

Housing affordability, quality of life, and residential satisfaction in the Austrian cross-border suburban region of Bratislava, Slovakia

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Abstract

Bratislava's satellites have experienced massive development in recent years. The population of a regional centre has moved into its Slovak hinterland. However, Bratislava's cross-border suburbs have recorded spectacular population growth too. After 2008, housing in the EU became more affordable due to rising incomes and decreasing bank interest rates. Yet, the housing affordability index in the EU (and in the studied area) decreased in recent years due to increasing property prices and, more recently, a reverse tendency in bank interest rates. Through a questionnaire, we sought to establish a link between housing affordability and suburban residents' expected quality of life. We assumed that a large proportion of the population had moved here specifically for a higher quality of life (residential satisfaction) and more affordable housing. Indeed, these were among the most common reasons for moving, with a large proportion of respondents choosing at least one. The Mann-Whitney U test showed that residents who moved to the Austrian suburbs of Bratislava for affordable housing were more satisfied with living in the municipality and housing costs. The article tries to fill the gap in the literature on housing affordability in suburban areas and on the quality of life of cross-border suburban residents.

Keywords: housing affordability, quality of suburban life, residential satisfaction, cross-border metropolitan region, suburbanisation, Bratislava, Slovakia, Austria

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1. Introduction

With border controls in the EU being mostly history, cross-border consumer and commercial mobility increased over time, although cross-border residential suburbanisation might still be a rarity in Europe at present. To mention a few, this list includes Luxembourg (Dörry & Decoville, 2016), Salzburg (Hamedinger, 2011; Chilla & Heugel, 2018; Štefkovičová & Koch, 2022) or the so-called Eurometropolis Lille-Kortrijk-Tournai at the French-Belgian border (Durand & Perrin, 2017). The Slovak capital, Bratislava, borders two countries which formed a single country in the past. The Bratislava granularity pulls many economically active inhabitants behind its boundaries and those of Slovakia. The Bratislava region's average annual GDP growth in recent decades was one of the most substantial across Europe (Eurostat, 2021a). It is primarily affected by the city's location within Slovakia and in transnational terms, as well as by other factors (Michálek & Výboštok, 2019). This growth relates to migration to the city and its hinterland.

The suburbanisation processes of Bratislava started in the mid-1990s (Šveda, 2019). Consequently, their intensity slowly accelerated and affected larger and broader areas around the city. The migration into Bratislava suburbs is driven by the city-core population and the population from other Slovak regions. These

groups differ in housing preferences, with the population from "the regions" preferring to live in areas with longer distances and commute times to Bratislava. The preference for housing location and quality is impacted mainly by housing (un)affordability.

Property prices in Slovakia have strongly increased in recent years (Datalan, 2022; see Fig. 1). That led to a warning from the European Systemic Risk Board (ESRB) on overpricing property prices in Slovakia and the vast indebtedness of households, even until retirement (Apolen, 2022). According to the letter, these factors might impact financial stability and lead to economic issues (ESRB, 2021). The increase in property prices, the de facto non-existing affordable public housing (Meyfroidt, 2017), the absence of regulations on private rental housing, and a slower increase in real incomes in the last five years have worsened housing affordability (Šveda et al., 2021, 12).

The first waves of Bratislava suburbanisation were related to a hunt for better housing and higher quality of life in rural areas (Šveda, 2019). Yet, recent migration waves to Bratislava suburbs might relate to worsening housing affordability in the city and its closest suburbs with excessive property prices (i.e. the first wave of intensive suburbanisation, according to Šuška et al., 2019).

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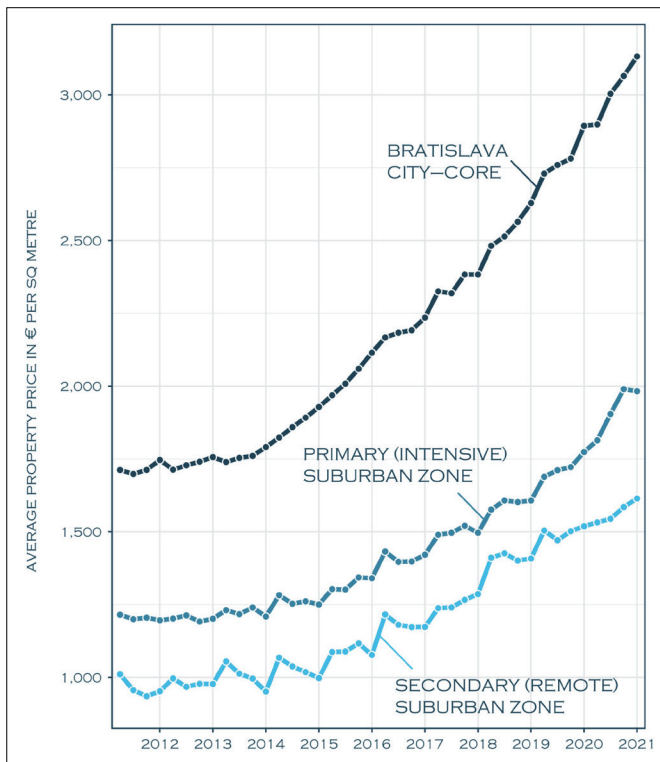


Fig. 1: The development of mean property prices in Bratislava's functional urban area (cf. Bezák, 2014) from 2012 to 2021

Note: suburban zones were delimited by Šuška et al. (2019) based on the intensity of suburbanisation processes

Source: Datalan (2022), authors' elaboration

Some historical events (particularly, the accession of Slovakia to the EU in 2004 and the Schengen area in 2007, and the abolition of border controls) engendered a new process – cross-border suburbanisation. As mentioned, Bratislava borders two countries: Hungary to the South and Austria to the West. The location of formerly peripheral municipalities (country-wise) behind the state boundaries made an instant U-turn and became a natural residential locality for Bratislava's suburban population. The peripherality was related to lower property prices and allowed the population working in Bratislava to seek affordable living in these areas even without speaking the official languages (German and Hungarian). Subsequently, some new residential localities were formed, typical for Bratislava suburbs in its Slovak hinterland.

An example is the residential locality in Rajka, Hungary, with a practically homogenous Slovak population (Balizs & Bajmócy, 2019; Šveda et al., 2020). These factors (population growth of Bratislava hinterland area, open borders) and other variables (increase in incomes, higher demand for quality living, worsening supply of estates for sale) led to a growing increase in property prices in the region of cross-border suburbanisation.

The paper aims to quantitatively evaluate selected aspects of quality of life and residential satisfaction through a housing affordability analysis in the Austrian hinterland of Bratislava. So far, this area has been analysed rather sporadically and has not even been delimited. Therefore, another objective is to contribute to the discussion on the delimitation of Bratislava's suburban area in Austria. The aim is to assess this area's current affordable housing situation and its changes after 2015. We hypothesise that housing affordability in this area would be similar to that in Bratislava and its closest suburbs in Slovakia. On the other hand, we assume that affordability decreased due to suburbanisation. Yet, we think it would not negatively affect the quality of life and residential satisfaction in this area in the short term. The obtained knowledge might not bring detailed answers to questions

on Bratislava suburbanisation: it opens space for other analyses narrowly connected to the Slovak capital and its Austrian hinterland, questions at present barely evaluated.

The article starts with a brief literature review on quality of life, residential satisfaction, and housing affordability in the context of cross-border suburbanisation. Sections on the delimitation of the Austrian "hinterland" of Bratislava, data, and methodology follow. It finishes with analysing the obtained results, their interpretation, and a discussion of our findings in comparison to the international literature.

2. Housing affordability, quality of life, and residential satisfaction: A literature review

Housing affordability means, in general, the ability and possibility to live under adequate conditions with a certain quality. It is made possible by a positive household incomes-to-expenditures ratio (including the cost of living), available housing stock, certainty on financial markets, etc. According to the UN Humans Settlement Programme (UN-Habitat, 2022, 3) "an estimated 1.6 billion people live in inadequate housing conditions, without access to basic services or sanitation, and struggling to afford housing costs." Housing conditions and quality differ across countries and regions. Some authors (e.g. Stone, 2006) view housing affordability as a challenge for households and individuals when reviewing the total costs of current and potential future housing. While financial costs are the most discussed and reviewed, housing costs include various objective and subjective well-being factors. The objective factors include dwelling size, available amenities, green areas, clean air, and low noise level. The subjective include neighbourhood satisfaction, personal safety, familiar neighbours, etc. There are multiple types of affordable housing. Social housing aims to aid low-income populations, while intermediate housing serves middle-income groups that still cannot afford market-price rents (Mulliner & Maliene, 2013). These two types are based on rental housing, yet the owner-occupied housing might also be affordable, provided there are lower loan interest rates and a healthy housing-stock market. Another type of affordable housing considers the affordability for existing homeowners (Kostecký & Vobecká, 2009).

Researchers have attempted to quantify housing affordability through various indices. A housing affordability issue was originally understood as a condition in which a household "pays more than a certain percentage of its income to obtain adequate and appropriate housing" (Hulchanski, 1995, 471). The European Union also applies this approach, which measures whether households' housing costs exceed 40% of their net monthly income in the EU-SILC survey. In the 21st century, the issue of housing affordability has become much more complex and multidimensional. In addition to the original problems, new ones are emerging that, if not addressed, could negatively affect the economic efficiency of cities and the standard of living and quality of life of their inhabitants (Haffner & Hulse, 2021). Yates (2008, 200) argues that broadly speaking, "affordability problems emerge when housing costs increase faster than household incomes." Monthly housing costs primarily include the amount of rent or loan repayments and utility prices. As discussed below, housing affordability is also affected by other costs such as childcare, nursery fees, food, etc.

In recent years, there has been a significant fall in housing loan interest rates in EU countries (European Central Bank, 2022), pushing down the cost of credit, which, together with rising incomes, has contributed to improving housing affordability. In contrast, excessive inflation, particularly in food and energy prices, pushes up prices, resulting in falling real incomes. It is also putting pressure on the European Central Bank (ECB) to

raise key interest rates, which, inevitably, leads to more expensive housing loans in the euro area. In the V4 countries that are not members of the Eurozone, interest rates increased significantly after 2020. Data valid as of 01 June 2022 show that key rates have increased from 0.25% to 5.75% (and to 7% by 16 November 2022) in the Czech Republic, from 0.6% to 5.9% (13% in November) in Hungary and from 0.1% to 5.25% (6.75% in November) in Poland (countryeconomy.com, 2022). In Slovakia, the banks have already increased their interest rates sharply up, and the ECB raised key rates up to 2%. At the end of April, average mortgage interest rates in Slovakia increased to about 1.7% p. a. (Kláseková, 2022b). By the start of December 2022, most of Slovak banks increased their interest rates for mortgages to about 4% (Kláseková, 2022a). In Austria, long-term fixations increased by 0.5–0.6 percentage points during the first quarter of 2022 according to the realtors (Draxl, 2022). The Austrian central bank data (ÖNB, 2022) show a slight increase in housing loans, mainly those with interest rates fixed for 5 and more years. Thus, energy price inflation has a double impact on housing affordability.

The issue of housing affordability is an integral part of the quality of life and its related concepts, such as life satisfaction (including residential satisfaction), happiness, or well-being of individuals and households. The concept of quality of life refers to “the qualitative parameters of human life, way of living, lifestyle and living conditions of society” (Godor & Hornák, 2010, 43). Besides favourable living conditions, quality of life is also commonly seen concerning health, individual well-being, quality of public services, or general satisfaction in terms of cognitive state (Vaishar et al., 2018). Similarly, Ira and Andráško (2007) explain that the study of quality of life is associated with concepts such as health, liveability, well-being, urban environmental quality, sustainability, satisfaction, happiness, quality of place or standard of living. Concepts such as quality of life, well-being, life satisfaction and happiness are thus closely intertwined and often difficult to distinguish (Phillips, 2006; Marans & Stimson, 2011). For example, Gerber et al. (2017) consider subjective well-being, happiness, and satisfaction as components of the quality-of-life concept. According to Cao (2016), life satisfaction is a cognitive measure of subjective well-being or quality of life. Ala-Mantila et al. (2018) consider the quality of life and happiness as measures of subjective well-being. The subjective dimension of quality of life is concerned with the quality of life from an individual's perspective, assessing satisfaction with phenomena and overall satisfaction with life (Marans, 2015).

The relation between housing affordability and the concept of quality of life is manifested by the strong influence of household income on housing quality. Quality housing affects the quality of life of household members in two ways. On the one hand, higher housing costs may be related to higher housing quality requirements. On the other hand, household members are left with fewer resources to meet other necessities of life, such as spending on food, utilities, culture, travel to work, health care and childcare, or fulfilling aspirations such as saving for retirement or emergencies, starting their own business, or pursuing higher education (Anacker, 2019). Household size and structure also play an important role in household expenditure on housing and other necessities of life. For example, a childless couple can afford to allocate more of their budget to housing than a (single parent) family with multiple children, which also needs to spend a higher share of their household expenditure on other non-housing living needs (Bentzien, 2016). It should also be noted that with the ever-increasing real estate prices in Slovakia, Europe, and elsewhere in the world in recent years (Peveřini & Cavicchia, 2021), acquiring one's housing through purchase is more difficult to afford, especially for people entering the housing market for the first time, who may thus be forced to look for rental housing (Haffner & Hulse, 2021).

Factors negatively influencing the purchase of a property include lack of knowledge of the property market (price, location, condition of the property), insufficient or poor credit history, low savings to repay the loan, as well as exaggerated expectations, e.g. overestimation of one's creditworthiness (cf. National Association of Realtors, 2022, 91). People tend to buy properties when prospering in their lives, and their incomes at that time are disproportionately higher than their earning trajectories (Reid, 2013). In addition, unregistered and unrecognised income and its instability harm obtaining a housing loan. Reid (2013) found there is an optimism bias on buying over renting preference for lower-income first-time property buyers. She points out they are “unwilling to decide any downsides of the decision to own”. Such downsides include possible price falls in the future or a possibility of losing a job and, therefore, income to pay the mortgage, potentially getting divorced or having a child, which also influences the household net income. These factors lead to parental borrowing in the form of upfront capital, mortgaging a second property, or loan sharing.

On the other hand, some higher-income households pay higher housing costs, not because of financial hardship but because of their own willingness to pay for decent housing (Park & Seo, 2020). Thus, they pay for a certain standard and quality of the housing unit they own or rent, however, the external environment's conditions also play an important role. According to Gou et al. (2018), an individual's quality of life depends not only on the subjective evaluation of their personal life but also on the place in which they live, which is affected by the characteristics of the residential environment. The places where people live, work, and relax represent dimensions of quality of life, generally referred to as quality of urban life – QOUL (Marans, 2015). Pacione (2003) states that the variety of meanings of the term quality of life and its use in different contexts generally relates to the environmental conditions in which people live (e.g. water and air pollution, quality of housing) or to a particular attribute (e.g. health or educational attainment). From a geographical perspective, quality of life can be defined as the interaction of human preferences and opportunities for their fulfilment within a specific geographical environment (Angelovič & Ištók, 2016).

We assume that some residents will prefer to pay higher housing costs in a better location that meets their demands and perceptions of high quality of life, for example, in terms of accessible amenities, a high proportion of green spaces, or good transport accessibility to their place of work or school. Mulligan and Carruthers (2011, 108) describe amenities as “site- or region-specific goods and services that make some locations particularly attractive for living and working. Their opposites, disamenities, make places unattractive”. Amenities could be of natural origin (such as sunshine or a nice landscape) or human-created, for example, public goods and services (e. g. education), private consumption goods (e. g. restaurants), cultural institutions, transportation and communication, and social capital.

Since housing is an essential domain in people's lives, we consider its research to be an important subcomponent of research on the general concept of quality of (urban) life and life satisfaction, well-being, and happiness. In this context, therefore, we are also concerned with the concept of housing satisfaction (especially housing in the sense of living in a particular locality), the so-called residential satisfaction (for further reading on the concept of quality of urban life, see Biolek et al., 2017; for residential satisfaction, see e.g. Nguyen et al., 2018).

In environmental psychology, within the theory of place, residential satisfaction is defined as residents' feelings of gratification and pleasure in relation to living in a particular place (Bonaiuto et al., 2003). Satisfaction is often considered as a global indicator of perceived neighbourhood quality, whereby it is understood as a cognitive judgement based on the achievement

of a certain standard or desirable level of neighbourhood quality (Corrado et al., 2013). According to McCrea et al. (2011), the tendency of residents to be satisfied with the location of their housing depends on various psychological mechanisms and, at the same time, when moving to a new place to live, people tend to prefer locations that satisfy them in those aspects that are most meaningful to them. Marans and Stimson (2011) cite housing and neighbourhood satisfaction as one of several examples of subjective quality of life indicators used in quality of urban life research.

Florida et al. (2013) investigated the factors causing feelings of happiness in urban and metropolitan residents. The authors understood happiness and subjective well-being as subjective cognitive and affective evaluations of people's quality of life. According to these authors, housing represents the single biggest cost factor for most households. Based on this, it could be inferred that happiness levels would be higher in areas with more affordable and cheaper housing. Paradoxically, however, Florida et al. (2013) found that happiness levels were higher in those locations where housing was less affordable due to higher housing prices and a higher housing price-to-wage ratio. Florida et al. (2013) explained that higher housing prices tend to be in localities that are more economically productive and have a better supply of amenities. As a result, residents pay more for a higher quality of life, which affects residents' sense of happiness. The same results were found by Bursa (2021). He found that civic amenities are associated with higher residential satisfaction.

A similar conclusion was reached by Mulligan and Carruthers (2011), Anenberg and Kung (2020), Bieri (2012) and Shamsuddin and Campbell (2022). Anenberg and Kung (2020) find that rent elasticity is low and therefore infer that rental rates depend more on the level of amenities in a particular location than on the housing supply. Bieri (2012, 3) points out that "important aspects of housing quality depend on local nonmarket goods, such as local public goods and amenities tied to the location of housing, which affects the well-being of individuals and households." Therefore, Bieri (2012) further suggests that when assessing housing affordability, the various opportunities that arise for households concerning a particular housing location, such as the accessibility of jobs, environmental quality, public safety, or the quality of schools, should also be considered.

It should also be noted that cheaper housing, which low-income groups usually prefer, may be in areas with inadequate quality of amenities or higher crime rates, affecting residents' quality of life. As Bentzien (2016, 132) states, "qualitatively and quantitatively adequate housing at affordable prices for the household may only be available in a very insecure area."

The low housing price does not only result from living in a lower quality location. It also reflects the lower standard of the housing unit. When low-income households spend a significant portion of their budget on housing-related expenses, such housing may also lead to mental stress if the housing quality does not match the costs incurred (Park & Seo, 2020). Thus, the issue of housing affordability in relation to the quality of life and residential satisfaction can also be interpreted in the context of its potential impact on the health of residents.

The considerations mentioned above of diversified housing affordability according to different locations, which reflect the economic, social or environmental conditions of a given environment and are also reflected in the perceived level of quality of life of the inhabitants, however, tend to be presented in the literature mainly in the context of urban or metropolitan environments. Haffner and Hulse (2021) provide examples of studies examining the so-called suburbanisation of poverty in the US, Australia, and the UK. The cases involved low-income households forced to seek cheaper housing on the periphery of the city but further away from employment opportunities and

with higher commuting costs, as housing in the centre was not affordable. In some large cities, however, middle-income households are also moving to the suburban zones due to the lack of affordable housing in their central areas (Haffner & Hulse, 2021). "Households moving to the urban fringe or adjacent rural areas face additional costs (and time) spent commuting which add to living costs" (*ibid.*, 70, Výboštok et al., 2020).

In the case of the Austrian-Slovak cross-border suburban region, which is the subject of our study, we can find several similarities and differences. Slovak inhabitants have been moving to Austrian border municipalities in the hinterland of Bratislava, especially in the last decade, due to more affordable housing compared to the Slovak capital (Falfan & Moravanská, 2020, 9). The fact that the Iron Curtain separated the two countries for several decades contributed to the lower property prices in this part of Austria, which left the Austrian municipalities near the Austrian-Slovak border on the periphery of the state, without the possibility of significant development. The fall of the Iron Curtain in 1989, Slovakia's accession to the European Union in 2004, as well as its accession to the Schengen Agreement in 2007, resulted in the formerly peripheral municipalities suddenly becoming more and more easily accessible for housing also for Slovak inhabitants. The adoption of the Euro in Slovakia in 2009 contributed to the facilitation of labour migration between Slovakia and Austria. This fact has conditioned the suburbanisation processes of Bratislava, as well as the position of Austrian border municipalities in a certain sphere of influence of the Bratislava city region.

Due to much lower real estate prices, good transport accessibility and the presence of other factors traditionally sought after by suburban migrants (cf. Šveda, 2016), these municipalities have become attractive to an increasing number of residents moving here from Slovakia. Official data (Statistik Austria, 2022b) suggest that 85% of Slovak incomers to Kitssee since 2002 immigrated after 2010 (52% after 2015). Since 2002, almost 7,000 Slovaks migrated to the three studied districts. Overall, three out of four Slovak immigrants to the three studied districts moved in since 2011 (40% from 2017 to 2020). It should be noted, however, that the continued high demand for real estate has pushed prices up in recent years, ultimately making it progressively less affordable compared to the period at the beginning of the suburbanisation processes (Falfan & Moravanská, 2020, 8). Haffner and Hulse (2021, 72) point out "flow-on effects to residents of towns and villages surrounding big cities who are affected by higher prices associated with property purchases in their areas by metropolitan households".

3. Data and methods

3.1 Area under study

Farkas and Klobučník (2021) were among the first to delimitate the Bratislava hinterland in Austria. Their area consists of municipalities (Gemeinde) across three districts (Bezirke) bordering Bratislava – Bruck an der Leitha, Gänserndorf and Neusiedl am See – with at least 5% Slovak population.

Regarding the absence of reliable data on migration from and daily mobility to Bratislava from this area, the share of Slovaks is the most precise data on the spatial extent of Bratislava behind the state border, yet this might not be inevitably related to the Slovak capital's suburbanisation processes. A limiting factor is that the Slovak population in the researched area is undoubtedly connected with Vienna. The city's work travel area is more extensive than Bratislava's, with many Slovaks joining in a daily commute. Therefore, we consider the Vienna Aussenzone as a spatial span of Vienna suburbanisation as delimited by the KDZ – Zentrum für Verwaltungsforschung (i.e. the Centre for Administrative

Research, KDZ, 2022). The KDZ delimited 43 urban regions based on the urban/rural typology (Statistik Austria, 2021c), daily commute, and other social and demographic data in Austria.

The authors' (Farkas & Klobučník, 2021) delimitation might be agreed with – however, we propose some changes. We assume that the delimited area does not include potentially new and emerging localities of Bratislava suburban population interest. Therefore, we include the municipalities which doubled their Slovak population from 2011 to 2021 and their current (2021) share reached at least two per cent. The authors' delimited area also excludes municipalities with a travel time to Bratislava comparable to the city's daily commute within its suburban area in Slovakia. Even though the area should be continuous (compact), the municipality of Hohenau an der March is optically divided from the compact area. The Bratislava functional urban area (Fig. 2; cf. Bezák, 2014; for Bratislava daily commute area cf. Halás & Klapka, 2020) stretches to further localities connected with Austria by the Moravský Sv. Ján – Hohenau border crossing. Mobile 'phone location data (Šveda et al., 2021) show a significant number of people commuting more than 60 minutes to Bratislava daily (car ride duration from Hohenau to Bratislava is about 55 minutes). In comparison to 17 municipalities delimited by Farkas and Klobučník (2021), we have delimited 28 municipalities that might be affected by Bratislava suburban processes (see the area filled by a diagonal grid in Fig. 2). The share of Slovaks in this filtered area strongly correlates with distance from Bratislava (Spearman's $\rho = -0.81$, $p < 0.001$). The map also shows that the whole delimited area is a part of the Vienna Aussenzone.

3.2 Data and methodology

We use the so-called housing affordability index *HAI* to quantify housing affordability. The index consists of the average household creditworthiness and the mean (median) property price. The creditworthiness *CRW* comprises the monthly income

after tax, social and health insurance x , and minimum monthly expenses ME .¹ Finally, the income is reduced by the debt-to-income ratio *DTI*, the ratio of the highest possible household credit indebtedness to monthly income. On the other hand, the monthly loan instalment *MLI* of an average-size property is measured. Its calculation is based on a property price per square metre y , average loan interest rate IR , and mortgage maturity length in years MM . The value is then lowered by the loan-to-value ratio *LTV*, the maximum amount a bank would lend to a potential borrower.

$$CRW = (x - ME \times 1.5) \times DTI$$

$$MLI = \frac{y \times \frac{IR}{12}}{1 - \frac{1}{\left(1 + \left(\frac{IR}{12}\right)^{MM \times 12}\right)}}$$

$$HAI = \frac{CRW}{MLI} \times LTV$$

This calculation has a few limitations. First, it uses aggregated data for the whole municipality population, and all sold properties, thus ignoring income differences within municipalities and inequality in social structure. Second, using mean property prices per municipality brings the same issue. An affluent person would look for more expensive property. Finally, operating with income levels and property prices in the same municipality evokes that a property in the municipality is being bought by someone already residing in it. These people, however, already live here and, therefore, might not need to buy another estate for a living. Despite the already published analyses on housing affordability in the Bratislava hinterland area, which included all properties suitable for a living (Šveda & Výboštok, 2020), we decided to analyse family houses only. The reason was the data availability (data are available either for flats or houses separately). Even though the “dream-of” better living in one's own house might look and sound like

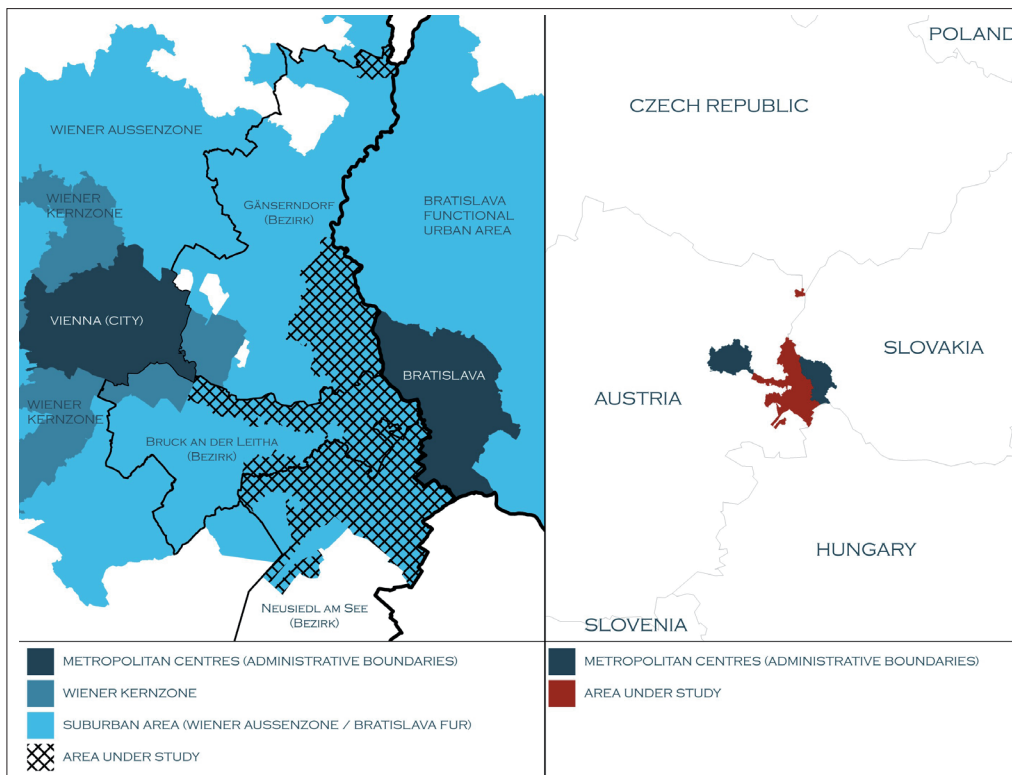


Fig. 2: Location of research area
Source: KDZ (2022), authors' elaboration

¹ In the *HAI* context, the minimum monthly expenses equal the minimum subsistence level.

a cliché (Šuška & Šveda, 2019), the number of houses (multiple-room properties, more precisely) and their construction dominates rather substantially in Bratislava suburbs (Šveda et al., 2016; Šveda, 2019; Šveda et al., 2021, 9). Despite Burgenland being one of the Austrian federal states with the highest newly built flats-to-houses ratio from 2001 to 2011, family house prices have been selected instead of flat prices. Mainly, houses with one or two flats represented 89% of all properties suitable for a living in 2011 (Statistik Austria, 2011).

As the house prices are not available at the local (municipality) level, a disaggregation through geographic conversion tables from the subregional (Bezirke) level was needed (Simpson, 2002; Madajová, 2011). This method is based on joining various groups of geographic units by a common variable (Sládeková Madajová & Hurbánek, 2016, 45–50). Therefore, we used land prices suitable for construction as such a variable (weight). As Madajová (2011) points out, an error of estimate for every final unit is as high as the value of correlation between weighted criterion and estimated data. The weighted criterion should be optimal for converting the data group and for their redistribution across source units. The used variable (land property price) satisfies both criteria (Spearman's $\rho = 0.78$, $p < 0.001$). Therefore, we assume that using this variable might predict property prices at the local level. This assumption comes from the findings of Sládeková Madajová and Hurbánek (2016), who tested multiple methods of areal data transformation.

The values of initial geographical units y_z (property price at district level) are disaggregated into predicted \hat{y}_c variable for target geographical units (property price at the municipal level) using weight w_{zc} (land property price at municipality level). The formula for conversion tables is as follows:

$$\hat{y}_c = \sum_z w_{zc} y_z; w_{zc} = \frac{a_{zc}}{a_z}$$

where a_{zc} stands for land property price for areas where initial and target units intersect (for individual municipalities). At the same time, a_z goes for land property prices at the district level.

Mean loan interest rates were obtained from the ECB (2022). Specifically, an aggregated value for Austria is used. One might assume that some new immigrants from Slovakia would prefer Slovak bank services due to language issues (e.g. Šveda et al., 2020) found that a part of the Slovak population in Kittsee is having difficulties related to the German language). Though, the Slovak central bank data (The National Bank of Slovakia, Národná banka Slovenska, 2021) indicate that is not the case.

Why do we prefer analysing housing affordability through selling properties instead of renting? About 43% of all households in Austria live in rented dwellings (including sub-tenancy), with “only” 49% residing in their properties. The latter is much lower in the metropolitan region of Vienna (Friesenecker & Kazepov, 2021). It is also markedly lower than in Slovakia, where people live in their own properties on more than 90% of occasions (Eurostat, 2021b). To be precise, the value is as high as 92% in the (Slovak) Bratislava suburban area according to the latest census (Štatistický úrad SR, 2022). The value is consistent across both Bratislava suburban-intensity zones (as per Šuška et al., 2019 and Fig. 1); there are only two municipalities with at least 10% people living in rent or leased properties. Burgenland and Lower Austria, however, score above-Austrian-average values of 68.5% and 62.7%, respectively. Rents and sub-tenancies in these states are represented on about one-quarter of occasions. We also assume that an average Bratislava suburban resident would prefer to buy than to rent. This preference is quite dominant in the Slovak part of the Bratislava hinterland. According to the Austrian statistical office, the mean property size is 100 sq metres. The value used for HAI calculation is specific for a given year and federal state (Statistik Austria, 2021a).

In addition to the analysis of housing affordability, we also investigated selected aspects of the quality of life of inhabitants of the Austrian border region of Bratislava in relation to housing based on our own questionnaire survey. The online survey was carried out in January 2021 to determine the residential satisfaction of the inhabitants of the districts of Neusiedl am See, Bruck an der Leitha, and Gänserndorf and involved a total of 205 respondents, 151 of whom were of Slovak nationality. For the purposes of the research in this study, we selected three samples of Slovak nationality only – either all 151 respondents (Tab.1), or samples from the municipalities with the largest number of respondents: 50 respondents from Hainburg an der Donau and 50 respondents from Kittsee that represent approximately 0.7% and 1.5% of their total population as of 2021, respectively, and 2.5% and 3.2% of their Slovak inhabitants, respectively. We chose a sample focusing on Slovak respondents because we were interested in assessing the satisfaction of immigrant Slovak residents with selected attributes of the residential environment in relation to their quality of life, which we would subsequently analyse in relation to their possible impact on housing affordability. The sample is not representative as the questionnaire was distributed online through social networks. Its purpose, however, was to connect with as many of the residents of the region, especially Slovaks, as possible, and any interested adult resident could participate.

Consequently, we statistically analysed respondents' answers to questions regarding their overall satisfaction with living in the municipality and specific neighbourhood, as well as their satisfaction with selected environmental and social attributes of their living environment. Knowing residents' subjective attitudes towards factors of their residential environment based on their expressed satisfaction can help discover issues that need to be improved to ensure a better quality of life for residents (Štefkovičová & Koch, 2022). Respondents were asked to express their satisfaction on a Likert-type scale ranging from “very dissatisfied” to “very satisfied”. In the analysis, we focused primarily on the housing costs and various (dis)amenities, such as general assessment of civic amenities, the overall appearance of the neighbourhood, green areas and their maintenance, cleanliness of public spaces, the noise in the environment, traffic intensity, or feelings of personal safety. The actual scales have been validated through a pilot study that we conducted before the official survey dissemination, with the aim to confirm the face- and content validity and improve the readability of the questionnaire.

For these attributes, we calculated Kendall's tau-b correlation coefficients to see if the environmental and social attributes of housing are related to the overall rating of their satisfaction with living in Hainburg an der Donau or Kittsee. The non-parametric Kendall's tau-b correlation coefficient was used because the variables were measured at the ordinal level. We also checked the correlations using Spearman's correlation coefficient, which can

Category	Description	Respondents (N)	Respondents (%)
Gender	Men	47	31.1
	Women	104	68.9
Age	20–29	12	7.9
	30–39	65	43.0
	40–49	51	33.7
	50–59	16	10.6
	≥ 60	7	4.7
Gross income (€/month)	≤ 999	4	2.9
	1,000–1,999	25	18.0
	2,000–2,999	30	21.6
	3,000–3,999	32	23.0
	≥ 4,000	48	34.5
Household size		3.14 (mean)	1.352 (std.dev.)

Tab. 1: The descriptive statistics of the sample
Source: authors' survey

be applied to ordinal data, too. Kendall's tau-b is more appropriate to use in the case of having small data sets with many tied ranks, however, as it can provide more accurate generalisations (Field, 2018).

In addition, we asked about Slovak residents' motives for moving to the Austrian suburban municipalities. By using the Mann-Whitney U test² we have statistically tested whether the motive of looking for "an affordable real estate offer (house, apartment, land)" was later fulfilled by residents' satisfaction with living in the particular municipality and neighbourhood, as well as satisfaction with housing costs, i.e. whether people, whose one of the reasons for moving to Austrian suburban municipalities was more affordable housing, were truly satisfied with living in the municipality, in the neighbourhood, and with housing costs afterwards in comparison with those people who did not express such reason.

4. Result

4.1 Housing becomes less affordable

The Global Residential Cities Index by Knight Frank (2022; Fig. 3) shows that property prices in Bratislava rose with higher intensity (in relative terms) than in Vienna. Both cities (especially Bratislava) recorded an extremely high increase after the initial Covid-19 breakout and the first worldwide economic lockdown in the spring of 2020. That strengthens the claim that properties close to Bratislava might be notably affected by suburbanisation processes even in the cross-border region. Arguably, the housing affordability of "Slovak" municipalities in Austria would be influenced by the realty market in Bratislava.

Figure 4 shows the ever-increasing values of disaggregated house prices within the three studied districts. The municipalities of these districts were divided into multiple categories: Bratislava hinterland, Vienna hinterland (Wiener Aussenzone), Vienna city-core (Wiener Kernzone), and other municipalities (that is, an area outside of the suburban sphere of both cities). The municipalities which are part of multiple categories are put into all-inclusive categories. Therefore, the visual shows that suburban processes substantially impact property prices and their increase in this area. It can also be seen that the municipalities with a higher share of the ethnic Slovak population significantly affect house prices. Apart from Vienna and municipalities closely adjacent to Vienna (Wiener Kernzone), the municipalities in the Bratislava hinterland have been increasing most rapidly in terms of property prices. We are still determining why property prices in municipalities outside Vienna and Bratislava suburban areas decreased (all these municipalities are located near Neusiedler See). The reason might be an initial "shock" of the pandemic and a chance to get some physical money back from selling the property. Another explanation might be that the Slovak or Hungarian populations were selling the properties and returning to their home country due to pandemic-related border-crossing measures. It might also be influenced by its remote location from Vienna and Bratislava and, therefore, lower attractiveness for suburban residents of these cities looking for high-quality and affordable housing. We currently need more data on this issue, however, and to exhaustively answer this question is far beyond this study's objectives. The small number of observations (municipalities) included in this category might also affect the shakiness of its development. Therefore, it might be influenced by the small number of properties sold.

Although property prices grew excessively, an increase in income and a decrease in loan interest rates after the financial crisis from 2007 to 2009 led to better (higher) housing affordability

in Bratislava and its hinterland (Šveda et al., 2021, 12). In recent years housing affordability has stalled, and since 2020 it has even decreased. The same development is evident in the Austrian hinterland of Bratislava (Fig. 5).

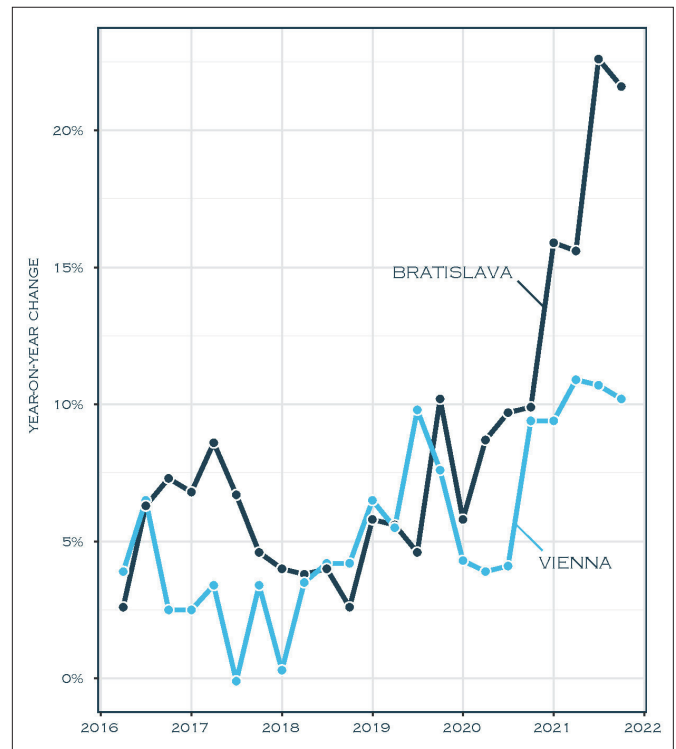


Fig. 3: Year-on-year property prices change in Bratislava and Vienna from 2016 to 2021. Source: Knight Frank (2022), authors' elaboration

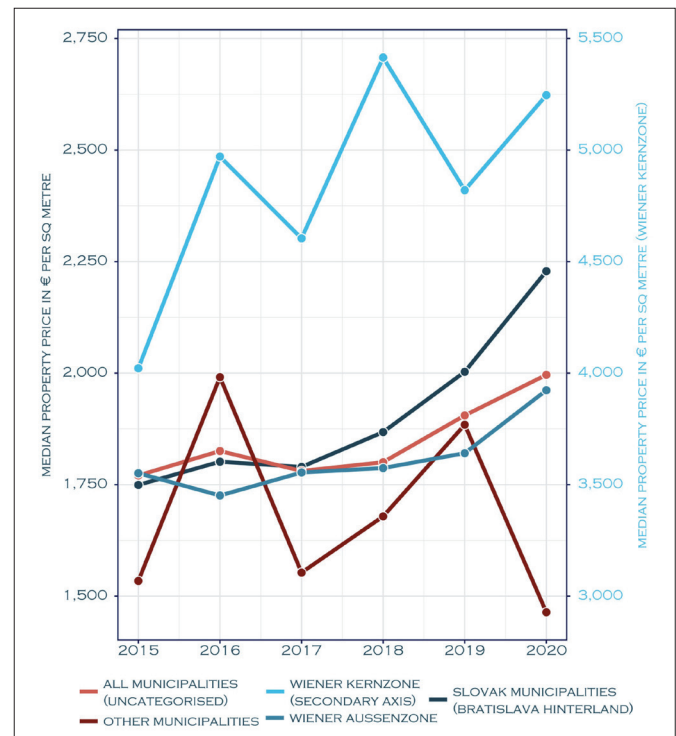


Fig. 4: Median estimated closing prices for family houses in the municipalities of the Bruck/Leitha, Gänserndorf, and Neusiedl/See districts from 2015 to 2020

Source: authors' calculations based on Statistik Austria (2021b) data

² Mann-Whitney U test (also called the Wilcoxon rank-sum test) tests for a statistically significant difference between two groups with non-normally distributed values or different variances (Fay & Proschan, 2010).

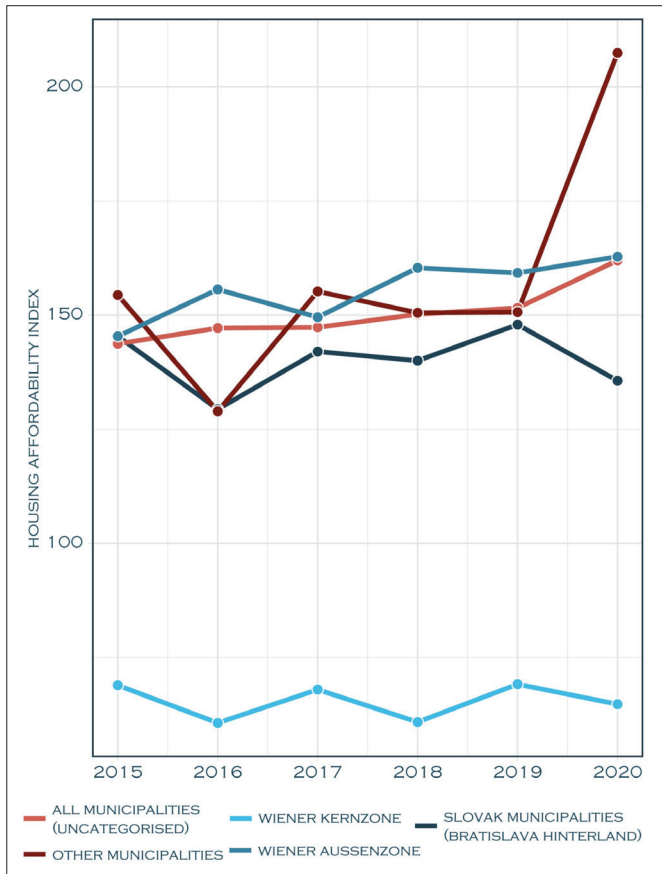


Fig. 5: The development of the housing affordability index in the defined (sub-)urban categories from 2015 to 2020
 Source: authors' calculations based on Statistik Austria (2021b, 2022a) data

On the other hand, this development is spatially differentiated. In recent years, the housing in this area (Bratislava suburban zone) has been affordable, but Vienna's and Bratislava's suburbanisation processes change that pattern. An increase in average income did not reach the levels of increasing estate prices and eventually led to a decrease in housing affordability (Fig. 6). The figure shows Kittsee as a municipality with one of the lowest housing affordability values in 2020 (HAI = 77.8; the only ones with lower values are Fischamend, close to Vienna, Neusiedl am See, a regional administrative and tourism centre, and its neighbour Parndorf).

Despite still being unfavourable, however, housing affordability in Kittsee has seen an increase in recent years. Such a pattern (increase) might be seen across the Neusiedl am See district. The incomes in the district are very high, and the property prices do not reach those of the Bruck an der Leitha and Gänserndorf districts (where housing affordability decreased).

4.2 Quality of life and satisfaction with living in the cross-border suburban area

Next, we analysed the strength of association of satisfaction assessment of living in a particular municipality and neighbourhood with several environmental and social attributes of the residential environment as expressed by respondents from Hainburg an der Donau and Kittsee, using Kendall's tau-b correlation coefficient (see Tabs. 2 and 3).

In the case of respondents from Hainburg an der Donau (Tab. 2), the correlation coefficients were found to be statistically significant for all pairs of attribute ratings examined, except for ratings of satisfaction with living in the municipality and traffic intensity. A strong positive relationship between satisfaction with the overall appearance of the neighbourhood and satisfaction with living in the municipality as well as in the neighbourhood, suggests that respondents who were satisfied with living in their

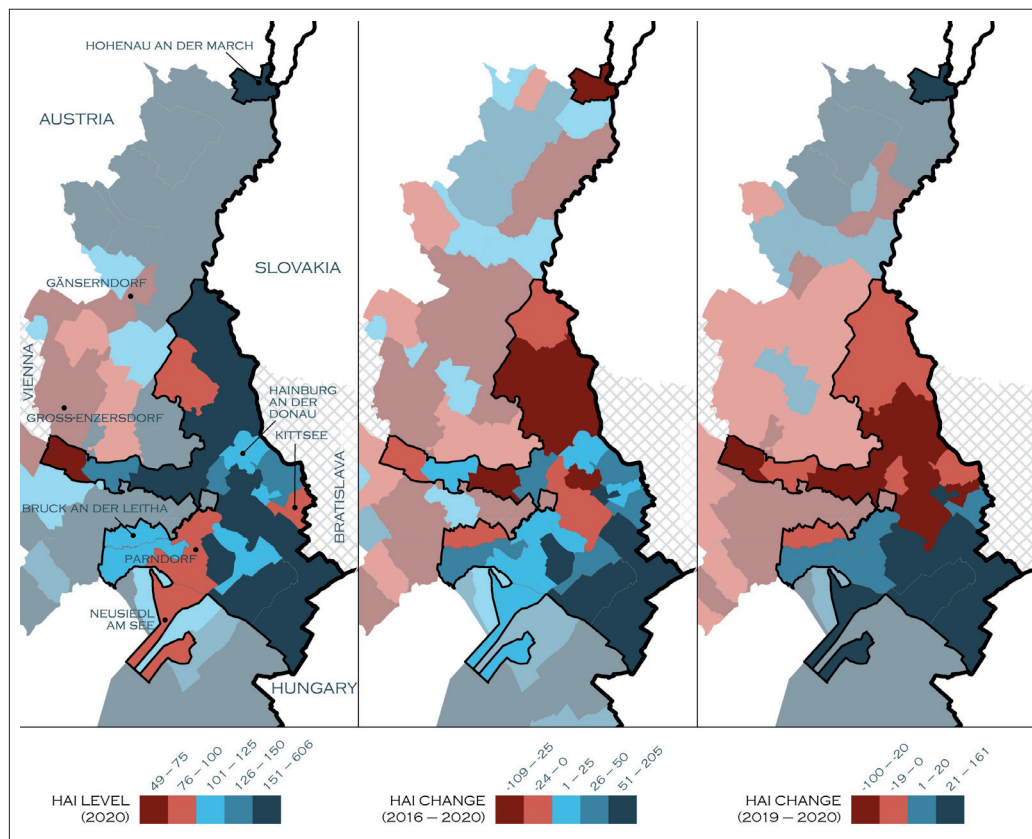


Fig. 6: Level and changes of housing affordability index in the municipalities of the Bruck/Leitha, Gänserndorf, and Neusiedl/See districts
 Note: Opacity was decreased for municipalities outside the Bratislava suburban area but within the three districts studied
 Source: authors' calculations based on Statistik Austria (2021b; 2022a) data

Satisfaction with		Overall appearance of the neighbourhood	Green areas and their maintenance	Cleanliness of public spaces	Noise in the environment	Traffic intensity	Personal safety	Civic amenities	Housing costs
Living in the municipality	τ_b	0.650***	0.387**	0.324*	0.358**	0.247	0.426**	0.258*	0.379**
	Sig.	< 0.001	0.004	0.014	0.006	0.054	0.002	0.049	0.003
	N	50	50	50	50	49	50	50	50
Living in the neighbourhood	τ_b	0.678***	0.429**	0.412**	0.415**	0.315*	0.573***	0.278*	0.300*
	Sig.	< 0.001	0.001	0.002	0.001	0.014	< 0.001	0.033	0.18
	N	50	50	50	50	49	50	50	50

Tab. 2: Kendall's tau-b correlation coefficients for assessments of satisfaction with living in a municipality and a neighbourhood, and satisfaction with selected attributes of the residential environment as expressed by respondents from Hainburg an der Donau
Note: τ_b = Kendall's tau-b; N = number of respondents; correlations significant at the (2-tailed) 0.001 (***), 0.01 (**), 0.05 (*) level
Source: authors' calculations

Satisfaction with		Overall appearance of the neighbourhood	Green areas and their maintenance	Cleanliness of public spaces	Noise in the environment	Traffic intensity	Personal safety	Civic amenities	Housing costs
Living in the municipality	τ_b	0.286*	0.337**	0.181	0.304*	0.262*	0.341*	0.438**	0.335**
	Sig.	0.030	0.009	0.169	0.017	0.037	0.010	0.001	0.008
	N	50	50	50	50	50	50	50	50
Living in the neighbourhood	τ_b	0.361**	0.248*	0.260*	0.293*	0.311*	0.304*	0.148	0.410***
	Sig.	0.005	0.048	0.042	0.018	0.011	0.018	0.255	<0.001
	N	50	50	50	50	50	50	50	50

Tab. 3: Kendall's tau-b correlation coefficients for assessments of satisfaction with living in a municipality and a neighbourhood, and satisfaction with selected attributes of the residential environment as expressed by respondents from Kittsee
Note: τ_b = Kendall's tau-b; N = number of respondents; correlations significant at the (2-tailed) 0.001 (***), 0.01 (**), 0.05 (*) level
Source: authors' calculations

residential environment were also satisfied with the general neighbourhood aesthetics. A relatively large effect was found with the relationship between both levels of the residential environment (municipality and neighbourhood) and a feeling of personal safety. A medium effect was observed with the relationships between the satisfaction with the residential environment and green areas and their maintenance, the cleanliness of public spaces, the noise in the environment, and housing costs. Although the correlation between satisfaction with civic amenities and the residential environment was significant, the effect was rather small, similar to the correlation between satisfaction with living in the neighbourhood and traffic intensity.

The values of Kendall's tau-b correlation coefficients for satisfaction assessments with their residential environment and its attributes by respondents from Kittsee (Tab. 3) represent a much smaller effect in most observed relationships than the same assessments by respondents from Hainburg an der Donau (Tab. 2). This does not necessarily mean that respondents from Kittsee were less satisfied with the environmental attributes assessed. A relatively medium effect was observed only with the correlation coefficients between satisfaction with living in the particular residential environment and satisfaction with civic amenities and housing costs.

Finally, we wanted to find out whether there is a difference in satisfaction levels regarding housing between two groups of Slovak respondents – those who, in their intention to move, also looked at the affordability of housing, and those, for whom this issue was

not important. Because the dependent variables were ordinal, we performed a non-parametric Mann-Whitney U test to compare the satisfaction levels of the two groups on three different aspects. The first group of respondents are those that expressed the affordable real estate offer (house, apartment, land) as a motive for the residential decision to move to the Austrian suburbs of Bratislava (marked as "Yes" in Tab. 4, i.e. affordable housing "seekers"). For respondents from the second group, such a motive was not relevant (marked as "No" in Tab. 4, i.e. affordable housing "non-seekers").

As regards the satisfaction with living in the municipality, affordable-housing-seekers (N = 64) have higher mean ranks (86.88) than non-seekers (67.99; N = 87), U = 2,087.5, p = 0.003, r = -0.24, which was a statistically significant difference and, according to Morgan et al. (2020), is a small to medium effect size (an effect size was calculated as $r = Z / \sqrt{N}$). Similarly, a statistically significant difference can be observed in the mean ranks of seekers (86.54) and non-seekers (67.28) on satisfaction with housing costs, U = 2,045.5, p = 0.005, r = -0.23, which is a small to medium effect size. The two groups did not show a statistically significant difference in satisfaction with living in the neighbourhood, with mean ranks of 73.24 and 79.76, respectively, and U = 2,543.5, p = 0.310, and r = -0.08 (Tab. 5).

5. Discussion and conclusions

Housing affordability in the Austrian hinterland of Bratislava has recently stalled and in 2020, it dropped substantially. It was partially affected by lower wage growth (about one tenth increase

	Affordable real estate offer ¹	N	Mean Rank	Sum of Ranks
Satisfaction with living in the municipality	No	87	67.99	5,915.50
	Yes	64	86.88	5,560.50
	Total	151		
Satisfaction with living in the neighbourhood	No	87	73.24	6,371.50
	Yes	64	79.76	5,104.50
	Total	151		
Satisfaction with housing costs	No	86	67.28	5,786.50
	Yes	64	86.54	5,538.50
	Total	150		

Tab. 4: Mann-Whitney U test – ranks (Note: ¹Affordable real estate offer (house, apartment, land) as a motive for residential decision) Source: authors' calculations

	Satisfaction with living in the municipality	Satisfaction with living in the neighbourhood	Satisfaction with housing costs
Mann-Whitney U	2,087.50	2,543.50	2,045.50
Wilcoxon W	5,915.50	6,371.50	5,786.50
Z	- 2.985	- 1.016	- 2.803
Asymp. Sig. (2-tailed)	0.003	0.310	0.005

Tab. 5: Mann-Whitney U test – test statistics (Note: Grouping variable: affordable real estate (house, apartment, land) offer as a motive for residential decision). Source: authors' calculations

from 2016 to 2020). That affirms the questionnaire results by Faltán and Moravanská (2020, 11), who found that less than 2% of respondents (Kittsee incomers) were looking for financially-affordable housing in this location. The unprecedented increase in house prices in the corona-crisis period led to a further deterioration of the property and housing market.

As a result of the anti-pandemic measures, we are witnessing a significant rise in inflation across the Eurozone, well above a sustainable 2%. The Russian aggression in Ukraine is pushing inflation even higher, and the pressure from the refugee wave may mean further house price rises in this region. Rising inflation pressures national central banks and the ECB to raise key interest rates. Moreover, inflation pushes construction material prices up, slowing housing construction down. The improvement in housing affordability after 2008 in Slovakia and the Bratislava region was mainly due to a significant reduction in interest rates on housing loans. A halt in their reduction has led to a reversal of this trend. Key interest rates have risen sharply in neighbouring countries (the Czech Republic, Hungary, and Poland). The ECB is still waiting for interest rate hikes, but banks in Slovakia, Austria and other Eurozone countries have started making mortgages more expensive.

Quality of life is interlinked with housing affordability, as housing affordability influences the perceived quality of life. Simultaneously, the prerequisites for a satisfactory residential environment that, to an extent, influence the perception of subjective quality of life, impact housing affordability (cf. Bieri, 2012; Florida et al., 2013; Anenberg & Kung, 2020). Slovak residents who moved to the Austrian suburbs of Bratislava intending to find affordable housing according to their wishes, were generally more satisfied with living in their municipality and housing costs than residents for whom this motive was irrelevant. It should be noted, however, that although the search for more affordable housing was one of the most common motives for many Slovak residents to move to the Austrian suburbs of Bratislava, it was outweighed by the motive of seeking a higher quality of life and better-quality housing in a quiet rural and aesthetically appealing environment close to a large city (cf. Šveda et al., 2020; Štefkovičová & Koch, 2022).

A higher reported quality of life from the perspective of residential satisfaction is also related to the attributes of the residential environment (cf. Bielek et al., 2017; Nguyen et al., 2018;

Bursa, 2021), such as its overall aesthetics and cleanliness, amount of greenery, perceived safety, the noise in the environment, or the presence of quality civic amenities. Provided the environment has the required quality of these attributes, it becomes more pleasant to live in. The demand for housing in attractive locations also pushes house prices and impacts housing affordability. On the other hand, residents are usually willing to pay a premium price to live in an environment that meets their needs. If residents pay more than a third of their net income in housing costs, however, housing becomes less affordable and can mean financial hardship (Shamsuddin & Campbell, 2022).

Although the research results may not provide exhaustive findings on housing affordability, quality of life, and residential satisfaction in the (cross-)border suburban region of Bratislava; they might be useful for decision-makers in providing quality rental housing. The National Bank of Slovakia (Apolen, 2022) has announced the regulation of silver mortgages, which the borrowers repay until retirement age. Although this may reduce upward pressure on house prices in the Slovak hinterland of Bratislava, it will, on the contrary, also reduce the affordability of housing for some social classes. Therefore, affordable rental housing should be an adequate substitute for selected population groups who cannot afford homeownership.

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