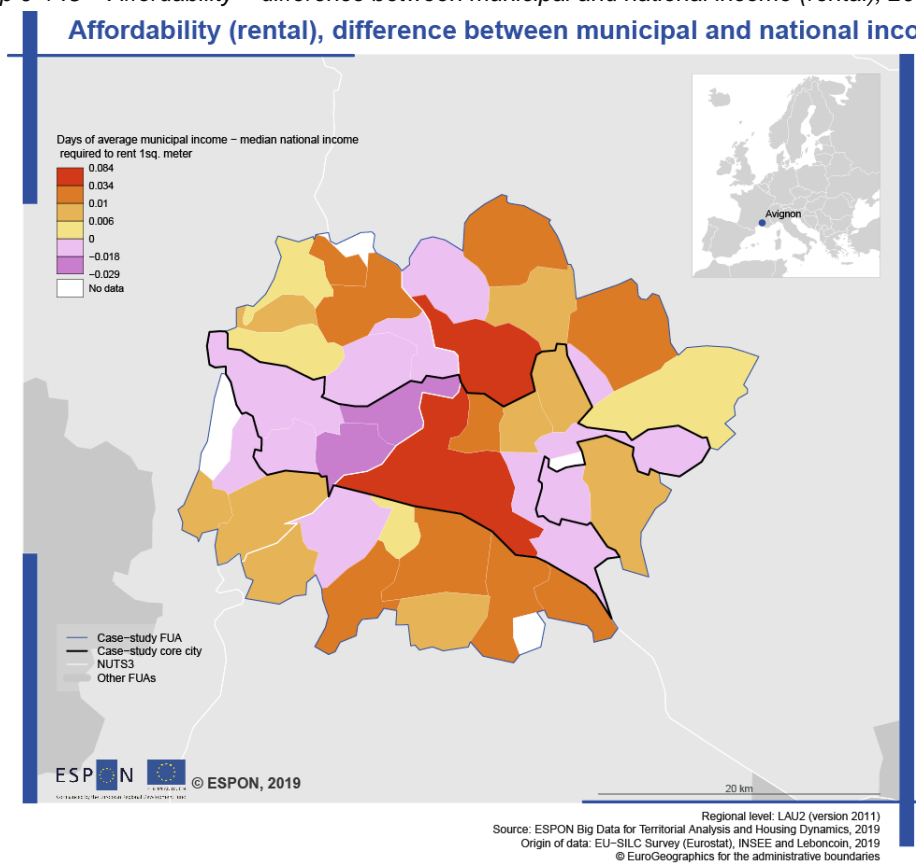
Map 0-143 – Affordability (rental) – municipal income, 2019 (Avignon)



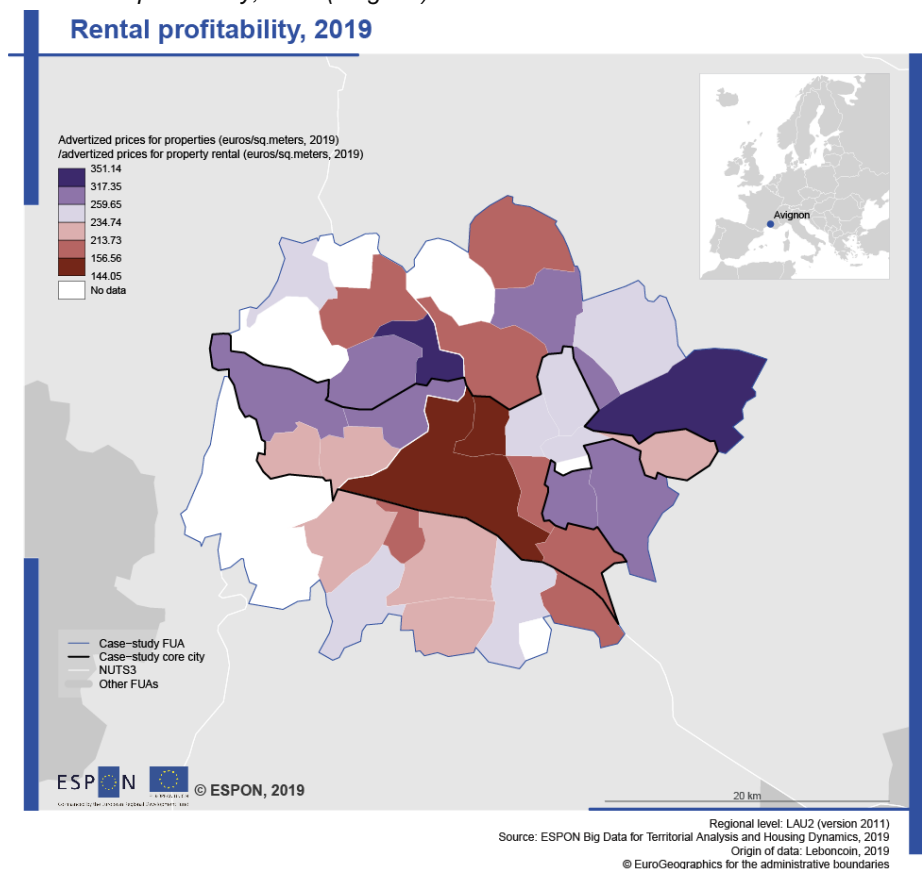
Map 0-144 – Affordability (rental) – national income, 2019 (Avignon)



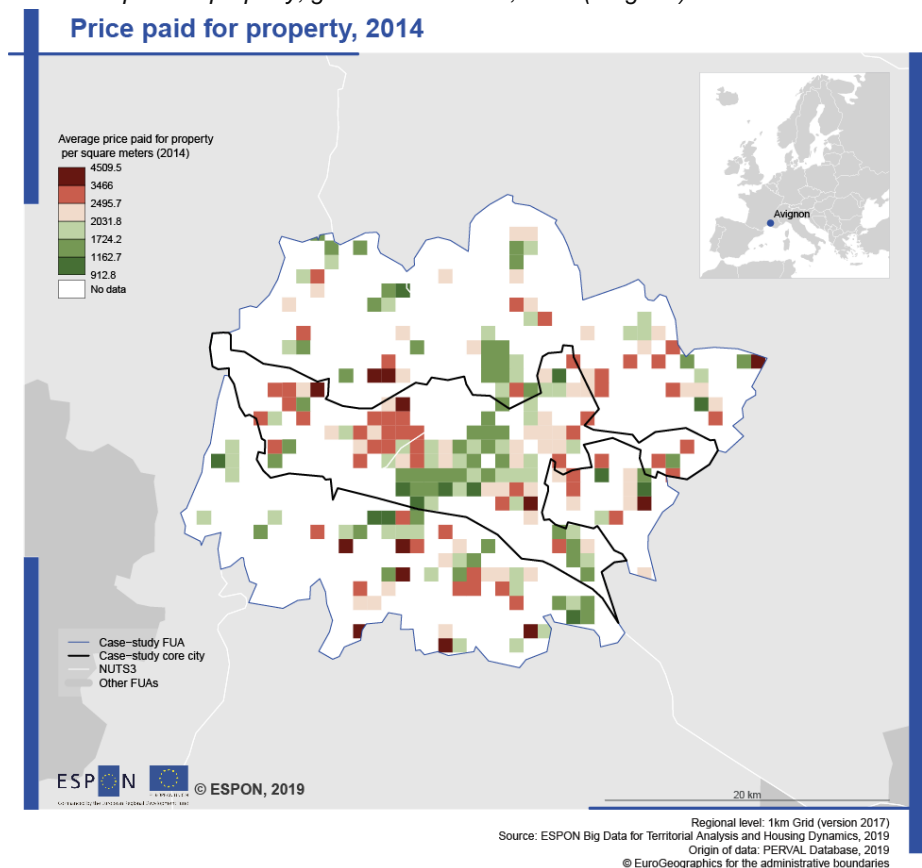
Map 0-145 – Affordability – difference between municipal and national income (rental), 2019 (Avignon)



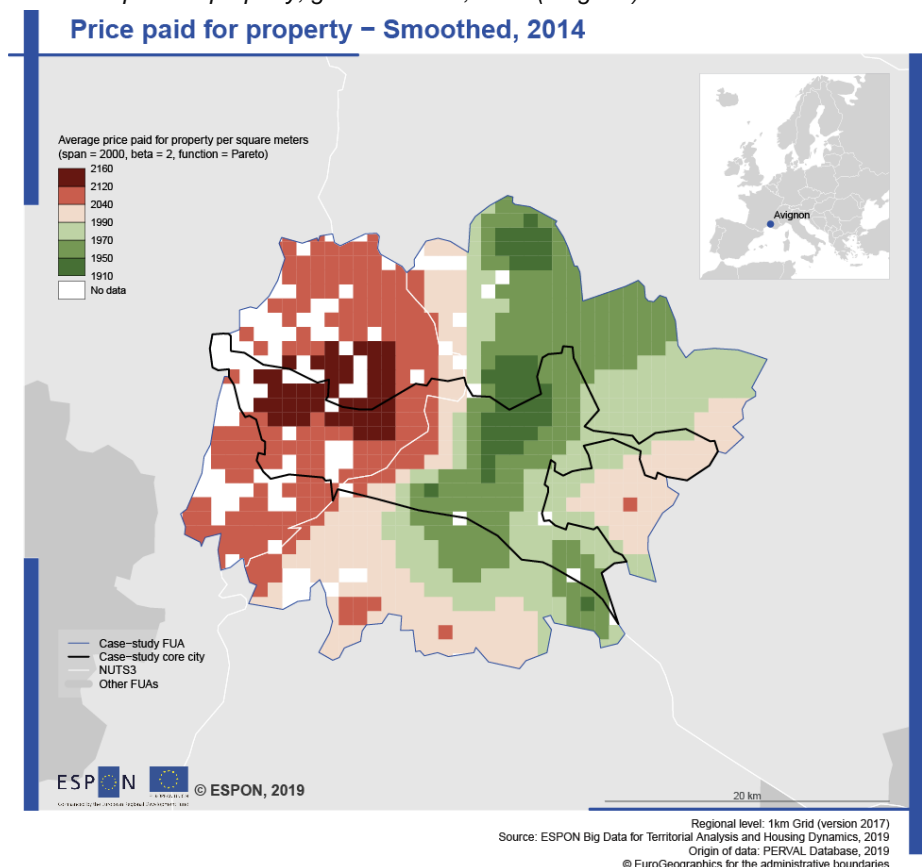
Map 0-146 – Rental profitability, 2019 (Avignon)



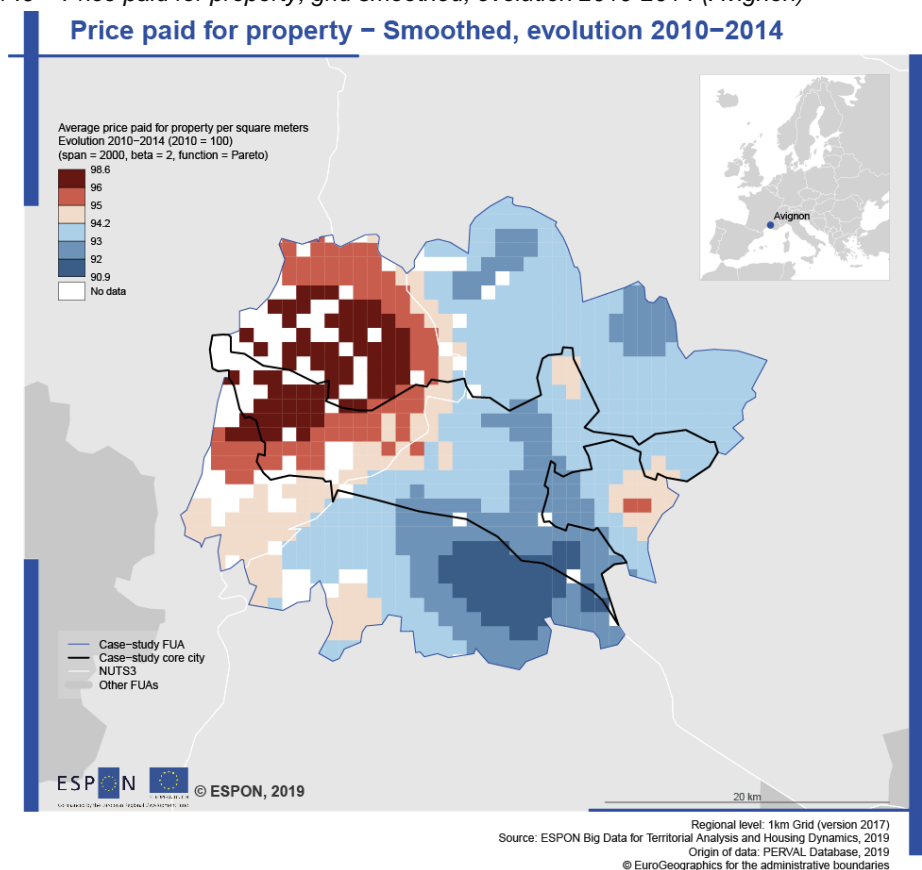
Map 0-147 – Price paid for property, grid non smoothed, 2014 (Avignon)

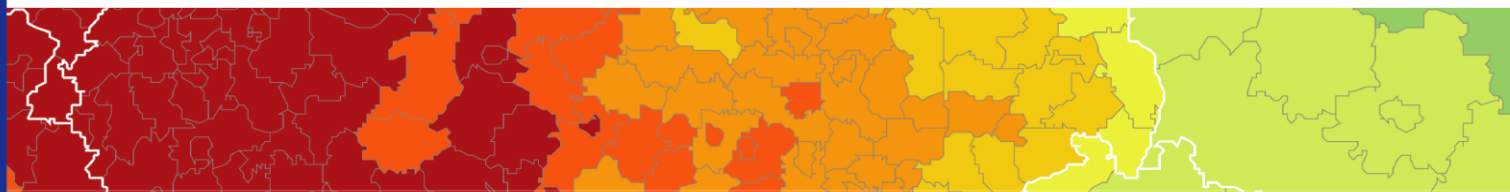


Map 0-148 – Price paid for property, grid smoothed, 2014 (Avignon)



Map 0-149 – Price paid for property, grid smoothed, evolution 2010-2014 (Avignon)





ESPON 2020 – More information

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The ESPON EGTC is the Single Beneficiary of the ESPON 2020 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.