sciendo
Review of Economic Perspectives – Národohospodářský obzor
Vol. 24, Issue 1, 2024, pp. 17–36, DOI: 10.2478/revecp-2024-0002

Comparison of Housing Affordability in Czech and Polish Regions

David Slavata,[1] Eva Ardielli,[2] Marta Maciejasz[3]

Abstract: Great differences are observed in the way of living, the quality of living, and the type of property ownership in individual countries of the world. However, housing affordability is currently a significant issue in every developed country. At the same time, it is also an important factor of economic development on both the national and regional level. The paper is focused on the comparison of housing affordability in the Czech and Polish regions. The presented research combines four different commonly used indicators of housing affordability (financial and physical) into a newly defined index and applies it to the Czech Republic and Poland regions for the period 2020-2022. The aim is the comparison of Czech and Polish regions according to the selected housing indicators and calculated standard housing affordability index SAI, which is a newly created index compiled by the authors. The result of the research is a calculation of housing availability in a total of 30 Czech and Polish regions and a comparison of the development of housing availability in 2020 and 2022 in these regions. The result of the research is the finding that the availability of housing in the Czech regions is on average lower than in the Polish regions and, in addition, that the availability has decreased compared to 2020 in both the Czech and Polish regions by 2022.

Keywords: affordability, Czech Republic, housing, ownership, Poland, real estate market, regions

JEL Classification: R30, P50

Received: 2 August 2022 / Accepted: 5 April 2024 / Sent for Publication: 22 April 2024

Introduction

Housing affordability is an important aspect of socioeconomic development in any society and is considered a topical issue today (Baker, Mason and Bentley, 2015; Wetzstein, 2017; Ryšavý, 2021; Mulliner and Maliene, 2016; Kašík and Slavata, 2018;

[1] VSB-Technical University of Ostrava, Faculty of Economics, Department of Public Economics, Sokolská třída 33, 70200 Ostrava, Czech Republic, david.slavata@vsb.cz
[2] VSB-Technical University of Ostrava, Faculty of Economics, Department of Public Economics, Sokolská třída 33, 70200 Ostrava, Czech Republic, eva.ardielli@vsb.cz
[3] Opole University, Faculty of Economics, Ozimska 46a, 45-058 Opole, Poland, marta.ms@uni.opole.pl

Ardielli and Janasová, 2012). Housing affordability broadly refers to housing costs, both for renters and owner occupants, relative to the disposable income of a given individuals or households, mainly as a percentage (Bieri, 2014, CECODHAS, 2012). The most common notion of affordable housing implies that households that spend more than 30% of their gross income to obtain adequate and appropriate housing have an affordability problem, see Paris (2007). According to the definition of Eurostat (Eurostat, 2021), a household is considered "overburdened" when the total housing costs represent more than 40 % of disposable income, where housing costs include mortgage or housing loans interest payments for owners and rent payments for tenants. For example, in 2020, 7.8 % of the EU population spent 40 % or more of their household disposable income on housing (Eurostat, 2020b). Over the past two decades, housing affordability has become one of the most pressing challenges, especially in cities, where house prices have often outpaced national averages (OECD, 2021). Despite constant efforts by governments to meet the increasing need for housing, many low- and middle-income households are being forced out of cities (Czischke and van Bortel, 2018).

The paper is focused on the calculation of housing affordability in the Czech and Polish regions. The aim is to compare the Czech and Polish regions according to the selected housing indicators and the calculated housing standard affordability index SAI. The affordability of housing in the Czech Republic has long been one of the worst compared to European countries. The Czech Republic also leaves the United Kingdom behind, even though nominal real estate prices are the most expensive here. This follows from the scientific study "Property Index - Overview of European Residential Markets", see Deloitte (2021). The property index analyses factors shaping the residential real estate markets in Europe and compares residential property prices in selected European countries and cities. This index has been monitored annually for the past ten years. The analysis in the presented paper will be made with regard to regional differences with a distinction into regions. In addition to the regions of the Czech Republic, the regions of Poland were selected for comparison. While the Czech Republic was evaluated as the worst among European countries in terms of the availability of new housing, a new apartment in the Czech Republic costs in 2021 12.2 of the average gross annual salary, in Poland it was only 7.6 of the average gross annual salary. The paper is focusing the issue at the regional level and is comparing the housing affordability in a total of thirty Czech and Polish regions. The Czech and Polish regions were selected for comparison due to the similarity of the housing markets in terms of cultural, historical, and socioeconomic aspects, as well as due to the good availability of data on housing in both countries.

Characteristics of the Housing Market in the Czech Republic and Poland

Despite the historical and socioeconomic similarities of both countries, the situation on the housing market differs in many respects in the Czech Republic and Poland, see Eurostat (2020b), GUS (2023), Rynio (2021), Malesa (2022) or Ardielli and Ardielli (2018). The size of the construction sector measured by the gross value added (GVA) generated by this economic activity (as a share of total GVA) was 7.2 % in Poland in 2020. The value in the Czech Republic reached only 5.7 %. Investment in housing was in Poland 1.9 % of GDP in 2020, while in the Czech Republic it reached a value 4.8 % of GDP. Looking at the trend of house prices between 2010 and 2020, there has been a

steady upward trend in both countries since 2013. However, in the Czech Republic, the growth was more significant.

The housing costs compared to the EU average differ significantly between EU countries. The Czech Republic and Poland reach below average values. The Czech Republic reaches a value of 27 % lower than the EU average, Poland even by 60% in 2020. With house prices and rents rising, the cost of housing can be a burden. This can be measured by the housing cost overburden rate, which shows the share of the population living in a household where total housing costs represent more than 40 % of disposable income. In the EU in 2020, 12.3 % of the population in cities lived in such a household, while the corresponding rate for rural areas was 7.0 %. The highest housing cost overburden rates in cities were observed in the Czech Republic (10.2 %) than Poland (5.4%), while in rural areas they were 3.6 % in the Czech Republic and 4.4 % in Poland, see Eurostat (2020b).

Another way to see whether housing is affordable is by the share of housing cost in total disposable income. On average in the EU in 2020, 20.1 % of disposable income was dedicated to housing costs. The Czech Republic is below this average with a value of 19.3 %, also Poland with 17.1 %.

Specifics of Housing in the Czech Republic

As shown by the above statistics, there is a problem for many Czech households with access to affordable housing (Eurostat, 2020b). Real estate prices in the Czech Republic are growing faster than household disposable income (OECD, 2021). This applies especially to Czech cities, where real estate prices often rise faster than the national average (Hromada, Čermáková and Piecha, 2022), (Deloitte, 2021). Although rising real estate prices can be beneficial for a large part of their Czech owners, it is increasingly difficult for new entrants to the housing market, especially young people (Ryšavý, 2021). Due to the fact that rental prices are also rising and their offer is relatively limited, the market of private rental housing offers few alternatives for people who are struggling to find affordable housing.

Owned housing is currently the predominant type of property ownership in the Czech Republic (79% of households vs. 70 % of the EU countries average). The private rental housing market is relatively limited (21% of households vs. 30 % of the OECD average) see Eurostat (2020b). In the conditions of the Czech Republic, a real estate bubble has been discussed in recent years. Czech real estate prices are inflated by about 20 % - 30 %. In 2022, real estate continues to rise in price and its price has risen to such a value that it is no longer worthwhile to buy real estate for investment.

An important aspect in terms of housing affordability was the period of the corona crisis in 2020 and 2021 (Rogers and Power, 2020). Conditions in the Czech market led to further increases in prices in real estate (Ryšavý, 2021). However, demand for real estate has grown. It was reinforced by low mortgage interest rates, the perception of real estate as a safe form of investment, the abolition of real estate acquisition tax, and other factors. The economic condition of Czech households deteriorated during the lockdown and the prolongation of the pandemic (Klimovsky, Nemec, and Bouckaert, 2021). To prevent people from starting to leave their homes, the Czech government has taken a number of emergency measures in the context of the ongoing covid-19 pandemic. For

example, it introduced mortgage deferrals, one of the most common support measures in OECD countries, which have helped alleviate urgent housing affordability problems. The pandemic to date has had a very different impact on the owner-occupied and rental segments. In terms of the owner-occupied segment, the pandemic has triggered even stronger demand, which in combination with limited supply and favourable financing conditions sent average transaction prices to a new record high in almost every larger city. (Deloitte, 2021) When the tourism industry came to a halt, the short-stay segment practically collapsed, which meant that owners of such dwellings were willing to compromise and offered these units for regular longer-term rental at a discount. Due to this, the overall asking rental level in the Czech capital Prague decreased by some 10 % during the course of 2020. The overall impact of the covid crisis on housing affordability is not yet known, but it is clear that the pandemic has reinforced the need to address existing problems in the area, such as insufficient housing supply and increased housing insecurity in many households (OECD, 2021), (Hromada and Cermakova, 2021).

Specifics of Housing in Poland

Poles live mainly in detached houses – 50.2% and then in flats – 44.3% (Eurostat, 2020a), which is not so common in the EU. The average distribution of the population by type of dwelling in the EU is 35.8 and 46.2% respectively. 17% live in semi-detached or terraced houses and 0.9% in other types of housing (Eurostat, 2020a). This sounds quite positive for Poland considering the quality of living. There is also one of the highest ratios of housing ownership, because 72.5% inhabitants live in owner-occupied houses, without a mortgage or housing loan, and only 13.1% in owner-occupied, with a mortgage or housing loan. Tenants are only 14.4%. These data can be confronted with overcrowding rate, which describes percentage of the population living in an overcrowded household, i.e., a household that does not have at its disposal a minimum number of rooms available, depending on the size of the household, family situation, and the ages of its members. In Poland, this ratio is pretty high – 36.9%, while an average in EU is 17.5%. This shows that Pole-owned houses do not guarantee good housing conditions.

This also corresponds to the level of housing costs, which often make up the largest component of expenditure for many households. Increases in housing costs can potentially lead to other expenditures being deferred or cancelled. In Poland the housing cost overburden rate is quite low – 4.9% compared with the average for the EU 7.8% and very low while looking at Greece (33.3%), Bulgaria (14.4%) or Denmark (14.1%). The housing cost overburden rate, analysed by tenure status, is high only for tenants who rent at market prices. Its value is 26.4%, while for the EU it is 25.1% (Eurostat, 2018).

In Poland, the severe housing deprivation rate is one of the highest within the EU (Sikora-Fernandez, 2018). Only Romania, Latvia, and Bulgaria note higher values. When comparing 2019 and 2020, a constant level is observed at 7.9% (Eurostat, 2020b). This means that almost 8% of the population do not have access to housing. Moreover, there is also a part of the population unable to keep home adequately warm. In 2017-2020 this share was 6; 5.1; 4.2 and 3.2% respectively (Eurostat, 2020b). Positive changes were observed, but the current energy situation will probably vary this trend.

Concluding this description of housing conditions in Poland, it can be stated that housing conditions in Poland are satisfactory from quantitative point of view but leave much

to be desired from qualitative point of view (Ulman and Ćwiek, 2020). Although citizens have their own properties, they are not large enough to provide all households' members good conditions for living. And there is still a group of people who cannot afford housing at all or need to rent at market prices that are too high for them (Willmann and Maciejasz, 2020).

Material and Methods

The aim of this paper is the comparison of Czech and Polish regions according to the selected housing indicators and the evaluation of the level of housing affordability by using the calculated housing affordability index SAI. The comparison is made at the level of the highest regional administrative units in the Czech Republic and Poland.

Two hypotheses were established as part of the presented research. Hypothesis H1 is as follows: Housing availability in Czech regions is on average lower than in Polish regions. Hypothesis H2 is as follows: Housing availability is on average decreasing in the Czech and Polish regions in the period 2020-2022. H1 is based on the claim that the availability of housing in the Czech Republic is one of the worst in European countries (Deloitte, 2021). H2 is based on the claim that the availability of housing in European countries has been decreasing in recent years (OECD, 2021). On the basis of these two presented hypotheses, it will be verified whether similar tendencies as at the state level are also observed in selected period in the regions.

The Czech Republic is divided into 14 self-governing regions and 6,253 municipalities. The territory outside Prague is divided into 76 districts. The regions of the Czech Republic are higher-level territorial self-governing units of the Czech Republic. The administrative division of Poland is also based on three levels of subdivision. The territory of Poland is divided into voivodeships (provinces); these are further divided into powiats (counties or districts), and these are divided into gminas (communes or municipalities). Poland currently has 16 voivodeships, 380 powiats (including 66 cities with powiat status), and 2,478 gminas. The analysis is carried out in a total of 30 regions of the Czech Republic and Poland.

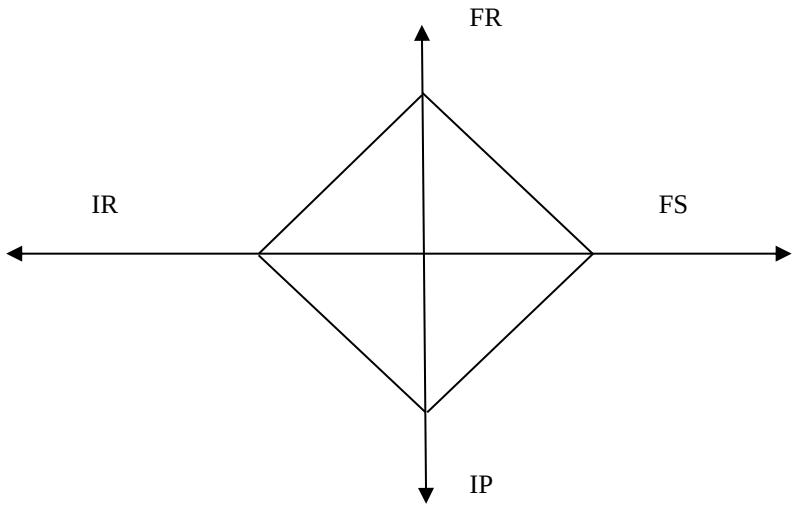
Model and Data

There are several approaches to measuring housing affordability (Anacker, 2019 or Czischke and van Bortel, 2018). The main stream compares the affordability of financial housing. It simply compares ratios of numbers of financial indexes. The most used indicator is the income to price ratio or the income to rent ratio (Bieri, 2014). The second stream of measuring housing affordability compares physical affordability. Generally, it answers the question how many flats are built or how many flats there are in the economy (URI, 2022). To use separate indicators of housing affordability, it may not provide the objective view for the problem. In the market economy, the financial and physical indicators are influenced by each other. Usually, as a rule, if the financial indicators show a high level of financial affordability, the level of physical affordability is low. The bodies can easily get the credits, but there is the problem of shortage of flats for sale. Such a problem was typical for the COVID period in the Czech Republic. From that point of view, it is complicate to present objective situation on the field of housing

affordability. We will try to develop a new methodology in the field of housing affordability which will provide a complex and more impartial view.

The new evaluation methodology presented in this paper more complexly assesses housing affordability. It includes four basic indicators, financial and physical. The indicators are IR (income to rent), IP (income to price), FS (flats for sale per 1000 inhabitants) and FR (flats for rent per 1000 inhabitants). Individual indicators are compared with each other when plotted on the axes, where the inner surface defines the level of housing affordability. The mutual interaction between indicators is clearly shown in Figure 1. We have decided not to use the weighted average formula, because it is highly complicated to decide which separate indicator is more preferable than the other. However, it may be the subject of further research.

Figure 1 - The methodology of linking housing affordability indicators



Source: Own methodology

The indicators are set in a logical way. The higher the value of the indicator, the better the affordability of the housing. The surface between the indicators (SAI) expresses a complex level of housing affordability in the region. The larger area bounded by indicators indicates better the level of housing affordability. The calculation of SAI (Standard Affordability Index) is made according to the formula (1):

$$SAI = \frac{(FR*FS)+(FS*IP)+(IP*IR)+(IR*FR)}{2} \quad (1)$$

where

FR…….. Flats for rent per 1000 inhabitants

FS…… Flats for sale per 1000 inhabitants

IP…….. Income to price ratio

IR…….. Income to rent ratio

The calculation of FR, FR, IP and IR ratio is summarised in following formulas (2), (3), (4) and (5):

$$FR\ ratio = \frac{Fr}{Inh} \tag{2}$$

where

Fr…….. Flats for rent in the housing market

Inh. …… Population of region

$$FS\ ratio = \frac{Fs}{Inh} \tag{3}$$

where

Fs…….. Flats for sale in the housing market

Inh. …… Population of region

$$IP\ ratio = \frac{I}{P} \tag{4}$$

where

P…… Average flat price per m^2

I…… Average year personal income

$$IR\ ratio = \frac{I}{R} \tag{5}$$

where

R…… Average year rent per 67 m^2 flat

I…… Average year personal income

The above indicators will be compared in the presented research of 30 Czech and Polish regions. The advantage of our methodology is seen in its simplicity and complexity. It transfers all the separate indicators of housing affordability into the one separate indicator (SAI). On the other hand, disadvantages of the presented indicator (SAI) can be seen in the possible omission of some other significant separate indicator or in the current impossibility to determine the weights of separate indicators (it may be the orientation of further research).

As the main source of data describing the Czech real estate market, the analytical portal on the Internet www.trzniceny.cz was used (Trzniceny, 2022). Data describing the Polish real estate market were obtained from the portal www.otodom.pl (Otodom, 2022). The data included information about flat prices, rent prices, and share of flats for sale.

The other needed data were obtained from the official national statistical offices www.czso.cz (CZSO, 2022) and www.stat.gov.pl. (STAT.GOV, 2022). Especially the information describing the level of salaries in the Czech and Polish regions. The analysis corresponds to the situation in the real estate market as of June 2022.

Research Results

The basic data on the housing market for 2020 and 2022 based on regions are shown in Appendix 1 and Appendix 2. By comparing the regional data, the highest prices of flats are indicated in the region Prague. Both the price of flats and the rents are higher in Prague. In Prague, there are even the highest number of flats offered on the housing market for sale and for rent. In Prague there is the highest level of average year salary.

The lowest price of flats is indicated in the Usti region (33 000 CZK/m2). The lowest level of flats for sale is seen in the Highlands region (248). The same number of flats for rent is indicated in the Highlands region (121). The lowest rent is indicated in the Moravian – Silesian region (170 CZK/m2/month). The lowest year salary is indicated in Karlovy vary region (39 1260 CZK).

The basic data of the Polish housing market from the point of regions are shown also in Appendix 1. When comparing the regional data, the highest prices for flats are indicated in the Masovia region (75 141 CZK). Both the price of flats and the rents (346 CZK) are higher in the Masovia region. In the Masovia region there are even the highest number of flats offered on the housing market for sale (14 496) and for rent (3 394). In Masovia region there is the highest level of average year salary (46 6432 CZK).

The lowest prices of flats are indicated in the Opole region (30 543 CZK/m2). The lowest level of flats for sale is also observed in the Opole region (851). The lowest number of flats to rent is indicated in the Podlaski region (149). The lowest rent is indicated in the Warmia-Masuria region (167 CZK/m2/month). The lowest year salary is indicated in Holy Cross Province (34 4785 CZK). CZK exchange rate is calculated to 28th June 2022.

In Table 1, the basic housing indicators in the Czech Republic (year (2022) are shown including the SAI result value for the regions in the Czech Republic. The values show the lowest housing affordability in the South Moravian region with a value of SAI of 9.54. On the other hand, the region with the highest value of SAI is indicated in Usti region. Housing affordability is the highest there. It is surprising that the Prague region is not the region with the lowest housing affordability. The value of SAI is 14.68. Housing affordability in Prague is fourth best in the Czech Republic according to the SAI indicator. The average SAI value for the Czech regions is 15.62.

Table 1 – Affordability index SAI in the Czech regions (June 2022)

Region	Flats for rent/1000 inh.	Flats for sale/1000 inh.	IP	IR	(FRxFS)/2	(FSxIP)/2	(IPxIR)/2	(IRxFR)/2	SAI
Prague	1.50	2.99	4.60	1.83	2.24	6.87	4.20	1.37	14.68
South-Moravian region	0.59	1.09	5.43	2.08	0.32	2.96	5.64	0.62	9.54
Karlovy Vary region	0.54	2.82	7.45	2.72	0.76	10.53	10.13	0.73	22.14
Central Bohemian Region	0.27	0.97	6.27	2.48	0.13	3.03	7.78	0.34	11.29
Pilsen region	0.44	0.91	7.39	2.76	0.20	3.35	10.21	0.61	14.38
Liberec region	0.53	1.35	7.07	2.41	0.35	4.76	8.52	0.63	14.27
South Bohemian region	0.38	1.11	7.11	2.67	0.21	3.94	9.50	0.51	14.16
Highlands region	0.24	0.49	7.79	2.57	0.06	1.92	10.00	0.31	12.29
Hradec Kralove region	0.43	0.93	6.42	2.46	0.20	2.99	7.90	0.53	11.62
Pardubice region	0.31	0.92	6.66	2.50	0.14	3.06	8.32	0.39	11.91
Zlín Region	0.34	0.65	7.27	2.38	0.11	2.37	8.64	0.40	11.52
Olomouc region	0.62	0.90	7.69	2.53	0.28	3.46	9.73	0.78	14.25
Moravian-Silesian Region	0.90	1.31	9.53	2.98	0.59	6.26	14.21	1.35	22.41
Ústi Region	0.95	2.00	12.71	3.02	0.95	12.71	19.17	1.43	34.25

Source: CZSO (2022), Trzniceny (2022), own calculations

In Table 2, the basic housing indicators in the Czech Republic (year (2020) are shown. The values also show the lowest housing affordability in the South Moravian region with a value of SAI of 13.05. The region with the highest value of SAI in 2020 is also Usti region with a value of SAI of 48.17. The values for both the lowest and highest SAI values in the regions are lower in 2022 than in 2020, indicating a reduction in housing affordability. The average SAI value for the Czech regions is 23.61 in 2020.

Table 2 – Affordability index SAI in the Czech regions (June 2020)

Region	Flats for rent/1000 inh.	Flats for sale/1000 inh.	IP	IR	(FRxFS)/2	(FSxIP)/2	(IPxIR)/2	(IRxFR)/2	SAI
Prague	6.90	3.77	4.89	2.00	13.01	9.22	4.90	6.92	34.04
South-Moravian region	1.17	1.02	7.00	2.17	0.60	3.57	7.60	1.27	13.05
Karlovy Vary region	0.90	3.47	9.54	2.79	1.56	16.57	13.33	1.25	32.71
Central Bohemian Region	0.55	1.06	8.64	2.50	0.29	4.57	10.81	0.69	16.37
Pilsen region	1.09	1.15	10.93	2.88	0.62	6.27	15.72	1.56	24.18
Liberec region	0.62	0.99	11.00	2.63	0.31	5.47	14.45	0.82	21.04
South Bohemian region	0.59	0.90	9.84	2.82	0.27	4.42	13.87	0.84	19.39
Highlands region	0.42	0.53	10.32	2.85	0.11	2.74	14.72	0.60	18.18
Hradec Kralove region	0.48	0.92	9.01	2.65	0.22	4.14	11.93	0.64	16.93
Pardubice region	0.45	0.66	11.02	2.49	0.15	3.64	13.70	0.56	18.05
Zlín Region	0.54	0.73	9.51	2.57	0.20	3.47	12.20	0.70	16.56
Olomouc region	0.90	1.49	10.38	2.57	0.67	7.71	13.32	1.15	22.85
Moravian-Silesian Region	0.91	0.78	14.22	3.05	0.36	5.58	21.65	1.38	28.96
Ústi Region	0.89	1.28	20.95	3.13	0.57	13.44	32.76	1.40	48.17

Source: CZSO (2022), Trzniceny (2022), own calculations

In Table 3, the basic housing indicators (year 2022) in Poland are shown, including the SAI result value for the regions in Poland. The values show the lowest housing affordability in Subcarpathia region with its value of SAI 12.07. On the other hand, the region with the highest SAI value is indicated in the Kuyavia-Pomerania region. Housing affordability is the highest there (SAI = 25.39). The average SAI value for the Polish regions is 17.82.

Table 3 – Affordability index SAI in the Polish regions (June 2022)

Region	Flats for rent/1000 inh.	Flats for sale/1000 inh.	IP	IR	(FRxFS)/2	(FSxIP)/2	(IPxIR)/2	(IRxFR)/2	SAI
Lesser Poland	0.41	1.98	7.01	1.77	0.41	6.95	6.20	0.37	13.93
Masovia	0.63	2.67	6.21	1.68	0.84	8.30	5.20	0.52	14.86
Pomerania	0.24	3.01	5.98	1.61	0.37	8.99	4.80	0.20	14.36
Podlaskie	0.13	1.20	8.72	1.93	0.08	5.23	8.41	0.12	13.84
Greater Poland	0.30	1.15	7.50	1.97	0.17	4.31	7.41	0.30	12.19
Holy Cross Province	1.47	0.89	9.31	1.99	0.66	4.16	9.28	1.47	15.58
West Pomerania	1.28	2.45	8.69	1.74	1.56	10.65	7.55	1.11	20.87
Lublin	0.91	1.09	8.22	1.69	0.50	4.49	6.96	0.77	12.72
Kuyavia-Pomerania	1.20	2.58	9.94	1.98	1.54	12.81	9.85	1.19	25.39
Subcarpathia	0.94	0.64	7.99	2.06	0.30	2.56	8.25	0.97	12.07
Warmia-Masuria	1.27	1.03	10.46	2.58	0.65	5.37	13.51	1.63	21.16
Lower Silesia	1.02	3.24	9.32	1.65	1.66	15.08	7.71	0.85	25.29
Opole	1.81	0.87	12,19	2.31	0.78	5.28	14.11	2.10	22.26
Lubusz	1.82	1.38	11.32	1.99	1.26	7.84	11.25	1.80	22.15
Łódź	0.90	1.31	9.06	1.96	0.59	5.94	8.90	0.88	16.31
Silesia	1.82	1.38	11.32	1.99	1.26	7.84	11.25	1.80	22.15

Source: Otodom (2022), STAT.GOV (2022), own calculations

In Table 4, the basic housing indicators in polish regions are shown (2020). The values show the lowest housing affordability in Subcarpathia region with its value of SAI 12.00. On the other hand, the region with the highest SAI value is the Lower Silesia region with its value of SAI 27.81. The average SAI value for the Polish regions in 2020 was 18.71.

Table 4 – Affordability index SAI in the Polish regions (June 2020)

Region	Flats for rent/1000 inh.	Flats for sale/1000 inh.	IP	IR	(FRxFS)/2	(FSxIP)/2	(IPxIR)/2	(IRxFR)/2	SAI
Lesser Poland	1.58	1.77	7.53	2.02	1.40	6.65	7.59	1.59	17.23
Masovia	1.88	2.75	7.14	1.44	2.59	9.83	5.13	1.35	18.91
Pomerania	1.36	2.96	6.69	2.01	2.02	9.90	6.71	1.37	20.01
Podlaskie	0.24	1.09	9.27	2.10	0.13	5.05	9.74	0.25	15.16
Greater Poland	0.66	1.00	8.01	1.92	0.33	4.00	7.67	0.63	12.64

Holy Cross Province	0.15	0.72	10.31	2.23	0.05	3.72	11.52	0.17	15.46
West Pomerania	0.55	2.28	9.11	2.10	0.63	10.40	9.57	0.58	21.17
Lublin	0.24	0.80	8.72	2.06	0.10	3.48	8.99	0.25	12.82
Kuyavia-Pomerania	0.64	2.55	9.65	2.14	0.81	12.32	10.32	0.68	24.13
Subcarpathia	0.24	0.51	8.45	2.25	0.06	2.14	9.52	0.28	12.00
Warmia-Masuria	0.11	0.74	9.64	1.97	0.04	3.54	9.48	0.11	13.18
Lower Silesia	1.41	3.22	9.01	2.12	2.26	14.51	9.55	1.49	27.81
Opole	0.19	0.94	12.90	2.47	0.09	6.04	15.94	0.24	22.31
Lubusz	0.33	1.47	13.01	2.28	0.24	9.56	14.82	0.38	24.99
Łódź	0.44	1.03	9.61	2.25	0.23	4.95	10.83	0.50	16.50
Silesia	0.33	1.47	13.01	2.28	0.24	9.56	14.82	0.38	24.99

Source: Otodom (2022), STAT.GOV (2022), own calculations

In Table 5, there are the SAI values presented together in the Czech and Polish regions. The values of SAI are compared in 2022 and 2020. In the third column the increases or decreases within the period are presented. SAI values have decreased in most of the searched regions (26 out of 30).

SAI indicates the most significant decrease in housing affordability in the Prague region (-56,87 %). The decrease is the highest in comparison of 30 searched regions. The most significant decrease in Polish regions is shown in Pomerania (-28,25 %).

However, the increase in housing affordability is indicated only in Polish regions. The increase was found in regions Subcarpathia, Holy Cross Province, Kuyavia-Pomerania, and Warmia-Masuria. On average, between 2020 and 2022, the availability of housing in the regions of the Czech Republic and Poland decreased by 17.12 percent.

Hypothesis H1 was confirmed. Housing availability in Czech regions is on average lower than in Polish regions. The average SAI value of Czech regions is 15.62 while the average SAI value of Polish regions is 17.82, as shown in Table 5 and Table 6. In 2022, the highest housing availability was found in the Ústí Region (value of SAI 34.25), but Polish regions tend to have higher values (Kuyavia-Pomerania 25.39; Lower Silesia 25,29; Opole; 22.26 or Lubusz and Silesia 22.15). The average value of SAI in all thirty Czech and Polish regions is 16.79. Most of the Czech regions (except the Ústí Region, Moravian-Silesian Region and Karlovy Vary Region) are below this average. 7 Polish regions are above this average, and 9 regions are below it. However, the last 5 places are occupied by Czech regions with a value lower than 12. The median value of the SAI values achieved is 14.37. The maximum value is 34.25 the minimum value is 9.54.

Table 5 – Evaluation of SAI Values (period 2020 - 2022)

Region	SAI 22	SAI 20	Change in % 22-20
Prague	14.68	34.04	-56.87
Pilsen region	14.38	24.18	-40.54
Olomouc region	14.25	22.85	-37.64
Pardubice region	11.91	18.05	-34.01
Highlands region	12.29	18.18	-32.42
Karlovy Vary region	22.14	32.71	-32.30
Liberec region	14.27	21.04	-32.18
Hradec Kralove region	11.62	16.93	-31.36
Central Bohemian Region	11.29	16.37	-31.03
Zlín Region	11.52	16.56	-30.46
Usti Region	34.25	48.17	-28.90
Pomerania	14.36	20.01	-28.25
South Bohemian region	14.16	19.39	-26.97
South-Moravian region	9.54	13.05	-26.86
Moravian-Silesian Region	22.41	28.96	-22.61
Masovia	14.86	18.91	-21.43
Lesser Poland	13.93	17.23	-19.15
Lublin	22.15	24.99	-11.36
Silesia	22.15	24.99	-11.36
Lower Silesia	25.29	27.81	-9.05
Podlaskie	13.84	15.16	-8.73
Greater Poland	12.19	12.64	-3.53
West Pomerania	20.87	21.17	-1.43
Łódź	16.31	16.50	-1.16
Lubusz	12.72	12.82	-0.78
Opole	22.26	22.31	-0.22
Subcarpathia	12.07	12.00	0.56
Holy Cross Province	15.58	15.46	0.73
Kuyavia-Pomerania	25.39	24.13	5.21
Warmia-Masuria	21.16	13.18	60.55

Source: own calculations

Table 6 – Descriptive statistics of achieved SAI values in Czech and Polish regions (2022)

Mean value	Mean error	Median	Standard deviation	Variance	Standard deviation	Max value	Min value
16.79	1.036	14.37	5.67	32.21	5.67	34.25	9.54

Source: own calculations

Hypothesis H2 was confirmed. Housing availability is on average decreasing in the Czech and Polish regions. In the period 2020 - 2022, the availability of housing in the

regions of the Czech Republic and Poland decreased on average by 17.12 percent. In all Czech regions, the drop in the SAI indicator was greater than 20%. A decrease of more than 20% was recorded only in two Polish regions, Pomerania and Masovia. Other Polish regions had values lower than 20 % and 4 Polish regions even recorded an increase in values. It is clear from this that the decline in housing availability between 2020 and 2022 is more pronounced in the Czech regions.

Discussion

A greater number of approaches to measuring housing availability are known, which are based on the evaluation of various indicators, see Gan and Hill (2009) or Stone (2006). The most commonly referred to and internationally recognised method of measuring affordability is the ratio method, which determines the proportion of income spent on housing costs (Whitehead et al., 2009).

There are some standard formulas to calculate property price indices as Case-Shiller Index or UK Housing Price Index, see FRED (2023) or ONS (2023). A cost-of-living index is a theoretical price index that measures the relative cost of living over time or regions. According to BLS (2023), the cost-of-living index is based on the conceptual measurement of changes over time in the amount that consumers need to spend to reach a certain standard of living.

For example, NUMBEO (2023) is the world's largest cost-of-living database that stores quality-of-life data such as housing indicators, perceived crime rates, healthcare quality, transport quality, and other statistics. Price to Income Ratio is the basic measure for apartment purchase affordability. It is calculated as the ratio of median apartment prices to median familial disposable income, expressed as years of income. Price to Rent Ratio is the average cost of ownership divided by the received rent income (if buying to let) or the estimated rent that would be paid if renting (if buying to reside). Lower values suggest that it is better to buy rather than rent, and higher values suggest that it is better to rent rather than buy. The Property Prices Index is based on the Price to Income Ratio and is measured every year. In 2022 the index reached the value of 13.6 in the Czech Republic. In Poland it was 11.2, which means that the apartment purchase affordability is higher in Poland. This confirms that the availability of new housing is lower in the Czech Republic than in Poland, see NUMBEO (2023). However, the presented SAI index is more complex, including a total of four indicators, and thus it is able to provide more detailed and accurate information about the availability of housing.

There are also some limits of the research. First, there are some methodological limitations. In the research, primarily financial indicators were used. Some authors state, that the involvement of other socio-economic factors is also required, see Mulliner, et al. (2016), Mattingly and Morrissey (2014), Belsky, Goodman and Drew (2005) or Rowley and Ong (2012). One of limitations is also geographical scope. The study is based on the comparison of regions in two countries. For the next research it would be appropriate to expand the study to other V4 countries, for the reason to compare the differences in development of housing affordability within countries with similar socio-economic background.

Conclusion

The aim of this paper was the comparison of Czech and Polish regions according to the selected housing indicators and evaluation of the level of housing affordability by usage of calculated housing affordability index SAI. The comparison is made at the level of the highest regional administrative units in the Czech Republic and Poland. Two hypotheses were established as part of the research presented. Both hypotheses were confirmed. Housing availability in 2022 in the Czech regions is on average lower than in the Polish regions. Furthermore, housing affordability in the Polish and Czech regions declined on average during the period 2000-2022. The value of the decline in the monitored period is on average 17.12 %. Housing affordability has decreased since 2020 in most of the compared regions. In the Polish regions, housing affordability is more available in comparison of the Czech regions. The region with the highest decrease in housing affordability is the Prague region. The region with the highest increase in housing affordability is Warmia-Masuria.

Thanks to the research, it became clear that the situation in the field of housing availability is poor in the Czech and Polish regions, while the situation in the Czech regions is worse than in the Polish regions and is still getting worse. It is necessary for the housing policy in both countries to adapt to this situation and try to facilitate the situation in the area of housing availability for people through its instruments, and above all, help young people get their first housing and increase the availability of housing in large cities.

There are also some limitations of research, the selected indicators are only quantitative in nature. The methodology does not address the aspect of housing quality, which could be the subject of further research.

Acknowledgements: This paper was created with the financial support of the Student Grant Competition at the Faculty of Economics of the VŠB - Technical University of Ostrava within the project SP2024/077 "Approximation of exogenous and endogenous factors of effective allocation of public resources to support the implementation of digital and technological innovations in the public sector" and the project No. CZ.11.3.119/0.0/0.0/16_013/0003093 "Increasing the knowledge and skills of university students in the field of implementation of public policies in the Czech Republic and Poland and improving their applicability in the labor market" (Program Interreg V-A Czech Republic-Poland).

Disclosure statement: No potential conflict of interest was reported by the authors.

References

ANACKER, K.B. (2019). Introduction: housing affordability and affordable housing. *International Journal of Housing Policy 2019*. Vol. 19, No. 1, pp. 1-16. DOI: https://doi.org/10.1080/19491247.2018.1560544

ARDIELLI, E., ARDIELLI, J. (2018). Dates on Real Estate Market in the Czech-Polish Borderland: Spatial Analysis in the Segment of Apartments in Ostrava Region. In Proceedings of *2nd International Scientific Conference on Development and Administra-*

tion of Border Areas of the Czech Republic and Poland: Support for Sustainable Development, 2018, Ostrava: VSB – TUO. pp. 20-28.

ARDIELLI, J., JANASOVÁ, E. (2012). Creation of Real Property Database for Determination of Capitalization Rate of Real Estate. In Proceedings of *12th International Multidisciplinary Scientific Geoconference, SGEM* 2012 vol. IV, Sofia: STEF92 Technology Ltd., pp. 877-882.

BAKER, E., MASON, K. and BRNTLEY, R. (2015). Measuring Housing Affordability: A Longitudinal Approach. *Urban Policy and Research*. Vol. 33, No. 3, pp. 275-290. DOI: 10.1080/08111146.2015.1034853

BELSKY, E.S., GOODMAN, J., DREW, R. (2005). Measuring the nation's rental housing affordability problems. Cambridge, MA: Joint Center for Housing Studies.

BIERI, D.S. (2014). Housing Affordability. In: Michalos A.C. (eds) *Encyclopedia of Quality of Life and Well-Being Research.* Dordrecht: Springer.

BLS (2023). *U.S. Bureau of Labor Statistics. Glossary*. [online]. [cit.2023-05-08]. Available from: https://www.bls.gov/bls/glossary.htm

CECODHAS (2012). Housing Europe's Observatory: Housing Affordability in the EU. Current_situation_and_recent_trends. Retrieved 2022-06-15 from https://www.researchgate.net/profile/Alice-Pitti-ni/publication/265059299_HOUSING_AFFORDABILITY_IN_THE_EU_Current_situation_and_recent_trends/links/568cf68d08ae71d5cd07075f/HOUSING-AFFORDABILITY-IN-THE-EU-Current-situation-and-recent-trends.pdf

CZISCHKE, D., VAN BORTEL, G. (2018). An exploration of concepts and polices on 'affordable housing' in England, Italy, Poland and The Netherlands. *Journal of Housing and the Built Environment*. DOI: 10.1007/s10901-018-9598-1

DALLAS, R., POWER, E.(2020). Housing policy and the COVID-19 pandemic: the importance of housing research during this health emergency. *International Journal of Housing Policy.* Vol. 20, No. 2, pp. 177-183. DOI: 10.1080/19491247.2020.1756599

EUROSTAT (2020a). *Housing Affordability.* Retrieved.2022-06-08 from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Living_conditions_in_Europe_-_housing#Housing_affordability

EUROSTAT (2020b). *Living conditions in Europe - housing,* [online]. [cit.2022-07-19]. Available from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Living_conditions_in_Europe_-_housing#Housing_affordability

EUROSTAT (2018). *Archive: Housing statistics,* Retrieved.2022-07-19 from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Housing_statistics&oldid=497245#Tenure_status

FRED (2023). *Index cen nemovitostí Case-Shiller* Retrieved.2023-05-08 from https://fred.stlouisfed.org/series/CSUSHPINSA

GAN, Q., HILL, R.J. (2009). Measuring housing affordability: looking beyond the median. Journal of Housing Economics. Vol.18, pp. 115–125.

GUS (2023). *Obrót nieruchomościami w 2022 roku. Analizy statystyczne.* Warszawa.

HROMADA, E. and CERMAKOVA, K. (2021). Financial Unavailability of Housing in the Czech Republic and Recommendations for its Solutions. *International Journa of Economic Sciences.* Vol. 10, No. 2, pp. 47-58. DOI: 10.52950/ES.2021.10.2.003

HROMADA, E, ČERMÁKOVÁ, K. and PIECHA, M. (2022). Determinants of House Prices and Housing Affordability Dynamics in the Czech Republic. *European Journal of Interdisciplinary Studies*. Vol. 14, Iss. 2, pp. 119-132. DOI: 10.24818/ejis.2022.24

KAŠÍK, J., SLAVATA, D. (2018). Analisys of Housing Affordability in Selected European Countries. In: *Economic policy in the european union member countries: proceedings of 16th international scientific conference*. Opava: Slezská univerzita v Opavě, 2018. pp. 150-158.

KLIMOVSKY, D., NEMEC, J. and BOUCKAERT, G. (2021). The COVID-19 Pandemic in the Czech Republic and Slovakia. *SciPap 2021*. Vol. 29, No. 1, pp. 1320. DOI: https://doi.org/10.46585/sp29011320.

MALESA, K. (2022). Mieszkalnictwo w Polsce w Latach 2018–2020. *Zarządzanie Innowacyjne w Gospodarce i Biznesie*. Vol. 33, No. 2, pp. 85–101.

MATTINGLY, K., MORRISSEY, J. (2014). Housing and transport expenditure: socio-spatial indicators of affordability in Auckland. *Cities.* Vol.38, pp. 69–83.

MULLINER, E. et al. (2016). Comparative analysis of MCDM methods for the assessment of sustainable housing affordability. *Omega.* Vol. 59, pp. 146–156

MULLINER, E., MALIENE, V. (2012). Affordable housing policy and practice in the UK. In: Hepperle, E., Dixon-Gough, R., Maliene, V., Mansberger, R., Paulsson, J., Pödör, A., editors. *Land management: potential, problems and stumbling blocks.* Zürich, Switzerland: Vdf Hochschulverlag; 2012. p. 267–77.

NUMBEO (2023). *Cost of Living.* Retrieved.2023-05-08 from https://www.numbeo.com/cost-of-living/

OECD (2021). OECD Urban Policy Reviews: Housing affordability in cities in the Czech Republic. Retrieved 2022-05-18 from https://read.oecd.org/10.1787/bcddcf4a-en.

ONS (2023). *UK House Price Index - Office for National Statistics.* [online]. [cit.2023-05-08]. Available from: https://www.ons.gov.uk/economy/inflationandpriceindices/bulletins/housepriceindex/october2022

PARIS, Ch. (2007). International Perspectives on Planning and Affordable Housing. *Housing Studies*. Vol. 22, No. 1, pp. 1-9. DOI: 10.1080/02673030601024531

ROWLEY, S., ONG, R. (2012). Housing affordability, housing stress and household well - being in Australia. Melbourne: Australian Housing and Urban Research Institute.

RYNIO, D. (2021). Rynek Pierwotny Nieruchomości Mieszkaniowych i Domów w Sześciu Naj- Większych Miastach w Polsce w Dobie Pandemii COVID-19. *Biblioteka regionalisty*. Vol. 21, No. 1, pp. 160–169.

RYŠAVÝ, D. (2021). One crisis after another? How much has the COVID-19 pandemic impacted opinions on welfare-state priorities. *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration*. Vol. 29, No. 1, pp. 1237. DOI: https://doi.org/10.46585/sp29011237.

SIKORA-FERNANDEZ, D. (2018). Deprywacja mieszkaniowa w Polsce na podstawie wybranych czynników. *Space – Society – Economy*, Vol. 26, pp. 103-116.

STONE, M.E. (2006). What is housing affordability? The case for the residual income approach. *Housing Policy Debate*. Vol. 17:151–83.

ULMAN, P. and ĆWIEK, M. (2020). Housing Poverty in Polish Households and its Diversity. *Folia Oeconomica Stetinensia*, Vol. 20, No.1, pp. 437-455. DOI: https://doi.org/10.2478/foli-2020-0026

URI (2022). Demographia International Housing Affordability. [online]. [cit.2022-05-08]. Available from: http://www.demographia.com/dhi.pdf

WETZSTEIN, S. (2017). The global urban housing affordability crisis. *Urban Studies*, Vol. 54, No. 14, pp. 3159–3177. DOI: https://doi.org/10.1177/0042098017711649

WHITEHEAD, C., et al. (2009). *Measuring housing affordability: a review of data sources.* Cambridge: Cambridge Centre for Housing and Planning Research.

WILLMANN, M., MACIEJASZ, M. (2020). *Finansowanie nieruchomości mieszkaniowych w Polsce.* Opole: Uniwersytet Opolski, ISBN 978-83-7395-884-5.

Appendix 1 – Czech ad Polish market basic data (June 2022)

Region	Population	Price per m2 in CZK	Flats for sale	Month Rent per m2 in CZK	Flats for Rent	Gross Year Salary in CZK
Prague	1275406	126500	3808	396	1912	581976
South-Moravian region	1184568	82100	1291	267	702	446052
Karlovy Vary region	283210	52500	800	179	152	391260
Central Bohemian Region	1386824	71900	1341	226	378	450984
Pilsen region	578707	58000	525	193	256	428724
Liberec region	437570	58100	589	212	230	410880
South Bohemian region	637047	57400	706	190	243	408156
Highlands region	504025	53500	248	202	121	416916
Hradec Kralove region	542583	65100	506	211	232	417756
Pardubice region	514518	60000	473	199	160	399600
Zlín Region	572432	55000	373	209	193	399624
Olomouc region	622930	52600	561	199	384	404640
Moravian-Silesian Region	1177989	42800	1548	170	1065	407772
Usti Region	798898	33000	1598	173	756	419448
Lesser Poland	3410901	57394	6762	283	1415	402433
Masovia	5423168	75141	14496	346	3394	466432
Pomerania	2343928	68218	7046	316	574	407992
Podlaskie	1178353	42296	1413	238	149	369009
Greater Poland	3498733	47819	4016	226	1064	358826
Holy Cross Province	1233961	37040	1104	215	1819	344785
West Pomerania	1696193	43231	4155	269	2167	375743
Lublin	2108270	43725	2303	264	1923	359447
Kuyavia-Pomerania	2072373	36235	5341	226	2483	360173
Subcarpathia	2127164	43426	1361	209	1989	346907
Warmia-Masuria	1422737	33150	1460	167	1800	346755
Lower Silesia	2900163	45815	9385	321	2970	426967
Opole	982626	30543	851	200	1780	372229
Lubusz	1011592	31454	1401	223	1838	356199
Łódź	2454779	42532	3216	244	2201	385475
Silesia	4517635	35311	8330	238	1679	404234

Source: CZSO (2022), Trzniceny (2022), Otodom (2022), STAT.GOV (2022), own calculations

Appendix 2 – Czech ad Polish market basic data (June 2020)

Region	Population	Price per m2 in CZK	Flats for sale	Month Rent per m2 in CZK	Flats for Rent	Gross Year Salary in CZK
Prague	1275406	104400	4806	317	8806	510636
South-Moravian region	1184568	56400	1210	226	1388	394752
Karlovy Vary region	283210	37700	984	160	254	359544
Central Bohemian Region	1386824	48500	1468	208	765	418800
Pilsen region	578707	36400	664	172	628	397848
Liberec region	437570	34600	435	180	272	380436
South Bohemian region	637047	37800	572	164	379	371820
Highlands region	504025	36200	268	163	212	373764
Hradec Kralove region	542583	42500	498	180	262	383100
Pardubice region	514518	33400	340	184	232	367908
Zlín Region	572432	38400	418	177	311	365100
Olomouc region	622930	35600	926	179	559	369408
Moravian-Silesian Region	1177989	26000	924	151	1067	369720
Usti Region	798898	18000	1025	150	713	377160
Lesser Poland	3410901	52500	6024	244,11	5390	395475
Masovia	5423168	64700	14936	399,59	10216	461963
Pomerania	2343928	59000	6944	244,3	3198	394460
Podlaskie	1178353	38100	1283	208,91	277	353132
Greater Poland	3498733	45000	3490	234,23	2320	360649
Holy Cross Province	1233961	33500	891	192,31	183	345487
West Pomerania	1696193	40100	3875	216,21	931	365196
Lublin	2108270	39800	1684	209,26	514	346991
Kuyavia-Pomerania	2072373	35900	5294	201,2	1316	346262
Subcarpathia	2127164	39500	1077	184,12	519	333718
Warmia-Masuria	1422737	34300	1046	208,93	159	330586
Lower Silesia	2900163	45500	9343	240,38	4077	409756
Opole	982626	27700	921	179,76	189	357268
Lubusz	1011592	26800	1486	190,45	335	348717
Łódź	2454779	39000	2529	207,04	1081	374928
Silesia	4517635	27900	6362	206,23	2594	402849

Source: CZSO (2020), Trzniceny (2020), Otodom (2020), STAT.GOV (2020), own calculations