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STUDY OF THE IMPACT OF HOUSING AFFORDABILITY ON THE FERTILITY RATE IN BULGARIA (2014–2021): A REGIONAL ASPECT

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Abstract. The present study is devoted to the influence of housing affordability on the fertility rate in Bulgaria. Both data published by NSI and data obtained by individual request were used. Housing affordability is a factor and is represented as the ratio of the average price of a 70 m^2 apartment and the average gross salary of an employed person, as well as the ratio of the average housing price and the average income per person in a household. Fertility has the role of an outcome variable and is represented by the gross fertility rate, average age of the mother at the birth of the first child and at the birth of a child, number of live births by age of the mother and total fertility rate. Such lag values of the factor variable were used due to the long period from the moment of availability of housing to its acquisition, completion, furnishing and commissioning, and the long biological period from the decision to implement reproductive intentions to the birth of a child. The Pearson correlation coefficient was used to assess the direction and strength of the relationship. A strong negative relationship is found between housing affordability and fertility rate, except for the relationship with the total fertility rate, which is weakly positive. The change in the lag has a minimal effect on the value of the correlation coefficients. Therefore, a conclusion can be made that children are mostly born where housing affordability is low and parents are forced to raise them in unsuitable housing conditions.

Keywords*: Correlation, fertility, housing affordability, regional analysis.*

INTRODUCTION

Housing affordability is a well-studied indicator of both population's standard of living and population's life quality. Housing affordability stands among the factors determining the investment behavior of the population in conditions typical of a period of inflation. The quality of the living environment undoubtedly affects the health and self-esteem of the residents. The influence of housing affordability on the fertility rate has been relatively little studied. Where any such studies are made, the emphasis falls either on the influence of living circumstances generally, derived from the income levels or from the influence of housing provision levels. The difference between housing affordability and housing provision levels is that the first indicator illustrates a potential opportunity that an individual would have

the capacity to implement. That is, they can make a free choice whether to live in a multi-family dwelling with their parents, if that is what they like, or to live in a rental to be mobile in space and use their wherewithal to start a private business or on a personal hobby, sport or on developing their talents.

A regional approach by provinces was used due to the significant differences in housing pricing levels and population's income levels. The municipality is an even better option, because any person would live in a specific settlement, and the environment there would have the strongest influence on the degree of anyone's satisfaction with housing conditions, but the information in this section about housing prices is not sufficient to conduct a representative study. Regarding the fertility rate and the income of the population, the information availability level is high. All information used for the purposes of this study is sourced from the National Statistical Institute.

The expected usefulness of the present study is to support the implementation of appropriate measures both at the national and regional level to improve housing provision levels, which are directly dependent on housing affordability. At the province level, the impact instruments are minimal, however if municipality level is taken, if low housing affordability is found in the region, it could be invested in municipal housing or in helping young and highly educated people and people in a disadvantaged position to meet their housing needs thus fulfilling their reproductive intentions.

The purpose of the present study is to reveal the nature and strength of the relationship between housing affordability and fertility rate, which would contribute to the planning and implementation of measures that have a favorable effect on fertility.

1. LITERATURE REVIEW

Deciding to have a child would easily rank among the most important decisions young people make, as children affect every dimension of family behavior and life, both in the short and long term. In the scientific literature, there are numerous publications and regulatory documents dedicated to the role of material conditions in stimulating birth rates.

In legislation, a fundamental role is played by:

- Updated National Strategy for Demographic Development of the Population in the Republic of Bulgaria (2012–2030);
- The National Housing Strategy of the Republic of Bulgaria.

In the Updated National Strategy, as one of the specific principles, it is stipulated: "Children are a priority of the state and families. Every child has the right to a high standard of living that ensures his or her well-being, as well as the right to the highest attainable standards of health and education." "Priority I. Slowing down the negative demographic processes and the decrease in the population number; Direction 1. Encouraging the fertility rate by creating an environment favorable for the birth, upbringing and education of children" is envisaged as one of the specific measures subject to implementation for its

achievement: creation of housing conditions, living environment and infrastructure. On the other hand, "Housing affordability from an economic point of view is the balance of market demand and supply in which new construction is possible and justified. The classical indicators of affordability of Bulgarian housing are much higher, i.e., they feature unfavorable values compared to those in developed market economies. The indicators of rent affordability in the private sector are no better. A middle-income household would have to pay half of its income to rent a two-bedroom apartment in a medium-sized city. Housing benefit systems in balanced economies do not allow this expenditure to exceed 30 % of income" (The National Housing Strategy of the Republic of Bulgaria, 2017). Municipalities have almost no departmental housing stock to be provided to those in extreme need.

According to a modern strategic development of the Ministry of Regional Development and Public Works, in the analytical part of The National Housing Strategy of the Republic of Bulgaria dedicated to the affordability of the housing stock, it is emphasized that "housing needs are covered by solvent demand only in 20–25 % of cases of aspiration to own housing and no more than 30 % in cases of searching for private rental housing. The choices are extremely limited. The supply in the private sector features unaffordable pricing. The public sector is reduced to a symbolic share (3 %). While in 2015, an average household needed 6.6 annual incomes to purchase a 75 m^2 home, in big cities these values were and are significantly higher" (The National Housing Strategy of the Republic of Bulgaria, 2017).

According to Bistra Nikolova's opinion, "to overcome the demographic problems in society related to negative natural growth and ageing of Bulgaria's population, the reproduction processes need to be stimulated, and for this purpose the housing policy should be oriented towards meeting the needs of young families (households) for housing, i.e., affordable opportunities for them having independent housing should be created" (Nikolova, 2017). Niko Kukov emphasizes that one of the factors determining the fertility rate is "a delay in the solution of a number of domestic and social problems affecting young families, such as housing provision" (Kukov, 2020). According to data from a representative study for 2017, conducted by the Institute for Population and Human Studies of the Bulgarian Academy of Sciences, 47.9 % of the respondents point out that the main reason why they find it difficult to make a decision to have a child or a next child is the lack of suitable housing conditions for raising a child (Moraliyska-Nikolova, 2019).

All options for calculating housing affordability show that housing prices are the ones that are regarded as critical. In the scientific literature, there are numerous studies revealing the influence of housing prices on the fertility rate. For example, in their research conducted in the period 1992–2011 in Denmark, Daysal et al. (2020) conclude that there is a positive effect of rising house prices on fertility rates. The authors find that a DK 100 000 increase (approximately $12 000 in 2006 adjusted to purchasing power parity) in housing prices in the previous year increased the probability of having a birth by 0.27 percentage points, which made 2.32 % if taken in relation to the average value. The effects were greatest among 35–39-year-old people and among first-time mothers (Daysal et al., 2020). According to some other studies, there was a negative relationship between housing

prices and birth rates. A similar finding was advocated in a study conducted in China based on data from 2013 and 2017. According to the authors thereof, there was approximately a 0.94 percentage point decrease in the probability of having a child per each 1 % increase in the housing prices. The article provides instrumental models to account for the endogeneity. The results were stable at the city level and across maternal age. The negative effect was significant in the thirty-five major cities in China, but not significant for other smaller cities. (Clark et al., 2020) A similar relationship was found in a study conducted in Singapore that used the resale price of public flats to test whether this wealth formation could potentially increase the likelihood of having more children. By conducting a co-integration analysis of housing, income, and fertility, the conducted research confirmed the prevailing belief of "no flat, no child" among young Singaporeans. A negative long-run effect was found: a single increase in resale apartment prices reduced the total fertility rate by 0.0036, which is statistically relevant, at a 1 % error risk. Income was also found to have a negative effect on fertility (Saguin, 2021). The inconsistencies in the quoted influence of prices and incomes on birth rate suggest that the effect was due not only and not so much to housing prices, but to the price-income ratio. There is nothing surprising in the fact that rising house prices seem to have a positive effect on fertility rates if one does not take into account the rise in incomes that may be pre-empting and ultimately increasing affordability.

According to a publication by Chobaligova, Bulgaria holds the 20th position in the world in terms of housing affordability, with Saudi Arabia, South Africa, the USA, Puerto Rico, and the United Arab Emirates occupying the top positions in that ranking. The author refers to a study conducted by the British company Roofing Megastore, engaged in the supply of building materials and presented in the World Property Journal. It is a study conducted in 2021, which covers 109 countries worldwide. Affordability was presented as the number of annual salaries needed to purchase a 100 m^2 home upon tax deduction. For Bulgaria, 13 annual salaries were needed, for Romania, which ranked 43rd in terms of housing affordability, it took almost 17 years to pay off a 100 m^2 apartment investing the entire average annual salary, in Saudi Arabia it took people less than 5 years' wages to buy their own home, and in the lowest-affordability country, Ghana, 149 years' wages were needed, while in the last-but-one Sri Lanka, it took 149 annual salaries, and in Hong Kong, 73.4 annual salaries were needed (Chobaligova, 2021).

According to a publication authored by Ioana Perova, Bulgaria ranks third in terms of affordability among first-time home buyers in the world. The author refers to the British online Investing Review portal. According to this source, only India and Turkey are ahead of us. To determine the affordability of housing in a total of 50 countries surveyed, Investing Review compares the average annual remuneration and the average price per square meter of living space, referring to a benchmark of 45 m^2 apartment. Utility costs for electricity, water, heating, and internet were also taken into account (Petrova, 2021).

One of the most in-depth studies on the affordability of housing in Bulgaria during the period from 2000 to 2020 was conducted by Kristofor Pavlov – Chief Economist of UniCredit Bulbank. He compared the offer prices of average homes of 73 m^2 with average annual household incomes, both in total and for the fifteen

largest cities in the country and for 98 locations by neighborhoods of Sofia, which is the city with the best developed housing market in Bulgaria. Household incomes were grouped into decile groups. A clear picture of the dynamics of affordability was outlined, which makes it possible to perceive the need for competent consulting services when buying a home, despite the author's stipulations that he did not claim to present an expert opinion on the right time to invest in a home. He came to the conclusion that housing affordability was too low, especially in large cities. Affordability would range from 2.9 annual household incomes in 2002 to 8.1 annual household incomes in 2008. For 2020, the necessary funds were equal to 4.3 annual household incomes. For low-income decile groups, these savings periods should be 4–5 times longer than for high-income ones (Pavlov et al., 2021).

An impressive study on the impact of housing affordability on fertility rates in the regions of the Czech Republic was conducted by Tomáš Kostelecký and Jana Vobecká from the Institute in Sociology at the Czech Academy of Sciences in Prague. The authors explicitly emphasized that while housing affordability is seen as a factor and fertility as an outcome, the opposite approach could also be taken. The total fertility rate and the average age of mothers at first birth were chosen as indicators of the fertility rate (Kostelecký & Vobecka, 2009).

The indicator is the number of years to save for the purchase of an average-sized home of 70 sq.m. It is obtained by dividing the average market price of this type of housing by the average annual income of an average household. The authors adopted the regional level, this being a reasonable compromise from a perspective of information available and number of observations ensuring statistical relevance of the parameters of the regression models developed. In addition to housing affordability, the following were taken into account in the form of controlled factor variables: average salary, unemployment rate, religiosity of women, relative share of the urban population, and the level of education of women. The researchers concluded that the impact of housing affordability on fertility rates is substantial, with housing affordability issues having a stronger effect on the timing of births than on the total number of children born per woman in reproductive age. The most significant of the other considered factors affecting regional differences in fertility is the education of young women. The higher the level of education, the lower the total fertility rate.

2. ANALYSES AND RESEARCH METHODS USED

2.1. Analyses used

To estimate the fertility, the total fertility rate was used (Rusev et al., 2008), the average age of the mother at first birth by region, the average age of the mother at birth by region, and the number of live births by age of the mother by region.

To assess the affordability of housing, different countries and international organizations use a number of indicators, which can vary in terms of housing acquisition costs and household incomes (Yovkova et al., 2019; Plouin et al., 2020) Among the indicators most often used in practice is the relationship between the average price of the property and the annual income of the individual/household. A

variant of this indicator is the ratio between the size of the residential area and the possibility of its acquisition with one monthly salary, i.e. the purchasing power of wages. Another indicator measuring the affordability of residential properties is the ratio between housing costs and income, and the costs necessary to acquire a property can include the costs of repaying the principal and interest when purchasing a property with a mortgage loan, the costs related to with the maintenance of the property, mandatory fees related to transaction costs (Gilina, 2021), intermediary services, etc. According to some international institutions and organizations, affordable housing is one where households do not spend more than 30 % of their disposable income on housing costs (UN-Habitat, 2020). To measure the affordability of residential properties, a number of authors also use residual income, i.e. the income available to an individual or household after paying for consumer spending on food, clothing, electricity, water, health care, transportation, leisure, etc. (Kutty, 2005; Bozev, 2016; Stone et al., 2011).

To study the level of affordability of residential properties in the regions of the country, the indicators of the number of years to acquire a residential property based on the average annual gross salary were used in the present study as well as the indicator of the number of years to acquire a residential property based on the average annual income of a person in a household. The indicators are calculated as a ratio between the average market price of a property of 70 m^2 and the average annual gross salary, i.e. the average annual income of a person in a household, respectively.

The arguments for selecting the two indicators will be as follows:

- The choice of the average annual gross salary indicator will be determined by the fact that most young families of childbearing age would rely mostly on salary savings and loans as function of the amount of the salary/wage. In addition to housing affordability, the degree of affordability will affect the supply of rental housing and the rental price. Typically, in the course of the first years after the conclusion of a civil marriage, young couples would live in rented accommodation until they have the wherewithal to purchase their own home.
- The choice of the indicator "the average annual income of a person in a household" would be determined by the fact that living in a large household formed by two or more generations in Bulgaria is not an isolated phenomenon. This is how mutual assistance and savings are achieved from some conditionally fixed costs, such as heating, internet, cable TV, common preparation of food for the whole household, etc.

In contrast to the average annual gross salary/wage, which includes the remuneration that a person would receive for their work, the average annual income including all of the individual's earnings from wages and salaries, self-employment, property, pensions, social benefits and benefits, regular transfers from other households, as well as one-off income from sales and others.

2.2. Methods used

The methods used in the present study are relative indicators of intensity and coordination, descriptive indicators of development/growth rate, standard deviation and coefficient of variation calculated on the basis of the standard deviation, and the Pearson correlation coefficient. One-factor regression models could have been used to achieve the same success in this case if among the objectives of this study were the idea of predicting fertility rates by influencing housing affordability. Since housing affordability is pretty much determined by a purely market-based approach and therefore targeted influence on the market would be unacceptable, such a forecast would often be of a hypothetical nature. Limited series of departmental, municipal or state housing could be much more affordable than those on the free market, but in this case the criteria for allocation for use or purchase would be socially oriented rather than tied to an economic logic, which is what we are trying to uncover in this work.

The analytical form of the Pearson correlation coefficient based on the built-in function of the same name in the Excel program is as follows in Eq. (1):

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 \sum(y-\bar{y})^2}}, \tag{1}$$

where:

y – empirical values of the resulting quantity;

$\bar{y}$ – arithmetic average of the empirical values of the resulting quantity;

x – empirical values of the magnitude factor;

$\bar{x}$ – arithmetic average of the empirical values of the magnitude factor.

3. RESULTS OF THE STUDY

Table 1 presents housing affordability by region in the period 2014–2021, calculated on the basis of the average gross salary.

From the indicators presented in Table 1, it becomes obvious that the number of years to acquire a home in Bulgaria's provinces would vary in a wide range – for 2021, from 2.546 years in the Gabrovo province to 8.065 years in the Varna region. In our opinion, it is no coincidence that at the bottom of the ranking in terms of accessibility are precisely the regions, where the largest cities of the country are concentrated, namely the regions of Varna, with 8.065, Sofia (capital city), with 7.206 and Plovdiv, with 6.967, because these are cities where the house prices are the highest and obviously cannot be offset by incomes. Of interest is the comparison of the affordability of residential properties in 2021 compared to the base year 2014, where its improvement is clearly highlighted, the most significant being in Sofia (capital city), where the number of years for acquisition has almost halved, Smolyan province (−46.370 %), and Gabrovo (−41.471 %).

Table 1. Housing Affordability in the Form of the Number of Years Needed to Save (Calculated on the Basis of the Average Annual Gross Salary)

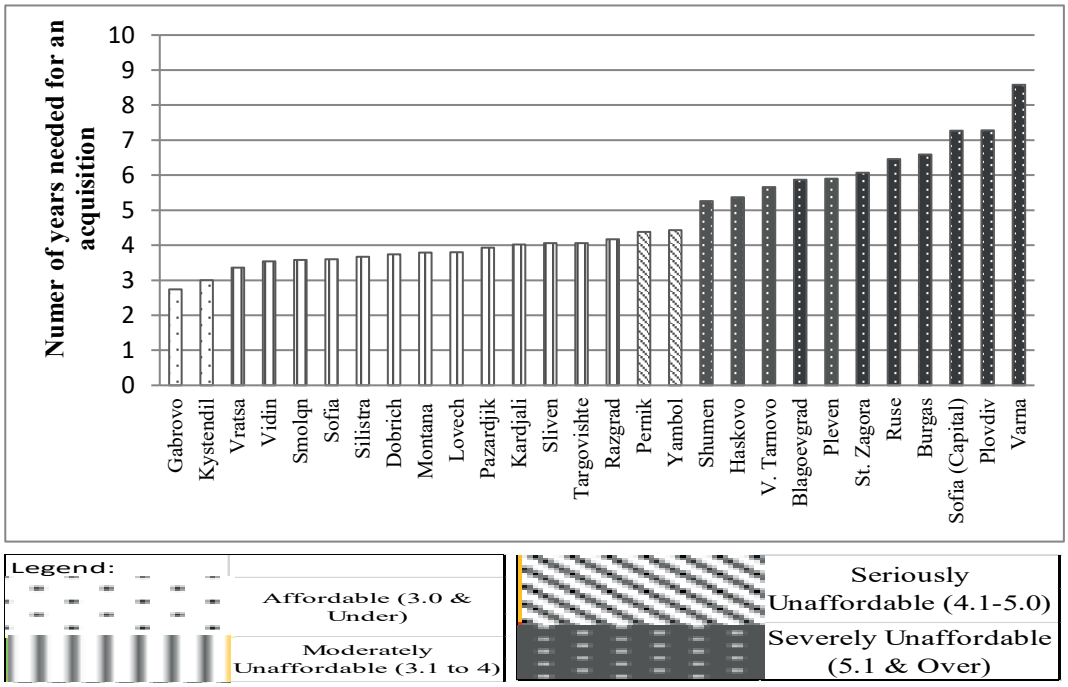
Provinces	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**Growth rate 2014 = 100**
Blagoevgrad	7.671	6.834	6.522	6.347	6.417	6.321	5.876	5.303	−30.863
Burgas	9.012	8.553	8.394	8.290	7.846	7.114	6.561	6.348	−29.557
Varna	10.39	9.678	9.644	9.747	9.410	9.157	8.576	8.065	−22.419
Tarnovo	6.655	6.854	6.396	6.218	6.180	5.896	5.648	5.457	−18.011
Vidin	5.384	5.235	5.021	4.559	4.276	3.861	3.539	3.363	−37.542
Vratsa	3.667	3.657	3.650	3.703	3.596	3.452	3.325	3.161	−13.775
Gabrovo	4.350	4.005	3.719	3.421	3.079	2.897	2.740	2.546	−41.471
Kardzhali	6.003	5.648	5.410	4.962	4.656	4.351	4.079	3.079	−40.470
Kyustendil	4.692	4.514	3.995	3.697	3.234	2.971	2.707	2.817	−39.963
Lovech	5.512	5.624	5.213	4.764	4.615	4.340	4.165	3.498	−36.548
Montana	5.222	5.381	4.614	4.430	4.390	4.051	3.738	3.401	−34.867
Pazardzhik	5.742	5.877	5.418	5.235	4.981	4.548	4.121	3.630	−36.782
Pernik	5.438	5.394	5.346	5.182	4.884	4.520	4.086	4.020	−26.074
Pleven	7.659	7.068	6.629	6.649	6.362	6.111	6.018	5.597	−26.919
Plovdiv	9.003	8.873	8.722	8.627	8.672	8.627	8.148	6.967	−22.615
Razgrad	5.359	5.074	4.919	4.769	4.564	4.336	4.077	3.952	−26.247
Ruse	7.436	7.363	6.778	7.129	6.989	6.587	6.309	6.087	−18.137
Silistra	5.493	5.359	4.759	4.367	3.987	3.563	3.196	3.329	−39.399
Sliven	5.718	5.473	5.135	5.040	4.859	4.511	4.293	3.809	−33.390
Smolyan	6.118	5.555	5.038	4.619	4.173	3.813	3.483	3.281	−46.370
Sofia (City)	14.29	14.393	14.43	14.896	14.305	14.05	13.85	7.206	−49.589
Sofia	4.863	4.551	4.407	4.234	4.092	3.844	3.594	3.453	−28.981
Stara Zagora	4.616	4.482	4.513	4.445	4.275	4.094	3.967	5.842	26.568
Dobrich	4.476	4.054	3.879	3.667	3.407	3.347	3.135	3.473	−22.418
Targovishte	6.138	5.925	5.295	4.964	4.603	4.308	4.063	3.755	−38.829
Haskovo	7.664	6.821	6.569	6.524	6.109	5.712	5.369	5.048	−34.144
Shumen	6.191	6.149	6.099	5.886	5.727	5.401	5.263	5.004	−19.174
Yambol	5.607	5.417	5.436	5.195	4.894	4.618	4.429	4.173	−25.581

Source: The indicators were calculated by the authors on the basis of data from NSI

Figure 1 shows how the specific numbers of years needed to purchase a home are reduced to a scale measuring affordability, using the Urban Reform Institute and the Frontier Center for Public Policy's assessment that “those homes are affordable where the number of years to acquire is 3 or less and, accordingly,

moderately inaccessible – from 3.1 to 4 years, seriously inaccessible – from 4.1 to 5 years and strongly inaccessible – from 5.1 and more years".

The indicators for the year 2020 are presented, as they will be used to study the relationship with the fertility rate. The reason is that housing affordability is studied as a factor and fertility as an outcome, and due to the long biological process for the realization of reproductive intentions, the factor is expected to act with a lag (delay) of at least one year.



Source: The indicators were calculated by the authors based on data from NSI

Fig. 1. Ranking of provinces in Bulgaria by number of years needed to save to purchase a home (based on gross salary according to data from 2020).

Taking into account the affordability values as mentioned above, we can conclude that the residential real estate market in the regions of the country is, for the most part, moderately and highly inaccessible to the population, since 24 of the considered provinces fall into these categories. The share of provinces where housing is affordable remains relatively low, namely Gabrovo and Kyustendil, and seriously unaffordable in Pernik and Yambol provinces.

What stands out from the data displayed in Table 2 is that they show a significantly longer period of saving for the purpose of purchasing a home given the average annual income per member of a household if compared to the average annual gross salary of an employed person. The values for this indicator vary from 23.346 years in the city of Sofia to 4.500 years in the Gabrovo province.

Table 2. Housing Affordability by Provinces in the Period 2014–2021, Calculated on the Basis of the Average Annual Income of a Household Member in BGN

Provinces	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**Growth rate 2014 = 100**
Blagoevgrad	12.509	10.901	11.196	10.142	11.150	10.200	9.796	8.838	−29.342
Burgas	19.036	18.210	17.438	16.912	17.485	16.928	12.622	12.688	−33.350
Varna	19.247	18.726	20.304	21.091	22.639	22.230	18.330	17.193	−10.673
Veliko Tarnovo	11.892	13.467	11.504	9.976	10.802	12.004	12.274	11.441	−3.792
Vidin	8.185	9.982	11.017	10.817	11.218	11.573	8.357	9.227	12.727
Vratsa	8.539	8.536	8.821	9.261	9.801	9.193	9.520	9.692	13.497
Gabrovo	7.527	6.928	6.167	5.189	5.236	5.045	4.686	4.500	−40.214
Kardzhali	11.124	11.276	9.608	9.043	9.277	9.051	8.619	7.143	−35.786
Kynstendil	9.008	10.174	8.567	8.461	8.306	8.086	6.109	5.630	−37.497
Lovech	9.856	9.178	9.089	8.625	9.162	9.222	9.445	6.514	−33.904
Montana	10.321	10.584	9.629	9.754	10.526	10.337	10.344	10.225	−0.935
Pazardzik	10.389	15.506	11.149	10.798	11.194	10.935	9.952	9.357	−9.936
Pernik	11.652	11.585	11.024	10.685	11.182	12.624	12.435	11.404	−2.129
Pleven	9.106	8.717	9.428	9.886	10.475	9.912	9.414	9.857	8.255
Plovdiv	13.210	12.405	13.284	14.046	15.712	16.933	15.276	12.791	−3.172
Razgrad	10.333	10.719	11.128	10.087	10.556	9.144	8.362	8.396	−18.747
Ruse	15.524	15.388	15.711	16.905	18.344	15.574	13.192	13.238	−14.723
Silistra	9.686	8.653	8.397	8.259	8.233	7.705	6.607	5.896	−39.124
Sliven	12.544	11.650	10.430	10.403	10.911	8.324	7.787	7.319	−41.652
Smolyan	11.064	10.268	11.537	11.106	11.016	9.506	8.473	7.338	−33.679
Sofia (City)	19.506	20.396	21.847	22.204	23.686	24.558	21.855	23.346	19.686
Sofia	12.593	12.496	10.681	10.599	11.321	11.574	9.646	9.751	−22.569
Stara Zagora	9.072	9.224	9.616	10.054	10.697	10.475	9.654	10.206	12.497
Dobrich	9.062	8.496	8.471	8.198	8.202	8.301	7.252	6.885	−24.016
Targovishte	12.922	11.975	13.042	12.482	12.855	11.330	9.910	9.954	−22.969
Haskovo	12.808	11.717	10.763	10.880	11.484	10.629	10.281	9.462	−26.130
Shumen	11.245	10.960	11.362	12.117	13.008	12.246	10.741	10.312	−8.296
Yambol	10.137	9.831	9.110	9.243	9.879	9.868	9.137	9.179	−9.451

Source: The indicators were calculated by the authors on the basis of data from NSI

The lower affordability stems from the lower incomes of some household members – pensioners, students, people with disabilities, etc. These are not directly related to fertility rates, however solidarity between household members is not to be neglected. It happens quite often that working persons in households support their elderly parents with part of their salary. In addition, it is worth considering that household income cannot include income from the so-called “grey economy”

and transfers from friends and relatives living and working abroad. Therefore, in regions featuring high unemployment rates and a declining economy, settlements or hamlets with modern new homes sometimes stand out, which could be the result of money laundering from activities not regulated by the law, but most often their sources are money earned abroad or money untaxed, which comes as a result of poor control exerted by the competent authorities. Housing located in areas with the largest cities stands out as highly unaffordable, as housing prices in these areas feature high price levels, which in turn increases the number of years needed to save in order to acquire any such homes. Comparing the affordability of residential properties in 2021 and the base year 2014, affordability's improvement in some of the regions is impressive, the most significant being in the Sliven province (−41.652) and in the Gabrovo province (−40.214). The number of years to acquire a home, according to the researched indicator, would be the largest for the city of Sofia, where affordability increased from 19.506 years in 2014 to 23.346 years in 2021, i.e. by nearly 20 %.

When assessing affordability, we should not underestimate the fact that each average household or individual has certain expenses that should be taken into account when acquiring a home, for example, expenses for food, clothing, electricity, transportation, vacation, etc. In this case, accessibility to the properties will be much more difficult. According to some authors, the affordability calculated on the basis of the average propensity to save can reach over 100 years in some of the regional cities of the country (Stoencheva, 2020).

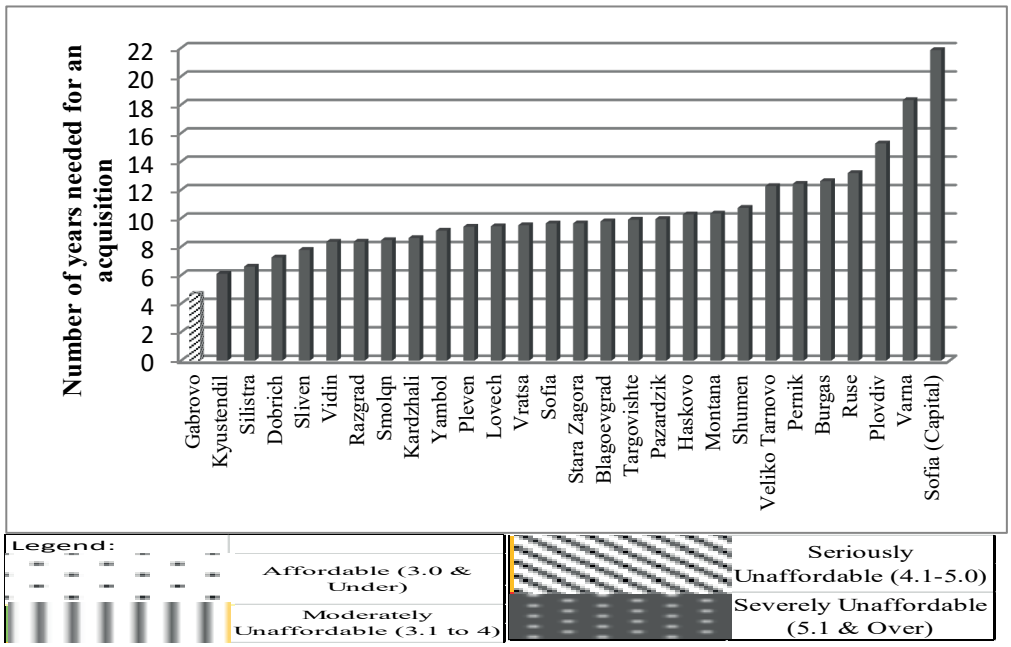
Figure 2 shows the obtained results for housing affordability calculated on the basis of the average annual income per person in the household for 2020, with these having been also interpreted by using the four-point scale of the Urban Reform Institute and the Frontier Centre for Public Policy.

From the data presented in Fig. 2, the strong inaccessibility to the housing market can be observed in almost all areas of the country. Only the Gabrovo province features a serious inaccessibility of the housing market based on the average income per person in the household.

Figures 3–6 present the variables: result. Much less variation is observed compared to housing affordability indicators.

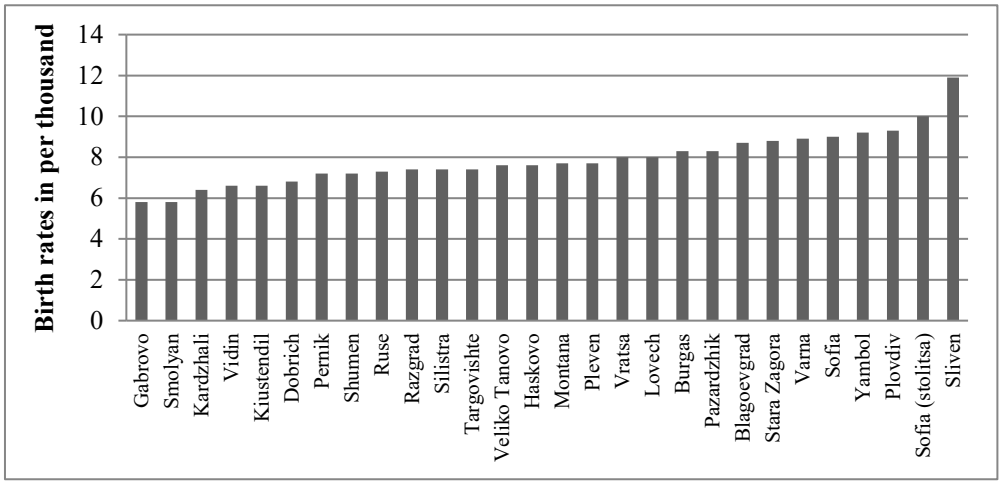
It can be assumed that the birth of the first child is less influenced by housing affordability. Very often it is a matter of prestige, and sometimes it is not planned.

Significant differences in fertility rates can be noted. In terms of fertility rate, the Sliven province stands out as the absolute frontrunner. To a large extent, this is due to the ethnic composition of the population. The runners-up after Sliven are the capital Sofia and Plovdiv, which, due to their multi-sectoral development, are attractive places to work in and the focus of accumulation of young people. At the bottom of the ranking is the Gabrovo region with quite a few depopulated settlements and a strongly ageing population.



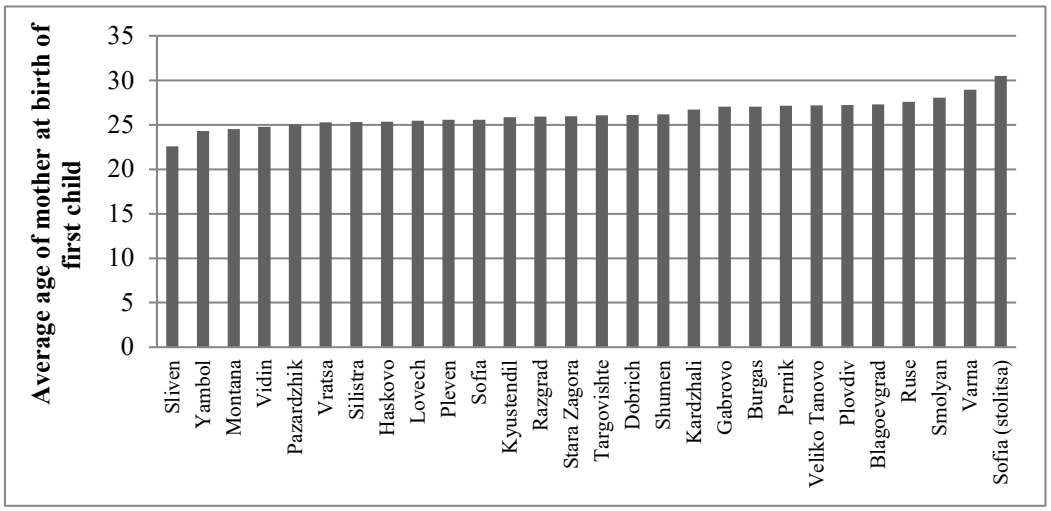
Source: The indicators were calculated by the authors based on data from NSI

Fig. 2. Ranking of provinces in Bulgaria by number of years needed to save to purchase a home based on gross salary according to data from 2020.



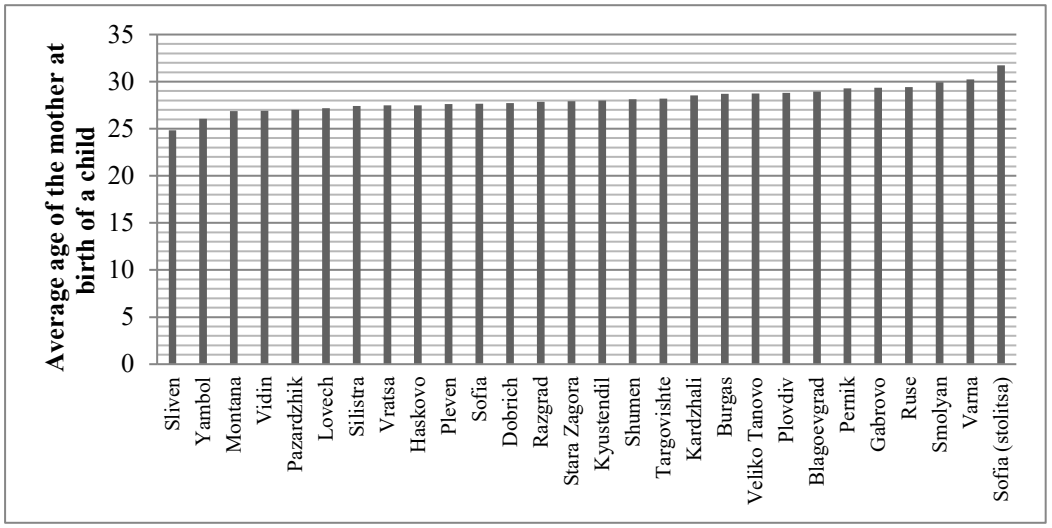
Source: According to NSI data

Fig. 3. Fertility data by provinces for 2021.



Source: According to NSI data

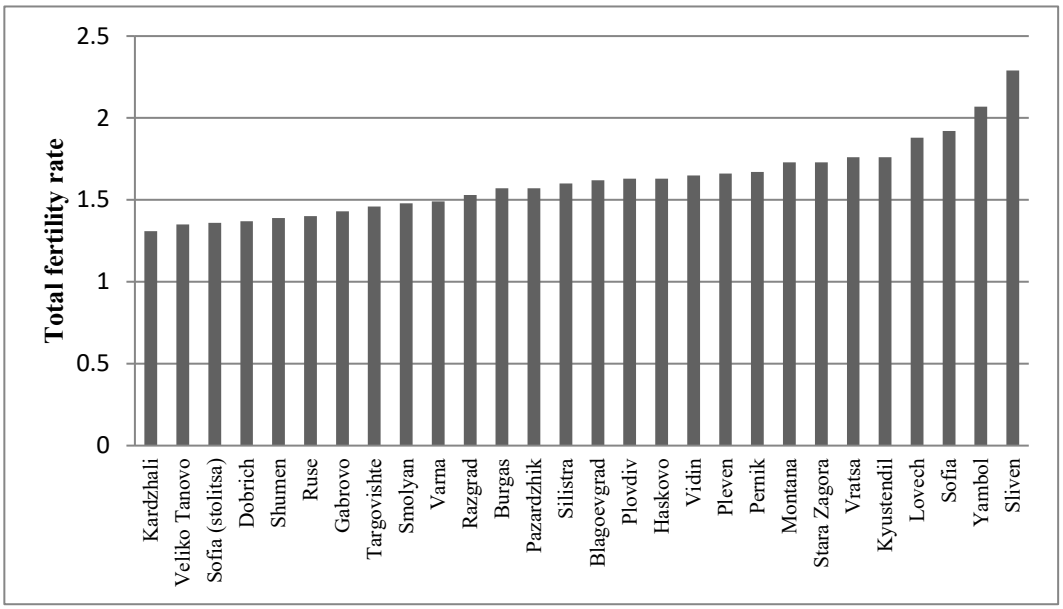
Fig. 4. Average age of mother at birth of the first child by region in 2021.



Source: According to NSI data

Fig. 5. Average age of the mother at birth of a child by province.

Logically, the province of Sliven, which ranks first in terms of fertility rate, has the lowest average age at birth of the first child. From a biological point of view, early birth, if not too early, is recommendable. The point is that newborn children need suitable living conditions for growing up and places in kindergartens and educational institutions at later ages. Early birth usually makes it difficult for the mother to obtain higher education and a high-paying job, making her dependent on the community she lives in. The lack of sufficient funds to raise children would sometimes have a negative impact on their development, making it difficult for them to access school, depriving them of the opportunity for extracurricular activities to develop their personal gifts and capacities.



Source: According to NSI data

Fig. 6. Total fertility rate by provinces for 2021.

The ranking of the provinces by the average age of having a child closely resembles the ranking according to the "birth of the first child". Since the variation in the two attributes is different, we expect that they will be affected to different degrees by housing affordability. It should be borne in mind that housing affordability usually coincides with the affordability of other consumer goods in a regional aspect, and the differences in the two average ages, in our opinion, stem mostly from the strong motivation of young families to have a first child regardless of economic conditions and, in particular, housing affordability.

The ranking of provinces by the size of the total fertility rate differs from the birth rate ranking. The degree of dispersion is not great and is lower than that of the fertility. In any case, this is a more accurate indicator, but also less dynamic and susceptible to the influence of cyclical economic changes.

Table 3 presents the correlation coefficients between the adopted indicators for assessing the fertility rate and housing affordability in Bulgaria by provinces.

A lag was used for the factor variable, since there is a significant period of time between the decision to purchase a home and its commissioning. In Bulgaria, new homes are sold on a stucco basis, and finishing and furnishing can take at least half a year. If the home is purchased in the under-construction phase, the commissioning turnaround time is even longer. As mentioned above, the long biological period between the creation of favorable conditions for the fulfilment of reproductive attitudes must also be taken into account.

Table 3. Correlation Coefficients on the Strength and Direction of the Relationship Between Fertility and Housing Affordability Calculated on the Basis of the Average Annual Gross Salary/Wage

Result: Variable by provinces, for 2021	**Factor: Variable by provinces**		
	Affordability of housing in 2020 (Lag 1)	**Affordability of housing in 2019 (Lag 2)**	**Affordability of housing in 2018 (Lag 2)**
Fertility rate	0.478	0.476	0.471
Average age of mother at birth of the first child	0.672	0.679	0.671
Average age of mother at birth of a child	0.606	0.612	0.606
Number of live births, mother's age under 20	0.377	0.382	0.377
Number of live births, mother's age 20–24	0.815	0.818	0.807
Number of live births, mother's age 25–29	0.927	0.923	0.913
Number of live births, mother's age 30–34	0.914	0.907	0.898
Number of live births, mother's age 35–39	0.905	0.897	0.890
Number of live births, mother's age 40–44	0.898	0.889	0.882
Number of live births, mother's age 45–45+	0.911	0.903	0.893
Total fertility rate	−0.274	−0.278	−0.277

Source: Authors' own calculations

All obtained correlation coefficients have a positive sign, except for those when the resulting quantity is the total fertility rate. Since the number of years to save for a home purchase is inversely related to affordability, what follows is that high affordability corresponds to low fertility rates and conversely, low affordability would be related to high fertility rates. The reason is that young people are attracted to live and work in large cities, where housing affordability is low. The total fertility rate is negatively correlated with the number of years of saving, that is, it is directly dependent on the housing affordability level. Its value is too low and slightly increases as the lag of the factor variable increases. This may lead to the conclusion that housing affordability has a positive effect on the total fertility rate, but is not a determinant of its value.

The value of the correlation coefficients is high enough to conclude that housing affordability significantly affects the fertility rate.

The relationship between the mother's average age at childbirth and housing affordability indicators would show that the less affordable the housing, the higher the mother's average age. It is logical to postpone the birth for some time in case of difficulties faced in the matter of providing suitable living conditions.

The relationship between the number of live births by maternal age and housing affordability is strong and inverse, being the strongest for the 25–29 age group and the lowest for the under-20 age group. Births when the mother is under 20 years old are not always planned, and this explains the weaker influence of housing affordability.

Table 4 uses the lagged values of housing affordability calculated on the basis of the average income of one person in the household in 2018, 2019, and 2020 as an independent variable.

Table 4. Correlation Coefficients of the Strength and Direction of the Relationship Between Fertility and Housing Affordability Calculated on the Basis of Average Income per Person in the Household

Result: Variable by provinces, for 2021	**Factor: Variable by provinces**		
	Affordability of housing in 2020 (Lag 1)	**Affordability of housing in 2019 (Lag 2)**	**Affordability of housing in 2018 (Lag 2)**
Fertility rate	0.440	0.400	0.422
Average age of mother at birth of the first child	0.676	0.678	0.633
Average age of mother at birth of a child	0.614	0.617	0.578
Number of live births, mother's age under 20	0.309	0.303	0.296
Number of live births, mother's age 20–24	0.747	0.730	0.690
Number of live births, mother's age 25–29	0.832	0.810	0.755
Number of live births, mother's age 30–34	0.813	0.792	0.738
Number of live births, mother's age 35–39	0.808	0.889	0.736
Number of live births, mother's age 40–44	0.801	0.781	0.727
Number of live births, mother's age 45–45+	0.801	0.783	0.732
Total fertility rate	−0.267	−0.280	−0.257

Source: Authors' own calculations

The correlation coefficients between housing affordability, represented as the number of years to save based on the average income per person of the household as a factor, and the indicators characterizing the fertility rate, which are shown in the first column of Table 4, have approximately the same structure as those calculated at the variant when housing affordability is calculated using the average gross salary of an employed person, but in the majority of cases they have slightly lower values. This may find its explanation in the inclusion in the calculation procedure of the number and incomes of persons who are members of the household, yet they have no direct relation to the fertility rate.

In our opinion, the obtained results confirm the conclusions made in the first version of the calculation of housing affordability, that is, that affordability and fertility rate are in a clearly expressed inverse relationship, which means that children would be born and raised in the conditions of suitable housing environments that are difficult for their parents to access. That is, high birth rates would be observed where the number of years to save to buy a home is high. The only exception is the total fertility rate (Rusev et al., 2008), which shows a weak to moderate positive relationship, meaning that the total number of children a woman would have in her lifetime at the current over-age fertility if there were no maternal mortality correlates, albeit weakly, with the degree of housing affordability.

CONCLUSIONS

The results of the study convincingly prove the presence of a strong negative relationship between housing affordability and the fertility rate, that is, children would be born mostly where it is too difficult for parents to provide suitable housing conditions. The relationship is weakly positive when the outcome variable is the total fertility rate. The relationship between the factor variable (housing affordability) and the outcome variables are of varying strength. It is relatively weak when the outcome variable is the total fertility rate, moderately strongly expressed in relation to the total fertility rate, and much more strongly expressed when working with specific measures of fertility (average age of the mother at birth of the first child and at birth per child and number of live births by mother's age groups). An exception would be the number of live births to mothers under the age of 20, where the relationship with housing affordability is the lowest. The reason is in the spontaneous nature of these births, that is, most often the lack of planning or in the desire of young couples to have a child regardless of the living circumstances in order to meet their emotional need or the desire of the community in which they live. Early births, if not too early, are favorable from a biological perspective but would create problems for young mothers in acquiring higher education and finding gainful employment, making them dependent on their relatives. The lack of good income, in turn, would reduce the opportunity for children to be provided with hygienic conditions for growing up, regular attendance at school, and the opportunity to develop their talents through additional extracurricular activities.

These facts should motivate the municipal and state authorities that are trying to stimulate the fertility rate, i.e. to provide comfortable and affordable housing for young people, and, precisely, in those locations where they are most needed. This

would be feasible and viable either by building a departmental housing stock in the municipalities, as used to be the practice in the past, or by providing financial support for the purchase of housing or the repayment of a housing loan or rent by young and highly educated married couples in order to prevent their emigration abroad.

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